At a general meeting on Wednesday, and another on Thursday, it was resolved that the council elect four members for three years from the past membership of the council, in order to insure permanency; it was suggested that in future the meetings of the society be inaugurated by a conversazione; the question of extending the term of presidency from one to three or to five years was discussed, and deferred till next session; a committee was appointed to welcome, in the name of the society, the American Society of Mining Engineers in Ottawa in the autumn; a committee was nominated to meet the American Association for the Advancement of Science in Toronto; and the following officers for the ensuing year were elected: L'Abbé Casgrain, president; Principal Grant, vice-president; Dr. Bourinot, secretary; and Dr. Selwyn, treasurer.

Mr. Sandford Fleming entertained a select party of members at luncheon in the Rideau Club, and on Thursday afternoon the entire society was invited to a garden party at Government House.

ELECTRICAL NEWS.

Overhead Wires for Electric Railways.

THE rapidity with which electric street-railways have been introduced into towns and the suburbs of cities, and the success that has attended their introduction, have called the attention of the managers of the larger city lines to this method of traction. Its advantages are unquestionable: it is cheap, it is clean, it gives a rapid and easy service to the public, the cars are more readily and safely handled than by any other known method. There is one legitimate objection to it, and but one; and that is the necessity, except in special cases, of overhead wires to convey the electric current from the power-station to the cars. The public is prejudiced, and generally justly prejudiced, against overhead wires. Overhead wires mean to most of us a confused network of telegraph, telephone, and electric-light wires, unsightly and dangerous. But the wires used for electric railroads are very different from these. The poles used to support them are only slightly larger than the ordinary lamp-posts: they may be made even less objectionable. The line consists of a small span wire going from pole to pole, with the conducting wires supported by these, and extending over the track, one small wire for each track. An inspection of some of the latest and best-equipped electric roads shows a marked advance over those of a year or a year and a half ago. If expense is not spared, the most sightly of the present roads can be improved on, and two or three thousand dollars a mile is a small sum when a city road is to be equipped.

There are alternative electrical methods which do not involve an overhead structure, but they are not at the present time successful enough to warrant their general adoption. The storage-battery system will probably work well on level lines, but can hardly be economically used when grades of four per cent and over are to be taken. The conduit system could possibly be made to work if enough money were spent on it, — $50,000 or $60,000 a mile, — but so far it has not been a success. In Boston it has not worked satisfactorily; and at San José, Cal., where it has been from time to time reported as successful, it has turned out a flat failure. In fact, for an extended system of street-railways, the only electric system which would be any thing more than an experiment is the overhead system. In Boston two lines have been in operation for some time; and they have worked so successfully, and have seemed so unobjectionable, that the Board of Aldermen has given permission to the West End Street Railway Company — a company operating all of the important street-railway lines in Boston — to equip their entire system with the overhead electric wires. There can be no doubt of the advantage that this will be to the public. It will allow rapid transit to the suburbs, and in the crowded portions of the town the cars will make much better time than is possible with horses; they will be under better control, and will occupy less space in the streets.

In fact, the question is getting to be, not shall we use electricity on our railroads, but what system shall we adopt? Shall we use the overhead, or shall we wait for a storage-battery? It is probable that many of the managers will decide to put in the overhead system until the secondary battery is ready to take its place. The loss will not be very great, and two or three years' successful operation will more than pay for the change. The equipment of the Boston roads — if they are equipped — will give a decided impulse in this direction.

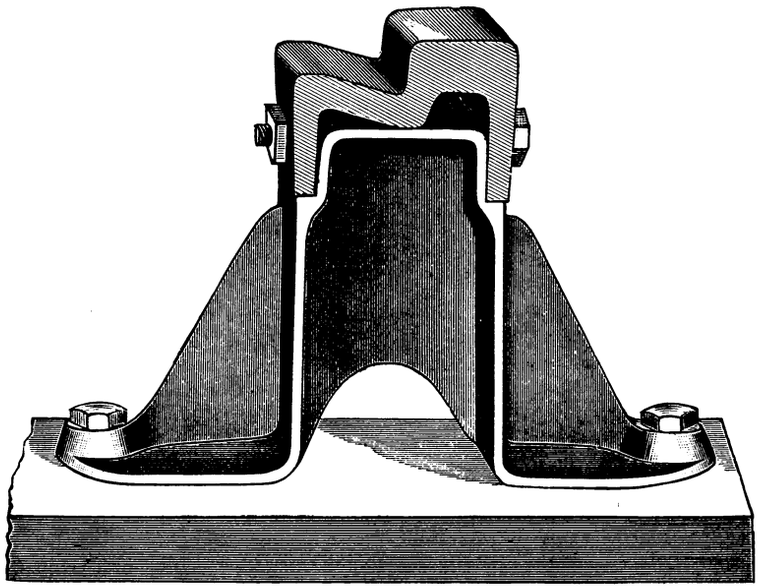

FIG. 2. — WHITE'S DOUBLE-GIRDER STREET-RAILWAY RAIL.

SOME EXPERIMENTS ON LIGHT AND ELECTRICITY. — The following is from the London *Electrician*: "An experiment described by M. J. Borgman has an important bearing upon the explanation of the remarkable discovery of M. Hallwachs, in which a beam of light seems to act as a conductor for an electric current. The latter experiment consisted in placing a piece of metallic gauze parallel with but insulated from a second sheet of metal. The first is connected with the positive, the second with the negative, pole of a battery, and in one of the leads a delicate galvanometer is placed. If, now, a beam of light be made to pass through the gauze, and to fall on the plate behind, a current is set up in the circuit, and continues to flow as long as the illumination is maintained. It has, moreover, been shown that the action is due to the ultra-violet waves. Now, M. Borgman wanted to ascertain whether or not the effect was instantaneous; that is to say, whether the commencement and the cessation of the current was or was not simultaneous with that of the illumination. M. Borgman probably reasoned, that, if the beam acted in some sense as a con-

ductor of the current, the effect must be instantaneous; while, if the phenomenon resulted from some secondary action, it would probably go on increasing up to a certain point with the duration of the illumination, and it would also probably continue for a time after the light had been cut off. His method of making the test was equally simple and ingenious. The light was interrupted at rapid intervals by means of a rotating disk with holes or slits, and he placed a telephone in circuit with the battery. It is, then, obvious, that, if the effect is instantaneous, the telephone will produce a note corresponding in pitch to the velocity of the disk; if otherwise, there will be silence. There was silence. A make and break in any other part of the circuit could be heard, but not in the beam of light: hence we must seek for some secondary action on the surface of the plates to explain M. Hallwach's experiments."

THE ELECTRO-CHEMICAL EQUIVALENT OF SILVER. — A very important electrical constant — one often used in the measurement of electric currents — is the amount of silver deposited in a given time by a given electric current. Determinations have been made by Kohlrausch, Rayleigh, and Mascart, the results of the last differing from those of the first two by as much as one part in four hundred. Recently Pellat and Potier have repeated the experiments, using to measure the currents an electro-dynamometer constructed by M. Pellat, and taking every precaution to insure accuracy. The result obtained gives 1.1192 milligrams of silver deposited by one ampère in a second. The previous results are, Kohlrausch, 1.1183; Rayleigh, 1.118; Mascart, 1.1156; Pellat and Potier, 1.1192. The mean is very near to Rayleigh's value.

THE VOLTAIC CURRENT OBTAINED WITH BISMUTH IN A MAGNETIC FIELD. — The following experiments are due to Dr. G. P. Grimaldi. A wide U-tube contained a solution of bismuth chloride in hydrochloric acid. In the two limbs of the tube dipped two wires of chemically pure bismuth very carefully polished. One limb of the tube was placed between the conical pole-pieces of a Faraday electro-magnet of medium size in such a way that the surface of the liquid was in the most intense part of the field. The two wires were joined up to a very sensitive Thomson astatic galvanometer. On closing the galvanometer circuit, a current was observed which at first varied rapidly, but which finally reached a permanent value. This was compensated by means of a shunt containing a standard element, and the galvanometer was brought back to zero. If then the electro-magnet was excited by a powerful current, a permanent deflection of the galvanometer was observed; if the magnetizing current was broken, the galvanometer returned to zero. The current produced by magnetism, which the author calls the galvano-magnetic current, is independent of the intensity and direction of the current first observed in closing the galvanometer circuit before the magnet circuit is made. The latter is variable; the former is always in the same direction, — in the galvanometer circuit, from the magnetized bismuth wire to the non-magnetized one; and in the liquid, from the non-magnetic metal to the magnetic one. The intensity of the galvano-magnetic current depends on the state of the surface of the metal, and to get regular results it is necessary to carefully polish the bismuth wires. To give an idea of the magnitude of the electro-motive force of the galvano-magnetic current, the author states that in the various experiments hitherto made under good conditions with various wires, and in various modifications, it has varied from $\frac{1}{12000}$ to $\frac{1}{2400}$ of a Daniell cell, the magnetic field being produced by a Faraday magnet of ordinary size, excited by a current of eight to twelve ampères, and with conical poles seven millimetres apart. With less powerful magnetizing currents, the results are smaller; and, with a current of two ampères, the galvano-magnetic current is scarcely appreciable. The direction of the galvano-magnetic current is independent of the direction of the field: its intensity sometimes varied a little when the field was reversed, and sometimes remained constant.

NOTES AND NEWS.

THE fourth annual meeting of the Science Club of the University of Kansas, Lawrence, was held Friday, May 17. The following is a list of the papers read: "Proximate Analysis of the Mountain Sage," by L. E. Sayre, John Scott, and E. Morris; "On the Action of Various Organic Acids on Calomel," by E. H. S. Bailey and W. B. Hilton; "Blue-Printing," "Columns of Uniform Strength," and "Maximum Bending Moment in Beams and Arch-Ribs," by E. C. Murphy; "Notes on the *Lanidæ*," and "Notes on Bird-Migration, Spring, 1889," by V. L. Kellogg; "On Some Corrections on the Thomson Calorimeter," by L. I. Blake; "Development of the *Luccinea* and the *Planorbias*," and "The Nervous System of Some Invertebrate Types," by Gertrude Crotty; "The Psychology of Counting," and "A New System of Derived Units," by W. S. Franklin; "A Case of Atavism," by E. E. Slosson; "On the Quality of Commercial Potash and Soda," by George F. Weida; "Coals of Kansas," by E. H. S. Bailey and L. T. Smith; "Methods of Stating the Results in Water-Analysis," by E. C. Franklin; "The *Mallophaga*," by V. L. Kellogg; "The Mode of Respiration of Salamanders," and "Curve of Daily Mean Temperatures for Twenty-one Years," by F. H. Snow; and "Proximate Analysis of the Fruit of the Pawpaw (*Asimina triloba*)," by L. E. Sayre and B. L. Hill.

— At a recent meeting in New York of the American Institute of Mining Engineers, Mr. Oberlin Smith of Bridgeton, N.J., read a paper on the making of nails of good quality from tin-scrap. This process undertakes to use this material just as it is, without trying to separate its constituents at all, and to use it, moreover, for a purpose in which the qualities of both these constituents — namely, the tensile strength and ductility of the iron, and the resistance of the tin to corrosion — are directly employed with advantage. The nail was invented, in its original shape, by Mr. George H. Perkins of Philadelphia, and has been developed, through various forms, until it has almost reached a commercial stage, the machine in which it is to be made in marketable shape being nearly completed. Mr. Smith has been associated with Mr. Perkins in its development. The machine now under construction has been very much simplified, and made enormously strong and heavy. It is adapted to cutting, crushing, griping, and heading the nails at one operation, and can be run as fast as an expert operator can feed the material. Its feed probably varies, with jagged, irregular scrap, from thirty to ninety nails per minute, although straight strips of sheet metal can be fed by hand into a machine running as high as 240 strokes per minute. During the course of their experiments, various forms of nails have been tried. Among others were straight cylindrical nails with conical points, straight square nails with pyramidal and with wedge-shaped points, hexagonal nails, etc. The most practical form seems to be the square taper nail with about the same shape as the ordinary cut nail, but is somewhat stronger and a good deal tougher. The economy of this system of nail-making is obvious. The scrap can be bought for about seventeen cents per hundred pounds, and a boy can make perhaps a hundred pounds of nails per day. The most economical system of manufacture will probably be to run one or more nail-machines at each large "tinshop," set as close as possible to the presses which produce the scrap, so as to avoid the expense of unnecessary handling, and the extra tangling-up incident thereto.

— The bearing of chemistry upon construction is thus illustrated by the *Lumber Trade Journal:* It is safe to say that no two varieties of wood possess the same essential chemical characteristics, and, the instant one possessing much alkali is placed near another that gives acid in its re-action, it will invite rapid dissolution and decay. What is true with reference to wood applies with all the force to the other materials used in structures. Two uprights, the main-stay of a quite large country bridge, rotted off at the ends when bolted together with an iron bolt. New ones were put in, and fastened by wooden pins of the same variety; and ten years have elapsed, and still they stand. In the first instance, beech, which is known to contain much acetate, was used, and the iron soon oxidized, transmitting the rot to the wood, and, though the rest was perfectly sound, the wood about the splice soon rotted off; while in the latter case the same wood from the same tree was used, but the wooden pins did not rust, and the joint remains firm and sound at this writing, and it is now nearly ten years since the renewal was made. Now, if a wood like ash or oak, having less acetate in its composition, had been used, instead of rotting or oxidizing, it would have tended to preserve the iron, hence would last