

"The second consists therein, that his practical (that is laboratory) experience in chemistry is confined to reactions carried out on a very small scale and with apparatus to correspond. His thinking is in terms of test tubes and borax beads. If you speak to him of filtration, it means to him a three-inch disc of filter paper. He is unfamiliar with the tools he will have to work with, filter-presses, distillation-columns, large mills, tank reactions and with all the other aspects which chemical work has in the mind of the manufacturer. It is this ignorance of the tools of his trade that is the most serious obstacle he must overcome.

"The remedy is to be found in the equipment of laboratories with factory types of apparatus and in the institution of courses of study of such apparatus, determinations of their efficiency under various conditions, etc.

"In such study may easily be found a rich field for *research work*, which will tax the student's native resources to the limit, and will at the same time make him at home with his tools. Here is my partial answer to questions 8 and 9.

"There is much in these views in common with those advanced by Professor Whitaker, but with an important difference. Dr. Whitaker disclaims the intention to give the chemical engineering student instruction in special industries, while at the same time he advocates the erection of a model gas plant, or some other practical and complete plant, for instructional purpose. It is in the nature of the case that such a plant must be a mere imitation of the real thing, and I seriously doubt its value for the intended purpose. The same amount of time and money would probably bring in a much larger return if devoted to the separate study of those chemical manufacturing operations and appliances which constitute the elements or operative units out of which nearly every chemical factory is built up."

We think that the thought expressed in the last sentence of Dr. Andrews' remarks will bear study and developing.

Chemical manufacturing operations and appliances ought to be studied in both a descriptive and a practical way. Consider for a moment the variety of mixtures that have to be dealt with and from which values have to be extracted or created. The methods of extraction and separation in wet and dry ways, purification, and modification whereby the product acquires valuable properties can give rise to innumerable practical problems to be given to be worked out by the would-be chemical engineer. The economical handling of large quantities of materials, both end-products and lesser valuable side-products, should be studied in concrete examples as far as possible.

The former chairman of the committee, Dr. Frerichs, has given on pp. 30 and 31 of the Bulletin of Aug., 1910, a list of such lines of practical study that is very suggestive and shows some of the things that ought to go into a course for chemical engineers.

Then there are a few books, some in German and some in English, which take up for comparative

study the appliances and apparatus of manufacturing chemical works. We may mention Parnicke's "Maschinelle Hilfsmittel der Chemischen technik," Rauter's "Die Betriebsmittel der Chemischen Technik," and Oscar Nagel's "Mechanical Appliances of the Chemical and Metallurgical Industries."

The study in the class-room and in the technical school laboratories of working models of factory apparatus and the designing of modifications and special forms for varying conditions under an instructor who has had factory acquaintance ought to help materially in developing independence of thought on the part of an intelligent student.

Just as the making of preparations, both simple and more complex, is now considered a proper and necessary part of the work of the inorganic and the organic chemical laboratories, so the making of preparations on a small factory scale, using factory appliances and factory methods, and above all reckoning the cost of materials, time and labor, ought to be systematically practiced as a proper training for chemical engineering students. Our German brethren have published books covering this line of instruction also. I have a recent one which I found quite suggestive and of the type I have had in mind in referring to such exercises. It is called "Chemisches Prakticum, Präparative und fabrikatorische Uebungen," by A. Wolfrum, and is accompanied by an atlas on "Die apparate der chemischen technik und des laboratoriums, sowie die Einrichtung vollständiger betriebe," with many figures and tables.

However, the committee feel that it is not their province to go too much into detail concerning courses, but to present to the Institute what has resulted from the issuing of the Circular No. 2 to the Institute membership and would leave it to the Institute to determine what, if any, steps should be taken to give expression to our views in some formal or official way to those interested in chemical engineering education.

W. M. BOOTH,
A. A. L. VEILLON,
M. C. WHITAKER,
F. C. WIECHMANN,
SAMUEL P. SADTLER,

Chairman.

REPORT OF THE COMMITTEE ON QUANTITATIVE METHODS.

INDIANAPOLIS MEETING, A. C. S., JUNE, 1911.

Your Committee begs to submit the following report.

Since the time of the last meeting of this Section, it would seem that an unusual amount of work has fallen to the lot of the various members of the Committee, so it has been extremely difficult to make nearly the amount of progress which was anticipated. Some of the members of the Committee have found it impossible to do any work at this time, but this is off-set by the work of other members, who in the previous six months were likewise hindered from doing any work.

On February 2nd, the following assay process for mercury salts, as suggested by the chairman, was sent out.

"Estimation as Mercuric Sulphide.—This method may be applied to all of the mercury salts used in the Pharmacopoeia by following the procedure indicated below.

"Mercurous Chloride, Mercurous Bromide, Mercurous Iodide and Mercuric Iodide.—Weigh out accurately about 0.2 gram of the sample to be assayed, dissolve by the aid of 1 gram KI in 20 cc. water. Add 10 cc. 10 per cent. solution NaOH and then 3 cc. of 40 per cent. formaldehyde solution diluted to 10 cc. with water. Warm on a water bath for ten minutes or until complete precipitation of metallic mercury takes place. Decant through a Gooch filter and wash the precipitated mercury thoroughly with water. Dissolve off the filter with 2 cc. concentrated nitric acid, washing the filter carefully with water.

"(From this point on the process may be applied also to mercuric oxide, metallic mercury, ammoniated mercury, mercury with chalk and mercuric nitrate by solution in 2 cc. nitric acid and carrying out the following procedure.)

"Evaporate the solution to dryness on water bath and take up with 2 cc. concentrated hydrochloric acid and water sufficient to make 50 cc. of solution.

"(From this point the process is applicable to mercuric chloride by solution as above.)

"Precipitate the mercury from this solution in the cold by slow stream of hydrogen sulphide, let settle and filter through Gooch filter. Wash thoroughly with water and then three times with alcohol. In order to remove any sulphur precipitated along with the mercuric sulphide, the precipitate should now be washed with carbon disulphide, which may be accomplished most easily by the method given in Treadwell-Hall, Volume 2, page 89. After extraction for one hour wash once with alcohol and once with ether to remove the carbon disulphide. Dry at 100°-110° and weigh."

It was requested that this be tried both with and without washing the precipitated mercuric sulphide with carbon disulphide.

Reports were received as follows:

Brown: HgCl with CS₂, 98.79 per cent., 98.82, 98.49, 99.44; average, 98.98 per cent.

HgI₂, with CS₂, 97.94 per cent., 97.28, 98.84, 98.91; average, 98.24 per cent.

Sy: HgCl, without CS₂, 98.84 per cent, 96.91, 98.41; average, 98.06 per cent.

With CS₂, 98.55 per cent., 96.91, 98.09; average, 97.86 per cent.

HgI₂, without CS₂, 93.24 per cent., 101.60, 82.64; average,

With CS₂, 93.24 per cent., 101.02,; average,

Taylor:

Comments of various members of the committee are as follows:

Mr. Brown: "I have tried out the sulphide method on the mercury samples as per your request,

but am not very well pleased with the method or the results.

"The method is tedious and long and there are too many chances for error to creep in. I find it very difficult to dissolve the reduced mercury off the asbestos pad completely. The proportion of mercury in the sulphide is very large, making any loss of mercury show up to a great extent when calculated to per cent. on the original sample."

Mr. Murray: "I have always looked upon the method as a laborious one and have thought that the Committee of Revision also regarded it in that light."

Mr. Sy: "I am unable to explain the results on the mercuric iodide. Washing with carbon disulphide seems to be unnecessary."

Mr. Taylor: "One frequent objection to this method is the liability of precipitation of sulphur and the difficulty of washing with carbon disulphide. However, unless the solution is very strongly acid, the precipitation of sulphur is negligible. As an illustration of this, hydrogen sulphide was passed into 1 and 2 per cent. nitric acid and the strongly smelling solution was allowed to stand, but no precipitate or opalescence appeared within two hours. While the percentage of mercury in the sulphide is large, yet the loss with careful manipulation should be but very small. Experience with this method will, I believe, show that it is easy and rapid and fully as desirable as any of the volumetric methods which were presented at the last meeting.

"The solution of mercury compounds may also be accomplished easily by hydrochloric acid and potassium chlorate instead of nitric acid.

"This gives practically a solution of mercuric chloride and it only requires to blow cold air through the solution for about one hour to remove every trace of chlorine, this being the most important part of the process. See that no trace of chlorine remains in the solution."

ZINC ASSAYS.

The following zinc salts of the Pharmacopoeia have the purity requirements as given but without any corresponding assay process:

Zinc acetate, 99.5 per cent.; zinc bromide, 97.0 per cent.; zinc carbonate, 72.0 per cent., ZnO; zinc chloride, 99.5 per cent.; zinc iodide, 98.0 per cent.; zinc phenolsulphonate, 99.5 per cent.; zinc stearate, 13.5 per cent., residue chiefly ZnO; zinc sulphate, 99.0 per cent.; zinc valerate, 99.0 per cent.; zinc oxide, 99.0 per cent.

Requests for suggestions on assay processes for these compounds were sent out on February 2nd and the following process was suggested by several members of the committee. This is the well known zinc ammonium phosphate method.

A cold solution of the zinc salt (0.5 to 1.5 grams) is very carefully neutralized or made slightly alkaline by the addition of ammonia with methyl orange and is made up to about 125 cc. Dissolve in this solution 5 grams of ammonium chloride and then add, with stirring, 50 cc. of 10 per cent. solution of diammonium hydrogen phosphate. Let stand on top of

water bath at nearly boiling temperature, for about one hour, or until the flocculent precipitate has become crystalline and the liquid clear. Cool and filter through a Gooch crucible, washing first with about 100 cc. of 1 per cent. solution diammonium hydrogen phosphate, then with about 500 cc. of water, followed by a little alcohol, and lastly ether. Make the washing a continuous operation, not letting the liquid get entirely off the precipitate until the end. Dry at 100°-120° and weigh as NH_4ZnPO_4 . If desired, this may be ignited in the usual way and weighed as $\text{Zn}_3\text{P}_2\text{O}_7$.

Mr. Murray writes that "this method has been tried on zinc sulphocarbolate, valerate, acetate, stearate, oxide, etc., with promising results. The acetate and sulphocarbolate require no special treatment. The valerate dissolves upon addition of the ammonia. The stearate is freed from fatty acids by hydrochloric acid, filtration and washing before the zinc can be precipitated. The oxide must, of course, be dissolved in hydrochloric acid. Judging from present experiences, the method may be expected to give no trouble with the bromide, chloride, iodide, carbonate and sulphate of zinc, nor with the zinc metallic."

This process, while it has not been put to actual trial at this time on a special sample by the Committee, yet is perhaps the most reliable and efficient method we can find for the estimation of zinc and can be readily applied to all of the various compounds in the U. S. P. with some little variation.

Following the zinc salts, the Committee expects to take up such substances as are official in the Pharmacopoeia having the definite purity requirements without an assay process and go over them in alphabetical order. The Committee is desirous at this time of receiving any further suggestions or instructions from the section as a whole and will be pleased at any time to have their attention directed to work such as will be of interest or aid to them.

Committee on Quantitative Methods,

FRANK O. TAYLOR,

Chairman.

REPORT UPON THE THIRD NATIONAL CONSERVATION CONGRESS.

Sept. 25th, 26th and 27th, 1911.

The first session of the Congress opened at ten o'clock Monday morning, Sept. 25th, at Convention Hall, Kansas City. After a prayer by the Roman Catholic Bishop of Kansas City, addresses of welcome were given by Mayor Brown, of the City, Mr. J. C. Lester, of the Kansas City Commercial Club, and Gov. Hadley, of Missouri. Responses were made by Dr. Henry Wallace, President of the Congress, and Hon. J. B. White, Chairman of the Executive Committee. Dr. Wallace pointed out how the new conditions which gradually arose in this country caused a flow of population from the rural to the urban districts. He suggested remedies for this, namely, the improvement of agricultural conditions, and this was the subject

that was to receive especial consideration in this Congress. After announcements the session closed.

The second session was called to order at 2 P.M. After an invocation the chair appointed committees on resolutions, on nominations, etc. He then called for reports from state conservation commissions and other organizations concerned in conservation. The chief address of the afternoon was given by Hon. Benjamin Lindsay, Judge of the Juvenile Court of Denver, on the *Country Child* versus the *City Child*. The Judge held there was no essential difference between the two but that surroundings, manner of life, etc., of the country boy were conducive to a better development physically and morally than in the case of the city boy. He was not as sanguine as Dr. Wallace that the trend of population from the country to the city can be checked.

The third session was called to order at 8 o'clock. After preliminary addresses by state representatives, President Taft gave the address of the evening on "*The Conservation of the Fertility of the Soil*." The President is optimistic and believes that although our methods of agriculture will have to be improved, owing to the fact that our population is growing at a greater rate than the increase in tillable land, we will still be able to feed our own population for many years from our own soil. The Department of Agriculture is doing much and plans to do more, to educate the farmer. With improved methods of farming the profits of the farmer will be more certain. The national and state Departments of Agriculture are working together for the purpose of placing in each country of every state an agricultural expert whose duty it will be to give instruction to the farmers of the country.

The fourth session opened at 10 o'clock, Tuesday, Sept. 26th. After prayer and routine business, reports from state and national organizations were continued. Papers were then read by Prof. P. C. Holden, on *Social Life on the Farm*, by W. A. Beard on *Cooperation*; and by H. Quick on *The Farmer and the Railroad*. Mr. Barrett, who was scheduled to speak on *The Farmers Educational and Cooperative Union of America* was prevented from being present by sickness.

The fifth session opened at 2 P.M. After prayer, announcements, routine business and reports of committees, addresses were given by Dr. Frederick B. Mumford, Dean of the University of Missouri, on *The Live Stock Farm and Soil Fertility*; by Mrs. Harriet W. Ashby on *The Farmer's Wife*.

The sixth session was called to order at 8 P.M. A paper was read by Mrs. Philip N. Moore on *The Community Club*. Dr. Warren H. Wilson made a forceful address on *The Church in the Open Country*. Then, after a most enthusiastic reception, Dr. Harvey W. Wiley spoke on *The Health of the People*. Dr. Wiley advocated the establishment of a national department of health in Washington, the secretary of which should be a cabinet member.

The seventh and eighth sessions were held on Wednesday the 27th inst. The printed program was