

number of young men trained in agricultural science, many of whom were being called upon to conduct field and laboratory enquiries into questions of fundamental importance to practical agriculturists, and, inasmuch as agricultural production and rural development would in the future turn largely on the results of their labours, the furtherance of their efforts by every possible means became a matter of national concern. The responsibility in that direction rested mainly upon the shoulders of the Federal and State Governments. To them was entrusted the framing of their agricultural policy, and on their sagacious foresight would depend in great measure the extent to which the agricultural problems of Australia were unravelled in the near future. Their whole-hearted sympathy and practical support were vital to the extension, indeed, even to the maintenance, of the systematic enquiries already instituted, and when it was realized that agricultural research in Australia had as yet hardly shed its swaddling clothes, the plea for liberal sustenance and fostering care by those in authority, would be recognised as well founded and opportune. While the final responsibility fell on the political powers, however, there were undoubtedly obligations of no mean order to be discharged by the departments, institutions, and educational bodies that were charged with the elucidation of those problems, and with the dissemination of agricultural truths and findings. It was to that subject that earnest thought should be given. They asked were they even at the present time organizing their activities and exploiting their opportunities to the limit of their powers, and whether it was not possible for improvements to be effected in regard to standardization and co-ordination by co-operative efforts and combination? It appeared to the writers that very little had been done as yet to overcome the disadvantages that were an inevitable corollary to the intervention of wide stretches of space and time between groups and individuals. The stimulus of collaboration, the inspiration and encouragement arising from discussion and enthusiasm engendered by intimate knowledge of the ambitious and objectives of others were felt in minor degree only, if at all, under present circumstances.

Achievements in England.

In Great Britain much had been achieved by the Agricultural Education Association along the lines indicated, and the time seemed ripe for the formation of an analogous body in Australia. Among the several functions which it would be expected to discharge might be mentioned the classification and publication in an annual volume of all forms of experimental work, field and laboratory having a bearing on agriculture in Australia. Hitherto they had been able to glean a little knowledge of the progress being made in different centres from the pages of the departmental publications, but there was a vast amount of work carried out that was of little direct value to the farmer, and in consequence, did not appear in print. That work, however, might be of engrossing interest to other investigators, and consequently it was eminently desirable that progress reports giving complete records of the whole of the work undertaken each year should be brought together in an annual reference volume. Had the dream of a Federal Bureau of Agriculture been allowed to materialize, that body would have been the proper authority to undertake the co-ordination and standardization of experimental work. In its absence, the writers submitted, the Federal Government should be urged to render financial assistance, and to share with the States the responsibility for the appointment of a Commonwealth Agricultural Research Association competent to bring about the desired reforms. It might be deemed more appropriate to place the matter in the hands of the Federal Institute of Science and Industry, although the conviction of the writers was that, while the collation and publication of annual reports might be confidently entrusted to the institute, the defining of standards was a matter for consideration and decision by those actually engaged upon investigational work. Finally, the view was expressed that if a conference of those actually engaged in conducting experimental work were convened at intervals of two to three years, a vast amount of benefit would accrue. Each representative would have his vision widened and his enthusiasm stimulated by exchange of views upon points of difficulty in his own work, as well as in that of others. New ideas would be gathered and fresh light would be thrown on problems already under investigation.

INDUSTRY AND HEALTH.

THE DOCTOR IN FACTORIES.

Value of Industrial Medicine.

"There are sound national reasons why industry should bear its share in raising the country's standard of health, and industrial medicine affords a way, as it is well within the power of employers to insure a high standard of health within their own organizations." This statement was made by Dr. D. G. Robertson (Director of the Commonwealth Division of Industrial Hygiene) in a paper read before the sanitary science and hygiene section of the Science Congress at the University

to-day. The chief value of industrial medicine lay in its potentiality for preventing disease. It offered the following benefits:—A decrease in the number and length of absence of employees due to injury and disease, a decreased turnover in factory labour, and increased earnings for the worker, and increased production for the employer. The National Cash Register Company, of America, had, by an efficient medical department, reduced the sickness of their employes from nine days to 134 hours for each employe a year. Public health not only postponed mortality and prevented sickness, but furthered the positive side of health by increasing the vitality, capacity, and efficiency of the human body. That was accomplished by supervision by the individual. Industrial medicine afforded an economical means of supervising large groups of individuals. The sickness of the industrial worker caused a huge financial loss yearly. In certain Government departments it had been found that on every working day at least 2 per cent of the employes were absent through sickness, due largely to preventable causes. For the financial year ended June 30, 1923, the salaries of permanent officers of the Commonwealth public service amounted to £6,000,000, and of that sum £132,000 represented sick pay. In increasing numbers Australian employers were instituting some system of medical service. In 1923 14 separate establishments in Sydney had engaged nurses, in some cases for a staff of less than 500 employes. It was essential that employers should set before themselves clearly the work a medical service should do, and how that work should be undertaken.

The Industrial Physician's Work.

As a first step, the industrial physician should become familiar with the plant. He should possess a working knowledge of the principles of lighting and ventilation, and be familiar with the effects of the more common industrial poisons. He should report to the management all conditions that he considered potentially detrimental to health and comfort. Prompt and proper treatment should be available for all injuries, and employes should be compelled to report immediately all injuries, no matter how trivial. Medical attention should be confined to minor ailments, other cases being referred to the family physician, but it should be made a working rule of the establishment that every employe becoming sick during working hours should report to the medical department before going home. If examinations of applicants for employment were required, they should not be held for the purpose of rejecting the physically unfit, but to prevent persons being placed in occupations in which they were likely to be dangerous to themselves, to others, or to property, or where they could not reasonably prove efficient. The prevention of the spread of infectious diseases, such as the common cold, was an important duty of the medical department. Australian employers were now recognizing the importance of dental hygiene by offering dental attention. Accurate records of the work performed in the medical department, and of the sickness among employes, should be kept. In the ability to reduce the amount of sickness below the general or accepted average lay the test of the industrial physician or nurse. As the medical department was placed in touch with the employes throughout the whole organization, excellent opportunities were afforded for instructing the workers by personal advice on healthy habits of living. The accommodation required by the medical department depended upon certain factors, but generally speaking, a surgery, consulting room, and rest room were necessary. The industrial canteen was a valuable adjunct to medical services, and Australian employers were setting a high standard in that respect.

OUR RIVERS.

THE UPPER MURRAY.

Solving Its Problems.

The manner in which the efficacy of the River Murray upper reaches is being destroyed was outlined by a paper delivered by Mr. G. L. Wood to the geographical section on the subject of "Problems of the Australian river with particular reference to the upper Murray." He contended the importance of the upper Murray terrain depended upon the deltaic character of the Australian rivers after they left the hill country. Therefore, all problems of drainage, more especially that of irrigation must be attacked in the region where the streams followed well-defined valley bottoms. The upper Murray catchment, with its hundreds of wooded ranges tight back to the Kosciusko wall, was economically a most important area. Farther down the valley deforestation and dilapidation had followed in the wake of settlement. The chief effect on the streams had been to derange the natural regulation of the river volumes. Great changes in the catchments were taking place almost unnoticed. The reckless waste due to a stupid lack of control over the catchments beggared description; and in a matter which affected the economic life of three states more had to be done to protect the natural regulators. The chief mischief resulted from the feral and criminal lack of control over keesholds. Timber getters did some damage, but in that matter far more was done by the employes of the big freeholders and bus-

nessmen. Their wanton depredations had to be sternly and immediately checked, in particular frequent and "accidental" fires that so strangely provided grass for the next season. Those wooded hills were losing their protective covering and becoming bare rock ridges. The coarser scrub was giving place to grass and the ground was becoming "packed" hard by cattle traffic. The result was the forest floor, the natural reservoir and the regulator of the run-off, was gradually disappearing. The rainfall in that area was comparatively heavy, and the soil from the hillsides was being swept off into the valleys and deposited as barren sand and gravel flats. Thousands of acres of good agricultural land had already been lost through that cause alone. The seasonal flow of the rivers was likewise disturbed by the acceleration in the speed of the run-off. The rivers ran "bankers" and speedily sank to a low level. In the last dry period some of the rivers actually ceased to flow for the first time in the memory of settlers. Flood water problems were causing road engineers and shire councils great anxiety; and the annual bill of the railways for washouts, &c., was mounting very rapidly.

The Remedy.

The derangement of the natural regulators would become increasingly important as irrigation works were extended. The annual run-off passing down the river in the dry months, December to May inclusive, showed a loss in 40 years of about 30 per cent of the normal summer volume. They had to think what that would mean to the Australia of 60 years hence. The rivers in all States would become the series of stagnant waterholes that were so familiar in the interior. Further than that, great natural regulators and reservoirs of the Hume Reservoir type would become necessary at an expense of millions of pounds. The natural reservoir—the forested catchment—was being shamefully treated. Erosion was becoming very prominent over the whole area; gullies were everywhere being torn into the hillsides and the rubbish deposited lower down; landslips were frequent and a steady loss was going on from year to year by soil depreciation.

In the rivers serious siltation effects were becoming noticeable. Fertile flats were becoming overlaid with stretches of sand, and bank erosion was becoming accelerated through the "speeding-up" of flood waters caused by deforestation. The chief remedies that were urgent were suggested by the serious position revealed. The neglect of the Governments concerned for allowing the trouble to attain such dimensions could not be too strongly condemned. An immediate demand had to be made for the abolition of the grazing licence in all catchment areas. Fines, penalties, forfeiture would all fail to protect the catchments. All highly inclined land near river basins should become a permanent reserve; and alienation should be forbidden for ever.

TRANSPORTATION.

ROADS AND THEIR DEVELOPMENT.

Importance to Australia.

Mr. Norman H. Taylor (Federal President of the National Roads Association) read an interesting paper to the engineering section on the subject of roads, and their development in relation to modern traffic. Transportation, some one had said, had been the ladder upon which humanity climbed from a condition of primitive life to that of a finely wrought and complex civilization. A new interest in roads had been made necessary by increased motor traffic. Starting out as a plaything, transformed into a luxury, and then becoming in turn a definite element in the standard of living, the motor vehicle had assumed the role of a highly efficient factor in their transportation system, touching the lives and promoting the welfare of America as few developments in the history of any nation had done. A man who had been called the English Ford, the maker of one of their English cars, was asked the other day whether he saw an end to the present rapid production of motor cars. He replied that that day would never come. "I confidently anticipate," he added, "the time when it will seem the most ordinary thing in the world for the British workman to have his own car." The awakening of a great public demand for better highways was not confined to Australia. The whole of the civilized world and much of it that they were prone to regard as uncivilized, was tackling the problem with equal, if not greater, vigour than ourselves. The reason for that movement in Australia was not far to seek. Probably the greatest curse from which Australia suffered was centralization. They got most of their wealth from primary production, yet more than half of their very small population lived in the five capital cities.

Roads and Rural Production.

One of the greatest questions exercising the minds of the statesmen of to-day was how to place and keep a greater population on the land. The National Roads Association thought the solution lay very largely in providing them with good roads, so

that in fair weather as well as foul they could get to their home towns. Australia was spending as much per head of the population as most other nations, but her needs in view of her scattered population and vast distances, were greater. She could afford to spend a good deal more. What had been spent up to now was only a small portion of what she could and ought to disburse. They borrowed millions to build railways, to which there could be no objection. Surely it was just as desirable, necessary, and moral, to borrow millions to build permanent roads (at all events as permanent as were railways) so that settlers could get their produce to the railway stations. It must not be forgotten that all their primary products had their genesis and exodus on the roads. Bad roads depreciated the value and earning power of the railways, good roads enhanced their value and usefulness.

Mr. Taylor dealt with the various experiments now being made in roadmaking, and said he did not pretend that roads in the distant country areas could be constructed either of cement or bitumen, but he was sure that all arterial roads, urban and suburban roads, should be so constructed to ensure not only comfort, but economy. No roads should be built without an adequate sum being set aside for their maintenance. Too often roads were built and then gradually wholly destroyed. Railways had gangers every few miles, why not roads? A great many of their roads were much too narrow, especially those leading to populous suburbs or watering places, and the call was urgent and insistent that they should be widened once. Many of their important roads were overcrowded, especially those with double lines of tramways. So important were roads to development, and so great was the problem that he felt strongly that nothing entirely satisfactory could be done until they had a separate Roads Department free from political control, with a Commissioner at its head with the same power as the Railways Commissioner had to-day. Three sources of revenue were open to him. The direct taxation of all road users (pedestrians excepted); a certain grant from all municipal and district councils for being relieved of all responsibility in regard to main or arterial roads, and a grant from the Government, to which all would subscribe for increased facilities of transportation, would cheapen goods, and so benefit the whole community.

EDUCATIONAL.

SCHOOL ORGANIZATION.

The Dalton Plan.

Dr. E. Neil McQueen (head master, Presbyterian Ladies College, Croydon, N.S.W.), speaking on "The Dalton plan" before the mental science and education section, observed that the ordinary school organization and methods were too rigid and afforded too little opportunity for the development of initiative. The Dalton laboratory plan had been in operation at the Presbyterian Ladies College, Croydon, N.S.W., since 1923. The pupils received monthly printed programmes of work or "contracts." Each subject had three grades of assigned work to allow for variations of ability. About two-fifths of the school time consisted in class lessons. The remainder was for individual work, consultation of teacher and reference books, and discussion with other pupils, unless Miss Parkhurst (the originator of the plan) the writer found it advisable to retain the class unit for purposes of presenting new matter. Apart from class lessons, students could move about the school at any time while carrying on their work. Time was not wasted, and more work was done. The students of the second and third years of the secondary course showed themselves least able to accommodate themselves to the changed conditions. A few students did not thrive under the plan, and a special class mainly on the old lines was run for them. Almost invariably those students show lack of primary grounding. So as to avoid losing the advantages of community spirit, the writer had in his school made some of the assigned work definitely co-operative in character. This co-operative work where the class or section depended on the work of the individual had been better done than the other work. Interesting instances were given of co-operative work in various subjects.

EDUCATING MINING ENGINEERS

Methods of Improvement.

Mr. P. D. Riddell, M.E. (principal of the Technical College, Broken Hill), in a paper on "The education of mining engineers," set out before the education section members the decrease in the value of mineral production during the past 19 years, and also the decrease in the number of men employed. Parallel there was the falling off in the number of candidates for training in mining engineering. The possible reasons were considered, and the present institutions giving instruction in mining engineering were reviewed and the