

of the industry. The figures indicated under several heads except those shown under hand-loom production are from authentic sources. They reveal that there has been a slight set-back in the past year compared with the steady progress the industry was maintaining in the past decade from year to year. Compared with 1929-30, the imports in piecegoods have fallen from 1900 million yards to 560 million yards in 1939-40, whereas the production of piecegoods in Indian mills and on hand-loom has increased from 2,290 million and 1,380 million to 3,790 million and 1,600 million yards respectively, the *per capita* consumption in the same interval varying from 15.97 to 16.5 yards during the same interval.

Mr. Gandhi has followed the same lines as in previous years in arranging the matter pertaining to the various phases of the development of the Indian Cotton Industry from its early days. He has forcibly brought out before the public, the view held by the industry that the New Indo-British Trade Agreement of 1939 is not in the best national interest and has for this purpose traced the history of the negotiations in the matter quite comprehensively.

Mr. Gandhi has also devoted much attention in presenting the difficulties that the industry was experiencing in matters connected with labour engaged in the industry in the different parts of the country and has made an impartial survey of the situation in the various provinces.

Under the caption "The Hand-loom Industry in India" Mr. Gandhi has merely mentioned the work of the Eleventh Industries Conference. In view of the importance of the hand-loom weaving industry which according to Mr. Gandhi accounts for nearly 27 per cent. of the total production of cotton goods produced in India, it is desirable to have a more comprehensive review of the industry in all its phases. Even if a detailed review of work done in each province and State, even of those to which grants are given from Government of India, can be included in future issues of Mr. Gandhi's annuals, a very useful service will be done to the industry as detailed information on each and every important phase of the cotton industry would become available.

Mr. Gandhi's review of the general conditions of the industry during 1939-40 is both instructive and convincing. After reading through the annual, one cannot resist the conclusion that the cotton textile industry of India is our largest industry, controlled, manned and financed by the nationals of the country. It is one of the few organised industries in India which the Indian industrialists have been able to develop against heavy odds, and indeed against severe competition from the industrially advanced countries. It occupies a very important position in the National Economy of India and with it the welfare of millions in this country is closely linked up.

B. K. MURTHY.

HYDROCARBON CHEMISTRY

THIS is a somewhat prosaic title to the interesting group of papers presented and discussed at the 70th General Discussion held by the Faraday Society (Gurney and Jackson, 1939, price 12s. 6d.). To the present-day student of text-book organic chemistry and the high brow organic chemist pursuing the synthesis of vitamins, hormones, colouring matters and new medicinal chemicals, the chemistry and properties of hydrocarbons are perhaps the least inspiring. And yet the chemistry and technology of hydrocarbons presents one of the thrilling chapters in modern chemistry and none who has gone through the present monograph can lay it down without being deeply impressed by the immense importance and vast potentialities of the new synthetical methods applied to petroleum and coal. There are essentially two aspects of the subject. The

first is concerned with the increasing demands for high grade aviation and automobile fuels with rising octane and cetane numbers. It is found that aromatic hydrocarbons have in general increased anti-knock characteristics and thus one of the problems is that of bulk production of aromatic compounds from the open chain raw materials available, by methods much more economical than those hitherto known for the syntheses of fine chemicals. Secondly, the various hydrocarbons, synthetic or natural, are likely to assume increasing importance as basic materials for a number of newer chemical industries, such as, to give outstanding examples only, the production of synthetic glycerol, and the new polymerisation processes for production of lubricants and plastics.

The technical development of several

phases of hydrocarbon chemistry has already reached a high standard, thanks largely to the enterprise of the petroleum technologists of America. However, our corresponding knowledge of the mechanism and theory of the reactions involved are by no means clear. This lacuna needs to be filled up, as such a basic knowledge will not only be helpful to the improvement of industrial technic, but also provide new ideas for development. The aim and purpose of the Faraday Society Symposium has been to bring together the various schools of thought for a helpful discussion and progress towards the complete elucidation of the mechanisms of the reactions.

The contributions from the notable gathering of scientists have been conveniently grouped into four main sections: I. Homogeneous thermal reactions of hydrocarbons. II. Catalytic reactions of hydrocarbons. III. The mechanism of the technical synthesis and transformation of hydrocarbons. IV. Olefine polymerisation. The significance of the several contributions has been very elegantly and lucidly brought out in an introductory paper by Prof. E. K. Rideal, who was also the President of the Symposium. In general a knowledge of the kinetics of reactions includes the elementary steps and the energies of activations. Of the large number of reacting organic molecules, the hydrocarbons lend themselves easiest to fundamental calculations of these factors and the place of honour has been given to four such contributions of "theoretical chemists". Lennard Jones and Coulson give an excellent review of the theoretical valence rules in molecules, while M. G. Evans has suggested that the low activation energy for the dimerisation and polymerisation reactions is due to the large resonance energy in the complexes formed in the transition state. Other papers in Part I deal with studies of the mechanism of thermal cracking processes, all of which, as was first emphasised by F. O. Rice, are essentially chain-like in character, a free radical like methylene being the initiator. The possible alternative methods of chain propagation and breaking have received detailed attention in these papers and the accompanying discussions.

The methods of catalysis are becoming a normal procedure in hydrocarbon industries. Such processes can be operated at a lower temperature and permit of more selective control in the nature of the products than the purely thermal reactions. Although

many of the successful commercial developments have not awaited any complete understanding of the whys and wherefores of catalyst behaviour, such knowledge will doubtless be helpful for further, quicker and surer progress. Part II of the Symposium deals with the catalytic reactions of hydrocarbons. A notable contribution is that of Taylor and Turkevich who have reviewed the present position with reference to catalytic ring closure of open-chain hydrocarbons and also reported how with chromium oxide gel as a typical catalyst and normal heptane as typical paraffin hydrocarbon quantitative conversion to aromatic hydrocarbon can be secured.

In these times of Ersatz and National self-sufficiency, the synthetic production of liquid hydrocarbon fuels is one of no mean importance. In the Fischer-Tropsch process discovered as early as 1926, and since developed on an industrial scale in Germany, paraffin and olefine hydrocarbons ranging from lightest members up to solid waxes are simultaneously produced from CO and H₂, in the presence of promoted iron, cobalt and nickel catalysts, at atmospheric pressures and temperatures about 200° C. Secondly the catalytic high pressure hydrogenation of coal and oil has also been successfully developed for the production of petrol and other refined products such as lubricating oils, etc. The group of papers in Part III are devoted to the elucidation of the mechanism of these reactions. Included in this group are also some studies of the processes for the production of quality fuels of high anti-knock value, by the catalytic aromatisation of the aliphatics and by the addition reactions between saturated hydrocarbons and olefines to produce higher isoparaffins.

Polymerisation is yet another technique for extending the possibilities in the processing of hydrocarbons. A variety of products such as lubricants and plastics can be synthesised in this manner. The chemistry of growth of macromolecules of hydrocarbons is therefore of special interest and forms the main interest of the group of papers in the last section.

It is evident from the above that the contents of this volume must be of absorbing interest as much to the academic as to the technological scientists. A Faraday Society General Discussion needs no additional recommendation.

M. A. GOVINDA RAU.