as the consumer would apparently receive less in pounds and it would appear as though the manufacturer would be correspondingly benefited. The benefit, on the other hand, which the consumer would derive from a standard temperature for measuring liquids, would ultimately be greater than any possible temporary loss he might sustain.

If we desire to calculate from specific gravity to weight per gallon, the question of ratio arises. Shall this specific gravity relate to water at the same temperature $\frac{t_m}{t_m}$ or shall it relate to water at 4°C . $\frac{t_m}{4^\circ \text{C}}$?

Practically it does not make any difference, however, as we will show by the following reasoning:

1. The gallon is 231 cubic inches.
2. A brass gallon measure standardized at 4°C . contains 231.20 cubic inches at 20°C .
3. *a*, 231.20 cubic inches of water at 4°C . weighs in air 8.3432 lbs. = *W*.
- b*, 231.20 cubic inches of water at 20°C . weighs in air 8.3285 lbs. = *W*₁.
4. Specific gravity $\frac{20^\circ}{20^\circ}$: Specific gravity $\frac{20^\circ}{4^\circ}$ =
 $1 : 0.9982343 = W : W_1$

Therefore:

$$\text{Specific gravity } \frac{20^\circ}{4^\circ} \times W = \text{specific gravity } \frac{20^\circ}{20^\circ} \times W_1$$

For practical purposes, therefore, we could define the gallon in about the following terms:

"The gallon of liquid shall be considered as equal to the weight obtained by multiplying *a*, the specific gravity of the liquid at $\frac{20^\circ \text{C}}{4^\circ \text{C}}$, by 8.3432 lbs. or *b*,

the specific gravity of the liquid at $\frac{20^\circ \text{C}}{20^\circ \text{C}}$, by 8.3285."

Whether this definition would be of practical value in specifications or not is yet to be determined, but it is certain that it at least is deserving of consideration.

A METHOD FOR THE DETERMINATION OF TIN IN CANNED FOODS.

By HERMAN SCHREIBER AND W. C. TABER.

Received January 27, 1911.

The determination of tin in canned foods, which has recently become of increased importance, may be made by several methods, each having its advantages and defects. Ashing the material at a very low heat in a muffle will give correct results with some foods under some circumstances, but not always, and when the composition of the material is not known, it is not safe to apply this method. Moreover, tin and its salts are volatilized by heat in the presence of chlorid of ammonia and probably with other chlorids also, since it is well known that sodium chlorid volatilizes on heating strongly. When small amounts of a metal are to be recovered from a large amount of organic matter, the danger of mechanical loss in the fumes is very great. After ashing, the ash must be fused with caustic alkali if all of the tin is to be recovered, so that this process does not offer any advantage over the

method herein proposed in regard to the time necessary for making the determination.

Munson¹ has proposed carbonizing the organic matter with sulphuric acid and heat, and ashing in a muffle with the aid of nitric acid. Determinations made by this method did not give satisfactory duplicates, and the results represented only about 50 per cent. of the tin present, as determined by sulphuric acid digestion (Table I) in Halenke's wet ashing method, as modified by Schryver.² In this method the organic matter is destroyed by digestion with large amounts of sulphuric acid with the aid of potassium sulphate.

TABLE I.
COMPARISON OF THE MUNSON METHOD AND THE SULPHURIC ACID OR WET COMBUSTION METHOD (SCHRYVER).

Sample.	Gram of tin found in 50 grams of sample.	
	By Munson method.	By sulphuric acid method. (Schryver).
Herring in tomato sauce.....	0.0236	0.0458
Do.....	0.0217	0.0652
Sardines.....	{ 0.0318 }	0.0652
	{ 0.0462 }	
Do.....	{ 0.0682 ³ }	
	{ 0.0801 ³ }	

Table II shows that the results obtained when the precipitates are weighed as stannic oxide (SnO_2) are as correct as when the precipitate is dissolved and determined electrolytically⁴ as tin. Schryver has shown that the wet combustion method gives accurate results and good duplicates. This is also shown by the determinations given in Table II. However, this method has some very serious practical defects. When tin is to be determined in meat, fish, or sirups, only 25 grams of material can be digested in one flask. This necessitates making two digestions in order that an amount can be used which will avoid the great multiplication of the analytical error which would occur if the result were calculated as milligrams per kilogram. Using such small quantities of the sample increases the error of weighing and sampling, and, moreover, limits the amount of work which can be done under ordinary conditions. The flasks have a tendency to break during the digestion, which, together with the foaming of the material, requires constant attention and considerable experience before satisfactory results can be obtained. No attempt was made to determine the amount of tin which could be recovered by the various methods by adding known amounts of soluble tin salts to food, since this would not give conditions analogous to those met in practice.

Our work indicated that the following was the most satisfactory method of making a sulphuric acid digestion: Weigh 25 grams of fish or meat or 50 grams of vegetables into a beaker, wash into an 800 or 1000 cc. Kjeldahl flask, add from 100 to 150 cc. of water, 25 grams of potassium sulphate, 50 cc. of sulphuric acid (sp. gr. 1.84), and a few glass beads. Place over a small flame, rotate a few times till it boils, then in-

¹ U. S. Dept. Agr., Bur. of Chem., *Bull.* 107, 62 (revised).

² Report 7 of the Local Government Board (medical department) of Great Britain on the presence of tin in certain canned goods.

³ Wet combustion not made, given to show poor concordance of results.

⁴ U. S. Dept. Agr., Bur. of Chem., *Bull.* 207, 69 (revised).

crease heat and boil vigorously until the water is boiled off and fumes of sulphur trioxid appear in the neck of the flask and settle back, remove it from the flame before it foams or caking will ensue and the flask break in subsequent boiling. Add 50 cc. of sulphuric acid (sp. gr. 1.84), turn the flame down so that it just touches the flask, and heat gently until the mass boils quietly. Again increase the heat and boil vigorously until decolorized. If the flask is placed in an asbestos ring, cracking can often be avoided. This digestion requires at least six hours.

TABLE II.

COMPARISON OF RESULTS BY WET COMBUSTION OR SULPHURIC ACID METHOD AND BY ELECTROLYSIS.

Gram of tin per 50 grams of sample.

Sample.	Wet combustion method. Gram.	Stannic oxid dissolved and redetermined by electrolysis. Gram.
Blackberry jam.....	{ 0.0126 0.0128 }	0.0124
Herring.....	0.0325	0.0346
Herring in tomato sauce.....	0.0296	0.0304
Herring in bouillon.....	0.0464	0.0468

To determine the accuracy of duplicate determinations by the sulphuric acid method, samples of canned fish were very carefully prepared by passing them through a sausage grinder and then thoroughly mixing them by hand. From these mixtures duplicate weighings of 25 grams were made on an analytical balance to ± 0.05 gram and the following results were obtained:

TABLE III.

DUPLICATE DETERMINATIONS OF TIN BY THE SULPHURIC ACID OR WET COMBUSTION METHOD.

Sample.	Gram of tin in 25 grams of sample.
Composite fish:	
Sample A.....	{ 0.0134 0.0138 0.0079 }
Sample B.....	{ 0.0087 0.0164 0.0158 }
Sample C.....	

To determine the effect of the presence of sodium chlorid on results obtained by the wet combustion method, 10 grams of salt were added to the material to be analyzed. The figures given in the following table prove that this had no effect on the results:

TABLE IV.

DETERMINATION OF TIN BY THE SULPHURIC ACID METHOD IN THE PRESENCE OF SALT.

Gram of tin in 50 grams of sample.

Sample.	50 grams of sample + 10 grams of salt.	Original sample.
Fish.....	0.0363	0.0339
Beets.....	0.0425	0.0419
Peas.....	0.0282	0.0254

If tin is to be estimated in foods, such as fish, which contain so great an amount of salt as not to be edible before soaking, it is better to determine the tin by the sulphuric acid method, as large amounts of salt would interfere with the burning off of the carbon by the

proposed method on page 259. However, such cases would be very rare, as salt fish are commonly packed in wood and not in tin.

The method proposed on page 259 requires practically no experience in its manipulation, and a large amount of the sample is used, in both of which points it is superior to the wet combustion method. It was at first thought that the destruction of the organic matter could be effected by an alkaline fusion, using alkaline hydrate and nitrates. However, when material, such as fish, which contains fat, is to be analyzed, it is impossible to make such a fusion, as it will burn and blow out of the crucible. When alkaline hydrates are used alone, a solid cake results which retards the complete destruction of carbon by coating the small particles. A mixture of hydrate, carbonate, and magnesium oxid was found to give a very porous fusion, in which the carbon was easily oxidized in the muffle. The fusion was at first attempted in large nickel crucibles with very good results as shown by Table V.

TABLE V.

COMPARISON OF THE SULPHURIC ACID OR WET COMBUSTION METHOD WITH ALKALI FUSION IN A NICKEL CRUCIBLE BY THE PROPOSED METHOD.

Gram of tin per 50 grams of sample.

Sample.	Wet combustion method.	Proposed method, using a nickel crucible.
Herring tomato sauce No. 3552.....	0.0397	{ 0.0400 0.0383 0.0351 }
Herring tomato sauce No. 3553.....	0.0325	{ 0.0334 0.0310 0.0101 }
Pineapple No. 4876.....	0.0102	

The nickel crucibles, however, were very seriously attacked, and since they are expensive, it was thought that fusion in an iron crucible would be a great advantage on account of the lower cost and the higher melting point of iron. When iron crucibles were first substituted, the results obtained were lower than by the wet combustion method, and a repetition of the determination gave no solution of the difficulty. At this time hydrochloric acid was used for dissolving the fusions and finally, on the theory that the trouble was due to the solvent action of the iron chlorid on the tin, sulphuric acid was substituted for hydrochloric acid and correct results were obtained, as shown in Table VI.

TABLE VI.

COMPARISON OF RESULTS BY THE WET COMBUSTION METHOD AND THE PROPOSED METHOD USING DIFFERENT SOLVENTS AND AN IRON CRUCIBLE.

Gram of tin in 50 grams of sample.

Sample.	Wet combustion method.	Using hydrochloric acid.	Proposed method. Using sulphuric and nitric acids.
Beets.....	0.0419	0.0331	{ 0.0416 0.0403 0.0331 }
Tomatoes.....	0.0345	0.0290	{ 0.0310 0.0283 0.0268 }
Peas.....	0.0254	0.0252	{ 0.0276 }
Corn.....	0.0277	0.0238	{ 0.0320 0.0343 }
Apples.....	0.0338	0.0239	{ 0.0332 }
Spinach.....	0.0048	0.0060	{ 0.0298 0.0328 }
Mushrooms.....	0.0107	0.0147	
Canned fish.....	0.0325		

The results reported in Tables IV to VII were obtained in the preliminary work done in developing the proposed method. In the method, as then used, 5 grams of magnesium oxide were employed, and the solution of the fusion was not concentrated until it fumed with sulphuric acid, but was simply boiled down, and blue ribbon paper was used for the first filtration. It was found that the fusions could be burned at a lower temperature if 10 grams of magnesium oxide were used, which makes the burning much easier and materially lengthens the life of the crucible. It was also found best to use a larger amount of acid, as specified in the method, since under certain circumstances all of the tin was not dissolved when only 50 cc. of 1 : 1 sulphuric acid and 5 cc. of nitric acid were used. The use of blue ribbon paper was also abandoned, since it decreased the speed of filtration, and, furthermore, it has no apparent advantage (Table VII) when the precipitation is made as specified in the proposed method. The experimental data indicate that sulphuric acid alone will not take all of the tin into solution, although no explanation of this can be offered.

TABLE VII.

COMPARISON OF RESULTS BY THE WET COMBUSTION METHOD AND PROPOSED METHOD USING BLUE RIBBON FILTER PAPERS AND SULPHURIC ACID.

Gram of tin in 50 grams of sample.		Proposed method using blue ribbon filter papers ¹ for the first filtration and 50 cc. of 1 : 1 sulphuric acid and 5 cc. of nitric acid to dissolve the fusion.
Sample.	Wet combustion method.	
Beets.....	0.0419	{ 0.0403 } 0.0414 { 0.0424 }
Peas.....	0.0254	{ 0.0265 } 0.0270 { 0.0275 }
Corn.....	0.0277	{ 0.0269 } 0.0273 { 0.0276 }
Apples.....	0.0338	0.0323
Fish.....	0.0325	{ 0.0303 } 0.0316 { 0.0329 }

The proposed method has several advantages over the wet combustion method: (1) it decreases the errors of sampling; (2) it decreases the errors due to multiplication when calculating to milligrams per kilogram; (3) there need be no loss of samples if the material is properly ground and not heated too rapidly on the hot plate; (4) in the wet ashing methods it is necessary to neutralize a large amount of acid before precipitating with hydrogen sulphide.

Molasses and heavy syrups must be dried longer on the hot plate than any other material analyzed, over three hours being necessary to dry these properly. However, as it requires no attention at this stage, this is not a serious defect as compared with the difficulties of determining tin by the wet ashing method. In drying any material on the hot plate it is not necessary to dry it down to a hard crust if it is put in a cold muffle and heat applied gradually. If tin is to be determined in oils, less of the sample should be used, so that there will be an excess of free sodium hydrate.

¹ These tin oxides were only very slightly discolored, being very nearly the same shade as those from the wet combustion.

The sulphuric acid method for the determination of tin can not be applied to oils, and therefore no comparison of the two methods can be made.

THE PROPOSED ALKALI FUSION METHOD.

Pass the sample through a meat-grinding machine and mix the resulting mass well so as to get as homogeneous a sample as possible. Weigh 100 grams of the sample and 10 grams of magnesium oxide into an 8-ounce wrought-iron crucible on a rough balance. Add 50 cc. of an aqueous solution containing 150 grams of sodium hydrate and 100 grams of sodium carbonate per liter, stir well with a short piece of stout glass rod, add 75 cc. of 95 per cent. alcohol and stir again. Place on the steam bath and evaporate the alcohol. This must be done with care, stirring frequently at the beginning, else it may bump or foam over, but if the material is gradually heated there is no danger of loss. If the material foams, remove from the steam bath or hot plate for a moment, and then replace on the bath and it will usually boil quietly. Large lumps in the mass will cause bumping, therefore the sample should be as fine as possible. Fish liquefy on the steam bath, boil down quietly, and without bumping. After danger from frothing has ceased, apply the full heat of the steam bath. This evaporation requires about one hour. Transfer to a hot plate covered with a thin sheet of asbestos and dry down gradually, running at from 130° to 160° C. at first (determine temperature by laying a thermometer on the asbestos); then raise the temperature and continue the boiling, finally using the full heat of the hot plate, which should be sufficient to boil off sulphuric acid. This requires from one and a half to two hours. Place in a cold muffle, heat gradually until all volatile matter is driven off, and then burn until all of the carbon is destroyed. This requires from two to three hours. Remove from the muffle as soon as burned, cool, cover the residue with water, and let stand a few minutes. Using an iron spatula, scrape and wash the contents of the crucible into a 600 cc. beaker. Cover the beaker and add gradually 40 cc. of dilute sulphuric acid (1 : 1) and 10 cc. to the crucible containing some water. Rotate, scrape the sides of the crucible with a spatula, and wash into the beaker. When the reaction is ended, add 50 cc. of sulphuric acid (sp. gr. 1.84) and 30 cc. of nitric acid (sp. gr. 1.42). Cover with a watch glass and boil briskly on a hot plate, finally with the full heat of the hot plate, until the residue gives off fumes of SO₃. Allow to fume for 10 minutes, remove from the hot plate and allow to cool but not to solidify. Pass the stem of a funnel bent at an angle over the lip of the beaker and under the cover glass and add successively small amounts of distilled water through the funnel from a wash bottle until violent action has ceased. Then add rapidly about 150 to 200 cc. more water through the funnel and remove the funnel and watch glass, washing into the beaker with distilled water. Stir the cake in the beaker and wash into a 1-liter erlenmeyer with distilled water.

The total volume in the erlenmeyer at this time

should be about 300 to 400 cc. Cool, pass in hydrogen sulphid for a few seconds, rotate the flask and add 28 per cent. ammonium hydroxide slowly until the black color of the precipitated iron sulphide just persists on rotating the flask. Immediately make acid with 1 : 1 sulphuric acid and add 10 cc. excess of the dilute acid. Dilute the contents of the flask to 1 liter with boiling water and continue passing in a rapid stream of hydrogen sulphid for 25 minutes more, cork, and let stand over night. The next morning heat on the steam bath for about half an hour, rotating the flask two or three times during the heating, partly cool by setting in cold water, so that the flask can be handled easily, and filter onto a 12.5 cm. ashless white ribbon paper, No. 589, washing the filter with a solution consisting of 50 cc. glacial acetic acid and 100 cc. of a saturated solution of ammonium acetate, made up to a liter with distilled water. Wash the precipitate six times with this solution, filling the filter at each washing. Return the filter paper and precipitate to the erlenmeyer, add 100 cc. of 20 per cent. potassium hydroxid and boil over a free flame for a couple of minutes until the filter paper is broken up and the solution is clear. (The flask can be manipulated over the flame easily with a large wooden test-tube holder made of strips of pine wood and rubber bands.) Immediately decant through a double white ribbon filter paper of 12.5 cm. into a 400 cc. beaker, washing the flask and filter with successive portions of hot water until the filtrate comes through colorless. The filtrate will have a volume of about 200 to 300 cc. Add 20 cc. of concentrated hydrochloric acid to this solution, stir, add a few drops of phenolphthalein and add concentrated hydrochloric acid from a burette until the dark color of the solution disappears, then add 1 cc. excess of the acid. Test with a strip of litmus and see that the solution is acid, stir well, place on a steam bath, heat for 20 minutes, cover, and let stand over night.

In the morning test the supernatant liquor, which should be perfectly clear and brilliant, with a piece of blue litmus. If not acid, make so with concentrated hydrochloric acid and then add an excess of 1 cc. If the supernatant liquor is acid and turbid, make alkaline with potassium hydroxide and then acid with 1 cc. excess. The solution must be neither alkaline nor too acid, or there will be trouble in filtering and washing. Heat on a steam bath for half an hour, stirring two or three times. Filter onto a 12.5 cm. white ribbon paper. The precipitate will sometimes run through and must be returned until the filtrate is perfectly clear and brilliant. If the solution to be filtered is stirred vigorously, allowed to stand until the precipitate clots, and then poured onto the filter, refiltering may usually be avoided. The filtrate must be perfectly clear or some tin will be lost. Wash alternately with distilled water and the ammonium acetate solution previously mentioned until the filtrate obtained from a washing with distilled water is free from chlorides. (Do not mistake the precipitate given by the acetate solution and silver

nitrate, which is soluble in water, for silver chloride.) This requires washing until the volume of the filtrate is 200 cc. or more. Fill the filter at each washing. Place the moist filter in a porcelain crucible, dry and char on an asbestos gauze, and burn off all carbon over the free flame. Cool in a desiccator and weigh as stannic oxide.

Table VIII gives a comparison of the results obtained by this method and those obtained by Schryver's method.

TABLE VIII.
COMPARISON OF PROPOSED METHOD WITH SCHRYVER'S SULPHURIC ACID METHOD.

Sample.	Gram of tin in 100 grams of sample.	
	Proposed alkali fusion method.	Schryver's sulphuric acid method.
Mushrooms.....	$\left\{ \begin{array}{l} 0.0385 \\ 0.0366 \\ 0.0355 \end{array} \right\}$ 0.0368	0.0370
Herring in tomato sauce.....	0.0682 ¹	0.0664
Apples.....	0.0700 ¹	0.0676
Beets.....	$\left\{ \begin{array}{l} 0.0859 \\ 0.0847 \end{array} \right\}$ 0.0853	0.0838
Tomatoes.....	$\left\{ \begin{array}{l} 0.0662 \\ 0.0697 \end{array} \right\}$ 0.0679	0.0698
Do.....	0.0210 ¹	0.0204
Herring in bouillon.....	0.0959 ¹	0.1008
Kipperd herring.....	$\left\{ \begin{array}{l} 0.0336 \\ 0.0299 \end{array} \right\}$ 0.0317	0.0320
Composite samples of fish:		
Sample A.....	0.0508 ¹	0.0544
Sample B.....	$\left\{ \begin{array}{l} 0.0338 \\ 0.0386 \end{array} \right\}$ 0.0363	0.0332
Sample C.....	$\left\{ \begin{array}{l} 0.0615 \\ 0.0638 \end{array} \right\}$ 0.0627	0.0644

Experiments were made to determine the relative value of potassium hydrate and ammonium sulphid as solvents for tin sulphid and it was found that they gave concordant results. In one instance the solution by potassium hydrate gave 0.0313 gram of stannic oxid, and the ammonium sulphid gave 0.0318 gram. The sample of ketchup on which these determinations were made contained a large amount of sand, and the results show that there is no danger of silica contaminating the stannic oxid when potassium hydroxid is used. Copper was found in some of the foods examined, and since copper sulphid is more soluble in ammonium sulphide than in potassium hydrate, it seemed advisable to use the latter.

A muffle 9 by 21 inches will hold 16 crucibles at a time, and one analyst can easily make 20 determinations in a week. If the heating in the muffle is gradual and the crucibles are removed as soon as all of the carbon is destroyed, the crucible will not be blistered on the outside and only slightly on the inside, and can be used for repeated fusions. If the crucibles have been spun with a copper or brass tool, the traces of copper adhering to the crucible should be filed off. Fifteen determinations can be weighed, dried, and burned in nine hours, using a hot plate 14 by 18 inches, and a muffle 9 by 21 inches. This requires three hours' continuous watching, and then only an occasional inspection of the muffle and changing the position of the crucibles. Straight ashing, on the other hand, requires at least seven hours' burning in the muffle if even approximately accurate results

¹ Duplicates not run, as there was not sufficient material left.

are to be obtained and if the food can be put into the muffle without previous drying.

Two hundred and fifty determinations were made in working out the details of this proposed method.

SCIENTIFIC SOCIETIES.

DEDICATION OF THE CHEMISTS' CLUB.

The formal dedication of the New Chemists' Club building was celebrated on March 17th to 19th by a series of scientific meetings and social functions participated in by a large number of prominent scientific men and members of the American Chemical Society, Society of Chemical Industry, and American Electrochemical Society.

PROGRAM

Dedication Exercises

Friday afternoon, March seventeenth

Address—Dr. Morris Loeb, President of the Chemists' Building Company.

Address—Dr. Edward S. Morley, Honorary President of the VIII International Congress of Applied Chemistry.

Address—Professor Alexander Smith, President of the American Chemical Society.

Address—Professor William Walker, President of the American Electrochemical Society.

Address—Professor Wilder D. Bancroft, on "Chemical Education."

Unveiling of Rumford Memorial by Professor F. W. Clarke.

Address—Dr. Russell W. Moore, President of the Chemists' Club.

Extraordinary Meeting American Chemical Society,

Friday Evening, March Seventeenth

Address—Professor Charles Baskerville, Chairman of the Section.

Illustrated Lecture—Professor R. B. Moore, "The Rare Gases of the Atmosphere."

Lecture—Professor Jacques Loeb, "The Characteristics of Living Matter from the Physico-Chemical Point of View."

Extraordinary Meeting American Electrochemical Society,

Saturday Morning, March Eighteenth

Address—Mr. Elmer A. Sperry, Chairman of the Section.

Lecture—Dr. W. R. Whitney, "Mental Catalysis."

Lecture—Professor Wilder D. Bancroft, "Chemistry of Phosphorescence."

Extraordinary Meeting Society of Chemical Industry,

Saturday Afternoon, March Eighteenth

Address—Dr. Charles F. McKenna, Chairman.

Lecture—Dr. Wm. P. Mason, "The Contributions of Chemistry to Sanitation."

Lecture—Professor Charles F. Chandler, "The History of Chemical Industry in New York City."

*First Banquet in the New Building.
Saturday Evening, March Eighteenth*

Toastmaster

President Russell W. Moore

Master of the Revels

Mr. Elwood Hendrick

*Concert under the Auspices of the Chemists' Club,
Sunday Afternoon, March Nineteenth*

GENERAL MEETING OF AMERICAN ELECTROCHEMICAL SOCIETY.

APRIL 6TH TO 8TH.

NEW CHEMISTS' CLUB BUILDING, NEW YORK.

PROGRAM

THURSDAY, APRIL 6TH

10.00 A.M. *Annual Business Meeting* of the Society, in the Assembly Hall of the Chemists' Club. Reports of Board of Directors; Announcement of the Annual Election.

PAPERS.

Report of the Committee on Standard Tests for Dry Cells: C. F. BURGESS.

Electrically Fused Alumina as a Refractory: L. E. SAUNDERS.

A New Electric Resistance Furnace: F. A. J. FITZGERALD.

A New Laboratory Electric Furnace: M. M. KOHN.

The Johnson Electric Zinc Furnace: J. W. RICHARDS.

The Condensation of Zinc from Electric Furnaces: F. T. SNYDER.

Reliability of Electric Furnaces for Commercial Work: F. T. SNYDER.

2.00 P.M. *Visit to the Laurel Hill Works of the Nichols Copper Co.*

7.00 P.M. *Subscription Dinner, en famille, at the Chemists' Club.*

FRIDAY, APRIL 7TH

9.30 A.M. PAPERS.

The Electric Cyanamid Process for Treating Gold Ores: J. F. CLANCY.

The Electrolytic System of Amalgamating Gold Ores: E. E. CAREY.

The Electrolytic Corrosion of Electroplated Objects: W. S. LANDIS.

Electrolytic Refining as a Step in the Production of Steel: C. F. BURGESS.

Some Problems of the Electroplater: G. B. HOGABOOM.

The Haas-Oettel Electrolytic Cell: E. E. NISWONGER.

Electrical Heating for Preventing Superheating of Liquids: J. HOWARD MATHEWS.