C. F. Craig: "On a class of hyperfuchsian functions."

W. D. Macmillan: "Periodic orbits about an oblate spheroid."

The December number (Volume 16, number 3) of the *Bulletin of the American Mathematical Society* contains: Report of the Princeton Colloquium of the society, by Virgil Snyder; Report of the September meeting of the San Francisco Section, by C. A. Noble; Report of the Winnipeg meeting of the British Association, by J. C. Fields; Report of the Salzburg meeting of the Deutsche Mathematiker-Vereinigung, by E. Dintzl; "Gergonne's pile problem," by H. Onnen; "The integral equation of the second kind, of Volterra, with singular kernel," by G. C. Evans; "Descriptive geometry" (review of recent works by Müller, Loria-Schütte and Wilson), by Virgil Snyder; Review of Jackson and Milne's First Statics and Martin's Text-book of Mechanics, by F. L. Griffin; "Shorter notices": Beltrami's works, by Eduard Study, Laplanche's Etudes sur les angles imaginaires and Thomae's Bestimmte Integrale und die Fourierschen Reihen, by J. B. Shaw; "Notes" and "New Publications."

The January number of the *Bulletin* contains: Report of the October meeting of the society, by F. N. Cole; "Note on the groups generated by two operators whose squares are invariant," by G. A. Miller; "The solution of the equation in two real variables at a point where both partial derivatives vanish," by L. S. Dederick; "Tables of Galois fields of order less than 1,000," by W. H. Bussey; "Bôcher's Integral Equations," by G. A. Bliss; "Shorter notices": Pasch's Grundlagen der Analysis, by F. W. Owens; Bennecke's Zweidimensionale Logarithmentafel, by E. J. Townsend; Young and Jackson's Elementary Algebra, by E. B. Lytle; "Notes," "New Publications."

The February number contains: Report of the meeting of the Southwestern Section, by O. D. Kellogg; "Note on a new number theory function," by R. D. Carmichael; "Baire's Lecons d'Analyse," by E. R. Hedrick; "Infinite series" (review of Nielsen's Unendliche Reihen), by J. B. Shaw; "The collineations of space" (review of Sturm's Geometrische Verwandtschaften, Volume III.), by Virgil Snyder; "A synoptic course for teachers" (review of Klein's Elementarmathematik, Volumes I. and II.), by J. W. Young; "Correction"; "Notes"; "New Publications."

THE FORTY-FIRST GENERAL MEETING OF THE AMERICAN CHEMICAL SOCIETY

The forty-first general meeting of the American Chemical Society was held in Boston in connection with the annual winter meeting of the American Association for the Advancement of Science, December 28–31, 1909. Nearly 600 chemists were present, making this the largest meeting ever held by the society.

On Tuesday, December 28, excursions were made to the breweries of Massachusetts Breweries Company and to the factories of Walter Baker & Co., chocolate and cocoa preparations, the New England Gas & Coke Co. and the Forbes Lithograph Manufacturing Co. In the evening the members enjoyed a complimentary smoker given by the members of the local section at the Hotel Brunswick.

On Wednesday the members of the society went to Cambridge, where a general meeting was held in the New Lecture Hall of Harvard University. They were the guests of the university at lunch at the Harvard Union. The following papers were read:

Report for the International Committee on Atomic Weights: F. W. Clarke.

Methods Employed in Precise Chemical Investigations: T. W. Richards.

On the Constitution of Curcumine—the Coloring Matter of Tumeric: C. Loring Jackson and Latham Clarke.

The Application of Physical Chemistry to the Study of Oleoresins: Charles H. Herty.

The Function of Chemistry in College Education: Lyman C. Newell.

The Cause of Color in Organic Compounds: Richard S. Curtiss.

The United States Pharmacopœia and the American Chemical Society: Joseph P. Remington.

J. A. R. Newlands: Chas. E. Munroe.

The Past and Future of the Study of Solutions: Louis Kahlenberg.

The Chemist's Place in Industry: A. D. Little.

In the evening the president of the society, Dr.

W. R. Whitney, gave an address on "Some Chemistry of Artificial Light."

Thursday and Friday the different divisions and sections met in the Lowell Building of the Massachusetts Institute of Technology. Two special features were a symposium on the Chemistry of Paint in the Division of Industrial Chemists and Chemical Engineers and a meeting of a special section to consider the Chemistry of India Rubber. The regular subscription banquet was held Thursday evening at the Hotel Somerset.

On Friday excursions were made to Lawrence, Mass., where the Wood Worsted Mills, the Water Supply and Sewage Experiment Station of the State Board of Health, and the New Water Filtration Plant were examined and the Fore River Ship Building Co. and the Distillery of Felton & Son, Inc.

DIVISION OF INDUSTRIAL CHEMISTS AND CHEMICAL ENGINEERS

A. D. Little, *Chairman*
B. T. B. Hyde, *Secretary*

Losses in the Storage of Coal: HORACE C. PORTER and F. K. OVITZ.

The organic matter of coal readily takes up oxygen from the air at ordinary temperatures and the coal thus deteriorates during storage in the air. The amount of this deterioration as determined by a laboratory study was found to be small (1.0 per cent. or less) when the coal was confined in bottles and a current of air passed through. It proved to be somewhat larger (over 2.0 per cent.) in the case of Illinois coal exposed to the outdoor weather. Deterioration was shown to be practically nothing during under-water storage for one year in the laboratory.

Immediately after mining coal absorbs oxygen rapidly. In one case 10 kilos exhausted the oxygen from 10 liters of air in four days. Only a very slight amount of CO_2 was formed during this oxidation. Methane, however, is exuded from freshly mined coal in considerable quantities and continues to be produced in some cases during long periods. The quantities of methane evolved are not sufficient to lower appreciably the heat value of the coal, but are of importance in producing explosive mine gas. The relative amount evolved by each coal conforms to the known gaseous character of the mine from which the coal was taken.

Outdoor tests are now being carried on by the U. S. Geological Survey in cooperation with the U. S. Navy and at the Isthmus of Panama to determine loss of heat value in coal stored in the open air as compared to that in under-water storage. Outdoor tests on Wyoming sub-bituminous coal showed a loss of five per cent. of the heat value in eight months open-air storage.

The True Melting Point of Trinitrotoluene: A. M. COMEY.

The accepted melting point of α-2-4-6 trinitrotoluene is 82°, but previous determinations vary from that figure down to 78.8°.

Careful melting point determinations were made on samples of C.P. trinitrotoluol obtained from various sources, and preparations of this substance were made in the laboratory from purified C.P. toluol, with the result that 80.5 to 80.6° was obtained as the corrected melting point in every case.

Bacterial Activity as a Corrosive Influence in the Soil: RICHARD H. GAINES.

Casting about for a theory to account for corrosion of iron and steel structures which are embedded in the soil, scientists are now giving consideration to the rôle played by bacteria. Recent work has shown that decompositions hitherto unsuspected and chemical changes in the soil are especially destructive to the iron. It has been found that acid contributions of the soil which have formed in abundance as a result of bacterial activity contribute to a large degree to the corrosive influences present. This corrosion is now known as shell rust and is often seen on steel or iron conveying pipes running through marshes or under water. Microscopic inspection of this rust shows that bacterial organisms have done the work. The following remedy for the evil was proposed: (1) Free drainage carrying off the acid solutions, (2) in localities where drainage is impossible slack lime should be packed about the metal, to neutralize acids formed as a result of bacterial activity.

Paint Films as Accelerators to Corrosion of Iron: W. H. WALKER.

Although the tendency to corrosion in iron or steel varies greatly with the condition of its manufacture, and although some samples are inferior to others, the fact remains that all iron and all steel will rust, hence the necessity of the study of the available methods of protecting such structures and the most general way is by paint. Any substance which will absorb, or combine with hydrogen, will on this account accelerate corrosion if such substance be in contact with iron. Linseed oil in its natural condition does this, and that is why when such oil film is completely oxidized it ceases to accelerate corrosion. The influence of various pigments when they form parts of a linseed paint were discussed, and a method for quantitatively measuring this influence was described. It is believed that a development of this method may show much concerning the properties of ordinary protecting paint.

A Convenient Method of Refrigeration: J. O. Handy.

Liquid air is most convenient for temperatures below — 80° C. It costs $4 per liter and there are losses and possible breakages of containers which make its use in most cases expensive.

Carbon dioxide is satisfactory down to — 78° C. It is inefficient if used as a gas and not very satisfactory when used as the solid CO_2 snow.

The CO_2 snow dissolves freely in acetone alcohol, ether, gasoline and several other solvents of low freezing point. These solutions absorb heat rapidly from objects placed in them. They are perfectly mobile and easily handled.

Liquid carbon dioxide costs about 10 cents per pound. Three and one third pounds of liquid yield one pound of solid in two minutes if blown from the original container through canvas bags.

A mixture of 50 grams of CO_2 snow and 150 grams of acetone had a temperature of — 63° C. and caused one pound of mercury (freezing point — 39° C.) to congeal in two and one half minutes.

This method of refrigeration is useful for freezing tests of oils, for condensation of volatile substances, for precipitation of substances like paraffine from oil distillates and for general research work.

The Present Conditions of the Birch Oil Industry in the United States: Edward Hart.

The industry is one of those classed by the census takers as neighborhood industries and is carried on for the most part in the Appalachian plateau. The birch wood (*Betula lenta*) is cut into short pieces and distilled with water in primitive stills. About 50,000 pounds are produced annually. Oil of wintergreen (*Gaultheria procumbens*) is produced in the same way to the extent of 5,000 pounds. Illustrations of the stills and samples of the oil were shown.

Variations in Car-painting Practise: Carl F. Woods.

The four fundamental operations in car painting are filling the pores of the wood, smoothing down the natural inequalities of the surface, putting on the color in a smooth homogeneous film and finally covering the surface with a film of varnish. The three methods are the "lead and oil," the "surfacer" and the "color and varnish" processes. The advantages and disadvantages of the different methods are discussed. It is probable that no one of the methods embody the maximum efficiency but it has been shown that a saving of $20 to $30 can be made on the painting of each car and an increase in life obtained of from five to ten years by the adoption of scientific methods of finishing.

Some Variations in the Official Determination of Volatile Matter in Coal: A. C. Fielder and J. D. Davis.

Experimental data obtained in two different laboratories bearing on the variations in the volatile combustible matter, as determined in the official method of the American Chemical Society, are given in this paper, from which the following conclusions are drawn:

Laboratories using natural gas are apt to get results on volatile combustible matter that are considerably lower than those obtained in laboratories using coal gas unless the following precautions are observed: (1) Gas must be supplied to the burner at a pressure of not less than ten inches of water; (2) natural gas burners admitting an ample supply of air should be used; (3) air should be adjusted so that a flame with a short well-defined inner cone is produced; (4) the crucibles should be supported on platinum triangles and kept in a well-polished condition; (5) semibituminous coals should be placed in an inclined position across the corner of the bottom of the platinum crucible, to prevent the swelling up of the coke in the early stages of the heat treatment.

Results by destructive distillation in a small iron retort are practically the same as the official volatile matter in the coal.

Two laboratories may expect to vary as much as 2 per cent., both using the official method.

The following papers are reported by title:

Practical Corrosion Tests of Iron: W. D. Richardson.

Methods for Testing Commercial Anhydrous Liquid Ammonia and Results: W. D. Richardson.

The Temperature Reaction of Oil Mixtures with Sulphuric Acid: W. H. Boynton and H. C. Sherman.

A Comparison of the Accuracy of Different Formulæ for Calculating Fuel Values: H. C. Sherman and D. A. Bartlett.

Action of Liquid Anhydrous Ammonia on Rubber Gaskets: CHARLES H. EHRENFIELD.

A Simple Viscosimeter: CHAS. S. PALMER.

Lubrication, Lubricants—Oils, Greases and Solids: C. F. MABERY.

The Oxidation of Iron and Steel and how to Prevent it: J. S. STAUDT.

The Effect of Non-Metallic Impurities on the Properties of Steel: HENRY FAY.

New Methods of Asphalt Examination: ALBERT SOMMER.

A New Precision Centrifuge: H. E. HOWE.

Guayule Grinding Experiments: CHAS. P. FOX.

Incompatibilities in Chemical Manufacture: J. T. BAKER.

An Adiabatic Calorimeter for Use with the Calorimeter Bomb: FRANCIS G. BENEDICT and HAROLD L. HIGGINS.

The Weathering of Coal: S. W. PARR.

A New Gas Calorimeter: S. W. PARR.

Manufacture of Oxide of Zinc: GEO. C. STONE.

Scientific Preparation and Application of Paint: G. W. THOMSON.

The Determination of Oil in Flaxseed Products by the Specific Gravity Method: CHAS. A. HERTY and E. J. NEWELL.

DIVISION OF PHARMACEUTICAL CHEMISTRY

A. B. Stevens, *Chairman*

B. L. Murray, *Secretary*

Gamboge: F. O. TAYLOR.

Different adulterations of pipe and powdered gamboge are referred to and analytical results for starch tests, ash, alcohol solubility and acid value on fifteen samples are given. The value of the different tests and their indications, directly and by comparison, are discussed. The alcohol solubility is stated to be an unusually good means of detecting adulteration and the inclusion of a starch test in the U. S. Pharmacopœia specifications is recommended.

The Melting Point of Aconitine: F. O. TAYLOR.

Attention is called to the double melting point given by the U. S. Pharmacopœia and to the variation in this constant as recorded by different authorities. Results of 35 determinations confirm Dunstan's results of 188.5° and show that the melting point may be seriously affected by the manipulation employed. It appears that a statement of the melting point without reference to apparatus or method used is misleading and the need of some definitely stated process in the U. S. Pharmacopœia is emphasized.

Pharmacopœial Tests for Ammonium Benzoate: ATHERTON SEIDELL and GEORGE A. MENGE.

The only pharmacopœial tests for ammonium benzoate which might be expected to indicate the purity of the salt are the melting or decomposition point, and the litmus paper test for free acid. Both of these tests are shown to be unsatisfactory. In the case of the first, the decomposition point curve is almost horizontal for samples varying between pure ammonium benzoate and containing 50 per cent. of benzoic acid. The litmus paper test will not show the presence of 8 per cent. free benzoic acid. The quantitative analysis of the salt by distillation of its ammonia is recommended in preference to the "formaldehyde method" for the acid radical, although the latter method is to be preferred for the majority of the pharmacopœial ammonium compounds.

The Purity Rubric and the U. S. Pharmacopœia Tests with Notes on Quantitative Methods for Certain Pharmacopœial Compounds: ATHERTON SEIDELL and M. I. WILBERT.

The purity rubric of the U. S. Pharmacopœia is not always accompanied by satisfactory quantitative methods to determine the exact per cent. of purity of a given compound. The desirability of having satisfactory and withal simple methods of assay is generally accepted and in this paper a method for the quantitative determination of mercury is outlined, also a method for the determination of iodine as iodide. Several additional quantitative methods are referred to more briefly to illustrate the possibility of adapting more or less well-known quantitative methods of assay to pharmacopœial compounds and thus enhance the practical value of the purity rubric.

The following papers were reported by title:

Scope of Pharmaceutical Chemistry: A. B. STEVENS. (Chairman's address.)

Strychnine Sulphates: A. B. STEVENS.

The Botanical Source of the Crude Drug Known as Wild Yam: H. H. BARTLETT.

On the Availability of "Idophenine" in the Separation of Acetanilid and Acetphenetidin: W. O. EMERY.

Detection of Colocynth Seed in Powdered Colocynth: V. K. CHESNUT.

Pancreatin: JOHN P. STREET.

The Relation of the Chemist to Proprietary Medicines: W. A. PUCKNER.

Geo. D. Rosengarten, chairman of delegates of the American Chemical Society to the Pharmacopœial Convention, led a discussion in regard to matters to be settled at that convention and received suggestions in regard to the policy that should be followed.

DIVISION OF PHYSICAL AND INORGANIC CHEMISTRY

Charles H. Herty, *Chairman*

Wilder D. Bancroft, *Secretary*

Ionization of Salts in Mixtures with No Common Ion: Miles S. Sherrill.

That the mass-law does not hold for the ionization of salts is well known. A thorough examination of data relating to the ionization of salts present in water alone and mixed with other salts has led to the formulation of the following general principle.

For any salt the ratio of the product of the concentration of its ions to the concentration of its un-ionized part is a function of the total equivalent ion-concentration in the solution and of that alone.

This rule, originally stated by Arrhenius as applicable to uni-univalent salts and extended by A. A. Noyes to include salts of higher types, has already been confirmed by various investigators through conductance measurements of mixtures with a common ion.

The conductivity of solutions containing definite mixtures of potassium sulphate and sodium chloride was measured and compared with the conductivity calculated with the help of the above stated principle. The agreement confirms the validity of the principle.

Ionization of Salts in Mixtures with a Common Ion: W. C. Bray and F. L. Hunt.

The experimental verification by conductance measurements of the principle given in the preceding abstract has been confined to mixtures of salts in which neither component was present in large excess. By taking advantage of the high mobility of hydrogen ion, an extreme case has now been investigated, viz., dilute solutions of HCl in the presence of large excess of NaCl. For each mixture the conductance, when calculated in the assumption that Λ_H (the conductance of hydrogen ion) is constant, was somewhat greater than the measured value; but the consistent nature of the deviations for all proportions of HCl and NaCl indicated that the ionization of HCl was determined by the total ion concentration and not by its absolute concentration. The transference experiments of Noyes and Sammet and Noyes and Kato show, however, that, if ΛCl remains constant, Λ_H increases rapidly with increasing concentration, and that the degree of ionization of HCl is almost the same as that of KCl. On using these results and assuming that the mobility of hydrogen ion depends only on the concentration of acid in the mixture, the calculated and measured values of conductances were found to agree very closely.

Heats of Combustion of Certain Liquid Hydrocarbons: T. W. Richards and R. H. Jesse, Jr.

In further prosecution of the revision of thermochemical data the heats of combustion of benzene and a number of octanes and xylenes were determined with unusual care. The object in choosing these substances was to endeavor to trace the effect of constitution or arrangement upon the heats of formation of isomeric substances and thus to obtain more definite idea of the relation of total energy-change to structure. The adiabatic method of calorimetry was used with great success, and in general the precautions used in previous work of this kind were adopted throughout, with several new improvements. Each specimen of volatile liquid was sealed in a flexible flattened glass bulb and ignited by means of a small weighed quantity of sugar placed above the bulbs on a glass shelf, the substances being contained in a very small narrow platinum crucible. When conducted in this way, the combustion was in every case complete. The final results showed very satisfactory agreement among themselves, and all will be soon published. This investigation will be continued in the near future, and the effort will be made to obtain as much light as possible upon the energy relations of these closely related compounds.

The Compressibilities of Certain Isomeric Hydrocarbons: T. W. Richards and C. L. Speyers.

In continuation of the work upon compressibility, described in Publications 7 and 26 of the Carnegie Institution of Washington, and in connection with the work above summarized concerning the heats of combustion of octanes and xylenes, the compressibilities of these substances at various temperatures was investigated in detail. The effort was made to attain greater accuracy than ever before. The standard of pressure was verified to a degree of precision far exceeding anything which had hitherto been attained. The new method for determining compressibility was found to give satisfaction as before. Five octanes were investigated with great care. Their compressibilities were found to vary over a much wider limit than their heats of combustion, being comparable to the variations in the boiling point. In general, the isomers with higher boiling points possess lower compressibility, and the greater the density the less the compressibility; but there are interesting minor variations in these relationships which deserve further investigation. Ortho- and metaxylene and ethyl benzene also were investigated. The authors received important pecuniary assistance from the Carnegie Institution of Washington.

Electrochemical Investigation of Liquid Amalgams of Thallium, Indium, Tin, Zinc, Cadmium, Lead, Copper and Lithium: T. W. RICHARDS, J. H. WILSON and R. N. GARROD-THOMAS.

The investigation was a continuation of the research concerning amalgams of zinc and cadmium, described in a recent paper by Richards and Forbes. The object was to extend the study to elements possessing other valences and to study more accurately the phenomena investigated. The electromotive forces (and their temperature-coefficients) of various cells containing amalgams of the eight metals named in the title were measured with many precautions against experimental errors. Thallium and indium were found to behave in the same manner as cadmium, but in a much more exaggerated degree. Tin and lead were found to behave in the same manner as zinc, but likewise in a more exaggerated degree. It was shown that the greater part of these deviations from the concentration law may be explained by the heat of dilution of the amalgam, according to the equation of Cady. The temperature coefficient of a cell of this type was shown to correspond closely with the requirement of this equation. The difficulties of the actual measurement of thermochemical data involving amalgams were emphasized, and many errors in the work of previous investigators were discovered. It was shown that the deviations from the simple concentration law in every case decreased as the dilution increased, so that upon reaching a concentration of 0.01 gram-atom per liter all the amalgams investigated behaved practically as ideal solutions.

Further Investigation concerning the Atomic Weights of Silver, Lithium and Chlorine: THEODORE W. RICHARDS and HOBART HURD WILLARD.

This investigation consisted in a careful study of three ratios, namely, LiCl/AgCl, LiCl/Ag and $LiClO_4$/LiCl. By means of the latter two ratios the ratio of O_4/Ag was calculated, and new values were obtained in an entirely original way for the atomic weight of silver, lithium and chlorine. In the process of this work new methods of purifying lithium salts better than any preceding were devised. The lithium chloride was fused in such a way as to show perfect neutrality to the most sensitive indicators, and was weighed in a strictly anhydrous condition. The preparation of perchloric acid also was subjected to rigid scrutiny, and this substance was made in a state of unusual purity. A new precise method was devised for converting lithium chloride into lithium perchlorate, and its sources of error were carefully examined.

The atomic weight of lithium was found to be very nearly 6.94 (much less than Stas's value) and that of silver 107.871, if oxygen is taken as 16.000.

On the Velocities of Certain Reactions between Metals and Dissolved Halogens: RALPH G. VAN NAME and GRAHAM EDGAR.

Under like conditions the metals mercury, cadmium, zinc, copper and silver were found to dissolve in an aqueous iodine solution containing a large excess of potassium iodide at practically the same rate. In bromine mercury dissolves somewhat faster, in cupric bromide much slower than in iodine. The so-called diffusion theory of reaction velocity, of Noyes, Whitney and Nernst, seems to give a satisfactory explanation of the results obtained, as regards both the observed agreements and the change in the velocities with the conditions.

The Estimation of Radium Emanation and of Radium in Common Materials: MERLE RANDALL.

A definite quantity of radium emanation, obtained from a definite volume of a solution of the mineral uraninite, was introduced into electroscopes of the various types now in use for determining radium emanation. The values for the ionization current due to the emanation associated with one gram of uranium varied from 2.36×10^{-10} amperes for a Boltwood type to 4.80×10^{-10} for a Schmidt type. Thus it is incorrect to assume, as many European investigators have done, that data, expressed in amperes or C.G.S. units, obtained with one instrument, are directly comparable with those obtained with another. Some forms of apparatus for separating the emanation from solution removed a greater percentage than others. With all types the percentage loss was greater when the total amount of emanation present was small. Accurate determinations can be obtained only when the methods and instruments are identical with those used in the standardization experiments, and the amount of emanation is also approximately the same.

On the Oxalates of Hydrazine: J. W. Turrentine.

Two oxalates of hydrazine have been prepared, the neutral monoxalate $(N_2H_4)_2.H_2C_2O_4$, and the acid dioxalate, $N_2H_4.H_2C_2O_4$. They crystallize from water in colorless plates.

The monoxalate is very soluble in water, while the dioxalate is only sparingly soluble in that solvent when cold. Both are insoluble in alcohol and ether. These salts do not exhibit definite melting points. When heated, intromolecular oxidation occurs with the formation—among other products—in the case of the monoxalate, of hydrazine hydrate, hydrocyanic acid or cyanogen, and a white crystalline sublimate which, from tests, appears to be a salt of hydrazine with an unidentified, carbonaceous acid, and in the case of the dioxalate, of ammonia, a cyanide and a white sublimate of an ammonium salt with some carbonaceous acid. A new method of analysis is described, especially applicable to the analysis of salts of hydrazine with easily oxidizable acids, whereby, with standard potassium permanganate solution, both the acid and the basic radicals of the oxalates are determined simultaneously.

Notes on the Preparation of Chromyl-Compounds: Harry Shipley Fry.

The paper is a résumé of attempts to prepare the unknown compounds chromyl bromide and chromyl iodide. While only partially successful in this respect, certain noteworthy results were obtained, namely: a new reaction for the preparation of chromyl chloride; a reaction for the detection of minute traces of chromyl chloride (0.00001 gm. per 1 c.c. of solvent) depending upon the formation and color of chromyl bromide; the preparation and identification of two new compounds—chromyl acetate and anhydrous chromic acetate.

The Solubility of Gold in Nitric Acid: Frederic P. Dewey.

Contrary to the general statement that gold is not soluble in any single acid, there are various statements in assay literature that gold may go into solution in the nitric acid during parting. After reviewing previous work upon the subject, the results of which are not, for various reasons, conclusive, this paper describes some tests upon the nitric acid after use for parting in gold bullion assays which gave most conclusive evidence that the acid did really carry gold.

These tests are followed by more elaborate ones upon larger amounts of gold and with increasing precautions. On two occasions 6 to 700 c.c. of solution were obtained, carrying more than 180 mg. of gold per liter.

A final crucial test, carried out with the utmost care, entirely in platinum, on about 30 grams of finely divided gold, by boiling it for two hours in previously boiled nitric acid of 1.42 sp. gr., yielded a solution which, after filtering, contained gold at the rate of over 660 mg. per liter.

It is shown to be very easy to dissolve finely divided gold in boiling nitric acid of 1.42 sp. gr.

On the Chief Determining Factor in the Toxicity of the Metal Ions: L. L. Woodruff and H. H. Bunzel.

Discussion of a series of experiments to determine the relative toxicity of various salts toward protoplasm. Results show a parallelism between the smallest fatal concentration of the various ions and their "ionic potential."

Metallic Titanium: Matthew A. Hunter.

The only successful preparation of pure titanium is that used by Nilson and Peterson by the reduction of $TiCl_4$ with sodium. Titanium so prepared does not differ in outward appearance from polished steel. It is however hard and brittle when cold. If however it be raised to a low red heat, it may be forged like red-hot iron. If the temperature be carried much above a low red the metal oxidizes superficially in air. Homogeneous rods 6 inches in length have been prepared and it is hoped to be able to prepare wire from them. The metal may be easily polished on an ordinary grindstone. It is too hard to be sawed by a hack saw but may be filed to shape by an ordinary file.

The specific gravity of the melted metal was found to be 4.51 at 18° C. The specific gravity of the forged material did not differ sensibly from this value. The melting point of the material is between 1,800 and 1,850° C. Analysis of the molten beads shows that the material is 100 per cent. titanium, containing no iron, sodium or oxygen as impurities.

Some New Double Arsenates: L. J. Curtman.

If to a hot ferric chloride solution, strongly acid with hydrochloric acid, diammonium arsenate solution be added to incipient precipitation, and the mixture heated, there forms a white finely divided precipitate which analysis showed to be a double arsenate of ammonium and iron of the formula $NH_4H_2AsO_4.FeAsO_4$. Like the corresponding phosphate prepared by the author, the double arsenate readily hydrolyzes when washed with water. It readily dissolves in mineral acids, but is practically insoluble in 50 per cent. acetic acid. Ammonia dissolves it on heating to a deep reddish-brown solution from which 95 per cent. alcohol precipitates a basic double ammonium ferric arsenate. When sodium and potassium arsenates were respectively used under the same conditions, precipitates were obtained which from the results of qualitative analysis appear to be the double corresponding alkali arsenate.

Solubility Relations in Concentrated Solutions: Arthur E. Hill.

An effort has been made to calculate the solubility of a salt in solutions of a second electrolyte, throughout a wide range of concentrations. The lack of success of previous investigators has been due to the want of a dilution formula by which the dissociation of one salt might be accurately calculated in the presence of another, under which condition it has long been known that a change of degree of ionization occurs in addition to that brought out by chemical interaction. The formula most often used to express this "neutral salt effect" is that demanded by the isohydric principle of Arrhenius. It is known, however, that this formula always gives a calculated ionization greater than that experimentally found, and accordingly solubilities calculated by this method are always too low. Arrhenius himself, realizing the inadequateness of his formula, proposed one remedying the defect, but containing three constants. The author finds that an adequate formula may be written containing only the two constants of the Storch-Bancroft dilution formula for a single electrolyte, and proposes the expression

$$\mathrm{Cs} = \frac{(\mathrm{Ca} \times \mathrm{Ck})^{n} \left(\frac{\Sigma \mathrm{Ca} \times \Sigma \mathrm{Ck}}{\mathrm{Ca} \times \mathrm{Ck}} \right)^{\frac{n-1}{2}}}{\mathrm{K}},$$

where Ca and Ck indicate the concentration of the anions and cathions respectively of the simple salt, ΣCa and ΣCk the total concentration of anions and cathions, and Cs the concentration of undissociated salt.

This dilution law has been used in calculating the solubility of several binary salts in presence of other electrolytes. In cases where the mixture contains no common ion, the calculated results agree with the experimental data within a few per cent. even in solutions of high concentration. In the case of mixtures containing a common ion the agreement is less nearly perfect, although in every case it is better than that obtained when the calculations are made according to the isohydric principle.

Measuring Capillary Ascension in Tubes of any Material: S. Lawrence Bigelow.

An apparatus was shown with which the capillary ascension of any liquid in tubes of any material can be accurately and quickly determined.

Experimental results were given demonstrating that the ascension of water (and of benzene) was practically the same in tubes of glass, copper, silver and platinum.

The fact that water will ascend in tubes not wet by it, in tubes of paraffin, bees-wax and celluloid, was shown experimentally. The ascension in such tubes is about 70 per cent. of what it would be in glass tubes.

The ascensions of a saturated solution of sugar in a tube of sugar, and of a saturated solution of copper sulphate in a tube of copper sulphate, were measured and found to be about two thirds of the ascensions shown by the same solution in platinum tubes. Theoretical discussion of these results was deferred to the appearance of the article in the journals.

The Reaction between Bromic Acid and Hydriodic Acid in Concentrated Hydrochloric Acid Solution: D. L. Randall.

This paper compares the action of bromic acid and that of iodic acid on hydriodic acid in the presence of strong hydrochloric acid solution, and shows that while the reaction with iodic acid is

$$2KI + KIO_3 + 6HCl = 3KCl + 3H_2O + 3ICl$$

the reaction with bromic acid is

$$3KI + KBrO_3 + 6HCl = 4KCl + 3H_2O + IBr + 2ICl.$$

Test-tube Holder: H. Emerson Wetherill.

Results of three years' studies off and on on the most useful way to bend up a wire into a test-tube holder with a stand, cover glass holder feature, pinch cock, wide utility and practicability, clamp for various positions, opening by one hand.

The following papers are reported by title.

Some Observations on Phosphorescence: W. L. Dudley.

Solarization without Light: W. D. Bancroft.

The Reduction of Zinc by Mercury and the E.M.F. of Zinc Amalgams: J. L. Crenshaw.

Rôle of Water in Minerals: W. F. HILLEBRAND.

Ammonolysis of Hydrazine Sulphate: A. W. BROWNE and T. W. B. WELSH.

Quantitative Application of the Theory of Indicators to Volumetric Analysis: ARTHUR A. NOYES.

The Electrolysis of Copper Sulphate Solutions with Intermittent Current: W. LASH MILLER.

A Revision of the Atomic Weight of Phosphorus: G. P. BAXTER and GRINNELL JONES.

A Revision of the Atomic Weight of Neodymium: G. P. BAXTER and H. C. CHAPIN.

The Velocity of Saponification of Formic Esters: JULIUS STIEGLITZ.

The Influence of Acids and Alkalies upon the Activity of Invertase: C. S. HUDSON and H. S. PAINE.

Specific Heat and Heat of Neutralization of Aqueous Solutions: T. W. RICHARDS and A. W. ROWE.

The Nature of Attractive Forces: J. E. MILLS.

Changes in Volume during Solution of the Alkali Halides: G. P. BAXTER.

A Simple Dynamic Method for Determining the Boiling-Points and Vapor Pressures of Liquids or Solids with Small Amounts of Material: ALEXANDER SMITH and ALAN W. C. MENZIES.

A Method for Determining Vapor Pressures: ALEXANDER SMITH and ALAN W. C. MENZIES.

A Redetermination of Vapor Pressures of Water and of Mercury: ALEXANDER SMITH and ALAN W. C. MENZIES.

A Quantitative Study of the Constitution of Calomel Vapor: ALEXANDER SMITH and ALAN W. C. MENZIES.

Wire Silver in Ores and how it is Formed: C. E. SWETT.

The Electrical Deposition of Zinc: ELWOOD B. SPEAR.

The Determination of Antimony by the Gutzeit Method: CHARLES R. SANGER.

Molybdenum and Tungsten: COLIN G. FINK.

Cæsium Nitrate and the Mass Action Law for Strong Electrolytes: E. W. WASHBURN and D. A. MCINNES.

Cryoscopic-Cryohydric Studies: S. C. LIND.

The Influence of Temperature on the Formation of Water Gas: J. K. CLEMENT and L. H. ADAMS.

A Method for Determining the Molecular Weights of Dissolved Substances by Measurement of Vapor Pressure: ALAN W. C. MENZIES.

The Condensation of Water by Electrolytes: F. K. CAMERON and W. O. ROBINSON.

The Hydrolysis of Raffinose by Invertase: C. S. HUDSON.

A Relation between the Chemical Constitution and the Optical Rotatory Power of the Sugar Lactones: C. S. HUDSON.

A Constant Temperature Regulator: EDWARD BARTOW and FRANK BACHMANN.

A New Method of Separating Chlorine, Bromine and Iodine: LOUIS KAHLENBERG.

The Solubility Relations of Calcium Sulphate at High Temperatures: ARTHUR C. MELCHER. (Presented by A. A. Noyes.)

A New Method of Determining the Potentials between Liquids: GILBERT N. LEWIS.

Forces at the Boundary between Two Liquids: W. D. HARKINS.

Chlorsulphonic Acid and Pyrosulphuryl Chloride: CHARLES R. SANGER.

The Electrical Conductivity of the Alcohols in Liquid Hydrogen Chloride: E. H. ARCHIBALD.

D. L. RANDALL,
Press Secretary

(To be continued)

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION K AT THE BOSTON MEETING

THE sectional committee decided to hold one session, and to devote this to the discussion of a subject of general interest (especially to the entire field of physiology and experimental medicine), and to hold this meeting in conjunction with the American Physiological Society. The subject "Internal Secretion" was selected, and the following program was adopted;[1] all the papers were by invitation:

TUESDAY, DECEMBER 28, 1909, 2:30 P.M.

Joint meeting with the American Physiological Society, Lecture Room, Building B, Harvard Medical School.

Address of the retiring chairman: "Chemical Regulation in the Animal Body by Means of Activators, Kinases and Hormones," William H. Howell.

Symposium on Internal Secretion

"A General Review of the Chemical Aspect of Internal Secretion," by R. H. Chittenden.

"The Comparative Physiology of the Adrenal Bodies," by Swale Vincent.

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[1] Professor Swale Vincent was unable to attend the meeting.