BULLETIN

of the

AMERICAN CERAMIC SOCIETY

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Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

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EDITORIAL

REPORT OF GENERAL SECRETARY, 1926-27

BY ROSS C. PURDY

Mr. President, Ladies, and Gentlemen, it is a pleasure to serve as the Secretary of this organization. The **AMERICAN CERAMIC SOCIETY** is closing the fifth year of service for a full-time secretary, and I wish to register with you my personal appreciation of the honor that our Board has rested on me as General Secretary during these five years.

As you know, I do not take my work seriously, although I am very much in earnest and am happy in my work. The success of the **SOCIETY,** however, is not due to the efforts of any one person or group of persons; it is due to the fact that we have a cooperative spirit, each of us endeavoring to serve our neighbor as we ourselves want to be served. Mutual organization is progressive only in that fashion.

Our seven Divisions are "officered" and "committeed" by men and women whose efforts are to provide the very best collection of information of interest to their particular group; *i. e.*, enamel information for the Enamel Division, etc. That is the real source of animation of this organization.

Those who are not, perchance, officers or members of a committee this particular year should feel it a duty to respond promptly to the request of the officers and committeemen, as you will want them in turn to respond when you are in office or are on a committee.

The President of the SOCIETY feels that his office is a great honor, as do the Treasurer and the other officers and trustees, but their work is light compared to the work of the Division officers.

These officers and committeemen take the lead in the work of the SOCIETY, but the work is not done by them; they are the correlating agencies. We are happy because, as an organization, we have as much real cooperation as is to be found in organizations of this sort. The fact that we can publish a *Journal* of the high character for which it is credited, that we can collect information of the high caliber for which it is generally recognized, with the size of membership we have, all at a low monetary cost, is a surprise to all who have had experience in such work. Several persons qualified by experience to testify have said that they could not understand how so much could be accomplished with the finances available. The secret of it lies in coordinated cooperation, exceptionally active. We are all working together, seven Divisions as a unit. That is the real secret of this organization, and if I have one plea that is more urgent than another, it is that you get behind those whom you will choose this year in your Divisions.

This SOCIETY, as the President has said, is engaged in two chief endeavors, collectively referred to as research and education. It is an unfortunate man who thinks that his education is completed; it is an unfortunate man who thinks he knows very much about the work in which he is engaged. It is indeed a very fortunate man who realizes that there is much for him yet to learn, that he can get a great deal from his neighbors, that the mite which he gives in the way of information to his neighbor, in exchange for that which he receives from the others associated with him is small, and that he can afford to be liberal in the giving of information.

This is education of the most virile sort. It is education of self.

We are, through our schools, engaged in educating those who are coming up without a very definite idea of what the future holds for them. They want to prepare for something. They have been advised to choose ceramics. Even then they do not know which branch they will choose. The purpose of our schools is to give them preparatory training, but after those boys are out of the school, and go into the shops and laboratories their education has just begun, as you know. But I want to testify as one who has been through the experience, that the education of those who are through school and are employed in manufacturing or in operating plants, is not much more completed than that of the boy who is just graduating from school. We ourselves lack a great deal of information needed in our work. The best that we can do is to struggle together to obtain the most information.

A manufacturer recently told me that practically everything he had in the way of fundamental information on which he is operating, was obtained through the agencies of this **SOCIETY** plus translation of that information by the college-bred men. That probably could be said by most of the manufacturers in the United States. All research is educational because it is simply a search for knowledge.

The report of our finances is already before you. The President referred to it in his address. The detailed figures are in the February number of the *Bulletin.*[1]

Our membership record is before you every month.

We have in this country about 10,000 persons who ought to be members of this **SOCIETY,** personal members. Where are the other 7700? You know them, they are waiting for your invitation. Imagine what this **SOCIETY** could do if all of these 10,000 persons were members of this organization.

We have in this country about five thousand corporations who ought to be supporting an organization of this sort as corporation members. You know them; they are waiting for your invitation.

I agree with the President[2] that we do not want any "sawdust-trail" enthusiasm, drumming up members; but I hope that his words will not be taken as meaning that you should in any way hesitate to invite those persons and those corporations whom you know ought to be supporting this organization.

We are particularly proud that our personal membership fee has not exceeded $10.00. Most organizations of this sort, doing equivalent work, have personal membership dues of $15, $20, or $25, and corporation membership dues of $50 or $100.

We have never had an assessment. In the years past, our financial reports have shown a loss. These losses have been due to the fact that we have written off of the books: (1) all members who are delinquent, and (2) most of our publications, so that the Financial Report shows only live assets. The **SOCIETY** has an invested interest of about **$10,000,** no outstanding obligations, in addition to about **$10,000** on deposit; all of it is active material that could be turned into money quite readily. The old numbers of the *Journal* are being written off, most of our bibliographies are written off, as is the Collective Index for the *Transactions.* Not a delinquent is represented in the statement.

The time is coming when this organization will have a power financially to function, but that power is going to depend not upon money, but upon our will.

[1] *Bull. Amer. Ceram. Soc.,* 6 [2], 54-56 (1927).

[2] See R. L. Clare, "Presidential Address/' *Bull. Amer. Ceram. Soc., 6* [3], 67-69 (1927).

An hour ago a man in conversation said that he would pledge $1000 for each of the next five years, provided I could find ninety-nine other persons to make a like pledge, in support of any research which committees of this organization would care to undertake.

One of the ceramic trade organizations raised $50,000 for research almost on the instant that the plea was presented. The spirit is with us.

This **SOCIETY** is in no wise in competition with any of the trade organizations. The technical research which they undertake is being given support by this **SOCIETY** to the full extent of its ability. We desire that every trade organization should be engaged in research. It does not matter how secretly they hold the results of those investigations, or how they finance them, and what relations they might have with the conducting agency, such as a university or government bureau; as long as they are making investigations and are applying the results of those investigations, progress will be made.

In the same manner this **SOCIETY** is giving hearty support to the ceramic trade periodicals. These periodicals are broadcasting information. We should like to have this organization pack its covers to the maximum carrying capacity with boiled down facts, all good, sound data of general interest.

The ceramic press has changed from news into technical journals, and we are pleased. This **SOCIETY,** I am quite certain will, as time passes, have an increasing interest in the trade journals. These journals are all enthusiastically in support of the work which this organization is doing.

Now, the theme of my thoughts is that with all of the trade organizations, and with all of these journals, there is not one iota of competition, all simply going along the same path for the same purposes. There is need that these agencies keep in step with one another. Could there be a national organization common to all ceramic interests in which all could have a common interest, common support, and which would correlate the technical interests of these organizations in a way not to encroach on their private or individual interests? I am sure that an American Ceramic Research Council would serve as a unit force in more rapidly and at less expense increasing the total of ceramic knowledge, proved and applied.

You have heard the remarks of the President regarding the *Refractories Bibliography*.[3] Mr. Landrum and his associates have collected a bibliography on enameling literature which, with the abstracts, is equal in bulk to that of the *Refractories Bibliography*, and fully as complete, and is about ready for editing. Our small organization of one

* [3] "Presidential Address," *loc. cit.*

man and three and one-half girls hopes to have this in your hands within a short while.

We also have a bibliography on white wares being compiled. Your committee on geology has one on feldspars, relating entirely to the geology and mineralogy of feldspars.

These bibliographies (collections of the literature as published) are the foundation of our education, because when a research or an investigation is to be undertaken the first thing to be done is to review that which has already been learned, so as not to duplicate, but to progress.

The enameling, white wares, and feldspar bibliographies will be out this year, without the least encroachment upon the budget which the Budget Committee is preparing.

PAPERS AND DISCUSSIONS

CONFERENCE ON CERAMIC RESEARCH

Led by A. F. Greaves-Walker

A. F. **GREAVES-WALKER:** Although there is a great deal of research going on at the present time throughout the country, there is no co-ordination, and little cooperation, and there is a question of whether much of it is essential, unless it is directed properly toward the ends that would serve best.

With the view of getting some conclusions as to what we should best do, and in an effort to solve this problem that has been put before you, so that this **SOCIETY** can by some measure do what it should, we are calling for this discussion.

We all know that the British Government has been subsidizing ceramic research councils in Great Britain, and that because of these the British industries have advanced rapidly in comparison with what they did before the war.

The Canadian Government is also backing a Research Council.

Mr. Purdy will present this matter to us, because he has had the subject very close to his heart and for several years past he has brought it before us time and again in a brief way.

Ross C. **PURDY:** The ceramic industries in Germany have organized a Ceramic Research Council within the past year, along exactly the same lines as has been proposed by this **SOCIETY,** and it is today functioning exactly as we have proposed. They caught the idea, and in their usual way have put it through. We are going to be at least one year behind them.

As to the research directly promoted by this **SOCIETY,** there seems to be wrong impressions existing. The Enamel Division Research Committee has met frequently during the year, has raised on its own solicitation among the enamel manufacturers a sum **(I** think it is $5000), and is carrying on quite an extensive investigation on both cast iron and sheet steel at the Bureau of Standards.

The Glass Division has an active Research Committee, with researches going on at different industrial plant laboratories and at the Bureau.

The heavy clay products industries, as a Division, are not active at present in cooperative research.

The Terra Cotta Research Committee, a few years ago, got under way with a very definite problem, and today, through the agency of the National Terra Cotta Association, is carrying on a very large investigation financed by the terra cotta manufacturers.

[1] Presented at the Annual Meeting, AMERICAN CERAMIC SOCIETY, Detroit, Mich., Feb. 1927, (General Session.)

The white wares trade associations, through the several groups, such as the tile and dinner ware are advising and actually carrying on investigations at the Bureau and in some of the schools, suggestions for which originated in the White Wares Division.

The Refractories Division, through the American Refractories Institute and jointly with other organizations such as the Foundrymen's Association, is carrying on extensive investigations.

Two things which should be thoroughly understood are: (1) The German ceramic industries have already organized a Ceramic Research Council for and of themselves, and (2) that nearly all of the research committees of the Divisions of this SOCIETY are quite active.

It is proposed that we have an American Ceramic Research Council, which is not to finance investigations, which is not to handle money, and which is not to prosecute investigations, but one whose sole function would be to have available the information regarding (1) ceramic problems, and (2) the ceramic laboratories where investigations can be made, and to be able to advise each of the groups so that they can the most quickly prosecute the investigation they desire to make.

When an investigation is undertaken, the contact will be solely by the trade organization or industrial group which is to finance the work, with the laboratory that is to do the work. This advisory council would not be a factor in the prosecution of the investigations; it would have no control over the investigation, nor of the disposition of the results of the investigations; it would not in any way be involved in finances. It would, however, at all times serve in an advisory capacity to both parties.

For a beginning, we would need (1) to employ full time one or two men to study the ceramic problems of each group, and (2) to provide a cabinet of technical men from the industries who would meet periodically. This would give us the essentials of a virile advisory council. Such a modest beginning could be made on fifteen thousand dollars annual budget. On such an organization thirty or forty thousand dollars could be expended annually with assurance of profitable returns.

Understand, please, this idea would not set up a research organization whatsoever, but an advisory council only.

This SOCIETY, of its own volition and by political wire-pulling, has instituted ceramic divisions in the national bureaus. We then left them without support and they are now dependent upon the Director of the Bureau of Standards to obtain from Congress funds to carry on the research work. The present allotment to cover the ceramic work in the Bureau of Standards is about $125,000. (This may not be the exact figure.) This, the Bureau Director has obtained without any support whatsoever from the ceramic industries. It is his estimate of the amount

of money required. He made the request without full knowledge of the need for research on the part of the ceramic industries because the ceramic industries have made no effort to inform him.

The greatest amount of this sum was given to those groups which were most urgent, most persistent for investigations to be conducted.

The ceramic industries are not making an appeal to the Director, because they are not organized to make a concerted appeal. Some groups are making their wants known but ceramic industry as a unit is not. Therefore, the Director of the Bureau of Standards feels no particular urge to ask for money for ceramic investigation, except to use the organization which the Bureau has employed. The result is that the ceramic industries of this country are being served about one-tenth the amount that they should be served. The government should spend more money in fundamental research along ceramic lines (not that it should spend less on the other industries), but the ceramic industries deserve, and they could have their proportionate share, which is much larger than what they are getting of the money appropriated by Congress, providing they were organized to get it.

Monies are appropriated by the states for the support of universities. These instructional organizations desire to carry on research and they desire industrial contact. The need is there, but they do not know how to make that contact. The work now carried on by Prof. Greaves-Walker is an instance of what is possible. North Carolina State College was there before Prof. Greaves-Walker went there, ceramic raw materials were there, the market was there, but because he is a promoter for the ceramic interests within that State, they now have a ceramic department that is alive and growing, they are getting appropriations from the State, and getting attention from people outside of the State, focusing attention on that State. North Carolina, ceramically, is bound to go ahead in leaps and bounds because Prof. Greaves-Walker is there promoting this work. He came into a university that is keen to the situation. The men are still alive and young, as I understand it, who first introduced the idea of tax supported schools in North Carolina, so all of the school systems there are alert to the method of obtaining support from the Legislature.

In Ohio, the great grandchildren of those who labored for tax support of schools are now in the schools, but they have divorced their thoughts from the legislative needs. There is not that urge on the part of the schools in Ohio to solicit individual support of the industries, as there is in the Southern States.

Ohio was the first state to have a ceramic department, thirty-two years ago. It has had a state ceramic organization whenever there was

a need for concerted support of any project. At one time there were enough students in the ceramic department to graduate nineteen four-year men, plus about twenty men from the short course.

Notwithstanding all this leadership the ceramic department at Ohio State dwindled so that it finally had only fifty-eight students; not because it did not have a good faculty, good facilities, or because it did not want to serve the State, but simply because it had gotten out of touch with the industries.

Ohio has that contact today. There are two hundred students in the department. There is for the first time a ceramic department in the Engineering Experiment Station, and for the first time there is a full-time research professor partially paid by the industries and partially by the university. Other things are under way that are not essential to the point we are making this afternoon.

The point is this: Ohio ceramic industries have learned how to get behind their University, to get legislative support of the University to the extent of increased appropriations, increased research, and educational facilities. The State has now turned over the present State operated brick yards to the Experiment Station for the purposes of research. These brick yards are to be under the technical control of the research professor. There is to be a research laboratory in conjunction therewith. All of the kilns, the driers, and the manufacturing will be brought under the control supervision of the Ceramic Division of the Engineering Experiment Station. The product such as is made will be sold by the Welfare Board, and the state prisoners will be employed and directed by the Welfare Board. Ohio, in other words, is going to employ its State prison in the prosecution of research.

What is done in Ohio is what the other states can do and will do when they awaken to the facts.

Ceramics needs, in this country, a centralized activating force to show the industries how they may contact with the universities and to show the universities how they may contact with the industries, so that the large research facilities, already established, financed, and operated can be employed for the benefit of the ceramic industries.

The ceramic industries are paying their proportionate share of the cost of these Universities and they ought to be getting adequate returns. If it should cost the industries of this country twenty thousand dollars to know how to get their share they would find it to be a mighty large economy.

We already have in this country a National Research Council for the scientific needs. It is often asked why the **AMERICAN CERAMIC SOCIETY** does not become a part of that Council? That is possible, but not probable. It would be very hard indeed to get the ceramic

manufacturers to consent to become an integral part of that organization. They would feel that they were swallowed up. They would have to conform to rules and procedures that perhaps would not be altogether effective.

The National Research Council will aid us in organizing a Ceramic Research Council, but it would prefer that the ceramic industries organize their own council. The two would cooperate and collaborate in many ways.

It would be possible, through the influence of the National Research Council, to bring in outside financial assistance provided that we are organized to ask for that assistance. There are large endowments in this country that are idle, the interest on which is accumulating. The National Research Council is interesting those vast resources of finances. If an American Ceramic Research Council were organized it would collaborate with the National Research Council with the result that the ceramic industries would benefit from these endowments.

I have presented this idea several times, and lately the Board of Trustees, the Research Committee, and the officers of the Divisions were asked to vote as to its feasibility. The Board of Trustees voted unanimously in favor of presenting this matter and giving support to the idea in general. All but two members of the Research Committee approved it, and all but two of the officers of the Divisions approved it. There were five out of thirty-nine persons who withheld their support of this proposition.

This proposal was presented to the Terra Cotta Association; it was unanimously approved, and a resolution written which has already been published.[1] We now want to present it to the other associations, provided it is sound in principle.

R. D. **LANDRUM:** The greatest need is to secure some man whose job it is to know the problems of the industry, to know where those problems can be worked out, and to organize around him a sufficient number of men to make an active organization, and to accomplish the things that the **SOCIETY** has not been able to accomplish.

L. E. **BARRINGER:** I quite agree with the idea that research needs direction, and our particular field is perhaps even more complicated than other scientific fields. Just how to bring that about, though, I am not at all certain.

I endorse Mr. Landrum's suggestion that we ought to start. But I do not understand just what making the start involves. Does it involve financial support on the part of the **AMERICAN CERAMIC SOCIETY?** Does it involve tying in the universities and the Government

[1] *Bull. Amer. Ceram. Soc.,* 5 [1], 60 (1926).

laboratories? Does it involve a great deal of volunteer work, or is it mostly paid work?

Ross C. **PURDY:** The American Ceramic Research Council is not complicated. It is simple to have all of the ceramic interests in one organization. We were told when we wanted to have seven Divisions in this **SOCIETY** that such organization would be too complicated, but our industrial Divisions have worked successfully. We were told in Ohio that the attempt to organize the ceramic manufacturers was impossible, but many of those who doubted are now some of the best supporters of the Ohio Ceramic Industries Association. When we started, it was "hands off" until they saw we were going ahead.

The American Ceramic Research Council is more simple than the Ohio proposal. The proposition is that the several ceramic trade groups contribute to a common fund, possibly $15,000 a year to start with, to finance the full-time work of one man. That man would make a survey in each state, where ceramics is of economic importance, of the research facilities available. If he could do in other states what has been done voluntarily in Ohio, it would pay adequate returns on the money invested in this work.

The groups which finance jointly this full-time man would have an Executive Committee to correlate the needs of the associated groups. They would also set up an advisory cabinet with one representative from each of the trade groups.

How would the Institute respond to a request from a given group for counsel? For example, if the grinding wheel industry should wish to undertake an investigation, it could, as one of the supporters of the Council, lay its ideas before the chief adviser. He, with the grinding wheel representative on the advisory cabinet, would determine what is in the literature, what information, both fundamental and applied, is needed and where best the work can be done. The chances are that the preliminary survey would save much time and expense. Possibly the work could be subdivided and different portions done in laboratories best adapted because of equipment and personnel. The investigation might be carried on to the mutual advantage of the university and association at a very low cost, because these men have the survey of the problem and of the research facilities already available.

At the present time if a group of manufacturers wants a problem solved it goes to the Bureau of Standards (no criticism of the Bureau of Standards is intended) because it is assumed that the Government has the equipment, the personnel, and the intelligence necessary to solve any problem. Theoretically that ought to be so, but the group oftentimes presents the problem without adequate preliminary information of its own, the work is dribbled along because the Bureau has not

the time, facilities, and personal experience required for the best and most expeditious conducting of that study.

Mr. Clare, who has been active on the Research Committee of the National Terra Cotta Society, will agree that its problem has dragged along because there has not been a full-time disinterested activator on the job. The director now employed by the Government is being pulled on one side by the Bureau and the other side by the industry, and is not an impartial adviser.

The adviser whom we propose should not take an active part in investigations. It is reasonable that the work undertaken by the National Terra Cotta Society could be done at less cost by parcelling the investigations out to the laboratories best equipped for the work assigned, so that they would get much better work, in a shorter time.

If it is possible to have such an organization in Germany, it certainly is possible in this country. It is simply setting up a full-time research adviser to study the research facilities of industry, study the research problems, and to advise the trade associations.

A. F. **GREAVES-WALKER** : This **SOCIETY** will not be directly connected with the Council, but it would naturally be a member. The **AMERICAN CERAMIC SOCIETY** would not attempt to direct the research of all of these other organizations as some members have assumed. The **SOCIETY** is to sell this idea to the ceramic industries and get it started, then to let the financing organizations handle the proposition themselves.

B. M. **HOOD:** It seems to me that one of the biggest difficulties with this problem is to visualize how we can invest a dime and get back a dollar. If we can visualize that here, we can comprehend the idea.

We must feel that as an American nation we are in competition with other countries for foreign markets. We are spoiled in this country, having forty-eight countries with which we trade on the basis of free trade. There is no manufacturer that occupies as enviable a position as a leader in an industry in a country where he has forty-eight states in which he can enjoy free trade; but we have reached a period of economic surplus in this country, where we must look for foreign markets. We must have trained minds to produce materials that will compete in those foreign markets against lower labor costs, and lower standards of living.

We do not so much need a highly specialized research man at the head of the proposed Ceramic Research Council as an executive who would encourage research, avoid duplication, get a result quicker at lower cost, and eliminate waste. I do not know of anything that Secretary Hoover has done more effectively than standardization and the elimination of waste. If we can catch the idea of standardization

and put it over through a concentrated coordinated effort, we shall get ceramic results through research, ably directed, and we shall then accomplish definite results.

One of the handicaps of this movement is that it is rather generally thought that our Secretary is the "daddy" of the idea, and is the "daddy" of an idea to create a job for himself. This is plain speaking, but we have to brush away, sometimes, shades and shadows to arrive at the truth. I know your Secretary. He is not a candidate for the position. He is an enthusiast for the idea as the parent of a child. If there is some capable man who would come within the horizon to fill the position, the industry would naturally select that man. To get something done we need a method of transportation to carry the idea over, and that method of transportation is money.

I am not wedded to any scheme as to how the American Ceramic Research Council will be put over; but, as we mentioned before, the elimination of waste has been one of Mr. Hoover's finest accomplishments in the Department of Commerce in Washington. Waste and bankruptcies and failures are going on in this great, young, growing country, that can be turned into constructive channels in which industries can be more profitable, bigger dividends can be paid, greater sums put aside to the surplus, and our industries can grow, not alone nationally, but internationally successful.

T. B. **ANDERSON:** One reason that I approve of research work in ceramics is that I dislike to work. If there is any way to eliminate manual labor, I am in favor of it. We can easily recall the days when white ware was made practically by manual labor; that is being eliminated to a great extent, and the production cost lowered, which results in service to more people than ever before.

It is not often the man in the factory who brings forth the ideas that lessen the hard work connected with the industry. These ideas are brought forth by the idealists of the business, by men who use their imagination to project new ideas.

It is only a question of time until at least a large percentage of white ware will be fired in tunnel kilns because they reduce the amount of manual labor required.

In the older styles of firing ware, it is hardly expected that a kiln man will last longer than fifty-five years. He is generally ready to quit at fifty; but with the tunnel kiln, which removes a large percentage of the heavy labor, the kiln man's usefulness will be increased at least ten years.

I have always been in favor of research work, not because the pottery industry has been especially forward in it, but because other industries of much greater volume and greater extent and greater value to the

country have spent so much money, and time, and talent in the research work.

In our industry we very often find fellows who are worried about some little thing that^has gone wrong in the plant; they would be glad if they knew where to turn for help. It really is true, as Mr. Hood has said, that much money has been wasted. Referring to the heavy clay products industry Mr. Hoover recently said that he had no doubt that there were at least five million dollars spent in needless building of plants for production of materials from clays that were not suitable for the purpose. I am glad to hear this borne out by Mr. Hood's remarks. In our immediate vicinity there are at least four plants in which enthusiastic men have spent large amounts of money that are idle today; and we all know that Ohio is a very large producer of heavy clay products.

So we should not give up the idea of the American Ceramic Research Council. There is not any question about its paying, and paying big.

MARION W. BLAIR: Five years ago, the AMERICAN CERAMIC SOCIETY volunteered to act as a clearing-house for information that would be derived from a cooperative ceramic research, and that research was put across, with the cooperation of four organizations, the American Face Brick Association, the National Paving Brick Association, the Common Brick, and the Building Tile Association. The results were published, but this information was never offered to the AMERICAN CERAMIC SOCIETY, and I shall venture to say that not 25% of the gentlemen in this room today ever saw the publication, and that 50% do not know that it exists; and yet this proposition was to be cleared through the AMERICAN CERAMIC SOCIETY. I refer to the investigation of industrial kilns. The results were criticized as being of no practical benefit, which positively is not true. I can take that publication and apply the results found there to any plant using periodic kilns and save from 15 to 25% of the kiln costs; but the industry as a whole did not recognize the application, and today it is almost impossible to get hold of a copy of the investigations. Only a few concerns in the industry as a whole received copies, and most of them did not even know how to read it.

A. F. **GREAVES-WALKER:** What Mr. Blair has said is true. The proposition that we have before us now would help to clear up that very situation. **So** far as we as a **SOCIETY** are concerned, it seems impossible to expect these Associations to make of this **SOCIETY** a clearing-house of the results of research work. That is entirely out of the question.

The idea we have is that each association shall select the problems, and choose the place of doing the work, and if it wishes to keep the

results of its investigations, which is paid out of its own pockets, under cover, or for the use of a few, that is entirely its own business.

The proposed Council would coordinate research, cut out waste, promote research along proper lines, and see that this work is done at the very lowest cost.

The objection that we have heard to this idea has been always that the **AMERICAN CERAMIC SOCIETY** could not act as a body in the matter, that it could not be an **AMERICAN CERAMIC SOCIETY** proposition. What we want to do is turn this idea over, sell it to the people who want to do research (I do not think there is the slightest question but what all of them want to do it), and see if we can get them together so that there will be less loss, less waste, and that there will be a definite organization promoting cooperative research in lines most essential to the ceramic industries.

J. B. **SHAW:** I venture a guess that 95% of the Program presented at this Meeting consists of papers that are the result of research investigations that have been carried on. The men who did this work and wrote these articles have been carrying on research in their various plants to the best of their ability. Does the Research Council propose to guide these men in this work to better advantage? Does the Research Council propose to go into these manufacturing plants where research is being carried out and assist them in raising funds for promoting such investigations, or does it propose to give these men information?

If it is the purpose of the director of this Council to give these men information which will enable them to carry out their investigations to better advantage, I doubt the ability of any single man in this country to do it. As Mr. Hood has said, we are living in an age of specialization, and I believe that the specialist is better able to carry out an investigation in his particular line than any man who may be selected by the ceramic industries.

The greatest need of the ceramic industries is research in the fundamentals. I am gratified to hear of the resolution that was passed by the Board of Trustees that the money which has been appropriated for the Bureau of Standards this year shall be spent in fundamental research. That is the greatest need of the ceramic industries today.

I am not in favor of the **AMERICAN CERAMIC SOCIETY** organizing a Research Council without some definite aim in view. I should like to see the proposers of this idea present a definite program and give us a definite idea of exactly what they propose to do, before we start out.

I believe it would be the better for such a Council not to go halfway, as proposed by Mr. Purdy, and act in an advisory capacity. I think that the **AMERICAN CERAMIC SOCIETY** should organize an institute and ask the various trade organizations to put up sufficient money to

support the institute which will study the fundamentals of ceramic reactions, and will carry out specific fundamental researches in ceramics. I believe they will have better success in securing such support than if they undertake the support of something indefinite and of doubtful value.

Instead of trying to raise $15,000 **for an Advisory Committee, we should go to these people and try to raise $100,000, get a first-class scientist who is versed in the direction of research to direct the thing, secure sufficient laboratory equipment and sufficient personnel to establish a research laboratory of the AMERICAN CERAMIC SOCIETY which will be devoted to the fundamental problems in ceramics. That kind of research institute, I believe, would be of great benefit to the industries, and to the SOCIETY. Such an indefinite thing as has been proposed here, I am neither ready to oppose nor to support, because I do not know what it means.**

R. J. **MONTGOMERY:** There is only one sound basis for tackling any problem and that is the direct method. If this Society is to assist in forming a Research Council it must sell the proposition to the trade associations. If this idea is sold to those associations, and they take it up as their own proposition and go ahead with it of their own volition, we shall get definite results. It is not necessary that it should be sold to all of them, but as in any marketing proposition, we must make a start some place.

The proposition could properly, perhaps, come from a scientific association, such as ours, but then it should be turned over to these men who are in position, and who psychologically are the only men who are going to get behind it and stay with it.

A. F. **GREAVES-WALKER** : For Prof. Shaw's benefit I am going to ask Mr. Purdy to again explain the idea that has been approved by the Board of Trustees of the **SOCIETY.**

R. C. **PURDY:** This is a matter which has been gone over carefully and thoroughly by the Board of Trustees, the officers of the Divisions, and the members of the Research Committee. Some correspondence has gone to a few of the schools, and I presume Professor Shaw has had some letters.

He wants something concrete. In Ohio we have a concrete illustration of getting the industries and the universities together. We have in this country vast investments in university research laboratories. They could be harnessed up for research to our benefit provided we could approach them intelligently.

A movement four years ago was started by the Refractories Division. It had samples fired at different kilns, and the petrographers at different laboratories were to make the investigations. The samples were pre-

pared and marked, and the work was carried up to the petrographers, with the result that the samples remained there. Why? Because there was not sufficient contact between those who started the program and those who were to make the observations. Those who were to make the observations did not feel they could spend the time merely to record what they saw. They wanted to correlate what they saw with the past history of the samples. That investigation lacked the carrying power that would be given by an organization such as we have in mind.

The proposed Research Council will never set up a laboratory of its own and will never handle finances. What Professor Shaw suggests is excellent, but quite different and much more remote in probabilities. What we propose is a small organization to sit in an advisory capacity to study the research facilities as to the best manner in which they can be employed.

Ohio's ceramic industries have for years been paying in support of the Ohio State University, and are just beginning now to get something back from their investment. Both the industries and the University are profiting. Both had to be shown how this could be done. What has been accomplished in Ohio can be done in other states.

Those who have studied the history of investments such as that kiln investigation which was done four years ago (that was never carried through to the plant application, simply because it lacked a directing force outside of the Bureau, outside of the schools, in the industries themselves) realize the potential profit that would accrue from an Advisory Council. If we can save from 10 to 50% in kiln firing on certain plants, why not do it in all plants in the country? That is what Mr. Hood is talking about. He wants a dollar's return from the ten cents he invested in that kiln study and such a profit is in that investigation provided the industries be led to make proper application of the facts disclosed.

If this Research Council did no other thing than to get the industries to apply the lessons learned in that one study, and to carry on the further fundamental investigations that are needed to complete that work, it would justify its existence.

We have in this country a National Research Council that has earned the support of the large corporations. Thirty million dollars are being raised today in support of that organization because such corporations as the American Telephone and Telegraph, with its three hundred research men and with millions already invested in research sees the value of having a National Research Council that will coordinate in research the various laboratories throughout the country. The organization of which Mr. Barringer is a member, the General Electric Company, is a heavy supporter of the National Research Council;

not because it is dissatisfied with the effort of its own Research Laboratories, but because it knows the value of coordinating the research laboratories of the country and the research efforts in the country.

The American Telephone and Telegraph Company, the General Electric Company, the Western Electric, the Westinghouse Electric, and many other big organizations, with big research organizations of their own, have increased their support of the National Research Council. Why? Because they feel that they will get more return from the work in which they are investing in their individual plants.

Now if it is true nationally and true generally scientifically, it is true in ceramics.

Let me give you another idea: If the Germans see this vision, what is wrong with us? Are ceramists in this country short-sighted?

A. F. **GREAVES-WALKER:** It is the desire of the Board of Trustees that the members of the **SOCIETY** assembled here shall vote on the question of this **SOCIETY** sponsoring the organization of an American Ceramic Research Council, merely getting an opinion expressed in a vote, as to whether they should proceed to work out this idea and to present it to the various industries.

The question was put to vote and as there was no opposition it appeared that the **SOCIETY** as a whole is in favor of the Board of Trustees proceeding in an effort to organize the proposed American Ceramic Research Council.

ACTIVITIES OF THE SOCIETY

DEFINITIONS OF WHITEWARES AND RELATED TERMS[1]

Progress Report to the White Wares Division

By Arthur S. Watts[2]

This Committee has grown in size by the inclusion of members of the Division who have indicated interest in the work until it now numbers nearly thirty and all other members interested are welcome to participate in this work.

Our efforts during the past year have resulted in a much clearer understanding of many ceramic terms and a list of several terms with proposed definitions are here appended, and will be submitted to ballot to the White Wares Division in the near future.

List of General Ceramic Terms

(Vote for one or if none suit, send your proposal to the Chairman)

(a) *Pore* (ceramic), An interstice or void in a body or glaze structure which is permeable by fluids.

(*b*) *Pore* (ceramic), A small opening, interstice or void between adjacent constituent particles. It may be open or sealed.

(c) *Pore* (ceramic), An interstitial space other than a crack or void due to external forces or to drying or firing strains.

(a) *Porous* (ceramic), Containing pores or voids which are permeable by fluids.

(b) *Porous* (ceramic), Containing pores or voids.

(a) *Porosity* (ceramic), The total volume of the pores expressed as a percentage of the exterior volume of the piece.

(*b*) *Porosity*, The quality or state of being porous.

(a) *Vitrify* (ceramic), To develop by heat such compactness of structure that the mass is impervious to fluids. *Note:* Commercial usage tolerates a limited penetration of fluids depending on service requirements.

(*b*) *Vitrify* (ceramic), To develop by heat such solution between constituents that the mass is impervious to fluids. *Note:* Same as (*a*).

(c) *Vitrify* (ceramic), To develop by heat such amount of glassy or liquid phase that a fracture surface has a glassy or a flintlike appearance and the mass is impervious to fluids. *Note:* Same as *(a).*

(a) *Vitreous* (ceramic), Nonabsorbent as a result of heat treatment.

(b) *Vitreous* (ceramic), Impervious to fluids, vitrified.

(a) Semivitreous (ceramic), Not completely vitrified.

(a) Incipient Vitrification (ceramic), That state produced by heat, in which contraction of the individual particles has reached a maximum and the first traces of solution between the constituents are visible by the aid of a microscope.

(&) *Incipient Vitrification* (ceramic), That state in which the first traces of fusion between constituents are visible.

(a) *Maturing Temperature* (ceramic), That temperature at which desired physical and chemical characteristics are attained.

(*b*) *Maturing Temperature* (ceramic), That temperature at which the article attains the physical and chemical characteristics required in wares of its class.

(a) *Porcelain*, White or nearly white ceramic ware translucent in thin sections and having vitreous structure.

{b) Porcelain, A vitreous ceramic ware, which is translucent in thin sections.

(c) *Porcelain*, A vitrified, white or tinted, ceramic ware which is translucent in thin sections.

id) Porcelain, A vitrified ceramic product obtained by heating a properly blended

[1] Received March 2, 1927.

[2] Chairman, Standards Committee, White Wares Division.

mixture of siliceous materials with or without the addition of fluxes and characterized by a vitreous fracture, translucency in relatively thin sections and freedom from pores.

(*e*) *Porcelain,* The generic term employed to designate all kinds of pottery to which an incipient vitrification has been imparted by firing.

(*f*) *Porcelain*, A ceramic ware possessing to a prominent degree the properties of whiteness, translucency, imperviousness, hardness, and high fusibility. The more it excels in these respects, the better its quality.

(g) Porcelain, A ceramic body which in moderately thin layers is translucent. (Dr. Mellor).

(*h*) *Porcelain*, A translucent ceramic body with vitreous or glassy fracture.

(*i*) *Porcelain*, A vitreous ceramic product translucent in thin sections and containing microscopically visible mullite crystals.

(a) Earthenware, A porous, ceramic ware, devoid of translucency.

(a) *Whiteware,* A white porcelain, china or earthenware.

(a) Semiporcelain (indefinite). Same as white earthenware.

Porcelain vs. China

A very thorough survey of these two terms as used in both Europe and America indicates that unless they can be separated on the basis of composition or on characteristics of the finished product, the differentiation will not meet with general approval and adoption will be difficult if not impossible. Throughout continental Europe the term "porcelain" is used in referring to all vitreous ceramic bodies which display translucency to any appreciable degree. In referring to Chinese and Japanese ware the same term is used. In England and America the term is used only in referring to chemical and industrial ware.

The term "china" is used in both England and America in referring to all other vitreous ware which display translucency to an appreciable degree, including table or service ware and vitreous sanitary ware.

The term "porcelain" is erroneously used in America in referring to a semivitreous white ware which was formerly called semiporcelain but has been shortened by omitting the prefix.

A study of the vitreous ware classed as "porcelain" discloses the fact that they are either unglazed or covered with a "hard glaze," composed essentially of feldspar, alkaline earths, alumina, and silica, which matures at the same temperature as the body.

The term "china" generally refers to vitreous ware which is covered with a complex "soft glaze" containing boric acid and lead oxide or other bases which cause the glaze to mature at a temperature distinctly below the maturing temperature of the body and necessitating a preliminary hard fire for maturing the body followed by glaze application and maturing of the glaze at a separate low or moderate temperature.

The only serious exception to the foregoing classification is a growing habit in America, of referring to all vitreous translucent table ware as "china" *e. g.,* French china, Bavarian china, Austrian china.

On the basis of characteristic body and glaze, it would be highly desirable from a ceramic viewpoint to classify as follows:

Porcelain—China Differentiation

"Porcelain," all vitreous ware which is translucent in thin sections and unglazed or coated with a hard or difficultly fusible glaze maturing at the maturing temperature of the body.

"China," all vitreous ware which is translucent in thin sections and coated with a soft or moderately fusible glaze maturing at a distinctly lower temperature than the body.

On the basis of general usage, it can probably be claimed that the terms "porcelain" and "china" are synonymous, since the word "china" is not used in continental Europe, and the word "porcelain" is used in only an indefinite way in England and America.

If these terms are accepted as interchangeable, we should develop a classification by which the various types of porcelain or china may be differentiated beyond the common characteristics of vitrification and translucency in thin sections.

Fortunately such a classification is already in existence and with slight modifications could be adapted to general use.

Porcelain—China Classification

"High fire" or "hard porcelain," in which feldspar is the chief vitrifying agent, the other essential constituents being clay and flint.

"Low Fire" or "Soft Porcelains," in which the feldspar is materially supplemented by other vitrifying agents or the flint is increased at the expense of the clay or both, thereby lowering the temperature necessary for vitrification.

"Artificial Porcelains," in which either feldspar or flint is replaced by some other material.

High Fire or Hard Porcelains would naturally include:

(1) Industrial porcelains in which translucency and color are sacrificed for mechanical and electrical properties.

(2) Chemical porcelains, in which all other properties are sacrificed for chemical and temperature-change resistivity.

(3) Service porcelains, in which translucency, color, and mechanical strength are balanced, would be in this class, provided their compositions entitle them to be included.

(4) Art porcelains, in which color and translucency are developed at the expense of all other properties, may if their compositions justify, be included in this class.

Low Fire or Soft Porcelains would include;

(1) Seger porcelain which contains auxiliary vitrifying agents in addition to the feldspar and also abnormal flint content at the expense of clay.

(2) American china in which the feldspar is reduced and in part replaced by other vitrifying agents and the flint increased at the expense of the clay content.

NOTE: The peculiar and valuable qualities of this ware are due to their compositions and the fact that they mature at lower temperatures than the high fire porcelain does not indicate inferiority.

Artificial porcelains would include;

(1) Bone china in which the flint is partly or entirely replaced by calcined bone.

(2) Jasper or Wedgwood china in which the flint is replaced by barite (heavy feldspar).

(3) Belleek china in which the feldspar is replaced by a glass composed of feldspar and other vitrifying agents fused together and pulverized prior to incorporation in the body.

(4) French paste (Pate Tendre) which was produced from a mixture of lime-soda glass, a calcareous clay, and quartz sand.

(5) American industrial porcelains in which the feldspar is replaced by an artificial vitrifying agent or the flint is replaced by an artificial nonplastic or both.

Such a porcelain-china classification may not meet the demands of those who claim that definitions must be based on properties of the product and who probably believe that classification should be on the same basis. It is doubtful however if any agreement could be reached for a classification on the basis of translucency or of mechanical properties and with the terms "porcelain" and "china" accepted as synonymous, the use of a classification would be confined to technical literature where a classification based on composition is as legitimate as in the field of metal alloys or glass.

It is hoped that the readers will give this presentation careful consideration and be prepared to vote and offer constructive criticisms when the ballot is received.

PERMISSIBLE MOISTURE CONTENT IN BALL CLAY[1]

The following is the Report of the Special Committee Appointed to Investigate Permissible Moisture Content in Ball Clay Shipments.

After a study of moisture content of ball clay shipments, including light, medium, and dark ball clays of both England and the United States, and including laboratory tests, reports from buyers and reports from shippers, the Committee finds:

(1) That the American shipper objects to any recommendation by this Committee of a maximum moisture content which the buyer can be reasonably expected to pay for.

(2) English ball clay shippers and agents agree that 20 % moisture is a fair average of their shipments.

(3) Both American and English shippers urge that if shipments are to contain much less than 20% moisture, the clay must be handled during the summer months.

(4) All shippers claim that any attempt to dry the clay by artificial heat would add more to the market price than the saving in freight.

(5) Many shippers urge that a classification on the basis of color would not be satisfactory.

(6) The buyers of ball clay feel that many shippers are making no effort to protect the clay from an accumulation of moisture during handling and storage, and that the cost per ton of the clay delivered is thereby greatly increased.

(7) The buyers further claim that with reasonable care in handling and with protection from weather during storage the shipments need not contain more than 21 % maximum moisture in the dark ball clays, 19 % maximum moisture in mixed and medium ball clays, and 17 % maximum moisture in light ball clays.

(8) The majority of buyers have suggested 20 % maximum for dark, 18 % for medium, and 16 % maximum moisture content for light ball clay shipments.

(9) Most buyers recognize the undesirability of artificial heat driers for ball clays, but believe that reasonable protection of the mined clay will enable the shipper to deliver the clay with a moisture content below the maximum indicated above.

(10) Both shippers and buyers recognize that any control of the maximum moisture content in ball clay shipments must be accomplished by purchase specifications, which are subject only to such limitations as are definitely stated in writing and made a part of the contract between the parties concerned.

Respectfully submitted,
ARTHUR S. WATTS, *Chairman*

Report Approved: A. V. Bleininger, Geo. Brian, Geo. Simcoe, J. D. Whitmer, Paul Teetor. Approving items 1, 4, 5 and 10 only, R. W. Greene.

ELECTROMETRIC DETERMINATION OF IRON[1]

REFERENCES: J. C. Hostetter and H. S. Roberts, *Jour. Amer. Chem. Soc.,* 41, 1337 (1920); and H. S. Roberts, *Jour. Amer. Chem. Soc.,* 41, 1358 (1920).

To determine the oxidation-reduction potential of a given solution, it is sufficient to determine the potential difference between a platinum electrode and a standard electrode, the standard electrode usually being a calomel electrode connected to the solution by means of a salt bridge.

In the titration of a solution in oxidimetry the shift in potential resulting from a given addition of the titrating reagent depends not on the actual amount of the reagent added, but on the percentage alteration in the quantity of the material governing the potential of the solution. Hence, as the end point is approached small additions of the

[1] Arthur S. Watts, Chairman, Special Committee, White Wares Division.

[1] Adopted as Tentative Standard, Glass Division, AMERICAN CERAMIC SOCIETY, Feb., 1927.

titrating solution will produce increasingly great changes in potential, and after the end point is passed decreasingly great changes in potential. The maximum change occurs at the end point.

If the potentials be plotted against volume of the titrating solution we have a curve with a point of inflection at the end point of the reaction.

In the determination of iron by titration with potassium dichromate in hydrochloric acid subsequent to reduction with an excess of stannous chloride in hydrochloric acid, we have the following reactions:

2 $SnCl_2+K_2Cr_20_7+14\ HC1 = 2\ CrCl_3+3\ SnCl_4+2\ KC1+H_20$

6 $FeCl_2+K_2Cr_20_7+14\ HC1=2\ CrCl_3+6\ FeCl_3+2\ KC1 + 7\ H_20$

The first reaction is completed before the second begins owing to the lower potential of stannous chloride. Hence we have two end points, or two points of inflection in the curve of potential against volume of potassium bichromate solution.

The second reaction is the one we desire to measure. It is the one taking place between the two end points. Hence our titration is the volume of solution added between the two end points.

The oxygen of the air will also effect the oxidation of both the stannous chloride and ferrous chloride. By using a narrow-mouthed flask this oxidation is so slow that by rapid work no appreciable error results. For extreme accuracy a flow of carbon dioxide should be maintained for at least five minutes before the titration and continued during the titration.

Apparatus and Standard Solution For the electrometric titration of iron in glass or glass-making materials the most convenient strength of potassium dichromate q QQ5 jy **q£** ,j1js so iu ti0n 1.00 cc =0.000399 g. iron oxide. To make up this solution dissolve 4.9 g. of c. **P.** potassium dichromate in 100 cc hot distilled water and dilute to 20 liters. Shake well.

Standardize this solution by titrating electrometrically in the usual manner accurately weighed samples of c. p. iron wire newly polished with emery cloth.

Factor on Solution

$$\frac{\text{g.FeO wire } \mathbf{X}\ 79.84}{\text{cc } K_2Cr_20?X55.84} - = \text{g. } Fe_20_3/\text{cc}$$

Stannous Chloride Solution Dissolve 113 g. stannous chloride in 200 cc concentrated hydrochloric acid. Dilute to one liter and keep a few pieces of tin metal in contact with the solution.

Brine Solution for Salt Bridge Make a saturated solution of sodium chloride and arrange the customary glass siphon with about twelve inches of rubber tubing to connect with the half cell. A spring pinch clamp conserves the brine satisfactorily. Two liters of the brine should last several months.

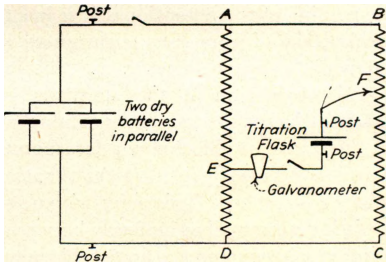

FIG. 1.—Roberts Titration Potentiometer showing wiring diagram.

In the Roberts Titration Potentiometer we have a sliding contact *F*, making contact with the resistance coil *BD* divided into 200 equal divisions. In parallel therewith are two fixed resistances *AE* and *EC* in series with each other and having resistances in the proportion 140 to 60. *E* is connected to *F* through a galvanometer and the titration cell. Since *A B* and *CD* have negligible resistance *A* is at the same potential as *B* and *C* as *D*. That is, *AC* equals *ED* in voltage drop. The potential drop between *B* and *D* is proportional to the divisions. The potential drop of *AE* is to that of *EC* as 140 is to 60.

When contact is made across *EF* a current will flow and deflect the galvanometer unless the position of *F* is such that its potential, less that of the titration cell, is equal to that of *E*. Accordingly, if we adjust *F* so that no current is indicated by the galvanometer, the reading *F*— 60 is proportional to the potential of the titration cell. For the purpose to which the Roberts is put, direct readings of F, an arbitrary measure of the potential, are sufficient, for the addition of 60 to the potentials merely shifts the whole volume-potential curve, upward without altering its shape.

The calomel electrode is assembled by placing in the bottom of the arm about i inch of freshly cleaned mercury. (Cleaned by filtering, or washing with nitric acid). Then J inch of dry calomel is placed on top of the mercury and water or brine added to moisten the calomel. Stirring will help wet the calomel. However, care must be taken not to mix with the mercury. Then connect with the brine and be sure to sweep out all bubbles and allow the brine time enough to displace the water in the calomel. The wires leading from the platinum connections on the half cell to the potentiometer are conveniently annunciator wire.

The platinum electrode should occasionally be ignited in a flame. It should be kept standing in hydrochloric acid,

proced re To determine electrometrically the iron in any glass or glass-making material it is first necessary to get the iron into solution in II1 hydrochloric acid. For the methods of effecting solution see the particular material under consideration.

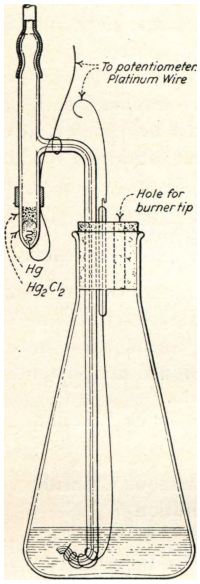

FIG. 2.

Having obtained solution of the iron in 111 hydrochloric acid (150 cc) in a 500 cc Erlenmeyer flask, bring the acid solution to boiling, let cool so that the flask can be shaken by hand, add the minimum number of drops of stannous chloride in hydrochloric acid (usual qualitative reagent) to decolorize the ferric iron. Wash the titration head with distilled water and flow out a few drops of brine from the salt bridge to prevent contamination from the last analysis. Insert the titration head in the Erlenmeyer and insert the tip of the buret through the hole provided in the titration head.

Close the switches on the Roberts potentiometer and balance the potentiometer. (Turn the wheel so that the galvanometer reads zero). Shake the solution well and again balance. If the reading of the potentiometer is less than 70, add a few cubic centimeters of potassium dichromate solution, shake well and balance the potentiometer. If the potentiometer reading is over 70, oxidation of the stannous chloride by the air is a sufficient factor to cause a continuing shift in the potential. This oxidation will destroy all the stannous chloride in a few minutes. The air will also oxidize ferrous chloride, so that it is necessary to start the titration just as soon as the end point of the stannous chloride is reached. This point with new batteries is 85-90 and with old batteries 95-100.

It is determined as half-way between the last stable potential while stannous chloride is in the solution and the first stable potential after the stannous chloride is all destroyed. Another means of identifying this point is that at this point the solution begins to turn faintly yellow.

The buret reading at this point should be noted for it is the beginning point of titration. Add quickly a considerable amount of potassium dichromate solution, shake and balance. Govern the next addition of potassium dichromate by the potential obtained on each previous addition. As the end point is approached, decrease the additions to 1/100 of the total titration and record the titration and corresponding potentials. As the end point is approached, after each addition, shake and balance repeatedly until a

constant balance is established. Continue additions beyond the end point until each addition produces less than one-third of the greatest change produced by any equal addition.

Plot the curve of the potential against buret readings and determine therefrom the point of inflection. After a little practice it is possible to estimate the point of inflection by an inspection of the potentials without drawing the curve. Subtract the reading of the buret at the beginning point of the iron titration from the buret reading at the end point (point of inflection last obtained). The difference is the measure of the iron oxide present in the sample.

Calculation $$\frac{\text{cc} \times \text{factor} \times 100\%}{\text{g. sample}} = \text{Fe}_2\text{O}_3 \text{ in sample}$$

note: If desired the titration may be repeated merely by reducing and titrating as before.

note: It occasionally happens that a bubble gets in the capillary salt bridge and breaks contact, so that turning the potentiometer wheel makes no change in the galvanometer. The remedy is to flow enough of the brine to sweep the bubble out of the capillary.

Another cause of breaking contact is corrosion of the copper wires at the point of contact with the platinum wires. The junctions should be disconnected and the copper wires scraped. On re-connecting no trouble should be experienced.

Sand is likely to accumulate in the tip of the salt bridge. It does no harm as long as it is possible for the brine to flow slightly.

note: Be sure the galvanometer needle comes to rest at zero when no current is flowing.

note: In the procedure recommended by Hostetter and Roberts, the solution is blanketed throughout the titration by some nonoxidizing gas, as carbon dioxide. The carbon dioxide is introduced through the titration head by means of a t-tube, one leg of which affords a means of exit for the platinum electrode. The exit gases flow out around the buret tip.

This procedure is more strictly accurate than the one described above. It gives a smooth curve at the beginning point of the titration and eliminates the necessity for haste at that point. However, if the titration without the carbon dioxide blanket is conducted rapidly the same result is obtained as with the carbon dioxide. Twice as many titrations may be made in an hour without carbon dioxide and one is saved the nuisance of the carbon dioxide generator.

note: The end point in the determination of iron in sand is more sharp than in the determination of iron in lime or feldspar. More care is therefore necessary in following the potential changes in these cases than with sand.

note: Nitrates interfere with the titration owing to their slow and continuing tendency to oxidize the stannous chloride and ferrous chloride. They should be destroyed before starting the titration. Removal is effected by precipitating the iron as hydroxide and filtering off the liquid, then redissolving the iron. Filtrates may be destroyed by long continued boiling with an excess of stannous chloride.

note: The method is independent of the presence of titanium for the reduction potential of titanous chloride is similar to that of stannous chloride, so that it is all oxidized before the ferrous chloride begins to be affected.

The method is independent of the presence of chromium, for it would be converted to chromic chloride by the stannous chloride and chromic chloride is one of the products of the reaction.

note: Copper is included in the results, as its curve is very closely like that of iron.

Vanadium is included in the results, but is not apt to be met with.

THE DETERMINATION OF IRON AS Fe_2O_3 IN GLASS SANDS BY THE ELECTROMETRIC METHOD

Weigh a 10-gram sample of the sand into a platinum dish of 150 cc capacity. (It is not necessary to grind the sand). Moisten the sample with distilled water and add 2 cc concentrated sulphuric acid. Mix thoroughly by shaking the dish. Hydrofluoric acid (c. p. 48%) is now added until a few drops no longer produce any reaction.

NOTE: This reaction is not violent unless the sand is ground.

Fill the dish with hydrofluoricacid, place on the sand bath or hot plate, and evaporate. The sand becomes flocculent and may completely dissolve. In the latter case, the evaporation is carried to sulphuric acid fumes, rapidly at first, then carefully to avoid loss by spattering.

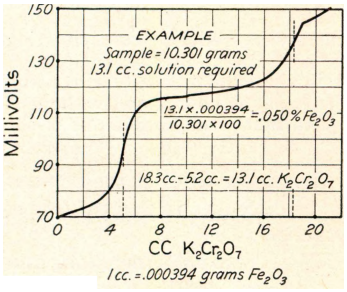

FIG. 1

In case the solution is not complete, carry the evaporation down half way, then refill the dish with hydrofluoric acid and evaporate to sulphuric acid fumes and dryness.

Ignite the dish containing the residue for a few minutes at 1800° F to drive off any excess sulphuric acid and burn out any organic matter that may be present.

Cool the dish containing the residue and add 25 cc hydrochloric acid 111, cover with a watch glass, heat to boiling and filter into a 500 cc Erlenmeyer flask. Wash the filter paper three times with hot water.

Return the paper to the dish and ignite. Make a quick fusion with sodium carbonate (2 grams, 5 minutes). Dissolve the melt with hydrochloric acid 111 and add to the Erlenmeyer flask, disregarding any silica that may have been carried over. Add hydrochloric acid *11*1 (and concentrated hydrochloric acid equal to the volume of wash water used) to bring the volume up to 150-200 cc. Cover with a watch glass and heat to boiling. Cool the neck of the flask with a stream of cold water. Reduce the iron with stannous chloride (minimum number of drops). Adjust the titration head, insert the buret tip, and titrate with standard potassium dichromate solution, while recording the potential by means of a Roberts Electrometric Titration Apparatus. From the potential titration curve ascertain the number of cubic centimeters of potassium dichromate solution required by the iron chloride in the solution.

Calculate the percentage of total iron as iron oxide. Report as iron oxide. A blank is run on the reagents used and the blank subtracted from the titration.

REPORT OF THE COMMITTEE ON "THE USE OF THE WORD "ENAMEL" "[1]

1. The use of the word "enamel" for certain kinds of gloss type paints is so well established that this Committee reports that it cannot hope to keep the paint manufacturers or producers of painted metal products from using this designation.

2. It is recommended that in describing porcelain or vitreous enamels that one or both of these adjectives be used.

3. It has been suggested that a new word might be coined to use for enamel that could be trade-marked, similar to the way in which the manufacturers of artificial silk have coined and used the word "Rayon" for their product.

[1] Submitted by R. D. Landrum, *Chairman.*

NEW MEMBERS RECEIVED FROM FEBRUARY 19 TO MARCH 15

CORPORATION

The Central Alloy Steel Corp., Massillon, Ohio. F. M. Portz, representative.

The Conover Co., 310 S. Michigan Ave., Chicago, 111. M. R. Ferris, representative.

Midwest Fire Brick Construction Co., Stephenson Bldg., Detroit, Mich. Chas. M. Pease, representative.

PERSONAL

A. **Raymond Brown,** Hadfield-Penfield Steel Co., Bucyrus, Ohio.

Robert B. Burr, 103 Pacemont Rd., Columbus, Ohio. Industrial Engineer, Logan Gas Co.

John A. Cullen, Supt., Yankee Hill Brick Mfg. Co., Lincoln, Nebr.

G. G. Hanson, 2642 N. Mozart St., Chicago, 111. Sales Representative, Erwin Feldspar Co.

W. A. Heisel, Chas. Taylor Sons Co., **1225** Glenlake Ave., Chicago, **111.**

Hermann Knuth, Bonn a. Rhein, Bahnhofstrasse 42, Germany.

Adam F. Moranty, 1271 Union Trust Bldg., Cleveland, Ohio. District Manager, Leeds and Northrup Co., Philadelphia, Pa.

Wilson A. Philips, 309 Fifth Ave., New York City.

***Roy W. Schweiker, 509** Derstine Ave., Lansdale, Pa. Vice President and Superintendent, Franklin Pottery.

Olin K. Smith, United Light and Power Engineering and Construction Co., Davenport, Iowa. Chemical Engineer.

Robert W. **Sneddon,** G. P. O. Box 1536, Wellington, New Zealand.

Simon H. Stupakoff, Secretary and Manager, the Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

Kasper Olaf Swenson, 78 New Bond St., Worcester, Mass. Norton Co.

Paul H. Taylor, 307 N. Michigan Ave., Chicago, 111. District Manager, Leeds & Northrup Co., Philadelphia, Pa.

James G. Thompson, 5045 Lindell Blvd., St. Louis, Mo. Laboratory Assistant, Laclede-Christy Clay Products Co.

Walter J. Troy, 93 Melrose St., Rochester, N. Y. Asst. Chemist, The Pfaudler Co.

*Received at Detroit Meeting.

STUDENT

Charles H. Commons, 1212 W. University Ave., Urbana, **111.**

Frank J. Fallon, 810 W. Springfield Ave., Urbana, **111.**

Thomas M. Felton, Dept. Ceramic Engineering, Ohio State University, Columbus, Ohio.

Edward L. Harcourt, 44§ E. Norwich Ave., Columbus, Ohio.

N. O. Alex Kleerup, 212 E. Chalmers St., Champaign, **111.**

Perry C. McCallum, 503 N. Lake St., Urbana, **111.**

Earl F. McDonald, 603 E. Springfield Ave., Champaign, **111.**

Lane Mitchell, 850 Penn Ave., N. E., Atlanta, Ga.

Richard S. Moore, 6959 Paxton Ave., Chicago, **111.**

Theodore H. Palmer, 125 N. Logan Ave., Danville, **111.**

Walter E. Williams, 401 Allen Street, State College, Pa.

Geo. Wolfram, 212 E. Chalmers St., Champaign, **111.**

MEMBERSHIP WORKERS» RECORD

Corporation			
George Blumenthal	1	Office	1
F. H. Riddle	1	Total Corporation	3
Personal			
Hugo Akermann	1	H. G. Parsons	1
Henry Brewer	2	E. E. Pressler	1
J. L. Crawford	1	Malcolm A. Schweiker	1
W. A. Darrah	1	Office	6
E. E. Geisinger	1		
Arthur T. Malm	1	Total Personal	16
Student			
A. I. Andrews	3	E. J. Vachuska	2
R. K. Hursh	3	Office	1
C. W. Parmelee	2		
J. B. Shaw	1	Total Student	12
		Total	31

NEWS FROM MEMBERS OF THE SOCIETY

Albert S. Aldcock has been transferred from the Tiffin, Ohio plant of the Standard Sanitary Manufacturing Company to the Richmond, Calif, plant,

Henry N. Baumann, Jr., formerly a ceramic student at the University of Washington, Seattle, Wash., is employed in the research department of the Carborundum Company, Niagara Falls, N. Y.

Robert C. Boyd, recently ceramic engineer for the Chicago Hardware Foundry Company, has become affiliated with the Standard Sanitary Mfg. Co., 2801 Preble Ave., Pittsburgh, Pa.

Miss Mabel C. Farren, active in Art Division work of the Society for several years, is located at Laguna Beach, Calif.

On March **1, Fred B. Garrod,** chemist for the Owens Bottle Company, was transferred from Toledo to their plant at Charleston, W. Va.

S. E. Hemsteger, who has been associated with the Mt. Clemens Pottery Co., Mt. Clemens, Mich., has recently joined the Research Department, Standard Sanitary Mfg. Co., Pittsburgh, Pa.

T. A. Klinefelter moved to Columbus, Ohio in February from Washington, D. C. Mr. Klinefelter is superintendent of the Ceramic Station, Bureau of Standards, located in Columbus.

Wm. **H. Landers,** formerly of Collinsville, Illinois, has moved to Oakland, Calif.

Michael Maloney is no longer with the Glascote Co., Euclid, Ohio, but is affiliated with the Davidson Mfg. Co., Montreal, Canada.

J. Burnett Matson has moved from West Chester, Pa. to Rochester, N. Y. where he is connected with the Mechanics Institute.

On March **1, Samuel J. McDowell** took up his new position with the Corning Terra Cotta Company, Corning, N. Y. Mr. McDowell was formerly superintendent, U. S. Bureau of Standards, Columbus Station, Columbus, Ohio.

Richard G. Mills has moved from Champaign, Illinois, to Cayuga, Indiana.

Ralph J. Paddock is located with the Pittsburgh plant of the Standard Sanitary Mfg. Co., having left the U. S. Gypsum Company at Gypsum, Ohio.

H. A. Rossell, Tennessee Mineral Products Company, has moved to Spruce Pine, N. Car., from Bristol, Tenn.

W. W. Tsou, who attended the University of Illinois last year, is located at Sheffield, England, University of Sheffield.

Bruce F. Wagner has moved from Rochelle, Illinois, to 4150 E. 56th St., Cleveland, Ohio.

Tso Ming Wu, a student in the ceramic department at Ohio State University, has moved to Wheeling, W. Va., where he is employed.

IN MEMORIAM

Oliver Otis Bowman

Oliver Otis Bowman, Trenton, N. J., frequently referred to as the dean of the manufacturers and bankers of that city, died at the McKinley Hospital, Trenton, Dec. 5, 1926, aged 88 years.

Mr. Bowman was born August 23, 1838, at Wilkes-Barre, Pa.; was educated in the public schools of that city. He later attended the Weissport, Pa., Seminary. In 1859 he took over the business of Bowman Brothers, a general mercantile concern, in Perryville, and conducted this enterprise until 1862, when his store was swept away by the swollen waters of the Lehigh River, a flood which nearly cost him his life. After the inundation, he was awarded the contract for rebuilding part of the damaged canal in the vicinity.

After serving in the Civil War as a member of the Nineteenth Pennsylvania Volunteers, he came to Trenton to engage in the manufacture of terra cotta and bricks under the firm name of O. O. Bowman & Company, which was succeeded in 1877 by the Trenton Fire Clay and Porcelain Company, of which he was president. This grew to be one of the important industries of the city.

O.O. BOWMAN

It was largely due to Mr. Bowman's efforts as head of the latter concern that the removal of the J. L. Mott Iron Works from New York to Trenton was effected. For a time he was treasurer of the Mott concern.

He was one of the organizers and once president of the Broad Street National Bank and throughout his life was active in the interests of that institution.

Mr. Bowman was particularly prominent in the ceramic industry at Trenton, and his passing caused general sorrow among his many business friends and acquaintances, despite the fact that he had not been active since the injury which resulted in his death. His passing was not only a severe loss to the clay-working field in the state, but to the city of Trenton, where he had been so active in civic affairs concerning the welfare of the municipality.

REPORT OF THE CHAIRMAN OF THE EXHIBITION COMMITTEE (ART DIVISION)

The exhibition of ceramic art ware which was displayed at the Arts and Crafts Club during the meeting of the AMERICAN CERAMIC SOCIETY in Detroit in February was the finest which the Art Division has ever sponsored. There were more exhibitors than ever before and the art work shown was both varied in style and of high artistic value.

Through the efforts of Martha G. Westfeldt, Chairman of the Committee, an exhibit of Danish ware from the Royal Manufacture of Copenhagen was secured. Eight pieces were shown from the Dalgas exhibition as follows,

(1) Jais Nielsen, (one vase, grey stone ware with decoration underglaze and iron glaze), and (2), (one vase, turquoise blue stone ware), (3) Knud Kyhn, (one animal in stone ware, half-matt glaze), and (4) (one animal turquoise blue stone ware), (5) Hans Hansen, (one vase, Celadon porcelain), (6) Gerhard Henning, (one figure, overglaze decorated porcelain), (7) A. Malinowski, (one figure in biscuit, soft china), (8) N. Tidemand, (one vase in grey crackled porcelain, decorated overglaze, special rough body).

A loan exhibition of French ware included nine pieces.

(1) Lenoble, (Persian blue vase), and (2) (white decorated bowl), (3) De Coeur (white vaseX (4) De la Herche (white porcelain vase), (5) Mayadon (Persian blue), (6) Simmen (white vase, coral top), (7) Serre (cream-colored decorated vase), (8) Massi (minuscule), (9) Sevres (biscuit lamb), (10) Decorchemont (blue glass vase).

Three other Danish pieces were also shown,

(1) Jais Nielsen, (Celadon incense burner), (2) Henning, (girl with mirror), (3) Bing & Grondahl (small white bowl).

The latter Danish and French ware were pieces owned by Mrs. Westfeldt and shipped from New Orleans for use at the Meeting.

In the United States, thirty companies and individuals were solicited and eighteen replied by sending an exhibit. Nine declined for various reasons, chiefly because there was nothing new to show or they were too busy and only three failed to reply.

Those who exhibited from this list were,

American Encaustic Tiling Co., 16 East 41st St., New York City, Leon V. Solon, Art Director.

Art Institute of Chicago, Chicago, 111. Myrtle M. French, Instructor Pottery Dept.

Batchelder Wilson Co., 101 Park Ave., New York City.

Boston Pottery Work Shop, 79 Chestnut St., Boston, Mass. (A group of studio potters working together.) Ellen W. Cushing, Secy.

Chas. S. Connick, 9 Harcourt St., Boston, Mass., Leading designer and maker **of** stained glass windows.

Charles M. Harder, high school pottery, Peabody High School, 813 Collins Ave., Pittsburgh, Pa.

T. G. Hawkes & Co., Corning, N. Y., Samuel Hawkes, President. Glass Manufacturers, Grand Prize, Paris. Six pieces of crystal for exhibition.

Lenox Inc., Trenton, N. J., Frank G. Holmes, Secy. First White House dining service made in United States (by Lenox), Wilson administration.

Muncie Clay Products Co., Muncie, Ind., C. V. Grafton, Gen. Mgr. (Makers of sand crucibles and rainbow art pottery.)

Near East Relief, 151 Fifth Avenue, New York City, Fred M. McCallum. (Studio pottery done by children.)

Mrs. Bentley Nicholson, 1122 Jackson Ave., New Orleans, La. (Studio potter, hand-built tiles, bowls, etc. "Master craftsman.")

H. V. Poor, Rockland Company, New York City, N. Y., (Studio potter, free use **of** design.)

Mrs. Adelaide Robineau, 204 Robineau Road, Syracuse, N. Y. (Master craftsman. Delicate carved designs on porcelain, crystalline glazes, etc.)

Maud Robinson, Greenwich House Potteries, 27 Barrow Street, New York City. (Studio potter.)

Steuben Division of the Corning Glass Works, Corning, N. Y., Irving B. Cary, Mgr.
Zane Pottery Co., South Zanesville, Ohio, Leo J. Decker, Asst. Treas.
Paul St. Gaudens, The Chappell School of Art, Denver, Colo. (Can be reached at 338 W. 6th St., Claremont, Calif.) (Studio potter.)
Mrs. Robert Bowditch Stone, Woodland Road, Jamaica Plain, Mass.

Eighty members of the Art Division were solicited for samples of their work. Twenty-six of these accepted and forwarded an exhibit. These were:

Mrs. Lulu S. Backus, 451 S. Goodman St., Rochester, N. Y., Head Ceramic Dept. Mechanics Institute.
A. E. Baggs, The Cowan Pottery Studio, Rocky River, Ohio. Director Marblehead Pottery, Marblehead, Mass. and associated with Cowan Pottery Studio.
Charles F. Binns, Alfred, N. Y., Director New York State School of Clayworking and Ceramics, Alfred, N. Y. (Influence has been very great. Has produced a series of highfire copper reds of fine quality and color.)
May E. Cook, 1550 Clifton Ave., Columbus, Ohio. (Sculptor in glazed terra cotta and marble.)
Cowan Pottery Studio, Rocky River, Ohio, R. G. Cowan, President.
Russel G. Crook., South Lincoln, Mass. (Studio potter salt-glazed vases, polychrome tiles.)
Ellen W. Cushing, 138 Marlborough St., Boston, Mass. (Same as Boston Pottery Work Shop)
Flint Faience Tile Co., Flint, Mich. Ralph E. Hanna. ^
Marion L. Fosdick, Alfred, N. Y., (Instructor, Ceramic Art Classes.)
Myrtle M. French, Art Institute of Chicago, Chicago, 111.
Fulper Pottery, Wm. H. Fulper, Flemington, N. J.
Green Shutter Pottery, 633 Royal St., New Orleans, La. Martha J. G. Westfeldt.
Iowa State College, Ames, Iowa. (Paul E. Cox., Director Ceramic Dept.)
Henrietta O. Jones, St. Louis School of Fine Arts, Washington University, St. Louis, Mo., Instructor of Ceramic Art.
Robert H. Louden, The National Tile Co., Anderson, Ind.
Newcomb School of Art, Newcomb College, New Orleans, La. Mary G. Sheerer.
Elizabeth G. Overbeck, Cambridge City, Ind. Overbeck Pottery.
Pewabic Pottery, Mrs. W. B. Stratton, 10125 E. Jefferson Ave., Detroit, Mich.
Mr. and Mrs. Frederick H. Rhead, Zanesville, Ohio.
Roseville Pottery Co., Zanesville, Ohio.
Schenley High School, Pittsburgh, Pa., Edna P. Carson.
Shearwater Pottery, Ocean Springs, Miss., Peter Anderson.
University of North Dakota, University Station, Grand Forks, N. Dakota. Margaret K. Cable, Instructor Ceramic Art.
Leon Volkmar, 3427 Cornell Place, Cincinnati, Ohio.
Harry Voorhees, Inwood Pottery, W. 207th St. and Ship Canal, New York City.
Mrs. Martha T. Weaver, Cleveland School of Art, 11441 Juniper Road, Cleveland, Ohio.

Among the replies listed from those who did not exhibit this year were many who expressed a desire to be allowed to present their ware at the 1928 meeting in Atlantic **City.**

OUR ADVERTISING RECORD

The accompanying curve shows for the years 1922-26 inclusive, the monthly average number of pages of advertising other than "classified" which the members of the SOCIETY have secured.

Advertisements in this *Journal* are for two purposes, (1) information and (2) income. The *Journal* is the tool or means by which the members exchange and preserve results of study, investigations, and observations. It is a costly means but the cost is at the minimum consistent with clear and full presentation in good style. Advertisements are

essential to sufficient income to permit of issuing such a *Journal* monthly and keeping the annual personal membership fees at the low sum of $10.00.

It is a surprise to those who know of the cost of association work and the cost of monthly journals of such high character and size that it is possible to keep the personal membership of this SOCIETY at such a low figure. Usually, for like association enterprises, the personal fees range from $15 to $25 with, too, an occasional assessment.

The SOCIETY'S argument is that if it is to be of the maximum benefit to the ceramic industries it must keep its personal membership fee down to a figure which employees can pay. The securing of advertisements for the *Journal* is one of the means of making possible the participation in the benefits of membership in the SOCIETY by ceramic employees.

Advertisements in the *Journal,* however, serve another purpose; they disseminate information. In this respect the advertisements in the *Journal* are very much worth while. Even though financed by endowments sufficient to cover the printing costs of the *Journal*, there would remain the question of whether the SOCIETY would be justified in discontinuing the advertisements because of their educational value.

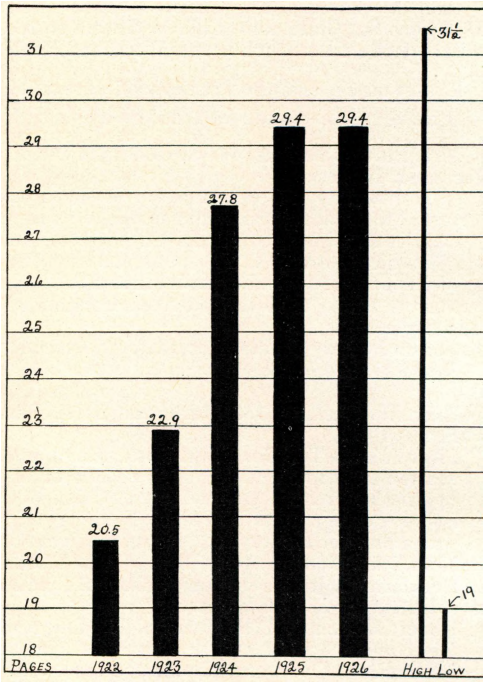

FIG. 1.—Advertising record for *Journal of the American Ceramic Society.*

The SOCIETY does not have a personal representative soliciting advertisements. The SOCIETY does not feature installations in modern plants nor does it allow of advertisements that do not give ceramic information. The SOCIETY is dependent on solicitation by the personal members from those firms known to have material or equipment which can to advantage be used in producing ceramic wares.

Those members who have not been assisting in securing and keeping the *Journal* advertising up to standard in quantity and quality by direct solicitation and by communication written or spoken with those firms who are advertising should remember that this is their enterprise and that the larger the advertising income, the more active can be the committees and much larger can be the amount of information recorded in the *Journal.*

LOCAL SECTION NOTES

The St. Louis Section[1]

The members of the St. Louis Section, AMERICAN CERAMIC SOCIETY held a meeting on March 4, 1927 at The American Annex Hotel. Following dinner, the meeting was called to order by Chairman Crawford at 8:00 P. M.

[1] C. C. Lake, *Secretary.*

An excellent talk on geology, illustrated by many colored slides, was given by Dean W. E. McCourt of Washington University. Dean McCourt used the beautiful canyon country of Arizona and southern Utah to show the formation of rock and the effect of erosion by wind and water.

A resum6 of the papers read at the Detroit Meeting was given by several of the members who attended.

H. W. Perry reported the progress of the Smoke Abatement League in its efforts to educate the householder as well as the industrial plant in correct firing methods so as to reduce smoke to a minimum.

J. L. Crawford reported that the Ceramic School at the Rolla School of Mines was now established with Dr. M. E. Holmes in charge, and that the school could make the general tests of raw material or finished product as required by the industry.

Following the program, election of officers was held and the following officers were unanimously*elected to serve during the ensuing year;

C. H. Modes, Chairman
F. E. Bausch, Vice-Chairman and Councillor
C. C. Lake, Secretary
H. W. Perry, Treasurer

Those present were:

Dean W. E. McCourt, Washington University
F. E. Bausch, Frederick E. Bausch
Laclede Gas & Light Company
E. P. Bell
C. E. Hartwein
W. H. Hoagland
W. D. Thompson
T. E. Wood
C. O. Wright
Evens and Howard
H. B. Stone
B. W. Wilson
Russel Engineering Company
W. W. Aulepp
J. Cox
C. C. Lake, Parker Russell Mining & Mfg. Company
Laclede Christy Clay Products Company
H. P. Williams
L. C. Hewitt
H. W. Perry
W. F. Godejohn
J. L. Crawford
J. B. Ives
L. H. Blue
J. G. Thompson
H. E. Johnson
H. W. Perry
F. G. Jaeger, Superior Enamel Products Company
F. H. Schwetye, Mo. Fire Brick Company
J. S. Groppe, Highland Fire Clay Company
L. M. Diven, Blackmer and Post Pipe Company
A. D. Oetjen, Standard Oil Company

REPORT ON THE NORTH CAROLINA STATE STUDENT[1] BRANCH OF THE AMERICAN CERAMIC SOCIETY

The past year and especially the past half-year has been the most successful in the short history of this Branch. Interest in the meetings has been constantly growing and the attendance has been splendid, due largely to the leadership of this year's president, P. E. Trevathan and the chairman of the Program Committee, L. R. Whitaker. Mr. Whitaker has arranged for a special speaker for each meeting held during this college year. Each program has also included addresses by two members who have been encouraged to speak extemporaneously. The students have taken as their subjects their experiences on summer work.

[1] A. F. Greaves-Walker, Councillor

The principal speakers and their subjects were as follows:

J. L. Stuckey, State Geologist, "The Shales of North Carolina."
J. G. Vann, "Selling Clay Products."
G. M. Norwood, President, Norwood Brick Company, "The Future of Ceramic Engineering in the South."
Bruce Drysdale, President N. C. Clay workers Assn., "The Future of the Ceramic Industry in North Carolina."
J. G. Moland, President Moland-Drysdale Corp., "West Indies Travelogue."
A. F. Greaves-Walker, Ceramic Department, North Carolina State College,. "Artistic Brickwork."
G. R. Shelton, Ceramic Department, North Carolina State College, "Colloids."

The Branch has been making plans and preparations for its part in the program for Engineer's Day and will have a float in the parade and ceramic souvenirs for the Engineer's Fair. One of the members, A. McK. Greaves-Walker, was elected manager of the Fair by the Engineering students.

Fifteen new members were initiated at the beginning of the college year, making a total membership of thirty.

The Treasurer's report is as follows:

Dues collected	$37.00
Expenditures	31.50
Balance on hand	$ 5.50

The officers for the year are:

P. E. Trevathan, President
A. McK. Greaves-Walker, Vice President
W. L. Stafford, Secretary-Treasurer

P. E. Trevathan
A. McK. Greaves-Walker — Representatives on Engineer's Council

NOTES AND NEWS

AMERICAN REFRACTORIES INSTITUTE MEETING

The spring meeting of the American Refractories Institute will be held at Atlantic City, N. J., Hotel Traymore, May 18 and 19. The first day of the meeting will be taken up by a business and technical session and on the second day there will be a golf tournament.

GERMAN CERAMIC SOCIETY ANNOUNCEMENT

Members of the German Ceramic Society will meet in Berlin in October, 1927. An exhibit of "Ceramic Masters' and Scholars' Work" is being drawn up for the occasion, according to the plans, and models, from the work of teachers and students of all German polytechnic schools will be shown so as to usher in a union of the industry with the artistic aftergrowth.

At the same time a "Materials Convention" will be held at which German industry will cooperate, both ceramic materials and ceramic methods of testing being demonstrated.

Members of the AMERICAN CERAMIC SOCIETY are invited to attend this meeting if they are in Europe at the time.

SOCIETY OF GLASS TECHNOLOGY

Meeting of January 18 and 19

At the meeting of the Society of Glass Technology held in Manchester on January 18 and 19, 1927, the following papers were presented:

1. The Effect **of** Cullet **on** the Melting **of Glass.** By W. E. S. Turner. In the course of his remarks Prof. Turner said that cullet was used largely for economical reasons and the desire to use waste materials. The amount of cullet mixed in batches might vary greatly according to the type of glass being,made and according to the method by which the glass was being worked out.

The questions they had to consider were: what was the effect on the melting and on the working of glass, and what was the cause of the change in the working properties of glass as the amount of cullet changed. It had been stated, said Prof.Turner, that manufacturers using all cullet never succeeded in getting seed-free glass. With regard to the influence of cullet on the working properties, it would appear that after a certain proportion of cullet was reached, the glass became stiffer and stiffer to handle. The important question was, how much cullet could be employed, especially in machine working. With a large proportion of cullet in the batch, the viscosity of the glass tended to become high and the working range to become shorter. Why did this happen? The usual explanation was that there was a volatilization of alkali and the glass became stiffer. Experiments, however, did not substantiate this, as was indicated in the results of certain meltings. V. H. Stott in a recent paper to the Society, found that it was only between 1500° and 1600°C that volatilization of alkalis began to be a factor. Was there then some change in molecular state which influenced the viscosity? How far real viscosity was affected was a problem still to be settled. There was something far more reaching than change of chemical composition.

2. Investigation of the Glassy State by the Method of Forced Crystallization. By **J.** F. Ponomareff, Tomsk, Siberia. In glass the ability to spontaneous crystallization was so weakly expressed and its speed was usually so small, that in ordinary conditions of cooling the molecules of glass had no definite position in the space lattice which accounted for the formation of the crystalline structure. Accordingly the substance chilled in an amorphous state producing a glass. The method of forced crystallization made it possible to crystallize every glass and to determine the temperature of the beginning of crystallization, as well as the melting point of the newly-formed crystals. In the glass under investigation a constant lowering of temperature was maintained, so that the temperature was reached at which the number of spontaneously forming nuclei reached its maximum value. This value could be very small, as in his study of acid borates of sodium in mixtures approaching pure B_20_3, which he was obliged to maintain at such temperature condition for three weeks uninterruptedly until the crystals began to form.

The method of forced crystallization could be used for determining the temperature and speed of devitrification. It should also be used in research work with organic pitch-like substances which resemble glasses in their properties; also in the case of carbohydrates, glycerine and explosives. In conclusion Prof. Ponomareff gave a definition of glass which he believed to be the first approach to a precise characterization of glass. His definition was "A substance is to be regarded as a glass, independently of its chemical composition, which, being a strongly undercooled fusion, gives on crystallizing from the molten mass, crystals of the same chemical composition as the mass itself."

3. The Durability of Some Soda-Lime-Magnesia Glasses. By Violet Dimbleby and W. E. S. Turner. A series of glasses was tested by the powder method. The first member of the series was obtained by the replacement of 0.2 molecule of CaO by 0.2 molecule of MgO, in the parent glass, 6 $Si0_2$: 1.2 Na_20 : 0.8 CaO. Succeeding members of the series

were obtained by the gradual replacement of CaO by MgO molecularly. The boiling reagents used were water, hydrochloric acid of constant boiling strength, and twice normal caustic soda solution.

From the results obtained it was concluded that the gradual molecular substitution of magnesia for lime produced the following effects: (1) durability toward boiling water was slightly enhanced, (2) resistance to attack by boiling hydrochloric acid was slightly impaired, (3) resistance offered to action of boiling caustic soda solution was somewhat decreased.

4. The Present Position of the Glass Industry in Germany. By W. E. S. Turner. The greatest concentration of the glass industry in Germany was in the Lausitz district; indeed, the Germans claimed this to be the greatest concentration of glass works in the world. There were two sections of Silesia in which one encountered a number of works, some of which were, in a way, relics of the former mountain and forest industry. Saxony had a strongly developed glass industry. Dresden could boast of a number of glass factories. Then there was Thuringia which was a strong center. On the western borders of Bavaria, also, touching upon Czechoslovakia, one came across another glass center, while in the Saar district there was a considerable glass industry. Similarly, in the district between Cologne and Essen there was a strongly developed industry, and a still further group of factories as one came into the neighborhood of Aix-la-Chapelle. Out of about 350 factories which existed in Germany in 1924, not more than between 50 and 60 were concerned with glass bottle production. The largest group of factories was that known as the hollow-ware group, which was identified with the production of all kinds of domestic articles. The manufacture of window glass and plate glass was also more widely separated than in Britain. Chemical and scientific glassware was produced in considerable volume, the Thuringian factories being particularly important from this particular aspect.

In regard to raw materials, the German manufacturer might be said to be well supplied, although in regard to fuel, supplies of hard coal were not so well-distributed as in England. The Lausitz district, for instance, had depended almost entirely for its fuel supplies on the enormous beds of brown coal situated thereabouts. In respect to other raw materials Germany was particularly fortunate.

German glass making had not undergone anything like such drastic changes since the war, as had been the case in England. In Germany sheet glass was still being produced by methods which did not involve continuous operation. The general expectance, however, seemed to be that within a year or two, the hand production of sheet glass would be a negligible quantity. In the making of electric light bulbs, automatic equipment was only just being installed. In the bottle section, conservatism was far deeper than in any other branch of the industry. The machines which had been developed were largely of the semi-automatic type.

It was noticeable that something had been done directly and definitely during the last four or five years to encourage research work in glass technology. In this connection such institutions might be mentioned as the one at Zwiesel; a trade school in Bavaria in which technique played a part; the technical school at Karlsruhe in which, in 1923, there was set up a department of glass technology; the high school at Hanover, where there was a section devoted to glass and ceramics; and the department of silicates which was opened in May 1926 at the Kaiser Wilhelm Institute in Berlin.

5. Developments in the Glass Industry in Russia, By J. F. Ponomareff (Tomsk, Siberia). One of the many difficulties encountered was the great distance which sepa-**rated** the various factories. Many works were run without having any technical or trained men in authority. The supplies of raw materials were good, there being plentiful deposits of sand and limestone. Sodium sulphate was obtained cheaply by evaporation from

natural lakes. Since the revolution the number of glass factories had been reduced from 200 to 100; some 40,000 laborers were now employed. Stress was laid upon the need for attracting young educated men to help in the development of the glass industry in Russia. At the same time it was noteworthy that the simple worker could do excellent work, although he was uneducated.

6. Owing to lack of time the reading of the following paper was postponed, namely, [4]**"The Thermal Expansions of Some Boric Oxide Containing Glasses,"** by W. E. S. Turner and F. Winks.

Meeting of February 16

The meeting of the Society of Glass Technology held in Sheffield, February 16, 1927, was a joint one with the Yorkshire Section of the Society of Chemical Industry. The following bodies also took part: The Sheffield Metallurgical Association, The Sheffield Section of the Institute of Metals, and The Sheffield Society of Engineers and Metallurgists. The meeting was devoted to a general discussion on "Silicate Analysis." The following papers formed the basis of the discussion:

1. A Critical Survey of the Method in Use for the Analysis of the Simple Glasses. By W. H. Withey. The glasses comprised in the scheme normally contained silica, iron oxide, alumina, manganese oxide, magnesia, soda and potash, with sulphate, chlorides, and sometimes the oxides of arsenic and antimony in small proportions. The soda-lime series of glasses was included, and lead glasses differed only in that they contained lead. Borosilicate glasses containing zinc, and other glasses of more complex composition were excluded. Attention was directed only to criticisms of methods and recommendations as to the best procedure in order to insure the most accurate results. Referring to the question of the limits of accuracy possible in glass analysis, the author pointed out that the adoption of any standard became naturally a matter for personal opinion and experience. It was not unreasonable to suppose, however, that the limits of accuracy for the major constituents were in the order of 0 + 08, calculated on the weight of the original material, and that the total for the best analyses should fall within the limits 99.75 to 100.20. A comprehensive examination of various methods was made under the following main headings: (1) general survey, (2) the precise determination of the constituent oxides, (3) suggested scheme of analysis, (4) modifications of above scheme for approximate results for purposes of works control.

2. Notes on Methods Used in the Analysis of Glasses. By Violet Dimbleby. Stress was laid upon the precautions to be observed in the determinations of silica and alumina, even in the case of the simple glasses. There was great need for careful washing and for control of the temperature of "baking" the silica; for the latter the use of high temperature was strongly condemned. Experiments made with pure rock crystal indicated that nothing was to be gained by this practice, and when other constituents were present with the silica, as in a glass, serious contamination of the silica would arise. Passing to the study of the more complex glasses, consideration was given to the determinations of ferric oxide, ferrous oxide, manganese oxide, arsenious and arsenic oxide, lead oxide, titania, zirconia, zinc oxide, cobalt oxide, baryta, boric oxide, sulphur trioxide, chloride, and fluoride. Difficulties that were likely to arise, and the precautions or modifications that were necessary under certain conditions, were indicated. The choice of method for the determination of any one of the constituents of a complex glass was determined by the qualitative analysis of the glass; that is, by the nature of the other constituents present. Reference was also made to alternative methods which might be adopted in some cases, where speed was of more count than absolute accuracy.

3. **The Analysis of Refractories.** By W. J. Rees. In the case of most refractories the finest grinding of the sample before fusion was necessary, while for a glass an exceedingly fine division was not absolutely necessary. For fire clays containing 3% or

more of iron oxide and titania, it was undesirable to heat the evaporated fusion at a temperature higher than 105 °C. He found that above 105° there was an increase in the contamination of the silica. He contented himself with evaporating on a water bath. He seconded Mr. Withey's recommendation of the use of methyl red as an indicator; it was very useful in cases where the materials contained large proportions of lime and magnesia. Reference was then made to the analysis of magnesite bricks, basic dolomites, sillimanite, chrome refractories and silica bricks. Sillimanite gave trouble in analysis unless care was taken in the fusion. For the determination of alkalis in fire clays, the author relied on the Lawrence Smith method. He expressed his great interest in a suggestion made by W. Rosenhain in the course of the discussion of Miss Dimbleby's paper, namely, the use of superheated water for the first breakdown of the original material. He (Mr. Rees) had tried the method in a small way, without getting very good results. The method, however, was worthy of further investigation.

4. Notes on the Analysis of Silicate Slags. By T. P, Colclough. A close knowledge of the compositions of the slags formed in metallurgical processes was of fundamental importance, and methods for their rapid and reasonably accurate analysis were necessary. A table was given showing typical analyses of various kinds of slags, from which it was seen that the slags were generally much less siliceous than glasses. Methods were then indicated for the determinations of silica, iron oxide, alumina, phosphate, manganese oxide, lime, magnesia, sulphur and vanadic oxide. In addition to the more precise methods indicated, it was necessary, for the control of commercial processes, to be able to make analyses of slags for certain constituents, with sufficient rapidity and accuracy to be a guide to the person operating the plant. In each of the separate operations in iron- and steel-making at least one constituent of the slag was of vital importance in either the control of the operation or the manner of disposal of the material produced, and a method for the determination of that constituent must be available. A few examples were given to illustrate this point.

CALENDAR OF CONVENTIONS

AMERICAN CERAMIC SOCIETY		
Annual Meeting	Feb., 5-11, 1928	Atlantic City, N. J.
American Chemical Society	April 11-16, 1927	Richmond, Va.
Amer. Electrotechnical Soc.	April 28-30, 1927	Philadelphia, Pa.
Amer. Foundrymen's Association	June 6-9, 1927	Chicago, 111.
Amer. Gas Association	Oct. 10, 1927	Chicago, 111.
Amer. Inst. Chem. Engrs.	June 1-4, 1927	Cleveland, Ohio.
Amer. Refractories Institute	May 18-19	Atlantic City, N. J.
Amer. Soc. Mech. Engrs.	May 23-26, 1927	White Sulphur Springs, W. Va.
Amer. Soc. Steel Treating	Sept. 19-23, 1927	Detroit, Mich.
Amer. Soc. Testing Materials	June 20-24, 1927	French Lick, Ind.
Amer. Zinc Institute	April 18-19, 1927	Montreal, Canada.
Assn. Chem. Equipment Mfrs.	Sept., 1927	New York City
Exposition of Chem. Industries	Sept. 26-Oct. 1,1927	New York City
Glass Container Assn.	April or May, 1927	?
Manufacturing Chemists Assn.	June 2, 1927	New York City
Natl. Academy of Sciences	April 25-27, 1927	Washington, D. C.
Natl. Assn. of Stove Mfrs.	May 11-12, 1927	New York City
Natl. Safety Council	Sept. 26-30, 1927	Chicago, 111.
Natural Gas Assn. of Amer.	May 17-19, 1927	Cincinnati, Ohio.
Stained Glass Assn. of Amer.	June 27, 1927	St. Louis, Mo.