industry has not so far benefited by any appreciable increase in price level. Compared to August, 1939, the start of the present war, all commodities have increased 38.3 per cent., farm products 103.1 per cent., foods 61.2 per cent. and petroleum 19 per cent.[8] As Fig. 13 shows, the petroleum industry's record is one

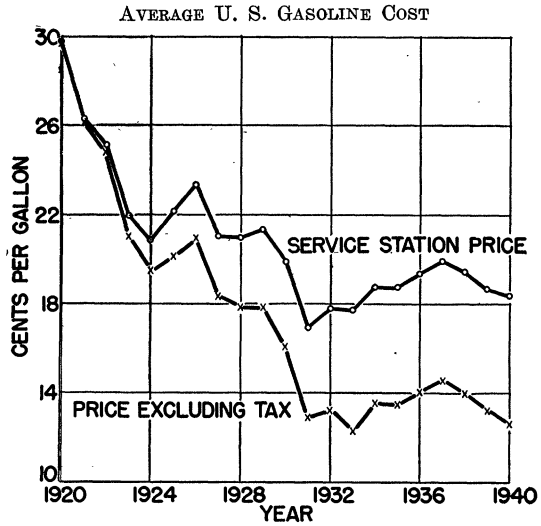

FIG. 13. Cost of gasoline in the United States (average for fifty cities.)

of decreasing costs brought about by technological improvements. This is particularly evident from the lower curve which represents the average gasoline cost in recent years, excluding the steadily mounting taxes. With a guaranteed supply of basic raw materials we should, in light of the petroleum industry's past achievements, be able to look with confidence toward the future.

It is not possible to predict the exact sequence of technical developments which lie ahead of us in this field. There is also a great deal of uncertainty in regard to the time element involved. New discoveries of crude reserves or an early termination of the war would undoubtedly relieve the present situation and delay the need for synthetic products; conversely, a prolonged war with continued heavy demands for petroleum would, in the absence of any substantial new discoveries, accelerate the need for alternate sources of supply. When the day comes, however, that the petroleum industry must turn in earnest to new sources of liquid fluids, its dependence on chemistry and engineering will become increasingly great. Whether the problem is one of recovering oil from shale, of liquefying natural gas, of working the tar sands or of hydrogenating or otherwise liquefying coal, chemistry and engineering will be called upon to work out processes which in major respects will differ from those currently in use by industry. We hardly need be concerned over the future of petroleum chemistry in general or even of the present trend toward utilization of petroleum as a chemical raw material, for these new processes will continue to yield the conventional hydrocarbons now obtained from crude oil and natural gas. In addition, such alternate processes are likely to increase the supply of hydrocarbon derivatives containing oxygen, sulfur and nitrogen which are being obtained from petroleum in such dilute concentrations that only in exceptional cases is their recovery a paying proposition.

This leads to the following general conclusions: In addition to the petroleum known to be present in the ground, large but as yet undiscovered reserves may be expected to exist in different parts of the world, including the United States. How long we can continue to locate this oil and bring it to the surface at the desired rate is an open question. At some future date, whether it be in the immediate future, in the next generation or in a much later generation, a shortage in natural petroleum will occur. In the meantime, there is nothing to indicate that this should result in any sudden change as far as our supply and consumption of gasoline and other petroleum derivatives are concerned. Progress will continue in the petroleum industry's efforts to improve the efficiency of its processes and the quality of its products. Advances in engine construction will make for better efficiency in the utilization of fuels and lubricants. Increased drilling on a world-wide basis will bring in more oil. There will be necessary adjustments in supply and demand so that oil will be moved freely from the principal centers of production to the principal centers of consumption. All this will tend to prolong the necessity, at least in time of peace, for turning to alternate sources of supply. As the need arises, synthetic products from the sources indicated will then gradually work their way into the picture.

OBITUARY

JOHN MUIRHEAD MACFARLANE

September 28, 1855—September 16, 1943

JOHN MUIRHEAD MACFARLANE, professor emeritus of botany at the University of Pennsylvania, died at his summer home, Lancaster, N. H., on September 16, twelve days before attaining his eighty-eighth birthday. He was born at Kircaldy, Scotland, and received the B.S. and D.Sc. degrees from the University of Edinburgh, where he held various academic positions, including that of professor in the Royal Veterinary College. In 1891 he was invited to speak before the American Association for the Advancement of

Science on insectivorous plants, especially on Dionaea. While in this country he was invited to a professorship in biology at the University of Pennsylvania; he accepted and in 1893 became professor of botany, a position held until his retirement in 1920.

Through the untiring and unremittant efforts of Dr. Macfarlane as head of the botany department and director of the botanic garden over a period of twenty-seven years great advances and constructive improvements were wrought, both for the cause of botany at the university and for the general field of this science. From "extended vistas of sand-hills and gravel hollows" there was evolved a well-balanced and highly useful botanic garden. From a shelf with seventeen volumes on botany in 1893 there emerged a well-stocked botanic library with more than five thousand volumes. Greenhouses were erected and filled with a large and representative collection of plants. Laboratories were equipped with essential apparatus. The faculty was enlarged and the student body greatly augmented from time to time, with five hundred students taking courses in botany in 1920. Dr. Macfarlane believed in the influence and usefulness of subsidiary organizations that would serve to bring the alumni of the university and the general public in contact with the botanical department of the university. With this aim in view he founded the Botanical Society of Pennsylvania in 1897. This organization, which very soon included 150 members, has continued to the present and held the founder's interest and guidance to the end of his long life. The Graduate Botanical Club, organized about the same time, served to unite faculty, graduate students and graduates in their common interests. At the bi-weekly meetings results of investigations were reported and botanical literature was discussed. These meetings were preceded by a social hour when a repast was served. Here also Dr. Macfarlane showed that delightful geniality so characteristic of this beloved Scot and frequently he recited bits of Scotch poetry and prose in his pleasing native brogue into which he could lapse so readily.

A classical as well as a scientific background in his training, wide experience in the laboratory and in the field and the close association with his fellow man, all gave Dr. Macfarlane a universality of knowledge and a versatility of application seldom found in any one individual. He will be remembered longest as a magnetic teacher, who loved students and who never "talked down" to them but rather on the same plane. Classes coming to him for the first time were usually greeted by "Fellow Students" which would put even the most timid student at ease. He was never too busy to help and to counsel the student. To his colleagues he was ever an inspiring leader. He was an ideal friend and host and the portals of his office and of his home were ever open to all his friends.

Although Dr. Macfarlane carried a heavy teaching schedule, yet he found time for research, writing and publishing more than 140 volumes, monographs and contributions. He was active in research practically to the end of his long and full life, leaving much unpublished work, mainly on taxonomic botany. The unique versatility and ability in his researches are portrayed in the variety of scientific fields which he explored so thoroughly. He held first rank as an authority on insectivorous plants. To cite some of his volumes—as "The Causes and Courses of Organic Evolution," "The Evolution and Distribution of Fishes," "Fishes the Source of Petroleum," "The Quantity and Sources of our Petroleum Supplies," "The Evolution and Distribution of Flowering Plants (Apocynaceae. Asclepiadaceae)"—further shows not only the diversity of his interests but also that he wrote with authority.

Dr. Macfarlane enjoyed membership in many learned societies here and abroad. In addition to the degrees from the University of Edinburgh he held an honorary LL.D., University of Pennsylvania, 1920, and an honorary Litt.D. from LaSalle College, 1929. He was married twice. His first wife, Emily Warburton Macfarlane, died in 1927. His second wife, Lily Wells Macfarlane, survives him, as do four children—Alistair, a teacher in the Philadelphia public schools; Norman, a physician; Archibald, in the State Department, Washington; and Mrs. Winifred Mair, Carlisle, Pa.

WALTER STECKBECK
UNIVERSITY OF PENNSYLVANIA

RECENT DEATHS

DR. HERMAN L. FAIRCHILD, professor of geology emeritus at the University of Rochester, died on November 29. He was ninety-three years old.

DR. FRANK E. LUTZ, chairman and curator of the department of insects and spiders of the American Museum of Natural History, New York City, and since 1909 a member of the scientific staff, died on November 27 at the age of sixty-four years.

ELMER SETH SAVAGE, professor of animal husbandry at Cornell University, died on November 20 at the age of sixty years.

DR. GEORGE H. BURROWS, who retired in 1942 as professor of chemistry and head of the department of the University of Vermont, died on November 22 in his sixty-eighth year. He had served on the faculty for thirty years.

DR. IRWIN BOESHORE, assistant professor of botany at the University of Pennsylvania, died on November