cracking of residue oils, although of course it will function on distillates. The process is simple in that the oil, after leaving the pipe-still, passes into a large reactor under a much lower pressure than that used by the Cross system. In the standard plant the oil enters the reaction chamber at 450° C., and the vessel is 10 ft. in diameter and may reach 30 ft. in height, with a capacity for coke ranging from 30 tons upwards. From the reactor again the vapours are subjected to dephlegmation, and a heavy condensate can be passed along with the incoming crude oil to the pipe-still.

The question of temperature in liquid-phase cracking is decided by the particular oil under treatment and the amount of gasoline required, because there appears to be a definite relationship between the variables time, temperature, and yield. It is interesting to note that the percentage of spirit obtained, after the oil has reached a definite cracking temperature, appears to double, within limits, for an increase of 10° C.

There has been little advance in our knowledge of cracking from a chemical point of view during the past ten years, because problems connected with cracking processes have been more often of an engineering nature, and the most urgent question to the majority of operators is the possibility of elimination—or at any rate the diminution—of coke, so that the plant may run continuously without the necessity for frequent shut-downs for cleaning.

It is surprising how little progress has been made in the examination of the residues left after the cracked gasoline has been removed from the synthetic crude oil, and investigators would do well to bear in mind that herein lies reactive material of unknown constitution, knowledge of which would probably amply repay intensive research.

Recent development in the design of the high speed, high compression, and high efficiency light car engine has brought to notice the importance of suitable fuel. It is in this connexion that cracked spirit shows particular advantages over straight run gasoline, in that it withstands high compression and is less prone to detonation, and it is a fact that, at the moment, quite considerable quantities of this material are being marketed as "anti-knock" motor spirit. The vapour phase product, having been processed at considerably higher temperatures, is specially noteworthy from this point of view.

No account of the present position of oil-cracking to-day would be complete without some consideration of the Bergius process, about which such far-reaching claims have been made. From the early work of Bergius there emerged the formation of artificial coal from cellulose at temperatures of 350° C. and pressures of more than 100 atmospheres. This substance was capable of hydrogenation by being heated to 400° C. in the presence of hydrogen at very high pressures. From this observation naturally led the application of hydrogenation to coal itself.

An entirely new technique had to be developed in this research and its later development, and only the discovery of a new method of joint construction rendered possible the application of very high pressures to this problem.

A commercial plant has been set up at Rheinau, and consists of an autoclave 30 ft. long × 3 ft. in diameter, fitted with stirring device and capable of handling 50 tons of material a day, under a pressure which may reach nearly 300 atmospheres.

In the case of coal, the material is ground to pass a 400-mesh sieve and is mixed with oil to permit of its passage through pipes. The autoclave is heated very ingeniously by surrounding it with heated nitrogen under pressure. Bergius has claimed that any coal containing less than 84 per cent. of carbon on an ash-free basis can be successfully hydrogenated.

In this connexion a good deal of work has been carried out the last few years in Great Britain, more particularly in the University of Birmingham, which more or less substantiates claims advanced by Bergius, and a variety of coals, lignites, and so on have been liquefied; but it should be borne in mind that the liquid product, whatever it may be, is certainly not petroleum, seeing that it contains liquid compounds of oxygen, sulphur, and nitrogen; and at the moment of writing it can be safely stated that the process has not yet been placed on a commercial basis.

Obituary.

PROF. EDMUND KNECHT.

BY the death of Prof. Edmund Knecht, associate-professor of technological chemistry in the College of Technology, University of Manchester, chemistry, as applied to dyeing and other branches of textile industry, has lost one of its chief exponents.

Henry Edmund Knecht was the third son of Gustave Knecht, B.Sc. (Lond.), a Swiss who became a naturalised Englishman and for many years had a large private school in Liverpool, where Dr. Knecht was born in 1861. His mother was English. On leaving school he matriculated at the University of Zürich, studying chemistry under Victor Mayer, to whom later he acted as assistant. He graduated Ph.D. at the Swiss Federal Polytechnic in 1882, and returned to England in 1883 on his appointment as Head of the Department of Chemistry and Dyeing of the then newly opened Bradford Technical College. In 1890 he entered upon the long period of service at the Manchester College of Technology which ended only with his death.

When the Society of Dyers and Colourists was formed in 1884, Dr. Knecht became the first editor of the journal of the Society, a position which he held continuously for forty-one years and was the source of great satisfaction to him. To commemorate the completion of the fortieth year of his editorship, an excellent portrait of Dr. Knecht was issued with the journal and a valuable presentation was made to him, towards which subscriptions were received from the United States, Canada, India, Japan, and most European countries—for he had friends and admirers the world over.

Dr. Knecht was an indefatigable and prolific worker, his published researches, which number more than one hundred, appearing in the *Journal of the Society of Dyers and Colourists*, the *Journal of the Chemical Society*, the *Berichte*, and elsewhere. They cover a

wide range, dealing with the production and application of dyestuffs, the chemistry of textile fibres and textile processes, etc. He also developed an entirely new series of analytical processes based on the use of titanium salts. He was the author alone or in collaboration of several standard works on dyeing, printing, and allied industries, the best known being the "Manual of Dyeing" by Knecht, Rawson, and Loewenthal. He also contributed a number of articles to the last edition of the "Encyclopædia Britannica."

Dr. Knecht was in good health until July last, when he underwent a serious operation from which he made a good recovery. Going to Switzerland to recuperate, he remained there until November, but during the whole time kept in close touch with the investigations carried on by his assistants in Manchester. Arriving in England during one of the worst fogs experienced for years, he caught a chill which developed into bronchitis, and he succumbed quite suddenly to heart failure on December 8 last, at his home at Marple, Cheshire.

As a teacher Prof. Knecht acquired a great reputation, not mainly through formal lecturing but by personal contact and example in the laboratory. The letters received from past students in many parts of the world at the time of the presentation recently made to him indicate the abiding affection in which many of them held "the Doctor."

Dr. Knecht was never married, but is survived by three sisters. He had the gifts of humour and good comradeship, but to hide an excessive sensitiveness and shyness he had also a natural reticence which was penetrated only by his intimate friends. His publications are characterised by sound judgment and lucidity, and frequently by those flashes of vision which connote genius. To no other man does the Society of Dyers and Colourists so largely owe its present considerable reputation; and it may truly be said that no man in any country has done more to enrich our scientific knowledge of textile materials and processes.

WALTER M. GARDNER.

MR. R. B. NEWTON, I.S.O.

RICHARD BULLEN NEWTON, lately senior assistant in the Geological Department of the British Museum, was born in London on February 23, 1854. His father was Librarian and his uncle (Mr. E. T. Newton, F.R.S.) Palæontologist to the Geological Survey. He was educated at the Central London Foundation School, Cowper Street, entering there as one of the first scholars. At the age of thirteen years, Newton obtained work at the Geological Survey, and in 1873 became one of the assistant naturalists under Huxley. In 1880 he was transferred to the British Museum and was soon engaged in the removal of the geological collections from Bloomsbury, and the rearrangement in their new home at South Kensington. He became an expert conchologist and especially interested himself in the Tertiary Mollusca, issuing a systematic list of the Edwards Collection in 1891. Other contributions flowed from his pen, to the number of about a hundred; many of them, though professedly systematic reports on collections of fossils sent to the Museum from distant regions, constituted considerable additions to our geological knowledge of Africa, Asia, and the near East. Another branch of his work was the study of the Foraminifera as guides to geological horizons.

In 1914 Mr. Newton received the Wollaston Fund from the Geological Society of London. He was president of the Malacological (1910–12) and of the Conchological Society (1913–15). His wide knowledge of fossils and their literature and his familiarity with the national collection made his services of much value to the British Museum and to the Empire at large. Since his retirement from the service he had continued to work in his old room at the Museum, and was hard at work there until, only a few days since, he left to undergo the operation to the effects of which he succumbed on January 23, in his seventy-second year. His helpful presence will be greatly missed by all his colleagues.

F. A. B.

WE regret to announce the death of Dr. Karl Goldschmidt, chairman of the directors and for many years head of the executive of the firm of Th. Goldschmidt and Co., of Essen, who succumbed to an operation on January 5 at Stuttgart, at the age of sixty-eight. He and his brother, the late Prof. Hans Goldschmidt, were well known as the inventors of "thermit," and in a recent monograph entitled "Aluminothermie," Karl Goldschmidt has described fully the nature and importance of the thermit-reaction. The brothers inherited from their father a chemical manufacturing business, which they transferred from Berlin to Essen thirty-five years ago. Under the management of Karl Goldschmidt, the business developed enormously and in 1911 it became a public company.

WE regret to announce the following deaths:

Dr. Charles A. Doremus, formerly professor of chemistry and toxicology at the University of Buffalo, known for his work on foods and on the chemistry of sanitation, on December 2, aged seventy-four years.

Mr. C. M. Doughty, honorary fellow of Gonville and Caius College, Cambridge, traveller and poet, the author of "Travels in Arabia Deserta," on January 21, aged eighty-two years.

Dr. C. Iris Fox, senior assistant pathologist at the Royal Free Hospital, Gray's Inn Road, London, who died as the result of a poisoned finger sustained during a *post-mortem* examination, on January 21.

Prof. C. Golgi, emeritus professor in the University of Pavia, Nobel prizeman in medicine with Prof. Ramon y Cajal in 1906, and distinguished for his work on the histology of the nervous system, on January 21.

Prof. H. A. Gossard, chief of the Department of Entomology of the Ohio Agricultural Experiment Station and president of the American Association of Economic Entomologists, on December 18, aged fifty-seven years.

Dr. W. R. Lang, formerly professor of chemistry in the University of Toronto, known for his work on low-temperature phenomena and on the chemical industries of Canada, on November 20.

Prof. Edward S. Morse, formerly professor of comparative anatomy at Bowdoin College, and also of zoology at Tokyo, an authority on Mollusca and on Japanese ceramics, who was president in 1886 of the American Association for the Advancement of Science, aged eighty-seven years.