

## CHEMICALS PRODUCED FROM PETROLEUM

### The Petroleum Chemicals Industry

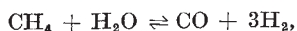
By Dr. Richard Frank Goldstein. (Industrial Chemistry Series.) Pp. xiii+449. (London: E. and F. N. Spon, Ltd., 1949.) 63s. net.

THE manufacture of chemicals from petroleum was started in the United States after the First World War and had reached very large proportions in that country at the beginning of the Second World War. During the same period, virtually no chemicals were manufactured from petroleum in the United Kingdom, but this serious deficiency in the British chemical industry is now being remedied by the erection of large plants in various parts of Great Britain—a development which has been encouraged by the removal of the duties on the hydrocarbon oils that are needed for chemical synthesis.

The publication of this excellent monograph on petroleum chemicals is therefore very timely; and how well the author has carried out his task can be seen from the foreword in which Sir Robert Robinson writes: "this work deserves to be termed monumental because of the labour which its preparation must have involved and because of the completeness of the survey which it affords".

In the selection of his material the author has chosen mainly those fields of industrial organic chemistry in which oil is the most economic starting material, but alternative non-petroleum routes have been included where coal and vegetable products compete, as, for example, in the manufacture of alcohol.

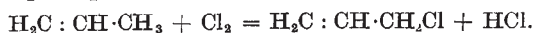
The book opens with a brief discussion of the composition of petroleum and its separation into its components. The reactions of the paraffins with steam, oxygen, chlorine and nitric acid are then considered. In the United States the methane-steam process,



is now competing with the well-known water-gas reaction for the manufacture of both hydrogen and carbon monoxide-hydrogen mixtures. Thus, whereas most of the world's methyl alcohol has hitherto been obtained from coal or coke, in the United States 29 per cent was obtained from natural gas in 1946, and the projected figure for 1949 was 77 per cent.

A very comprehensive and interesting account is given of the manufacture of the olefines and of their utilization in the production of other chemicals; and the possibilities of interchange among the various types of hydrocarbons by cracking is discussed from the thermodynamic point of view by the provision of free-energy data.

The description of the manufacture of glycerol from propylene is of particular interest in view of the world shortage of this substance. The propylene is made to react with chlorine at a high temperature (500° C.) so that substitution rather than addition is the principal reaction:



The resulting allyl chloride is treated with hypochlorous acid to give glycerol dichlorhydrin,



which is then hydrolysed to glycerol by the action of aqueous caustic soda. Since fatty acids can now

be prepared by the controlled oxidation of hydrocarbons, it is quite possible that an edible, all-synthetic 'natural fat' may be manufactured in future years from petroleum or even coal.

One of the major developments in the petroleum chemical industry has been the manufacture of aromatic hydrocarbons, which are not only valuable constituents of high-grade petrol but also are needed on a very large scale in chemical industry; for example, toluene for explosives, and ethyl benzene ( $\text{C}_6\text{H}_5 \cdot \text{C}_2\text{H}_5$ ) and styrene ( $\text{C}_6\text{H}_5 \cdot \text{CH} : \text{CH}_2$ ) for synthetic rubber. Benzene is ethylated by treatment with ethylene and aluminium chloride at 90° C. and then catalytically dehydrogenated to give styrene.

In the account on aldehydes, ketones, acids, acid anhydrides, esters, nitriles and amines, two substances are of particular interest, namely, glyoxal ( $\text{CHO} \cdot \text{CHO}$ ) and keten ( $\text{CH}_2 : \text{C} : \text{O}$ ). The first of these, manufactured in the United States by the catalytic oxidation of glycol with air at 250–300° C. in the presence of a copper catalyst, is used in the dimensional stabilization of rayon by the 'Sanforset' process, the glyoxal presumably forming cross-linkages with the hydroxyl group of the rayon molecule. The second is used in the manufacture of acetic anhydride and of acetic acid esters.

In the appendixes, charts are given showing the more important routes to petroleum chemicals, and for comparison the main routes to aliphatic chemicals from coal and fermentation processes are included. Statistics are also provided of world petroleum production and consumption, and of the chemicals produced from oil in the United States. The book is printed in large type which is well spaced, and both the author and publishers are to be congratulated on the production of a fine book which deserves a very warm welcome from all chemists interested in modern developments.

A. C. CAVELL

## FISHING TECHNIQUES THROUGHOUT THE WORLD

### Fishing in Many Waters

By James Hornell. Pp. xv+210+37 plates. (Cambridge: At the University Press, 1950.) 30s. net.

JAMES HORNELL had an unrivalled experience of fishing all over the Old World, for he was called in to investigate and report upon the fisheries of many territories, including Malta, Palestine, Sierra Leone, Mauritius and Fiji, as well as of India, and had many years experience of fishery work in India and Ceylon. In this work, published posthumously, Hornell brings together his observations on a number of fishing methods and devices. It is not intended to be a manual of fishing, but has the anthropological approach. Modern highly industrialized fisheries are very briefly dealt with.

Hornell does not confine his attention to fish: there are chapters on methods of destroying crocodiles and alligators, on pearls and chank shells, octopus, cuttlefish and squid, and on miscellaneous marine products. The first chapter deals with weapons of the chase, such as the spear, harpoon, bow, cross-bow and blow-gun, used for capturing fish. Particularly interesting are the ancillary devices, such as lures to attract fish within striking distance, or retarders to check the flight of stricken fish. The second chapter describes simple angling devices, and how heavy fish can be played without the use of a reel.