

One feature of our authors' results is their corroboration from different data of those obtained by Sir Joseph Hooker regarding the distribution of Arctic plants. Study of large genera widely distributed in the northern hemisphere suggests that during the latest southward flow distinct routes of migration were followed. The flora of the Reuverian horizon which antedated the precedent northward flow shows, as might be expected, an intermixture of elements characteristic of what are now somewhat specialised floras. One instance of this is illustrated by the figures from Plate VI. here reproduced. The figures 9 *a*, *b* show a fruit which our authors refer to the genus *Hakea*, the family of which is no longer European, alongside those of an existing Australian species, figured in 10 *a*, *b*. Another curious point is brought out by these figures. In a noticeable number of these Reuverian plants the carpels or seeds are considerably smaller than in existing species of the same genera. Besides *Hakea* may be mentioned *Alisma*, *Bucklandia*, *Epipremnum*, *Liriodendron*, *Mimusops*, *Nelumbium*, *Trapa*, *Zelkova*, and the list might be extended.

Those who have had to identify, in the jetsam of a tropical sea-beach, the seeds and fruits of species growing close at hand, can understand better than others the difficulties our authors must have experienced in dealing with material in every stage of decay, due to submersion and dissolution caused by pressure. But even these can only dimly appreciate the labour involved in identifying material yielded by species which no longer exist, with no better help than the all too inadequate herbariological collections of even the best European *herbaria* can afford.

More than a passing acknowledgment is due to the care with which this work in a foreign speech has been printed for the Netherlands Institute for Geological Exploration. There are very few of the slips which seem inevitable under such conditions. "Tot" for "to," "al" for "all," "ot" for "or" do indeed occur, but the only one which calls for correction, in addition to those indicated in the errata at the end of the text, is "exerted" for "exserted" on p. 78.

NATIONAL ECONOMY IN FUEL.

THE need for economy in our national life has been urged upon us in the most emphatic manner by his Majesty's ministers and others, and there can be no doubt but that, great as efforts to economise may have been in recent months, still greater efforts must be made in the immediate future. From the national point of view there can be no greater need than for the most rigorous economy in the utilisation of our coal supplies. The appointment of a committee by the British Association, as announced in *NATURE* of October 21, shows a timely appreciation of the necessity for, and a desire to do everything within the powers of the association to achieve, economy in this direction.

NO. 2408, VOL. 96]

The question is not a new one. It was considered exhaustively in the report to the Royal Commission on Coal Supplies, 1901-1905, and many eminent men have directed attention to it. Sir William Ramsay dealt with the subject some few years since in his presidential address to the British Association, and advocated the formation of an annual stocktaking commission. More recently, at Cardiff, Prof. H. E. Armstrong emphasised the necessity for more scientific methods, and a committee was formed to deal with points of benefit to local industries, which would necessarily include coal. But hitherto the question has been treated mainly from the point of view of exhaustion of our supplies, and it cannot be claimed to have attained any great success. On the whole, waste in production and most uneconomical utilisation still persist.

As Mr. Lloyd George has said, "in peace and in war King Coal is the paramount lord of industry." The demand for coal has not been lessened by the war; rather do we find it largely increased by reason of the enormous demands for the output of war material. In Sheffield it has been stated that the consumption of gas for power and heating purposes is ten times greater than before the war. In Birmingham the demand was 135 per cent. greater in the past six months than in the corresponding period of last year. Similarly, the demand for electric power is affecting numbers of towns. In addition, the large requirements of our Allies must not be overlooked.

In 1913 the coal output was 287,411,869 tons and the number of employees 1,110,884. Owing to the great response of the miners to their country's call, Mr. Asquith estimated the output as reduced by 12 per cent. or 34½ million tons below the normal. Clearly at no time in our history has need for economy in coal been so absolutely essential.

The reduction in output and the difficulties of transport have been brought home forcibly to the individual by the big rise in prices. Hitherto the realisation of the need for economy has been confined to the few, and therefore been largely futile. The more general recognition of this need is the best augury for the success of the committee's efforts, as far more likely to result in Government action.

Whilst the open fireplace, responsible for so much waste, still retains its popularity, consumers may be trusted to exercise greater personal care with coal at its present prices than in the past; but the undoubted extension which will take place in the utilisation of gas for heating and cooking, and of coke in the grate, will ensure far more efficient utilisation of coal. Further, the householder can, at this juncture, be brought to realise how essential to the supply of the munitions of war the by-products of the gas industry are; products he sends to waste up the chimney.

In production every waste must be avoided and the output per head of the mining population largely augmented, although this will at once bring its attendant troubles over hours of labour.

In America the output is higher than in this country, a result ascribed to the more general use of improved cutting machinery and the greater capacity of mine tubs. But naturally economies at the pit will, to a considerable extent, have to wait, the whole energy of the management being concentrated on increased output in face of shortage of skilled labour. In the utilisation of coal for power and industrial heating we have been extravagantly wasteful in the past, but of recent years there has been a marked improvement through the introduction of more efficient power-generating plant. In the case of steam, the higher efficiency of engines, and particularly the introduction of the turbine, has lowered fuel consumption per horse-power. The extended use of power-gas plants has given a very low cost of fuel for both power and heating purposes, and enabled poor-class coal to be employed efficiently and valuable by-products to be recovered. Much improvement may still be effected through further developments in these directions, and particularly in the more scientific control of methods of combustion and gasification by trained fuel specialists.

In connection with the metallurgical uses of coal, it is impossible to compute the amount of waste in the past by the coking of coal in the old type bee-hive oven, in which no inconsiderable proportion of our coke is still produced, and as long as one of these ovens is in use, unnecessary waste is being entailed. There has fortunately been a steady increase in the introduction of by-product recovery ovens, and about two-thirds of the total coal carbonised for metallurgical coke (more than 20 million tons) is treated in recovery plant. When the valuable by-products, which include benzene and toluene—so much in demand for the production of high explosives—and sulphate of ammonia are considered, it is obvious that any coal carbonised in non-recovery plant leads to absolute waste of valuable materials, in addition to a prodigal waste of heat units. Prof. W. A. Bone, in addressing the Chemistry Section at the meeting of the British Association in September, suggested that, in the public interest, the Government might fix by law a reasonable time-limit beyond which no bee-hive coke-oven installation should be allowed to remain in operation.

The present writer, several years ago, in a lecture on fuel economy, urged the necessity of a comprehensive study of our coal supplies in order to afford systematic information as to the suitability of the different seams for various industrial purposes, as being essential to the most efficient use of our supplies, and advocated the establishment of a Government fuel-testing laboratory on the lines of the United States Bureau of Mines laboratory. Prof. Bone, in the address referred to, suggested a memorial to the Government for the establishment of a similar central organisation. It may be that at present difficulties in the provision of funds for this purpose would be great, but there can be no doubt of a very adequate return for the outlay, and if the committee ap-

pointed by the British Association can secure a sympathetic consideration of this question, it will have done an incalculable service to the community and have fully justified its existence, independently of the other fields in which its activities will find scope.

J. S. S. BRAME.

AGRICULTURAL EDUCATION AND RESEARCH.¹

WE open the latest report on Grants for Agricultural Education and Research wondering how the war is going to affect the liberal policy adopted in recent years by the Board of Agriculture. It is satisfactory to find that the Board means to continue on the high plane on which it started: economies there will have to be, but the main lines are, for the present at least, to continue as before.

Perhaps the most important change during the year has been the framing of new regulations for the distribution of grants for agricultural education and research. Hitherto the grants have been paid in several different ways; in future there is to be more uniformity of procedure. When Government aid was first given to agriculture in the form of "whisky money," it was left to the local authorities to decide how they would spend the money. Some simply used it as a dole to the farmer and applied it towards the relief of the rates; others set up local schools; others, again, realising the need for higher work, set up colleges and aimed at having scientific investigations carried out.

This diversity of aim on the part of the local authorities was accompanied by equal diversity of procedure on the part of the Board, and the schemes were aided on four different plans, viz., by block grants made to colleges, by farm institute grants paid on a partnership basis, by grants representing the agricultural shares of block grants previously paid by the Board of Education, and by grants in aid of particular schools and classes based on the number of pupils and hours of attendance. By skilful management, an astute county council clerk could manage to draw the bulk of the money out of the State, basing the claim for grants on expenditure which was really being met by "whisky money." The more progressive counties, on the other hand, were hit rather hard, and substantial expenditure by the ratepayers drew little or no assistance from the State, because it was disqualified for some technical reason quite unconnected with the value of the work itself.

It is gratifying to know that all this is now being taken in hand, and a scheme has been evolved for dealing with the matter. The main trouble is, of course, that the taxpayer has parted with his control over the "whisky money," and the local authorities can do with it what they think fit. The Board's scheme has therefore to be attractive, or the backward counties will have

¹ Annual Report on the distribution of Grants for Agricultural Education and Research in the Year 1914-15.