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British Society of Scientific Glassblowers

Founded 1960

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EDITORIAL

AT the Council meeting on the 13th May, 1967, the main topic discussed was Society finance in view of the fact that the once substantial reserve has been seriously reduced and we are now relying on incoming subscriptions to pay our way. But at the same time it must be remembered that this reserve was built up in days when there was little activity within the Society.

Although not yet in serious difficulties the position must be closely watched and Council is very much alive to the need to retrieve our stability. It is perhaps not surprising that as we become more firmly established, new enterprises are embarked upon, most requiring financial support, and coupled with subsidies the Journal has received and considerable increases in administration costs there must be a point when if left unchecked expenditure will exceed income.

Much time has been spent examining Journal finances with the conclusion that although a small section of opinion considers it should show a profit, because it has a comparatively small circulation and in spite of a substantial advertising revenue, it will always need help from Society funds, the average deficit on each issue being not unreasonable. From the Journal point of view, were more funds available we might then be in a position to pay contributors and give a higher standard. Society administration expenses have soared partly because of a greater volume of paperwork and increased postal charges but also because more paid help is used to replace services once given freely to the Society at minimum cost. In addition part travelling expenses are now paid when attending Council or other necessary meetings.

Taken individually there is justification in each case and Council has no wish to restrict any genuine activity on behalf of the Society or to lower standards in any way.

One answer of course would be to raise the annual subscription, which may have to come, but first an appeal is made for restraint and more careful spending of Society funds and it was the feeling of Council that if there is a genuine response and we can revert to voluntary assistance we can recover our financial stability in a very short time.

On the part of this Journal we shall for the time being content ourselves with more modest issues hoping this will be only a temporary phase and that more funds will soon be available. But let there be no misunderstanding that we still need as many contributions as possible for publication from all sources and value technical papers and news items from members.

We also need replacements for members of the Journal management and would appreciate volunteers to ensure future production and distribution. The average member is probably only vaguely aware of the continuous service by Messrs. Hensen, Frost and Fussey, each of whom plays his part with quiet efficiency. Were more helpers available their load could be lightened.

Another point which needs clarification is that now the rule making examination a condition of membership has been relaxed this does not mean that the Certification scheme has been dropped and we hope that many who voted for the change will now respond and take the test.

J. H. BURROW
12th June, 1967

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SAFETY TOPICS—CARIUS TUBES

I. C. P. SMITH, B.Sc., *E.R.D.E., Waltham Abbey, Essex*

Reprinted from "Fusion," May 1967, by permission of The American Scientific Glassblowers Society

THE description in *Fusion* by M. F. Capurso* of the dangers associated with the use of Carius tubes prompts this note on similar experiences and the remedies adopted to mitigate the dangers.

In using Carius tubes it should not be assumed that the pressures achieved either at high temperature, or after the reaction and cooling down, are those to be expected from simple chemical and physical considerations. The glass surface, particularly at higher temperatures and pressures, is a considerable catalyst, and many unscheduled reactions may occur; the frequent consequence of these is the production of one or more permanent gases, such as hydrogen, oxygen, or nitrogen, etc., according to the chemicals present, causing the high bursting pressure, even on thorough cooling.

The mechanism of the burst, only after the pressure tube has been cooled, scored and finally the hot rod-end applied, is almost certainly as follows: The tube contains a very high over-pressure of gas, one which would normally be expected to burst it, but the part of the tube in the maximum state of tension is the inside surface, and glass needs a point of initiation for a crack or a series of cracks to develop—an analogy is the inner part of toughened (tempered) glass. The score mark on the outside of the tube does not have the necessary effect by itself; however, when the hot rod-end is applied and the crack travels through to the inside surface, this affords the necessary point of initiation and the whole tube fractures explosively, again very much like toughened glass, but here it has a reservoir of compressed gas behind it to increase the force and dangers.

With regard to remedies, the following procedure has been found most reliable in avoiding trouble, as it enables blowing off all the excess gas pressure before proceeding to open the tube.

The Carius tube is prepared first by drawing down to a neck about 40 mm. long and 10 mm. diameter (Fig. 1); there is no need to thicken up the glass here, since as drawn out the proportion of wall thickness to diameter is maintained, this being the necessary factor for strength. The tube may be annealed at this stage. It is then filled, avoiding rubbing or scratching the bore of the neck with such a thing as a glass rod or tube, using for instance rubber or plastic. The neck is checked clean, e.g. with a doubled pipe-cleaner or a rolled piece of filter paper and solvent, and is drawn down to a narrow spear, about 1 mm. diameter (Fig. 2); it is allowed to cool at this stage, then finally sealed, leaving about 10 mm. of the narrow section (Fig. 3). The tube is now placed in a steel protecting tube, closed at one end, with the narrow tip of the glass projecting

FIG 1

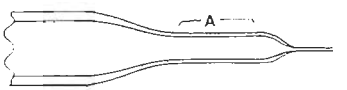


FIG 2

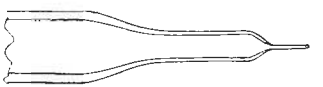


FIG 3

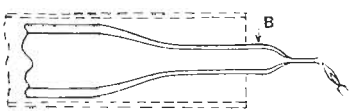


FIG 4

at the other, and placed in the furnace. After heating and cooling, and while the tube is still in the furnace, the narrow tip is touched with a small hot flame (Fig. 4). This allows the gases under pressure to escape and the wide section of the neck may then be scored and opened in the usual way.

It is always desirable to heat and handle the Carius tube in a steel tube (shown in position in Fig. 4), which is itself directed at the wall or a corner of the laboratory so that an explosion during the heating would be directed away from personnel. Also at all times a face shield should be worn. If at the stage Fig. 2 a fair length is left at A, and the tube is finally opened by a score-mark at B, Fig. 4, the tube may be used for more than one run.

* *Fusion*, Nov. 1966, p. 12

HISTORY OF GLASSWORKING

Résumé by J. A. FROST *of Reading University of talk given at Leeds by* J. H. BURROW, B.Sc.

WHEN I was asked to give this talk it was an appropriate moment as I had completed 40 years of glassblowing; there have been some diversions into other fields allied to glassblowing, but I will confine this talk to the story of glassblowing.

Because of isolation, a complete history, particularly of the early years would be impossible, but as I have subsequently discovered, similar changes were happening elsewhere, both in this and other countries. As scientific research increased, so the need for glassblowing and glassblowers expanded. So although this is a personal account it must be regarded as a story of change, a story which could almost certainly be paralleled by other older members of the Society. We all began with the crudest of facilities which have gradually evolved into our present-day well equipped glass shops. Tribute must be paid to former glassblowers, both professional and amateur, who, with crude tools, foot-operated bellows and soda glass, produced apparatus, some of which would be considered intricate even today. Probably because of the advances in science in Europe in the early part of this century—Holland, Germany and parts of Central Europe—one regards this area as the home of our type of glassblowing, from which workers migrated all over the world carrying their skills and techniques with them.

So before 1914, although there were a few British glassblowers, many were of German origin, and after the 1914 war, as again in 1945, there was a build-up of research and the demand for glassblowers increased.

My first glimpse of glassblowing occurred in school in 1920, where we had a chemistry master who was able to make joins, bends and T-pieces with a bunsen burner and a mouth blowpipe. Later, when I went on to University, I found the same practice held and students and research workers had to make most of their glass apparatus themselves. I spent a lot of time trying to find out how to work glass but there was no one from whom I could gain any experience. When I graduated in 1926 Professor Tyndall suggested that I took it up as a career; now these were difficult times economically, graduates who had left a year or so before me were already becoming unemployed, so a safe though poorly paid job at the University was not to be ignored. It was realised that I would need some experience so I was sent for a six week course to the Natural Science Laboratory in Lieden, Holland. Here I joined the apprentices under the senior, an old German glassblower named Kesselring, whose standards were very high. The equipment was, by modern standards, primitive; a bench lamp with home-made glass jets, bellows for air, carbon steel for a knife and a bent wire for cracking off. I spent the first week of fifty hours drawing splints which had to be straight and axial, before going on to bulb blowing and joining. If the work of the older apprentices was not up to standard, then at the end of the day Kesselring would throw the whole lot away and make them do it all again. This may seem harsh, but the principle was right, and whoever passed out of Leiden with a certificate was certainly up to standard. The exams were run at the end of the course in the same shop and I saw for the first time more experienced glassblowers at work, and they used the glasses made by Schott of Jena with a coloured line down them so it was easy to see by the distortion of this line whether the turning had been accurate. I also saw uranium glass which I was told was for tungsten sealing, though I did not see it used and had to wait until 1960 to rediscover this glass! In six weeks I made little progress, the language was one difficulty, but I met a Dutch glassblower from Oxford, Van Hespen, who spoke good English, and subsequently at Oxford he showed me how to make stopcocks.

Back in Bristol, using German glass and foot bellows, I was able to meet the simple requirements of a small physics department. I also used a British glass, Durosil, for vacuum work, making crude home-made joints and stopcocks. In 1928 we moved into a new laboratory with a big influx of research workers and a greatly increased demand for glassblowing. The basic glass was still soda, made by Plowden and Thompson, with plain Heraus nickel-iron wire for seals. I well remember the struggle to make a certain piece of apparatus for soft X-ray research. A 6 in. bulb blown on 3 in. tube with a ten wire pinch seal plus a lot of other complications; about twenty were made altogether and each one took about a fortnight from starting to the seal-off stage. We looked for easier glasses, trying Monax and eventually the new

Pyrex, but we still had plenty of trouble, the Pyrex scummed and discoloured on working and produced a multitude of pinholes. But a great deal of real hard-won experience was gained in hand-working and making tungsten seals in this new Pyrex, which gave a great deal of trouble and which almost certainly led firms like G.E.C. and B.T.H. to develop their own tungsten sealing glasses.

The G.E.C. Research Laboratory at Wembley and the B.T.H. one at Rugby were always very helpful, and about this time the news filtered through that they were using lathes for some of their valve work. In 1928 I spent a fortnight at the G.E.C. in Wembley where I met Mr. Breadner and saw the tipping lathe they had made. I was allowed to practice, and I saw many interesting things in that glass shop. Back in Bristol, from a photograph, our workshop made a similar type of lathe, but it was not too successful. So I continued making stopcocks, diffusion pumps and so on as much as possible by hand, and this was probably the period of greatest effort for it often meant a ten hour day to keep up with the demand. About this time Stan Yorke made a copy of the old G.E.C. type which was much more successful and ran, I believe, until 1950. Back to the early 1930's and among the Ph.D. graduates leaving Bristol were Drs. Broadway and Pearce, who went to E.M.I. Research Laboratory, and it was Dr. Broadway who, on a return visit told me that the E.M.I. glass shop were using lathes for the production of TV tubes. In 1932 they designed and made a tipper and later copies were made for them by the Heathway Engineering Co. I have no doubt B.T.H. and G.E.C. were proceeding on similar lines. Still we were unable to buy, so we battled on, but we now had better glass; Chance Bros., had produced Hysil and Intasil, there was also Phcenix, and Pyrex had improved.

By 1938 our equipment consisted of a bench cannon burner, hand torch, hot wire cutter for large tubing, carbon steel hacksaw blades for glass cutters, a grinding spindle (as we made our own stopcocks), and a flat grinding plate. War came in 1939 and altered the whole outlook. Professor Oliphant of Birmingham University had visited the U.S.A. and found them using Litton lathes for glassworking. Litton had made their first lathe in 1932, and by 1935 had produced several different types. Professor Oliphant bought a small one for Birmingham University and in 1939 Jack Morris and myself were trying to make copper disc seals on it for research on klystrons. Jack subsequently went to the U.S.A. to work on the then secret atomic bomb project. I returned to Bristol and in 1940 an Admiralty valve group took over part of the laboratory, and myself, to develop various radar devices. At first I did much work by hand but it became obvious that for the work we were

By courtesy of Litton Engineering Laboratories

1932 Litton Model B Lathe

attempting a lathe would be an advantage. The story is rather involved but we obtained a Litton lathe at the second attempt, the first one was lost in Liverpool docks by bombing, and from then on we used it on as many operations as possible. We had access to any materials we needed and all firms were very co-operative and special materials were imported for us from the U.S.A. But besides advancing techniques the war had another and in some ways even more important effect, the isolation from which most glassblowers suffered was broken, as it was necessary to move around, passing on and gathering, information. By going into other glass shops and valve construction units which would normally have been closed to us, we became aware that there were plenty of glassblowers working in different environments who were equally skilled in their particular way. Eventually the war ended and in 1945 the Admiralty group moved off to set up S.E.R.L. at Baldock, leaving the Litton with me, and I set about restoring the glass construction services in our laboratory. Out of my war-time experiences had come a new approach and I could see that by fully exploiting the lathe, making use of the new materials now available, and using jigs and gadgets, much of the drugery of pre-war days would disappear. So there was a sudden increase in efficiency, which was just as well, for research had started with a new enthusiasm and empty laboratories were waiting for their glass. We soon found that our small

Litton would not cope with the larger work required and for which glass was now available. In 1949 we managed to find an English manufacturer who would make us a lathe to approximately the Litton specification, it being difficult to obtain an import licence.

However, we must not talk too much about lathes, important as they are, for this is not an account of lathe development. There has been a considerable change in burners, both for lathe and bench work. At one time the cannon was in general use and was quite satisfactory for lead and soda glass because of it's easy flexibility. But as early as 1930 industrial laboratories had changed to fixed jet premix burners to cut down noise, and this demand for silence has extended so that pre-mixed oxy-coal gas single and multiple jet bench burners are now in general use. On the lathe early burners were air-gas Marshal burners, excellent for joining lead to copper but not powerful enough for working the borosilicates, so a ring of oxy-coal gas burners was used and many of this type are still in use. The next step was to make these in banks with each bank adjustable, and after this several varieties or copies of the Litton type appeared and some of these, due to faulty construction, were not too satisfactory in use. These have now been followed by the block-type surface mix which still retains adjustment properties, but is much more durable. This is not the time to draw comparisons between different types of burners, but we now spend much larger amounts of money on our burners than formerly when they were much simpler in construction.

There has been a corresponding development in lathe chucks and other features too numerous to mention here, for when I started to prepare this talk I wrote to a few manufacturers and it is obvious that a history of glassworking machines would need a special lecture.

There have been changes in our cold cutting and abrasive grinding methods, whereas we were limited to a stationary flat plate and carborundum for grinding tube ends and flanges, and sometimes a small rotating flat cast-iron disc ; we still use the flat rotating disc, except that they have grown much larger in diameter. But diamond impregnated tools for drilling, for slitting, for sawing and for edging are now very much in evidence, and there has been an improvement in carborundum cutting discs which, for light work, are probably better than a diamond saw. In the last fifteen years ultrasonic drilling and machining has been developed and it fills the gap which the diamond drill does not cover. We are still learning to exploit this very useful addition to our equipment.

There is little to say about annealing ovens except that we have come a long way from the days when we made our own, and several robust types are now on the market with temperature controllers and automatic switching which makes them very reliable in use.

But there is one item of equipment which is now seldom seen in glass shops and that is the grinding spindle with its cones and laps once in general use for grinding joints and stopcocks. Around 1934 Q and Q set up to produce interchangeable joints and as the idea caught on glassblowers gradually ceased to make their own except in special cases. Firms also began to specialise in stopcock manufacture and after the war such firms as Jencons, Loughborough, Woods, Springham and L.G.M. came into full production and stopcock making outside specialist firms has now practically ceased.

Thus a big slice of the glassblowers former activity from which he gained his skill and experience in accurate working is no longer there.

The practice of buying instead of making is now extending to other standard items such as vapour pumps, traps, Dewars and water stills.

We are now at the state when we can, with a much shorter training period, cope with glassworking that would once have needed a lifetime of experience to do it by the old methods. This has to be, for it would be, in fact, impossible nowadays to build up the same type of experience there just isn't time—and in any case the working week is now much shorter and distractions more numerous.

But without encroaching any more on the lines which I hope Nigel Payne will explore I am bound to express the opinion that there is a danger if we fill our glass shops with too many items of equipment that either a large part will be idle or we shall deteriorate into machine operators, and handcraft will be pushed into the background. I hope money will become scarcer and we shall be forced back into making more for ourselves instead of buying ready made parts.

I think it is fair to say that it is those with this background who have been able to make the best use of our machines.

EXAMINATION SYLLABUS ARTICLES

No. 6 GLASS TO GLASS GRADED SEALS

WHEN it becomes necessary to join glasses of different types, e.g. a lead glass article to a "Pyrex" system, the seal cannot be made directly as the difference in thermal expansion is greater than the tolerable limit. A graded seal is then employed which is a succession of glasses of ascending thermal expansion in controlled steps, usually 0.5×10^{-6} but never more than 1.0×10^{-6}. In making, the usual practice is to start with a tube of the lower expansion glass, close it in the flame and blow to a round butt end. On to this a short length of rod of the next grade is fused and blown so that the round butt end is now formed in the second glass. The process is repeated until the required expansion is reached, and is best done on a small glassworking lathe.

No. 8 GROUND JOINTS AND STOPCOCKS

SCIENTIFIC glassblowers may justifiably have taken for granted the quality of ground joints and stopcocks supplied by reputable manufacturers without cause for disappointment, since these suppliers maintain a very high degree of inspection on the finish of these components.

However, it is well that the glassblower should be prepared to inspect ground joints and stopcocks for quality and the following information may be a useful guide.

Structural check

The British Standards Institution has established a specification for interchangeable conical ground joints, B.S. 572:1960, which includes dimensions, surface finish, marking and leak-test. A useful guide for a satisfactory design in stopcocks can be found in an article by I. C. P. Smith,* "Fundamentals in the Design of Stopcocks."

The cones and sockets of joints and the barrels and keys of stopcocks are normally constructed from the same glass. When this is not so and different glasses are used, care must be exercised to avoid temperature changes during operation, since the dissimilar coefficients of expansion can cause jamming or cracking.

General appearance

The glass should be free from flaws such as air-threads, stones, bubbles, cracks and crizzles. The surface texture of ground faces should have a fine matt appearance, free from scratches and polished rings and, when finally ground with 600 or 800 grade silicon carbide abrasive, should have a surface finish of the order of 20 microns or better. The ground surface should be of straight sided tapered form, free from "shoulder" at the wider end of the inner members of the joint or stopcock, also free from a step at the narrower end of the ground surface of the socket or barrel. The stopcock must also be free from irregularities and coarser grinding texture at the bore positions.

For a correct fitting the ground surface of the stopcock key should not protrude beyond the wider end of the barrel, but the ground surface at the smaller end of the key should just protrude through the smaller end of the barrel.

Construction

The joins in the construction of stopcocks, side-arms to barrel, key-bore to key-blank and handle to key should be free from foreign matter, cracks and pinholes. The side-arms must be strongly fused to the barrel with the wall of the side-arm tubes gradually thickening into the barrel with both inside and outside contours of the join being free from crevices and undulations. The handle must also be joined onto the key with a strong, clean seal without sharp corners.

Bore positions

The orifices of the bore(s) in the key of a stopcock should coincide with the orifice(s) of the side-arm(s) at all the operating positions.

Surface engagement

No rock or "knock" should be perceptible when a cone and socket, or key and barrel are lightly inserted together. A more positive check can be obtained with a liquid medium or engineer's blue between the surfaces.

Greasing and cleaning stopcocks

As purchased the key of a stopcock will have a protective wrapping. Irreparable damage can readily be done to the ground surfaces of stopcocks if the two members are firmly inserted or operated when dry. Lubricating mediums are supplied for stopcocks operating under the most critical or exacting conditions. Many stopcock suppliers recommend methods for greasing and cleaning stopcocks which will both ensure satisfactory and prolonged operation.

Spherical ground joints

The British Standards Institution has established a specification for spherical joints, B.S. 2761:1963.

* I. C. P. Smith. B.S.S.G. 2, No. 4, p. 45

ABSTRACTS

Compiled by S. D. FUSSEY

CATHODES

(401) Flat Lanthanum Boride Cathode for use in Electron Guns.

L. Bakker and Th. J. van Velzen, *Rev. Sci. Inst.*, 37, 10, 1404, Oct. 1966.

Using a flat wound filament from a projection lamp, an initial coating of thoria provides protection of the tungsten from the subsequent coating of lanthanum. S.D.F.

CLEANING

(402) Cleaning Vitreous Silica Spectrophotometric Cells and Cuvettes.

G. Hetherington and E. Hutchinson, *Lab. Pract.*, 16, 3, 310, March 1967.

Recommended methods of cleaning cuvettes are reviewed. Cells for ultra-violet transmission at 240 $m\mu$ (BS 3875, 1965), because of transparent vitreous silica made by fusing quartz crystal, have a variable absorption at this wavelength. Synthetic vitreous silica and plates are not subject to this variation, therefore variation in transmission of cells can be related to cleanliness of the end plates. This has led to a re-examination of cleaning methods. B.R.W.

DENSITY

(403) Measurement of Density of Small Particles.

G. W. van Oosterhout, *Philips Tech. Rev.*, 28, 1, 30-31, 1967.

Drawings and description of apparatus for determining the density of a single particle by floating it in a liquid mixture of adjustable density. A simple method is described of overcoming the difficulties which may arise due to convection currents. S.D.F.

DILATOMETER

(404) Measurement of the Coefficient of Thermal Expansion of Solids and its Precise Variation with Temperature.

D. J. Evans and C. J. Winstanley, *Jour. Sci. Instru.*, 43, 10, 772, 1966.

This dilatometer operates between —196°C and room temperature. A transducer is used to sense the change in length and an amplified signal can be read on the indicating meter. Full scale deflection corresponds to $\pm$ 0.25 X 10^{-3} ins. Diagrams and graph. D.A.H.

DISTILLATION

(405) A Glass Water Still with Automatic Safety Switch.

G. M. Lect, *Lab. Pract.*, 16, 3, 323, March 1967.

This still is designed to produce high quality distilled water and to fulfil the following conditions:

(i) Continuous running with minimum attention.
(ii) Safety devices to prevent the element burning out due to fluctuating water pressure, or the still overflowing in the case of power failure.
(iii) Can be drained and flushed out without dismantling.
(iv) Can produce up to 2 litres per hour. B.R.W.

(406) A Simple Tilting Apparatus.

H. J. Lacey, *Lab. Pract.*, 16, 3, 318, March 1967.

Apparatus designed to tilt and lift the distillation flask clear of the water bath. Photographs showing distillation and off positions. B.R.W.

FLOW-CONTROL

(407) A Protecting Switch for Water-cooled Diffusion Pumps.

C. James and D. Warman, *Lab. Pract.*, 16, 1, 55, Jan. 1967.

Description of a device to prevent damage to the pump should the cooling water supply be interrupted. B.R.W.

GAS

(408) North Sea Natural Gas

Sir Henry Jonew, K.B.E., *Glass*, 44, 3, 117-118, March 1967.

An extract from an address to the Institution of Gas Engineers, dealing with the supply, effects, and use of natural gas on an already expanding industry, together with the job prospects in a rapidly changing organisation. S.D.F.

(409) Comparison of Natural Gas with Town Gas.

Glass, 44, 3, 118, March 1967.

Information on the composition, calorific value and advantages of natural gas over town gas. S.D.F.

GAS—FLOW CONTROL

(410) The Introduction of Trace Amounts of Dopant Gases into Continuous Flow Crystal Growing Systems.

D. M. Evans and A. Motham, *Jour. Sci. Instru.*, 44, 2, 178, March 1967.

Detailed method whereby small amount down to at least 10^{-3} ml. min. $^{-1}$ of gas can be easily introduced into a continuous system for doping purposes when bottled mixtures are not available. D.A.H.

(411) Simple Glass Flow Switches

N. A. Lowde, *Jour. Sci. Instru.*, 44, 2, 173, Feb. 1967.

Description and detailed drawings of two switches. One uses an encased magnet actuating a reed switch, the other uses two tungsten leads contacted by a nickel ring. Both switches are independent of the pressure in the system and incorporate the fail-safe principle. D.A.H.

(412) A Simple Laboratory Gas-Circulation Pump.

M. R. Hillis, *Jour Sci. Instru.*, 44, 3, 213, March 1967.

Electrically-operated glass ball and socket valves control the flow caused by the oscillation of a mercury column. Operates over a range at 760 Torr to 0.1 Torr and against a considerable back pressure. D.A.H.

GLASS—OUTGASSING

(413) Outgassing of Glass Caused by Thermal Neutrons and Gamma Radiation.

V. O. Altemose, *Jour. Amer. Ceram. Soc.*, 49, 8, 446, Aug. 1966.

Gas evolved from various types of glass used. Hydrogen main gas, but helium predominates in boron glasses. All glass darkened. D.A.H.

GLASS—TUBING

(414) Accurate Drawing of Thin-walled Glass Tubing.

D. Griffiths, *Jour. Sci. Instru.*, 43, 11, 835, Nov. 1966.

Description of a simple arrangement for making close tolerance, thin wall glass adequate for Dewar flasks. A ring of twelve bunsens is used and the "Pyrex" tubing is drawn over a carbon mandrel. Accuracy achieved, $\pm$ 0.1 mm. on diameter and straight to $<$ 0.5 mm. over 30 cm. length. Sketches. D.A.H.

HYDROMETRY

(415) A Magnetic Total Immersion Hydrometer for Use in Dilute Electrolyte Solutions.

V. I. Little and M. A. Ragib, *Jour. Sci. Instr.*, 43, 10, 723, Oct. 1966.

A simple relationship between coil current and the density increase, permits the density of the solution as a function of concentration of solute to be investigated to a high degree of accuracy. Detailed drawing. D.A.H.

LASERS

(416) **Ball-Joint for the Adjustment and Fixing of Mirrors and Windows of a Gas Laser.**
V. D. Zaitser, *Instr. and Exp. Tech., U.S.S.R.,* 3, 736, Pub. Trans. Jan. 1967.
Mounting of the window on a ball-joint makes possible the adjustment of the electric field vector of the emitted radiation and a very accurate positioning of the plate at the Brewster angle. D.A.H.

LIQUID—CONTROL

(417) **A Simple Liquid Dispenser.**
N. J. Cartwright and M. H. Jeynes, *Lab. Pract.,* 16, 2, 171, Feb. 1967.
A foot-operated solenoid device eliminates the use of taps, pinch clips, etc., and with silicone tubing, can be sterilized by autoclaving. Can be used for the aseptic dispensing of sterile liquids. B.R.W.

PLASTICS

(418) **The Place of Plastics in Laboratory Glassware Manufacture.**
R. Oakes, *Lab. Equip. Dig.,* 5, 4, 93, April 1967.
An account of the evolution of the plastics department recently established at Stone, (Staffs), by Quickfit and Quartz Ltd. An indication follows of the company's future policy for expansion and technical development in this field. B.R.W.

SAFETY

(419) **Spotlight on Hand Protection.**
N. T. Freeman, *Indust. Safety,* 12, 2, 671-672, Dec. 1966.
Statistics of hand injuries together with information on cleanliness, barrier creams and gloves. S.D.F.

(420) **Optical Plastic to beat Abrasion.**
Indust. Safety, 13, 2, 84, Feb. 1967.
C.R.39, Allyl diglycol carbonate by Pittsburgh Plate Glass Co., is a new optical plastic with exceptional resistance to impact plus a very high resistance to abrasion. S.D.F.

STOPCOCKS

(421) **Steam Jacketed, High Vacuum Stopcock.**
K. Lynn-Hall and W. R. Dotg, *Rev. Sci. Instru.,* 37, 10, 1423, Oct. 1966.
The use of a mercury-seal type stopcock permits a steam jacket to be sealed on, thus enabling conventional high vacuum manipulations to be extended to higher boiling substances such as biphenyl. S.D.F.

VACUUM—EVAPORATION

(422) **An Evaporation Filament with Automatic Cut-off.**
R. G. Sherwood, *Jour. Sci. Instru.,* 44, 2, 166, Feb. 1967.
Two filaments are joined together with the silver charge. On evaporation the silver decreases and separates thus breaking the circuit. This minimises the evaporation of less volatile impurities and elminates the sudden pressure surge which occurs with single wire filaments as the last trace of evaporant is used. Diagram. D.A.H.

VACUUM—PUMP

(423) **Vacuum Unit with a Condensation Pump.**
A. K. Kikoin, A. E. Buzynov and E. E. Yurchikov, *Instru. and Exp. Techs., U.S.S.R.,* 3, 682, Pub. Trans. Jan. 1967.
A condensation pump placed immediately into the evaporation chamber enables a pressure of 6 X 10^{-8} units (Torr ?) to be obtained within a short time. Liquid hydrogen is used with the apparatus. Drawing. D.A.H.

(424) **Absorbtion Pump with Jalousie Screen.**
A. D. Donde, *Instru. and Exp. Techs. U.S.S.R.,* 3, 648, Pub. Trans. Jan. 1967.
The pump consists of a copper vessel filled with liquid nitrogen. Externally the vessel is covered with a 10 mm. thick layer of activated charcoal absorbent. The whole thing is placed inside a jalousie screen which considerably reduces the absorbent temperature. Suspended inside the chamber to be evacuated, pressure was reduced to 2 or 3 X 10^{-7} Torr. Drawing. D.A.H.

VACUUM—SEALS

(425) **A Simple Method for Preparing Silver Chloride Sheets for Bakeable, Vacuum-tight Seals.**
C. F. van Huysteen, *Jour. Sci. Instru.,* 44, 2, 172, Feb. 1967.
Silver chloride powder is heated to 500°C then poured on to a suitable cold metal slab. A metal weight placed on top flattens the molten mass to an ingot which can be rolled to the required thickness. A strip about 3 mm. wide and 0.5 mm. thick was used for sealing. D.A.H.

(426) **A Bakeable Quartz-Metal Sealed Window.**
K. Klein and L. Verheyden, *Jour. Sci. Instr.,* 44, 3, 174, March 1967.
A method is described for joining 12 mm. diameter quartz windows to Kovar type tubes. A matching shape is formed on both window and tube with a titanium filler surrounded by copper/silver eutectic mixture. The whole assembly is vacuum brazed in a quartz tube by heating to 850°C with a H.F. induction coil. Drawings. D.A.H.

(427) **A Field Ion Microscope Operating at Liquid Neon Temperature.**
K. M. Bowkett and B. Ralph, *Jour. Sci. Instru.,* 43, 10, 703, Oct. 1966.
Scale drawing of the microscope head showing use of glass buttress joints and indium seals. D.A.H.

VACUUM—TRAP

(428) **A Liquid Helium Cooled Trap for Ultra-high Vacuum Systems.**
B. J. Hopkins and K. R. Pender, *Jour. Sci. Instru.,* 44, 1, 73, Jan. 1967.
A double walled spherical trap has been designed and tested with a mass spectrometer. The dwell time of the liquid helium was about 20 hours, inner dewar capacity 1 litre. Measurements prove a reduction of pressure can be expected in a mercury in "Pyrex" system. Drawing. D.A.H.

VACUUM—VALVES

(429) **A Simple Glass Electromagnetic Valve Suitable for Low Pressure Systems.**
A. R. Burgess, R. W. Laughlin and R. D. Lane, *Jour. Sci. Instru.,* 43, 12, Dec. 1966.
A greaseless, solenoid valve for rapid gas handling in pressure range 10^{-2} to 760 Torr. Drawing. D.A.H.

MISCELLANEOUS

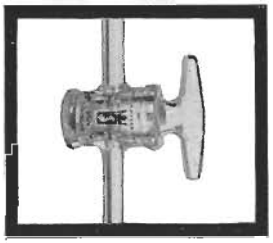
(430) **Glass Filaments for Surface Studies.**
W. Bode and P. C. Fletcher, *Jour. Sci. Instru.,* 44, 3, 228, March 1967.
A hollow glass fibre, coaxially sealed to a metal wire so that the glass and its surface represent the experimental system. The wire core is to provide a convenient means of controlling the temperature of the glass surface. Diagram and graph. D.A.H.

(431) **A Gas Discharge Switch with a Cold Cadmium Cathode.**
R. W. Young, *Jour. Sci. Instru.,* 43, 10, 740, Oct. 1966.
Constructional details of a switch with a low voltage, rapid triggering characteristic with a hold-off voltage of 12 K.V. and passing peak currents of 2,000A. D.A.H.

STOPCOCKS complete range by SPRINGHAM

HIGH VACUUM Hollow Key

Pyrex Glass, precision ground. Each INDIVIDUALLY TESTED and GUARANTEED. Early delivery



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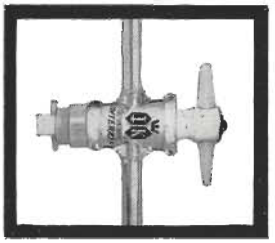

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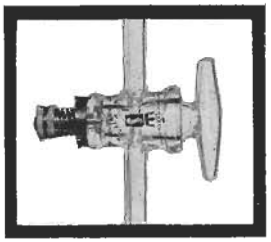
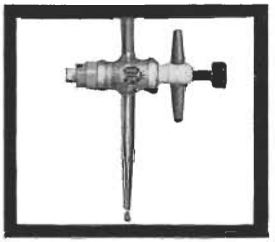


MICRO CONTROL p.t.f.e. (Fluon)

For use with liquids at less than 1 drop per second. No grease and also fully interchangeable with INTERKEY range of Stopcocks and Apparatus



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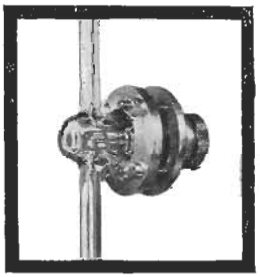

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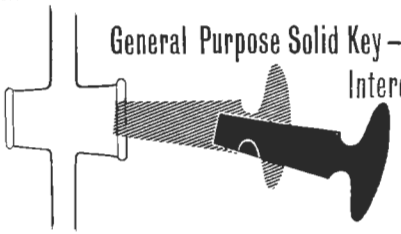

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ANNUAL GENERAL MEETING

held on 15th April, 1967, at the Glass Manufacturers Federation, Portland Place, W.1

Chairman's Address

FIRST I wish to thank the officers of the Society and members of Council for their continued support and hard work throughout the year and now the Society is well established I hope they will continue to serve. You have elected these members to office and the dedication they have shown in furthering the success of the Society is something of which we should be proud, and I can assure you they are looking after your interests to the utmost.

But I do feel that reciprocal action is needed from you by more frequent attendance at the meetings and functions which are provided for you, and also by forwarding more articles and information to the Editor of the Journal for publication. The Editor is always hungry for your news and ideas, and we all want an interchange of techniques, no matter how small, so do not hesitate to send them in.

If you have spare time to give the Society we can use it, as volunteers are needed in various capacities and the experience gained in Society work can be very valuable later on.

Further to the Education report which has been circulated to all members, I would like to add that some 500 copies of the syllabus for "Introduction to Elementary Glassblowing" (non-professional) will be sent out to various authorities this year.

Two applications have been made for the Certificate of Competence and both have been successful, the standard in each case being high.

Mr. S. G. Yorke, our representative on the City and Guilds Board, has made our position clear and outlined the part we wish to take, but it appears that at the moment they have no direct interest in the practical aspect of Scientific Glassblowing.

The Board of Examiners have been successful in establishing two cups, the "James A. Jobling" and "A. D. Woods" trophies, both being awarded for the first time at the 1966 Leeds Colloquium.

It is also hoped that the Thermal Syndicate Award will be secured this year.

I hope there will be much stiffer competition for these awards in the coming year by the student members, and it is the responsibility of senior members to encourage their students and apprentices to enter for these magnificent trophies.

Individual membership certificates have been printed and will soon be distributed.

The Leeds colloquium was an outstanding achievement by the North-Eastern Section, and is proof of what can be done by interested, conscientious and energetic young men—and some not so young. They have given example and inspiration to the Thames Valley Section who are this year endeavouring to run a two-day Colloquium and on your behalf I wish them every success.

I stated in last year's report that the outcome of the rule change to allow membership only by examination was not clear and as yet there is no final indication of the wishes of members, but if only two applications for membership by this method is a true reflection, either Council were wrong to ask for the implementation of this rule or perhaps we have not given a really fair test of time. True we were gaining many more members before 1st August, 1966, and it has been expressed by many people in the trade that they will not apply for membership if a test has to be taken, but on the other hand, some have expressed a wish to take the test at a later date. This indicates mixed feelings on all sides, so much so that a proposition will be forthcoming to revert this rule to something near the original —the decision will be yours according to your vote.

Other rule changes needing a vote are purely administrative and the alterations are designed for the smooth functioning of the Society. Again I must emphasise the need for your support of section meetings some of which are very poorly attended, which is both discouraging to the organisers and to the speaker who may have travelled a considerable distance.

I have now formed a new East Anglian Section with headquarters and meeting place in Cambridge—the first meeting to take place on the 21st April, 1967.

We hope that this Section will be well supported by those who find the meetings held in London too far for convenience.

You will note that there is no change in the Society officers nominated for the coming year. I am confident that if accepted by you they will continue to serve the Society with loyalty and devotion and fulfil the exacting demands made on them.

In concluding I would like to express our sincere thanks to Messrs. James A. Jobling for providing the facilities of this building, lunch and a comprehensive programme for this afternoon, demonstrating their interest in our Society and confidence in its future.

Rule changes

An important change was made to rule 5.1 and it is again not a condition for full membership to have gained the Certificate of Competence. Other changes to administrative rules were proposed and accepted. Full details appear in the recorded minutes.

Fifty-five members attended.

Officers and Council for 1967

Chairman : E. G. Evans
Secretary : D. W. Smith
Treasurer : F. C. Branfield
Councillors :

G. Robertshawe	F. G. Porter
C. Blackburne	J. W. Price
J. A. R. Hill	Dennis W. Smith

Section Representatives :

H. S. Butler	J. S. MacDonald
J. W. Stockton	M. H. Noad
J. Edkins	E. White
A. J. Leeson Magry	L. Benge
R. F. Garrard	

NEW MEMBERS OF THE SOCIETY

Full (by examination)

E. C. Wiggitt, 39 Hill Lane, Blackley, Manchester, 9 (North-Western Section)

Full

R. Fitzpatrick, 16 St. Peters Mount, Leeds, 13 (North-Eastern Section)

Associates

J. H. Kelly, 35 Ashwood Gardens, Gildersome, Leeds (North-Eastern Section)

K. A. Roberts, 107 The Upway, Basildon, Essex (Southern Section)

Students

K. Robins, 42 Puller Road, Barnet, Herts (Southern Section)

R. T. Batchen, 7 Gosforth Road, Southmead, Bristol (Western Region)

C. J. Tomkins, 28 Cliffe Way, Warwick (Midlands Section)

SECTION ACTIVITIES

East Anglian Section

The inaugural meeting of this section took place on Friday, 21st April, at the clubhouse of Fisons Pest Control Ltd., Harston, and was opened by the National chairman Mr. E. G. Evans who introduced Mr. D. W. Smith, the Society secretary to the meeting. As there were many newcomers to the Society each one was introduced and welcomed by the chairman, and the large attendance left no doubt that the purpose of calling the meeting to form the East Anglian Section was fully justified. A formal proposition made by Mr. J. Green and seconded by Mr. W. Stripe that the East Anglian Section be formed was carried.

The following officers were then elected:

Chairman: E. G. Evans
Secretary: J. Green, 1 Vicarage Close, Oakington, Cambridgeshire
Treasurer: A. W. Stripe
Committee: L. Wellstead, F. Morse, M. Stubbs, A. Willis, G. Leutenegger, R. Adnitt. Student D. J. Hardware
Councillor: R. Adnitt
Representative: G. Leutenegger
Reporter: G. Hepburn

The chairman then informed the meeting on the duties of the committee: to run a programme of meetings, to hold an Annual General Meeting and to organise a Colloquium when called on to do so. A letter from the Southern Section was then read wishing every success in the formation of the new section. The report on the Society A.G.M. was read out and points on provisional and section rules were discussed. Application forms and hand outs were passed round to prospective members. Suggestions were given and views expressed on compiling a programme for the coming year and it is hoped to begin with a Jobling Evening. Forty-nine signed the attendance list for the meeting, a very encouraging beginning. This was followed by questions from members and many interesting points were put. A date was fixed for the first committee meeting, to take place at Fisons Pest Control, Chesterfield Park, Saffron Walden on 7th May, 1967, and finally Mr. Evans gave a vote of thanks to Fisons for allowing the Society to use the clubhouse for the meeting, it being agreed to record this in the minutes.

G. HEPBURN
Section Reporter

Southern Section

This quarter has been a very active one and attendance at monthly meetings has improved, with a record count of 40 members at the March meeting. It is indeed pleasing that the slight increase mentioned in a previous report as being a hopeful sign of the future has been maintained and more and more members are finding the meetings interesting and informative.

The February meeting was addressed by Mr. D. Denton who was ably assisted by Mr. D. Marshall from G. H. Zeal Limited. This lecture was very much enjoyed by all, and with the aid of coloured slides we were enlightened on the history and development of the thermometer. Mr. Denton has kindly supplied a paper on the subject for inclusion in the Journal.

February also saw that very popular annual event—the "Stag Dinner" which was, as usual, held at the Horse Shoe Hotel, Tottenham Court Road. An excellent meal, a good supply of liquid refreshment, and chat, added up to a very fine social evening. That such a function should show a surplus of £10 does credit to its organiser—Bob Reader—well done, Bob!

The March meeting, which was addressed by Mr. A. Fletcher of the Heathway Machine Co. Ltd., was spectacular in attracting a record attendance of forty members. Mr. Fletcher described the advent of the glassworking machine into a new field and before the second world war few lathes being built specifically for glass-working, most being nothing more than modified engineers' turning lathes. Of the six main manufacturers of glassworking lathes in the western world each has developed a design of drive and traverse which has become a recognition feature; Mr. Fletcher had prepared drawings of these features and left us in no doubt of the advantages and disadvantages of each. He continued to outline the setbacks to good design from the glassworker's point of view, one being the engineer-glassworker relationship, in which for too long the engineer told the glassworker what he needed. In more recent times there has been much closer co-operation and, as a result, some very successful design features have been introduced, an example being the work of our Chairman on glass centrifuging in conjunction with the Heathway Machinery Co. Many questions were asked and some appraisals from an unusual quarter were heard. We are indeed grateful to Mr. Fletcher for his talk.

A. C. A. PRICE

Western Section

AT the February meeting Mr. N. Lowde, a member of the Western Section, gave an account of the "Chemistry and History of Glass," opening by giving compositions of glass in present use and some very interesting data on formulae which were used in the past. He also gave many examples of samples of glass and historical objects which have been unearthed, some dating back to as far as 2000 B.C. Slides of various works of art in glass were also shown and the methods of construction used were also described, one or two cases still remaining a mystery.

Mr. Lowde had obviously given an enormous amount of time to the preparation of this talk, searching the Science Museum and literature on old glass, and it was regrettable that perhaps because of bad weather the attendance was very poor.

In March Mr. Webster of A.R.O. Machinery Limited gave an intensive study of resistance welding. Although his firm provides mainly for high power and rapid production spot welding, his description of the various types and grades of welds, and the conditions necessary to obtain durable welds was of great interest although not directly applicable to our normal small scale work. His account of current build up during welding led to a long and absorbing discussion which included the welding of high melting point metals such as tungsten and molybdenum. Mr. Webster is an expert on all types of resistance welding and his comments on the problems which arise are of great value.

On 25th April Mr. Burrow talked on "High Vacuum in Glass" beginning with the respective uses of glass and metal systems. Various types of pumping equipment were described and the numerous effects such as sorption, vapour and ion pumping which can be used to obtain high vacuum. The general construction of glass apparatus and the precautions needed to keep a clean system were followed by the procedure necessary to reliably produce high vacuum, and indications were given on how ultra high vacuum can then follow.

Midland Section

The section held its A.G.M. on 31st March, 1967. In a short report the chairman stated that visits had been well attended and in view of a survey carried out during the year it had been decided to keep the number of meetings down to four, perhaps combined with lectures. The

audited accounts were accepted and Mr. Conway was thanked for taking over the office of treasurer at short notice. Mr. Hanley was also thanked on the occasion of his retirement as Secretary. The elected officers for 1967 are :

Chairman: J. A. R. Hill, 50 Charlemont Drive, West Bromwich, Staffordshire
Secretary: J. W. Cookson, 59 Torbay Road, Allesley Park, Coventry
Treasurer: V. H. Conway, 10 Holkham Avenue, Chilwell, Nottingham
Councillor: J. A. R. Hill

Fixtures are being arranged including demonstrations at the University of Birmingham during meeting of the British Association for the Advancement of Science, 11th-15th September, 1967.

North-Western Section

On 17th February Mr. A. J. Fletcher of the Heathway Machinery Co. Ltd., gave a talk on glassworking lathes at the Training Centre of Joseph Crosfield & Sons Ltd.

In his talk Mr. Fletcher traced the development of glassworking lathes as begun by Charles Litton through to today's selection available in England, the Continent and the U.S.A. Trying to be impartial he pointed out the various methods of construction and their relative merits, including drives and speed controls, tailstock movements and chucks. Burners he described as a "thorn" due to different fuel gases and the strong influence of personal preferences of glassblowers. Many questions were asked after the talk which emphasised this tendency of personal preference.

J. W. STOCKTON

North-Eastern Section

Officers for 1967:

Chairman: H. Butler, 45 Tinshill Road, Cookridge, Leeds 16
Secretary: D. H. Bancroft, 223 Main Street, Burley in Wharfedale, nr. Ilkley, Yorkshire
Treasurer: G. Robertshaw, "Rose Lea," Arkendale, Knaresborough, Yorkshire
Councillor: G. Robertshaw
Representative: H. Butler

Thames Valley

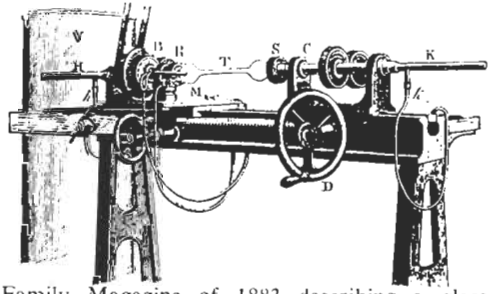
On 2nd January the section held a workshop session at the Clarendon Laboratory, Oxford, when Mr. Luxton explained the making of a Dur seal, a low temperature glass to metal seal, and a Born-Kessel jet.

On 2nd March the section met at Reading University for a lecture by Mr. D. Hunt of the U.K.A.E.A. on gas lasers. This was a most informative lecture with a great deal of hardware to back it up.

On 6th April, at a meeting at Reading University, Mr. Draper of Q.V.F. gave a very interesting lecture on the application of chemical glassware followed by a very good film to complete the evening.

EARLY GLASSWORKING LATHE

ONE of our overseas members, Mr. "Bill" Barr of the University of Auckland, New Zealand, has unearthed an article in Cassell's



Family Magazine of 1883 describing a glassworking lathe invented by two electrical engineers, Mr. F. Wright and Mr. M. W. W. Mackie. These were the very early days of the lamp industry and the lathe was used to make incandescent lamp bulbs and the mercury vapour pumps used to exhaust them. Although the method of coupling the drive to the two chucks is not shown, other features bear a strong resemblance to machines of much more recent date.

The American Scientific Glassblowers Society Twelfth Annual Symposium and Exhibition Atlanta, Georgia — 28th, 29th, 30th June, 1967

Papers

Sealing of Gases Under Positive Pressure ; The Physics of Glass ; Properties of Molten Glasses ; A Simple Comparator for Comparing Sealing and Applications ; Glass Electrodes for Chemical Analysis ; Glass to Metal Seals (Cryogenic) ; Solder Glasses—Principles and Applications ; R Z Glass Sealing ; Forming Glasses ; Superconducting Glass to Metal Seals ; Chemistry of Petroleum ; Outgassing from Glass by Bombardment with Electrons.

Notices

1967 SYMPOSIUM

Provisional Programme

"GLASS"—ITS ROLE IN TECHNOLOGY

This function will be held on Friday and Saturday the 8th and 9th September at Reading University, your hosts on this occasion being the Thames Valley Section. We are honoured to be able to announce that the opening ceremony will be performed by Mr. I. Maddock, Controller Industrial Technology, Ministry of Technology.

1967 will be a breakaway from the traditional single day event and the committee hope that this will set the trend of multi-day symposia for the future.

Some of the features will be :

Reading of Papers on Glass Engineering, High Power Gas Lasers, Optical Seals, Safety and Temperature Control

Films	**Exhibits**
Demonstrations	**Trade Exhibits**
Gadgets	**Presentation of Cups**

A full programme and registration forms will be sent to all members of the Society in the near future.

JOHN PRICE

SOCIETY TIE

Mr. L. Benge has, with the authority of Council, ordered a large number, and delivery will commence shortly. When the order is complete they will be paid for from Society funds and it is important they should be sold as quickly as possible so that the amount frozen in unsold stock shall be as low as possible.

Some members have already responded to appeals to send £1 in advance, and we hope that those who have not yet ordered will do so immediately to help the Society's finances and assist Mr. Benge in the project he has undertaken. Mr. Benge's address is 75 Birchen Grove, N.W.9.

NORTH-WESTERN SECTION

Preliminary Notice

ANNUAL SYMPOSIUM 1968

To be held in the Hotel Majestic, St. Annes-on-Sea, Lancs, on 13th and 14th September. Wives and families are invited and free amenities' tickets will be given to members and their families allowing use of deck-chairs, putting greens, tennis courts, etc., in all public parks and gardens.

As the time of the Symposium coincides with the Blackpool illuminations, hotel accommodation is expected to be extremely difficult. Also, for obvious reasons, the hotel manager is anxious to have an idea of how many members attending the Symposium will require sleeping accommodation in the hotel. Maximum sleeping accommodation in the hotel is 180 persons and if you wish to stay at the hotel you are advised to make a provisional booking now. This will in no way mean that you are committed to accept the booking should you later find that you cannot attend. The charges are bed and breakfast 45s., including service charges. Children 1-3 years sharing room with parent and using cot £1, and children up to 12 years 40s. including services.

Should you be attending the Symposium and not staying at the hotel, I shall be pleased to provide lists of other local accommodation on application. Please help us to help you and reply immediately if there is any possibility of you attending this Symposium.

J. W. STOCKTON
Hon. Secretary North-Western Section
Unilever Development Centre
Bank Quay, Warrington

"THE LITTLE TORCH"

THE LITTLE TORCH is a versatile new lightweight (1¼ oz.) microflame torch which provides flame temperatures up to 6,300°F. It is used with oxygen and fuel gas (acetylene, hydrogen, LP-gas, or natural gas). It is a precision instrument which accomplishes pinpoint accuracy in control of the flame. Swaged tips of pure copper plus highly refined design detail in the torch body combine to give outstanding flame stability.

The 5 tips afford an array of flame settings which will weld from tiny filaments up to 16 gauge steel (1/16in.), to plastics, ceramics and glass. Tips are bent 45° and swivel 360° for flexibility in manoeuvring under limited access conditions. "The Little Torch" can be used with piped installations as well as cylinders.

Kit, consisting of torch, 5 welding tips, 6ft. green oxygen hose, 6ft. red fuel gas hose and instructions, all in plastic case

Cat. No. H164/1 **£23 each**

Tip Size	Orifice Size	Gas Pressures (p.s.i.) Oxygen	Gas Pressures (p.s.i.) Fuel Gas	Consumption C.F.H. Ea. Gas
1	.003	2	2	.023
2	.006	3	3	.087
3	.011	3	3	.215
4	.020	3	3	1.625
5	.029	4	4	2.540

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