

ratus consists of a long tube with copper electrodes inserted in tube-shaped depressions at suitable points, the milk being passed continuously through this tube, from a raised tank, at a predetermined rate of flow. The current used varies from 2 to 3 amperes at an E.M.F. of 3900 to 4200 volts, and each unit quantity of milk is exposed to the action of this current for such a brief period of time, that no heating effects are produced. Details of the bacteriological results are given in the report, from which it is seen that *B. coli* and the ordinary milk-souring bacteria have been invariably absent from the electrically-treated milk, and that the average percentage reduction in the number of total bacteria, over a period of fifteen days' operation of the plant, was 99.93 per cent. The electrical sterilising apparatus in use at the Earle Road Milk Depot of the Liverpool Corporation has a capacity of 125 gallons of milk a day, and this quantity is distributed in 3000 bottles. The question of extending the plant is now being considered.

A PAPER on recording pyrometers, read by Mr. C. R. Darling at a meeting of the Faraday Society on April 22, was accompanied by a full display of the most recent types of instruments. The marked improvement which has been effected in the accuracy of these instruments was attributed by the author, and by several speakers in the subsequent discussion, to the admirable work of the National Physical Laboratory as an impartial standardising agency. Some recent advances include (1) the introduction of electric power to operate the pyrometers, either by means of relay-circuits or in place of clockwork, in such a way that the automatic control of large technical furnaces may easily be provided for; (2) arrangements whereby the same instrument may be used either with a resistance thermometer or with thermal couples; (3) automatic switches with the help of which the records from several furnaces may be recorded by the same machine.

THE Chemical Society's journal for April contains two papers by Dr. Pickard and Mr. Kenyon on the dependence of rotatory power on chemical constitution. The first paper, recalling the monographs of Sir William Perkin on magnetic rotatory power, contains a description of no fewer than seventy-three optically-active esters of the fatty series. Unlike the alcohols from which they are derived, which exhibit the simplest type of rotatory dispersion at all temperatures, the esters show marked deviations from the simple law when the temperature is raised; in certain solvents they even exhibit anomalous rotatory dispersion. The second paper includes a description of the optical properties of naphthyl methyl carbinol $C_{10}H_7.CH(OH).CH_3$. This substance obeys the simple dispersion law at temperatures above 160° , but shows anomalous rotatory dispersion in the superfused condition at temperatures below about 10° . It is suggested that the anomalous dispersion is caused by the actual presence in the superfused liquid of two of the hypothetical varieties of the naphthalene nucleus which have long been postulated by organic chemists.

THE transportation problem in Canada, and Montreal Harbour, were discussed in a paper read at the

Institution of Civil Engineers on April 7 by Mr. F. W. Cowie. It appears that the farmer receives for his wheat 67 per cent. of the price paid by the consumer; the remaining 33 per cent. represents the cost of transportation, handling, and selling profits. It is important that the latter percentage should be reduced to the lowest possible figure, so that the farmer may receive the full due for his toil, and the cost of living in Great Britain may not be unduly enhanced. Montreal Harbour handled sixty million bushels of grain in 1913, and nearly a hundred million bushels of Canadian grain were shipped in the same year through Buffalo in the United States. The loss to Canadian transportation and selling organisations by reason of the latter shipments amounts to about 18,000,000 dollars. The magnificent railway systems between New York and Buffalo are the most powerful rivals of the "all Canadian" routes. Great efforts are being put forth by the Canadian Government and others interested to improve facilities and render available Canadian routes. The author is of the opinion that the advantages for future transportation should lie with the St. Lawrence route. It is believed that improvements for the storage and handling of grain in the ports of Great Britain are not advancing in measure equal to the Canadian ports.

Six new volumes have been added to "The People's Books," which Messrs. T. C. and E. C. Jack are publishing at sixpence net each. The additions fully maintain the high standard of this excellent series, which is bringing within the reach of all readers the results of modern studies in many branches of human knowledge. Particular attention may be directed to Dr. W. E. Carnegie Dickson's little book on bacteriology, and Mr. Ford Fairford's on Canada. Dr. Dickson, in the sub-title to his volume, "Man's Microbe Friends and Foes," sufficiently describes the point of view from which he has written. He gives a brief historical summary of the growth of the science, explains the relation between health and disease, describes some of the commoner organisms which produce disease, and explains the importance of bacteria in the arts and industries. Mr. Fairford's book should prove of service to students of commercial geography, and interest general readers in an important part of the Empire.

OUR ASTRONOMICAL COLUMN.

A NEW COMET.—A Kiel telegram, dated May 17, reports the discovery of a new comet, stated to be of the fourth magnitude, by Zlaitinsky. On May 15 the comet was situated close to η Persei, while on the following day it was recorded as being half a degree north of α Persei.

A further telegram from Kiel communicates an observation by Prof. Schorr. On May 16, at 11h. 12gm. Bergedorf mean time, the comet was of the 4th magnitude, and its position was R.A. 3h. 17m. 37s., declination $+49^\circ 51' 7''$.

TELESCOPIC METEORS.—One of the interesting contributions to the *Observatory* for May is an account by Mr. W. F. Denning of observations of telescopic meteors. Thirty years ago Mr. Denning directed attention to the importance of making combined ob-

observation of these bodies, for he and others were of the opinion that these faint shooting stars were at vastly greater distances than those visible to the naked eye, for their slowness of movement and diminutive size suggested such remoteness. While ordinary meteors rarely become visible at a greater height than about 100 miles, these telescopic objects require distances of 1000 to nearly 2000 miles to explain their appearance assuming as standard the ordinary velocity and length of flight of naked-eye meteors. From four objects Mr. Denning inferred heights of 1260 to 1820 miles, and these he states were "only examples of a class and not rarities." The whole question is interestingly summarised in this contribution, and the author describes in detail observations extending over the period 1881 to 1902, and reproduces numerous diagrams of various forms of trails observed.

A NEW PHOTOGRAPHIC CHART OF THE MOON.—In the April number of *L'Astronomie*, M. Camille Flammarion gives an account of the new photographic chart of the moon, which has recently been prepared by M. C. Le Morvan. M. Le Morvan during the last eighteen years has been associated with the production of all the plates for the great atlas of Loewy and Puiseux, and this important and unique collection of clichés, taken with the Paris equatorial coudé, provides him with a rich assortment of material. The object of the work is to provide in a more convenient form as perfect a representation of the lunar surface as is possible in every detail. The plates are reproduced in héliogravure, and are issued in two parts, each part consisting of twenty-four sections, and representing increasing and decreasing phases respectively. The publication of this chart is rendered possible by a grant of 4000 francs out of the Bonaparte funds by the Académie des Sciences. M. Le Morvan communicates also a brief account of the construction of lunar charts.

THE ROYAL SOCIETY CONVERSAZIONE.

THE annual May conversazione of the Royal Society was held on Wednesday, May 13, and was, as usual, largely attended. During the evening demonstrations were given in the meeting-room by Prof. J. P. Hill and Mr. P. Schilowsky. Prof. Hill gave a short account of the work of the Percy Sladen Expedition to Brazil, 1913, illustrated by lantern-slides of material collected and regions visited; and Mr. Schilowsky demonstrated the application of gyroscopes to locomotion on land, on sea, and in air. The gyroscope's stabilising property can be applied to unstable bodies like monorail cars or monotrack automobiles, making them stable; that property can be used for stable but oscillatory bodies like ships, submarines, flying machines, preventing their rolling movement and rendering them perfectly steady. A description of the application of the system to a two-wheeled motor-car appeared in *NATURE* of May 7 (p. 251). Dr. J. G. Gray exhibited gyrostats with accessories for showing the more obvious properties of the gyrostat, and a series of what may be called "animated" gyrostats. The latter consist of gyrostatic acrobats, bicycle riders, and gyrostatic motor-cars, both two-wheeled and four-wheeled. A two-wheeled car was provided with a gyrostatic "chauffeur," which stabilised the car and presided at the steering wheel. This car illustrated the action of directing and stabilising apparatus for use on torpedoes, airships, and aeroplanes. A further form of two-wheeled car demonstrated methods of stabilising and manœuvring an airship by means of forces derived from the propellers, which apply a direct push to the moving body. Dr. Gray's bicycles and motor-cars

can be steered by the wireless transmission of electrical action. There were many other exhibits of objects and devices of scientific interest, and we give descriptions, from the official catalogue, of some of the most interesting grouped according to related subjects.

The Astronomer Royal: Transparencies of the Milky Way (selected from the Franklin-Adams chart). The whole sky was photographed on 206 plates by the late J. Franklin-Adams. The plates have been presented to the Royal Observatory, and the number of stars of different magnitudes from the 12th to the 17th have been determined. There are altogether fifty-five million stars on the plates, and from the sequence of the numbers for different magnitudes it is shown (S. Chapman and P. J. Melotte, Mem. R.A.S., vol. ix.), that the total number of stars in the sky is not less than 1000 millions, and cannot much exceed twice this amount, and that half the stars are brighter than the 23rd or 24th magnitude. **Mr. George H. Cobb:** A terrestrial globe, dated 1620, constructed to serve as a timepiece; supported by a gilt bronze figure of Atlas. Inside the globe is a movement of the verge type, so geared to the axial spindle that the globe revolves once in twenty-four hours.

The National Physical Laboratory (Mr. F. E. Smith): Photographic record of the variations in the horizontal intensity of the earth's magnetic field at the National Physical Laboratory. The record shows the variations in H from 1 p.m. on Saturday, April 19, to 11 a.m. on Sunday, April 20. The time scale (abscissa) is 43 cm. to the hour (7 mm. to the minute), and the intensity scale (ordinate) is 2.5 mm. for a change in H of 1γ (0.00001 c.g.s. unit). The sudden variations are principally due to the earth currents produced by the London United Electric Tramway system. These sudden changes are not in general greater than 5γ. **Mr. W. A. Douglas Rudge:** Electrification produced during the raising of a cloud of dust. During the raising of a cloud of dust by almost any method, considerable charges of electricity are produced. A charge of one sign is found upon the dust itself, and another charge of opposite sign, either upon the air, or else upon fine particles of dust which remain suspended in the air. Generally, dust of an acidic nature, such as silica or molybdic acid, give a negative charge to the air, metallic oxides and organic bases give positive charges to the air.

Dr. J. A. Fleming: An apparatus for the production of stationary vibrations on strings, loaded and unloaded. Various arrangements have been employed for the production of stationary vibrations on strings to illustrate the laws of wave motion. The apparatus exhibited consists of an electric motor having on one end of its shaft a counting mechanism, and on the other a disc to which is fixed a pin carrying the end of a rocking lever. This lever has on it a hook to which a string can be attached. The other end of the string is fixed to a slide rest arrangement, by means of which any required tension can be put on the string. When the motor revolves it gives to one end of the string an irrotational motion in a circle and propagates waves along the string. By adjusting the tension these waves can be made stationary. By employing a cotton cord, either single or multiple, in various degrees, it is easy to prove the fundamental laws of wave motion along cords. By using strings loaded with glass beads the effects of reflection at loads, or the laws of vibration of loaded cords, can be shown. **Mr. W. Duddell:** Water model of the electric arc. One of the essential properties of the electric arc is that, when the current through the arc increases, the potential difference between its terminals decreases. The model exhibited consists of a mushroom