standpoint, has so far failed to give sufficiently uniform results, one of the chief objections to the process being the difficulty attendant upon the solution of the cuprous oxide.

With improvements in the details of manipulation of the process, however, it is quite possible that more satisfactory results could be obtained.

SECOND INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

By H. W. Wiley.

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At the first congress held in Brussels, in 1894, it was decided to hold the meetings bi-annually and Paris was selected as the most desirable place for the reunion this year. As has already been announced to the readers of the Journal, the present congress is organized under the patronage of the French government and under the immediate direction of l'Association des Chimistes de Sucrerie et de Distillerie de France et des Colonies. The late Professor Pasteur had accepted the honorary presidency of the congress, and all delegates from foreign countries have felt an especial regret that his death has prevented them from listening to his words of welcome and from forming his personal acquaintance.

To promote the interests of the congress, committees were organized in most countries. The personnel of the one in the United States has already been published in this Journal. Through the French Foreign Office all the principal governments were invited to send delegates to the congress. Official representatives were present from Belgium, Germany, Italy, Russia, Switzerland, Austria, Portugal, Denmark, and the United States. So far as I can learn, and the fact is worthy of remark, there is no representative in attendance from England, either official or otherwise. The official delegate from the United States is Mr. C. A. Doremus, of New York, while the writer has a commission as a delegate from the Department of Agriculture, and one from the American Chemical Society, sent through the courtesy of the president and council. Belgium has the largest representation of any foreign country, and, since these gentlemen are all French in their language, the congress, as is natural, is essentially French.

The congress was formally opened July 27, at 10 A. M., in the grand amphitheater of the Sorbonne. Perhaps there is no other spot in the whole world so well suited by its history and tradi-

tions for the seat of a scientific congress, especially of chemistry. In or near the Sorbonne were made those advances in chemical science which have made famous the names of Lavoisier, Chevreul, Dumas, Deville, Wurtz, Pasteur, Berthelot, and many others scarcely less renowned. The address of welcome was fitly made by Mr. Berthelot, rendered, by the death of Pasteur, the head and front of French science. The response was pronounced by Mr. Lindet, provisional president. After these addresses, the provisional secretary of the congress presented a report showing the activity of the French and other committees and giving the number of chemists who had become members of the congress.

The congress is organized with ten sections, as follows:

1re Section.—Sucrerie.

2e Section.—Industries de la fermentation: alcools, vins, bières, cidres, vinaigres.

3e Section.—Industries agricoles: laiterie, fromagerie, féculerie, amidonnerie, glucoserie, matières alimentaires.

4e Section.—Chimie agricole: engrais, terres, eaux résiduaires; alimentation du bétail.

5e Section.—Analyses officielles et commerciales des matières soumises à l'impôt.—Appareils de précision.

6e Section.—Industries chimiques: produits chimiques, pharmaceutiques; corps gras, caoutchouc, matières colorantes, papiers, tannerie, verrerie, céramique, etc.

7e Section.—Photographie.

8e Section.—Métallurgie, mines, explosifs, etc.

9e Section.—Chimie Appliquée à la mêdecine, à la toxicologie, à la pharmacie, à l'hygiene et à l'alimentation. Matières alimentaires: altérations et falsifications.

10e Section.—Électricité: électro-chimie.

The meetings of the congress are held in the Hôtel de la Société d'Encouragement de l'Industrie Nationale, 44 rue de Rennes, opposite the church of St. Germains des Prés and in the Hôtel des Sociétés Savantes, situated in rue Serpente, opposite rue Danton. Only four or five of the sections are in session at any one time, thus affording an opportunity to the members of the congress of attaching themselves to several sections.

In the afternoon of the first day visits were made to the Gobelin tapestries, the Museum of Natural History, botanical gardens, the National Tobacco Factory, and the Eiffel tower, the latter being reached by boats on the Seine. At the end of these visits a banquet was served on the first floor of the tower and from the tables a pleasing vision of Paris by night was obtained.

On the second day of the congress, an interesting paper was read by Mr. Moissan on the electric furnace. A large number

of samples of the typical compounds obtained at the intense heat of the furnace was exhibited and a description of their physical and chemical properties given. The possibilities of the electric furnace in the near future were outlined. Mr. Moissan described in some detail the construction of the furnace. It is best made by carving a block of quicklime into the proper shape. The high infusibility of the quicklime and its non-conducting power are points in its favor. The electrodes should be of the purest carbon and there should be no deflection of the arc into the crucible. The control of the current is of the greatest importance. For instance, in the case of titanic oxide it is reduced to titanous oxide with a current of thirty ampères; at 300 ampères titanium nitride is produced and at 3,000 ampères titanium carbide. Many metallic carbides, as, for instance, calcium, yield a gas when moistened, but the gases are not identical. In addition to acetylene, hydrogen, marsh gas, and petroleum have been obtained, the latter from uranium carbide. This fact is of great interest in respect of the origin of natural gas and petroleum, which, by many, are supposed to be of organic derivation. In the furnace, molybdenum and manganese are capable of forming compounds similar to cast iron. Fine samples of chromium obtained in the furnace were shown and many specimens of various nitrides, carbides, and borides. Chromium oxide was reduced to metal before the audience and silica was sublimed.

In addition to Mr. Moissan's paper, a general discussion of electrolytic problems was held including electrolytic methods of preparing chlorine, chlorinated soda, and calcium carbide.

Mr. Moissan has accepted an invitation to attend the Princeton College celebration in the autumn and has made arrangements to give some lectures in the United States. Our chemists, therefore, will have an opportunity in the near future to hear him and to note the great progress which the electric furnace has made possible in the line of discoveries in mineral chemistry.

Another discussion of unusual interest was devoted to the official graduation of instruments of precision. It was the general consensus of opinion that a uniform 100 gram weight of platinum should be adopted by all countries, and that all instruments and utensils for weight and volume should be referred to this standard. The official meter was regarded by all to be the ultimate standard of instruments to measure length. Some of the members favored a standard of brass coated with gold or platinum, in order to have an ultimate standard of greater volume than the one made of platinum. The difficulty of securing brass of uniform and definite constitution was considered as an insuperable objection to this proposition.

Among the many papers of special interest read on this day only a few can be mentioned here by title, *viz.*, Application of Electro-Chemistry to the manufacture of Chemical Products, by M. Joly; The Difficult Digestibility of Sterilized Milk, by M. Laurent; Determination of Soil Elements Assimilable by Plants, by M. Garola; Plan and Installation of an Agricultural Experiment Station, by M. Soillard.

At 4 P. M. the sections were adjourned to visit the new city hall (Hotel de Ville), which has finally been completely restored from its destruction by the Commune. There the members were received by the mayor of the city (Prefet de la Seine), the chief of police and the chief of the fire department. After enjoying a delightful collation, such as the city of Paris knows so well how to prepare, we were conducted by the mayor throughout the building and had described to us the mural decorations and the various groups of statuary. In the opinion of experts, the new Hotel de Ville is quite equal in its artistic decorations to the magnificent structure so wantonly destroyed by the Communists in 1871.

On the third day of the congress sessions of the sections were held only in the morning. A communication was presented to the second section by Mr. Chas. J. Murphy, describing a new process of fermenting maize and showing the way to a more extended use of this product in the European distilleries. Before the third section was read several papers giving the latest European processes for the manufacture of starch. Mr. Grandeau, an agronomist well known in the United States, presented a communication to the fourth section on the assimilability of phosphates. Methods of analysis of phosphates, especially those applicable to phosphatic slags were discussed by Mr. Cluss, of Halle, and by many others. The Wagner method of solution in ammonium citrate, of a definite constitution, was advocated by nearly all those taking part in the discussion. A paper on the official German method of determining iron and alumina in phosphates, was presented by Dr. von Grueber. The method of E. Glaser, as modified by Jones, is the one which the German chemists regard as the most reliable. This method has already been described in the *Journal of Analytical and Applied Chemistry*, **5**, 671. It was pointed out that analysts had received an impression that E. Glaser had acknowledged that this method was unsound. This, however, is not the case, but the impression arose by reason of a critique of the method by C. Glaser, of Baltimore. Mr. E. Glaser died soon after publishing his method and it devolved on Dr. Grueber to continue his work. The modifications of the original method, as proposed by E. Glaser,

which have been accepted by the German chemists are principally those made by Jones and with which American chemists are quite familiar. The process, as conducted by the German official chemists, is as follows:

Ten grams of the sample are dissolved in twenty-five cc. hydrochloric acid, sp. gr. 1.20, and the volume completed to a half liter. Fifty cc. of this solution, corresponding to one gram of the substance, are evaporated to half that volume in a beaker, ten cc. of sulphuric acid (one part to four of water) added and the mixture shaken. 150 cc. of absolute alcohol are added, shaken, and the beaker placed aside for three hours. The deposited calcium sulphate is separated by filtration and washed with absolute alcohol. The washing is finished when ten drops of the filtrate, diluted with the same volume of water, does not become red when a drop of a solution of methyl orange is added. The alcohol from the filtrate and washings is recovered by distillation, and the residue oxidized by bromine and hydrochloric acid, a slight excess of ammonia added and heated until the excess is expelled. This operation is very important to prevent the incorporation of magnesia in the precipitate. The residual precipitate is separated by filtration, any remaining on the walls of the beaker being washed off with cold water and a rubber-tipped tube. The whole is washed on the filter with boiling water until all traces of sulphuric acid have disappeared. The precipitate is dried, ignited and weighed and consists of the phosphates of iron and alumina. One-half of the weight of the precipitate consists of the oxide of iron and alumina.

The quantity of iron is determined by reducing the iron in fifty cc. of the first solution made, by means of zinc, and titrating the amount reduced by a solution of potassium permanganate in the usual way. The quantity of iron having thus been determined, it is calculated to oxide and subtracted from half the weight of the iron and aluminum phosphates. The difference is the alumina.

The members of the photographic section were provided with an interesting program, but the writer was not able to be present, and the total absence of any reports of the meetings in any of the daily papers, or in any other accessible form, makes it impossible to give even a summary of what was accomplished. I do not think it advisable to encumber the pages of the Journal with a complete list of the papers presented, inasmuch as the presenting of the titles of the papers would fill many pages and give but little idea of the proceedings. Moreover the published program, although extensive, does not include perhaps more than half the titles of the papers presented, and I am not sufficiently acquainted with the French way of doing things to be able to

complete the list. Only one program of papers and proceedings has been printed, and that evidently is to serve for the whole congress. The French in this particular might well imitate the practice of the American Association for the Advancement of Science in providing daily programs.

Interesting communications were presented to the ninth section on food adulteration, and Mr. Doremus read a paper on the nature of the gases contained in canned goods. He showed that these gases were chiefly hydrogen and probably the hydrogen is produced by galvano-electric action in the metals of the can. In all cases where much gas was found, the sides of the can were found deeply corroded. There was no evidence in these cases of the action of ferments and in every case the sterilization of the canned goods was perfect. Mr. Thomas Taylor sent to the section a communication on the crystals of butter fat embodying the results of his observations while chief of the Division of Microscopy of the Department of Agriculture. Mr. F. Jean read a communication on the distinction between butter and margarine as determined by his instrument, the oleorefractometer. This instrument has been carefully tested in the Chemical Division of the Department of Agriculture, and while it has been found to give valuable indications it is by no means so definitely diagnostic as its inventor claims.

Before the eighth section were presented memoirs on the methods of determining sulphur, phosphorus, nickel and carbon.

The afternoon of the third day (Wednesday) was given over to a visit to the celebrated agricultural school and experiment station at Grignon. The members of the congress traveled by railway to Versailles where carriages were provided to conduct us to Grignon. Passing the palace and garden of Versailles, we entered the forest and after two miles reached a stretch of fields which for beauty and fertility are scarcely equaled in the world. The wheat and oats harvests were going on and I was impressed with the primitive methods employed. The cradle and the sickle are almost universally used, only one reaping machine being seen in a drive of ten miles. At Grignon the tourists were received by Mr. Philippar, the principal of the school, and by Mr. Deherain, the director of the station, whose name and fame are well known to all chemists, especially those engaged in agriculture in the United States.

The experimental plots of the station were explained by Mr. Deherain, and thereafter, in his laboratory, he gave a brief explanation of the charts representing the results of the experiments for many years. After leaving the experiment station, the members of the congress were driven over the farm connected with the

school and they also inspected the barns, stables, horses and herds of sheep and cows. I noticed that much of the agricultural machinery, especially the reapers, hay-rakes and plows, were of American manufacture. The college buildings are part of an old chateau which, under the first empire, belonged to one of the marshals of France. The school at Grignon is the largest and most important of the three national colleges of agriculture. The other two are established at Montpellier and Rennes respectively. Three classes of pupils are admitted; *viz.*, internes, who pay $240 a year, demi-internes, who pay $120, and externes, who pay $80. Others known as free auditors are also admitted to all the lectures and pay $40 a year. The course of instruction lasts two years and a half and includes zoology, botany, mineralogy, agricultural geology, physics, meteorology, general and agricultural chemistry, agriculture, horticulture, arboriculture, viticulture, sylviculture, rural economy, entomology, sericulture, apiculture, technology, agricultural legislation, hygiene and military exercises. The number of pupils admitted to each class is fixed annually by ministerial decree, and is limited also in the class of internes by the number of beds. The total number of pupils, excluding the free auditors, is about 250. On the completion of the course and passing a satisfactory examination, which shall merit at least sixty-five out of a possible 100 points, the pupil receives the diploma of the National School of Agriculture, and four-fifths of the whole number thus graduating, comprising those who have received the highest marks, are excused in time of peace from all military service, except one year.

Examinations for admission to the school are competitive and include arithmetic, algebra, geometry, trigonometry, elementary physics, chemistry, zoology, botany and geology. The chemical instruction is given by Mr. Dehérain and his assistants and consists of lectures and demonstrations in general and agricultural chemistry, including the chemical study of plants, soils and fertilizers. It is evident, however, that in the short time at their disposal the students can not acquire great efficiency in chemical manipulations and in fact it is not the object of the school to train agricultural chemists, but rather to provide young men with that character of instruction which will enable them to manage with intelligence and in harmony with the most advanced teachings of science, large landed estates.

Those members of the congress who did not desire to visit Grignon were offered an alternative excursion to the nickel works of Messrs. Christofle, Bouilhet and Cie., at Saint Denis. I have not been able to secure any reports of this visit.

The fourth day of the congress, July 30, was devoted exclu-

sively to the honor of the late M. Pasteur. At 9.30 in the morning, the members assembled in the chapel of Notre Dame and placed a memorial wreath on Pasteur's coffin. The body of the illustrious savant lies in an alcove near the middle of the north side of Notre Dame, the coffin scarcely visible beneath a mountain of wreaths and crowns. Not only is the alcove in which the coffin rests full of these offerings, but they have been stored, in cart-loads, in all the adjoining alcoves. They come from individuals and learned societies from all parts of the world and from nearly every municipality in France. The coffin rests here temporarily until the tomb and monument, to be erected by popular subscription from all parts of the world, are ready. The final resting place of the body of Pasteur is to be in the court of the Pasteur Institute. With bowed heads the members of the congress marched by the coffin holding only the motionless brain whose activity has done so much to advance knowledge and benefit mankind. Thence the carriages conveyed us to the Pasteur Institute where the laboratories were inspected. A collection of many compounds of historical interest, prepared by Pasteur, was on exhibition, among which were all the tartaric acids and tartrates used by Pasteur in demonstrating molecular asymmetry as displayed by the same chemical substance having opposite relations to polarized light. A large collection of original cultures of the ferments leading to the discovery of antidotes for rabies was also on exhibition. A large number of microscopes showing the specific microbes of phthisis, cancer and diphtheria attracted general interest. In the clinical rooms we were permitted to see one of the daily inoculations with antirabic serum. About thirty patients were treated in less than half that number of minutes. About two or three cc. of serum are administered by hypodermic injection to each patient. The serum is inserted in the skin on the right or left side of the abdomen, the most convenient place on account of the infrequency of nerves. Each patient receives from ten to fifteen injections on successive days. About 150 patients are received monthly, and the treatment is entirely gratuitous. Those who are able, however, usually give generously to the funds of the institute. A large collection of rabbits, guinea pigs and dogs, serving for experimental purposes, was also inspected. We were next driven to St. Cloud and through its beautiful gardens and forests to Garches, where a delightful breakfast was served at one o'clock. After breakfast a visit was made to the stables containing the horses used to furnish the anti-diphtheritic serum. There are 120 of these and all seemed to be in perfect health. Each one of these horses has been inoculated with the diphthe-

ritic poison and the blood thereafter serves as the source of the serum. Two horses were operated on as an illustration of the method of work. A large vein in the neck of the animal is opened, a tube inserted and the blood collected in a sterilized jar. So skillfully is this accomplished that scarcely a drop of blood is lost. From four to six liters of blood are collected from each animal, when the vein is closed and the horse returned to his stall. In three or four weeks he is ready to supply another quantity of blood. The jars containing the blood are placed in a cupboard for about forty-eight hours, when, if the horse has been properly inoculated, their contents will be found sharply separated into clots and serum. The serum, which is of a light yellow color, is removed by decantation and by an ingenious apparatus, which prevents all danger of infection, is bottled in vials containing ten cc. each. One horse was shown us that had furnished in the past few years several hundred liters of serum. He appeared to be good for many hundred more. The serum thus prepared is used directly by subcutaneous injection on patients suffering from diphtheria. Every appointment in these stables was such as to impress the visitors with a new and a noble idea of science, ministering thus directly to saving life and especially the lives of children. No wonder the body of him who did so much to establish the lines of investigations which, under his immediate direction, if not by his own hands, have led to such ameliorations in the sufferings of men, lies to-day in honor in one of the most magnificent churches in the world, buried under flowers and wreaths, while the memory of his work lives immortal in the hearts of the people it has blessed.

Next was inspected the national porcelain works at Sêvres, reached after a pleasant drive from Garches. The officials of the factory received the guests at the entrance and dividing the visitors into small parties each was personally conducted through the works. Beginning with the crude materials, kaolin, quartz, etc., the methods of grinding and mixing were first explained. The character of the mixing is of course suited to the nature of the object in view, the massive urns and vases having a different proportion of the several ingredients from the delicate cups and saucers. The molding of the objects was shown in detail in its three forms; *viz.*, by carving the solid moist mass, by allowing it in a pasty state to flow into moulds, and by turning the waxy mass on a table and imparting the desired form by the hands of the operator. The urns and vases are made by the first and third methods, while the thinner vessels, such as cups, etc., are made by the second method. After drying, the glaze is applied by dipping the objects in a creamy bath of the silicates serving

to form the glaze. After the glazing is fixed by firing, the objects are passed to the decorating room to receive their final colorings. After each color is applied, it is fixed by firing. The ingenious hoods used to secure an even firing of the objects were exhibited and the manner of using them shown. The construction of the large furnaces where hundreds of vases and other objects are fired at once, was described, and the furnaces cold and in action exhibited. The visit concluded with an inspection of the museum and salesrooms with their artistic and costly contents. These are known to all visitors, but the process of manufacture which was so minutely shown us is not open to the public in general. The day was finished by a drive back to Paris through the parks of Meudon and Boulogne.

Having taken the whole of the fourth day for the interesting and instructive excursions which have just been briefly described, the fifth day, Friday, July 31, was wholly devoted to the scientific work of the congress. Sections 1, 2, 4, 5, 9, and 10 held morning sessions, and 2, 3, 5, 6, 8, and 9 met in the afternoon. The time of Section 1 was devoted to a discussion of the crystallization of sugars and the methods of suppressing the molasses in the manufacture of sugar from canes and beets. The papers presented and the discussions thereon were more technical than chemical.

In the second section, the difficulties attending the detection and estimation of the higher alcohols, aldehydes and ethers in brandies and whiskies were set forth and Mr. Tavildaroff, of St. Petersburg, gave a résumé of the best methods of procedure.

In the third section the methods of determining phosphoric acid in soils and fertilizers were again the subject of discussion and papers on this subject were presented by Messrs. Garola and Sidersky. Mr. Lasne presented a résumé of his work on the detection and estimation of iron and alumina in phosphates. In section 5, papers on the analysis of fats, estimation of acetic acid in pyroligneous acid, a new method of estimating alcohol by means of the ebullioscope, and a rapid method of analyzing denaturalized alcohol were presented by Messrs. Jean, Kestner, Wiley, and Guillier, respectively.

In the ninth section, the application of the spectroscope in medico-legal cases was discussed. In connection with a discussion of the influence exerted by ptomaines on the detection of alkaloids in medico-legal cases, Mr. Doremus presented a paper entitled "Recovery of Morphine from a Cadaver Embalmed with Arsenical Solution."

The subject of the possible detection of toxines in potable

waters was also discussed and the influence exerted on them by organic matters in process of decomposition pointed out.

In the afternoon, in section 2, a paper was presented by Mr. Kayser on the properties of yeasts of different origin. A subject of interest to the wine growers of our southern states and California was a paper on the vinification in warm climates, by Mr. Dugast. The pasteurization of wines was discussed in a paper by Mr. Malvezin. Other papers of interest to wine makers were presented and discussed.

To chemists and bacteriologists engaged in the manufacture and study of butter and cheese, the proceedings in section 3 were of great interest. The best methods of disinfecting stables and creameries by chemical means were presented by Mr. Bordas. A résumé of our knowledge concerning the influence of food on the composition and character of milk and butter was presented by Mr. Martin. A general discussion of the best means of providing cities with pure milk was led by Mr. Saillard. The importance of selecting ferments in the manufacture of butter and cheese was discussed by the section, but the work done by Conn and others in the United States did not seem to be appreciated.

In section 3 a paper on the effect of impurities on the properties of metals was presented by Mr. Le Verrier, and the methods of micrographic and photomicrographic examination of metals and alloys were described by Mr. Osmond.

In section 5, Mr. Jobin presented a paper giving the data for comparing the different saccharimetric scales in use in the determination of sugar by the polariscope, and the method of securing a uniform scale was discussed by Mr. Sidersky. It was voted that a quartz plate of exactly one millimeter thickness was the most scientific standard by which to measure or fix a saccharimetric scale. The most probable value of this standard at the present time is expressed by an angular rotation of $21^{\circ}\ 40'$.

In section 8, papers were read by Mr. Lasne on the phosphate industry, by Mr. Th. Schloesing on the condensation of vapors at a high temperature, on the ammonia industry by Mr. Truchot, and several other papers of less importance.

In section 9, the subject of the analysis of urine and the determination of urea was discussed by Messrs. Monfet, Taffe, Hodencq, Vicario, Hugnei, Barthe, Girard, and Doremus, the latter describing an apparatus for the purpose, invented some time ago by himself, and also the use of bromine dissolved in sodium bromide, as proposed by Rice.

In the evening a lecture was given to the congress in the amphitheatre of the Sorbonne on color photography by Mr.

Lippmann, who has achieved an international reputation by his researches into this important process. The principles of color photography were described and illustrated by apt experiments in conjunction with a projecting lantern. The process developed by Lippmann is based on the well known properties of thin films, as, for instance, a soap bubble to show colored bands due to the relation between the thickness of the film and the length of the waves of light. Mr. Lippmann has succeeded in depositing on a glass plate superimposed films of silver of extreme tenuousness and each of these films differs in thickness for each variation of color in the object producing the photograph. When the photograph is thus constructed it happens that when it is viewed by reflected light, every color of the object photographed is exactly reproduced. A large number of these photographs, representing paintings, flowers, landscapes and persons, was projected by reflection with the most vivid verisimilitude. Perhaps the most interesting of these was the spectrum of argon, in which the blue bands were shown in perfectly natural colors and clearly defined. The photographic effect is secured by exposing a perfectly transparent sensitive plate, backed by metallic mercury, in contact with the film. The sensitive surface of the plate is turned away from the object to be photographed. The plate holder for this operation was shown and is remarkable alike for its ingenuity and simplicity. The importance of color photography, as a means of fixing objects for study, is as great as its usefulness will prove to be in preserving with all the tints of vitality the faces of friends and the beguilements of beauty.

Mr. Lippmann kindly granted to Mr. Doremus and myself a private interview after the lecture, where we had a better opportunity to examine the negatives. They resemble the daguerreotypes of forty years ago and a distinct view of the image is only obtained by inclining the plate in the proper manner to secure the reflection of the light. Unfortunately, these negatives are not capable of being reproduced as positives as in the case of ordinary photography, and we are apparently as far away as ever from multiple printing color photography.

Sixth day, Saturday, August 1. Sessions of the sections were held only in the morning and those meeting were 1, 2, 4, 6, 7, 8 and 10.

In the fourth section Mr. Kjeldahl gave a brief statement of the present methods of conducting his process for the determination of nitrogen by moist combustion. Papers on methods of detecting and preventing frauds in the sale of commercial fertilizers were presented by Mr. Petermann. A paper on the importance of international agreement in methods of agricultural

analysis was presented by the writer. A general discussion of official methods of analyzing fertilizers was carried on, and at the end it was voted that the congress collect and publish in German and French the official methods of France, Germany and the United States. Mr. Sidersky was selected as editor of this brochure.

Messrs. Roy and Jean gave a paper in section 6 on tannins, their nature and analysis. It contained little that is new to American chemists and showed a lack of familiarity with the American publications on that subject.

In section 7 Mr. Vogel presented a paper on photography in colors, and one on the same subject was presented by Mr. Vidal. These papers gave in detail the points given *en résumé* in Mr. Lippmann's lecture.

In section 9, Mr. Guichard read a paper on alcohol from a hygienic point of view.

The employment of aluminum in the construction of cooking utensils and its influence on the wholesomeness of food prepared therein was the subject of a paper by Mr. Boroma. It was shown that with proper precautions aluminum could be safely used, but that it presented few if any advantages over copper or other metals in common use.

So widely has aluminum come into use for cooking utensils that a brief abstract of our present knowledge concerning its merits may be presented. The utility of an aluminum dish, in respect to its fitness for culinary vessels, depends on the purity of the metal. A pure aluminum dish is almost if not quite as resistant to solvent effects of ordinary foods as any common metal. The impurities which do the most harm are sodium and carbon. When the aluminum contains carbon an electric current is at once set up when a suitable liquid is applied. In such cases after water, especially if it be saline, has stood in the dish for one or two weeks, the surface will be found dotted with brilliant rings, and on scraping off the aluminum the particle of carbon will be disclosed. If a strong solution of salt be used, the action may be sufficient to cause a perforation of the metal. The aluminum of commerce, unfortunately, is not very pure, and it is for this reason that so many aluminum dishes have shown a rapid deterioration. The French troops in Madagascar have been supplied with 15,000 sets of aluminum dishes, and, when a soldier has to carry his kitchen with him, the importance of lightness is not to be despised. But even granting that in cooking in aluminum dishes a small amount of alumina is introduced into the food, it has not been shown that it exercises the least harmful action on the digestion. The experience of two men

may be cited who lived for a year on food prepared exclusively in aluminum dishes without the slightest impairment of their health.

In the afternoon the members were driven in carriages to Gennevilliers, where they inspected the irrigation works, lately constructed to supplement those at Asniéres in disposing of the sewage of Paris. It has now been more than a quarter of a century since the city of Paris has been using its sewage for irrigation. The fact that in the light of that long experiment it has recently more than doubled the area under irrigation, shows that the process is considered a practical success. The sewage of Paris consists mostly of the water used for washing the streets. Water-closets are, to a large extent, connected with vaults whose contents are removed by means of wagons, pumps and closed tanks during the night. The sewage, therefore, is not so highly polluted nor so rich in fertilizing materials as might have been supposed. For summers like the present one, which has been excessively dry, the disposal of the sewage by irrigation is easily accomplished. But in summers of excessive rainfall and in the winter, the problem is much more complex.

We first were shown a plan on a large chart of the system of sewers and the distribution of the waters. Next the pumping house was visited where the sewage is raised to a sufficient height to carry it under the Seine by a siphon aqueduct and distributed to the irrigated fields. The fields which were inspected are only a part of the vast system of irrigation now in operation. They contain 799 hectares, a part of which was once covered by the old forest of St. Germain. The city of Paris spent 200,000,000 francs in the purchase of the grounds, the building of the aqueduct, erecting the pumping machinery and building the irrigating canals. The work on the aqueduct of Achéres was commenced in 1893 and the whole work was completed in 1895. The aqueduct is eleven kilometers long and is three meters interior diameter, and it crosses the Seine, which below Paris forms a loop, twice. Fortunately, the soil, forming the basin of the Seine in this locality, is of a sandy nature and permits a somewhat rapid filtration. A clay subsoil would render the whole process inapplicable. The gardens, though only two years old, presented a scene of almost tropical exuberance. Many dwarf fruit trees were already in bearing and older trees showed the existence of orchards before the present system was inaugurated.

The methods of irrigation are exactly those practiced in the arid regions of the United States. The water is conducted in furrows on the surface between the rows of growing crops. Aside from a slightly unpleasant odor arising from the sewage, there is nothing in the scene to cause the observer to look on

the perfect vegetables and flowers with suspicion. In harmony with the French devotion to art, the borders of all the plots are planted in roses and other flowers and these, at the time of our visit, were all in full bloom, recalling in their floral exuberance the gardens of California. Here, as a result of the applications of science, typhoid fever is turned into turnips, dysentery dances in the dew on the dahlias, and cholera comes chortling as cabbage. The one unpleasant reflection is found in the fact that this extensive harvest is sold exclusively in the Paris markets and one can hardly avoid thinking in the restaurants over his cauliflower and artichoke of the long race they may have run in the aqueduct of Achères. At the end of the experimental field, next to the river, the sewage which has passed through the soil reappears as a large stream of pure water, absolutely colorless and bright. Glasses of the attractive fluid were offered the visitors, many of whom, unmindful of miasm and microbes, drank, willing martyrs to science or curiosity. The number of micro-organisms, which is many millions in the sewage, is diminished to 2,500 in each cubic centimeter of the filtered water.

Seventh day, Sunday, August 2. An excursion was offered to the members of the congress on Sunday to Compêigne. On reaching the station, a band of music welcomed the excursionists. They were driven through the gardens and forests in carriages and at one o'clock a breakfast was served.

Eighth day, Monday, August 3. In section 1 papers were presented on the methods of determining water in organic viscous liquids, by Mr. Pellet. The process recommended is by absorption with pumice stone and subsequent drying, first at 60° to 80° and finally at 100°. Molasses and solids should first be dissolved in water to promote absorption by the pumice. A drying dish was exhibited with a circular depression in the center, into which the body is weighed and mixed with enough water to make it flow easily. The fragments of pumice are placed on the flat bottom of the dish, exterior to the depression, and the dissolved mass is absorbed by the pumice on inclining the dish. The dish and cover are made of aluminum. The diameter of the dish is about seven and its depth two cm. The composition of molasses derived from the sugar cane was discussed at some length. Raffinose, to the extent of three per cent., has been detected in samples of cane molasses of Egyptian origin. The reducing sugar, in cane molasses, according to the statement of Pellet, is composed solely of invert sugar, a conclusion which he has reached by applying the method of estimating levulose described by the writer in this Journal a few months ago.[1]

[1] Vol. 18, No. 1, p. 81.

An interesting paper by Mr. Herzfeld, of Berlin, gave a rêsumé of the best methods of separating sugars in mixtures.

In section 3, the session was devoted to the chemical study of processes of bread making, and especially to the methods of analysis of moist and dry gluten. The processes presented are almost identical with those in use in the United States. Mr. Lindet, the president of the congress, read a communication on the methods of determining starch in grains and flours, in which the separation by a ferment or by water under steam pressure was recommended as the best. These are the processes which we have preferred for several years in the agricultural laboratory at Washington.

In section 6, papers were presented on gutta percha, paper, and paint used to prevent corrosion of ship bottoms.

In section 9 a paper on the analysis of wines and vinegar was presented by Mr. Leroy. The detection of glucose in beer was discussed by Mr. Padé. The question of fermentation and the germicidal methods of controlling it by means of fluorides was discussed by Mr. Effront.

An interesting exhibition was given of the workings of the latest form of bomb calorimeter for the determination of the thermal equivalents of foods.

Among the more interesting papers presented in the afternoon may be mentioned one by Mr. Fernback, director of the laboratories of the Pasteur Institute, on the utilization of the carbon dioxide arising from fermentation, in section 2; the influence of culture on the chemical and physical properties of the soil, by Mr. Deherain, in section 4, and the estimation of lactose and sucrose in condensed milks, by Mr. F. Dupont, the general secretary of the congress, in section 5.

In the evening a banquet was given to the chairmen of committees of organization and to the delegates of foreign governments, in the Salle des grandes Fêtes of the Grand Hotel, under the presidency of Mr. Cochery, Minister of Finance, at which nearly 500 sat down. An orchestra rendered beautiful music during the repast, giving among other things the national airs of the various governments represented. "Yankee Doodle" doubtless was heard with equanimity, but one can imagine the feelings of the Frenchmen present when "Die Wacht am Rhein" was given. Short addresses were made by Mr. Lindet, the president of the congress, by Mr. Doremus, on the part of the foreign delegates, and a rather long one by the Minister, who greeted the chemists for many reasons, and especially, he said, "because you are the precious auxiliaries of my department in promoting the production of articles that can be taxed." Mr. Doremus introduced his address by quoting one of the inscriptions on the statue

of Danton : " Apres le pain l'education est le plus grand besoin du peuple." He alluded to the addresses of Berthelot, Moissan, and Lippmann, as illustrations of a few of the accomplishments of applied chemistry, and said the congress had shown in a striking manner the necessity of a close alliance between applied and research science. Pasteur will owe his immortality to the great faculty he possessed of finding a practical application for his discoveries. He concluded as follows : " Hon. Minister of Finance, representing the French Republic, M. Berthelot, the illustrious president of honor of this congress, M. Lindet, the president of the congress, M. Dupont, the secretary, I wish to thank you in behalf of the foreign delegates, for the hospitality, friendship, and good fellowship with which we have been received. In the name of the foreign delegates, I propose this toast, the French Republic, patron not only of this congress, but also of science, art and industry, the mother of men famous in each science, but especially in chemistry."

The strangers present were given a very favorable opportunity to understand the heartiness of French hospitality and the excellence of French cooking. We might learn more things than good cooking from a French banquet and among others the art of limiting the post prandial speeches. At ten o'clock the guests left the table and assembled in the grand salon, where coffee and liqueurs were served and an hour or more spent in social intercourse.

Ninth day, Tuesday, August 4. I have already used so much space in giving even a few of the details of the congress that it is not advisable to mention even the more important communications presented to-day. Morning sessions only were held. In the afternoon the Conservatoire des Arts et Métiers was visited, where the congress was received by Mr. Aimé Girard, the professor of applied chemistry, and shown through the laboratories and museums. In the latter alone are enough objects of interest to employ the time of a scientist for a month for a careful study. We can only mention *fastigia rerum*. The pendulum used by Foucault in his classical experiments is still swinging and showing by its deflections the rotation of the earth. All the important apparatus used by Lavoisier is collected here. The globes employed by him for determining the composition of water are remarkably well made and even to-day would be regarded as entirely convenient. But they have their chief value as the remains of those era-making investigations, cut short by the guillotine, which laid the foundation of modern chemistry. A wooden wheel, preserved by the copper sulphate in an abandoned copper mine since the fifth century, illustrates in a most

striking way one of the best methods of preventing decay in railroad ties. The standard measures of all nations make an interesting collection, but, unfortunately, we were not permitted to see the original meter, which is preserved from view in the vaults of the building. In the courtyards are bronze statues of Le Blanc, who made the fortunes of so many and committed suicide by reason of his own poverty, and of Boussingault, the contemporary of Liebig and the father of French agricultural chemistry. A photographic view of the congress was made on the steps of the west facade of the building.

Tenth day, Wednesday, August 5. In the morning the sections held their final sessions for hearing papers and discussions. In the afternoon the closing meeting of the congress was held in the grand amphitheatre of the Sorbonne under the presidency of Mr. Henri Boucher, Minister of Commerce and Industry. Addresses were made by Mr. Lindet and the Minister and a report of the proceedings of the congress presented by the secretary, Mr. Dupont. Turin and Vienna were placed in nomination as the places of meeting of the congress in 1898. Vienna was selected by a large majority. An invitation was extended by Mr. Lindet to hold the congress of 1900 in Paris during the World's Exhibition, and that invitation will doubtless be accepted at Vienna.

After the adjournment of the meeting, the new laboratories of organic chemistry, constructed by Friedel, were inspected by Mr. Doremus and myself. In the confusion of the summer cleaning, we could hardly form any favorable judgment of their points of excellence. The ultra impressionist painting of Paradise Lost, a mural ornamentation back of the professor's lecture table, was the most original and inexplicable feature of the laboratory.

PARIS, August 10, 1896.

NOTE.

The fourteenth annual report of the Committee on Indexing Chemical Literature was presented to the American Association for the Advancement of Science at the Buffalo meeting, August 24. A large amount of work has been done in this field during the year. The committee is an active one and has done a valuable work in encouraging and recording biographical undertakings. Copies of the report may be obtained of the chairman, Dr. H. Carrington Bolton, Cosmos Club, Washington, D. C.