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The Safeguarding of Research.

THE fact that the Bill for the Safeguarding of Industries has passed its second reading in the House of Commons has directed renewed attention to the manner in which its provisions will react on the prosecution of scientific research in this country. It will be remembered that the supply of scientific apparatus and chemicals was the subject of a discussion in our correspondence columns about a year ago, and we have received many further letters showing the importance of the question. In NATURE for June 9, p. 457, attention was directed to the formation of a committee of the British Science Guild to report upon the matter. We hope that all our readers who have knowledge of facts bearing on the problem, or suggestions to offer, will give this committee the benefit of their views.

Our concern here is for the advancement of scientific discovery, which is the only real basis for the safeguarding of all industrial development. For this reason we think that the point of view of the user and consumer, more particularly that of the worker in science, should receive chief attention. Certain documents that have been issued suggest rather that the interest of the manufacturer is to be the primary consideration. Although British men of science are undoubtedly desirous of supporting the industries of their country, even if they have to pay a somewhat higher price for the goods, it is clearly their duty to see to it that the main object of their work does not suffer thereby. Great improvements have been made in British laboratory ware, but there are still difficulties in obtaining a sufficient supply

of apparatus and chemicals on which reliance can be placed.

Users would be saved no small waste of time and receive encouragement in their purchase of British goods if they knew how far they could really depend on these being what they profess to be. Prof. Cohen's experience with propyl alcohol, as given in NATURE for March 3, p. 12, is to the point here. It is not meant to imply that even the best German chemicals are beyond reproach, although some workers appear to be under the impression that if they use Kahlbaum's preparations no further control of purity is needed. Excellent glass and porcelain is certainly being made here, and our optical and electrical apparatus is second to none. But the price is often very high, and there are still uncertainties in the uniformity of the supply. There appear to be no difficulties in the manufacture of articles for domestic use, and if manufacturers do not find it worth while to put good workers on to scientific apparatus, which has a comparatively small sale, why do they not give it up? The suggestion has been made that purchasers should return any unstamped glass ware, while payment might be refused for goods the origin of which is not stated.

The problem is to discover how best to enable manufacturers to perfect their processes and to protect them from loss while this is being done. It is superfluous to say that the great need is for more and more research, and any legislation that tends to remove the opportunity for this is to be deprecated. The manufacturers appear to dread the competition of countries of which the currency is depreciated. But it is to be noted that the Bill applies to Allied and neutral countries as well as to Germany. Moreover, as was evident in the discussion in the House of Commons, the opinion of many competent speakers is that such competition is exaggerated, and that in any case a depreciated currency is of no real advantage in the world markets, and will continue until normal trade relations are restored. The bankers' manifesto points out that the only satisfactory way of dealing with the situation is to allow trade complete freedom to develop on its own initiative. Artificial attempts to remedy conditions that can right themselves only by the greatest expansion of trade in all directions delay any real solution. This is very far from saying that nothing is to be done at all. The most effective way of avoiding dumping is surely to aim at raising depreciated money value, rather than to restrict trade by import duties.

So far as makers of scientific apparatus are

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concerned, we believe they are not satisfied with import duties, and want prohibition of import for a time, with permits to import in special cases. Many consumers have stated their preference for a system of subsidies to enable prices to be low enough to compete with foreign goods. Such a scheme naturally offers difficulties, and there would need to be assurance that efforts at improvement are being made. There seems to be no reasonable objection to the price being made as nearly as possible equal to that of the foreign article, so that the competition should become one of quality. The Bill, however, will probably be passed, although it may still be possible to insert provisions to enable free import to recognised scientific institutions. Such permits must be of a general character, not requiring renewal, and not demanding the intervention of the Customs or other Government Department. No special licences for individual cases would be satisfactory.

How obstructive to scientific progress the Customs regulations may be is shown by letters that have appeared in these columns. The question of books is a very serious one. Incidentally, reference may be made to the increasing difficulty of publication of scientific papers, which seems to be greater in England than in other countries. But here again what is wanted is a general fall in prices, and this can be brought about only by a return to normal trade relations throughout the world.

Much stress was laid by certain speakers in the House of Commons on the necessity of our industries as a national insurance in case of future war. The only remark that need be made in this place is that the most important matter is to keep abreast of scientific work in other countries. Restriction of research is likely to do more harm than the more or less ineffective artificial protection of a few industries would do good. It is to be hoped, therefore, that institutions in which such scientific research is carried on will be placed beyond the effect of the new restrictions on import.

Steam and Thermodynamic Theory.

Properties of Steam and Thermodynamic Theory of Turbines. By Prof. H. L. Callendar. Pp. xi + 531. (London: Edward Arnold, 1920.) 40s. net.

IN this substantial volume Prof. Callendar has set his seal to the experimental and theoretical investigations of the properties of steam on

which he has been engaged for many years. By these investigations, which have done much to advance technical thermodynamics, Prof. Callendar has made the engineering world his debtor. It is twenty-one years since he first published, in the Proceedings of the Royal Society for June, 1900, his paper on "the thermodynamical properties of gases and vapours as deduced from a modified form of the Joule-Thomson equation, with special reference to the properties of steam."

With the publication of the book now under review Prof. Callendar's theory comes of age. The book leads up to, and includes, his steam tables, which were issued separately five or six years ago and are accepted as the standard tables, at least by English engineers. Here the author describes, much more fully than before, the basis of the tabular work, discusses its agreement with the latest results of observation, and replies to objections that have been taken to his method on the part of some American writers. Into this controversial matter there is no need to enter here: the replies will have answered their purpose if they succeed in removing misconceptions regarding the scope and character of Prof. Callendar's fundamental work, which, indeed, his own earlier papers can scarcely be said to have presented in a form that made its meaning very clear or its importance obvious.

Perhaps for that reason engineers were slow to appreciate the practical bearing of Prof. Callendar's treatment of the properties of steam. The first of them to do so was Prof. Mollier, of Dresden, himself distinguished for original contributions to technical thermodynamics, who in 1906 published a set of tables and diagrams for steam based on the Callendar characteristic equation. Shortly afterwards the methods of Prof. Callendar and the tables and diagrams of Prof. Mollier were brought to the notice of English engineers by the present writer in the third edition of his book on "The Steam-Engine and other Heat-Engines."

Prof. Callendar's own tables, published in 1915, embody the results of a more complete application of his methods, and make use, in some particulars, of later data. They give all the necessary figures for properties of steam throughout the range of temperature and pressure which is usual in the practice of steam engineering. It is the essence of Prof. Callendar's method to secure results which will be thermodynamically consistent with one another, and will also agree with the results of experiment within a limited but sufficient range. His characteristic equation makes no pretension to be applicable outside that range.

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