THE SOCIETY OF CHEMICAL INDUSTRY AND THE PROGRESS OF THE CHEMICAL ARTS.

THE Society of Chemical Industry has done wisely in following the example of the Chemical Society in initiating the compilation and issue of annual reports on the progress of the various sections of applied chemistry dealt with in its journal. Its action is most opportune, for there can be no question that such a publication, if well and judiciously carried out, will have a profound effect on the development of that branch of technology which it is the special function of the society to foster. Valuable as the present volume undoubtedly is, we venture to think it furnishes only a partial indication of what such a work, if loyally supported, is destined to become. It would not be fair to its projectors to infer its ultimate character from the issue before us. It is confessedly incomplete, and covers only a portion of the sections of the classification followed in the society's journal. This has, no doubt, arisen from the circumstance that many of those best qualified to report on the missing sections have, owing to the special conditions of the time, been wholly engaged upon more pressing occupations. Indeed, this circumstance has probably reacted upon the production of the work generally, and is a sufficient explanation of its somewhat belated appearance. It was a bold venture to carry out such an undertaking in circumstances so unpropitious, and the editor and the Publication Committee are to be congratulated on the measure of success that has attended their efforts under such untoward conditions.

In addition to the missing reports on fibres, dyeing, metallurgy, electro-chemistry, and sugar, to which the preface refers, and to that on explosives, which for obvious reasons it is undesirable to include at the present time, no action has been taken in respect to agricultural chemistry, the chemistry of foods, and analysis, ostensibly on the ground that these subjects are dealt with in the annual reports issued by the Chemical Society. This appears to us no valid reason for their future exclusion. As these sections are part of the fortnightly issue of the society's journal, they presumably meet a want, and are acceptable to a more or less considerable fraction of its readers. If so, these readers are equally entitled, and may fairly look forward, to the annual summaries of progress and development in these sections as well as in the others. Moreover, it must not be forgotten that the compilers and readers of each of the two annual reports look at the subjects from somewhat different points of view. One set is primarily concerned with abstract and theoretical principles, the other with practical application. Of course, it is not possible to draw any hard-and-fast line between them, as each is intimately related to the other. But as the angle of view is certainly different, there is surely room for both, and it would unquestionably tend to efficiency and comprehensiveness if the council of the society decides that in future its annual reports of progress should include every department of applied chemistry with which its journal is concerned.

The present volume is made up of reports on fifteen out of the twenty-three sections of the classification adopted in the society's journal, and thirteen contributors, together with the editor, Mr. Burton, have been engaged in its production. Each author is well qualified to treat of the section which has been entrusted to him. Thus Prof. Cobb, the Livesey professor of fuel and gas industries of Leeds University, deals with "Fuel and Heating" and with "Mineral Oils"; Mr. E. V. Evans, the chief chemist of the South Metropolitan Gas Company, reports on "Gas: Destructive Distillation: Tar Products"; Prof. Gilbert Morgan writes on "Colouring Matters and Dyes"; Dr. Auden, of the United Alkali Company, on "Acids, Alkalis, Salt, etc."; Mr. Audley on "Glass and Ceramics" and "Building Materials"; Mr. Warburton, who was associated with the late Dr. Lewkowitsch, on "Oils, Fats, and Waxes"; Dr. Morrell, of Messrs. Mander Bros., on "Paints, Pigments, Varnishes, and Resins"; Dr. Stevens on "India-rubber"; Mr. Joseph T. Wood, of Messrs. Turner Bros., Ltd., on "Leather and Glue"; Mr. Arthur Ling, the chairman of the London section of the society and the editor of the Journal of the Institute of Brewing, reports on the "Fermentation Industries"; Mr. O'Shaughnessy on "Water Purification and Sanitation"; Dr. Pyman, director of the Wellcome Research Laboratories, on "Fine Chemicals, Medicinal Substances, and Essential Oils"; and Mr. B. V. Storr, of the Ilford Company, on "Photographic Materials and Processes." Such names, with such connections, are well calculated to inspire confidence in the judgment, knowledge, and critical ability with which the reports have been compiled.

Of course, it would be impossible in the space at our disposal to enter into any detailed analysis of these several communications, or to show at any length in what respects they fulfil, or fail in, their purpose of being "the abstracts and brief chronicles of the time." As is to be expected, much of the subject-matter is too technical to be of general interest. But in certain of their aspects these reports are highly significant, and the story they tell is of national importance. As might have been anticipated, the authors have not been able, however much they might have wished, to get away from the war. That stupendous event is profoundly influencing the position of chemical industry in this country, and anyone who deals with its present condition and prospective development cannot possibly ignore that fact if he rightly interprets his duty as a chronicler.

It is therefore of interest to ascertain what, in the judgment of experts, has been the effect of the war on the several branches of applied chemistry in this country, and how far that effect is likely to result in a general and permanent improvement in their character. It may be thought too soon to pronounce any definite

opinion on this matter, and this may have led certain of the contributors to hesitate in giving it. Others, however, have been able to read more clearly the signs and portents of the times, and, on the whole, their testimony is reassuring and full of hope. There can be no doubt whatever that the general body of chemical manufacturers in this country, as well as of the manufacturers dependent on chemical industry, have had a rude awakening. The war has completely upset commercial conditions, and many generations must come and go and a long period of peace ensue before pre-war relations are resumed. Public sentiment will force this country to depend more and more upon its own efforts, and to develop to a far greater extent its own internal resources. There is a general recognition that at the base of this problem is our educational system, and we see the evidence of this fact in the appointment of a professed educationist as director of a new policy. It is being realised that science and the methods of science must enter more largely into the curriculum of our secondary schools, and that colleges of science must be multiplied and strengthened. It is now everywhere perceived that the future of all industries depends upon science and upon the application of scientific principles. The bread that has been cast upon the waters is now being found after many days.

Many proofs of this fact are to be met with in the volume before us, accompanied, we regret to add, with certain disquieting features. There are those who aim at ends which are not those of their country, and too many new activities are secret. Perhaps in the circumstances this is unavoidable; but, as the example of our enemies has shown us, those industries flourish best and develop most rapidly where their leaders co-operate for their common good, even though they may themselves combine *contra mundum*.

Progress in applied chemistry may be measured by different standards. From an economic point of view it may be estimated by the wealth it brings to a community. This aspect of the matter finds practically no mention in the compilation before us. It is probably difficult to get together the requisite information, but if the Society of Chemical Industry could be induced to add a statistical department to its staff and publish the results of its labours each year as a supplement to these annual reports, we should obtain a real and valuable measure of the progress of the chemical arts in this country. As it is, the present work is too obviously based upon the pattern of the annual reports published by the Chemical Society, and is too exclusively a *catalogue raisonné* of the yearly output of the literature of applied chemistry. We would by no means undervalue the worth of such a compilation, but we venture to believe a fuller measure of its usefulness might be secured by a further extension of its scope.

These observations are offered in no spirit of carping criticism. We welcome with sincere pleasure the advent of an enterprise which is bound to have a far-reaching influence on the development of chemical industry in all English-speaking countries. Its inception at the present juncture is most timely, and we heartily wish it success. Thanks to the energy, skill, and perspicacity with which it is conducted, the journal of the society has become its most valuable asset. We are confident that these annual reports are destined to be a no less valuable feature of its work, provided that those who control its affairs are determined to rise to the full extent of their opportunity.

THE RADIATION OF THE STARS.

SINCE the publication of Homer Lane's paper "On the Theoretical Temperature of the Sun" in 1870, many writers have discussed the internal state of a star, considered as a globe of gas in equilibrium under its own gravitation. Recent observational work gives encouragement to these investigations, for it is now known that numerous stars are in a truly gaseous condition with mean densities similar to that of our atmosphere. To such stars the results for a perfect gas may fairly be applied, whereas stars, such as the sun, with densities greater than water must necessarily deviate widely from the theoretical conditions. The stars which are in a perfectly gaseous state correspond to the "giants" on H. N. Russell's theory,[1] or to the stars of rising temperature on Lockyer's principle of classification; the denser "dwarfs" are outside the scope of this discussion. The two series coalesce for spectral type B, which marks the highest temperature attained.

The internal temperatures which have been calculated are so far beyond practical experience that we may well hesitate to apply the familiar laws of physics to such conditions. But in so far as the investigation can be based on the second law of thermodynamics, the conservation of momentum, or laws which are directly deduced from these, there can be little doubt of the validity of the treatment. We cannot altogether avoid assumptions of a speculative or approximate character, and no doubt some of the results described in this article are open to serious criticism on that account; but to a considerable extent the discussion can be made to rest on laws which are held to be of universal application. Moreover, natural phenomena usually become simpler at high temperatures; gases become more "perfect"; the absorption of X-rays follows simpler laws than the absorption of light; the heat-energy comes to be located in greater proportion in the ether, so that the precise nature of the material atoms is less important.

Most investigators have assumed that the stars are in convective equilibrium.[2] In that case, when

[1] NATURE, vol. xciii., pp. 227, 252, and 281.

[2] There are strong reasons for believing that the interior of a star must be in radiative equilibrium, not convective equilibrium. The internal distribution of temperature and density is, however, of the same character in either case; if the coefficient of absorption is independent of the temperature, then the distribution corresponding to radiative equilibrium is the same as that of material for which $\gamma=\frac{4}{3}$ in convective equilibrium. See *Monthly Notices, R.A.S.*, vol. lxxvii., p. 16.