



into the works as a result of the installation of a small plant in the Bournemouth gasworks. In the initial stages a semi-coke, heated to 600° C., was treated with hydrogen under 50 atmospheres pressure. Under these conditions, gasification partly by liberation of volatile matter and partly by reaction of hydrogen with carbon takes place with great rapidity, for the formation of methane is an exothermic reaction. Another approach to the production of methane from coal is the synthesis from mixtures of carbon monoxide and hydrogen. Synthesis of liquid hydrocarbons is better known, but by choice of catalyst and conditions methane can also be obtained. The most important of the conditions is the almost complete removal of organic sulphur from the gas by processes which require very stable catalysts. Results of high promise have been obtained and suggest that fuel gas may soon be distributed almost free from sulphur.

All this work aims at the preparation of a fuel gas without the limitation of starting from high-class coking coal, rather indeed from any coal. This achievement will almost certainly be accompanied by the production of gas from sulphur.

In recent years it has been recognized that although heat is transferred by convection and radiation, the differentiation of the two may be important. In certain operations, especially those involving drying, radiation may prove more effective than convection. Effectiveness may be influenced by the quality not only of the source of radiation but also by that of the surface receiving the radiation. The report shows that the Gas Research Board is actively engaged in this field because gas-heated surfaces are specially effective for radiant heating, and this promises great industrial application.

Another branch of the Board's activities involves the separation by refrigeration of coal gas into its constituent gases, whereby advantage can be gained from the special properties of each.

The report shows that the Board, in spite of wartime difficulties, is making rapid progress in the development of new techniques for the manufacture and use of gaseous fuel.

## FREQUENCY OF EARTHQUAKES IN CALIFORNIA

ACCORDING to Gutenberg and Richter, the southern California area, including the Owens Valley, has about one half of one per cent of the seismic activity of the globe ("Frequency of Earthquakes in California." By B. Gutenberg and C. F. Richter. *Bull. Seis. Soc. Amer.*, 34, No. 4, 185; 1944). This conclusion is arrived at by considering statistically up-to-date information concerning earthquakes, employing the instrumental magnitude scale.

The magnitude  $M$  of an earthquake was originally defined as proportional to the logarithm of the maximum trace amplitude on the seismogram of a standard torsion seismometer distant 100 km. from the epicentre, and having a normal shallow depth. The magnitude scale is chosen to make  $M = 0$  correspond to the smallest instrumentally recorded shocks. It is found that  $M = 2$  corresponds to the smallest shocks ordinarily reported felt,  $M = 4.5$  causes slight damage,  $M = 6$  earthquakes are moderately destructive, and  $M = 8.5$  corresponds to the largest recorded shocks.

Since 1921, the following shocks in the California-Nevada region have had magnitude 7 or greater: Jan. 31, 1922 (7.3), off the north coast; Jan. 22, 1923 (7.1), off the north coast; Nov. 4, 1927 (7.0), off Point Arguello; Dec. 20, 1932 (7.3), west-central Nevada; Dec. 31, 1934 (7.0), south of the Imperial Valley. In the present century, two shocks in the same region have exceeded magnitude 7.5: April 18, 1906 (8.25), central California; Oct. 2, 1915 (7.75), north-central Nevada.

This gives the California-Nevada region about 90 per cent of the seismic activity of the United States.

According to the authors, the expected occurrence of about four great earthquakes per century in the California region by no means excludes the possibility that double that number might occur in a given century, or that a whole century might pass without even one. Further, the events are not strictly independent. A great shock, such as that of 1906, represents a regional release of strain; after the immediate aftershocks have subsided, it may be expected to be followed by a period of abnormal quiet, as is probably now the condition in central California. It is worth noting that great shocks are to be looked for only in association with the major active faults and structures, such as the San Andreas fault zone and the trough of the Owens Valley. The other faults and active structures are characterized at most by moderately destructive earthquakes like those at Santa Barbara and Long Beach.

## THE STONE AGE IN EAST AFRICA

IMMEDIATELY before the War, industries belonging to a so-called Tumbian culture were being recognized at many sites in eastern and western Africa. First noticed by Dr. X. Stainer in the Congo, industries of similar types were soon being identified in many other areas. Dr. Menghin and T. P. O'Brien (in his book on the prehistory of Uganda) went so far as to suggest that the Tumbian culture was derived directly from that of the *coups de poing* makers, that it could be described as a sort of Acheulean gone to seed. Prof. H. Breuil, however, in a recent study of Dr. Cabu's finds, denies the existence of the Tumbian as a distinct culture, and he and Prof. van Riet Lowe suggest that the industries represent only a variation of the Sangoan culture of Uganda with strong Fauresmith affinities (*Trans. Roy. Soc. of South Africa*, 30, pt. ii; 1944).

Dr. Leakey and Archdeacon Owen have now entered the ring, and in the first Occasional Paper of the Coryndon Memorial Museum, entitled "A Contribution to the Study of the Tumbian Culture in East Africa", they unequivocally uphold its status as a culture. Owen and Leakey's publication deals mainly with a series of sites, chiefly from the Kavirondo area, where industries belonging to various stages of this debatable culture have been discovered. There are several pages of illustrations. In conclusion, there is a general discussion on certain aspects of the Stone Age in Kenya, followed by an appendix, where Breuil and Lowe's work, quoted above, is cited, and the conclusions there set out denied.

As a personal opinion I can only add that every so-called Tumbian assemblage of implements which I have seen has appeared to contain several elements and to have been a mixture of the relics of more than