working with the Otto cycle, he was of opinion, that, with engines of large size, the results would be still better if the cycle were altered, especially when generator-gas was used. His reasons for this were fully stated in the paper.

The following was a summary of the points urged by the author:—

1.—When town-gas was used for driving the engines of an electrical station, the consumption was about 50 per cent. less than the volume of gas required to give the same amount of light by ordinary burners.

2.—When town-gas was used, neither boiler nor firemen were required, and there were no ashes to remove; less space was needed; no accumulators were required, except such as might be necessary to equalize the load of the engines and to provide for a small amount of storage. The engines could be worked in the most crowded districts, close to where the lights were required, and where boilers were not allowed.

3.—When generator-gas was used, the consumption of fuel under a full load would be at least 50 per cent. less than with steam-power, and the loss due to steam-boilers not being fully worked could be almost entirely avoided.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—We regret to hear that Professor Cayley has been suffering from serious illness, and that he is in consequence unable to give this term his advertised course of lectures in Pure Mathematics.

L. Cobbett, M.A., M.B., of Trinity College, has been appointed Demonstrator of Pathology in the place of Dr. E. Lloyd Jones, who has resigned the office.

Mr. F. Darwin, Deputy Professor of Botany, announces a special course of lectures in the Chemical Physiology of Plants, to be given by Mr. Acton, of St. John's College, on Tuesdays in the present Lent Term.

Mr. J. Y. Buchanan, F.R.S., announces a second course of lectures in Geography, to be given in the Easter Term.

Mr. A. E. Shipley has been appointed an additional member of the Special Board for Biology and Geology.

SCIENTIFIC SERIALS.

Journal of the Royal Agricultural Society of England, 3rd series, vol. iii. pt. 4.—Cottage sanitation (illustrated), by H. McLean Wilson, a paper prepared under the supervision of Dr. Spottiswoode Cameron and T. Pridgin Teale, F.R.S. It contains a discussion of the principal sanitary defects, which are most likely to be found in the houses of agricultural labourers, with valuable suggestions and remedies. The object aimed at is "to put the whole country, and every house in the country, into such a condition that if the epidemic (cholera) should break out it would have no chance of spreading."—Field experiments on the fixation of free nitrogen, by James Mason, gives an account of the enriching of some plots of poor land on the Oxford clay at Eynsham by the growth of two leguminous crops in succession. The two crops chosen were beans and mixed clovers. So far as they go the results are striking. Prior to 1888 the land had never been cultivated or received any manure. Brought into tillage in that year two plots produced 10½ cwts. and 9 cwts. per acre of barley and oats respectively, straw included,—an excessively low return. In the autumn of 1888 the plots were treated with 20 cwts. of basic slag per acre, and the subsoil with the same amount. Beans in the following year yielded an average of 46 bushels and 23 cwts. straw per acre. In 1890 mixed clovers gave a yield of 28 cwts. per acre as the average of the two plots, and in 1891 a crop of three tons clover-hay was obtained. Potatoes were grown upon the plots last year, and gave an average yield of eight tons per acre. Excepting the basic slag, no manure of any kind had ever been applied to the plots. The experiments are being continued and extended.—Wild birds, useful and injurious (illustrated), by C. F. Archibald.—Utilization of straw as food for stock, by Joseph Darby. Showing methods of using chaffed straw as a remedy for the deficient hay crop of last summer, with records of previous experiences under similar circumstances.—Yew poisoning, by Mr. E. P. Squarey, Mr. Charles Whitehead, Mr. W. Carruthers, F.R.S., and Dr. Munro. But few definite conclusions can be arrived at, owing to the conflicting nature of the information available. It appears, however, (1) that both the male and female yews are poisonous; (2) the poisonous alkaloid (or alkaloids) exists chiefly in the leaves and in the seeds; (3) the fleshy part of the fruit is harmless, or nearly so; (4) the amount of poisonous alkaloid in the leaves varies considerably with individual trees, and perhaps with the season of the year. Dr. Munro contributes a review of the chemical work done upon taxine, the only alkaloid in yew which has been investigated; very little is known with certainty about it, either as to its chemical nature or its physiological action. As Dr. Munro suggests, "yew leaves merit *exhaustive* chemical examination."—Besides the official reports, there are several short articles, including one upon the ferments of milk, abridged by Dr. Munro from Prof. H. W. Conn's pamphlet on the subject, issued last summer; also a paper upon the decline of wheat-growing in England, by the editor.

American Journal of Science, January.—The age of the earth, by Clarence King. This paper contains an application of Lord Kelvin's reasoning from probable rates of refrigeration to the determination of the earth's age, aided by Dr. Carl Barus's recent work in geological physics, especially his determination of the latent heat of fusion, specific heats melted and solid, and the volume expansion between the melted and solid state, of the rock diabase. Thermal considerations have shown that with a given initial excess of temperature of the earth over surrounding space, and an assigned value for rock conductivity, it is possible to determine the curve of temperature from the earth's centre to its surface. It appears that for an initial temperature of 2000° C., the initial maximum temperature must still extend uniformly from the centre to within a few hundred miles of the surface for any admissible value of the age. But since the pressures increase steadily as we proceed towards the centre, there must be a point at which their effect outweighs that of the temperature, and the material, though very hot, remains in the solid state. Now on the data supplied by Barus's researches it is possible to state what temperatures are necessary to keep a certain representative species of rock in the fluid state at successive points within the earth. The amount of possible liquid layer is limited by the facts of tidal rigidity, which fix the maximum admissible temperature at 1950° and the age at 24×10^6 years. Lower values are excluded by the gradient of temperature observed on proceeding downwards from the surface. This value, twenty-four million years, agrees fairly well with the age assigned by Helmholtz and Kelvin to the sun. It is also concluded that the earth never was all liquid, that the original liquid layer did not exceed 53 miles, and that the spheroidal shape is due to the plasticity of the lithosphere as manifested under the action of very slowly applied forces.—Tertiary geology of Calvert Cliffs, Maryland, by Gilbert D. Harris.—"Anglesite" associated with boleite, by F. A. Genth.—Preliminary account of the iced-bar base apparatus of the United States Coast and Geodetic Survey, by R. S. Woodward.—Some experiments with an artificial geyser, by J. C. Graham.—Observations of the Andromed meteors of November 23 and 27, 1892, by H. A. Newton.—Preliminary notice of a meteoric stone seen to fall at Bath, South Dakota, by A. E. Foote.—New Cretaceous bird allied to Hesperornis, by O. C. Marsh.—Skull and brain of Claosaurus, by O. C. Marsh.

THE *Botanical Gazette* for October contains an interesting article by Mr. H. L. Russell on the bacterial investigation of the sea and its floor. The author has had the opportunity of carrying on bacteriological observations in sea-water, both from the Bay of Naples and from the coast of Massachusetts. He finds micro-organisms invariably present in sea water, though not in such large numbers as in fresh water, even at a great distance from the shore, and to a depth of 3200 feet; and a larger number in the slime at the bottom than in the water itself. Some marine forms are cosmopolitan, and the bacteria that are so universally present in sea-water and mud seem to be quite peculiar to this habitat.—Mr. E. L. Berthoud describes the mode in which the geographical distribution of some plants has been greatly extended by the agency of the buffalo.—In the number for November Prof. Underwood gives a report of the proceedings of the International Botanical Congress lately held at Genoa.—Mr. G. W. Martin contributes an account of the development of the flower and embryo-sac in *Solidago* and *Aster*.