drying, the tissue loses its excess water and becomes translucent again ; but if frozen whilst swollen, the fibres become broken up and disorganised.

The fat becomes rancid on prolonged storage : the change can be followed by estimating the increase in free acids and the decrease in the iodine number. The state of the fat determines the period of storage, since the slightest taint of rancidity is undesirable, and this develops whilst the lean part of the meat is still improving in flavour.

Little alteration occurs in the proteins during storage after the resolution of rigor : in a short period of hanging, autolysis is negligible, there is no increase in the water which can be expressed from the muscle, and, except on exposed surfaces where methæmoglobin may be found, no change in the pigment.

As regards the carbohydrates, the effective changes are over within 3 days of slaughter : the lactic acid reaches its maximum of about 0·8 per cent and then remains unaltered throughout storage.

With ordinary cleanliness, bacterial contamination of the carcase is only slight, and experiment showed that increase in the bacterial content of meat hung for 17 days at 41° F. is negligible.

The experiments on the palatability of the stored beef were carried out at the Household Arts Department, King's College for Women, London, and at Messrs. J. Lyons and Co.'s laboratories. They showed that conditioning effects a marked improvement in palatability, particularly in respect of tenderness, but also of juiciness and texture, without any change in flavour. The improvement is more marked with coarse than with prime joints. A few experiments also indicated that freezing beef has no marked deleterious effect on its palatability.

Apart from the scientific aspects of the improvement of the meat supply, the demand of the public for good meat is an important factor to be considered, and it is to be hoped that the experimental grading and marking scheme for home-killed beef [3] will stimulate this demand by giving purchasers confidence that they can obtain exactly what they require.

FRUIT AND VEGETABLES.

The chemical changes occurring in apples stored at 12° and 1° C. have been further studied by D. Haynes and H. K. Archbold. The rate of loss of respirable material, sugar, acid, and residue (cell wall material) per unit of nitrogen (protoplasm) has been found to be characteristic of the variety. Storage life may be roughly divided into three periods : in the first, the starch is hydrolysed with a concomitant rise in sugar ; in the second, at 1° C., the total sugar and sucrose decrease, but the reducing sugar rises slowly to a maximum ; in other words, the rate of inversion of sucrose is greater than the rate of consumption of its products ; in the third, at 1° C., internal breakdown has set in and the rate of loss of sugar is increased ; at this point the sucrose has all been inverted and the stable reducing sugars stored in the vacuole are oxidised. Throughout, acid is lost, the rate in the first and third periods being faster than in the second. At 12° C. internal breakdown does not occur but is replaced by senescence, which is observed at an earlier period of storage life and is characterised by very similar changes in the constituents of the fruit.

Fungal invasion of stored apples has been studied by A. S. Horne : a close relationship between the chemical composition of the fruit and susceptibility to invasion has been found ; thus decrease in the amount of acid is associated with an increase in the rate of invasion. The relationship between growth of fungi and the environment, especially the humidity, has also been studied by R. G. Tomkins.

The possibility of the cold storage of vegetables has been investigated by J. Barker : the commoner vegetables can be stored for a few weeks at 45° or 33° F. The lower temperature is the more satisfactory, except for potatoes, which sweeten near the freezing-point. Even lower temperatures, 26° and 29° F., at which partial freezing occurs, are satisfactory for cabbages, cauliflowers, or sprouts, but not for tomatoes, cucumbers, or lettuces. Preliminary experiments on the rate of deterioration after removal from cold store indicated that 33° F. was more suitable than 45° F., except for tomatoes.

These excerpts must suffice to indicate the nature of some of the work which has been carried out under the direction of the Board. Among other subjects dealt with are corrosion of metal food-containers, with the production of hydrogen and perforation of the can, the transport of butter in insulated vans, and the freezing of fish on board the trawler so that it can be kept for a longer time and landed in a fresher condition. The report also refers to work on the control of temperature and humidity and on methods of refrigeration.

[3] Home-killed Beef : Experimental Grading and Marking Scheme. Ministry of Agriculture and Fisheries. Marketing Leaflet, Nos. 13 and 13*a*.

Nickel in Engineering.

IN a lecture on "Nickel and its Uses in Engineering", delivered before the Junior Institution of Engineers on Nov. 15, Mr. W. T. Griffiths stated that, prior to the War, 65 per cent of the world's production of nickel was utilised in the manufacture of nickel steel for armament purposes ; after the Armistice, production dropped to the level of the years 1890–91.

New uses for nickel have now increased the consumption to as high a figure as any attained during the War. A considerable portion of the output is used, on account of its high melting-point, in the radio electrical industry for parts of wireless valves ; it is also used for the electrodes of sparking plugs. In chemical engineering much use is made of it on account of its ability to withstand alkaline reagents. In mechanical engineering it is largely used by means of electro deposition for building up worn parts of mechanisms, but its principal uses are found when alloyed with other metals ; for example, in steels it increases toughness, and in conjunction with heat treatment much improves the homogeneity of castings ; in case-hardened articles it increases the penetration of the hardening material, and in many cases eliminates a preliminary heating and quenching ; in conjunction with chromium and molybdenum, large forgings can be made as the elastic limit of the material is much improved. In Canada, nickel alloy steel is used in casting the bar framing of locomotives and even in boiler parts including plates, firebox and tubes being made of an alloy steel containing 2 per cent of nickel, thus enabling the boiler pressure to be increased by some 37 per cent without increasing the weight of the engine.

When alloyed with iron, nickel has the property when present to the extent of about 25 per cent of destroying the magnetic properties of iron, but a higher percentage of nickel restores these properties, and the Western Electric Co. of America has established that after heat treatment of high content nickel-iron alloys, the magnetic qualities are 10-13 times better than the best soft iron ; it also has much effect in diminishing the hysteresis loss. These properties are

of much use in submarine cables where great permeability is desirable to ensure quick working. The alloy is insulated from but wound round the copper conductor and prevents the interference of stray currents. An alloy of 35 per cent nickel, 35 per cent cobalt and iron, known as perminvar, shows great constancy of permeability. In heat-resisting steels, it prevents corrosion of the steel up to temperatures of 600°-700° C. Nickel chromium alloys are now largely used for electrical heating purposes, ribbons of the alloy arranged along the top and sides providing the heating elements in large annealing furnaces.

Nickel alloyed with copper increases the tensile strength of the latter from 21 tons to 45 tons per square inch. It is now greatly used for condenser tubes, these as compared with brass having a long life without corrosion.

In the discussion following the paper, it was stated that nearly all the nickel used in the world comes from within the Empire, Canada producing 90 per cent of it; there are also small deposits in New Caledonia.

University and Educational Intelligence.

BIRMINGHAM.—On Nov. 13 the new Mining Machinery Laboratory was opened by Mr. Evan Williams, president of the Mining Association of Great Britain. The object of the laboratory is to enable students of mining to get first-hand knowledge of the construction and mechanism of the latest coal-mining machinery, which will be supplementary to the knowledge of the operation of coal-cutting and conveying, which can only be learnt underground. The Miners' Welfare Fund has found the money for the building, and the machinery for equipment has been presented by the manufacturers themselves, no fewer than twenty-two firms having contributed of their products. The opening of this laboratory marks a further step in the policy of the Mining Department, which is to help the coal industry to regain its prosperity by providing it with trained public school and university men who, after acquiring experience underground, should be capable of contributing to the solution of some of the many problems with which the industry is confronted.

CAMBRIDGE.—Mr. D. Portway, St. Catharine's College, has been appointed University lecturer, and Mr. G. S. Gough, Pembroke College, University demonstrator in the Faculty of Engineering.

Dr. E. K. Rideal has been appointed a member of the Board of Research Studies.

MANCHESTER.—Prof. F. E. Weiss will retire at the end of the present session from the George Harrison chair of botany and the directorship of the Botanical Laboratory. He has held these appointments since 1892.

IT it announced in the Report of the governing body of the School of Oriental Studies of the University of London that a lectureship in Iranian studies has been founded in the School. The funds for the foundation have been provided for a period of five years by the Parsee community of Bombay. This is not the first occasion on which humane and historical studies in Great Britain have been indebted to the public spirit and munificence of the Parsee community in India, and there can be little doubt that when the first period of five years has elapsed it will once more come forward to meet an increasing need. For, as the report points out, this chair is the only provision in Britain for this important branch of Oriental studies. In fact, the great increase in the study of Sanskrit and Indian history has necessitated the institution of two new lectureships in these departments.

Calendar of Patent Records.

November 23, 1848.—The idea of perforating sheets of postage stamps was due to Henry Archer, who devised a machine for "cutting or stamping around the margin of every stamp a consecutive series of holes whereby the tearing up of the sheet will be greatly facilitated," and obtained an English patent for his invention on Nov. 23, 1848.

November 24, 1854.—In a patent granted to him on Nov. 24, 1854, Sir Henry Bessemer proposed to give rotation to a projectile when fired from a smooth-bore gun by allowing a portion of the powder gas to escape through passages formed in the projectile and terminating in the direction of a tangent to its circumference. The tangential emission of gas would then act as a turbine and produce a rapid rotatory motion of the projectile. The British military authorities refused to undertake tests of the invention, but Bessemer carried out successful experiments in his own grounds near Highgate and afterwards at Vincennes before the Emperor Napoleon III. It was the necessity of increasing the strength of the guns to enable them to withstand the resulting pressures that led Bessemer to the serious study of the metallurgy of iron.

November 24, 1874.—The earliest proposal for a barbed-wire fencing was made in the United States in 1867, but the most important patent was that granted to Joseph F. Glidden on Nov. 24, 1874, on an application made on October of the previous year. Glidden's application was challenged by Jacob Haish, another prominent inventor of a barbed wire, but the United States patent office decided in favour of Glidden, and it is mainly on his invention that the industry was established. Patent litigation between the rival interests was continuous from 1874 until 1892.

November 25, 1802.—William Dobson was granted a patent on Nov. 25, 1802, for his "new invented method never before applied for that purpose of chasing away flies and venemous insects, and calculated to promote the free circulation of air in rooms". The invention comprised a clockwork-driven fan mounted on a telescopic standard or pendant. The 'Zephyr', as it was called, was adopted by many large houses in Great Britain and abroad.

November 26, 1822.—Joseph Egg, a London gunmaker, who, on Nov. 26, 1822, was granted a patent for improvements in fire-arms "upon the self-priming and detonating principle", is one of the claimants to the invention of the copper percussion-cap. He appears to have been the first to manufacture such caps, but it was stated a few years later that he obtained the idea of the cap indirectly from Joshua Shaw, who probably has a better right to be called the actual inventor.

November 29, 1879.—The early multiple switchboards for telephone exchanges did not completely fulfil their function, because satisfactory means had not been devised whereby any operator could instantly ascertain whether a particular subscriber's line was already engaged by another operator. The first to incorporate a practical 'test' apparatus of this kind in a telephone switchboard was the American, C. E. Scribner, who was granted a British patent on Nov. 29, 1879, for his invention. The earliest known proposal for a switchboard for the purpose of intercommunication between individual subscribers at their own request was made in connexion with the telegraph system, and was patented by François Dumont in France in 1850, also in the month of November, and in England a few months later. A few installations of this character came into use.