

in 1873 have proved to be fundamentally correct. He was strongly insistent on the importance of the size of the fuel particles and of the intimate mixture of air and fuel.

It was not until 1895, when powdered fuel began to be successfully used in rotary cement kilns, that the system can be said to have become established. In this branch, however, its success has been so marked that it can be claimed to account for about four fifths of the world's output of portland cement. In this same year a remarkable result was obtained from tests carried out by Bryan Donkin in Berlin. A Cornish boiler was operated for one day by hand-firing on the ordinary grate; two days later, after being fitted with the Wegener apparatus, it was given a day's run on powdered coal. On the first occasion the thermal efficiency was 54 per cent, whereas on the second it was 77 per cent, the total duration of smoke in the two tests being 105 minutes and 6 minutes respectively.

In view of these figures, it is remarkable that the development of this method of firing has been so retarded and that in England, even now, the number of plants in operation is very limited. This is not explained by any inherent difficulty, as the crushing, drying, pulverizing and delivery plant are of robust construction and generally reliable in operation. The risks associated with the use of pulverized coal can be controlled by strict attention to cleanliness in the boiler house and to the cleaning of all pipes when closing down. The powdered fuel is entrained in a limited blast of air which, before entering the furnace, is enabled to carry with it the additional amount of air requisite for combustion. As the carbon dioxide percentage may be as high as 15, it can be seen that the proportion of excess air is lower than that needed for ordinary coal firing, where 12.5 per cent is the normal figure for carbon dioxide. The ash produced is a very finely divided flocculent powder, and the amount which escapes to the atmosphere can be reduced to any desired degree by suitable interceptors.

The history of the efforts made to use coal dust directly in internal combustion engines is in strong contrast to the record just given, as the main problems have not been satisfactorily solved. It is an interesting fact that when Diesel, about 1890, was planning the type of engine which now bears his name, his primary idea had been to employ coal dust as fuel. After several years of experimental work, the engine which he constructed proved to be adapted to oil fuel but not at all to coal or even gas, and so for this as well as economic reasons its ultimate development was directed toward the utilization of oil. At the Glasgow Exhibition of 1901 there was shown an engine made to the patents of 1894 and 1900 of P. F. MacCallum, which developed 100 B.H.P. at 150 r.p.m., using coal dust as fuel. The difficulty of completely consuming the solid particles was never fully overcome, no matter how finely the coal was pulverized, and this continues to be one of the chief problems to be solved. The ash is also troublesome and inevitably so, for the limited combustion space offers little scope for devising means of interception and control.

These considerations suggest that, instead of the direct use of coal dust in the engine cylinders, some indirect or semi-direct method might be developed. The use of a special form of gas producer is an indirect method, but so much so as to come under a different classification, the engine becoming a gas engine supplied by gas from an individual gas generator. The term semi-direct is intended to suggest an arrangement whereby the processes of combustion are isolated from the cylinder, but in which the working substance is the gas formed by combustion. The indirect method, on the other hand, would be one in which the products of combustion do not enter the cylinder but are enabled through another medium to do work on the piston. It is never possible to forecast how practical conditions may modify theoretical suggestions, and it will be interesting to see by what means the coal-firing of engines, if indeed it is practicable, will be realized.

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## OBITUARIES

### Dr. W. B. Wright

**D**R. W. B. WRIGHT, lately of the Geological Survey of Great Britain, died on October 11 at the age of sixty-three years. Wright received his university training at Trinity College, Dublin, which in 1928 honoured him with the Sc.D. He approached geology through mathematics, being attracted by Croll's astronomical theory of ice ages. He joined

the Geological Survey of Great Britain and Ireland in 1901, and to begin with had the good fortune to work in the Dublin, Belfast, Cork and Limerick districts under the inspiring leadership of the great glacialist Lamplugh. During these early years Wright's most original contribution was a joint account with Maufe, published in 1904, of a low pre-Glacial raised beach preserved at many points

around Ireland. A similar feature had long been familiar to geologists on both sides of the English Channel and in South Wales and Yorkshire.

During 1904, a year before the separation of the Geological Survey of Ireland, Wright came to England. Here in the Midlands he encountered the Millstone Grit and Coal Measures, which later came to mean so much to him. He also learnt at close quarters the elusiveness of the Older Glaciation of this district.

In 1906, eager to rejoin his friend Maufe, Wright transferred to Scotland, where he worked officially in the West Highlands and Midland Valley, and unofficially everywhere on the coastline. His main discoveries were: two earth movements separated by a period of igneous activity and recorded in the disturbed Torridonian of Colonsay; a pre-Glacial 100-ft. beach in the same and neighbouring islands; and north-west symmetry in the Tertiary volcanic centre of Mull. Wright was in at the beginning of the detailed study of Mull, and though one contribution is here singled out for special recognition, he had a lion's share in the elucidation of the whole. Wright also played an important part in developing the coalfield technique of the Edinburgh office of the Survey.

In 1910 Wright was appointed to the Irish Survey, where he did good work during the next ten years. It was in this period that he sponsored a deep bore at Lough Neagh, in search of a concealed coalfield, but the results, published in 1924, proved disappointing from the economic point of view. In 1914 Wright produced his *magnum opus*, "The Quaternary Ice Age", which put all the world in his debt by collecting and correlating in one volume a vast amount of international literature, not easy of access and definitely difficult to assess.

In 1921 Wright was invited to return to England to undertake for the Geological Survey of Great Britain the organization of a branch office in Manchester and the revision of the Lancashire coalfield. His success was outstanding, and his staff has covered the area with excellent maps and descriptive memoirs. He gave special attention to palaeontology and to actual inspection of underground workings. At first he studied the Millstone Grit, and here received much help from Bisat, the chief of goniatite experts; but the return he made was generous. Moreover, he brought the modern work to the notice of a wide public in his section on the Millstone Grit contributed to the "Handbook of the Geology of Great Britain", a compilative work that appeared in 1929.

Presently Wright specialized on the Coal Measures, and produced splendid results in the form of sub-zones, based on freshwater mussels. Like certain others of his countrymen, Wright had a pugnacious tendency, which has perhaps concealed the comradeship that exists in this difficult field, or, one would like to say, pool, of research. He stood for the definition of a fossil species in terms of a type specimen that one can handle, rather than in terms of a synthesis derived from an assemblage of specimens, which, in the researcher's opinion, would have been

able to interbreed if they had lived together in time and space. There is evidently more than one way of attacking this difficult problem, but Wright's method of convenience has certainly given valuable results, valuable to industry as well as to science.

Wright's latest publications have been a second edition of his "Quaternary Ice Age" (1937), and "Tools and the Man" (1939). These clearly reveal that whatever else caught his fancy on the way, he remained ever true to his early glacial love.

Wright is survived by a widow and a daughter, both of whom take an active interest in zoology.

E. B. BAILEY.

#### Dr. G. A. Sutherland, C.B.E.

WE regret to announce the death on October 10 at the age of seventy-eight years of Dr. George Alexander Sutherland, consulting physician to the North West London Hospital and the Paddington Green Hospital for Children. Although ill-health had compelled him to retire from practice many years previously, he was at one time one of the best-known London specialists in children's diseases. He was born in 1861 at Aberdeen, the third son of the Rev. James Sutherland, and was educated at Aberdeen, where he graduated M.A. in 1882 and Edinburgh, where he became M.B. in 1886 and M.D. in 1893, after which he took a post-graduate course in Vienna.

Sutherland took an active part in the formation in 1900 of the Society for the Study of Disease in Children, as well as in the amalgamation of this Society eight years later in the Royal Society of Medicine. In 1906 he was made president of the Paediatric Section for the annual meeting of the British Medical Association at Toronto, and in 1911-12 was president of the Section for the Study of Disease in Children of the Royal Society of Medicine. In addition to contributions to periodical medical literature and to Latham and English's "System of Treatment", he published in the series of Oxford Medical Publications works on "The Treatment of Disease in Children" (1907 and 1913) and "The Heart in Early Life" (1914). In 1917 he delivered the Lumleian Lectures before the Royal College of Physicians, of which he had been elected a fellow in 1903, his subject being "Modern Aspects of Heart Disease". He was also editor of a "System of Diet and Dietetics" (1908), to which he contributed three chapters on diet in diseases of the lungs, the feeding of infants and children in health, and diet in diseases of children. During the War of 1914-18 he was appointed consulting physician to the Royal Air Force and was created C.B.E. in recognition of his services. He was unmarried.

J. D. ROLLESTON.

WE regret to announce the following deaths:

Mr. T. D. Rice, senior soil scientist of the Bureau of Chemistry and Soils, U.S. Department of Agriculture, on September 12, aged sixty-one years.

Prof. R. V. Wheeler, professor of fuel technology in the University of Sheffield, on October 28, aged fifty-six years.