

varies characteristically with different industries, and depends largely on their degree of mechanization and localization. A particularly pressing problem is the large number and the small size of middlemen and shops in the distributive trades. The lack of any official census of distribution for Britain makes calculations difficult, but it seems probable that there is one retailer for about every ten families, and, even for single commodities like tobacco or confectionery, an outlet for every twenty to thirty-five families! This appears excessive, since the smaller the sales turnover of each retailer the more profit he must charge per unit of sales to obtain a given income for himself. This raises prices and leads, in a vicious circle, to yet lower turnover.

Policies involving the scope of industry are those 'integrating' various processes, products or services under the control of one organization, or specializing upon and standardizing certain varieties. Standardization, as against integration, allows of mass production and of possibilities of increasing returns. There are difficulties in measuring and comparing the scope of plants or firms, but several recent experiments in connexion with plans of rationalization have shown the great increase in efficiency that specialization and narrowing of scope may achieve within one plant.

Policies of site, size and scope are interrelated. Large size is more manageable if of narrow scope, but difficult if sites must be scattered among the consuming population owing to the intransportability or the servicing requirements of the product. Further research along realistic and statistical lines is urgently needed if public policy or the policy of private firms is to achieve greater efficiency and save wastes of materials, mechanical power and man-power.

Research in Engineering

IN his presidential address to Section G (Engineering) Sir Alexander Gibb deals with the importance of research in the history of engineering. Recognition of this fact has been of very slow growth.

Organized research was nearly unknown until the end of the nineteenth century. Early progress was due almost entirely to individuals and learned societies, such as the Royal Society, working often in an atmosphere of public ridicule. Though the British led the way in Government recognition about the middle of the nineteenth century, it was largely due to the German example after the Franco-German War that the true value of research to the nation and industry was realized.

The Reichsanstalt and other testing laboratories had a direct effect on British policy which showed itself in the setting up of the National Physical Laboratory in 1900, leading later to the Department of Scientific and Industrial Research, which is now the focus, linking together all research going on in Great Britain.

The year 1900 is a boundary mark in the history of research in Great Britain. The National Physical Laboratory (1899) and the Engineering Standards Association (1901) were born then. The first, with the Department of Scientific and Industrial Research, of which it became a part in 1918, has grown into a body employing a staff of more than 1900 scientific workers; while the Engineering Standards Association has become an immense organization of no fewer than 870 committees with 4850 members.

Engineering, which started as an art, is now an applied science; and we look on scientific and industrial research as an essential factor in our national existence. In one generation our attitude has completely changed, from individualistic effort to co-operation and co-ordination. To-day national research departments, industrial research laboratories belonging to great firms or industries, research associations, scientific institutions and universities and technical colleges are the chief agencies which carry out the work, often in close co-operation one with another.

In the United States, the Dominions, and on the Continent progress and development have been equally revolutionary; and more so in some of the totalitarian States, where all research is centralized under State control. In Great Britain, though co-ordination and co-operation have done much to link together the various elements, we still lack a general national plan. Some form of affiliation to a central controlling body is inevitable if we are to avoid overlapping and duplication with their attendant waste of energy, time and money. This, incidentally, is especially necessary where the publication of the results is concerned. At present these are scattered in far too many different periodicals. A central clearing-house for engineering information is an urgent need.

One note of warning is sounded by Sir Alexander. The effects of research may sometimes be too sudden and revolutionary. Obsolescence may be too rapid, and vested interests may be tempted to buy up and suppress new inventions in order to save the loss their exploitation may involve to already operating plant. It would, however, be a short-sighted policy to restrict our enthusiasm for these reasons. He is satisfied that at the moment in the engineering world there are two outstanding questions, the co-ordination of effort and the promotion of intensive research.