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SCIENTIFIC AND TECHNICAL SERVICES IN THE FUEL INDUSTRIES

THERE is a practice of fuel technology of long standing, if empirical, which in the past generation has been developed scientifically with varying intensity in almost all industrialized countries. There is a technical literature on fuel circulating throughout the world, and there are substantially no secrets on the subject. This means that, although improvements should be sought, few revolutionary discoveries can be expected. For example, in the past twenty years, large modern steam generators have been available to produce steam from coal with a thermal efficiency approaching 90 per cent. There is here little room for increase in thermal efficiency. In the carbonization of coal, the position is analogous. The design of modern gas retorts and coke ovens permits the carbonization of coal with an efficiency of 80 per cent. Although present practice lags behind this standard, the scope for discovering increased efficiency is not great. The real scope for advance lies in the direction of complete gasification ; but the gas industry started on this quest fifteen years ago, and by now has gone some way towards the operation of large-scale plant. The efficiency of gas producer plants has long ago attained similar high thermal efficiency.

It may be inferred from the above that there is little scope for any revolutionary increase in the thermal efficiency of the art of processing fuel. On the other hand, there are many fields of utilization where normal practice falls short of the standard of efficiency which at best is already attainable. In these, the solution requires only the application of existing knowledge, as is exemplified by the war-time work of the Ministry of Fuel and Power through its engineering staff—both permanent and voluntary—and publications. In association with this is the need for new plant and apparatus likely to promote more efficient utilization. Change in household practice will call for great efforts in this direction.

The Association of Scientific Workers has recently prepared an "Interim Memorandum for the Scientific and Technical Services for the Fuel and Power Industries", which is stated to be based on the experience of students of the natural and social sciences who have been concerned with fuel and power problems, or in war-time work of the Supply and Service Ministries where scientific methods have been applied on an unparalleled scale. It makes recommendations, the keystone of which is the establishment of a single unified scientific and technical service, to meet the whole requirements of the nationalized fuel and power industries of Britain. It is proposed that the co-ordination, stimulation and regulation of all research activities should be the responsibility of the Ministry of Fuel and Power, through a controller of research and development. For the central research establishment, a programme is suggested which includes : (*a*) survey of coal resources ; (*b*) coal mining ; (*c*) domestic fuel production and utilization ; (*d*) indus-

trial use of coal, including steam generation; (*e*) conversion of coal into products of high value with the object of (i) working the coal seams to best advantage, (ii) increasing the efficiency of utilization, and (iii) creating new industries using coal as a raw material for products of high value for export.

To these proposals an emphasis is given comparing them with that which drove the development of radar during the War. It is, however, open to doubt whether the analogy between radar and fuel technology is a close one. Brilliant though the achievement of radar no doubt was, its development faced another sort of difficulty. It involved the application of a branch of new physics by a relatively small body of scientific workers essentially of one mind and undisturbed by economic factors or personal prejudices.

It is easy to condemn industries for inefficiency or waste; but systems of production, marketing and utilization have not been conducive to thrift. In some industries, the cost of fuel plays only a minor part in the cost of production; and the incentive to spend money on plant or control has been insufficient to prove effective. War-time experience has disclosed this in some of the largest concerns. Indeed, growing scarcity has probably produced more effect than all exhortations—both spoken and written. Reducing consumption is a sure method of resisting short supply. Unfortunately, short supply of coal, due to low output, is something on which scientific effort makes little immediate impression. There are human problems which still await solution, and current events only emphasize this.

In all endeavours to raise the efficiency of fuel utilization, education can play a part which is recognized in the memorandum. It urges the establishment of a college of fuel technology. It is apparently overlooked that at least half a dozen places of university rank in Britain are engaged on teaching and research on various aspects of fuel technology. Moreover, there are other technical organisations and institutions making their contributions. Surely it is advantageous to develop studies and investigations on fuel in the closest contact with the area where coal production and utilization are practised. War experience has revealed the need for education, not only of higher technicians, but also of skilled plant operatives trained to understand combustion processes. Existing public education authorities usually meet the demand for this when it arises, but the demand is less active than it should be.

Mention is made in the memorandum of the research and development contracts which have been freely used during the War. By these, the State has supported financially branches of industrial research even on quite a small scale, sometimes with firms or individuals, and with important useful results. This may prove advantageous in peace-time, if it is certain that action taken will promote rather than hinder the efforts of the individual.

In conclusion, it may be said that the memorandum is an interesting document enumerating the range of problems in connexion with British fuels and the agencies for their investigation and control. It advocates that the whole should be committed to a single organisation. If the major industries of a country are to be nationalized, the State can scarcely escape taking an interest in all that concerns fuel technology. Moreover, there must be problems and industrial enterprises so great as to require nothing less than the action and support of the State. There runs through the memorandum, however, a strong advocacy for complete centralization of all activities. It seems to imply that given a sufficiently large and complex organisation, all difficulties could be solved. This will not find general acceptance among those directly concerned with the production and use of fuel, and present experience does not support the view.

A THIRTEENTH CENTURY HERBAL

The Herbal of Rufinus

Edited from the Unique Manuscript by Lynn Thorndike, assisted by Francis S. Benjamin, Jr. Pp. xliii+476. (Chicago: University of Chicago Press; London: Cambridge University Press, 1945.) n.p.

THE botany of the Middle Ages has commonly been held in low esteem by historians of science, who have regarded it merely as a phase in the decline of the text of Dioscorides. The publication of Dr. Lynn Thorndike's edition of Rufinus affords striking evidence, however, that in thirteenth century Italy, at all events, there was a growing interest in plants themselves as well as in their medicinal properties. Rufinus, whose herbal was composed not long after A.D. 1287, was a monk, titular abbot of the monastery of Tyre, and penitentiary to the archbishop of Genoa. His original manuscript is unknown; but the first half of the unique manuscript now reproduced may date from the late thirteenth century, while the second half seems to be written in a later, Bolognese hand. The table of contents seems to have been added still later.

There is an indication that the treatise of Rufinus was originally illustrated with figures of herbs: describing 'gariofilata', he says that it has six small leaves under a large one which are almost hidden by it, "as you see here" (fol. 57 vb). The herbal was mainly a compilation from Dioscorides, "Circa Instans", Macer, "Alexander Philosophus", "Magistri Salerni", Isaac Judæus and the "Synonyma" attributed to Nicolaus Salernitanus, but contained much original matter, including descriptions of plants as well as remarks on their properties and application. Rufinus, indeed, described numerous plants, such as 'herba Roberti' and 'herba Gualterii', the virtues of which were unknown to him. The citations from Dioscorides were apparently taken from a text which may be no longer extant. Those from "Alexander Philosophus" correspond to matter in the "Antidotarium Nicolai".

One fact which emerges from a study of the herbal is the extraordinarily limited circulation obtained by even important manuscript works in the Middle Ages. Rufinus apparently did not know of Albertus Magnus' celebrated treatise "De vegetabilibus et plantis", although it had been composed long before the death of Albertus in A.D. 1280. The two authors did not even use the same sources: Albertus adhered to the Parisian, Aristotelian and scholastic tradition, whereas Rufinus followed the medical tradition of