

the report of Sir E. J. Reed on the *Daphne* disaster, and the discussion which resulted, that naval architects were using the term stability both in its proper sense, as meaning a tendency to hold a particular position, and also as meaning a tendency to change position in a particular direction. The writer of the paper proceeded to urge the desirability of using two terms, the one to express the greatest angle of disturbance from which a vessel would return to her normal position, and to limit the quantitative meaning of the term "stability" to the measure of that angle, using the term "stiffness" to express the moment of the upsetting forces necessary to produce any particular angle of disturbance. The adoption of that system, which was consistent and definite, would prevent the confusion into which it appeared naval architects had fallen, and it would then be seen that what were ill-called curves of stability would be well-called curves of stiffness.

On the Construction and Working of Alpine Railways, by J. B. Fell, C.E.—There are three Alpine railways in existence at the present time—the Mont Cenis and St. Gothard Railways, which have been made with long summit tunnels and with ordinary gradients, and the Brenner Railway, that has been made with similar gradients but without a long tunnel. The important question has now arisen, and has been taken into serious consideration by the Governments and local authorities interested, as to how far it may be possible to make other trans-Alpine railways, some of which are urgently needed, at a cost that would render them financially practicable; and to accomplish this object it has been proposed to effect a reduction of one-half or more of the cost, by carrying these railways over the mountain passes by means of steep gradients and the use of the centre rail system, as it was adopted on the Mont Cenis Railway. Upon these improved summit railways the same weight and number of trains could be run that are now running on the Mont Cenis Tunnel Railway, and with the protection of avalanche galleries and covered ways the regularity of the service would be maintained at all seasons of the year. The extra cost of working expenses caused by working over a higher level than that of a tunnel line would, if capitalised and added to the cost of construction, still leave a clear net saving of more than one-half in the cost of construction as compared with the cost of a tunnel railway. The result of the experiences of the last twenty-five years seems to point to the conclusion that a method of constructing Alpine railways with long, non-paying tunnels is a thing of the past. The future belongs to the best system that can be devised for overcoming the difficulties of trans-Alpine railways rather by adding to the powers of the locomotive engine and by other mechanical appliances for reducing the cost of traction on steep inclines, which methods are capable of indefinite improvement, than by burying in gigantic tunnels enormous sums of unproductive capital that, when once expended, are irrecoverably lost.

The Euphrates Valley Railway as an Alternative Route to India, by J. B. Fell.—The author described the proposed route, and gave the total cost as 8,500,000. He stated that, when not only its commercial but also its strategic and political advantages were taken into account, it must be admitted that the Euphrates Valley Railway certainly has the prospect of being one of the most successful enterprises in the world. Canon Tristram detailed his experience in the Tigris and Euphrates valleys, and stated that he believed the former to be the preferable route.

On Injector Hydrants, by J. H. Greathead.—This paper described the method proposed for the author for meeting the serious increase of fires in the metropolis. A separate system of water supply at very high pressure would be laid under the footway with hydrants at short distances apart. The high pressure water would be used in conjunction with the ordinary water supply in the mains, and jets of water would thus be enabled to be raised to sufficient heights without the aid of fire-engines. The paper was illustrated by numerous diagrams, and elicited an interesting discussion, generally favourable to the author's views.

Nest Gearing, by Prof. Fleeming Jenkin.—This paper contained an account of a new friction gearing, the chief novelty being in the mode of obtaining any required amount of pressure between the wheels which roll upon each other. As many as thirty-two modifications have already suggested themselves, and the opinions expressed in the discussion were unanimously in favour of the invention as being a very valuable one.

Electric Launches, by A. Reckenzaun.—The paper commenced with a description of the launch *Electricity*, which made her first trip in September, 1882. The *Electricity* is 25 feet long, with a

5 feet beam, and draws 21 inches forward and 30 inches aft. Her speed is 8.3 miles per hour with ten passengers on board. Forty-five Sellon-Volekmar accumulators stored under the seats and decks forward and aft supplied the current to two Siemens D₃ Series dynamos placed side by side on the floor of the boat, with their axes parallel to the propeller shaft. A Carliss-Browne two bladed propeller of 20 inches diameter and 3 feet pitch was employed in these first experiments; straps and pulleys were resorted to in order to reduce the speed of the screw to 350 revolutions, whilst the motors revolved at 950 revolutions per minute. The two motors were coupled in parallel circuit, whereas the cells formed one series. Each machine had its own switch and ammeter, and the starboard machine could be stopped mechanically by means of a friction clutch on the countershaft. Both machines were tested with a Prony brake, and they gave 1.86 horse-power on the brake at 950 revolutions, consuming a current of 21 amperes and 100 volts. At 694 revolutions, 100 volts and 33.25 amperes, the brake horse-power rose to 2.78. With 47 cells on board, the current used by both motors running together was 46 amperes, and the propeller made 360 revolutions; when disconnecting one of the motors the current passing through the other was 33 amperes, and the speed of the propeller shaft fell to 250. Messrs. Siemens' dynamos lend themselves very readily to the purposes under consideration; the height of a D₃ machine is only 10 inches, length 28 inches, and width 23 inches. The two machines weigh together 632 lbs., countershaft, supports, and pulleys 180 lbs., total for the driving apparatus 812 lbs.

Electric Launches, by J. Clark.—This paper contained a very brief account of advances in this subject.

The Fire Risks of Electric Lighting, by Killingworth Hedges.—The author first drew attention to the great difference between the electric currents which have been in constant use for telegraphic purposes and those which are to be supplied by the undertakers under the Electric Lighting Act. The latter can only be said to be free from danger when the heat generated by the current is utilised in its right place, and not developed in the conductors or wires which lead the electricity to the incandescent lamps. The Fire Risk Committee have already issued rules for guidance of users of electric light; these can hardly be said to embrace all the salient points of the new subject, which can only be arrived at after years of practical work. The necessity of proper regulations has already been recognised by the insurance offices, both in the United States and Germany, and some of their special rules are given in this paper. The conductors must be properly proportioned for the current they have to carry; whatever resistance there is in the conductor will cause a corresponding development of heat, which will vary with the amount of electricity passing, and inversely as the sectional area. As the temperature in Dr. Matthiessen's experiments upon the subject was not increased over 100° C., the author has made some further experiments—heating the wires by the electric current from a secondary battery to within a few degrees of their melting-point. Various materials were tried—the wires and foils having such sectional area, and so arranged that, on the current being increased by 20 per cent., they were immediately fused. The total length of each experiment was twenty-four hours, during which time the current passing through varied slightly. The results of the experiments were then given.

SCIENTIFIC SERIALS

Archives of the Physical and Natural Sciences, Geneva, September 13.—Verification of some atomic weights (second memoir); zinc and magnesium, by M. C. Marignac. The atomic weight of zinc, fixed by Erdmann at 65.05 and by Favre and Jacquelain raised to 66, is approximately determined at 65.33, a figure which further analysis may show to be slightly too low. For magnesium, calculated by MM. Marchand and Scheerer at 24 and by others at 24.5, the number 24.37 results from the author's fresh experiments.—Essay on the protistology of Sardinia, with a description of some new or little-known lower animal organisms, by Prof. Corrado Parona. In the fresh and marine waters of Sardinia the presence is determined of as many as 228 species belonging to the families of Bacteria—Monera, Flagellata, Lobosa, Diatomea, Heliozoa, Ciliata, Acinetia, and Catalacta. The paper is accompanied by seven illustrations.—Memoir on earthquakes and volcanoes (continued), by Prof. F. Cordenons. In this second and concluding part the

author expounds his own views, and argues against the generally accepted theory that underground disturbances of all sorts have their source, not in the upper but in the lowest regions of the earth's crust.—On a case of commensalism between a fish (*Caranx melampygus*) and a medusa (*Crambessa palmipes*), with two illustrations, by M. Godefroy Lunel. In this instance the fish appears as the parasite or guest of the medusa, taking up its abode in one of its cavities, which it enters and leaves at pleasure without apparent injury to the gelatinous substance of the sea-nettle. This circumstance, which has been fully verified, seems to throw a new light on the relations of a species of *Schedophilus* to the medusa, on which it is supposed to feed, and has accordingly, by Prof. Cocco, been named *Schedophilus medusophagus*. One of these is described by Günther in the *Transactions of the London Zoological Society*, October, 1882.—Meteorological observations with tables of temperature and barometric pressure made at the Observatory of Geneva and on the Great Saint Bernard during the month of August.

Rivista Scientifico-Industriale e Giornale del Naturalista, July 15 and 31.—On the measurement of altitudes by means of the barometer, by S. Paolo Busin.—Further remarks on a new experiment in electrolysis, by Prof. Eugenio Semmola.—On the comparative electric resistance of fixed and vibrating metal wires, by Prof. Angelo Emo.—An essay on some new applications of the hyperbolic functions to pseudo-spherical surfaces, with a description of Gronau's tables for all kinds of trigonometrical functions of cyclic and hyperbolic sectors, by Prof. Angelo Forti.—On the language of birds, by Prof. Luigi Paolucci.

SOCIETIES AND ACADEMIES

LONDON

Entomological Society, October 3.—Mr. R. McLachlan, F.R.S., vice-president, in the chair.—Two new members were elected.—Mr. F. P. Pascoe exhibited several interesting British *Hemiptera*, and Mr. T. Wood exhibited a supposed new British species of *Malthodes*.—Mr. W. F. Kirby (on behalf of M. Wailly, who was present as a visitor) exhibited a large box of bred specimens of various *Saturniide*, &c., and some living larvæ of *Telea Polyphemus*, and *Hyperchiria Io*.—Mr. Billups exhibited specimens of the celery fly (*Tephritis onopordinis*), and a small larva of *Meloe* (?).—Dr. D. Sharp communicated some proposed alterations of names in the genus *Batrachus*.—Mr. W. F. Kirby read notes on the Diptera of New Zealand, supplementary to Prof. Hutton's list of 1881.

SYDNEY

Royal Society of New South Wales, July 4.—The Hon. J. Smith, C.M.G., M.D., president, in the chair.—Ten new members were elected and sixty-three donations received. The following papers were read:—By the Rev. J. E. Tenison-Woods, F.G.S., &c, on the Waiianamatta shales.—By R. Etheridge, jun., further remarks on Australian Strophalosia; and description of a new species of Aucella from the Cretaceous rocks of North-East Australia.—Prof. Liversidge, F.R.S., &c., exhibited specimens of tin ore; he explained that most of the tin worked in this colony was alluvial tin, though occasionally thin veins of crystallised tin had been met with. Those shown, however, were from a vein which had already proved to be of a width of ten feet, and the full width had not yet been reached. The tin, as could be seen, was disseminated through the felspar, and the specimen, which came from the Stannifer Bischoff Mine in New England, closely resembled the ore found in the St. Agnes Mine, in Cornwall, England.

August 1.—The Hon. J. Smith, C.M.G., M.D., president, in the chair.—Three new members were elected, and sixty-seven donations received. The following paper was read:—On plants used by the natives of North Queensland, &c., for food and medicine, by E. Palmer.—Mr. J. Trevor Jones, City Engineer, exhibited and explained the MacGeorge test, an instrument for determining the deviation in diamond drill bores.

PARIS

Academy of Sciences, October 1.—M. Blanchard, president, in the chair.—On the slow upheavals and subsidences of the ground, by M. Faye. In reply to M. Issel of Genoa, the

author revives the old theories of Élie de Beaumont, Cordier, and many others, and argues that the progressive cooling of the earth's crust goes on at a more rapid rate under water than on dry land. There is nothing hypothetical in this view, which might have been deduced from the thermometric soundings taken fifty years ago by the *Venus* in deep seas, and repeated with similar results in recent times. It follows that the solidified crust is much thicker under the oceans than on the continents. Hence also the liquid mass in the interior of the globe is subjected to far greater pressure under the seas than on the main land; and as this excess of pressure is diffused more or less rapidly in every direction, the less dense continental crust must yield to the pressure exercised on it from within. It is thus being everywhere continually upheaved, while the submarine crust, becoming denser and denser, is slowly subsiding.—Note on the recent attempts made by M. Delauney and others to foretell seismic disturbances, by M. Daubrèe. The author concludes that the hitherto collected statistical data are insufficient to justify any theorising for the present on the future recurrence of earthquakes.—Separation of gallium (continued); separation from tantalic acid, by M. Lecoq de Boisbaudran.—Researches on the encephaloid cancer, by M. C. Sappey.—On the destruction and utilisation of the carcasses of animals dying of contagious diseases, and especially of charbon, by M. Aimé Girard.—Observations made at the Observatory of Marseilles, by M. Coggia.—On the calculus of perturbations, by M. A. de Gasparis.—On the approximate evaluation of integers, by M. Stieltjes.—On the interpretation of some phenomena of the solar spectra, by M. L. Thollon.—On the transport and distribution of electric force; experiments made at Grenoble by M. Marcel Deprez, by M. Bou langer.—On the presence of arsenic in certain wines in the absence of all foreign colouring matter, by M. A. Barthélemy.—Quantitative analysis of the chloroform in the blood of an animal treated with this anæsthetic, by MM. Gréchant and Quinquaud.—Researches on parasitic infusoria, with an account of fifteen new species of protozoa, by M. G. Kunstler.—On the marine lamprey, by M. L. Ferry.—On the caterpillar that feeds on the citron blossom, by M. Laugier.—On the position of a foetus found in a *Pontoporia Blainvillæ*, by M. H. P. Gervais.—On a meteor observed at Evreux on the night of September 23, by M. H. Dubus.

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