Editorial IIIIIIIIIIIIII

RESEARCH WORK AND THE MANUFACTURER.

The aim of all industrial operations is toward perfection, both in process and mechanical equipment, and every development in manufacturing creates new problems. It is only to be expected, therefore, that the industrial researcher is becoming less and less regarded as a burden unwarranted by returns. Industrialists have, in fact, learned to recognize chemistry as the intelligence department of industry, and manufacturing is accordingly becoming more and more a system of scientific processes. The accruement of technical improvements in particularly the great chemical industry is primarily dependent upon systematic industrial research, and this is being increasingly fostered by American manufacturers.

Mr. W. A. Hamor, of the Mellon Institute of Industrial Research, writing recently in The Scientific Monthly, and discussing the contributions of the research student to the industries, calls attention to the very extensive service which he is rendering. He reviews the industrial achievements of the scientific scout, and his handiwork in such industries as copper, asphalt, cement, soda, leather, wine, sugar, corn products, fertilizer, flour food transportation and preservation, illumination, pulp and Paper, celluloid, and a number of others. In the water supply of cities, too, the chemist has put certainty in the place of uncertainty; he has learned and has shown how, by chemical methods of treatment and control, raw water of varying quality can be made to yield potable water of substantially uniform composition and quality. Mr. Hamor states that ten thousand chemists in America are at present engaged in pursuits which affect over 1,000,000 wage-earners and produce over \$5,000,000,000 worth of manufactured products each year. These trained men have actively and effectively collaborated in bringing about stupendous results in industry. There are, in fact, at least nineteen American industries in which the chemist has been of great assistance, either in founding the industry, in developing it, or in refining the methods of control or of manufacture, thus ensuring profits, lower costs and uniform outputs.

Robt. A. Falconer, president of the University of Toronto, is quoted to have stated recently that that University has inaugurated a scheme for enlarging its scope for post graduate work, and that a special board will immediately be established to take up the question. Dr. Falconer states that there should be 20 or 30 scholarships in the University, that it has the laboratories and the staff sufficient for present needs, but that scholarships are really needed, to encourage research work, thereby enlarging the sphere of activity of the institution.

The Engineering Alumni Association of that University established a research scholarship fund in 1911 and awarded several scholarships, one of which was extended for three successive terms. The importance of such research work has been amply manifested in the interest taken therein, and it is regrettable that there is not more co-operation between manufacturers and the universities in a like respect. The president's remarks indicate the general attitude of the educational institutions. But the manufacturers are standing in their own light, in the matter of scientific

research. They are quite naturally opposed to publishing any discoveries made in their plants, since "knowledge is power" in manufacturing as elsewhere, and new knowledge gained in the laboratories of a company may often very properly be regarded as among the most valuable assets of the concern. The universities and the scientific societies, on the other hand, exist for the diffusion of knowledge, and from their standpoint the great disadvantage of the above policy is this concealment of knowledge, for it results in a serious retardation of the general growth and development of science in its broader aspects, and renders it much more difficult for the universities to train men properly for such industries, since all the text-books and general knowledge available would in all probability be far behind the actual manufacturing practice.

Fortunately, the policy of industrial secrecy is becoming more generally regarded in the light of reason, and there is a growing inclination among manufacturers to disclose the details of investigations, which, according to tradition, would be carefully guarded. These manufacturers appreciate the facts that public interest in scientific achievements is stimulating to further fruitful research, that helpful suggestions and information may come from other investigators upon the publication of any results, and that the exchange of knowledge prevents many costly repetitions.

NEW STEP IN ENGINEERING EDUCATION.

Beginning with this academic session at Columbia University all the engineering courses are on a graduate basis, requiring a college course before admission. This is a new departure in educational training of engineers, although the professions of law and medicine have already been benefiting by its establishment in several large schools, requiring a bachelor's degree for admission. Such a broad qualification as that, however, is regarded insufficient as a preparation for an engineering career, as preliminary work in the latter instance must include a definite amount of training in mathematics, physics and chemistry, which are very necessary to the engineer.

The new course at Columbia School of Engineering consists of three years spent in any college giving these fundamental scientific subjects and three years' professional work at Columbia. How successful the plan will be remains to be seen. At any rate, the procedure is a step in the right direction, as our educational institutions have all realized that it is impossible to accomplish much in the professional line if the general subjects are given as completely as they should be. Some have included a more thorough technical training and given a professional degree. Others do not give a professional degree. It is recognized, however, that as a general rule graduates are lacking in some very important qualifications, particularly the ability to express their ideas in speech and writing in a clear and forceful manner, and partly in the broad attitude of mind which comes from a good, liberal education.