tivities and annual expenses would be submitted to each association participating. This was seconded by Mr. Koch and carried.

Mr. Howington moved that Mr. Butterworth act Ex-officio as chairman of the Organization Committee. This was seconded by Mr. Dickey and carried.

The possibilities of accomplishment were then briefly and informally discussed by a spokesman from each association following which the meeting adjourned.

J. S. SLEEPER, *Temporary Secretary.*

RESOLUTION FOR CERAMIC INSTITUTE

At a meeting of the Executive Committee of the New Jersey Clay Workers Association and Eastern Section of the AMERICAN CERAMIC SOCIETY held at the Trenton Country Club, Trenton, N. J., on June 20, 1924, the Secretary was instructed to forward copies of a resolution, as follows, to the Secretary and members of the Board of Trustees of the AMERICAN CERAMIC SOCIETY:

RESOLVED: It is the concensus of opinion of the members of the Executive Committee of the New Jersey Clay Workers Association and Eastern Section of the AMERICAN CERAMIC SOCIETY that the functions of the proposed Ceramic Institute can be carried out by the AMERICAN CERAMIC SOCIETY as at present constituted, through its Industrial Divisions and Local Sections.

SOCIETY OF GLASS TECHNOLOGY

During the last week of May a party of some 20 members of the Chambre Syndicale des Maitres de Verreries de France paid a visit to England at the invitation of the Society of Glass Technology, thus returning a visit paid last year to France by members of the British Society.

The program included visits to glass works, to Harrow School, to the British Empire Exhibition at Wembley and to the Department of Glass Technology of the University of Sheffield. On Tuesday evening the delegates were entertained to dinner in London on the occasion of the annual dinner of the Society. The other guests were Dr. E. F. Armstrong, F.R.S. (President of the Society of Chemical Industry), Judge F. E. Bradley, LL.D. (Master of the Glaziers Company), J. Holland, Esq. (President of the Ceramic Society), and Dr. C. Baring Horwood (Master of the Glass Sellers Company).

During the week two meetings were held. The first was held in University College London, on Tuesday, May 27, and was a joint meeting with the British Society of Master Glass Painters. The President of the latter Society, the Earl of Crawford and Balcarres, was in the chair and was supported by Col. S. C. Halse, C.M.G. President of the Society of Glass Technology. Three papers were presented.

1. Dr. Ethel Mellor, in a paper entitled "The Decay of Window Glass from the Point of View of Lichenous Growths" gave an interesting account of the acceleration of the decay of glass in ancient stained glass windows by the growth of lichens which made their habitat on the glass. Numerous specimens of these were exhibited and the paper was illustrated by a number of slides.

2. Mr. Noel Heaton, B.Sc., contributed a paper on "The Decay of Mediaeval Stained Glass." He referred to the wide variations in resistance to decay found in mediaeval stained glass. He considered that this was to be attributed mainly to variations in the composition and physical structure of the glass used.

Window glass was introduced by the Romans, who arrived at a very sound composition, and their glass was remarkably durable. Analyses of glass of different periods revealed the differences in composition which resulted from a departure from the Roman tradition in mediaeval times. The resulting loss of durability was illustrated by a series of slides. The lowest ebb was reached about the end of the 14th century, one of the most notable examples being the glass of York Minster, which was in such an extreme state of decay as to require the most careful supervision in its repair.

In the process of decay two causes operated simultaneously; surface weathering due to atmospheric action, and well defined pitting due to the structure of the glass. The variations found in stained glass of the same period was attributed mainly to primitive methods of manufacture, with certain affecting causes. It was characteristic of mediaeval glass that the painted portions resisted decay better than the glass itself, which might be attributed to the lead silicate used uniting with the glass to form a more durable composition. The reverse was the case in later times, the enamel often perishing while the glass remained sound.

3. The last paper was "The Weathering and Decay of Glass" by Prof. W. E. S. Turner, D.Sc. Ancient observers, attributed the decay of glass to various causes, some to the moon, others again to the sun. Even as recently as 1879, James Fowler in his well known treatise on this subject made a minute examination of the decay of glasses of different epochs without being able to come to any precise conclusion. But the nature of the corrosion of glass has been methodically studied by the physical chemist, and the principal causes were now fairly well known.

The chief agent of the action of the atmosphere was moisture. All glassware absorbed moisture to an extent dependent in the first place on its composition, but partly also on the manner in which it had been treated by the workman. Glasses with little stability were those which contained excessive proportions of alkaline oxides, whether of sodium or potassium. Glass of the type silica-soda-lime (such as window glass and ordinary sheet glass) which contained more than 18% of sodium oxide too readily decayed; at the same time the presence of at least 2% of potassium oxide permitted the total alkaline oxides to be increased to 20% without serious danger.

The components which increased the resistance to decay of ordinary glasses were silica, lime, alumina and magnesia. Boric oxide was also very beneficial in a proportion of less than 12%. The eventual hollowing out and the furrowing of glass in process of decay were associated with the mechanical treatment which it had received.

The second meeting was held in the Applied Science Department, Sheffield University, on Thursday, May 29. Col. S. C. Halse, C.M.G. in the chair. The following three papers were presented:

1. "Alumino-Silica Minerals in Fired Glass Pots," by W. J. Rees, B.Sc.Tech., F.I.C.

N. L. Bowen and J. W. Greig of the Geophysical Laboratory, Washington, U. S. A., had recently revised the investigations previously made on the binary system Al_2O_3-SiO_2. They showed that there was only one compound of alumina and silica which was stable at high temperatures. This compound had a composition $3Al_2O_3.2SiO_2$, and chemically was quite distinct from sillimanite (Al_2O_3-SiO_2), although its optical and crystallographic characteristics were almost the same. The crystals of so called sillimanite which were found in the different kinds of fired refractory material and in the ceramic articles were always crystals of the compound $3Al_2O_3.2SiO_2$. Researches made by the author (Mr. Rees) during the firing of pots, and blocks from glass works, as well as during their use at high temperature, corroborated the results obtained by Bowen and Greig. The proportion of $3Al_2O_3.2SiO_2$ which were found in refractory materials after firing depended upon the composition of the material, upon the degree and duration of the heating, and upon contact with, or absorption of, siliceous matter such as glass.

2. "The Effect of Various Constituents on the Viscosity of Glass." by S. English, M.Sc.

To the glass manufacturer, the viscosity of molten glass is perhaps the most important of its properties, as it is the viscosity and the way in which it varies with alteration of temperature that determine whether a glass can be satisfactorily melted, planed and worked. Though the importance of this property has been realized, the practical difficulties of measuring the viscosity at temperatures up to 1400 has prevented the subject being systematically investigated. Results have been published of only a few determinations, and the data provided do not always appear to be consistent, though it is not easy to test this point as the composition of the glasses are not generally given.

Of the various methods which have been used or suggested for the determination of the viscosity of liquids the "rotation" method seems to be the most useful for glass as it can be used over such a large range of viscosity. In applying this method, the glass was melted from cullet in a standard sized cylindrical crucible, and an iridioplatinum sheath secured on the end of a porcelain rod was rotated on its own axis in the center of the crucible of glass. The time required for the iridioplatinum sheath to complete one rotation under different loads at various temperatures was determined, and the viscosity was given as a function of the product of the net effective pull and the time of rotation. The apparatus was calibrated by using syrup, the viscosity of which had been previously determined.

The glasses used consisted of a series soda-lime-silicates obtained by a molecular substituting lime for sodium oxide in a simple sodium silicate, and a similar series in which the sodium oxide was substituted by magnesia.

The curves for the viscosities from about *750°* to 1400 °C show the way in which the viscosity is increased by substitution, and decreased by a rise of temperature.

3. "The Thermal Endurance of Glass. Part I." by V. H. Stott, M.Sc.

In spite of its practical importance the theory of the thermal endurance of isotropic bodies had been somewhat neglected. A theory was submitted, which however owing to the complexity of the phenomena involved, was necessarily not entirely satisfactory. Actually it was possible to increase the thermal endurance of glass by a suitable thermal treatment, but a general method for effecting this could not be given. Another question of practical utility, which could not be determined in a general way, was that of finding the shapes of glassware which were most resistant to thermal shock in the limits imposed by usage. Here again, each case had to be specially considered. It seemed therefore that, from the point of view of thermal endurance, they could choose a glass which suited a given purpose according to its physical properties, but it was most difficult to determine the best process of manufacture for an actual article, or to arrive at a proper method of testing the value of the object made. It was therefore not desirable at present to fix any formal method of testing.

Part II. By V. H. Stott, M.Sc., and Edith Irvine, B.Sc.

Experiments were made which showed that rupture was generally due to local differences of temperature, rather than to the uniform shrinkage of large surfaces. Although this interpretation of the experiments showed that the conditions assumed in the first part of the paper were not strictly fulfilled, the effects of the different factors were not greatly changed, and the formula cited would give satisfactory comparative results. In particular, since rupture was almost instantaneous, the conductivity of glass could not have great importance.

The last meeting of the Society of Glass Technology for the session 1923-24 was held in Sheffield, on June 18th, the President, Col. S. C. Halse, C.M.G., in the chair. Two papers were presented.

(a) "Some Remarks on the Erection and Operation of Modern Pot Furnaces," by Percival Marson. In the absence of the author, this paper was read by Prof. W. E. S. Turner, D.Sc.

The author pointed out that the glass manufacturer, before constructing a pot furnace, which represented so heavy a capital expenditure, should have adequate plans prepared. A furnace builder who knew his business should be able to guarantee his furnace, but in any case it was desirable to have a technologist as intermediary in order that suitable specifications might be laid down and adhered to. Among other things the builder should study the nature of the ground upon which the furnace was to be erected and he should construct an adequate foundation, providing also any necessary drainage and protection of the flues from ingress of water. The provision of suitable flue dampers with some form of indicator allowed of a more accurate regulation of the furnace during working. A small hole in the furnace above one of the pots served to give an indication, by observation of the issuing flame, of the state of combustion, so that correct conditions could thereby be attained. For a "full crystal" glass a furnace temperature of 1306° was sufficient and nothing was gained by exceeding this, but for soda-lime glass a temperature of 1400° could be maintained with advantage. It was claimed that for the crystal glass a circular pot was better than an oval or egg-shaped one, since it was less likely to cause cords in the glass.

(b) "Note on an Unusual Type of Recuperative Tank Furnace," by F. W. Hodkin, B.Sc. and Prof. W. E. S. Turner, D.Sc. This paper was presented by Mr. Hodkin who gave an account of observations made upon a recuperative tank furnace in operation at the Belinda Works of Messrs. Law & Shaw, Ltd., Leeds. The observations were made as the result of an invitation extended by Mr. J. S. Shaw to Prof. Turner to inspect the furnace.

The main feature of interest was the method of recuperation of the secondary air. This air entered by arched passages situated beneath the bottom of the tank and above similar passages conveying the exit gases to the chimney flue. It then passed by means of vertical channels in the working end of the furnace to a space between an upper and a lower crown. After traversing the space between the crowns, the air entered the furnace through a series of ports which were placed so as to have the gas ports between them.

Producer gas was admitted, without preheating, through a gas-chamber connected with ports or burners opening into the melting end of the furnace. The flames traversed the whole length of the furnace, the products of combustion escaping through vertical downtakes in the working end to the flues beneath the tank.

The batch was charged through an opening at the side of the furnace and one big advantage claimed for the method of construction was that it permitted of working operations being conducted along the walls, not only of the working end, but also of the melting end, by the use in the latter of syphons.

The tank had a double bridge. In other words, the bridge had three walls separated by cavities through which steam was blown for cooling purposes.

With gas at 700 °C and air at 720 °C, the temperature of the glass in the melting end was 1460 °C. The production of glass from the tank, which was not being worked at full capacity, averaged 60 tons per week for a consumption of about 60 tons of coal on the producers. This glass was worked by three machines with feeders situated in the working end of the furnace, and by hands from four boots in the melting end. The designers anticipated a production of more than 120 tons of glass per week when working fully.

The President intimated that a party of members of the Society was visiting Belgium from July 7th to 12th.