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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.
SECTION B—PHYSICS.

AT the summer meeting of the American Association for the Advancement of Science, held in Ithaca, N. Y., from June 28 to July 3, 1906, Section B met in joint sessions with the American Physical Society. The section was, in an especial sense, the guest of the department of physics of Cornell University, for on this occasion there occurred the formal dedication of the new Rockefeller Hall of Physics. At the dedication exercises there were addresses by President Schurman, Professor E. L. Nichols, Dr. Elihu Thomson, Professor W. H. Welch and by Professor W. A. Anthony (read by Professor Merritt, in Professor Anthony's absence). After the addresses, the magnificent laboratory was opened for inspection.

On account of the interest in the new laboratory, no doubt, the attendance at the regular sessions was large, there being about seventy present. The president of the American Physical Society being absent, the vice-president of Section B, Professor W. C. Sabine, presided at all the sessions. A very interesting joint program of twenty-seven papers was presented. Abstracts and titles are given below. Besides the features already mentioned, several receptions and excursions, and the general hospitality of Cornell University added greatly to the enjoyment of the meetings. This summer meeting was very successful.

A New Type of Young's Modulus and Hooke's Law Apparatus: B. B. Brackett, Clarkson School of Technology.

This apparatus has a horizontal bed or base of wood, about 1.8 m. long, 20 cm. wide and 5 cm. thick. At one end is a clamp elevated 6 cm. to hold the wire tested, and at the other end is a rather large disk pulley over which the wire is drawn, while weights attached to the vertical portion of the wire beyond the pulley supply the desired tensions.

To compensate for the springing of the light and not very rigid base, an easily rolling platform is placed upon the base, between it and the wire. One end of this platform is held by a spring in firm contact with the clamp just at the point where it grips the wire, but the platform is entirely free from the wire at all other points.

A micrometer microscope is placed on the end of the platform next to the pulley to read the elongations of the wire. This arrangement keeps the microscope at the same distance from the fixed end of the wire, however much the plank base may be warped or shortened by the tensions placed on the wire.

The apparatus is of very simple construction, is easily used, quickly adjusted and gives results of the most satisfactory kind.

A Convenient Lecture Room Resistance for Electrical Experiments: B. B. Brackett, Clarkson School of Technology.

The resistance is to be used for controlling the current from a dynamo circuit. Usually a tap is made from the lighting mains.

Twelve incandescent lamps are arranged within a partially open box, 70 cm. long and 25 cm. square. Single pole, double throw switches are connected to the lamps so that all possible parallel, series and combination groupings are readily obtained.

While open enough for ventilation and to make the switches easily accessible, the containing box protects both lamps and switches from all the usual accidents to such apparatus, and enables one to use it in any place or position, on either end or on any side.

All the connecting wires are plainly visible and this, with the regular arrangement of the switches, shows at a glance what grouping of the lamps is being used. Hence there is little probability of making a mistake. Short circuits can not be made by any position of the switches.

Two Neglected Factors in the Determination of Musical Quality: W. C. Sabine, Harvard University.

The musical quality of a sound in an ordinary room or other confined space is very greatly affected by the character of the walls. Diagrams are presented showing the effects of various wall surfaces and substances. The other factor is the sensitiveness of the ear to sounds of different pitch and a diagram is presented showing the relative intensity for equal loudness under ordinary musical conditions.

Silver Perchlorate as the Electrolyte for the Silver Coulometer: Henry S. Carhart, H. H. Willard and W. D. Henderson, University of Michigan.

A New Alternating-current Galvanometer: L. A. Freudenberger, Lehigh University.

A Lecture Experiment in Electrolytic Thermo-Electromotive Force: Henry S. Carhart, University of Michigan.

Note on the Graphical Representation of Non-Sinusoidal Alternating Currents: Frederick Bedell, Cornell University.

Spark Potentials in Liquid Dielectrics: Robert F. Earhart, Ohio State University.

Measurements on the potential required

to cause a spark to pass between a ball and plate were made, with kerosene, olive oil, paraffin oil and a transformer oil as the intervening dielectrics.

Distances of separation vary from .003 to .118 mm. and were measured in terms of wave-lengths of sodium light.

A plane surface was attached to the movable carriage of an interferometer. This was brought in contact with a ball mounted on the interferometer base. These were separated and the fringes crossing the interferometer field noted. From this data distances of separation of the surfaces were computed.

P.D.'s were obtained from an A.C. transformer and were measured with a Weston voltmeter.

The data secured are compared with similar measurements made by the author when air was used as a dielectric.

Spark potential-distance curves for the various oils used give curves similar in form to those for air.

These experiments on the limited number of oils used indicate:

1. A higher potential gradient for small than for large distances.

2. That for small distances air is a better insulator than a liquid dielectric.

3. That the potential at which the bend in the potential-distance curve occurs is the same for air and the liquids operated upon.

The Dispersion of Silver Chloride: E. F. NICHOLS and W. S. DAY, Columbia University.

Properties of Electric Charges on Moving Conductors: E. F. NICHOLS, Columbia University.

The Separation of Electric Charges in a Metal by Centrifugal Acceleration: E. F. NICHOLS, Columbia University.

Comparative Observations on the Evolution of Gas from the Cathode with the Glow Current in Helium and Argon: CLARENCE A. SKINNER, University of Nebraska.

The Effect of Absorbed Hydrogen on the Photoelectric Current: W. F. HOLMAN, University of Nebraska.

Light from a spark arc between iron terminals in hydrogen was directed through a quartz optical system on to a zinc disk, serving as cathode—a disk of aluminum opposite serving as anode—the electrodes being in a highly evacuated chamber. Under these conditions the rate of leak of negative electricity from the zinc was represented by 32 scale divisions of the measuring instrument.

The zinc was then partially relieved of its supply of hydrogen by use as cathode with the glow discharge in hydrogen, after which it was again tested as before for its photoelectric current, which was found to be now represented by only about 22 scale divisions. This test was followed by using the zinc as anode with the glow discharge in hydrogen, the object of which process was to store up in it a new supply of hydrogen. A test of the photoelectric current as before showed that it had returned to its first value, giving, namely, a deflection of about 32 scale divisions.

The Production of Ozone by Becquerel Rays: HARRY S. HOWER, Case School of Applied Science.

The Production of Ozone by the Photoelectric Current in Oxygen: HARRY S. HOWER, Case School of Applied Science.

Fluorescence Absorption in Resorufin: FRANCES WICKE, Cornell University.

Further Experiments on the Phosphorescence of Sidot Blende: E. L. NICHOLS and ERNEST MERRITT, Cornell University.

Magnetograph Records of Earthquakes with Special Reference to the San Francisco Earthquake of April 18, 1906: L. A. Bauer, Magnetic Survey, Washington.

Rotation and Elliptic Polarization produced by Iron Films in a Magnetic Field: W. D. Harris, University of Nebraska.

Films were obtained on microscope cover glass by cathode deposit *in vacuo*. The rotation of the plane of polarization was measured by use of a Lippich half-shade Nicol prism, and the ellipticity of the light by means of a Brace half-shade elliptic polarizer and compensator. Films deposited in hydrogen exhibited a rotation rising gradually from zero in the violet to a maximum value in the red. The same films showed an ellipticity of the transmitted ray increasing from a zero value in the violet to a maximum at about 600 $\mu\mu$, then a gradually decreasing value toward the red end of the spectrum. With age the values for the longer wave-lengths dropped to a marked extent. A film of same density deposited in nitrogen produced a smaller rotation as well as smaller ellipticity, the latter possessing a maximum value at about 560 $\mu\mu$. A film deposited in oxygen gave no rotation for any wave-length, but a slight ellipticity, this being a maximum at about 540 $\mu\mu$ and dropping rapidly to zero in passing toward either end of the spectrum. All films showed marked polarity when suspended in a magnetic field.

The film deposited in hydrogen tested for variation in ellipticity with the strength of field showed this to be proportional to the field up to about 8,000 C.G.S. units, after which there was but a small increase as the field was intensified.

The reflected light exhibited in no case any observable ellipticity, although three per cent. of that observed in case of transmitted light would have been readily detected.

Cobalt and nickel films deposited in hydrogen showed a rotation similar to iron, but no ellipticity.

Coefficient of Linear Expansion at Low Temperatures: H. G. Dorsey, Cornell University.

New Diffraction Spirals: A. G. Webster, Clark University.

The Calibration of Capillary Tubes: Willard J. Fischer, Cornell University.

The Latent Heat of Recalescence in Iron and Steel: Frank H. Bailey, Clark University.

Thermal and Electrical Effects in Soft Iron between 100° and 218°: Edwin H. Hall, Harvard University.

This will give the results of a continuation of the study which my colleagues and I have already published, in the *Proceedings* of the American Academy for May, 1906. The general method followed has been the same as before and the results obtained are in general accord with those which we have before obtained at a lower temperature.

Note on Certain Aspects of Drude's Electronic Theory of Metallic Conduction: Edwin H. Hall, Harvard University.

I wish to raise the question whether the expansion of metals is to be accounted for by the expansive force of the imprisoned electrons and what effect these electrons should have on the specific heat of metals.

The Capacity and Resistance of Aluminum Anode Films: C. McC. Gordon, Central University of Kentucky.

Films were formed on aluminum anodes with a direct current of known voltage and their capacity measured in the Wheatstone bridge with a small alternating current.

As was reported in a previous paper, the

capacity was found to be practically independent of the electrolyte so long as water solutions are dealt with. Since, *cet. par.*, the capacity decreases proportionally to the thickness of the film, for the sulphuric-acid films to have a capacity as large as the films formed in other solutions seemed to be contradictory to the observation of others who had investigated the question of the thickness of the films; the sulphuric-acid films always having been found to be much thicker than those in other solutions.

Further experiments by the writer have confirmed the results as to the greater thickness of the sulphuric-acid film, as well as the fact that they do not have any smaller capacity than the others. With water-cooled tubular electrodes sulphuric-acid films more than 0.3 mm. thick were formed; but their minimum capacity values were slightly larger than those of other films whose maximum thickness could not have been more than 0.001 mm. Sodium sulphate gives films similar to those in sulphuric acid as to both thickness and capacity.

These results necessitate the conclusion that with the sulphates *the insulating film is not the whole film;* but that we have, superimposed on the insulating film, whose capacity is measurable, a conducting film many times thicker. For solutions other than the sulphates there is no evidence for any such dual-natured film.

The resistance of these films as measured by the Wheatstone bridge with small alternating current is much smaller than the apparent resistance as calculated from the residual direct current.

Bridge measurements were taken both while the direct current was still acting and after it was turned off, while the switching on or off of the direct current made no change in the capacity, the resistance of the films was only about one third as large with the current on as with it off.

Spark Potentials between a Point and Plane, for Small Distances: ROBERT F. EARHART, Ohio State University.

Measurements were made on the P.D. required to cause a spark to pass between a needle point and plane surface. The P.D.'s were secured from an A.C. transformer and were measured with a Weston voltmeter. No. 10 Sharp needles were used as the point electrode. A large number of needles were examined with a microscope and points approximating a pattern needle were chosen.

Distances separating the electrodes were measured with an interferometer.

Curves representing the relation between spark-potential and distance are similar to those showing the same relation between a spherical electrode and a plane.

For air, at atmospheric pressure the so-called 'minimum potential' was found to lie between 290 and 310 volts.

This value does not agree with results secured by other observers from static machines. The value given by Tamm is 2,150 volts when the point is negative and 3,300 for a positive point.

DAYTON C. MILLER,
Secretary of Section B.

THE SCIENTIFIC INVESTIGATION OF THE PSYCHICAL FACULTIES OR PROCESSES IN THE HIGHER ANIMALS.[1]

FOR a consistent investigator there is in the higher animals only one thing to be considered—namely, the response of the animal to external impressions. This response may be extremely complicated in comparison with the reaction of animals of a lower class. Strictly speaking, natural science is under an obligation to determine

[1] The Huxley lecture on recent advances in science and their bearing on medicine and surgery. Delivered by Professor Ivan P. Pavlov at Charing Cross Hospital on October 1, 1906. From the report in the *British Medical Journal.*