

OUR ASTRONOMICAL COLUMN.

THE SPECTRUM OF NOVA GEMINORUM NO. 2.—No. 4592 of the *Astronomische Nachrichten* contains two papers dealing with the apparent absorption lines in the spectrum of Nova Geminorum No. 2.

In the first, Herr R. Furuhielm discusses spectra taken with the one-prism spectrograph attached to the 80-cm. refractor at Potsdam Observatory, and finds coincidences between the fine dark lines in the nova spectrum, between $\lambda 3850$ and $\lambda 4650$, and the spark lines of Ti, Sc, and Sr, and possibly of Fe and Yt, having intensities of 15 or more in the lists of Exner and Haschek. He does this by first deriving a mean apparent radial velocity of -541 kms. from the shifts of all the lines, and applying this as a correction to the laboratory wave-lengths; the latter differ from the measured nova wave-lengths by about 7 \AA . In the spectrum taken on March 15 he is able to fit all the Ti, Sc, and Sr lines, numbering 10, 7, and 2 respectively, and 4 each of the 5 Fe and 5 Yt lines; 20 is the limiting intensity in the latter case. The differences between his calculated and observed wave-lengths range from $-1'21$ to $+1'36 \text{ \AA}$.

Herr Furuhielm also compares his lines with the lines for these same elements, of intensity 5 and over, in Dyson's list of chromospheric lines, and finds that there are only six lines in the chromospheric spectrum not found in that of the nova, and these lines belong to other elements.

Negatives taken on later dates did not afford so many, or so close, coincidences, and the necessary compensation for displacement varied considerably. Herr Furuhielm concludes that the apparent radial-velocities vary too much to be considered as real, two negatives taken on March 17 giving very different values.

Dr. Ludendorff, on a negative secured with spectrograph iv., at Potsdam, on March 15, finds that 37 of the dark nova lines between $\lambda 4310$ and $\lambda 4530$ coincide with lines in Rowland's table, with differences corresponding to radial velocities ranging from $+19$ to $+82$ kms.; the mean is $+49$ kms., giving a heliocentric radial velocity of $+20$ kms. He also compares his lines with the radium, uranium, and emanation lines falling in this region. The agreement for radium and the emanation is very uncertain, and for uranium negative, while the radial velocities are very different from those found by Dr. Giebel. From his results, Dr. Ludendorff does not venture to answer the question as to the presence of these radio-active elements in the nova.

OBSERVATIONS OF JUPITER.—The transit of the minor planet Lutetia across Jupiter on May 7 took place too early to be observed at the Yerkes Observatory, but Prof. Barnard made observations of the great red spot and of a transit of satellite ii. on that date, and records them in No. 4591 of the *Astronomische Nachrichten*. The spot was fairly well seen, and the bay north of it was, as usual, well defined. The southern edge of the spot was in contact with, or partly overlapped by, a heavy, irregular, and somewhat narrow, dark belt. At 18h. om. there was a long, dusky marking on the following limb of the planet, in the same latitude as the spot, which subsequently would overtake the spot and probably provide some interesting phenomena.

Herr Archenhold observed the spot at Treptow, and recorded its transit at 11h. 35m. (M.E.T.) on July 12; this gives a correction of $+4m.$ to Herr Kritzing's ephemeris. The spot appeared intensely white, without any trace of colour, while the "streifen" appeared to have a rosy-brown hue.

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THE THREE-PRISM SPECTROGRAPH AT MOUNT WILSON.—A most interesting description of the three-prism spectrograph constructed for use with the 60-in. reflector, in its Cassegrain form, at Mount Wilson, is published by Prof. Adams in No. 3, vol. xxxv., of *The Astrophysical Journal*. He also describes the method of working the instrument and reducing the plates, and gives a list of fifty stars, mainly of types A and B, that have been found to have variable radial velocities. The programme of work is directed to the measurement of the radial velocities of stars for which Boss has already determined proper motions, and the results are expected to provide valuable data for the study of star streams. Several stars have been found to have one or more hydrogen lines bright, and a table is also given of seven stars having very large radial velocities. Most of these are of the later types, and show radial velocities ranging from 96 to 170 kms.; their actual velocities in space were calculated and range from 119 to 343 kms. per sec. One star, Lalande 28607, is notable because it is of the A type, and has a radial velocity of -170 kms.; no other star of this type is known to have a constant velocity approaching this in magnitude.

THE INSTITUTION OF MECHANICAL ENGINEERS.

THE summer meeting of the Institution of Mechanical Engineers opened on Tuesday, July 30, in Belfast, and terminated on Friday, August 2. Papers were read and discussed on Tuesday and Wednesday mornings in the Municipal Technical Institute. As is customary during this meeting, a special feature was made of visits to works and points of interest to engineers in the neighbourhood of Belfast.

A paper dealing with rolling-stock on the principal Irish railways was read by Mr. R. M. Livesey, locomotive superintendent, Co. Donegal Railways Joint Committee. Practically the only reason for the construction of a narrow-gauge line is cheapness, and no doubt in certain cases a considerable saving can be effected. But if, as in many instances in Ireland, such railway has to be fully equipped, almost on the same lines as a broad-gauge railway, in order to comply with the somewhat onerous requirements of the Board of Trade, then there is very little to be gained from the point of view of economy. The author quoted one such railway which cost 11,500*l.* per mile, although no really heavy work was involved in its construction. No railway should be built of narrow-gauge if the cost will exceed 5000*l.* per mile, and then only if the proposed line will be for ever isolated from those of standard gauge, and the traffic is always likely to be small. The mileage of narrow-gauge lines in Ireland is 525, nearly all of which is 3-ft. gauge. It seems regrettable that the majority were not linked up to form one large system. The author gives particulars and illustrations of typical locomotives and cars used on these lines.

Mr. W. Redfern Kelly, engineer-in-chief to the Belfast Harbour Commissioners, presented a paper on the new graving dock at Belfast. This dock is the only graving dock in which it is possible to place the *Olympic*, the world's largest specimen of naval architecture. The Belfast Harbour Commissioners have expended on this dock and its collateral works no less than 350,000*l.* The works were commenced in 1904, and were finished in about seven years. The length over all is 901 ft., the breadth is 128 ft. from coping to coping, and 96 ft. at the entrance. Full descriptions and illustrations were given by the author of

the elaborate pumping appliances and machinery for operating the dock.

Mr. John Horner, of Belfast, contributed a paper dealing with the evolution of the flax-spinning spindle. Simple in construction, and decidedly effective in use, the spindle in its primitive form has descended from remote prehistoric times to the present day. This paper is of peculiar interest from the illustrations given from photographs of spindles used among primitive nations; one from the Congo has a whorl made from cassava root. Arkwright's spinning frames are also illustrated and described in the paper.

The commercial utilisation of peat for power purposes was dealt with by Mr. H. V. Pegg, of Belfast. The author has experimented with air-dried, hand-cut peat fired into a special form of gas producer. Owing to the high and varying percentage of hydrogen in the gas, it proved unsuitable for use in the works gas-engine. From the experience then gained, it appears to be wiser to extract the tar from the gas, and, further, that the producer must be comparatively non-sensitive to the amount of moisture in the peat fuel.

Mr. Daniel Adamson, of Hyde, presented a paper dealing with some conditions affecting the durability of wire ropes for lifting appliances. The most important of these are the quality of the material and the size of the wire, as well as the diameters of the pulleys and the arrangements of the ropes. The wire used is of crucible steel, having a tensile strength of from 80 to 130 tons per square inch. The effect of oiling the ropes is found to be very beneficial, increasing the life of a given rope by two or three times.

Mr. Charles Wicksteed, of Kettering, read a paper on reciprocating straight-blade sawing-machines. Saws were first found in the form of a notched bronze knife in the third dynasty, about 5000 B.C. The first knives on record were made out of flint, and were, in fact, saws with minute teeth. The author gives descriptions and illustrations of various types of modern hand and power-driven saws. The latter machines have now made themselves indispensable in modern engineering establishments.

THE RECENT CONGRESS OF THE ROYAL SANITARY INSTITUTE AT YORK.

THE Health Congress of the Royal Sanitary Institute, which was held at York during the week ending August 3, was attended by a large number of delegates. Although but few new scientific facts were brought to the notice of the meetings, many papers of great interest and value to the public health student and worker were read, and some useful discussions followed. Reference should also be made to the general appreciation of special addresses by the President (the Archbishop of York), Prof. Karl Pearson, and Prof. Henry Kenwood. The following communications may claim a special scientific interest. Dr. Myer Coplans exhibited an instrument, which is an application of the form of ohmmeter which has been in use for many years for testing electrical installations, for the purpose of obtaining the conductivity of liquids. The conductivity of pure water containing an electrolytic substance in solution being due almost wholly to dissolved matter, it is possible, in very dilute solutions, to estimate the percentage amount of substances in solution. By such means it was demonstrated that a fairly ready method is afforded for testing variations in the condition of public water supplies, more particularly the effects of sewage pollution, water softening, the presence of metals (such as lead, iron, or zinc), and the ability of water to take into solution dangerous metals when placed in contact

with them for any given period, the addition of water to milk, &c. Dr. Coplans in another paper dealt with some points in the purification of water, in which he pointed out that as all particles in suspension, bacteria included, show, with efflux of time, a tendency to agglutination, and the newly formed aggregates slowly sink, if at any time during the process of agglutination the so-called bacterial counts are made by the usual methods, the results show a considerable reduction of the organisms originally present, although in reality there is no reason to presume the death of a single organism; for if a number of organisms be aggregated into a single mass the result of "plating," followed by incubation, is but a single colony. He concludes that the number of colonies developing, as the result of "plating," followed by incubation, is evidence solely of the number of distinct masses of organisms pre-existing; there is no relationship established as to the total number of organisms originally present; furthermore that the methods available for the isolation and recognition of disease-producing organisms in water are so faulty as to be altogether untrustworthy, in so far as negative results are concerned. In this connection he refers to the experiments undertaken at the laboratories of the Metropolitan Water Board, in which in 66 per cent. of the samples intentionally polluted with millions of germs of typhoid fever it was impossible to recover or to recognise the dangerous organisms. He concludes that with such glaringly defective methods for the detection and recognition of dangerous pollution, it becomes increasingly necessary to guard jealously the purity of our water supplies, a proposition which involves an important corollary, namely, the effective control and disposal of domestic sewage and slopwaters. Mr. A. G. Ruston, dealing with the subject of "Air Pollution by Coal Smoke," directed attention to the difference between domestic and boiler soot obtained from the same coal, domestic soot being characterised by its relatively high content of tar and volatile substances and its low content of ash. He furnished experimental evidence that for every ton of coal purchased by the average householder, one hundredweight goes up the chimney unconsumed, while so far as the factory is concerned there is at least a loss of one stone out of every ton of coals. In one district of Leeds, the centre of one of the chief industrial areas, he finds that fully 40 per cent. of sunlight during the year of his investigation was shut off by the smoke in the atmosphere, and that the solid impurities which reached the ground as the result of coal combustion amounted to the high figure of 1565 lb. per acre.

Mr. J. E. Purvis and Mr. G. Walker described experiments which demonstrated that as the result of the sewage contamination of sea-water, nitrates are not formed until after six weeks, when there is a coincident increase in the number of bacteria present.

Other papers specially worthy of reference dealt with the subjects of the public health aspects of poliomyelitis; the municipal dispensary; the sanatorium and tuberculin treatment in the prevention of consumption; the physiological effects of exercise; the teaching of domestic economy in elementary and secondary schools; the housing of the working classes; rural housing; housing and town planning; the ventilation of churches and dwellings; the abolition of private slaughter-houses; the hygiene of the steel trades; the prevention of wool-sorter's disease; the pollution of streams by coal-washing water and spent gas liquor; works for sewage purification in country houses; the theory of probable error in its application to vital statistics; the eradication of the tuberculous milch-cow.