plied mechanics. So I use the word *working* advisedly, and mean thereby not only a knowledge of the fundamental theories and laws involved in every-day phenomena, but an acquaintance with them intimate enough to enable him to make daily use of them. The average student knows well the law of conservation of energy and of mass; although his arithmetic is usually poor, the law of multiple proportions is second nature to him and he handles it with ease. This is because the law is valid at all workable concentrations, at all workable pressures, and at all workable temperatures; and he has met with problems for the solution of which its application is imperative. Not so with the laws which he meets later in his work. In his course in Theoretical Chemistry or Physical Chemistry or General Principles of Science, or whatever name it may be called, he learns, for example, the law of mass action; if he solves any problems at all, they involve dilute solutions or low pressures alone. He learns that for concentrated solutions and strongly dissociated salts the law does not hold—and there the matter rests. He learns Henry's law, Raoult's law, the law of electrolytic conductance, transference, osmotic pressure etc., and if the subject is well presented, solves numerical problems to render clear his mental image of these laws; then he learns that under those conditions in which he lives and moves and has his being, they do not quantitatively hold—and there the matter rests.

Imparting to the student a knowledge of these general laws of science is one of the most important factors in technical education and must play a leading part in the upper year of college work. But the point I would emphasize is that when these principles are presented, the task is only begun. The first instruction must of necessity be given, set as it were, in dilute solutions. To be of pedagogic value, the work must be quantitative, and accuracy can be realized only in very low concentrations. But here is where the average teacher of so-called theoretical chemistry "lies down on the job." To have a working knowledge of these principles a man must be familiar with their use under the conditions of concentration, temperature and pressure with which he has to deal. He must have a general idea of the deviation from the theoretical which a law will suffer under working conditions. If such laws are not quantitatively applicable, they are at least qualitatively helpful; if they do not determine how far one can go to reach a definite end, they at least indicate the direction he must go. Our experience with men who have had a course in the general principles of chemistry is that they do one of two things—either they attempt to use the knowledge thus obtained, and develop a confidence in their ability to get at the roots of the problem and by applying these general principles determine the lines along which success most probably lies; or to use an analogy, they are afraid to venture into the open ocean of practical experience with a boat which they have sailed only in the closed and secluded harbor of dilute solutions. The result is that they lose interest in the boat and soon entirely forget her. Had they been taught to navigate this boat in times of storm and high tides as well as in the harbor, they might not have attained on

the ocean the accurate time they were accustomed to make in the harbor, but they would the more quickly have reached the haven of success which lies on the opposite coast.

It is but a truism to say that the way to acquire an ability to solve problems is in the exercise of this faculty. To become a successful research worker, we must do research work. While in every institution an attempt is made to train students to carry on original work, the four years allotted to the average man are not sufficient for accomplishing very much in this direction. While a genius is born, not made, good experimentalists can be produced from most men of average ability.

It is believed that the training to be obtained from investigation work is largely independent of the particular type of problem undertaken. If one wishes to become a bridge builder by the experience of building bridges, it is not material whether the bridge so built is demanded by the traveling public or not. It is in solving the problems incident to construction, not in the use of the finished structure, that the educational value lies. Thus it is with research work in so-called pure and applied science—whether the results obtained be immediately used, or very remotely used, need not influence the methods employed in the work.

So, in research laboratories, bridges are built not only where the public is anxious to have them built, but where someone is willing to pay for the building. The problems undertaken are brought by manufacturing concerns, and the expenses of the laboratories are met in this way. A two-fold purpose is thus accomplished—the manufacturing public is given facilities for overcoming some of its difficulties, and the more able men of the community are trained to fill the demand, which is constantly growing and now far outmeasures the supply, for men capable of conducting successful original research.

WILLIAM H. WALKER

CHANGES IN THE EDITORIAL STAFF OF CHEMICAL ABSTRACTS

The resignation of John J. Miller, Editor of *Chemical Abstracts*, to accept a managerial position, seems an appropriate occasion for an appreciation of his services to the Society.

Mr. Miller entered the work five years ago as Associate Editor, during which time the scope of the publication and the labors of the editorial force have grown greatly. Although Mr. Miller has been editor only six months, he had for the previous three years carried a large and increasing amount of editorial responsibility. His editorship was well earned and it is a matter of great regret to us that the Society must lose him.

Mr. Miller's special contribution to the Society's enterprise was executive ability of a high order and an energy that more than kept pace with the growing task. In the early years of the journal the editors used to wonder how the management of the *Zentral-*

blatt ever succeeded in publishing their semi-annual index with the last copy. Last year, however, the members of our Society received the much larger *Chemical Abstracts* index before the end of the calendar year. This result was not attained without a systematic improvement from year to year, but that it was achieved at all is due largely to Mr. Miller, assisted by Mr. Crane, and by Miss Laura Collison, who indexes *Abstracts* and the *Journal of our Society* so efficiently. Mr. Miller strove continually to extend the usefulness of *Abstracts* in many other ways, with notable success.

Mr. E. J. Crane, who now becomes Acting Editor, joined the office force as second associate editor something over three years ago. He is a young man of

JOHN J. MILLER

much ability, and naturally suited to editorial work. The writer feels that the Society is to be congratulated in having developed such men as these. A few years ago there was hardly such a thing as a paid chemical editorial position in this country. Now there are a few, and the number is sure to increase as the literature of the science becomes larger and larger. Is it not much better to discover the men that are naturally adapted to this work, train and promote them, than to select men because they have distinguished themselves in some other way in chemistry? For this reason it is a hopeful sign that the principle of promotion is being applied in the office of *Chemical Abstracts*; the Society will thus be best served and a better class of men can be secured to fill the subordinate positions.

AUSTIN M. PATTERSON

THE ANNUAL MEETING OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

The program of the last meeting of the American Society of Mechanical Engineers contained much material of direct interest to industrial chemists.

One day was devoted, under the direction of the Committee on Public Relations, to a consideration of the engineering questions involved in municipal administration. The purpose of this discussion was to direct the attention of good engineers to municipal opportunities and to get politicians, investigators and reformers to recognize and adopt engineering methods which are constructive instead of destructive, and which are based on facts rather than on opinions.

Another feature of the meeting was the formulation of a standard law for the regulation, construction, operation and inspection of steam boilers and other large pressure vessels, in the interests of public safety. This law was formulated to serve as a model for use by the different state legislatures and thus aid in unifying the existing laws. Many states now have either no laws at all or very bad ones. The present laws of some states even permit them to become the dumping ground for discarded boilers from other states.

The human element, the key to economic problems, was the subject of the presidential address by James Hartness. Mr. Hartness pointed out that the world of mechanism has become so intricate and complex that it has gone beyond the capacity of any single individual; that each person must be content to comprehend only a small part, and that it is only by selecting the character and limiting the amount of material taken into individual minds that the best results can be accomplished. Carrying the principles of the individual into the realm of organized industry, he points out that large organizations are essential as affording the opportunity for the most complete subdivision of work and the greatest degree of specialization, both of which lead to the most efficient employment of human energy. A most important element therefore in a large manufacturing plant is its organization. Without this the buildings and equipment are of little value. The greatest good to the greatest number requires taking into consideration each human being, his desires and his needs in finding the work for which he is best endowed.

President Hartness recommends that in addition to the regular treasurer's report, each industrial unit should have a human report, beginning with a description of the directors and going through the entire organization. It should contain a statement regarding the elements of harmony of the organization, the length of service of manager and workers, frequency of change of methods or articles manufactured, intelligence of executives in the management of men, the degree of contentment of each member, the extent to which each man in the organization approaches the best position for which he is endowed, how nearly he obtains the best remuneration for which he is qualified, the extent to which the management recognizes the inertia of habit of both mind and body, the degree in which the various men in the organization approximate the condition of highest efficiency, the extent to which the management