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STUDIES IN APPRENTICESHIP

LABOUR - APPRENTICES

Studies in Apprenticeship

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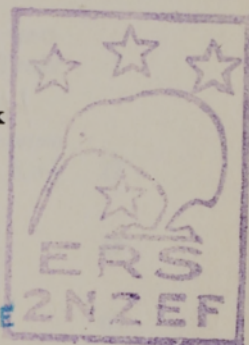
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EDITOR'S NOTE

A STUDY of apprenticeship in the electrical and the plumbing trades was made during 1937-8 by Mr. G. E. M. Keys and Mr. A. A. Kirk, in Christchurch and Wellington respectively. Their reports, originally made independently, have been collated in the office of the New Zealand Council for Educational Research and are presented in the second section of this book. The first section has been written by Mr. W. S. La Trobe, who was Superintendent of Technical Education from 1919 to 1938. He has brought an extensive knowledge of technical education, and a sympathetic understanding of the practical problems of apprentice training, to the writing of the introductory section, and the Council wishes to place on record its appreciation of the help he has so generously given.

Many employers, foremen, instructors, apprentices, and others have participated in the investigations into the two trades; without their help the studies could not have been made, and the Council and its investigators are deeply grateful to them for the time and thought they have given in answering the many questions that were necessary. The responsibility for the interpretations placed on their answers, however, remains with the authors.

H. C. McQUEEN

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STUDIES IN APPRENTICESHIP

APPRENTICESHIP IN NEW ZEALAND FROM THE EDUCATIONAL POINT OF VIEW¹

W. S. La Trobe

IN the widest sense apprenticeship means the special training of entrants into any one of the occupations existing at any time in a community. In large modern industrial countries there are tens of thousands of separately specified occupations. Even in a country like New Zealand with relatively few industries the number of occupations is astonishingly large.

The relationship between education and apprenticeship varies according to the type of occupation for which the apprentice is training and is therefore from the point of view of the educationist extremely complex. The problem is further complicated by the existence of a fundamental inconsistency which is gradually assuming the character of a menace to mankind. Modern industrial efficiency is inconsistent with the true welfare of the individual. The pursuit of industrial efficiency leads to the substitution of machine- for man-power in order to cheapen production, or, in other words, to secure the attainment of man's purposes with the least possible expenditure of human

¹ The author desires to say that large parts of this study consist of extracts, some modified, some word for word, from joint reports by officers of the Technical Branch presented to the Director of Education during the author's service as Superintendent of Technical Education. The opinions expressed here are, however, put forward without the authority of the Department or any of its officers.

energy, whether mental or physical. This substitution has been going on with increasing speed during the present century. The fact that it is greatly quickened in time of war is significant evidence of its inevitability. At first, by this substitution, the tradesman is converted into a machinist. As the process develops, the machines become more and more specialized, so that the machinist gradually becomes a machine-tender and finally the tender of a battery of machines. The splitting up of manufacturing processes due to the development of the machine leads further to the minute subdivision of labour where hand skill is still required, so that a workman may spend his days repeating one or two simple operations at a fixed point in the line of production. Thus the better organized an industry becomes the fewer tradesmen it needs and the less strength and skill does it require of each.

On the other hand the true welfare of the individual demands not only that he shall have the opportunity and the urge towards his own complete development to the extent of his natural abilities, but that conditions of life shall require and enable him to continue to exercise those abilities for his own health and satisfaction and the benefit of his family and country during his working life. Mankind thrives best on long hours of purposeful toil, and short hours of self-indulgence.

Thus the true welfare of man is fundamentally inconsistent with the efficiency of mechanized industry, that is, it is inconsistent with the satisfaction of his needs with the least possible expenditure of human energy, mental or physical. Put in this form the inconsistency is, of course, self-evident, and, incidentally, the real nature of the modern problems of unemployment and of consequent want in the midst of plenty is also self-evident.² The

² On this point see also *Science and Some Modern Problems*, a Hibbert Lecture delivered by Sir Alfred Ewing at Cambridge, February 17, 1933.

fundamental cause of unemployment is the effort to save labour. The general application of labour-saving machines and devices in all walks of life tends to extend the range of this inconsistency far beyond industrial occupations so that it must be faced by the educationist as a more or less general problem and not as connected only with apprenticeship in industry.

Before the industrial revolution the educationist, except in the guise of master tradesman and perhaps of priest, had little or nothing to do with apprentices. This state of affairs had existed without essential changes from time immemorial. The master tradesman was charged with the whole secular education and general discipline of the apprentice, who usually came to him as an infant and remained with him until he reached journeyman status at the age of manhood. In professional occupations the pupil was taken at a later age, but otherwise his training was entirely in the hands of the master to whom he was an indentured pupil. The apprentice or pupil commonly lived with his master.

In days when the individual tradesman or practitioner ran all branches of his business the general efficiency of this system, reinforced as it was by the activity of the trade guilds, guaranteed its continuance. Before the Renaissance the trades and professions were largely self-contained and their dependence on external learning, on science and mathematics, was small. The master tradesman, generally competent, had an authoritative position as a teacher in command of all the knowledge and skill on which his occupation depended. Thus the education of the apprentice was built into a framework of trade experience, trade knowledge and trade philosophy and from the first was specially adapted to his needs as a tradesman rather than to the general needs of an adult citizen. On this other side, however, the fact that both

he and his teacher were personally engaged in ordinary trade affairs ensured that the experience of the apprentice was not that of the cloister or schoolroom but of the market and workshop.

It is true that in general the old-time craftsman was illiterate. In fact even within the last thirty years many competent British workmen were unable to read or write. Less than thirty years ago a master plumber from London, sitting an examination in Wellington (New Zealand) for a certificate to get his licence for doing sanitary plumbing, had to be given the services of a shorthand-typist to read the questions to him and to record his answers. Illiteracy, however, did not prevent the old craftsman from being a repository of skill, knowledge and wisdom, especially in his own trade. He did not lack real education. Reliance on print is a modern obsession not entirely without drawbacks and the tyranny of the printed word is perhaps no less dangerous than that of its father, the machine.

However that may be, the Renaissance, besides opening up to all men stores of learning which had previously been buried in the monasteries and libraries of the near East, led to an enormous development of the experimental sciences, with applications of all sorts in trade and industry. In particular, the steam engine came into practical use and the industrial revolution followed.

More and more each trade and industry found itself dependent on others for essential material, tools, general equipment and even for technique and trade development. Master tradesmen remained masters of the handicraft of their trades, but the introduction of prepared materials and the gradual substitution of machine-made for hand-made goods restricted the scope of the craftsman in each trade, while on the other hand the resources of science and mathematics brought to bear on trade problems

removed from the master tradesman his former pre-eminence as the repository of the theory and 'secrets' of his trade. Thus, even without the growth of the factory system and the division of labour, the craftsman was destined to lose that position of authority as a teacher of the mysteries of his craft which he had so long enjoyed.

The factory system, with the extended use of power, the subdivision of labour and the concentration of large numbers of employees under factory managers, replaced the old training of the apprentice 'living in' under the eye of the master tradesman working for himself, by training under foremen and leading hands in the factory. The training became less intimate and in most cases less comprehensive. By the middle of the last century it became clear that future leaders of industry could no longer receive their entire training in the workshop or factory but must get additional instruction, bearing on their occupations, at the hands of experts in the applications of science to their industry. Technical Colleges and Mechanics' Institutes made their appearance.

The spread of learning and the enforcement of attendance at primary schools also cut directly across traditional apprenticeship practice. Step by step child labour became restricted. Step by step the range and depth of compulsory school training increased and the age of entry to trade apprenticeship gradually rose till it reached from thirteen to fifteen years at the end of last century. The rise during the last forty years has not been great, but, whereas formerly a Fourth Standard pass relieved the child from further compulsory attendance at school, the tendency now is to require not less than two years of post-primary schooling. In some industrial countries the school-leaving age has been raised to sixteen, and it appears to be probable that this age will be adopted more generally in course of time. When this takes place, nearly two-thirds of the time

allotted to apprenticeship in the Middle Ages will have been cut off.

Among the various causes which have operated against raising the age at which children leave school to enter apprenticeship has been the necessity, almost invariably stressed by both journeymen and masters, for beginning the training of the apprentice when he is young and pliable so that he may be able to acquire by long practice while he is still growing the physical constitution and the semi-automatic skill, speed, certainty and conservation of effort which mark the operations of the expert tradesman. Another factor has been the restless desire of the young adolescent to leave school and go to work, with which the economic factor is also bound up.

Thus, apart altogether from the merits or demerits of school training, and the attractions or repulsions which it had for the child and his parents, there have been strong influences at work against raising the school-leaving age beyond that of early adolescence. These influences are gradually losing force as the mechanization of industry proceeds and the craftsman is displaced by the machine, which far excels him in speed, accuracy and economy of human effort, but lacks the saving grace of authenticity. It produces endless facsimiles but no masterpieces. Creative work remains in the hand of the workman, but he no longer needs the speed of the old craftsman and a shorter apprenticeship after a longer school life suffices for his purposes in most cases. As a result of the rise in the school leaving age which has already taken place, and of the general fluidity of social life due to the development of democratic ideals, the choice of an occupation has largely ceased to be an 'act of God,' often incident to birth. A science of vocational guidance is being developed and its practice tends to become a regular part of the functions

of those concerned in the education of the young and their passage from school training to gainful occupation.

The problem of vocational guidance is not, however, a simple one. In theory, it consists, in each particular case, in finding out what occupation the child will be best fitted for when he grows up, in preparing him for that occupation and in placing him firmly in it. This clearly involves a difficult prognosis of the child's future abilities, based on a complicated analysis of his aptitudes, interests and performances at school. It also involves a complete knowledge of all possible occupations and the aptitudes, interests, character, and personality requisite for success in each. Finally it means finding a place in the right occupation for the suitable entrant. However completely the prognosis of the child's abilities may be made and however well the analysis of occupational needs may be done, it is easily seen that from the practical point of view vocational guidance stands or falls by its success or failure in finding a suitable place for each entrant, and in giving him after-care, and some help in keeping out of the pool of unemployment. In a static social and economic structure, such, say, as that of the Old Stone Age, the problems of vocational guidance might admit of a permanent solution but in the rapidly evolving conditions of modern industry they do not.

It is true that industry must ordinarily accept the material supplied to it and therefore that it must make the best of the recruits to its ranks whatever their preparation may have been. To an extent circumscribed by the limits within which the industry can maintain itself, employment may be made to fit the employee. To this extent, which varies according to the environment for any given industry, there may be adjustment of needs to the labour available, but on the other hand even for the

most suitable entrants there is in general a limit to the openings offering.

Fortunately, in spite of the fact that in regard to any particular occupation a proportion of the population, possibly in some cases a large proportion, are disqualified by specific defects in ability, character or interest from being suitable, the differences between human beings are on the average for ordinary occupations of much less moment than their similarities. Every able-bodied horse, so to say, is still a horse, even though he may not be a Derby winner!

Hence the vocational guidance officer is able to place his clients, some of them again and again, in fairly suitable occupations without having from the scientific point of view more than a rough idea of their aptitudes and general suitability, or of the needs of the particular occupations in which he places them. It is admitted, of course, that in exceptional cases the efforts of the vocational guidance officer may produce astounding results, not only in individual cases, but, indirectly, in whole industries. No doubt he earns his oats by his services in such cases alone apart altogether from his general utility in ordinary guidance and placement. Thus vocational guidance occupies in its relationship to the personnel of industry somewhat the same position as pure science in relation to the material side and for much the same reasons.

Apart from dealing with the specific problems of prognosis and placement, the educationist has the general, and important, duty of preparing the child for entrance into his possible occupation. A comprehensive view of the relationship of educational institutions to the preparation of young people for adult occupations must take account not only of the fact that practically all school children are concerned in the question, but also that the total number of occupations distinguished by separate classi-

fication amounts to tens of thousands in a large modern country, and that therefore the necessity arises of finding for leading occupations and groups of occupations the greatest common measure of pre-vocational training. In each particular case the school must try to work in with the trade or occupation in preparing the entrant for such trade training or apprenticeship as may exist.

The tendency of old institutions to persist after they have ceased to function effectively is well illustrated in the apprenticeship system, which, as we have seen, has been for many years weakened by the general mechanization of industry, and undermined by the development of compulsory school education and the gradual raising of the compulsory school age. Both these agencies may be expected to continue their work, so that the time must come when apprenticeship as at present understood will disappear altogether in nearly all, if not in all, industries. The effect, even now quite considerable, will be to transfer the training of the young person from the employer to the school, State or private.

In the past such a transfer was impossible since no school could provide the type of training which, through a long apprenticeship from tender infancy to adult manhood under the guidance of a master of all the branches of a comprehensive trade, produced the craftsmen of the old guilds. Mechanized industries do not require such craftsmen, but need rather a general adaptability and handiness which it is quite possible to develop satisfactorily in the school. In commercial, agricultural and domestic pursuits a similar tendency towards simplification of operations and reliance on machines and science involves similar modifications of the training of the young worker. With the rapid development of new industries and the revolutionizing or decay of old ones, occupations continually change, disappear and are created,

so that the worker must be prepared at any time to learn a new job or join the ranks of the unemployed. Thus adaptability and general usefulness of hand and brain are fast becoming the most marketable assets of the wage earner.

Ordinary apprenticeship is not specially designed to develop these qualities, especially in trades subdivided into highly specialized sections, while the machine-tender is very unlikely to acquire them in the performance of his ordinary duties. On the other hand the schools, which cannot hope to give specialized training for the great majority of occupations, may readily be organized to give a general training of hand and brain that will enable youth to adapt itself easily to the needs of highly specialized jobs. The general mechanization of industry, by thus making it possible and necessary for youth to receive most of its training in the school, will open the way for education in the widest sense to become not the by-product of infant labour or apprenticeship to a trade, but the whole business of the years of childhood and adolescence.

Increasing hours of leisure consequent on shorter working hours and earlier retirement from active service, together with the growth of the democratic spirit in civic, national and international affairs, require that the young should have careful preparation not only for earning a living but also for properly discharging their civic and social duties, and for the responsibility of making the best use of their leisure time. Without having by its derivation, history and traditions either the constitution or the experience for performing its new duties satisfactorily, the school will have forced upon it an open field, a universal application, and this triple responsibility.

Naturally conservative and little affected directly by the revolutionary changes which the machine has brought

in its train, the school is now suddenly confronted with all that these changes involve in transforming its own functions and its relationship with the multifarious occupations of adult years. From being detached and dealing with ideal rather than with real conditions, it finds itself thrown into violent contact with actual conditions in all kinds of occupations, and asked to bring order out of the chaos produced by the falling ruins of apprenticeship and professional pupilage.

Thus general compulsory education has taken the children from field and factory only to drag the school out of the cloistered quadrangle and throw it into the maelstrom of civic and industrial life. Its spiritual responsibilities remain as before, but to them have been added temporal obligations and, for good or evil, temporal powers of which the extent and implications will perhaps only be realized when the brave new world finds its axis and settles down to steady rotation. In the meantime industrial apprenticeships still exist in various stages of decay and the educationist must adopt such means as he may find practicable for supplementary trade training to the best advantage of the young people.

The means to be adopted depend mainly on local conditions and no general system can be put forward as suitable in all circumstances. In this Dominion conditions seem to suggest a solution of the problem, firstly by means of pre-vocational courses introductory to fairly well defined groups of occupations, and, secondly, by part-time teaching of the apprentice or trade learner in co-operation as far as possible with employers and employees. It is true that the rationalization of industry has not proceeded as far in the Dominion as in more heavily industrialized countries, but the process is certainly going on and must be increasingly in evidence as secondary industries become more fully organized on competitive lines and are

concentrated at suitable centres. The fact, however, that the great pastoral industries of the country are best served by the distributing and exporting centres existing at suitable ports round the Dominion will tend to retard a great concentration of population and of industries at any one of the principal ports. Thus each of the principal towns, as Dr. F. H. Spencer has pointed out recently,³ resembles a London in miniature, with a large number of industries each employing a relatively small number of tradesmen. In the secondary towns and rural districts the numbers in any one trade are in general less than in the principal towns.

Junior trade schools, on the lines possible in large industrial towns with centralized industries, are therefore scarcely possible in the Dominion with its scattered manufacturing units, apart altogether from inherent difficulties such as the high cost of providing, housing and maintaining specialized equipment, and the necessity for disposing of an output large in proportion as the practical training of the pupils conformed to trade requirements. On the whole, it would appear that post-primary school courses should be of a predominantly pre-vocational character even in those schools or courses which are specially organized to prepare boys and girls for entrance into specific occupations or groups of occupations in commerce or industry. Such courses include in addition to some training of a special kind suitable to the group of occupations contemplated, an introduction to the culture that is our heritage and to those accepted principles of science and mathematics upon which the industrial state is built, to the end that the young people may have a sound knowledge of scientific principles, a disciplined intelligence, and a developed power of adaptation and initiative.

³ Spencer, F. H.: *Technical Education in Australia and New Zealand*, 95. New York, 1939.

If the substance of such training is built into a framework of trade experience, trade knowledge and trade philosophy, as was the training of the infant apprentice in days of old, we may expect it to remain in the adult structure and not be shed at the first prick of the wage-earner's goad. Courses in the technical high schools of the Dominion have in general been designed on these lines, and present conditions demand that the qualities which they nourish should be developed to an even greater degree and curricula constantly modified to this end.

After leaving school and entering on some gainful occupation the young person continues his preparation for adult life. Whether as a young labourer or as a part-time university student or in any one of the diverse intermediate roles he continues to learn his part in the drama. The duty of the educationist is to help him to play a worthy part.

In this connection the problem of the trade apprentice and trade learner is peculiarly difficult in this Dominion. The same causes that restrict the practical extension of junior trade schools operate against the successful development of part-time courses for trade learners and apprentices. It is true that for many years technical schools in the Dominion have provided classes and courses in certain trades with some success and have also conducted continuation, commercial and art courses and classes mainly in the evening, which have been attended by many students who have *post hoc* if not *propter hoc* become leaders in their trades or professions. Attendance at classes for apprentices has in general been voluntary although powers exist under the *Apprentices Act, 1923*, for an Apprenticeship Committee to order the attendance of apprentices in a given trade and locality at classes provided by a technical school or by the employers. In the latter case, if a majority of those employing a majority of the

workers in a given trade and locality agree, a levy may be made on all the employers in that trade and locality to establish and maintain the classes.

Compulsory attendance of apprentices has only been really successful in cases where at least half the class time has been within ordinary working hours or on Saturday mornings (not working hours since the 40-hour week was introduced). The most favourable conditions probably exist in cases where the apprentices attend classes in the works during working hours while the technical school provides supplementary training in science, mathematics, economics, art etc. and their applications to the trade concerned. This supplementary training, usually given in the worker's own time and designed to improve his understanding of the principles underlying the practice of his trade or profession, is calculated to make him a better operative and also to prepare him, if he is otherwise eligible, for advancement to higher positions in the industry.

In the Government Railways Workshops, for example, such a scheme has been in operation for some years, and workshop classes are of course very common in the large centralized industries of other countries. Provision is made in some schemes for granting scholarships for full-time training in higher technical institutes or university professional schools to apprentices showing exceptional ability. Government Departments in the Dominion and large manufacturing corporations in industrial countries are able to take a long view of the apprentice's training, especially as in both cases the men directing the operations of the industry are themselves employed in stable and prosperous concerns. The employer-owners of small and often struggling industries can hardly be expected to take the long view. They employ apprentices for immediate business reasons and cannot afford to give them time off

for technical classes. The general result has been that the power to compel attendance at technical classes given to Apprenticeship Committees under the Act of 1923 has remained more or less dormant, especially as regards attendance during ordinary working hours.

Proposals have been put forward from time to time for the apprentice to spend alternate periods, ranging in different schemes from a fortnight up to six months, in the trade and in the technical school or institute. Such schemes have not been tried out in the Dominion, but in other countries they have never made much headway and seem on the whole to have been unpopular with all concerned.

Loss of wages, lack of continuity in training in both shop and school, continual abrupt changes from work to school and vice versa tended to prevent the apprentice from settling down properly either to work or study. Some disorganization and interference with the regular running of the shops, and loss of the assistance of the apprentice for half his time tended to antagonize the employer. Perhaps more important was the loss of full trade service in the ordinary period of apprenticeship. The same objections apply to the twin-apprenticeship scheme whereby one apprentice would be at school when the other was at work. The only advantage over the part-time single apprentice scheme would be that the employer had an apprentice all the time and so had the school, changing about taking place at set intervals. Moreover, in most trades the number of apprentices is limited at the instance of the employees, partly to avoid future overcrowding and consequent unemployment of journeymen, and partly to prevent the employers from exploiting boy labour to the detriment of the adult workers. Under either scheme, therefore, in practice either too many apprentices would be trained or the employers would lose up to half

the services of their apprentices while the apprentice would lose much of his training under trade conditions. The difficulty might in some cases be overcome by counting time at school as less than full-time service for apprenticeship purposes. There would, however, be considerable difficulty in practice in prolonging the period of ordinary apprenticeship beyond the age of manhood while at the other end full-time attendance at school up to the latest possible age would, in the light of all past experience of part-time school attendance, be preferable to an early transfer to part-time wage earning. Nevertheless, there are strong reasons for making at least the probationary period of apprenticeship one in which a substantial portion of the working week is devoted to attendance at school, so that the suitability of the apprentice-elect may be tested not only by his reaction to employment in the shop but also by his progress in more general and searching subjects on which his ultimate success in the trade might mainly depend. Since with such close examination of the aptitudes of the probationers there would be a considerably heavier percentage of rejection than at present, and since in any case the scheme would apply only to the earliest period of apprenticeship, it would appear that a modified form of the half-time or the twin-probationer principle might well be applied, especially in trades for which under present industrial conditions a long apprenticeship is still considered necessary. It would certainly be in the interests of the trade concerned, no less than to the best advantage of the public, that the apprentices should be carefully chosen and only those probationers accepted who gave certain promise of becoming thoroughly efficient workmen. Such a scheme would also help the vocational guidance officer in what is perhaps the most vital part of his work.

Similarly, full-time pre-vocational courses in suitable

schools, such as the technical high schools, perform a decidedly useful function in indicating the true bent of children before they become apprentices, as well as giving them a measure of vocational experience under conditions not too far removed from those of the trade itself.

Where such training is carried well beyond the stage reached by the average entrant on apprenticeship, it has long been urged by the technical school principals that provision should be made for counting full-time attendance in appropriate courses as equivalent at least in part to time actually served in apprenticeship. This would obviously be equivalent to shortening the period of apprenticeship in such cases, and giving additional wages for the first and subsequent years. While employers have occasionally looked with not unkindly eye on giving bonuses to specially prepared apprentices, trades as a whole, masters and men alike, have opposed any recognition of full-time attendance at school as counting towards apprenticeship. The truth is that the fixed period of service under tradesmen working in ordinary trade conditions is the one essential foundation on which the whole apprenticeship system is based. The master may neglect to teach his apprentices, the work may be unduly specialized or of low standard, the apprentice may be badly prepared to begin with, may be awkward or stupid or lazy or of doubtful character, but if he manages to avoid having his indentures cancelled before he is out of his time, and if, in such trades as require some kind of examination pass before he can work as a journeyman, he manages to scrape through, he becomes entitled to a journeyman's status and whatever advantages and privileges appertain thereto. The one thing he must do in all cases is to serve his time. There are of course sound reasons for this insistence on a fixed period of trade service. It ensures that all the apprentices shall have trained for the

same length of time in approximately the same environment and under the conditions in which they will afterwards work as tradesmen. It works automatically once the conditions are laid down. There does not appear to be any other way not depending on human judgment of individual cases of ensuring with even moderate certainty that a man shall have the necessary skill and experience to practise his trade. Once it is admitted that the whole of the period of apprenticeship may not be necessary in any class of cases the question of an objective test of trade efficiency must immediately arise.

The only satisfactory objective test is taken by all workers whether tradesmen or not. If they can get a job, keep it, and give satisfaction in it, that is sufficient evidence of their fitness for it. In another connection, but in not altogether dissimilar circumstances, it is argued that as a guarantee of fitness for entering the university four years in a suitable course at a post-primary school is better than a pass in the entrance examination.

The attitude of masters and men in refusing to consider school attendance of any kind as equivalent in any measure to trade service is therefore probably justified even at the present stage in the decay of apprenticeship in the Dominion. No radical change from the present system for the provision of training supplementary to the trade training of the apprentice can therefore be expected in the near future.

For the apprentice whose normal training in the shop covers reasonably well all the activities of a given trade, sufficient and suitable additional training in the principles underlying the practice of his trade may be obtained in a technical school which is provided with suitable classrooms, laboratories and workshops containing simple tools and general purpose machines. At present this additional training is given for the most part in voluntary evening

classes, though there is a tendency for Apprenticeship Committees to make classes compulsory but not usually for attendance during working hours.

There appears to be justification for at least half the supplementary technical training to be taken in working hours up to, say, two half-days weekly in the earlier years of apprenticeship. The technical school authorities have regularly in their reports emphasized the unsuitability of evening hours for training that ordinarily requires alert concentration on the part of the student, which he often cannot give after a day's work followed usually by his principal daily meal swallowed in haste and not digested at leisure.

In the case of keen and energetic voluntary students good results are possible, at the cost of considerable strain on the less robust, but where attendance of young people at evening classes has been made compulsory results have in most cases been disappointing, partly through indifference on the part of some of the youths and partly on account of the physical strain involved.

The rate of progress in voluntary classes is naturally much higher than in compulsory classes, where the general atmosphere is much less favourable, and the good students held back by the slow pace of the others are liable to become disgusted and to leave at the first opportunity unless the numbers available warrant placing them in special classes. Compulsory day classes for apprentices are much more satisfactory especially if they are taken in ordinary working hours for which the apprentice receives payment and during which he would be working at the trade if he were not at class. Even when he is not specially interested in the actual tuition, he may find it a welcome change from ordinary work and, at the worst, his attitude towards it is not likely to be so perverse as it may undoubtedly become when he is dragged out unwillingly at night

when other people are enjoying leisure hours. On the whole, compulsory evening classes are likely to be reasonably successful only when they are vigorously supported by an active and efficient Apprenticeship Committee ready to take strong disciplinary measures against idle and refractory students.

So far as the interests of the trade and the public are concerned, voluntary attendance at evening classes combined with a modicum of compulsory attendance at day classes would ensure, in all cases where the trade training was comprehensive and satisfactory, that the journeyman was as well trained as he needed to be, while the exceptional apprentice would find in the voluntary evening classes the best chance of making progress untrammelled by the drag of stupid or indifferent students.

Unfortunately, the apprentice may be debarred from getting comprehensive training in his trade under his indentures by the character of his master's business, which is often more or less narrowly specialized. The question then arises as to whether he needs a more comprehensive training than he is getting. If he does not, the apprenticeship arrangements are out of date and need revision, particularly, perhaps, as to years of service. If he does need more comprehensive training it is the duty of all concerned to see that he gets it. This is a matter that goes far beyond the particular trade and the personal interests of the apprentices, vitally as these are affected. The public has a right to demand that tradesmen enjoying special rights and privileges in the community should be competent to discharge the duties in respect of which they have secured those rights and privileges.

The obvious way, if open, of ensuring that the apprentice shall be fully trained is for the Apprenticeship Committee to switch the apprentices round among the

employers in different branches of the trade so that they may complete their training in all branches. This clearly involves, for all practical purposes, apprenticeship to the trade or to the Apprenticeship Committee and would go far towards severing the traditional bond of intimacy between the master and his pupil. In most cases, however, this has already been more or less impaired by the changing conditions of industry. At this stage other difficulties are much more serious. For example it is usually in the last years of his apprenticeship that the young worker returns to his employer the cost of his early training and it is decidedly in the interests of the apprentice that this should be so. If the employer had the apprentice for only a part of his time he would be compelled to see that he got value for wages paid during that part. Again, in one branch of a trade requiring many apprentices the period necessary for full training might be short, in another needing few apprentices the opposite might easily be true. In addition to practical difficulties of this kind the employers would naturally object to a practice which would to a large extent remove the apprentices from their control. Hence it is not surprising that the powers of transfer of apprentices given to Apprenticeship Committees under the Act of 1923 are invoked only rarely and in special cases.

The only alternative to transferring apprentices from one employer to another in cases where supplementary trade training is necessary appears to be the trade class or trade school. Evening trade classes have been a feature of technical school work for many years in the Dominion, mainly in work such as stair building which involves a knowledge of practical geometry not taught in the trade, milling machine practice for the same reason, lead work of kinds rarely met in practice, branches of motor mechanics depending directly on knowledge of theory,

and so on. The classes have been usually voluntary and the demand for them may be considered a sufficient justification of their existence.

The trade class at a technical school can rarely be carried on under ordinary trade conditions, and when it prepares candidates for trade examinations it is tied down more or less by the conditions and syllabuses of those examinations which, like the City and Guilds of London programmes, may have been drawn up in another country, or, which, like the licence examinations under Registration Acts within New Zealand, do not necessarily cover local practice, which often varies from place to place in the Dominion.

It is true that steps have been taken from time to time in some centres to provide such vocational training as the trade itself may consider necessary outside of what the apprentice gets in the ordinary course of the employer's business. On the whole, however, it cannot be said that there has been any widespread development of trade classes under the *Apprentices Act, 1923*. The provision of ordinary technical classes concerned with the inculcation, demonstration and application of the principles underlying the practice of a trade or occupation may rightly be regarded as a proper function of the educational authorities of the Dominion. To this category most of the purely voluntary trade classes at technical schools belong and no exception can be taken to their support and direction by the educational authorities concerned.

When however the object is to train operatives to handle materials at the rate and on the scale of the factory, demanding it may be the use of a manufacturing plant consisting of a series of highly specialized machines and involving an input of materials and an output of finished goods on a commercial scale, it would appear that such training does not lie within the legiti-

mate scope of the activities of the educational authorities. In such cases the trade concerned should be expected to arrange its own training as provided for in the *Apprentices Act*.

As a source of trained workmen the trade school has never found much favour among British employers and the method has only been employed in special cases, mostly for the training or re-training of adults who for some unavoidable reason have not served the usual apprenticeship. In ordinary cases the required supplementary training of the apprentice is intermediate in character to the pure study of principles and the acquisition of specialized manual dexterity in a single operation or group of operations.

This kind of training has been arranged very satisfactorily in some cases by co-operation between the trade and the school, the trade providing at least the equipment and material necessary for practical training in operations lying outside the normal scope of technical school work. Thus the problem of providing facilities for the training of apprentices is one of which the solution depends on many factors, which vary not only from trade to trade but from place to place and from time to time, so that almost day to day adjustments are necessary.

Developments in trade practice, for example, often precede the elaboration of the trade theory which is afterwards evolved to explain and rationalize them. It is therefore almost inevitable that the equipment of technical institutions should lag somewhat behind the most up-to-date practice especially as there is not usually the urge of strenuous competition to force the technical colleges to discard obsolescent equipment and to obtain the latest and best apparatus, though the necessity for doing so should be self-evident. What applies to the provision of material equipment is also true of personnel.

The need for refresher courses for full-time teachers is generally recognized, but the practice adopted in some countries of arranging for full-time instructors to obtain full-time trade experience for lengthened periods from time to time has not yet been introduced into the Dominion. The general employment however of tradesmen and professional men in active practice for evening class work enables the technical schools to keep the senior parts of their instruction in close accord with trade developments.

Apprenticeship Committees and the Trade Advisory Boards set up by some Technical Colleges owe a great deal of their success to their power of presenting with convincing arguments and unquestionable authority recommendations in regard to accommodation, equipment and teaching strength to the administrators concerned. This is but one of their important functions. The training of apprentices is not a matter solely of the provision of facilities for teaching and of engaging competent teachers. Mass production methods might be possible in the trade school, but in all other cases the training of an apprentice is an intensely individual problem which in each case demands careful attention by the school, the employer, the Apprenticeship Committee, and the vocational guidance expert as liaison officer.

As guide, philosopher and friend this modern concatenation of authorities would seem to be a poor substitute for the master craftsman of the middle ages, and the attachment of each apprentice to a skilled workman must remain wherever it is possible a most important factor in his training, even though the tradesman can seldom pretend to such complete mastery of current theory and practice as the old craftsman possessed in his day.

In normal times reasonable provision is made for future

requirements in regard to skilled labour. The *Apprentices Act*, 1923, provides for the employment and training of apprentices and for their transfer from employers unable to continue their training to others able to do so. In addition there are agreements limiting the numbers entering any trade. There may be in times of trade expansion a tendency to appoint too many apprentices and this is followed in times of trade restriction by the appointment of too few. In severe depressions even apprentices actually in training may become unemployed. Thus in the recent depression in the Dominion the number of apprentices dwindled to approximately two-fifths of those previously employed. When trade began to expand again new apprentices were taken on in relatively large numbers so that in a comparatively short time the deficiency in numbers had almost disappeared. The new apprentices were naturally not recruited from those who though eligible had been unable to get employment during the lean years, and were now too old. These unfortunates had lost their chance of employment in occupations for which they would have been well suited. Had they been trained they would have been available to meet the heavy demand for tradesmen when business revived.

This is not a matter within the power of industry itself to correct. It is part of the responsibility which the country as a whole has to bear in solving the problem of providing for people thrown out of their normal occupations and unable to obtain others in times of economic stress. The importance of seeing that the futures of our young people are not ruined by their missing a suitable training at the right time through no fault of their own is obvious enough.

It would also be clearly in the interests of all concerned that the numbers of apprentices in training should be

increased rather than diminished in times of trade depression so as to bring the supply of tradesmen more into phase with the fluctuations in demand. The smoothing out of waves in the employment and training of apprentices would also help in the establishment of a more logical system of vocational guidance, training and placement, and so add to the general stability of educational conditions in post-primary schools and colleges.

For these and other reasons it has been suggested that the Crown should be a party to the apprenticeship contract with power to assume the status and responsibilities of employing authority in exceptional circumstances. No doubt as the mechanization of industry proceeds the State will find it necessary to assume more and more responsibility for the training of young persons for employment, and this proposal for the State to take charge when employers are compelled to default seems to be a natural step in the process.

There will still remain the fundamental inconsistency between the apparently inevitable development of mechanical efficiency in industry and the true welfare of mankind. The suggested pursuit of self-respect by means of leisure-hour hobbies seems to savour too much of Samuel Butler's 'musical banks,' but it is difficult to see what other suggestion the educationist can put forward, so perhaps it tends to become necessary for all men to follow the example of that British statesman who was said to have made trifles his serious business and his serious business a trifle. A difficult task for a serious-minded people.

APPRENTICESHIP IN THE ELECTRICAL AND THE PLUMBING TRADES

G. E. M. Keys & A. A. Kirk

UNDER a system of apprenticeship it is the duty of the employer to train his recruits in workshop processes. Apprenticeship must consequently be regarded as an important part of the provision for technical education; and in the interests both of industrial efficiency, which depends upon an adequate supply of skilled tradesmen, and of the general well-being of youth in industry, it is necessary to have detailed knowledge of the way in which the system works in practice. Moreover, such knowledge has an obvious bearing on the question of just where the school's responsibility for technical education ends and that of industry begins.

Yet in New Zealand there has so far been little systematic study of trade training in industry, and it has been difficult to know what methods of investigation would yield the most useful and reliable results. This lack of a proved technique did much to determine the form of our research. Instead of attempting a wide survey of the whole field of apprenticeship we confined ourselves to two trades—the electrical and plumbing trades; and each investigator studied both trades, but worked in almost complete independence of the other, one in Wellington

and the other in Christchurch. It was argued that if, when allowance had been made for variations in local conditions, we reached somewhat similar conclusions, then there was reason to think that the general method of approach was satisfactory. This aspect of our investigation needs to be emphasized since, to save repetition, some of our material, mainly factual data, is presented in the form of a joint report. The actual methods we used, the planned interview and the questionnaire, for example, are familiar; what is new, for New Zealand at all events, is their application in the field of apprenticeship.

Our investigation should consequently be regarded, not merely as an attempt to evaluate the training given in two important trades, but also as an experiment in method designed to prepare the way for similar studies in other trades. In both the electrical and plumbing trades registration of apprentices is required, and this was one of the factors that determined their selection. But it might easily have happened that other trades were chosen for study.

THE ELECTRICAL TRADES

Methods of Investigation

It was found a relatively simple matter to become familiar with the procedure of appointment and indenture of apprentices in the electrical trades, and with the provisions concerning working hours, rates of pay, and conditions of employment. These are covered by the *Apprentices Act, 1923*, and by *Apprenticeship Orders* issued by the Court of Arbitration.¹ Nor was it difficult to find definitions of the theoretical training that most apprentices undergo. Reasonably clear statements of

¹ See pp. 76-8.

the theory involved in an apprentice's training are given in the syllabus of examination² set out in the *Electrical Wiremen's Registration Regulations*, 1926, and in the courses of study at the technical colleges, considered in relation to that syllabus.

Using this information and further data secured through interviews with employers, employees, and trade instructors, G. E. M. Keys compiled a questionnaire on the training of apprentices in the electrical trades, which was submitted for criticism and amendment to four experts before being used.³ A list was obtained of all employers engaged in electrical trades in the Canterbury Industrial District, and it was found that twenty of these (i.e. sixteen private employers, two Government Departments, and two Municipal Departments) employed apprentices. Three of the employers lived in towns outside Christchurch, and no replies were received to questionnaires sent to them. Only one city employer refused to help, although he was interviewed twice. All other employers of apprentices were interviewed, the purpose of the questionnaire explained, and difficulties discussed. Twelve senior apprentices, as well as instructors from the technical college, the university college, and the railway workshop classes also answered the questions.

In Wellington, A. A. Kirk abandoned the method of a planned interview, which he had used earlier in an inquiry into the plumbing trade, in favour of the questionnaire method. As a result of preliminary interviews with members of the Electrical Apprenticeship Committee, he was invited to be present at meetings of the Committee and for six months he attended them regularly, thus gaining an insight into the members' attitudes towards apprenticeship problems. A copy of the questionnaire was

² The relevant sections of these regulations will be found on pp. 71-4.

³ The questionnaire is printed on pp. 80-4.

posted to every employer in Wellington city and suburbs, and twenty-five of these employers were visited, in order that the questionnaire might be discussed with them. Fifteen replies were received. Analysis showed that this group was representative of the trade as a whole, and additional replies from men no longer engaged in business tended to confirm this opinion. With sixteen senior apprentices the interview method was retained, the inquiries being based on parts of the questionnaire.

Specialization in the Electrical Trades

The training an apprentice receives is conditioned by the class of work his employer normally undertakes; and the effects of specialization in the electrical trades became evident early in the investigation. These trades consist of a group of allied occupations, the workers in them being loosely referred to in everyday language as 'electrical engineers,' 'electricians,' and 'electrical wiremen.' In the past large electrical firms undertook work in all branches of the trade, and apprentices had opportunities of varied training within a single business. With the growth of the trade and the demand for wider service, other firms began business, but specialized in one way or another, according to the knowledge and practical ability of the man in control of each firm. Consequently apprentices to these firms received a limited training. During the depression of the early thirties numbers of employees were put off, especially the less expert among those who were trained in only one section of the trade. Having to earn a living, many commenced a 'back-yard' type of business in the line with which they were most familiar, and when at a later date they were able to take on a few apprentices, the training they gave was naturally narrow in its scope. To-day specialization has been carried to such a point that it

would be very difficult to find a private firm that could teach the trade in all its branches. Keen competition within the industry has, on the one hand, necessitated specialization with consequent limitation of the training an apprentice can be given; on the other, even in firms that could give a fairly wide training, it has reinforced the tendency to confine the work of an apprentice to operations that are directly profit-making.

All parties in both Wellington and Christchurch are agreed that such specialization exists and in general corresponds with the classification set out in the questionnaire used in the inquiry: (a) house wiring and installation work, (b) power and transmission plant erection with associated wiring and installation, (c) repairs and maintenance, winding, and automobile electrical work. In addition further specialization is becoming evident in work such as that connected with lifts, electric pumps, refrigerators, telephones, fire alarms, or Neon lighting. The distinction between the work of various firms is not entirely clear-cut, for, although firms tend to specialise in one particular branch of the trade, they undertake allied work in a minor degree. Nevertheless under present economic conditions specialization is sound business. A firm concerned with house wiring finds that, by sending out any job on, say, an electric pump, to a firm that specialises in pump motors, it is usually able to give the customer better service at a lower cost.

As the type of training an apprentice receives depends upon the firm to which he is apprenticed, it is impracticable for any private firm, except possibly a well-established country business, to undertake an all-round training of the kind outlined in the schedules in the questionnaire. Such organizations, however, as the local Supply Authority, the Tramway Board, and the Railway

Workshops are in a different position and can undertake a much more extensive type of training.

What of the future of the electrical industry? After a period of steady expansion, it has now entered on a new phase. The majority of dwellings and large buildings throughout the country have been wired, and major undertakings intended to serve for many years to come have been completed; the large, well-established industries are all users of electricity, and in many places whole systems have been changed from direct to alternating current. Installation work is an avenue of employment that is now practically closed. General wiring will be confined to new buildings, and the normal rate of building will produce only a fraction of the amount of work that has been available in the past, especially after the completion of the Government's present housing scheme. The work of maintaining and repairing existing installations will, of course, always exist and will tend to employ more men every year, yet any increase in work of this kind will probably be slower than the decrease in the amount of new wiring. In the manufacturing of electrical equipment the prospects (as far as apprentices are concerned) are uninviting. Modern mass production methods will prevail, and of the large number employed in this branch of the industry few will be skilled. There will be some need for extra wiring for new electrical appliances, but most homes are already well-equipped with utility plugs and the like. As far as the use of electrical equipment in automobiles is concerned, the field is undoubtedly growing, but the electrician gains little from it. In brief it may be said that the demand for installation work has passed its peak, while repairs and maintenance will be the main work of the future. With this background it is possible to understand the significance of the fact that, in spite of these

rapidly changing conditions, there has been no corresponding change in apprenticeship training.

Selection of Apprentices

At present the majority of apprentices receive a rather specialized training. Is it desirable to allow this to continue? Or should an attempt be made to devise a system that would ensure an all-round training for all apprentices? The danger here is in thinking of apprentices *en masse* instead of as individuals with differing capacities and interests. Just as we have under present conditions employment within the electrical industry ranging from the extensive and highly-skilled work of the Municipal Electricity Department, through that of the better class of well-established but rather specialized private firms, to that of the 'small' wireman, and finally to the routine and semi-skilled work found in an electrical manufacturing concern (work not covered by an apprenticeship order), so we have recruits ranging from those of high intelligence and marked practical ability, through the average type to those suited only for semi-skilled or unskilled work. It is evident that the selection of suitable apprentices for each class of work is an important matter, and in both cities all who answered the questionnaire (with the exception of the trade union in Christchurch) agreed that it would be desirable to have a system of vocational guidance in operation to assist in the selection of apprentices. The retention of the present probationary period of three or four months would still enable an employer to avoid the indenturing of a boy who proved on closer acquaintance to be unsuitable.⁴

⁴ Employers at present find that at least four boys out of every five survive the probationary period and are indentured, and that nearly all those who are so indentured complete their time and qualify as journeymen.

Employers were asked what standard of education they preferred a boy to have attained. Wellington employers in general like to have a boy who has been at a post-primary school for two to three years and who is thus about sixteen years of age. Eleven out of sixteen prefer a boy from the Technical College. In Christchurch the majority think that the training given in an engineering course in a technical high school is the most satisfactory preparation, and their choice of boys with two years' post-primary education agrees with the Wellington practice. As fifteen years is the minimum age for apprenticeship, the preference for boys of about sixteen can be understood, but some boys are engaged at an earlier age to run messages, and are later apprenticed.

In Wellington it appeared that at the time of the inquiry nine employers obtained their apprentices by direct application to the Technical College, five chose apprentices themselves (presumably from boys who applied to them for work), and one advertised when he needed an apprentice. No one method of selection seemed to predominate in Christchurch, where all the various methods were used by different employers.

Trade Training

Employers in general say they give apprentices definite instruction in their trade, either themselves or through their foremen and journeymen. Further inquiry shows, however, that employers rely mainly on the apprentice following the example of the tradesman, as there is little time for specific instruction. Both apprentices and employers agree that a period of six to twelve months is spent at the beginning of apprenticeship in running messages, low-grade routine labour, and 'feeding' a tradesman. Considerable variation exists in the amount of

time different employers expect an apprentice to give to low-grade routine work, and in the value they attach to it. It is obvious that a certain amount is inevitable, particularly message work. There are also different opinions as to what constitutes 'low-grade routine labour.' Some feel that message work, for example, not only is good for discipline, but also gives a boy a change of activity and an insight into buying. There is probably some truth in this, and even more in the opinion that 'feeding' a skilled tradesman is not low-grade routine labour. It may be a boy's most valuable experience.

Practically all concerned were opposed to the suggestion that, in place of the present system of apprenticeship to individual firms, plus instructional classes, a scheme should be introduced whereby apprentices would be fully instructed and trained either in a trade school or in a part-time continuation school. It may be granted that nothing can effectively replace good training under conditions of actual practice; such conditions not only supply essential first-hand experience of the trade but may also be more favourable than a trade school to the development of character, initiative and a sense of responsibility.

On the other hand, it must be recognized that the very nature of competitive business enterprise has profound effects on the training of apprentices. An employer's main concern is to make an apprentice into a paying proposition with the least possible delay, and trade training tends to be limited to operations that are profit-bearing. In some cases the apprentice would appear to be little more than an apprenticed labourer, and in practically all cases training must be gained incidentally in the course of his work. The journeyman is not expected to instruct; at the best his job is to set a first-class practical example. To this extent, then, if the journeyman is a good workman, he is *ipso facto* a good instructor, and the apprentice is expected

to watch, to ask questions, to assist, and to accept reproof for his mistakes. The average employer, foreman or journeyman will assist the inquiring and alert apprentice, but loses interest in the boy who is dull and stolid.

An attempt was made to discover both the actual amount of practical training given to apprentices and the amount that employers considered desirable, even if they did not actually provide it themselves. A schedule of processes was included in the questionnaire (see p. 82), but some employers preferred to give general rather than detailed answers, and others failed to follow the instructions. It can be said, however, that there is general agreement that the courses outlined include no more than is necessary if apprentices are to become first-class journeymen. But it is also evident from the replies that most apprentices receive a training that is markedly narrower in scope than the courses suggested. Employers state that they would like to give a more comprehensive training but generally add they cannot do so.

A five-year apprenticeship is considered desirable by all employers, and in this opinion the majority of apprentices agree. In both cities more than half the employers make a practice of retaining boys who are qualified as journeymen, but several think it wise for a boy just out of his time to seek work with another firm, in order to get a variety of experience. A statement made by the Wellington City Council, which is able to give its apprentices a comprehensive training, sums up the opinions of employers on this point:

'On engagement apprentices are informed that they cannot look to the Council for continuation of employment when their period is up. This should have the effect of not inducing them to look on the Council as a safe employer for all time. They must therefore regard their training in the light of whether it will make them useful

to the outside employers. Despite the foregoing we may or may not retain the brightest of the apprentices on completion of their term. In general, when employing a new tradesman we would give preference to one who, although trained by the Council, has had the benefit of outside experience.'

A suggestion was made by the investigators that a term as an improver would be useful to a young man after the completion of his apprenticeship. Employers were evenly divided on the point, opinions varying according to the nature of the work done by the firms. It was also suggested by the investigators that boys might be apprenticed to the trade as a whole, and not to individual employers; their services would be allocated to employers at the discretion of the Registrar of Apprentices, who would also be responsible for their training at some centre during slack periods. Almost universal opposition was shown to such a scheme. It was pointed out that difficulties would exist in the case of those firms that do not engage apprentices; and, further, that under existing conditions any apprentice can be transferred to another employer, and the Apprenticeship Committee can take action to assist any apprentice who is not being taught the trade properly. Unfortunately, however, these powers are rarely exercised in practice.

Theoretical Training

Employers were asked to comment on the statement: 'It is claimed that to be a good electrician the apprentice must not only be trained in pure electrical work, but in addition must have a good knowledge of mechanics, and at least a rudimentary knowledge of fitting and turning, steam, hydraulics, heating and illumination, and radio circuits.'

In general this statement was received sympathetically, though several employers expressed some doubt as to the meaning of the term 'a good electrician.' Most employers took it that the work of an electrician called for somewhat wider training than that of an electrical wireman, and, on this assumption, expressed the view that a knowledge of the majority of the subjects mentioned was most desirable, but several doubted whether steam and hydraulics were necessary. Others thought the full programme was rather a tall order for the average apprentice. The considered reply of one firm, which aptly sums up the situation, may be given here: 'Much depends on the definition of "good" electrician. A knowledge of mechanics is an advantage, also a knowledge of heating and lighting. Both these latter will take on a more and more important aspect. We think that the science of heating and lighting might be further stressed in the technical schools.

'With regard to a *rudimentary* knowledge of fitting, turning, steam and hydraulics, we would regard a tradesman so equipped as a distinct menace; all the more so, in that it is a person with a rudimentary knowledge of any subject who pretends to the full knowledge. If he cares to dabble in, say, hydraulics, after he considers himself fully equipped as an electrician, so much the better; but many of us who have spent our lives in pure electrical work find that we are quite unable to keep in touch with all its branches.

'With regard to radio broadcasting and reception of broadcasts, it is becoming a business of its own. In this department we do not expect or require an electrician to be in any way a radio expert.'

Employers were also invited to give their views on the nature and scope of the theoretical studies that apprentices should undertake at evening classes to supplement their

practical training. With the object of securing comment on points of detail the following schedule of studies was submitted for consideration:

1. Workshop mathematics—as applied to electrical wiring work.
2. Mechanical drawing—as applied to electrical wiring work.
3. Theoretical electricity and magnetism—elementary knowledge.
4. D.C. course.
5. A.C. course.
6. Properties and uses of metals and other materials, tools and appliances used in electrical wiring work.
7. General electrical wiring practice.
8. Knowledge of electrical terms.
9. Knowledge of switching and control of electrical apparatus and accessories.
10. Testing of electrical wiring installation.
11. Testing and repairing of electrical installation for earths, short circuits, open circuits, etc.
12. Elementary knowledge of measuring apparatus applicable to electrical wiring work, their construction and operation.
13. Knowledge of wiring electric elevators and cranes.
14. Knowledge of construction of domestic and industrial electrical apparatus and accessories.
15. Elementary knowledge of principles relating to heating, cooking, illumination and motive power.
16. Elementary knowledge of building construction applicable to installation of electrical wiring work and appliances.
17. Knowledge of wiring regulations.
18. Knowledge of fire, accident and mortality risks applicable to electrical wiring work.
19. Knowledge of methods of resuscitation of persons in case of electric shock.
20. Elementary knowledge of hydraulics.
21. Elementary knowledge of heat engines.
22. Elementary knowledge of radio.
23. Elementary knowledge of telegraphy and telephony.
24. Elementary knowledge of power generation.
25. Elementary knowledge of plant erection.

All employers readily agreed that most of the items in the schedule of studies should be included. One firm which appears to have examined the course with particular care made certain comments that are worth recording. It considered that the D.C. course could be confined to the elements, as few electricians in New Zealand today ever handle direct current. The item on elevators and cranes brought the comment that work connected with such mechanisms required specialized knowledge, and that even an electrical firm engaged in the widest range of activities would call in the services of an expert for lift work. In this field only years of experience could make a workman of any use. 'Elementary knowledge of principles' was a most important item in the schedule and it was here that theoretical studies could make their greatest contribution to apprenticeship training. The firm considered that the whole electrical trade was bound up with the application of electricity to heating, lighting, cooking and motive power, and added that old methods of application were being modified and new ones devised every day. With reference to the item on elementary knowledge of power generation, it was stated that power station operators and attendants were a group by themselves, many of them not even being registered electricians. If an apprentice decided to take up power station work, very little in the course of his apprenticeship would be of much use to him. Moreover, an *elementary* knowledge of plant erection would be of no use at all.

Instruction of Apprentices

If one can judge from the relative results of the practical and the theoretical sections of the Wiremen's Registration Examination, apprentices would appear to receive a training at least adequate for the passing of the

practical tests, but to be relatively weak on the theoretical side. For instance, the results of the examinations held in March and September, 1936, were as follows:

Percentage of Passes⁵

March

Written section - - - 28

Practical section - - - 41

September

Written section - - - 26

Practical section - - - 51

In their report the examiners expressed their regret that the answers to the questions were, with a few exceptions, very disappointing. They considered that the questions generally were of an elementary and practical nature and should have been readily answered by three-year apprentices interested in their calling. The examiners in reviewing the answers to the questions concluded that the causes of the unsatisfactory results were carelessness and lack of concentration, poor knowledge of the regulations and of elementary electricity, and bad writing and arithmetic.

A number of employers and several of the instructors also were emphatic on the point that most apprentices did not give sufficient time to their studies; and some were even more emphatic in their contention that, once the Wiremen's Registration Examination had been passed

⁵ *Electrical Wiremen's Registration Examination* (October 1926 to March 1937)

	Candidates	Passes	Percentage
Written part ..	4499	1458	32
Practical part ..	3549	1688	48

(and it was possible to complete it at the end of three years), the majority did not have the incentive or the initiative to continue their studies although conditions today are such that constant reading and study are essential to keep abreast of developments.

This brings up the problem of holding instructional classes in working time. The majority of employers are against the idea, particularly since the introduction of the forty-hour week, and give as their main reason the resulting dislocation of work, pointing out, for example, that every wireman needs a boy to 'feed' him. An apprentice in Christchurch expressed this point of view when he wrote: 'The economic aspect of such a scheme would be difficult; while only one who has actually worked at the trade knows how difficult it is to dispense with an apprentice for a certain period. So well do they (apprentice and journeyman) usually co-operate that with a strange apprentice taking his place things get really muddled.' The Union and the majority of instructors and apprentices, however, supported the idea, suggesting periods varying from four to six hours per week as the time that should be allowed.

At the present time an apprentice who intends sitting for his Wiremen's Registration Examination must attend technical evening classes for at least three evenings a week and do a reasonable amount of home work for each theoretical subject. Together with a working week, this is a heavy load for a boy to bear, particularly for his first year or two, and is in marked contrast to the hours he has been accustomed to as a schoolboy.

The New Zealand Railways Department has already made arrangements at its workshops for part of the apprentices' studies to be undertaken during the working week. Special instructors have been appointed and the system works very successfully. An amendment to the

Government Railways Act includes a number of clauses providing for the apprentices' studies both at day and evening classes and for the Department's assistance in the matter of fees, instruments etc. Three of the clauses are:

'During the first three years of apprenticeship every apprentice shall attend during working hours such instruction classes as may be provided by the Department; such attendance shall be for not less than three hours on one day per week.'

'The Department's day classes shall have as their objective instruction in Railway subjects and as far as practicable such instruction shall not overlap the instruction given to apprentices in public technical schools or colleges. Examinations for these day classes, which shall be supervised by public technical school or college authorities, shall be held and certificates shall be issued to successful examinees by such authorities.'

'Any apprentice who shall have passed the intermediate or higher examination of any public technical school or college may be exempted from attending the Department's day classes, but he shall take and persevere in such course of study as the Permanent Head may direct.'

Registration as Electrical Wiremen

The Electrical Wiremen's Registration Board is constituted of five members representative of (1) the Public Works Department, (2) electrical supply authorities, (3) fire and accident insurance companies, (4) electrical traders, (5) electrical wiremen. Just as the Plumbers' Registration Board functions in the interests of public health, so the Electrical Wiremen's Board functions in the interests of public protection and safety. It is quite obvious that it is right and proper that only those who are

qualified to do so should be allowed to work with electrical equipment and apparatus.

The initial function of this Board is, then, to grant registration to qualified electrical wiremen. Registration is granted on the following conditions: (1) The applicant must have had three years' legal service in the work of electrical wiring. (2) He must have reached the age of nineteen years. (3) He must have obtained a pass in the Board's examination or some equivalent such as the London City and Guilds Examination. Registration may also be granted to graduate electrical engineers, providing they can satisfy the Board that they are experienced in electrical wiring. Limited registration is given to factory workers in assembly and repair work.

If a tradesman does inferior work the Board has power to endorse his certificate or to delete his name from the register if this proves to be necessary. The usual procedure in these cases is first to send a letter of caution. If this fails as a remedial procedure a letter of censure follows. If this has no effect, suspension is the next step, with an endorsement of the offending tradesman's certificate. The last resort is the removal of the tradesman's name from the register. In the case of a man who has had his certificate endorsed, the Board may remove such endorsement after a period of twelve months of satisfactory work.

Many of the employers pointed out that although the main objective of most apprentices is to pass the examination for registration as electrical wiremen, a pass in the examination does not ensure good all-round experience. It is possible for a registered electrical wireman to be quite incapable of doing some kinds of work, because the only demands of the Electrical Wiremen's Board are the passing of the examination, and experience in electrical wiring. Incidentally, these demands debar some boys from registration, for the Board considers that repair work, and

automobile work, do not give sufficient experience in wiring and installation.

Certain modifications of the registration system were suggested for consideration by employers. Two-thirds of the men in both cities were in favour of a system with two licences, the second grade licence being approximately equivalent to the present Wireman's Licence (permitting certain types of work up to a given voltage), and the first grade licence allowing the holder to engage in any class of electrical work. As the present tendency is to look upon the acquisition of a Wireman's Licence as the end of training, employers favoured the institution of a higher grade licence because it would be an incentive to wider study. Some were of the opinion that the first grade licence should not be dependent on work with higher voltages, but on increased experience in more advanced types of work.

A corollary to the registration of electrical wiremen is the registration of businesses, which would then operate under a system of contractors' licences. The majority of employers are entirely in favour of such registration. It may be pointed out here that an Act embodying compulsory registration of contractors was brought into operation in Victoria in September, 1934, and that it appears to function satisfactorily.

General Conclusions

Up to this point the results of our study of apprenticeship in the electrical trades have been presented in the form of a joint report, but it seemed desirable that each investigator should make his own statement of his general conclusions and recommendations. As has already been explained, we worked quite independently, not because it was difficult for us to confer, but because the experiment

was designed to provide some check on the reliability of the methods we used. The reader who compares the two statements that follow will see that we reached broadly similar conclusions, though each has inevitably been influenced by his personal bias and the particular set of conditions he studied.

A. A. KIRK, WELLINGTON

Status of the Trade

(a) *Selection of Apprentices.* The first step in the direction of improving the status of the trade should be better selection of trainees. Since the standard of education required varies from a Standard V pass in a primary school to the equivalent of a University Entrance pass, it is clear that some levelling up is urgently needed. It is true that the majority of employers give preference to boys who have had at least two years' general education at a post-primary school; but until the trade as a whole takes a stand, and insists on this as a minimum standard of education, there can be no all-round improvement in its status.

As Vocational Guidance Officer for the Wellington district, I am in a position to know which firms are getting the most intelligent and efficient apprentices. The Post and Telegraph Workshops and the Automatic Exchange are securing the very best; the Government Railway Workshops and the Wellington City Council Electricity Department absorb the second best; the private employer who can provide good all-round training takes the next group; and finally the electrical wireman must be content with those who are left.

How is it that the two Government Departments are able to secure the cream of the recruits? It is not because

they can give superior all-round training. The first and most obvious reason is that they can offer a high degree of security against unemployment, and the second is that they demand a minimum of two years' day school training in the engineering classes of a technical college, and give preference to lads who have longer training. Boys who have passed their Matriculation and Engineering Preliminary Examination are encouraged to join these Departments, and as the commencing age is sixteen years (minimum) to eighteen years (maximum), there is plenty of time for prospective candidates to qualify. Furthermore, both Departments work through a vocational guidance officer, and take only those students whom he will recommend. Finally, the commencing salary is attractive—£80 a year.

The Wellington City Council accepts apprentices up to the age of seventeen years, demands 'a good secondary or technical college education' and works through a system of vocational guidance. Although it obtains very good boys it has to take second place, because it does not guarantee security of employment. It pays apprentices the statutory wages for the trade.

The Railways Department Workshops prefer boys with good secondary or technical education, but have been known to take lads before they have completed the first year of a post-primary course. They will not take lads who have turned seventeen, and hence the possibilities of good selection are limited. Security of employment is fairly well assured, and the course of training is very comprehensive. The Railways Department pays good commencing wages—approximately £80 a year.

Next come the good private employers. Their educational demands vary a good deal, but it is true to say that in general they prefer two years' technical college training. They cannot always guarantee continuation of

employment after completion of apprenticeship. Sixteen years is the maximum starting age, and the commencing wage is anything from 15/- to £1 per week. Only in one respect do these employers offer more than the electrical wiremen—they can give a more comprehensive training.

The examiner for the Electrical Wiremen's Registration Board constantly deplors the poor standard of the work done by the apprentices in the biannual examination of this body, and suggests that it is possibly due to poor training in fundamentals at the primary schools. Consideration of this suggestion is outside the scope of my inquiry, but a partial explanation of the low standard of work may be found by a consideration of the processes of selection outlined above. It must be borne in mind also that few of the best students who enter the Railway Workshops and Automatic Exchange ever sit for the Electrical Wiremen's Examination.

The lesson from all this should be clear. To secure good recruits the industry must, first, offer security of employment, second, insist on high educational attainments, third, select its trainees carefully and, fourth, pay attractive wages. Security of employment may not be easy to ensure (recommendations bearing on the subject are made later in the report), but the other conditions could all be fulfilled immediately if employers could agree on a defined policy.

(b) *Graded Licences and Higher Certificates.* Certification is another topic that must be considered in a discussion on the status of the trade. Reference has already been made to the need for a higher certificate than that which is secured by the Registered Electrical Wireman. It may be argued that higher status may be gained by passing the examinations of the London City

and Guilds, the Technological Board, or the Institution of Electrical Engineers, but unfortunately success in any of these examinations does not necessarily give a clear indication of the class of work a man can undertake. Consequently there does seem to be a case for a higher-grade certificate, which should indicate that those holding it are capable of undertaking a more comprehensive range of work than that for which the registered wireman is qualified. Furthermore, it seems reasonable to suggest that regulations should be brought into force forbidding a tradesman from undertaking the more advanced type of work unless he holds the higher certificate.

The question then arises: How is this certificate to be issued? Some employers have rightly pointed out that the best tradesmen are not always those who have the facility for passing examinations, and vice versa. If the higher certificate is not to be issued as the result of examinations, some system must be devised by which a tradesman can satisfy an authorized inspector, first, that his experience has been adequate, and, second, that he is qualified to do more advanced work. It has already been pointed out that the Registered Electrical Wiremen's Board has been set up in the interests of public safety. A similar body could be responsible for the issue of higher grade licences, and hence protect the public from exploitation by inexperienced or inefficient tradesmen. In making this suggestion I do not want to suggest that the electrical trade is any worse than any other trade or profession in this respect. We all know that there still exist the good and the weak teacher, the superior and the inferior doctor, the efficient and the inefficient public servant, and the more of the incompetent we have the more the public has to pay.

There is one other point that seems to call for some attention. The electrical trade should take steps to define

clearly such terms as 'electrical wiremen,' 'electricians' and 'electrical engineers,' and having done this, should seek protective legislation to prevent the abuse of such titles.

Registration of Contractors. We have a system providing for the registration of electrical wiremen, with a properly constituted Board to see that the work of these tradesmen is carried out satisfactorily, and with penalties for infringements of the Board's regulations. Yet electrical contractors as such are responsible to no body of this kind. In a regime of competition and price-cutting contractors may stint time and material in order to quote a low figure for a job. Such practices are most unfair to the tradesmen who have to do the work and if they fail in efficiency, *they* are responsible to the Registration Board, not the contractor.

Just as it is possible for an unregistered plumber to set up in business as a contractor, so an electrician who is not a registered wireman can go into business on his own account. It is not suggested that such a contractor need necessarily be classed as an indiscriminate price-cutter; but in making a strong recommendation for the compulsory registration of contractors, I do not think it unreasonable to recommend at the same time that such registration should demand a standard of attainment and trade experience equal at least to that required of the tradesmen employed.

Training of Apprentices. There is ample evidence to show that many employers are intensely interested in the training of their apprentices, and most desirous of making them efficient tradesmen. But in spite of this there are factors outside the control of the employer that often make it difficult if not impossible for him to give a comprehensive training. The greatest of these is speciali-

zation. The five-year apprenticeship period has been the subject of severe criticism in many trades during the past few years. It has been contended that with the gradual creeping in of specialization and the introduction of machinery, it is now impossible to learn all the details of handicraft work previously learnt during a period of indenture, and that consequently a five- or six-year term of training is no longer necessary. Careful inquiries were made to see whether this criticism could be applied to the electrical trade, but I am forced to admit that where firms are able to give their trainees comprehensive instruction there is no argument in favour of a term shorter than five years. Much, of course, depends on the aptitude, application, and intelligence of the apprentice, and there is little doubt that a particularly bright lad could cover the course in four years and qualify as a journeyman in that time. But with the new developments that are taking place in every branch of the trade from year to year, I would hesitate to recommend a shorter term of training. However, in the case of trainees who are apprenticed to employers whose work is restricted to electrical wiring, I think there is ample evidence to show that a period of three years would be sufficient for the average youth.

The Wiremen's Registration Board will grant registration to any apprentice who has reached the age of nineteen, and who has completed three years of his apprenticeship. This means that any apprentice who has qualified for registration may do electrical wiring work although he may have two years' more training to complete, and is evidence that a shorter period of apprenticeship could be allowed in the case of the electrical wireman's trainee.

I have the highest admiration for the good work that is being done by the Wellington Electrical Apprenticeship Committee, and feel certain that they are sincere

in their desire to ensure good training of apprentices. They are most diligent in keeping both employers and apprentices up to the mark. They have taken active steps to investigate the instruction given in classes for apprentices in technical and other schools, and have not hesitated to debar an apprentice from attending a school where the right facilities are not provided. At the same time I feel that they are more concerned to ascertain whether or not a firm has the necessary facilities for experience in electrical wiring than to see that there is scope for all-round training. I hesitate to suggest additional functions for this already very hard-working committee, but it is just such a body that could formulate a scheme for more comprehensive training.

From time to time, apprenticeship to the trade as a whole has been suggested as a possible method of ensuring all-round training, and the employers' attitude to this proposal has already been clearly shown. I have to admit that there are many difficulties in the way. A scheme of training would have to be drawn up, the types of work provided by each firm investigated, estimates made of the number of apprentices required year by year, and the possibility of satisfactorily organizing the circulation of apprentices explored. Without going further into the question I foresee two major difficulties. The first is that the firms that confine themselves to house wiring and installation work vastly outnumber those that provide more varied training, and the second is that such a scheme would necessitate a longer period of training.

The Government Railway Workshops give three hours per week of the Department's time to technical instruction at a school provided for the purpose, and they declare that this time is well spent. Yet very few employers would agree to their apprentices attending a local technical

college during working hours. In several States in Australia and in parts of the United Kingdom it is compulsory for an apprentice to attend technical training classes for an average of half a day per week, and it seems clear that the training of electrical apprentices would be considerably extended in scope if a similar practice were adopted in New Zealand. It is assumed, of course, that the technical colleges would be properly equipped and adequately and efficiently staffed to carry out this work. There is little doubt that greater use could be made of the senior departments of technical colleges in apprenticeship training schemes, especially during times of trade depression, when employers are unable to find sufficient work to allow them to complete the apprentices' training.

This presupposes the institution of some controlling organization such as a National Apprenticeship Committee whose duty it would be to control the supply of apprentices in accordance with the changing needs of the industry. I would suggest further that a research officer of the Labour Department, whose advice concerning possible trends in trade should be invaluable, should be associated with this Committee. Without some such system, one cannot expect private employers who are in competition with one another, and who are the victims of economic circumstances over which they have no control, to overcome the difficulties associated with the supply of apprentices. It seems that the State must assume some responsibility.

G. E. M. KEYS, CHRISTCHURCH

Appointment of Apprentices. The plan I have in mind presupposes an adequate scheme of vocational guidance, and increased duties and powers for the

Apprenticeship Committee, or for some other committee appointed in its place. The Vocational Guidance Officer, through co-operation with Careers Masters, should be in a position to decide the grade or type of electrical work for which each applicant is most suitable, taking into account his general intelligence, his special aptitudes, and his character and temperament. I would suggest: (1) that the Vocational Guidance Officer be added to the personnel of the Apprenticeship Committee (provision for such an addition already exists in the *Apprentices Act*), or that his recommendations should be before the Committee; (2) that in the allocation of apprentices due consideration be given to the abilities and attainments of the apprentice in relation to the grade of the job under consideration, the advice of the Vocational Guidance Officer being sought in this connection; (3) that the Youth Centre and the Apprenticeship Committee co-operate in the matter of the enforcement of indenturing within the time provided, and in periodical 'follow-up' visits and reports from the contracting parties (employer, parent, and boy) concerning training, progress, and general conduct throughout the probationary period, and the whole remaining period of apprenticeship.

I would point out here that these suggestions do not imply depriving the employer of the right to choose his apprentices, or the apprentice of the right to choose his employer. They lay down a general policy to guide the Committee's efforts, and provide the machinery for more effective vocational guidance and also for a more effective period of apprenticeship training.

I believe also that it would be wise to appoint a National Apprenticeship Committee to consider the problems of this and other trades from the national point of view. Included in this Committee should be those members of the staff of the State Placement Service whose

concern it is to investigate periodically the whole problem of supply and demand of labour within specific fields.

Practical Training of Apprentices. One suggestion I wish to make is that firms be graded into several broad divisions according to the scope of the training given to apprentices, and that journeymen also be graded according to certain standards, mainly to be determined by the length and scope of service as apprentice, or improver, and the passing of certain practical and theoretical examinations. I would suggest that the term 'Electrical Wireman' should apply to one who has served a period of four years with an approved firm and passed the Wiremen's Registration Examination. The Registrar of Apprentices, after consultation with the Apprenticeship Committee, should have the right to shorten this period to three years (the minimum time) where the practical training and theoretical studies have been unusually good, as shown in the results of the Wiremen's Registration Examination. But for most apprentices four years is preferable to three. Some even of those who can pass the examination at the end of three years need a further year in which to acquire the mastery of trade processes and the sense of responsibility and initiative that should be expected of a journeyman.

To follow this I suggest a period of improvership, not less than one year and not more than two years, for those who may choose to proceed to a higher stage involving more advanced training. The passing of higher tests, theoretical and practical, and the serving of an improvership (the actual period to be determined in each case by the Apprenticeship Committee) should be the qualification for a first grade licence, and should entitle the holder to the term 'Electrician,' and the right to undertake a more extensive range of work.

There is, however, the difficult problem of ensuring a more extensive and varied training for those wishing to pass this higher-grade certificate. To some extent this would be met by appointing as far as possible the cream of the applicants for apprenticeship to positions in the Municipal Electricity Department, or in firms able from the nature of their work to give all-round training, but the responsibility for supervision of this improvership should rest with the Apprenticeship Committee, working with the assistance of the staff of the Vocational Guidance Officer and the Labour Department. I am fully aware of the practical difficulties involved; of the antagonism of many employers toward any 'shuffling' of young employees; of the fact that, on a short-range view from the economic angle, the employer will probably consider that the wages payable to an improver should not be in excess of those paid to the fifth-year apprentice to-day. It may be claimed too, that as a youth will not be regarded as being closely attached to any one firm, there will be less likelihood of his services being retained after he has qualified. Against all this there is the consideration that under New Zealand conditions it is desirable to have available well-trained and versatile electricians, and that the present narrow training so many receive is neither in their own interests, nor in those of trade standards. The scheme proposed does not do away with specialists, who, it is rightly claimed, are highly efficient within their particular fields and consequently keep down consumers' costs, but it does mean a more intelligent appreciation of the place of specialization in the trade as a whole.

Finally, the scheme would provide for the still higher training and certification of a selected group through the University Engineering course, qualifying them for entry into professional grades and higher executive positions, with the title of 'Electrical Engineers.'

Theoretical Training of Apprentices. I would suggest four hours a week as a minimum number for which a boy should be released from work for attendance at classes. Saturday morning school makes possible another four hours weekly, although it is probably desirable that part at least of this time should be given to recreational classes. The actual times of attendance would necessitate an arrangement mutually satisfactory to the employers and the technical school authorities, but probably one half-day of four hours, or two periods each of two hours, would be quite feasible.

I believe that the minimum required should be increased to eight hours weekly, to be made up of four hours in working time and four hours at evening or Saturday morning classes, the additional time being used to provide a wider theoretical and practical training for the apprentices. A modification might be along the lines suggested by one apprentice, that most of the apprentices should receive some of their instruction in classes held in the workshops of one or more firms. In most cases talks could be illustrated by the use of practical materials and would thus help in simplifying knotty problems. The Municipal Electricity Department, the Tramway Board, and certain specialist firms could be very useful parties to such an arrangement, and a schedule of such classes could be arranged by the Apprenticeship Committee, and dovetailed into the general scheme of instructional classes counting towards the required number of hours.

Examinations. (1) The Wiremen's Registration Examination (or the suggested second-class licence) should be passed quite readily under the suggested conditions at the end of three years. The examination may be passed sooner than this, but three years' experience as

an apprentice should also be required before the licence becomes effective. (2) It should be possible to pass the examination for the first-class licence within the remaining period of apprenticeship plus improvership. (3) An ambitious student should also be able to pass the final of the examination of London City and Guilds (electrical) during the remaining period of apprenticeship and improvership, as it is intended that the release from working hours should continue throughout all this period. (4) Under present conditions it is very difficult even for a highly intelligent and ambitious apprentice to complete the Graduate Examination of the Institution of Electrical Engineers; yet it seems highly desirable that it should be made possible for him to do so. Where an apprentice passes the examination for a first-grade licence 'with honours' he should be entitled to an extended period of study during his working week to enable him to attend the necessary lectures. It should be more than theoretically possible for such a youth to qualify for a high executive position.

The New Zealand Railways Department offers annually two or more scholarships tenable for four years each, awarded on the basis of all-round qualifications in learning, tradesmanship and character. These provide *inter alia*, that after the Engineering Preliminary Examination has been passed, the holder 'may be granted leave of absence on full pay not exceeding five hours in any week during the terms of the University College in his district, in order to enable him to keep terms at such college with a view of passing the Engineering Entrance Examination,' and further that 'any such scholarship holder who shall pass the Engineering Entrance Examination before he has reached the age of twenty-three years shall become entitled to a two-years' course at the School of Engineering of the Canterbury University

College, and at the discretion of the Permanent Head (provided the scholarship holder has made and is making satisfactory progress at his studies) may be granted an additional year to enable him to qualify for the Engineering Degree.' He is paid as a tradesman during the time occupied by such a course.

General (1) The apprenticeship contract. I strongly endorse the suggestion made in a report on apprenticeship by Messrs. W. S. La Trobe and R. G. Ridling that 'The Crown should be a contracting party in the apprenticeship contract.' In other respects I am satisfied that the present form of apprenticeship contract needs little amendment.

(2) Registration of businesses. I believe that registration of businesses is necessary to protect the trade, and to prevent possible abuse of juvenile labour by the 'back-yard' workman. The charge for such registration need be only a nominal one.

(3) Scale of wages. Beyond the suggestion that the passing of examinations should entitle the apprentice to bonuses increasing with the grade of examination passed, and the general provision that due regard be paid to other wage changes and to the general cost of living index, I have no suggestion to make for the alteration of the present scale.

THE PLUMBING TRADE

In the course of his study of apprenticeship in the plumbing trade in Wellington, A. A. Kirk interviewed twenty plumbers and obtained information from fifty-four apprentices. Early in the investigation it was found necessary to decide, at least tentatively, what processes a qualified plumber might be expected to perform efficiently at the end of his six years' apprenticeship training. The foreman plumber of a large Wellington firm, a tradesman of wide experience, was approached, and he supplied what he considered to be a comprehensive list of the processes that should be mastered. In some trades it is difficult to get employers to agree on a programme of practical training for apprentices, but in this instance all twenty of the Wellington plumbers with whom the list of processes was discussed considered that it was quite satisfactory, and the Christchurch plumbers later took the same view. The list of processes was as follows: '(1) covering small flats in copper and lead, (2) knowing the procedure of work on small jobs such as (a) small copper pipe jobs, (b) covering roof with iron, (c) flashing, (d) fixing gutters, (e) spouting and ridging and downpipes, (f) small repairs, (3) repairing cistern and taps, (4) doing all cottage work including domestic hot water systems, (5) fixing bath, basin and W.C., and all wastes and vents, (6) fixing gas pipe. In addition to this the all-round plumber should be experienced in building plumbing, ships' plumbing, heating and ventilating, drainage plumbing, and possibly gasfitting.'

In Christchurch, G. E. M. Keys used this list in drawing up a questionnaire. Replies were received from seventeen

master plumbers, from seven senior apprentices, and from the Christchurch Plumbers' and Gasfitters' Industrial Union of Workers. Further information was obtained through interviews with representatives of each of these three groups.

Specialization in the Plumbing Trade

In the electrical trades, specialization is marked in both Christchurch and Wellington, but in the plumbing trades there is a decided difference between practices in the two cities.¹ Only four plumbers out of twenty in Wellington have the equipment and qualifications for giving instruction in all the processes outlined. Even in these four firms the apprentices are allowed to specialize, and hence do not in fact receive an all-round training. The remainder can give instruction in most of the processes, but can provide actual experience in little more than half of them. On the other hand, fifteen out of seventeen plumbers in Christchurch claim to give a good general training; and in the other two firms, which are concerned almost entirely with building plumbing, the training covers a fairly wide range of processes. In every case the employer claimed that he could provide training in all branches of plumbing referred to in the questionnaire. In Christchurch, apparently, a good all-round training is possible in most shops employing apprentices.

Training of Apprentices

The term of apprenticeship in the plumbing trade is six years, and all the employers agree that this is not too long. Some of the apprentices would like the term to

¹ As Christchurch is not a port, there is no ships' plumbing there. At the port of Lyttelton, eight miles away, there is, of course, work of this kind.

be shorter, but their reason may be only that they wish to be more quickly 'out of their time.'

The suggestion that time spent as full-time students in suitable courses at technical high schools should count as part of the period of apprenticeship was received unfavourably by nearly all the employers, who want to have the use of the apprentices in their businesses. The idea of a trade school for apprentices in the plumbing trade was also unpopular with employers. There are many who take a pride in giving their apprentices a good training.

All employers claim that apprentices receive instruction in the trade, but a careful examination of the training given leads to the conclusion that much of it consists of learning by doing—handing the tradesman his tools, or watching him at work and then imitating him. There is no doubt that the instructors are trying to do their best—as they understand the term—and that their efforts are appreciated by the apprentices. It is sometimes thought that low-grade routine labour takes up too much of an apprentice's time, but employers incline to the view that an apprentice's time is too valuable to be spent on message work and the like. They prefer to reduce work of this kind to a minimum, although it cannot be denied that every firm has messages to be run, and routine and 'feeding' processes to be performed that must naturally fall to the lot of the junior apprentice. There is, too, some value in the general 'acclimatisation' of the new recruit to the tools and technique of the trade.

The value of the instruction given at the technical colleges in the two cities is recognized by employers and apprentices alike. Employers in Christchurch are unanimous that the instruction is very good indeed, and Trade Union opinion, which is based on frequent visits to the

classes by representatives of the Union, is equally favourable.

Apprentices and journeymen in Wellington consider the instruction in theory to be excellent, for it gives them an insight into many branches of work in which they can get no practical experience. But they say that the practical training leaves much to be desired, for it deals entirely with work in lead, which is required in the Plumbers' Board Examination, despite the fact that plumbing practice in Wellington involves very little work in lead, copper being used almost everywhere. Employers corroborated the statements of the apprentices on this point, and some said they had been trying for years to have the position altered. As lead is still extensively used in Christchurch, the question seems to be one of adaptation of technical college work to suit local conditions in each centre.

An illustration of the differences in practice between the two cities is given by the way in which a statement made by one of the leading Wellington plumbers was received. 'Not twenty-five per cent of the apprentices in New Zealand ever see the class of work taught in the technical schools in the whole of their apprenticeship at work. Not fifty per cent ever see any work larger than two-inch pipe work. Only about twenty per cent of apprentices work in heating and ventilation work of any kind and very few see any kind of ships' plumbing.' All Wellington plumbers agreed that this was a very fair and correct estimate of the position in New Zealand. But when the same statement was presented to Christchurch plumbers, they regarded it as well astray, except perhaps for the last two sentences.

*General Conclusions on Apprenticeship in the
Plumbing Trade*

For the reasons given in the course of our report on apprenticeship in the electrical trades, we again present our general conclusions in separate statements.

A. A. KIRK, WELLINGTON

I am of the opinion that the training of apprentices in the plumbing trade is in general quite satisfactory. This is probably due to the fact that the registration of tradesmen is controlled by a fully constituted Plumbers' Board comprising (1) the Chief Health Officer, (2) a representative of the Education Department, (3) a borough engineer, (4) a master plumber elected by his Association, (5) a journeyman elected by his Association. The Board has done its best to maintain a high standard of efficiency, but its activities are limited to the control of the examination and the registration of plumbers. It has no control over general apprenticeship conditions, and is not interested in the production of all-round efficient plumbers. It appears that the original move for its establishment came from the Health Department, and the subsequent constitution of the Board and registration of plumbers were to safeguard the interests of public health. As sanitary work is essentially a function of the plumber, the Board endeavoured to ensure the health of the community by seeing that all registered plumbers were competent in this type of plumbing at least. As at the time most of it was being done in lead, the Board required work in lead for its practical examination. Now that copper is being introduced for sanitary work, the Board is willing to extend the scope of the practical examination accordingly.

The employers themselves, on the whole, show a genuine desire to train their apprentices properly. The standard of training has thus been kept from falling below a certain level, but while this is so, there are weaknesses in the system of training that might have been remedied years ago. The most notable of these has been the scheme for practical training laid down by the Plumbers' Board, whereby an apprentice is trained in lead. As a result, it has been possible for a man to pass his examinations in lead with first-class honours, to have completed his time as an apprentice with an inferior instructor, to be registered as a fully qualified plumber, but to be a very inefficient plumber in actual practice. I came across several cases of this kind in the course of my investigations. The Board has at last been convinced of the folly of this restricted training, and it is now possible for an apprentice to take his examinations in either copper or lead. This is a step in the right direction, but it does not entirely eliminate the possibility of the registration of an inefficient plumber.

The other obvious weakness is that an apprentice may be indentured to a man who, however honest his intentions, is not efficient. Obviously the apprentice's training must suffer. The fault, however, lies more with the general system of apprenticeship than with the employer himself.

Scope of Training. Even if all the tuition given to trainees were sound, a further weakness in the system of apprenticeship training would remain. The scope of the training that an employer can give his apprentice is limited by the amount of business he can obtain. So far as the small plumber is concerned, little can be done to remedy the position under existing conditions, but with the larger concerns it should be possible for the apprentice who has specialized in one branch of work to be transferred

to other departments of the firm during his last eighteen months of training. If such firms continue to give a restricted specialized training, it is obvious that the term of apprenticeship could be shortened, but the trade would have to admit that it was not training all-round plumbers. In this connection it is interesting to note that several lads apprenticed to the Gas Company, which trains apprentices to be gasfitters, are attending the plumbing classes at the Wellington Technical College in the vain hope that they may ultimately pass the Plumbers' Board Examination and be registered as plumbers. They apparently realize that their training is confined to an extremely specialized branch of the plumbing trade and are anxious to attain the status of registered plumbers, presumably as a precaution against bad times. The Plumbers' Board, backed by the plumbers themselves, has so far refused to allow these gasfitters to be registered in the trade. It is probably correct; but when plumbers officially ignore the specialization that is taking place within their own ranks, their attitude towards the gasfitters is, to my mind at least, extremely inconsistent.

Suggested Remedies. (a) Reconstruction of the Plumbers' Board, with increased scope and powers whereby it could ensure that the experience and training of the apprentice were adequate and sound, would go a long way towards remedying obvious defects. This might necessitate the appointment of an officer whose business it would be to see that this experience and training was being provided for satisfactorily. Such an officer should have the power to make application for the transfer of an apprentice where the employer is not able to give proper training. This would probably need some amending legislation. (b) It is quite obvious that on the practical side the present facilities offered by the technical college are not

sufficiently extensive. Their main purpose is to provide for the requirements of a very restricted examination, with the result that the training is of no great help to the apprentice who is anxious to extend his general practical experience. Increased facilities in this direction, then, would make it possible to fill in many of the gaps in the training given by the employers.

The Trade School. Employers in general are opposed to the introduction of Trade Schools, but that is not in itself sufficient evidence against their establishment. At the same time I doubt whether the population of New Zealand is large enough to warrant their introduction at present; and, even if it were, the plumbing trade would have no great claim to be the first to commence such a school, as it is not as strong numerically as some of the major trades, such as the motor and building industries. It would be very much easier for the larger trades to finance such schools.

G. E. M. KEYS, CHRISTCHURCH

As with the electrical trades, there is need for some better control of the supply of skilled tradesmen, for apprentices are sometimes appointed who are unsuited to the trade. Presuming that the Apprenticeship Committee allows boys to be apprenticed only to employers who have the facilities for providing a satisfactory training, I think it desirable that (a) the services of a vocational guidance officer should be more fully utilized by the Committee in ensuring that the boys apprenticed are suitable for the work, and (b) the training given by any employer should be subject to general supervision and periodical inspection throughout the six-year period.

In general there is not the same justification for a reduction in the apprenticeship period as there is in

the electrical trades, for the same degree of specialization has not occurred. There is not the same evidence of employers specializing in one particular branch of the trade and using the services of another firm to carry out work in a different branch. In fact the position seems to be that the processes to be covered in training have been increased in recent years by the introduction of welding, and of work in copper. In this district work in copper is used only within definite limits (hot water services, spoutings and down-pipes), and work in lead is still regarded as of primary importance in all sanitary work.

On the other hand, if apprentices were more carefully selected, their training supervised more methodically, and the services of the Technical College Evening Classes more fully utilized, the period of apprenticeship could be reduced. If training during the final years of apprenticeship was placed under the control of a Registrar of Apprentices, and an Apprenticeship Committee with a revised personnel, and wider powers, this stage might come to be regarded as a period of improvership during which transfers among shops were arranged for the deliberate purpose of providing as full and varied a training as possible.

Some allowance should be made for a student who attends a technical high school for a period longer than two years, and I suggest that a complete third year spent in a recognized building or engineering course should receive recognition equivalent to six months of the apprenticeship period, and a complete fourth year in such a course should entitle the boy to a total allowance of twelve months. Increased knowledge of trade mathematics, trade drawing, physics, applied mechanics, building construction, and increased facility in the handling of tools and machines, should more than compensate for loss of time in actual work on plumbing jobs. The

tendency today is for the school-leaving age to be raised, and if an increased length of time at post-primary school is wisely spent, it would seem to merit recognition in subsequent employment in the way suggested. (I am aware that the purpose of a technical high school is much broader and more valuable than mere preparation for a job.)

As an alternative, an employer engaging a boy for the full period should be compelled to allow him to attend technical classes during working time for at least four hours per week for the first three years of the apprenticeship if the lad has not attended post-primary school for two years, or for the first two years if he has attended such a day school for two years or longer. A small bonus payable for first and second class passes each year, provided attendance and conduct also were satisfactory, might be considered, and a bonus of perhaps five shillings per week should certainly be payable to any senior apprentice passing the registration examination.

I know the practical difficulties involved in the suggestions made above. In particular, the proposal relating to part-time attendance at day classes will meet with opposition from many employers. Nevertheless, I feel strongly that action in this direction is urgently needed.

APPENDICES

Extracts from the *Electrical Wiremen's Registration Regulations—1926*

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The Board may require evidence to be furnished to it by written statement, declaration of identity, statutory declaration, or otherwise, of the age, the good character and reputation, the competency, the employment or training as an electrical wireman, or the being engaged in the work of an electrical wireman, as the case may require, of any applicant for registration, or of any other matters as to which the Board is required to be satisfied under the said Act as regards any applicant for registration.

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The examination shall consist of two parts, namely:—
(i) A written examination, (ii) A practical test of workmanship in a workshop, or, provided a provisional licence has been issued, then upon an actual electrical-wiring installation.

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Definition of Electrical-Wiring Work

Where electrical energy of a voltage normally not exceeding 650 volts measured at the point at which the supply is delivered is used or intended to be used for lighting, heating, motive-power, electro-chemical power, or electro-metallurgical power

(but not otherwise), the following matters shall be deemed to be electrical-wiring work for the purposes of the said Act:

A. The connecting-up of any electrical apparatus for the generation or conversion of electrical energy.

B. The installation of any metal conduits, wood casing, or other systems of encasing electrical conductors.

C. The installation of any electrical conductor.

D. The installation of any switchgear or controlling apparatus used to control electrical energy.

E. The installation of any appliances, fittings, or accessories used in connection with the utilization of electrical energy.

F. The installation of any accumulator.

G. The repairing, alteration, or extension of any of the above-mentioned items.

H. The electrical testing of any installation.

J. All work included in the rules for wiring issued under section 2 of the *Public Works Amendment Act, 1911*, or any wiring regulations issued hereafter under the aforesaid *Act*.

K. Notwithstanding the foregoing provisions of this regulation, the following matters shall not be deemed to be electrical-wiring work for the purposes of the said *Act*, namely: the installation and connection by a workman employed by an electrical-supply authority of

(a) A service line (whether in conduit or otherwise) from the distribution main of the electrical supply authority up to the point of entry in the external wall of a consumer's building; and

(b) In the case of a distribution main being an underground feeder, a service line carried in a lead-covered cable up to a service fuse-box within a consumer's building.

APPENDICES

SYLLABUS OF EXAMINATION

Part I

Written Examination

(Questions will be limited in scope to the principles underlying electrical-wiring work as defined in Regulation 8.)

1. Workshop arithmetic and drawing as applied to electrical-wiring work.
2. The properties and uses of metals and other materials, tools, and appliances used in electrical-wiring work.
3. General electrical-wiring practice.
4. An elementary knowledge of theoretical electricity and magnetism.
5. A knowledge of electrical terms.
6. A knowledge of the regulations governing electrical wiring.
7. A knowledge of switching and control of electrical apparatus and accessories.
8. The testing and repairing of electrical installations for earths, short-circuits, open circuits, &c.
9. An elementary knowledge of measuring-apparatus applicable to electrical-wiring work, their construction and operation.
10. A knowledge of the wiring of electric elevators and cranes.
11. A knowledge of the construction of domestic and industrial electrical apparatus and accessories.
12. An elementary knowledge of the principles relating to heating, cooking, illumination, and motive power.
13. An elementary knowledge of building construction applicable to installing electrical-wiring work and appliances so as to ensure a minimum of cutting away of a building and the least possible weakening of the structure.
14. The testing of electrical-wiring installations.
15. A knowledge of fire, accident, and mortality risks applicable to electrical-wiring work.
16. A knowledge of method of resuscitation of persons in the case of electric shock.

Part II

Practical Test of Workmanship

1. Installation of— (a) conduit, (b) capping and casing, (c) uncased wiring.
2. Method of making and insulating joints in cable.
3. Soldering cable sockets and terminals to the ends of cable.
4. Fixing of conductors to insulators.
5. Fixing of electrical accessories, fittings, and appliances.
6. Wiring and connecting up electrical accessories, fittings, and appliances.
7. Earthing of electrical apparatus.
8. Repairing of electrical accessories, fittings, and appliances.
9. Testing electrical apparatus and installations.
10. Reading electrical meters and instruments.
11. Method of resuscitation of persons in the case of electric shock.

Extracts from the Regulations under the *Plumbers Registration Act, 1912*, Gazetted 21st May, 1914, and Amendment, Gazetted 16th January, 1930

- (4) The subjects to which a candidate shall be examined are those set out in the syllabus in the First Schedule hereto.
- (5) The examination shall consist of two parts, namely: (a) A written examination, for which not less than three hours shall be allowed; and (b) A practical test of workmanship.
- (6) The material for the practical test shall be supplied by the Board, but each candidate shall provide his own tools.
- (7) The examination may be passed in two parts or as a whole; but no candidate shall be allowed to present himself for the written examination until he has served at least five years as an apprentice or has been engaged in the plumbing trade for not less than seven years; nor shall any candidate

be allowed to present himself for the practical test until he has served at least five years and a half as an apprentice, or has been engaged in the plumbing trade for not less than seven years. No candidate shall receive credit for having passed the practical test unless at the same or at a previous time he has passed the written examination, or, not having passed, has gained at least two-thirds of the marks required for passing such examination:

Provided that, on special application being made, the Chairman of the Board may, if he thinks fit, permit any person who, being otherwise eligible, has reached within one month of completion of the above-mentioned periods of training, to present himself for examination.

SYLLABUS OF THE EXAMINATION

A Written Examination

1. Workshop arithmetic, geometry, and drawing as applied to plumbing work.
2. The properties and uses of metals and other materials, tools, and appliances relating to general plumbing work, hot- and cold-water supplies, and sanitary plumbing.
3. General plumbing practice.
4. A knowledge of the design and construction of sanitary appliances and of the principles relating to the flushing, ventilation, and disconnection of sanitary fitting, wastes, drains, &c.
5. The testing of soil, vent, and waste pipes, and of drains and sanitary fittings.
6. An elementary knowledge of the scientific principles applicable to plumbing work.
7. An elementary knowledge of the properties and of the principles affecting the storage, conveyance, and distribution of water.
8. Knowledge of the principles applicable to the bending, jointing, welding, and brazing of metal pipes.

B *Practical Test in Workmanship*

This part will be of an advanced character, and will be such as to show that the candidate can execute in a satisfactory manner within a reasonable time the following practical plumbing work:

(a) Lead-burning, lead-pipe bending, sheet-lead bossing, joint-wiping. (b) Copper and other metal-pipe bending, jointing, welding, and brazing.

No springs are allowed for pipe-bending, but heat is allowed, and any means of heat must be supplied by the candidate. In wiping solder joints to lead pipes, heat must be applied by means of hot metal and by that means alone. Other methods of applying heat to wipe joints will disqualify a candidate.

Extracts from *Canterbury Electrical Workers—Apprenticeship Order*, 19th December 1924 (amended)

3. Every contract of apprenticeship and every alteration or amendment thereof shall be in writing signed by the employer and the apprentice, and, if the apprentice is under the age of twenty-one years, by the parent or guardian (if any) of the apprentice, and shall be registered by the employer in the prescribed manner, within fourteen days of the date thereof, with the District Registrar.
4. The minimum age at which a person may commence to serve as an apprentice shall be fifteen years.
5. The term of apprenticeship shall be five years.
6. The proportion of the total number of apprentices to the total number of journeymen employed by any employer shall not be more than one to two. An employer before engaging an apprentice to learn the trade of an electrical worker shall first apply to the Apprenticeship Committee for its approval, and shall satisfy the Committee that he has the facilities for properly teaching him the trade.

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8. The minimum rates of wages payable to apprentices shall be 15s. per week for the first year, £1 per week for the second year, £1 5s. per week for the third year, £1 10s. per week for the fourth year, £2 per week for the fifth year.

9. If ordered to do so by the Court or a committee, any apprentice residing within a radius of five miles or a distance considered reasonably accessible by the committee to or from a technical college or school or other approved institution shall, during the first three years of his apprenticeship, or until he shall have obtained a wireman's license, attend the classes in such college, school, or institution in electrical wiring, and in such case the employer shall refund to the apprentice the amount of the fees for each term in which his attendance is not less than 75 per cent of the maximum possible.

10. Every apprentice who, whether he has been ordered to attend such classes or not, shall have obtained from the Wiremen's Licensing Board a second-class license shall, upon production of such certificate to his employer, be paid during the fourth year of his apprenticeship at the rate of not less than 5s. per week in excess of the minimum rate provided in clause 8 hereof, and during the fifth year of his apprenticeship at the rate of not less than 5s. per week in excess of such minimum rate.

11. The period of probation to be prescribed in any contract of apprenticeship to enable the employer of any apprentice to determine his fitness shall not exceed three months in the case of a first apprenticeship to the trade, and shall not exceed two months in any other case.

20. It shall be an implied term in every contract of apprenticeship that the apprentice will diligently and faithfully obey and serve the employer as his apprentice for the prescribed term, and will not absent himself from the employer's service during the hours of work without the leave of the employer or except as permitted by this order, and further will not commit or permit or be accessory to any hurt or damage to the employer

or his property, nor conceal any such hurt or damage if known to him, but will do everything in his power to prevent the same.

21. It shall be an implied term in every contract of apprenticeship that the employer will during the prescribed term, to the best of his power, skill, and knowledge, train and instruct the apprentice, or cause him to be trained and instructed, as a competent journeyman in the electrical trade as carried on by the employer in accordance with the provisions of the *Apprentices Act, 1923*, and of this order, and any amendments thereof.

22. No *premium* in respect of the employment of any person as an apprentice shall be paid to or received by an employer, whether such premium is paid by the person employed or by any other person.

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Suggested Form of Apprenticeship Contract

This Deed, made the day of , 19 , between (Full name of employer), of (Address and occupation), (hereinafter called 'the master') of the first part, (Full name of apprentice's parent or guardian), of (Address and occupation), (hereinafter called 'the guardian') of the second part, and (Full name and address of apprentice), a minor born on the day of , 19 (Hereinafter called 'the apprentice'), of the third part, witnesseth as follows:

1. The master hereby covenants with the apprentice, and also as a separate covenant with the guardian, that he will take the apprentice as his apprentice in the trade of a (or that branch of the trade known as), and the apprentice and the guardian hereby jointly and severally covenant with the master that the apprentice will serve the master as such apprentice for the term and upon and subject to the conditions hereinafter set forth.

2. The term of the apprenticeship shall be years, commencing on the day of , 19 , and shall be served at (State place).

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3. The master shall pay to the apprentice during the said term wages at the rates hereinafter specified, to wit: during the first year, per week (and so on for each period).
4. The provisions of the Apprentices Act, 1923, and the regulations made thereunder, and the general order of the Court of Arbitration, dated the day of , 19 , governing the conditions of apprenticeship in the trade, are, save as hereinafter expressly provided, deemed to be incorporated in these presents.
5. The period of probation referred to in section 12 of the said Act shall be months.
6. The apprenticeship shall be subject to the minimum conditions provided in and by the said general order, except as follows (here state conditions agreed to in so far as they differ from those of the general order).
7. (If the employer does not carry on a business that comprises all the operations usually included in the training of an apprentice as a journeyman in the trade, state specifically the operations to be taught the apprentice.)

In witness whereof these presents have been executed by the parties hereto the day and year first before written.

Questionnaire Used in Electrical Trades

A. GENERAL (please answer fully and frankly):

1. Do you agree that there is, of necessity, specialization in the electrical trades to-day; and that private firms may be classified in one of the following groups, according to the work most frequently undertaken; (a) house wiring and installation work; (b) power and transmission plant erection with associated wiring and installation; (c) repairs and maintenance, winding, manufacturing and automobile electrical work?
2. In which category would you include your firm?
3. In a normal year how many apprentices are in your employ?
4. How do you generally obtain your apprentices? (Advertising? Technical College? Boys' Employment Committee? Waiting List?)
5. Do you feel that this might be improved through a more fully developed scheme of vocational guidance, whereby a boy's aptitudes, interests and general intelligence could be more fully determined before engagement? (or do you feel that the present method of selection, plus the probationary period of three months, meet the situation adequately?)
6. What type of education do you prefer the boy you engage to have had? (Primary? Technical? General Secondary?)
7. What *standard* of education is it desirable he should have reached before you engage him?
8. At what age do you prefer them to start?
9. Is the length of probationary period satisfactory? (If not, what period would you suggest?)
10. For every 10 apprentices engaged (for example) how many would you estimate to survive the probationary period and become indentured?
11. Have all your apprentices during the past 10 years completed their time and qualified as journeymen?
12. What happens to your apprentices when they complete their time? (Do you still retain them in employment?)
13. Do you consider the present term of apprenticeship (five years) satisfactory? (If not, what period would you suggest?)
14. Do you think it possible and desirable that following the apprenticeship a term of 'improvership' should be compulsory?

APPENDICES

15. If so, what do you suggest as the length of this period?
16. Would you suggest that this period should *not* be served with the same firm, to ensure a broader training and therefore a better equipped journeyman?
17. Have you any suggestions as to how arrangements might be made to ensure (to 'improvers') this wider experience with different types of firms?
18. Have you any other suggestions for enabling an apprentice to gain wider experience? (For instance one suggestion has been that apprentices should be apprenticed to the trade as a whole, not to individual employers; and that their services be allocated to employers at the discretion of a Registrar of apprentices who would be responsible also for their training at some centre during their 'off' periods. Such a scheme might also check the fluctuations in the number being trained from time to time.)
19. Do you agree with the present proportion of apprentices to journeymen? (If not, what would you suggest?)
20. Have you any other suggestion for ensuring a reasonable number being trained throughout the trade from time to time?
21. Do you regard the present wage scale as satisfactory?
22. Are you satisfied with the present organization and functioning of the Apprenticeship Committee? (Considering, of course, the machinery and principle involved—not the individual members.)
23. Is the form of apprenticeship contract satisfactory?
24. Is there in your opinion fair and reasonable release from this contract provided for in exceptional circumstances, by existing legislation?

B. TRAINING OF APPRENTICES:

1. It is claimed that to be a good electrician the apprentice must not only be trained in *pure electrical work*, but in addition must have a good knowledge of mechanism; and at least a rudimentary knowledge of *fitting and turning, steam, hydraulics, heating and lighting, radio circuits*.
Would you please comment on this? (It is realized of course that few concerns can give such wide training.)
2. I have set out below three *schedules of work* which I believe it might be reasonable for apprentices to undergo in the course of their five years' training, according to the type of firm with which they are associated. (*A* represents a firm of wide interests and extensive opportunities; *B* represents a firm specializing in repairs and maintenance, winding, etc.; while *C* represents a firm concerned mainly with wiring and installation work.)
Would you please do two things: (a) *Underline* those processes in which you think it *would be desirable* for an apprentice to receive training in order to become a *first-class journeyman*. (Select any processes from any list; and add any others you feel would be desirable. The year of training for each process is not so important, but if you feel that any are misplaced please indicate by an arrow. Any part that you think a boy should learn through his studies rather than through practical training, please mark with an S.) (b) *Tick* those processes in which an apprentice is trained within your own firm, again selecting from any list and adding any others you feel should be included. (It is realized that in most cases this selection of processes will be much more limited than in the previous case.)

STUDIES IN APPRENTICESHIP

A	B	C
<p><i>First Year:</i> <i>First six months:</i> Assisting in workshop, assembling small switchboards, fitting and turning minor parts, repairs to household equipment, not involving motors. <i>Second six months:</i> Wireman's boy, meter tester's boy, or garage boy.</p>	<p>Small windings, cleaning down jobs, stripping windings, small coils of all kinds, magnetic coils, cutting insulations, mainly helping on large work.</p>	<p>Assisting journeyman.</p>
<p><i>Second Year:</i> Wireman's boy.</p>	<p>Larger windings, transformer coils, car armatures, fitting and turning (small bearings, etc.), small motors.</p>	<p>Assisting journeyman, drilling switch boards.</p>
<p><i>Third Year:</i> Wireman's boy.</p>	<p>Larger motor windings, erecting transformers after winding, connecting up windings, starter and generator repairs (bench work).</p>	<p>Assisting journeyman, marking out and drilling switch boards, repairing bell installation.</p>
<p><i>Fourth Year:</i> <i>First six months:</i> Wiring workshop, fitting and turning, wiring workshop repairs. <i>Second six months:</i> Operating and maintenance of distribution equipment (this possible only with large firms or supply authority).</p>	<p>Sole care of medium-class windings, connecting of motors, etc., locating faults on car electrical equipment, and taking own responsibility for repairs.</p>	<p>Installing extra lighting points, installing extra heating points, repairing fuses, switches and general maintenance work.</p>
<p><i>Fifth Year:</i> <i>First six months:</i> Testing of equipment, testing of meters and instruments. <i>Second six months:</i> Instrument repairs, testing of installations, or drawing office.</p>	<p>Repairs on break-down of larger apparatus, manufacturing and assembling of equipment, all car electrical work, including diagnosis of troubles, repairs to instruments, etc.</p>	<p>Installing cottage installations, repairing telephones, rewinding small armatures, maintaining lift installations, fault finding on installations, motor and control gear installing.</p>

3. Do you feel that these schedules represent reasonable courses of practical training within their representative types of firms?

4. Are your apprentices given definite instruction in all branches of the trade under a qualified tradesman?

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5. How long do you think it would take an apprentice to learn thoroughly the branches of the trade in which you provide training?
6. How much of your apprentices' time is spent in low-grade routine labour (running messages, feeding a skilled tradesman, etc.)?
7. How far do you justify this?
8. Do you regard your journeymen as efficient instructors?
9. How much of their time is necessarily devoted to instruction of apprentices?
10. Have you a foreman who spends part of his time in the instruction of apprentices? How much?
11. Have you time to spend in this respect yourself? How much?
12. Do you begrudge the time you or your representatives must spend in such instruction?
13. Would you prefer apprentices to be fully instructed in a trade school, or part-time continuation school, rather than in private firms?
14. If so, would you be prepared to support such an institution financially, or be agreeable to some system of taxation on industry for this purpose? (N.B.: Schemes of this nature have been tried in other countries.)
15. I have set out below a *schedule of studies* which I believe an apprentice should undergo at evening classes as supplementary to his practical training. Would you cross out or alter any with which you disagree and add any others which you feel should be included.
 - (1) Workshop mathematics—as applied to electrical wiring work.
 - (2) Mechanical drawing—as applied to electrical wiring work.
 - (3) Theoretical elect. and magnetism—elementary knowledge.
 - (4) D.C. Course.
 - (5) A.C. Course.
 - (6) Properties and uses of metals—other materials, tools and appliances used in electrical wiring work.
 - (7) General electrical wiring practice.
 - (8) Knowledge of electrical terms.
 - (9) Knowledge of switching and control of electrical apparatus and accessories.
 - (10) Testing of elect. wiring installation.
 - (11) Testing and repairing of elect. installation for earths, short-circuits, open circuits, etc.
 - (12) Elem. knowledge of measuring apparatus applicable to electrical wiring work, their construction and operation.
 - (13) Knowledge of wiring electric elevators and cranes.
 - (14) Knowledge of construction of domestic and industrial elect. apparatus and accessories.
 - (15) Elem. knowledge of principles relating to heating, cooking, illumination and motive power.
 - (16) Elem. knowledge of building construction applicable to installing elect. wiring work and appliances.
 - (17) Knowledge of wiring regulations.
 - (18) Knowledge of fire, accident and mortality risks applicable to elect. wiring work.
 - (19) Knowledge of methods of resuscitation of persons in case of electric shock.
 - (20) Elem. knowledge of hydraulics.
 - (21) Elem. knowledge of heat engines.
 - (22) Elem. knowledge of radio.
 - (23) Elem. knowledge of telegraph and telephoning.
 - (24) Elem. knowledge of power generation.

STUDIES IN APPRENTICESHIP

(25) Elem. knowledge of plant erection.

16. Are you in favour of time being spent in training at the local technical *day school* being included in the total time for an apprenticeship training? (If so, in what proportion do you suggest?)

17. Do you consider that your apprentices give adequate attention to their studies?

18. Do you consider that a clause should be embodied in the contract of apprenticeship, making attendance at classes compulsory?

19. Or (putting it more generally) do you believe that a clause should be inserted allowing employers to dispense with the services of an apprentice if a reasonable standard of technical training is not kept up?

20. Are you acquainted with the course of study undergone by apprentices at the technical college evening (and Saturday morning) classes?

21. Do you regard this as satisfactory? (If not, please state criticism.)

22. Are you acquainted with the course of study undergone by apprentices at Canterbury College?

23. Do you regard this as satisfactory? (If not, please state criticism.)

24. Do you favour the idea of instructors in those colleges who have dropped practical participation in the trade, being enabled (and perhaps compelled) by the Department of Education to undergo a refresher course (of, say, three months every five years) within the trade, to enable them to keep fully abreast with changes and developments?

25. Do you favour a reversion to some system along the lines formerly favoured whereby two certificates were issued: a *2nd grade licence* (approx. equivalent to the present wireman's registration licence, and permitting certain types of work up to a certain voltage) and a *1st grade licence* which allowed the holder to engage in any class of electrical work? (This, it is claimed, would provide an incentive for wider study and experience.)

26. Do you believe that there should be also compulsory registration of businesses, involving the issue of contractors' licences?

27. Have you any other criticism of the Electrical Wiremen's Registration Regulations? (Including the definition of electrical and wiring work?)

28. Is it in your opinion reasonable for an *apprentice*, under present conditions, to pass the following examinations (please state Yes or No opposite each)? Licensed Wiremen, Technological Board of New Zealand (Elect. Eng.), London City and Guilds (Elect.), A.I.E.E.

29. If 'No' is against any of those, do you think it desirable to make provision for apprentices to be enabled and encouraged to pass such?

30. Do you favour the idea of employers releasing their apprentices for part of their working time for attendance at technical classes in the day time?

31. If so, how much time do you suggest per week?

32. Do you favour the payment of fees, and of increased wages where examinations have been passed?

33. Would you increase or decrease the present amount payable?

C. GENERAL COMMENTS ON apprenticeship in the electrical trades in general (e.g. effects of depression, system of transfer, status of trade, Government inspection, Government competition, etc., etc.):

APPENDICES

Questionnaire to Master Plumbers

1. Please indicate the branches of plumbing that your firm caters for (building plumbing, ships' plumbing, heating and ventilating work, draining, gasfitting, etc.).
 2. How many apprentices have you employed since January 1st, 1929 (give number per year)? How many of these have completed their time and qualified as journeymen?
 3. What happens to your apprentices when they have completed their time? Do you still retain them in employment?
 4. Are apprentices given definite instruction in all branches of the trade under a qualified tradesman? Or do they pick up what they can in a general way?
 5. How long do you think it would take an apprentice to learn thoroughly the branches of the trade in which you provide training?
 6. Do you favour a shorter period of apprenticeship? If so, what length do you suggest?
 7. Are you in favour of time spent in training at the local technical colleges being included in the total time for apprenticeship training?
 8. How much of the apprentice's time is spent in low-grade routine labour—running messages, feeding a skilled tradesman, etc.? How far do you justify this?
 9. What is your opinion of the type of instruction given at the technical college?
 10. The following statement has been made *re* plumbing in New Zealand: 'Not 25 per cent of the apprentices in New Zealand ever see the class of work taught in the technical schools in the whole of their apprenticeship at work. Not 50 per cent ever see any work larger than 2-in. pipe work. Only about 20 per cent of apprentices work on heating and ventilation work of any kind and very few see any kind of ships' plumbing.' Do you agree with this? If not, how would you amend it?
 11. Do you agree that a journeyman should be able to carry out the following work efficiently at the end of his apprenticeship? (a) Covering small flats in copper and lead; (b) Know the procedure of work on small jobs such as (i) small copper pipe jobs, (ii) covering roof with iron, (iii) flashing, (iv) fixing gutters, (v) spouting, ridging and downpipes, (vi) do all small repairs; (c) Repair cistern and taps; (d) All cottage work which includes domestic hot-water systems; (e) Fix bath, basin and W.C. and all wastes and vents for same; (f) Fixing gas pipe. Would you add any other items to this list?
 12. Are you able to give your apprentices training in all branches of this programme?
- Please add any comments you care to make on the apprentices' order in general: effect of depression; system of transfer, status of trade.

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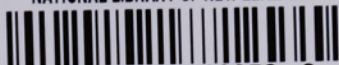
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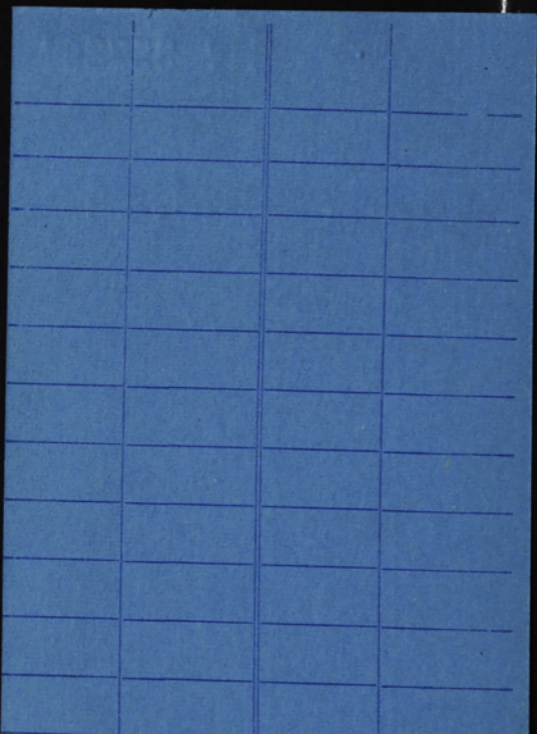
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