JOURNAL

OF THE

BRITISH SOCIETY OF SCIENTIFIC GLASSBLOWERS

Vol. 2 JUNE, 1965 No. 2

CONTENTS

	Page
Editorial	13
Chairman's letter	13
Sealing Glasses—Part 2	14
Abstracts	10A
Glassblowing in Japan	19
Workshop Notes	20
Council Matters	23
Section Reports	24
Education	25

Editor
J. H. BURROW
H. H. Wills Physics Laboratory
Royal Fort
Clifton, Bristol 8

Abstracts Editor
D. W. SMITH

Distribution Manager
L. C. HAYNES
80 Kings Drive
Leicester Forest
Leicester

British Society of Scientific Glassblowers

Founded 1960

Chairman
E. G. EVANS
Fisons Pest Control Ltd.
Saffron Walden
Essex

Hon. Secretary
I. C. P. SMITH
65 Woodberry Way
London, E.4

Hon. Treasurer
D. A. HENSON
Calcot, nr. Reading
Berks

CHAIRMAN'S LETTER

I AM proud to have the honour of being your Chairman for the coming year. I will endeavour to continue the progress already achieved by my predecessor, and to carry out the aims of the Society to their fullest where this is possible.

The Society has been extremely successful, more so over the last three years. It has 343 members which we hope will extend to at least 400 by the end of the year. This, I feel, is a great achievement.

We now have a Council representative of all sections. It is hoped that more attention will be paid to the important subject of training and education, now that the rules have been agreed for adoption. It will be the task of the new Council, in which I have every confidence, to deal with this extremely delicate situation, which incidentaly is also a major problem of the American Society.

The Journal is now becoming widely circulated and well known throughout the world, but please help the Editor, who is doing a magnificent job, by sending your contributions of "know-how," techniques, etc., so that they, on your behalf, can print these articles, thereby increasing our circulation and knowledge.

I wish all members of the Society continuing success for the future.

EDWARD G. EVANS
Chairman

EDITORIAL

WHILST most members will agree that the production of the Journal is a necessary part of the Society's function it appears that in spite of many appeals through these columns the flow of contributions from sections and members has, with a few exceptions, been reduced to a trickle. Space being available, other articles from reputable contributors in the field of glass technology are being accepted, and are likely to become the main contents. The abstracting service is in an equally precarious position and unless the appeal by the abstract editor is answered it is in danger of collapsing.

Thus the character of the Journal as visualised by the editors when it was promoted is now changing and it may be that members in their state of apathy are content to lose the opportunity of using the Journal to express their ideas and record activities, and accept articles which are less directly connected with their work. It may be considered that this is a problem for the editorial board, but it is only fair to inform members that at the time of writing it has ceased to function and the situation from the Editor's point of view is now most discouraging.

In fact, in our opinion, it is now time to make a complete assessment of the requirements and method by which the Journal is produced and make changes where necessary.

J. H. BURROW

Note : Contributions for the next issue are needed immediately.

The Journal is published quarterly by the B.S.S.G. and is available free to members and at 5s. per copy (or 17s. 6d. per annum) to non-members. Editorial communications should be addressed to the Editor, c/o H. H. Wills Physics Laboratory, Royal Fort, Clifton, Bristol 8, and enquiries for advertising space to Mr. I. C. P. Smith, 65 Woodberry Way, Chingford, London, E.4. Printed in Great Britain by E. G. Ellis & Sons, Willow Street, London, E.4.

SEALING GLASSES

by L. F. OLDFIELD, B.Sc., Ph.D., D.I.C.

(Wembley Glass Research Laboratory of Glass Tubes and Components Ltd., and Glass Bulbs Ltd., Hirst Research Centre, Wembley, England)

PART 2

Graded Glass Seals

In a graded glass seal series it is impossible to obtain conditions where the residual stresses at room temperature between glass pairs is reduced to negligible proportions. This could be done if an infinite number of glasses were used in the series, but this is not practicable. The best system is one in which the expansion differences between two adjacent glasses in the series are not greater than approximately $5.10^{-7}/°C$. It is usual for the end members of the series to have large differences in annealing points. It is therefore preferable that consecutive members of the series should show a steady change in annealing points and Mg points. This is illustrated in Fig. 6.

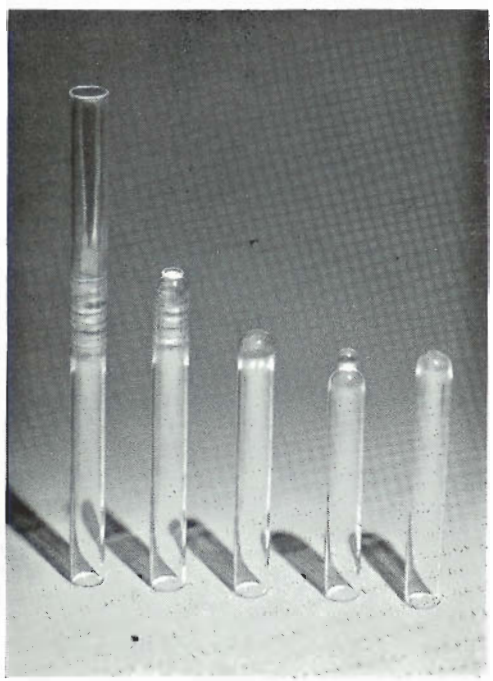


FIG. 6(a)
Graded seals

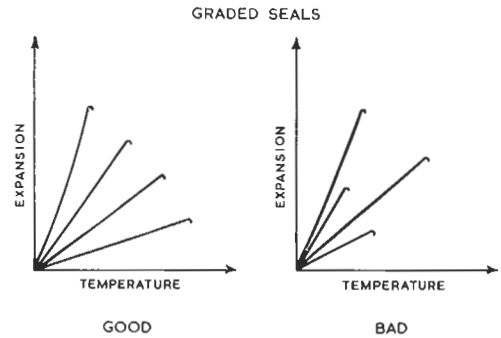


FIG. 6(b)
Expansion characteristics of "good" and "bad" series of graded seal glasses

Solder glasses

Solder glasses are special compositions which are intended to match the standard glasses expansion-wise but to soften at much lower temperatures than the latter. In this way standard glasses can be sealed together without deformation. The normal technique is to use a suitable suspension of powdered solder glass. This is sprayed or painted on to the surfaces for sealing, which is achieved at temperatures in the range 450°C to 550°C in the case of the lead borate solders. These glasses are dissolved relatively easily by nitric acid solutions so that the glass parts can be recovered intact if necessary.

Unusual solder glasses which can be devitrified when sealed will be discussed below.

Glass to Metal Seals

In a matched seal the contractions of the metal and the glass should be similar, as taken from the temperature at which the glass "freezes" on to the metal down to room temperature. The "freezing" temperature is normally the upper annealing temperature of the glass.

Glasses have been developed specifically to match most of the conventional pure metals and many alloys in this way. Some alloys, such as the nickel irons and chromium irons have been

formulated to match standard glasses. Other alloys, mainly in the iron-nickel-cobalt system were designed to achieve a particular expansion level, the glass subsequently being developed to match the most stable alloy in the system, for example B53(SBN124) glass to match Nilo K alloy.

An exact expansion match is not usually possible over the complete temperature range, due to the inflections at the Tg point of the glass and the Curie point of the alloy. The best compromise is made and the normal target is to achieve a low compressive stress in the glass at the working temperature of the seal (see Fig. 7). The larger the components are, in general, the closer has to be the expansion match. Thus, "Pyrex" technical borosilicate glass is often used to seal small pieces of tungsten. This is not good practice as a standard sealing glass, B37, is easily obtainable and this should be used for metal thicker than ~0.5 mm. Even this standard glass is not entirely suitable for tungsten thicker than ~4 mm.

These observations on expansion matching are also applicable to seals made between glass and ceramics.

Physics of sealing

In most cases the actual bonding of the glass to a metal is effected by an intermediate metal oxide layer. The strength of this layer appears to be greater than that of the glass itself. Some metal oxides, cobalt, chromium and nickel provide particularly strong bonds. The exact nature of this oxide interlayer is not known. It

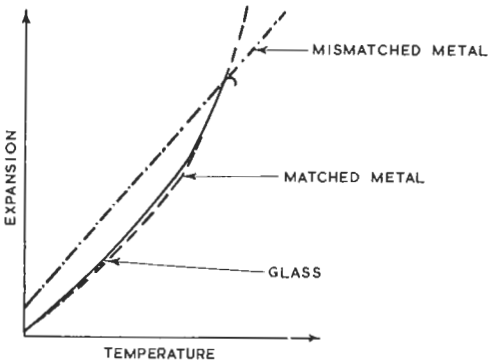


FIG. 7

Expansion curves for glass, matching and mismatching metals

is possible that mechanical keying by means of it is as important as any chemical bonding which may occur. Many metal pretreatments are therefore concerned as much with obtaining the correct surface roughness as with the correct oxide layer. The fact that the oxide enables the glass to wet the metal by reducing the contact angle is another important property.

Some seals, such as those between platinum and glass, are not true seals, except at the glass-metal-air boundary. Certain oxide layers, particularly those on tungsten and molybdenum (the tungsten or molybdenum bronze layers) are not strictly hermetic and may allow moisture to permeate. This can be overcome by preglazing the tungsten or molybdenum with a high silica glass (GS10).[18]

Further Treatment of Seals

When the seal has been made successfully subsequent treatments may cause it to fail. For example, thermal shock, especially that caused by gripping the hot seal with cold metal tongs or by washing in cold water, will fracture the higher expansion glasses. It must be remembered that glass is weaker when it is wet. Etching or plating solutions, particularly those which are strongly acidic or alkaline, can leach the glass surface and attack the glass-to-metal bond. Brazing, welding and spot welding near to glass-to-metal seal can also be hazardous.

In Fig. 8(a) a seal between a very thin cylinder of an iron-nickel-cobalt alloy and a matching borosilicate glass is viewed in normal light. The metal occupies the upper half of the photograph. The seal initially was stress-free and the few gas bubbles at the metal surface were not harmful. A spot weld was made subsequently on the metal about 2 mm. above the seal. This can be seen at the top of (a). The resulting distortion of the metal was continued into the seal itself and gave rise to the severe stresses as revealed by polarised light in (b).

Heat treatments, particularly of borosilicate glasses in the annealing range, can change their physical properties, such as thermal expansion. Nilo K sealing glasses contract noticeably with time at constant temperatures above approximately 350°C. Unfortunately Nilo K alloy expands at constant temperature in the range 300°C to 450°C (Fig. 9). The net result is such severe tensile stress in the glass that it will probably fracture.[19] This stress effect is shown in Fig. 10.

FIG. 8(a)

FIG. 8(b)

Stress induced into a small seal by a distortion due to spot welding (a) viewed in normal light; (b) as seen in a strain viewer

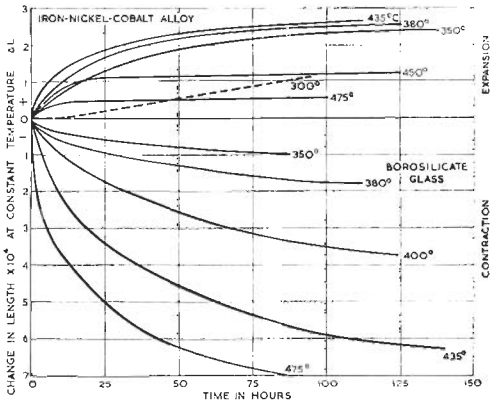


FIG. 9

A comparison of the rate of changes in unit length for an iron-nickel-cobalt alloy and borosilicate glass when maintained at constant temperature

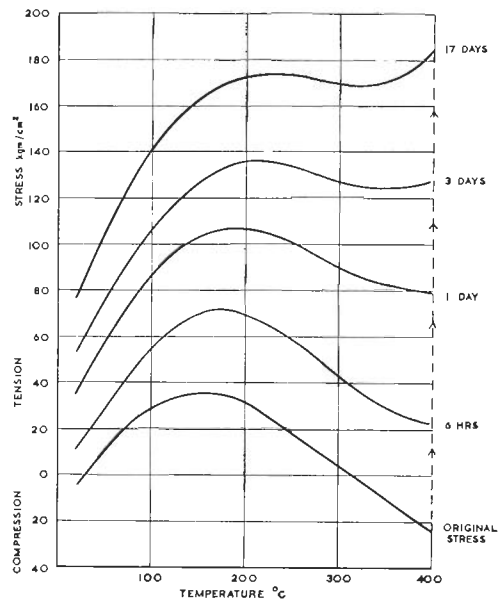


FIG. 10

Effect of heat treatment at 400°C on the stress-temperature relationship of borosilicate glass to iron-nickel-cobalt alloy seal

Fortunately, the glass anneals sufficiently rapidly at temperatures greater than 450°C to cause this heat-induced stress to release at a faster rate than that at which it grows (Fig. 11). However, at the upper end of the annealing range the glass will begin to deform under pressure, such as an evacuated bulb under atmospheric pressure. This maximum working temperature is ~480°C for thin bulbs of B53 glass. Thus extended bakes of B53-to-Nilo K seals can only be made in the approximate interval 450°C-480°C.

If the seal runs hot and is subjected to an applied electrical potential then electrolysis of the glass may occur. This has sometimes been observed with lamp and radio valve pinches and also in semiconductor devices. The exact temperature for the onset of electrolysis is determined by the glass composition, seal geometry and the applied potential. Even with the highly resistant lead glass, L92, breakdown has occurred at temperatures as low as 200° (Fig. 12).

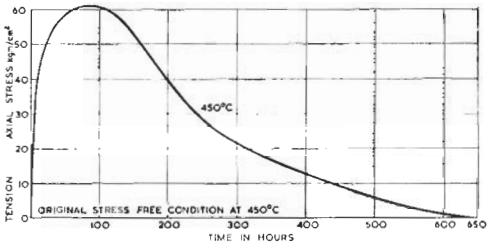


FIG. 11

Change in axial stress with time due to simultaneous dimentional changes and stress release at 450°C borosilicate glass to iron-nickel-cobalt seal

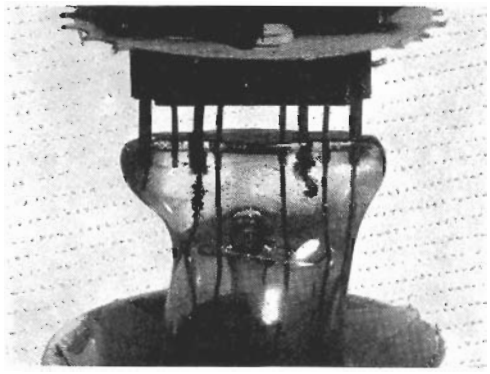


FIG. 12

"Lead trees" resulting from electrolysis in the pinch of a radio valve

Glass Ceramics and Devitrifying Solders

New materials have been developed by carefully controlling the devitrification of special glasses. The most important glass ceramics are made from lithia-alumina-silica compositions which can be melted and formed by conventional glass manufacturing processes. Subsequently the glassware is held at a moderate temperature which causes wholesale precipitation of minute crystals so that the body is converted into a ceramic. The main feature of this particular class of ceramics is the very low thermal expansion. The crystals formed are of certain lithium aluminium silicates, known as eucryptite or spodumene. These crystalline substances have negative or zero thermal expansions so that the ceramic itself has a very low expansion.[10]

This material has therefore a very good resistance to thermal shock and is refractory up to about 1,350°C. The domestic ware marketed as "Pyrosil" is a glass ceramic of this type.

By modifying the base glass composition, glass ceramics covering a very wide range of thermal expansions can be made. Glass ceramic to stainless steel or copper seals have been reported.[11] In this way all the usual sealing alloys and metals can be matched. The seal is made with the base glass in the usual way, but immediately after sealing the devitrification heat treatment is commenced as the base glass does not usually match the given metal. The expansions of the glass and its ceramic are usually very different. The time and temperature of heat treatment also affect the ultimate expansion of the ceramic.

Some devitrifying glasses which are softer than the standard sealing glasses can be used in a similar way to the lead borate glass solders. Such a glass-ceramic solder or cement can be sealed in a conventional manner to a matching glass or metal. The seal is maintained subsequently at a pre-established temperature in the annealing range of the standard glass. Devitrification of the solder glass then occurs and the ceramic material which is formed is at least 100°C more refractory than the initial composition. Such glass ceramics have been patented by Corning Glass Works[12] and marketed under the code numbers Pyroceram brand cements #45, #89, #95. Similar devitrifying solders have been

patented by other organisations.[13] These are mainly of zinc silicoborate compositions. The uses of these devitrifying solder glasses have been discussed by the American Scientific Glassblowers Society.[14]

It is in the field of glass ceramics that the new developments in sealing materials are most likely to occur in the near future. One advantage of the controlled devitrification process is the tremendous gain in mechanical strength compared with that of the initial glass. It is possible to strengthen a glass article by devitrifying the surface layers as in the Corning Chemcor process.[15] The success of this was illustrated by dropping a treated glass cup from the top of a multi-storey building on to a boiler plate on the ground. The cup remained intact.

It is probable that the glass ceramics and devitrifying solders can be tailored for any reasonable purpose. Development work of this type is being pursued in a number of laboratories in the U.K.

APPENDIX

Scientific work normally quotes the glass composition as a pseudo molecular formula or as mole per cent.

For example: 3 Na_2O. 2 CaO. 7 SiO_2 — Total molecules = 12

Calculation of Mole per cent from Molecular Formula

$$Na_2O = \frac{3}{12} \times 100 = 25 \text{ mole } \%$$

$$CaO = \frac{2}{12} \times 100 = 16.7 \text{ mole } \%$$

$$SiO_2 = \frac{7}{12} \times 100 = 58.3 \text{ mole } \%$$

Calculation of Weight per cent from Mole per cent

$$Na_2O = 25 \times 62/100 = 15.5 \longrightarrow \frac{100}{59.8} \times 15.5 = 25.9 \text{ wt. } \%$$

$$CaO = 16.7 \times 56/100 = 9.3 \longrightarrow \frac{100}{59.8} \times 9.3 = 15.6 \text{ wt. } \%$$

$$SiO_2 = 58.3 \times 60/100 = 35.0 \longrightarrow \frac{100}{59.8} \times 35.0 = 58.5 \text{ wt. } \%$$

$$\text{Total} = 59.8$$

NOTE: *For materials with molecular weights* 100 *and less there is little difference between weight and mole per cent.*

Calculation of Mole per cent from Weight per cent

$$Na_2O = 20 \text{ wt. } \% \; \frac{20}{62} = 0.322 \longrightarrow \frac{1}{1.667} \times 0.322 \times 100 = 19.3 \text{ mole } \%$$

$$CaO = 10 \text{ wt. } \% \; \frac{10}{56} = 0.179 \longrightarrow \frac{1}{1.667} \times 0.179 \times 100 = 10.7 \text{ mole } \%$$

$$SiO_2 = 70 \text{ wt. } \% \; \frac{70}{60} = 1.166 \longrightarrow \frac{1}{1.667} \times 1.166 \times 100 = 70.0 \text{ mole } \%$$

$$\text{Total} = 1.667$$

NOTE: *In these equations the molecular weights are used. These are :* $Na_2 = 62$ $CaO = 56$ $SiO_2 = 60$

ABSTRACTS

BALANCES

(155) **Thermogravimetric Studies.**
Bruck, S. D., *J. of Scientific Education*, Vol. 42,, No. 1, 1965, 20.
Illustration of electro balance assembly. F.G.P.

CERAMICS

See (165).

COMBUSTION

(156) **Determination of Trace Nitrogen in Petroleum by a Microcombustion Technique.**
Norriss, F. A., and Flynn, J. E., *Anal. Chem.*, Vol. 37, No. 1, 1965, 153.
Photographs of combustion coil and apparatus. E.G.E.

DISPENSING

(157) **Automatic Dispensing Apparatus—Liquids.**
Spratt, T. L. and Emde, J. W., *Anal. Chem.*, Vol. 36, No. 11, 1964, 2223.
Detailed drawing of dispenser and diagram of power supply. E.G.E.

DISTILLATION

(158) **Instrumentation for Condensing and Absorbing Vapours.**
Dalin, G. A., *J. of Scientific Education*, Vol. 42, No. 1, 1965, A7.
Principles of glass condensers, Graham, Allihn, Liebig, Hopkins, Freidrich, etc., theory of vapour paths in distillation units. F.G.P.

GLASS—HISTORY

(159) **Museum of Glass.**
Anon, *The Engineer*, April 30th, 1965, 767-9.
This is a short but very interesting account of the Pilkington Museum of Glass. D.W.S.

(160) **Glass—Manufacture.**
Anon, *Engineering*, Vol. 199, No. 5164, April 9th, 1965, 457-8.
A review of the research programme and the method used for the production of Float Glass. D.W.S.

PUMPS—DIFFUSION

See (161).

SAFETY

(161) **A Safety Device in the event of Water Supply Failure to Diffusion Pumps.**
Beer, R., Wright, G. A. and Davis, J., *J. of Science Technology*, Vol. 11, No. 1, 1965, 35-6.
A glass vessel and ground-glass float valve, constructed of " Pyrex " glass, is so arranged that if water-flow ceases the float falls and breaks electrical contact in the diffusion pump heater circuit. G.T.S.

(162) **Accidents to Glassblowers.**
Extract reprint from Laboratory Safety, *J. of Scientific Education*, Vol. 42, No. 1, 1965, A49.
Details of accidents which have occurred through cleaning glassware with aceton prior to glassblowing. F.G.P.

STEAM DISTILLATION

(163) **Rapid Accurate Microanalysis of the Lower Fatty Acids with particular reference to Serial Determination.**
Vanden Leavel, F. A., *Anal. Chem.*, Vol. 36, No. 10, 1964, 1930-3.
Well described and detailed drawings of multi unit manifold for micro steam distillation. E.G.E.

STILLS—MOLECULAR

(164) **Molecular Distillation of Thermally Supersensitive Liquids.**
Frank, W. A. and Kutsche, H. D., *Anal. Chem.*, Vol. 36, No. 11, 1964, 2167.
Photograph showing the main elements of the apparatus. Method uses revolving glass spiral to spread film of liquid, so bringing lighter volatiles to the surface to evaporate. E.G.E.

THIN FILMS

(165) **Evaporated Metallizing on Ceramics.**
Reed, L. and McRae, R. C., *American Ceramic Soc. Bull.*, Vol. 44, No. 1, 1965, 12.
Molybdenum has been evaporated on to ceramic substrates heated in temperature range 500-1,000°C. The resultant metallizing may be brazed to metal component to give a vac-tight seal. D.A.H.

ABSTRACTS SERVICE

Since the publishing of abstracts was started there have been many remarks about the value of this service. It seems to be the general feeling that this is a very valuable service, not only to glassblowers but to chemists and physicists too. Readers will note that in the last issue there were less abstracts than formerly, in this issue there are even less. The abstracts service is in very serious danger of breaking down for two reasons. The first is that some abstractors are just not doing their job. They may not now be able to spend quite as much time in the library as formerly, they may be very busy, they may have forgotten or they may not have bothered to do anything about it once they agreed to be an abstractor. The second reason is that there are not sufficient abstractors to survey all the journals that we want to be covered. At present 99 journals are being abstracted by 13 abstractors. There should be far more abstractors to enable us to raise the number of journals and reduce the number of journals per abstractor. This is serious when one considers that of the 13 nominal abstractors only eight are doing the job fully. Of these eight some are covering obscure journals and may find none at all in a full year, we do not expect to hear from them very often. This means that the vast majority of abstracts are prepared by half a dozen people, thus underlining the seriousness of the situation I spoke of earlier. Is the service of use to you ? Do you value this service ? Have you access to a good technical library ? Will YOU help ? If you can answer yes to all questions then please write to me letting me know of your field of science.

D. W. SMITH
Abstracts Editor

Research Department
Imperial Tobacco Co.
(of G.B. & I.) Ltd.
Raleigh Road, Bristol, 3

SCIENTIFIC GLASSBLOWING IN JAPAN

COE GOTCH, *Member of the Japanese Scientific Glassblowing Circle*

History

WHILE glassmaking in Japan can be traced back to 1570 the origin of the art of scientific glassblowing is not recorded. It seems that towards the end of last century two professors of the University of Tokyo, K. Ikeda and K. Sudoh, returned from Holland having acquired the art and taught an apprentice named Kawamura, who some years later opened a shop in down-town Tokyo. He recruited assistants and apprentices and also worked on development of burners. From Kawamura's shop apprentices went to research laboratories of firms and universities and they too trained young glassblowers. Thus today there are a large number of glassblowers in Japan in shops, factories and research laboratories whose training originated from Kawamura and his groups of trainees.

In 1923 Dr. Ishida of Riken invited Gunther Kessler, a German scientific glassblower, to work in fused quartz at one of the National Laboratories. After two years he left for the University of Michigan in the United States of America but from him glassworkers learnt the techniques of working fused silica and they contributed to the establishment of fused quartz factories. The prominent men in this field are M. Seino of Japan Fused Quartz Co. and S. Hayata of Kimmon Fused Quartz Works.

Training Courses

In 1943, because of the great demand for scientific glassblowers, Prof. H. Tominaga of Tohoku University in northern Japan established a Glass Technical Institute with a four-year course for trainee glassblowers. The system was similar to those at the Kammerling Onnes Laboratory in Leiden and Bundesfachschule für die Glasinstrumentechnik in Wertheim, Germany, namely a day divided into five hours of glassblowing and three hours of other subjects such as physics, chemistry, mathematics, drawing, languages, properties of glass, etc. The lectures were given by professors in the university.

This was the first attempt at this type of training and besides teaching Prof. Tominaga had many external difficulties to overcome. In 1955 however, because of Prof. Tominaga's retirement from the university and lack of a successor, the institute closed, but nevertheless about 90 fully trained graduate scientific glassblowers are actively employed throughout the country. This type of training, however, will not be resumed until the Japanese Government considers it necessary.

Qualification and Situation

It is estimated that there are over 400 glassblowers in Japan and the majority work in or run shops in the larger cities and few possess any government approved qualification. Salaries of those working in government organisations and university laboratories tend to be governed by educational background rather than ability and experience.

It is only in small firms that ability and experience are considered but because their economic stability is low the rates they pay are somewhat lower than bigger organisations. Because of this state of affairs the younger generation of today rushes to the more famous schools as a means of obtaining reputation and profit and it is clear that this situation will bring about an even greater shortage of good craftsmen.

Materials used

Various types of glasses are available to the Japanese glassblower and the following is a list of the well known hard glasses.

	Exp. x 10^{-7}	*Use*
Hario ...	34	General
Super ...	34	General
Terex ...	34	General
SB 24 ...	42	General
CP 34 ...	37	Nonex type. Tungsten copper and platinum seals
KS 34 ...	47	Kovar sealing
Fused quartz	5	

According to one source of information the order of widest use is Hario, Fused quartz, " Pyrex " 7740, Terex, Super and SB 24.

A super hard glass of expansion 13 x 10^{-7} is also available and, in addition, to add to the confusion there are a number of glasses without recognised code names.

For ordinary glassblowing where coal gas is available the Kawamure type burner is still popular. It is a blast burner using a coal/gas/air mixture and additional oxygen. Recently a Tokyo

toolmaker has developed a combination type premix burner which will no doubt become popular in the future. In country districts where coal gas is not available special burners have been designed to use oxygen and propanes. Because of price glassworking lathes are not yet in general use but large glassblowing firms and national laboratories have imported them mostly from fitters in the United States of America. During the last few years, however, Japanese steel firms are developing lathes for home use.

Glassblowers in the vicinity of large cities belong to unions or circles and most of the salesmen and representatives of glassblowing shops and factories belong to national and sectional unions aiming at improved business relationships. They hold irregular meetings for this purpose and for discussions on their products. As to production standards there is the so-called J.I.S. (Japanese Industrial Standard) laid down by the government but sizes and tapers of ground joints vary considerably and there are frequent complaints from users.

For the purpose of extending the knowledge of scientific glassblowers a technical circle was formed by Prof. Tominaga in 1950. It was then a small gathering of about 30 members but has grown steadily since to a membership of about 300. The direction of Yoshimasu Inoue of Mitsubishi Kasei Co. Ltd. during this period must be acknowledged. Technical sessions are held four times a year and a Journal is published annually, last year's being the fourth issue.

Sectional gatherings are also held, especially in the Nagaoya area, and the growth of the circle continues. With its co-operation the Youth Centre in Yokohama held a glassblowing course for science teachers of junior high schools in the area and in February this year the Chemical Society of Japan will also hold a three day glassblowing course for chemists, again with the co-operation of the society.

WORKSHOP NOTES

A HANDLE IN BRASS OR GLASS FOR THE CARBON REAMER

IT is supposed that every glassblower is equipped with the standard taper Morganite reamers which are, however, supplied without handles.

The following method of holding them may be of interest.

Prepare the larger end of the reamer by drilling and tapping ¼in. Whitworth, so that the brass fitting, shown in the sketch, may be screwed into it.

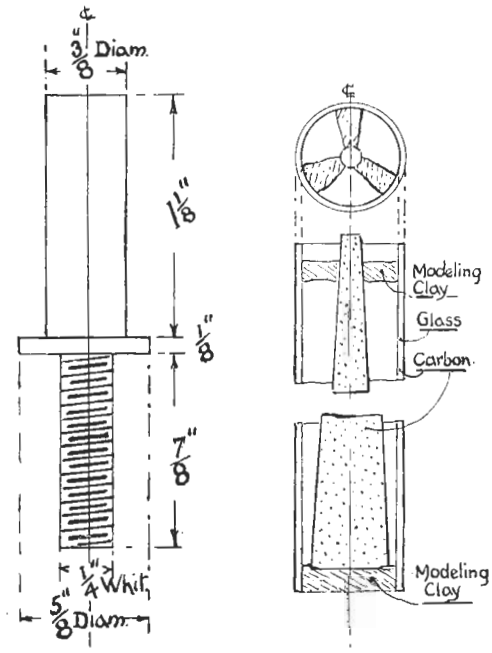
To enable this to be done, a holder is made by making a cylindrical plaster cast of the reamer, for gripping by the lathe chuck.

The method is to place the reamer, previously lightly greased centrally in an open ended glass tube. The reamer can be positioned centrally by means of modelling clay, as sketch.

The cast, when set, can be obtained by breaking the glass, also the reamer can be easily withdrawn.

For the handle, a piece of glass tubing is selected that will fit tightly over the brass end, when paper is wrapped around it. This allows the whole of the reamer to be used, keeps the hand away from it, and there is nothing more convenient and easier to use.

R. W. CONWAY



A MICRO-SAMPLE SYRINGE FOR GAS LIQUID CHROMATOGRAPHY

HYPODERMIC syringes are used successfully for the introduction of samples into G.L.C. columns and proprietary brands of syringes are also obtainable for micro-samples. However, the needles of these are easily bent and with some samples it has been found that coking occurs between the needle and wire. Although these syringes are repairable on a return to maker basis, there is, inevitably, a delay. Both the syringes and the repairs are expensive. Below is described a cheap and easily made syringe, the needle and wire being expendable.

Fig. 1 shows (A) a piece of 0.2 mm. dia. tungsten wire with a bead of silver solder at one end, (B) a LUER fitting No. 26 x 2½ in. serum needle, (C) a disc of silicone rubber cut from ⅛in. sheet with a No. 1 cork borer, (D) an 8 cm. length of 1.5 mm. bore glass capillary tube, with tapered end ground to fit the socket of the No. 26 needle, (E) a No. 11 serum needle with the socket tapped to take the 4 B.A. grub screw (F).

The tungsten wire is cut to length in an oxy/gas flame and is thereby pointed. The taper on the glass barrel (half angle 1° 54′), is ground on a metal working lathe, the glass being held in the chuck. The grinding tool is a piece of copper bar filed as in Fig. 2, and fixed in the tool post, carborandum paste applied by finger being the grindant. Great care must be taken to ensure that no grinding paste finds it way onto the lathe. The bed and tool rest are covered with cloth and the opposite end of the capillary is filled for about 3 mm. with plasticine.

The tungsten wire is threaded through the No. 11 needle and the grub screw inserted and tightened. The tungsten wire is then put through the glass barrel and the wire, being pointed, is pushed carefully through the centre of the rubber disc, and finally through the No. 26 needle.

It has been found that some hypodermic needles have a burr over the needle hole at that part which is joined to the socket. If this burr is removed with a small round file, the insertion of the tungsten wire into No. 26 needle becomes much easier. The length of taper on the barrel must be such that a pressure is exerted on the disc, to make a seal betwen wire and needle. Calibrations can be made, using the end of the No. 11 needle as zero.

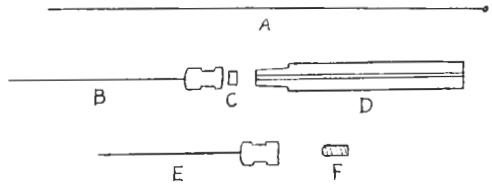


Fig 1

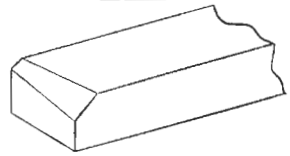


Fig 2

Thanks are due to Dr. D. McNeil and Mr. G. A. Vaughan for permission to publish. The work was carried out at the laboratories of The Coal Tar Research Association.

A. WATSON
J. SWITHENBANK

OBSERVATIONS ON PRE-MIXED OXY/GAS TURRET BENCH LAMPS

MOST glassblowers will find the changeover to the pre-mix type of lamp rather disconcerting, after being used to the cannon burner, the lack of noise is most apparent, but what is not so apparent is the correlation between the viscosity of the glass and the level of sound from the flame. When using a cannon burner the worker unconsciously relates sound to the condition of the glass and when the sound is greatly diminished as in the case of the pre-mix lamp, he will attempt to increase the sound level with the result that the flame temperature is too high. It is therefore true to say that the worker must alter his technique, particularly in respect of this sound factor and also because any given flame will be hotter than in the case of gas/air/oxygen mixtures. To obtain temperature gradients in the glass now requires different sizes of flame and indeed very different timing.

From the physiological aspect, the lack of noise makes the constant use of the pre-mix lamp far less tiring for the worker, and the effect on his health and well being is an advantage not to be underestimated.

The writer knows three makes of pre-mix lamps, each of these being in use in various establishments according to the preferences of those concerned. All three are very efficient but have certain differences.

(1) The " LVD Scorah MSc " burner has a turret with jets set in it, which can be turned to allow any size of flame to be used. This burner has been criticised for being too bulky and for its lack of flexibility; the angle of the flame being constant, but users apparently become used to this.

(2) The " Messrs. Jencons " turret burner operates in a similar manner to the first. It is mounted on an adjustable base, which provides for the adjustment of the flame angle. This too is a very good practical lamp.

(3) The " Peebles and Co. Ltd." turret burner is similar to the ones previously mentioned, in that it has a turret with jets set into it. To obtain different sized flames the turret is turned as with the other type of turret burners. The great advantage with this burner, however, is that it has separate oxygen control for each jet. This burner is operated with a constant oxygen supply which is not altered when changing from one jet to another. With the two previously mentioned burners, it is necessary to turn off the oxygen before turning the turret to alter the flame size.

All these burners have one failing, in that they all provide as the operational jet, the uppermost, centre jet. This limits the glassblower in his efforts to get close to the flame in such instances as when putting a small side arm into a piece of apparatus. When the writer has put these lamps into use, with the exception of the Scorah burner they have been modified* to make the left-hand jet the operational one. Contrary to the views of many observers, the pre-mix lamp can be satisfactorily used for soft-glass work, although change in technique is necessary.

Overall, the case for changing over to a pre-mix lamp is decidedly a strong one, for the advantages to be gained in all aspects of glass manipulation certainly justify the required changes in technique that the glassblower needs to make. The increased range of temperature in the flames make for very much easier working not only in glass but in working silica.

R. GARRARD
Chemistry Department
University of Bristol

* This modification is made by remounting the body of the blowpipe on a 90 degree bracket, thus positioning a working jet normally at the top to the left-hand side. This enables working close to the job in hand more accurately, when using the smaller jets. Having the jet so mounted prevents fouling of the glass on the blowpipe body. F. R. MORGAN

We would welcome comments and experiences with other types.—EDITOR.

SILVERING SOLUTIONS

OUR note in the December 1964 issue on the explosion hazards of the Brashear Silvering process has brought one or two more points to light. John Strong's " Modern Physical Laboratory Practice " warns of the hazards in this process and advocates the use of goggles when handling the silver solution. The method described, however, includes filtering the solution through a cotton-wool plug and we should add that any such plug or filter paper should be thoroughly flushed with water before disposal.

The Rochelle Salt process has never been known to be hazardous; in this no alkali metal is added to the silver solution until the reducing agent, the salt itself, is added.

COUNCIL MATTERS

THE newly elected Council of the Society held its first meeting in Birmingham on June 12th, facilities being afforded through the courtesy of International Nickel (Mond) Ltd. The following were present : The Chairman, Mr. E. G. Evans ; Councillors : Messrs. Burrow, Edkins, Parsell and Yorke. Section Representatives : Messrs. Atkinson, Collins, Haynes, Hanley, MacDonald, Price, W. Dennis Smith and White. Mr. Garrard, retiring editor, and Mr. I. C. P. Smith, secretary. The treasurer, Mr. Henson, and Councillors Messrs. Frost and Butler were unable to attend.

New Officers

At this meeting other officers connected with the Council were either elected or re-elected, and Mr. Burrow was elected sole editor of the Journal, Mr. Haynes, P.R.O., and Mr. Yorke, chairman of the Education Sub-committee, as well as Society representative on the Exploratory Committee being set up by the City and Guilds of London Institute for the Glass Manufacturing and Processing Industries. Mr. Garrard and Mr. Frost were accorded a hearty vote of thanks for their good work in the past year. Mr. Yorke's job on the City and Guilds committee can be very rewarding, as the industry is very much alive to the need for part-time and other education, training and qualifications for its younger operatives, and our Society can make an important contribution. Mr. Yorke has a separate report on the progress of educational matters.

Rules

It is necessary to print and circulate to all members the Rules as finalised by the A.G.M. This will take some time but in the meantime the following are some important points. Collective members are not to be included. In Rule 5.1 the five-year qualification for full membership stands. In Rule 10.2 the period of grace in the matter of payment of subscriptions is brought down from 15 months to 6 months. Councillors will be elected one from each section, and each Section will also elect two representatives to attend Council meetings. All of these and the Hon. Officers will have one vote each, the chairman having a casting vote. Other rules were clarified, simplified or modified as necessary.

Certificate of Full Membership

You will be pleased to hear that the Council has finally approved an appropriate layout and seal, which have been passed over to Mr. Parsell of the Southern Section to produce as soon as possible ; this Certificate of course precedes the Certificates of Competence, under preparation by the education committee.

Journal

It was clear that the Journal had come to stay, but discussion ranged round the financial policy, the ever-present problem of getting contributions from members, and the fact that the advertising, in attempting to make the Journal a minimum charge on the funds, had become the job for an advertising manager who has no other honorary post. A volunteer was needed—any offers ? On contributions I should like to stress in the strongest possible terms, the absolute necessity for the bulk of the contents of the Journal to be submitted by the members themselves. This can be in the form of published work, articles, criticisms, wittiscisms or likewise. Your editor will be pleased to have these on paper, skin, wood or stone, in pen, pencil or type ; if you are unable to write, telephone or form the letters in glass in your blowpipe—thank you !

Seriously though, we find certain causes responsible for this situation, members who have the ability to write useful items, either of a technical nature or of manipulative skills, who tend to hide their light under a bushel, either through apathy or possibly a secret fear of criticism from their readers ; if you are one of these sufferers, please remember that we have many younger members who need your help in this direction. To the younger members, may I suggest you write in to your Journal and put your problems in print, the replies should speak for themselves.

Annual Colloquium

The Society's 5th Annual Colloquium will take place on Friday the 24th September at the Howarth Building, Chemistry Department, Birmingham University. The theme will be " Glass in Chemistry." Finalised details will be made available to members in the near future.

With the holiday season now upon us, it is unlikely that many section activities will be taking place in the immediate future. Enjoy yourselves in this direction.

L. C. HAYNES

SECTION ACTIVITIES

Southern Section

At a meeting held on Wednesday, 10th March, 1965, at Queen Elizabeth College, London, members were invited to put questions to a panel of experts. The questions covered a wide range of subjects, some controversial. Members were able to air their views and pass on hints and tips, it is hoped that much useful information was gained at this meeting. Our thanks are due to Dr. Oldfield, Mr. Baker, Mr. Lee and Mr. Smith for answering the questions.

The meeting held on 14th April, 1965, at Queen Elizabeth College, London, was preceded by the election of a Councillor by members of the Southern Section. Mr. T. Parsell was elected.

Mr. S. Jacobs of Autoflow Engineering Limited, was the guest speaker at this meeting, his subject "Cutting and Grinding Glass." In his opening remarks the speaker mentioned that he had not lectured before, however to judge by the spontaneous applause at the end of the lecture, Mr. Jacobs has found a new vocation. During his lecture the speaker mentioned methods of cutting and grinding glass, polishing glass and the manufacture of cutting wheels and grinding tools. Mr. Jacobs has promised to write up his lecture for inclusion in a future edition of the Journal.

The Southern Section were very pleased to welcome Mr. William A. Wilt, a Director of the American Scientific Glassblowers Society. Mr. Wilt was kind enough to address the section and answer many questions from members. Southern Section members expressed the wish that there be co-operation between the American Society and our British Society.

E. WHITE

Thames Valley Section

I would like to thank members who have contributed 5s. each towards their representatives expenses; this is greatly appreciated by them.

I would like also to take this opportunity of reminding those that have forgotten, to send a 5s. postal order to N.I.R.D., Shinfield, Reading, Berks.

M. PRIEM

Northern Section

In the past few months the North-West programme has been mainly works visits with intermittent meetings to discuss these. The last meeting was held on 26th May, 1965, at the University of Manchester in the Roscoe Building. At this meeting Mr. J. W. Edkins was unanimously elected as Councillor to attend quarterly Council sessions.

A final decision with regard to transport for the proposed visit to Messrs. Joblings & Co. of Sunderland has been arrived at. A proposal by Mr. Blackburn that the journey be made by train was seconded by Mr. Collins.

It was also proposed that the Council minutes be read out at appropriate meetings. We intend to hold our next meeting at the Pilkington Research Laboratory at Lathom; incorporated in this meeting will be two lectures, one on First Aid and Hazards of the Glass Industry and the other on Welding Brazing and Soldering techniques.

P. A. ATKINSON

Western Section

On March 29th, Mr. R. C. Heard gave a lecture and demonstration to the section on "Glass Novelties." This evening's entertainment, for that is what it was, was very much enjoyed by members and also by members of the Chemical Society and the Physical Society who were invited along for a joint meeting.

The April meeting was held on Monday 26th, when the guest speaker was Mr. T. West of Radyne Ltd. The evening started with a film showing the various types of electrical heating used in industry. Members agreed that this was a very informative film. Mr. West followed the film by a lecture entitled "High Frequency and Dielectric Heating." This was a highly technical but easily understood lecture and members are grateful to Mr. West for speaking.

This meeting was followed by a Special General Meeting to elect a Councillor and two delegates to serve on Council as required by the change in rules of the Society at the Annual General Meeting.

The result was:

Councillor—Mr. J. H. Burrow

Delegates—Mr. R. A. Redford, Mr. D. W. Smith

RECENT DEVELOPMENTS IN EDUCATION AND QUALIFICATION OF SCIENTIFIC GLASSBLOWING

GLASSBLOWING instruction to an established standard followed by examination for the awarding of a certificate of National recognition, is one of the objects for which the British Society of Scientific Glassblowers has been created.

The progress of this aim has been briefly reported in earlier issues* with reference to the formation of a sub-committee for Education and Qualification. Reports have been submitted by the sections to the sub-committee, which have indicated the interest and feeling of members that qualifications for glassblowing may in the future be necessary for claiming full membership of the Society and for recognition of personal achievement.

The Sub-Committee held a meeting in the Conference Room of Messrs. Quickfit & Quartz Ltd., in October 1964, and duly presented to Council a proposition for a syllabus leading to the award of a Certificate for Competence. This proposal has been accepted in principle and a Board of Examiners has now been formed which should consist of two full members nominated from each section. To date this board has representatives from five of the six sections.

Representing Midlands : S. G. Yorke, chairman of the board, A. Clarke. Western : D. W. Smith, secretary to the board, R. E. Garrard. North Western : N. H. Collins, L. Elson. Southern : E. G. Evans, B.S.S.G., chairman, E. D. White. Thames Valley : J. S. MacDonald, D. G. Sexton.

A meeting of the Board of Examiners was held on Tuesday, 29th June, 1965, at Messrs. Quickfit & Quartz Ltd., of Stone, Staffordshire, a fairly central location from the sections, and although most members of the board had long distances to travel, only one was unable to attend. The members were entertained to lunch at Quickfit & Quartz, after which the meeting commenced at 1.30 p.m. and closed about 6 p.m.

The business considered was (1) a proposal for the B.S.S.G. to approve a certificate for glassblowing, suitable for use with Technical Colleges, and (2) to recommend a system of examination in accordance with the resolution for the Certificate of Competence which had been submitted to Council.

Dr. T. Green, Head of the Department of Science at Bristol Technical College, had expressed his interest in the B.S.S.G. approving the standard of glassblowing as instructed at the College by Mr. R. E. Garrard. Dr. Green had previously met four officers of the Society in February of this year to discuss this issue. The course of instruction concentrates on the basic operations of scientific glassblowing and has been considered by the Board of Examiners as worthy of recognition as an introduction to elementary scientific glassblowing.

This mutual recognition of the B.S.S.G. by the Bristol Technical College and of the glassblowing course by the B.S.S.G. is a precedence which it is anticipated will be followed by other colleges throughout the country.

The syllabus for a course of training for the awarding of the Certificate of Competence for full membership of the Society was discussed and it was decided to make investigations into the prospects of such courses being held.

A system of examination has also been considered which would consist of the selection by the examiners of various specified pieces of glass apparatus to be constructed by the examinee. The examination would also include theoretical knowledge essential to glass blowing.

A draft copy of the Certificate of Competence has been considered in Council.

In principle the applicant would apply to the Secretary of the Board of Examiners for the Examination and he would then make the arrangements for the examination to be conducted at a convenient establishment.

A meeting of the City and Guilds of London Institute will be held shortly with representatives of various branches of the glass industry to consider the prospects of organised training in these trades. Mr. S. G. Yorke will represent the B.S.S.G. at this meeting.

Appreciation is acknowledeged to the Management of Quickfit & Quartz Ltd., for the use of their conference room for meeting on two occasions.

S. G. YORKE

* J. B.S.S.G., Vol. 1, No. 2, p. 22. Vol. 1, No. 3, p. 35.