

has to depend on overseas sources for its supply of fuel oil of all kinds, but that the market for fuel oils is not trustworthy commercially, the price having fallen from more than 15*l.* per ton to from 3*l.*-4*l.* during the past eighteen months. "The bearing of this fall in price upon schemes for the low temperature carbonisation of coal will be at once appreciated when it is stated that it represented a drop of at least 10*s.* on the value of the fuel oil obtainable by carbonisation from 1 ton of coal." At the same time, it must be remembered that in low temperature carbonisation, fuel oils and gas only amount to about 6 to 9 per cent. respectively of the products, 70 per cent. being coke, and the opinion is expressed that the profitable working of the low temperature process must depend largely upon a recognition of the superiority of low temperature coke to raw coal as a fuel, which takes the practical form of willingness to pay a higher price for it. If that were secured so that the process could be adopted by gasworks, it is suggested that the rich gas produced in the process could be brought into use as an enriching agent for the raising of low grade gas made in other ways to a higher standard of calorific value. Plainly, however, any wide adoption of the process would depend upon the difference in price between the solid smokeless fuel and raw coal being small, and the position is summarised thus: "This process as an industrial operation will stand or fall on a perfectly definite issue which is whether or not it is possible to evolve an apparatus on sound engineering lines in which the capital and working costs would fall within the modest margin of working profit on which the industry must be founded."

The working out of any such process in its best form depends upon a thorough knowledge of the changes which coal, or rather coals, of different kinds undergo in the process of carbonisation, and the report deals with work on this subject. It includes interesting results which have been obtained in a study of the microstructure of cokes produced from different coals in different ways, and emphasises the value which attaches to the proper blending of coals for the carbonisation process as influencing their behaviour in the carbonisation process, and the quality of coke which can be produced from them. The work has, however, gone beyond the laboratory

stage, and experimental apparatus has been devised and worked in which the peculiarities of the low temperature process for good or evil have been brought out. The following results can be taken as typical of those obtained by low temperature carbonisation in horizontal retorts:

YIELDS AT 600° C. PER TON OF COAL (DRY)

Coke	14.5 to 15.5 cwt.
Crude oil	13.0 to 17.0 gallons.
Liquor	7.0 to 15.0 gallons.
Ammonium sulphate	4.5 to 8.5 lbs.
Gas	3000 to 3500 cub. ft.
	= 27 to 35 therms.

The coke is a smokeless solid fuel, the smoke-yielding constituents having been expelled. The gas is in small quantity but rich. The ammonia yield is very small, about one-quarter of what is usual in gasworks practice. The crude oil is some 50 per cent., greater in volume than would occur in ordinary gasworks practice. Its flash point was atmospheric, and when the light spirit was removed from it so as to give a fairly satisfactory flash point the oil was sufficiently fluid to meet the Admiralty specification at 15° C., but at 0° C. was much too viscous. The crude oil had a limited miscibility in mineral fuel oils—a grave practical shortcoming. The behaviour of the metal retorts used in this carbonisation was satisfactory in the sense that they showed no sign of distortion or depreciation after using for nearly two years, but the behaviour of steel in the moving parts of an automatic carbonising machine which was tried was not equally satisfactory, defects being encountered due to the loss of rigidity which occurs in steel at a temperature of 600° C. A number of points requiring further investigation have arisen, and the work now in hand includes the development of automatic methods of carbonisation, the study of briquetting as a preliminary to carbonisation, and the development of a practical method of briquetting at or near the fusing point of the coal. It is along some such lines that it is hoped to arrive at some form of process and appliance for low temperature carbonisation which will meet the technical and commercial demands which have to be satisfied if this method of dealing with coal is to find wide application.

Expedition to Chinese Tibet.

AS already announced, the Percy Sladen Trust Expedition to the Alps of Chinese Tibet, consisting of Prof. J. W. Gregory and his son, Mr. C. J. Gregory, has returned after a successful journey. The primary object of the expedition was the investigation of the geological structure of the mountain regions of China in localities which would throw light on the relations of the mountains of south-western China to those of the Himalaya and south-eastern Asia. The expedition left Bhamo on the Irrawadi in North Burma on May 7, and crossed the frontier hills to the "Treaty Port" of Tengyueh, where the Indian servants were sent back and a Chinese staff and muleteers engaged. Permission was there given by the Chinese magistrate to go to Likiang-fu, the administrative headquarters on the borders of Chinese Tibet. The expedition was allowed to proceed to Likiang-fu by a route across one of the blank areas on the existing map of Yunnan.

At Likiang-fu it was found that orders had been received from the capital of the province that the expedition was not to be allowed to go farther north; but the magistrate ultimately agreed to its going on if he were relieved of personal responsibility by a letter stating that the expedition was proceeding at its own risk, and in spite of his warning. From

Likiang-fu it travelled through the valleys of the Yangtze-kiang and the Mekong. Work in the upper Salween valley was found to be impossible, as it was reached in a district smitten with famine owing to the excessive rains of the previous autumn. The return journey to the caravan, which had been left to proceed north along the eastern side of the Mekong, was by forced marches on short rations. At Atuntze excursions were made to the higher mountains between the Mekong and the Yangtze-kiang and to the glaciers of Pei-ma-shan. The return route was through Likiang-fu to the city of Tali-fu and thence by the main trade route across Yunnan to the starting-point at Bhamo.

The geological collections will, it is hoped, be worked out during the winter, and the results of the expedition can now be judged only by the field evidence. It indicates that while the structure of the foundation of the country is due to the Hercynian movements of upper Palæozoic date, the area has been affected by a series of uplifts which, both by direction and date, belong to a continuation of the Himalayan system into south-western China. Various botanical and zoological collections were made, most of which are being examined at the Natural History Museum, London, and the Indian Museum, Calcutta.