Fuel Research.[1]

THE Report of the Fuel Research Board for the year ended Mar. 31, 1929, is remarkable for its range of subject matter, and it is only by selective treatment that a short notice like this can be made anything more than an enumeration of its contents.

The first part of the report, by Sir Richard Threlfall, the chairman, does not limit itself to an account of the activities of the Board, but deals also with other happenings in the world of fuel which may be regarded as relevant. The opening sentence states a wholesome truth which cannot be too strongly emphasised in these days, when the pursuit of what is known as rationalisation may lead to over-centralisation if it is not carried out with care, discrimination, and sober judgment. The sentence proclaims the difficulty (and might have said impossibility) of one research organisation dealing adequately with the many and complicated problems involved in the study of the coal resources of Britain and their utilisation, and welcomes the increasing attention given to fuel research, both by individual firms and by industrial organisations. Notice is also given to a particular recommendation by the National Fuel and Power Committee, which is not content with the prosecution of research alone, but insists upon the necessity for the application of the results of research and the consequent necessity of employment on the executive side of industry of more men trained as fuel technologists.

Another recommendation of the National Fuel and Power Committee is noted, that the thermal system of charging for gas (introduced by the Gas Regulation Act of 1920, on the recommendation of the Fuel Research Board) should be regarded as having proved its value, and be made compulsory, except for very small undertakings. This recommendation has been embodied in the Gas Undertakings Act, 1929.

The physical and chemical survey of the national coal resources is reported upon as having progressed steadily, and with the appointing of a committee to deal with the South Wales area, the organisation now covers coalfields producing 85 per cent of the coal raised in Great Britain. There is so much that might be done on such a survey, with its many possible ramifications indicated in the report, that a wide vista of usefulness is opened out for the Fuel Research Board, if it is to deal adequately with this part of its work. The survey once begun leads naturally to the operations of other committees (such as the Coke Research Committee, formed at the instigation of the National Federation of Iron and Steel Manufacturers), which deals with the properties of coal mined in certain areas for various industrial uses.

All this has led to a realisation of how comparatively little is known even to-day on many of the most fundamental and elementary things connected with coal and its carbonisation; and the Fuel Research Board is assisting workers at the universities in their endeavours to extend and strengthen the scientific foundations on which the structure of the fuel industries must be based.

Quite topical is the reference to the use of pulverised fuel, both ashore and afloat, and to work which the Fuel Research Board is itself carrying out on the interesting subject of burner design for this purpose, on the principle of so relating the movements of air and the solid particles of fuel that maximum efficiency of contact and rapidity of combustion can be secured. It is to be hoped that the Board will be able to turn its attention to the problem of dust emission from plants using pulverised coal, which promises to become very serious as this method of use is extended in scale.

The largest section of the report is contributed by Dr. C. H. Lander, the Director of Fuel Research. He deals with many subjects, but probably the one to which the most general interest will attach is that of low temperature carbonisation. If one were to choose the branch of work in which the Fuel Research Board has been of the greatest public service, it would surely be either this, or the formulation of the recommendations on which the Gas Regulation Act of 1920 was based. Low temperature carbonisation should, however, take first place, since the Fuel Research Board has not only interested itself in the subject by the examination and testing of quite a number of proposed processes embodying different ideas and types of construction, but also has carried out useful research work and informative experiments by its own staff at the experimental station at Greenwich. The time has now arrived when a limited number of the numerous processes and plants projected for carrying out low temperature carbonisation have reached the stage of full scale technical working and commercial trial. Some of these engage the attention of Dr. Lander in this report, particularly the setting of vertical cast-iron retorts at the Richmond Gas Works, erected by the Gas Light and Coke Company to the general design developed earlier at the Fuel Research Station.

Dr. Lander undertakes a two-page review of the general position of low temperature carbonisation as deduced from the experiments and observations of the Board. It is a summing up, characterised by knowledge, fair-mindedness, and caution, and is neither condemnatory nor eulogistic of any particular process or of the low temperature system as a whole.

So far as the summary can itself be summarised, it points to the necessity for considering every individual undertaking on its merits with due regard on one hand to the nature of the coal it is proposed to treat and the available supply, and on the other to the outlets for the coke, tar, and gas. Of equal importance are the questions of maintenance and depreciation of the plant, which must take a considerable time to ascertain unless the life is short and replacement expenses heavy. Then again come the factors which govern the prices of different classes of coal and the saturation point in the markets for the products. It seems likely that there are situations where low temperature carbonisation of coal can be made to pay, but the incidence of the factors mentioned above has to be considered carefully in choosing a plant and a locality for its installation.

Some experiments are described on the hydrogenation of coal. They are too few in number to allow definite deductions at this stage, but are undoubtedly promising and very interesting from their possible bearing on the constitution of coal. It is reported that by the action of hydrogen under pressure on the Bergius principle, but not carried so far, "a non-caking coal has been converted into solid products with strong caking power, and further experience has shown that carbonaceous materials ranging from cellulose and wood to anthracite, and including all types of coal and lignite, can, by controlled treatment with hydrogen under pressure, be converted into material which on carbonisation, yields a strong coherent coke".

[1] Department of Scientific and Industrial Research. Report of the Fuel Research Board for the year ended 31st March 1929; with Report of the Director of Fuel Research. Pp. viii+127. (London: H.M. Stationery Office, 1929.) 2*s.* net.

In high temperature carbonisation, the principal work of the year has been a study of the effect of size of coal on the working of horizontal and vertical gas retorts, being a continuation on a larger scale of work already carried out at the University of Leeds for the Gas Investigation Committee of the Institution of Gas Engineers. "The general result of the investigation is to confirm that the influence of size of the coal charged is greater with vertical than with horizontal retorts, and that with vertical retorts those variations offer a means of controlling, to some extent, the yields and qualities of the products to suit the needs of particular circumstances. In particular the increased yields of tar may be important."

Among other subjects receiving notice may be mentioned the composition of low temperature tars, combustibility, 'shatter' tests, and reactivity of coke, the effect of oxidation on the coking properties of coal, briquetting, the water gas process, the use of coke for domestic purposes, the heating requirements of a house, an interesting method of expressing fuel consumption in internal combustion engines, and various methods for sampling and analysis. JOHN W. COBB.

The Atlantic Earthquake of Nov. 18, 1929.

AN earthquake that could break a dozen deep-sea cables, that could give rise to destructive sea-waves on the Newfoundland shores, and to a shock felt along 940 miles of the American coast, must clearly have been one of unusual strength.

In Nova Scotia, the shock was felt severely in Halifax, Yarmouth, and other places. In Windsor, chimneys were thrown down. At St. John's (N.F.) the shock was slight, but all along the New England coast, as far as Boston, it was distinctly felt. At the time of the earthquake the White Star liner *Olympic* was about 300 miles from the spot at which cables were broken. The captain reported that, at 3.30 P.M. on Nov. 18, he felt the vessel suddenly quiver, as though she had cast off a propeller blade, and this movement was followed by vibrations lasting for two minutes. The ship was found to be undamaged and there was no wreckage in its wake.

Two and a half hours after the shock was felt, sea-waves flowed up the southern shores of Newfoundland. In Long Harbour, which lies at the head of a narrowing inlet, fishing-booms and stages were damaged by the sea-waves, and 75 yards of roadway were destroyed. A wave, 15 feet in height, swept away several houses in the town of Burin and all the buildings on the water-front. Nine lives were thus lost in Burin and seventeen others at Lord's Cove and Lamalin. In the open ocean the waves must have been much lower, but it might be worth while to examine the mareograms obtained at the western ports of Great Britain for any traces of their passage.

A remarkable effect of the earthquake was the fracture of a large number of telegraph cables. Of the twenty-two cables that traverse the central district, twelve were damaged, and ten of these cross the Atlantic. The probable site of the breakages is said to be in Lat. 44° N., Long. 57° W. The fractures, however, were not concentrated in one spot, for two of the Western Union cables were severed at a depth of 90 fathoms off the coast of Nova Scotia, while a third, belonging to the same company, broke at a depth of 900 fathoms. The exact positions of the fractures will throw light on the origin of the earthquake. It may be that all twelve sites will be found to lie along a straight line, as happened in 1884 with three cables on the south-eastern slope of the Newfoundland Bank. At the same time, it seems quite possible that the earthquake may have had a multiple origin and that a displacement not far from land was responsible for the strong shock felt in Nova Scotia. It is difficult otherwise to account for the damage at Windsor, slight as it was, this town being more than 300 miles from the spot assigned to the fractures. On the other hand, that the sea-waves originated at a distance from land of this order of magnitude seems to be indicated by the long interval that elapsed between the earthquake and the arrival of the waves.

That the disturbed area was one of great size is clear from the length of coast shaken. As Boston is 700 miles from the spot above mentioned, it is possible that the disturbed area may have contained so much as $1\frac{1}{2}$ million square miles, an area that has seldom been exceeded in earthquakes of the last fifty years. C. DAVISON.

Oil-Pools and Fault-Zones.

THE effect of faulting on oil accumulation, equally on oil dispersion, has always been a matter of added interest in working out subsurface conditions, probably because each new case studied presents some peculiar feature worthy of close investigation. So many circumstances enter into the consideration of fault-fields, that were a classification of these alone attempted it would result in a tabular scheme almost, if not quite, as large as those already in existence for other structures, and, moreover, just about as useless. Accumulations dominated by normal fault systems, as at Luling, Texas; by reversed faults, as at Whittier, California; by overthrust faults, as at the well-known McKittrick field, California; by the high factor of porosity in many fault-belt shatter-zones where adequately sealed; by the buffer action of solid bitumen resulting from inspissation of heavy oil along planes of dislocation: these are a few of the many possible expressions of fault-structure capable of influencing storage.

Probably the most difficult cases to elucidate, if not the most important from an economic point of view, are those pools either determined or to some extent controlled by low-angle overthrusting, with its concomitant network of subsidiary 'blatts', or by those thrust-faults in which curvature of the planes, when pronounced, complicates definition except under the most favourable conditions of full well-data. As illustrative of the latter, Mr. Frank Reeves' survey of the Highwood Mountain oil-areas, Montana (*Bulletin* 806-E, 1929, United States Geological Survey), is worthy of note. The type of overthrust most commonly displayed in this region is that in which the surface-trace has a high angle of hade (or low dip) and flattens out in depth by mergence with the stratigraphic planes, so that it becomes, in fact, an almost horizontal thrust at some particular horizon in the area concerned.

Altogether an interesting contribution, although in this region the author concludes that the structures are not favourable to the ultimate location of oil and gas pools.