

horticultural research stations, has long been regarded as an expert on the subject and the present book is a second edition, though since it has been rewritten and reset, since every phase of the subject has developed during the intervening eight-year period, it may virtually be regarded as a new book.

It is a well-balanced production with the material arranged in logical order—plant resistance is in the foreground, the factors which make plants susceptible come next and then follow several chapters on biological control, fungicides and insecticides; weed killers, fumigants, seed and soil killers, complete the list, though Dr. Martin has also something to say about traps.

A goodly list of chemicals is paraded before our eyes, as numerous as the nostrums in the druggist's

shop, and it is no wonder, in the words of Sir Daniel Hall, that "great commercial firms have embarked upon the manufacture of suitable materials for sprays and washes and have themselves promoted investigation in their desire to produce useful remedial preparations".

At the foot of the plants is the soil, which receives more than its share of the remedies, with an effect on its own fauna and flora which can only be imagined. The worms certainly object, but to-day Darwin's famous book on earthworms is out of date, and probably green-keepers do not read it.

The fact that the other side of the picture has been emphasized here must in no way be allowed to detract from the excellence of Dr. Martin's book or the economic importance of the application of the methods he describes. E. F. A.

Gases and Metals

Gases and Metals:

an Introduction to the Study of Gas-Metal Equilibria. By Dr. Colin J. Smithells. Pp. vii + 218 + 4 plates. (London: Chapman and Hall, Ltd., 1937.) 18s. net.

THE behaviour of metals towards the common gases is important to many industries, but investigators who have been concerned with its various aspects have had little contact with each other, and the subject has not hitherto been adequately treated from a theoretical point of view. Dr. Smithells's book is therefore extremely welcome, and its wide scope and original outlook make it a most valuable addition to metallurgical literature.

The work is divided into three chapters, which deal respectively with the adsorption of gases on the surface of metals, the diffusion of gases through metals, and their solution in metals. In each chapter there is a short general introduction and a brief description of the experimental methods, followed by a comprehensive survey of the most reliable results. No emphasis is placed on technical considerations, the data being discussed with the single purpose of defining the general laws which are obeyed, with the view of gaining an insight into the physical nature of the processes.

A sharp distinction is made between physical adsorption, which depends on van der Waals's forces alone, and activated adsorption, in which binding forces of a stronger nature are involved. Much importance is attached to the observation that only those gases which undergo activated adsorption by a given metal can dissolve in and

diffuse through it, from which it is concluded that activated adsorption is a necessary preliminary to diffusion and solution, and that for all these processes some degree of chemical affinity between the gas and the metal is necessary. This thesis is elaborated in the second chapter, which contains the results of the author's and Ransley's work on diffusion, and is the most vigorous and satisfying part of the book.

In the section dealing with solution, ample recognition is given to the work of Sieverts and his collaborators, and the absorption of hydrogen by palladium, which bulks so disproportionately in the literature, is relegated to its proper place as a somewhat unusual borderline case.

This chapter contains a most valuable collection of data, but more is known of the relations between compound gases and metals than appears in this account, and the ferrous metallurgist, in particular, will feel that the equilibria which control the refining of molten steel, and its carburization or decarburization in the solid state, have received less attention than they deserve. Yet in the present state of knowledge, these relations could not have been described in the comprehensive style accorded to the rest of the book. If the metallurgist finds that reactions between compound gases and metals have not been considered as fully as their practical importance would lead him to expect, the omission will come as a salutary reminder that the experimental work which would render a satisfactory treatment possible has, for the most part, not yet been done.

N. P. A.