Vegetable Oil Resources of the Shanghai District, China.—The chief plants yielding vegetable oils in China are beans, cotton seed, groundnuts, rapeseed, sesamum seed, tea seed, and woodnuts, practically all these being cultivated products. The quantities of oil, oil-seeds, and oil-cake, in piculs of 133½ lb., exported from Shanghai during 1918 were:—Bean oil, 5771 piculs (£14,320); cottonseed oil, 99,670 (£187,158); groundnut oil, 217,113 (£524,340); rapeseed oil, 3818 (£13,332); sesamum-seed oil, 422 (£1069); tea oil, 886 (£2328); woodnut (filbert) oil, 658 (£1944); other vegetable oils, 25,070 (£42,214); bean cake, 282 (£160); cotton seed, 75,195 (£25,837); groundnuts, hulled 781,071 (£835,533), unhulled 10,953 (£9111); groundnut cake 71,125 (£34,280); rapeseed, 243,471 (£205,592); and sesamum seed, 82,195 piculs (£83,180). The number of oil mills in China is increasing, and those in Northern China mainly treat soya bean, whilst those in central China produce the other varieties of oil mentioned. The oil mills do not work all the year round, as there is not sufficient seed available, and also the high summer temperature causes the oil to become rancid. The total capacity of the oil mills in Shanghai amounts to about 5400 piculs (321 tons) a day.—(*U.S. Com. Rep.*, Apr. 26, 1920.)

Exports of Glycerin from the United States.—The export of glycerin from the United States in 1919 was 1982 short tons, valued at £238,196. The amounts taken by the chief countries of destination are given in the following table:—

Destination.	Short tons.	Perctge. of total
Argentina	110.6	6.0
Brazil	23.5	1.1
British India	28.6	1.4
Canada	59.9	3.0
Chile	40.8	2.4
China	50.1	2.5
Cuba	54.5	2.7
Japan	1220.5	11.3
Mexico	30.3	1.5
Norway	132.0	6.6
Sweden	19.5	0.9
United Kingdom	11.3	0.5

—(*U.S. Com. Rep.*, May 26, 1920.)

Consumption of Chemicals on the Transvaal Mines in 1919.—The values of the chief chemicals consumed on the different mines in the Transvaal during 1919 are shown in the appended table:—

Chemicals.	Gold mines.	Other mines.
Carbide	110,248	3997
Cement	61,701	4554
Charcoal	457	6305
Chemicals, assay and smelting requisites	143,109	784
Cyanide	300,000	—
Disinfectants	35,221	3690
Explosives	1,299,672	113,339
Lime (white)	121,477	829
Lubricants (oils)	126,020	32,703
Greases and tallow	105,730	9448
Paint, tar, driers, etc.	23,784	2635
Mercury	48,560	—
Paraffin	23,420	2742
Petrol	22,007	3061
Soap	12,510	977
Soda	2726	226
Zinc and zinc alloys	238,608	13

—(*S. Afr. Engin.*, May, 1920.)

Rubber Trade in Norway.—Stocks of raw rubber were very scanty prior to the war, and difficulties of shipping rendered it necessary to shut down some factories and curtail output until conditions became easier with the conclusion of the Norwegian-American Agreement in 1918. The annual requirements are estimated at 150 tons rubber and 200 to 250 tons balata, practically all of which is purchased through the United Kingdom. Most factories at present are working on accumulated stocks. Motor tyres are in demand, but engineering troubles in Britain have enabled America to maintain the lead obtained during the war. Cycle tyres are mainly imported from Great Britain.

Goloshes are likely to be in demand owing to the high price of leather. In this line Britain has lost

the high place held twenty-five years ago, owing to the export of inferior material. It is anticipated that the import duty on goloshes will be removed. —(*India-Rubber J.*, Aug. 7, 1920.)

REVIEWS.

THE GRETNNA RECORD.

PRELIMINARY STUDIES FOR H.M. FACTORY, GRETNNA, AND STUDY FOR AN INSTALLATION OF PHOSGENE MANUFACTURE. Pp. xvi.+145. (London: H.M. Stationery Office. 1920.) Price 15s. net.

The work done by the Department of Explosives Supply has been generally claimed, at all events by chemists, to be second to none other accomplished during the war. Although our chemical industry, as a whole, was far from being in so moribund a condition as many of its critics would have us believe, yet we were seriously deficient in factories and plant adapted for the production of organic substances in quantity. Moreover, the war soon developed into one of nations rather than of armies, so that even the vast organisation and elaborate preparations of the Central Powers on the chemical side proved inadequate to supply the altogether unprecedented quantities of chemical munitions required by them. It is now a matter of history that the D.E.S. from its very earliest beginnings under the *egis* of Lord Moulton had the courage to originate an ambitious and far-reaching programme involving, in particular, the principle of the construction, in the very shortest space of time, of very large Government factories solely for the production of chemical munitions. Questions of economy of construction, cost of production, and post-war applications of the plants did not come into consideration, and the sites chosen were selected without reference to their commercial suitability.

Lord Moulton selected as his "master builder" a man of outstanding personality—Kenneth Quinan. One was impressed on meeting him, to know him was to love him, and to work for him was an inspiration. Little wonder, therefore, that the team at Storey's Gate—all far too modest to wish their names recalled here—worked early and late, but always methodically and scientifically, and that the great factories grew apace until the day came when they produced their munitions "according to plan."

Naturally, in the course of this work a large amount of technical information of every variety was produced and collected by the Factories Branch of the D.E.S., and it became a favourite scheme of Quinan's to have this made accessible after the war, particularly to the younger chemists of the country. His association with the best of our professoriate, whose attributes he was wont to describe in characteristic and flowery language, and his experience in training the staff available for his factories, who came to him largely without expert knowledge of the work they had to do, possibly gave him special insight into the ideal education for a technical chemist. He often waxed enthusiastic in private conversation over his schemes for training chemists, and felt that the publication of the information accumulated at the national expense would be of the greatest value in helping both the growing generation and those already in the industry, who probably without exception were ready at all times both to help the Factories Branch and to profit by their experiences.

It is a very fortunate circumstance that the authorities have seen their way to give effect to this idea, and all concerned are to be congratulated on their very broad-minded action. The selection and

preparation of the information could scarcely have been in better hands than those of Mr. William Macnab, who, apart from his intimate connexion with the Department throughout its whole existence, has had a lengthy and varied acquaintance with chemical industry and is fully in sympathy with the ideals of some of the leading teachers and industrial leaders who are striving to elevate British chemical industry into its rightful position. His preface is not the least valuable portion of the book and the considered expression of opinion in it should receive the widest possible publicity.

The first volume to be published deals with a portion of the great Gretna Factory and with the study of an installation for phosgene manufacture. The problem at Gretna was to produce 30,000 tons per annum of R.D.B. cordite involving the manufacture of the corresponding quantities of nitro-glycerin and nitrocellulose which in turn required cotton waste, dynamite glycerin and the necessary acids for their nitration. Quinan's plan was to set forth the quantities of materials required in the different stages and the plant necessary for carrying out the various operations. The usual drawings were prepared, but elaborate explanatory notes or descriptions were issued with each drawing which are stated to have been of the greatest help to those erecting the plant and to those who had to run it. The book contains these drawings and explanatory notes, so that even the tyro can follow step by step the development of the factory. Its value to the student and to all other chemists and chemical engineers inexperienced in the planning of large chemical works is quite unique, and teachers with this volume at their disposal should have a model on which to base their instruction. Even the more experienced cannot fail to profit from the study of the Gretna methods and will no doubt pick up many valuable points of detail. Criticism of such a work in the ordinary sense is impossible and would certainly be unprofitable, but it is of interest to discuss some of the broader issues which arise particularly in connexion with the vexed question of the chemical engineer which at the moment is the most prominent matter in chemical circles.

Very frequently in the old days the chemist stated the requirements of the process, indicating the more obvious pitfalls due to the nature of the chemicals to be used, and the engineer designed and constructed the plant. This usually required a good deal of modification before it worked, and by the time the process was running smoothly the plant was found to contain many faults which could have been rectified by a closer understanding between engineer and chemist, who, though co-operating loyally, have as often as not failed really to understand one another's difficulties. Generally, the result was even less satisfactory when the chemist had the larger say in the design, the plant being in particular too frail to stand the usual rough usage at the hands of the British workman.

The chemical engineer, as some of us understand his functions, should act as a connecting link between chemist and engineer. Speaking the language and, still more, in sympathy with the mentality of both, he can understand the requirements of the chemist and translate them to the engineer. Should he attempt to replace both, disaster is likely to result since the viewpoint of the two is so different as to be almost irreconcilable. His function is to be one of the team akin to the half-back in football. In addition to knowing the chemical and physical properties of substances and how to design plant, to handle them he should be possessed of a wide knowledge of every type of special plant with their advantages and defects, such as the motor enthusiast to-day seems to have about the various makes of cars. It requires experience to acquire this, but the same may be said

of the motor car, about which knowledge seems to be acquired without difficulty.

The properly trained chemical engineer in the future will play a large part in staffing the works both in control of processes and in the construction department. This is not the place to discuss his training, which is being earnestly considered by several bodies; it can be emphasised, however, that the teachers of chemistry have been handicapped by insufficient knowledge of the ideal factory in the past, whereas in the future the Gretna book will certainly go far towards supplying this information. If read carefully and critically, the story of the creation of the Gretna Works gives the clear impression of thoroughly sound team work, scientific work in the best sense, every detail calmly and soberly considered, alternatives carefully weighed, calculations made and verified, the whole with a slow, relentless certainty detached from the turmoil of war and yet leading to the production of a great factory in record time, satisfactory in every detail, yielding its products as calculated and planned and playing a great part in our final victory.

As the war developed, economy in materials became as important as economy in man power, and the demand for almost every conceivable material became so great as to exhaust the productive power of the world. Then it was that the recovery of the spent acids and the prevention of all kinds of waste became so necessary. The description of the details of this branch of the work and the accompanying flow sheets are some of the most valuable portions of the Gretna record; its careful study should lead many others to overhaul processes in which waste occurs to see whether under like treatment this can be reduced.

Contrary to the public belief, profits in chemical industry are cut very fine and the success or failure of a process depends largely on the elimination or utilisation of waste both in the form of actual materials and in that of heat. The increase in the cost of raw fuel and the deterioration of its quality have a most serious consequence for chemical works and far more attention will have to be paid to avoid loss of heat in the future. The chemical engineer specially trained in thermochemistry will find a lucrative field for his investigations.

It is increasingly necessary to emphasise that the chemical engineer, valuable as he is and will be, cannot replace the chemist, particularly the organic chemist. The experience of the writer has taught him that men possessed of the true mentality of the organic chemist are becoming increasingly rare in spite of the fact that industry needs them more than any other type of chemist, and our teachers will be doing a great disservice if, in the attempt to create chemical engineers, they sacrifice the organic chemist.

The phosgene-plant studies will be particularly valuable to students as they illustrate in the fullest detail the plan adopted of contrasting two alternative methods of manufacture and the reasons for giving the preference to one of these. Quinan was a particular zealot in advocating the use of thermochemical data in studying these problems, and the problem detailed in the book forms a perfectly admirable example of what can be done by the scientific application of physico-chemical data.

The writer would have wished to have emphasised some of the lessons and warnings contained in Mr. Macnab's introduction, but as this is likely to be widely reprinted it can adequately speak for itself.

A great service has been done to chemical industry by the publication of this work, and though it may take time before the harvest is reaped from its seed, it is certain that this harvest in time will be a bounteous one.

E. F. ARMSTRONG.