june 1979

25th Anniversary

bush telegraph

BUSH TELEGRAPH

vol. 21 no. 7

the magazine of R&EL wood lane

Cover

"Drummer Boy"
from 1954

Editorial

This month it is 25 years since the Bush Telegraph first appeared on the news stands at Wood Lane. Eagle-eyed observers will ask why only volume 21. Obviously publication has not been continuous with the longest shut down occurring towards the mid 1970's and initially caused by disruptions which resulted in the three day week.

In fact the B.T. was predated some five years by another social club magazine called The Bulletin. The first of these appeared in October 1949 and like this present issue contained contributions by Alan Bangay and Bob Black. Bob even in those days was a prolific writer.

In June 1954 the magazine officially became known as the Bush Telegraph and the "Drummer Boy", reproduced on the front cover of this edition, the standard cover design. The editorial board included two of the present members namely Geoff Holder and Ted Morrison, who wrote the first B.T. editorial.

Over the years the standard cover design has been replaced, the magazine's function has expanded to include management information and improved techniques have resulted in better reproduction. Hopefully the coming years will herald even greater changes and if we have a personal wish it is that staff and management will further increase their voluntary contributions. The Editorial Board does after all only have a limited amount of time for prompting and chasing people.

Personnel News

STARTERS Welcome to:-

Mr. M. Benn who joins us as an Assistant Technical Officer in the Communications Department.

Dr. A.R. Lane who joins us as Senior Physical Chemist in the Chemistry Department.

Mr. M.L. Gilmore, who transfers from Erith where he was a Graduate Trainee, to join the Mathematics Department as an Assistant Technical Officer.

LEAVERS Farewell to:-

Martin Swerdlow of the Polymers Department who leaves after 7 months to take up alternative employment.

Achilles Stamatiades of Product Engineering who leaves after 2 years to take up alternative employment.

LONG SERVICE AWARD

Congratulations to George Kitchie (Mathematics Department) on achieving 40 years service.

Thank you

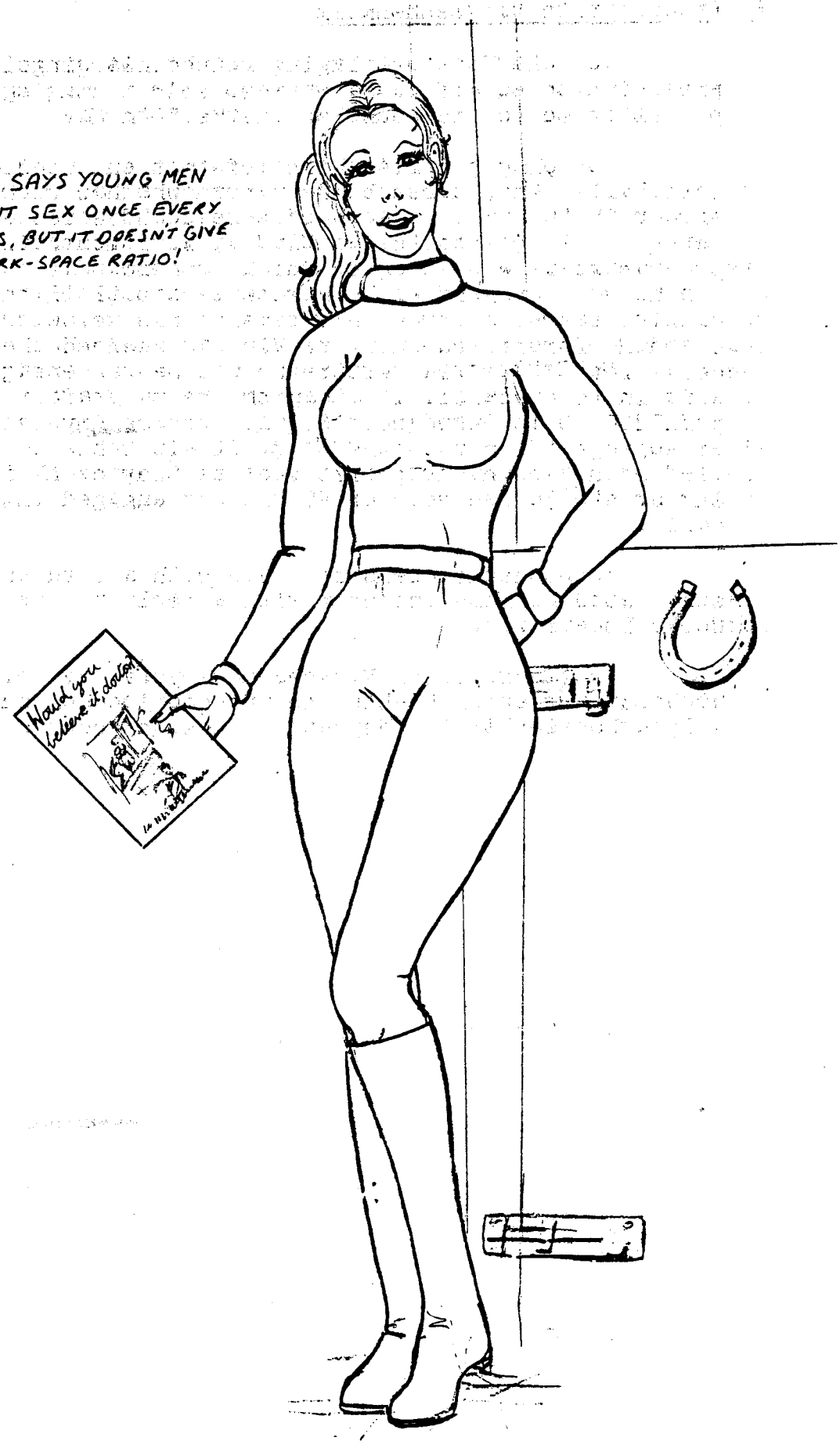
I'd just like to say thanks to you all at Wood Lane, who, through your cards and visits, helped make my stay in hospital a little easier.

R.J. Coomber

I would like to thank all of you who kindly contributed towards the presents of the bottle garden and gardening book, which have given me a lot of pleasure, and helped me 'potter' along the road to recovery.

Lindsey Buchan

Biccarella


THIS BOOK SAYS YOUNG MEN THINK ABOUT SEX ONCE EVERY 15 MINUTES, BUT IT DOESN'T GIVE THE MARK-SPACE RATIO!
Would you believe it, doctor?

Retirement Presentation

Presentation to Vic Denholm

John Endacott having gained his wings following the presentation to Alf in March went solo in making the retirement presentation to Vic Denholm on the 30th May.

John, supplied with information supplied from two sources both called Ann, wondered how a man who had spent his working life either in the navy or at Wood Lane could have led such a chequered career. Vic joined the Royal Navy at Portsmouth in 1932 and in the pre-war years was assigned to China command. At the outbreak of war he was re-assigned to home waters patrolling the Dover Straits on mine sweepers. During this time his vessel was hit by an 'E' boat and for his rescue work Vic was awarded the British Empire medal for Gallantry. After the war he was engaged on clearance work in the Suez canal. Leaving the navy after 30 years Vic then joined BICC in 1965 and initially became involved with the Magna Pipe project and then the Cook Strait Cable which according to Vic did not make any profit because they drank it all. Subsequently in August '76 to December 77 Vic was engaged in repair work on the cable.

John then presented Vic with a card and cheque from the staff at Wood Lane togehter with a replica of a cannon from the Works Engineering.

In his reply Vic thanked everybody for making his stay at Wood Lane so enjoyable and in addition commented that he was only a boy sailor in the days of Nelson when cannons were in use.

The History of Electric Wires and Cables

PART 17. THREE PHASE BELTED CABLES

By R.M. Black

Nikola Tesla

In May, 1888 Nikola Tesla described a new system for the design of alternating current motors to the American Institute of Electrical Engineers. In this new system, a rotating magnetic field was produced in the motor which in turn induced currents in the closed motor secondary circuit thus giving rise to mechanical rotation.

Nikola Tesla was born on 9th July, 1856 in Smiljan in Yugoslavia, the son of a Serb who was a priest of the Greek Church (and the son of an officer who served with the Grand Army of Napoleon). His mother was also of a distinguished Serbian family and came from a long line of inventors. She also exercised this talent and was credited with making improvements in agricultural implements, looms and other rural apparatus. Tesla was educated at Smiljan, Gospitch and then at the Higher Real School at Carlovatz. On taking up engineering as his career rather than the Church as was first intended, he studied at the Graz Polytechnic and then at Prague University. During his studies at Graz, he become interested in the Gramme dynamo and in the apparently insoluble problem of devising a dynamo that did not need a commutator. Tesla constructed his first commutatorless motor about 1883 and in the following year migrated to the United States becoming a naturalised American citizen. In 1887 he formed the Tesla Electric Light Company and was free to develop many of his earlier ideas which included:-

the discovery of the rotating field
polyphase systems of alternating current
the invention of the induction motor
the transmission of electric power for motive purposes
developments in dynamo electric machinery

Following Tesla's pioneer work, polyphase transmission was introduced into North America by the General Electric Company in 1893. Three phase current was used for the lighting of the Chicago World's Fair which took place in that year. This was not, however, the first application of a polyphase system. The first was the overhead transmission line from Lauffen to Frankfurt a distance of over 100 miles for the lighting of the Exposition there in 1891. The circuit operated at a voltage of 30 kV and delivered power to a 100 HP 3-phase motor designed by the Russian engineer Dobravolsky acting on Tesla's concept. Other early examples of three-phase transmission are:- the Niagara project in 1895 and the adoption of the system by the Kensington and Notting Hill Electric Lighting Companies in 1899.

Editor's Note: For the benefit of new readers, we would like to add that the buildings of the Wood Lane Power Station of the Kensington and Notting Hill Electric Lighting Companies, after closure in the 1920s, were acquired by the then Callender's Cables and Construction Co. in 1931 as their "Research and Outside Testing Department", which of course eventually became BICC Research and Engineering Ltd.

For three phase transmission by cable a three core construction was desirable. In the early days of single phase alternating systems the concentric structure as adopted by the B.I. Wire Company was eminently suitable and derived from the Hopkinson 3-wire dc system. But the logical extension to a triple concentric for 3-phase currents, though producing an aesthetically attractive cable resulted in considerable loss in flexibility. This was not the case with a multi-core cable in which the separate cores were cabled together, the spaces between the cores (if circular cores were used) filled with additional jute or paper fillers and the assembly held together with a paper belt of sufficient thickness to provide additional insulation between the cores and the sheath.

The 'Clover Leaf' Cable

The 'clover leaf' cable in which shaped cores replaced the round ones was a substantially improved design introduced by the BI Wire Company. It enabled the dimensions of the cable to be reduced for a given cross sectional area of conductor and supply voltage.

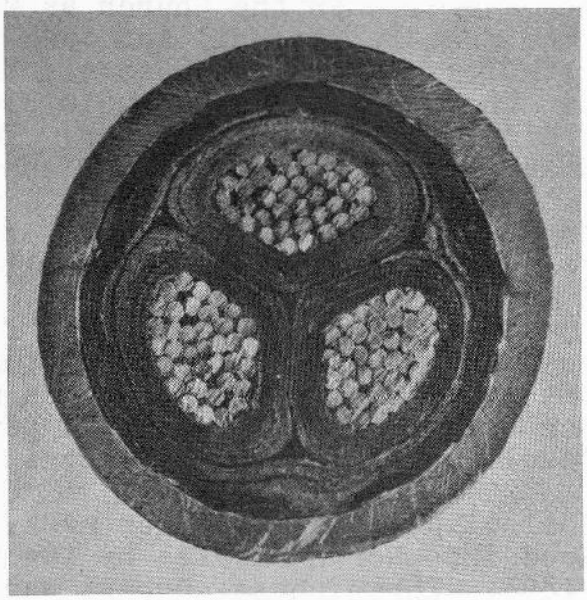


Figure 1. 3-Core, 5.2 kV Clover Leaf Cable for Wood Lane Power Station (0.15 sq.in.) 1900

The use of shaped conductors and the advantages to be obtained from so doing were set out by Ferranti in his 1892 patent (No. 22923). This patent not only describes the manufacture of rigid conductor cables (mains) enclosed within a rigid protecting tube of iron or other metal, but also "cables which are flexible and which may be coiled on a drum so that they can be manufactured in fairly long lengths according to ordinary well known practice".

The laid-up insulated shaped conductors were in circular form and a further layer of paper only was necessary before impregnation and protection with a lead sheath. The sector shapes of the individual cores precluded the necessity for any fillers to be included during the laying-up operation.

The Ferranti patent gives the earliest description of a belted type cable as it is now known:-

> "I sometimes bunch three sets of conductors, each set to form nearly the third of a circle, but which when stranded up together with insulation in between them, form three separate spiral conductors of approximately circular section as a whole. These may be insulated as described for solid conductors. (This circle of copper and insulation I then wrap separately with paper, which is afterwards impregnated with oil, wax or other insulating material, either before the process of manufacture, or after the whole of the insulating material has been applied, and the cable made up save and except its protecting lead sheath). It may be separated in the same way and finished with a spiral wrapping of paper and a tube of lead. This may be slightly modified by obtaining the above sections by drawing the above mentioned conductors through a die or rollers or pressing them in moulds, as before, before they are twisted up to form a circle, so that they may form a more definite section and more copper may be got into the space, or the twisting and rolling can be accomplished simultaneously".

An early example of this 'Clover leaf' design was the three-core 5.25 kV paper insulated cable supplied for the Wood Lane Power Station in Hammersmith (Fig. 1). This was, as mentioned in the previous article in this series, built and operated by the Kensington and Knightsbridge and Notting Hill Electric Lighting Companies in 1899/1900. The Electrical Review in describing the station, which was the first in this country to generate a three phase supply, mentions that:-

> "the cables are of the 'clover leaf' pattern, each of the three cores having a cross section of 0.15 square inch, they are insulated with prepared paper laid up together, lead covered and taped. They were made by the British Insulated Wire Company of Prescot. They are drawn into Doulton's earthenware casings, these casings being surrounded with 6 inch of cement concrete".

The cables ran beneath the floor of a cable subway which was constructed under the whole length of the engine house and then passed out underground and were carried under and across the lines of the West London and Hammersmith and City Railways into Hunt Street and then away to the districts of the two companies.

The Montreal Light, Heat and Power Company

At some time between 1900 and 1902 the Montreal Light, Heat and Power Company installed a three to four mile length of 3-core paper insulated cable on their Chambly circuits. The cables were commissioned in 1902 at 25 000 volts with a grounded neutral and were still in service in 1949. The maker of this cable was the National Conduit and Cable Company of New Jersey who had acquired the Norwich Insulated Wire Company in 1891. (This earlier company had been formed by E.O. McCracken in 1886 and was the progenitor of The B.I. Wire Company). The National Conduit and Cable Company later became the present Anaconda Wire and Cable Company.

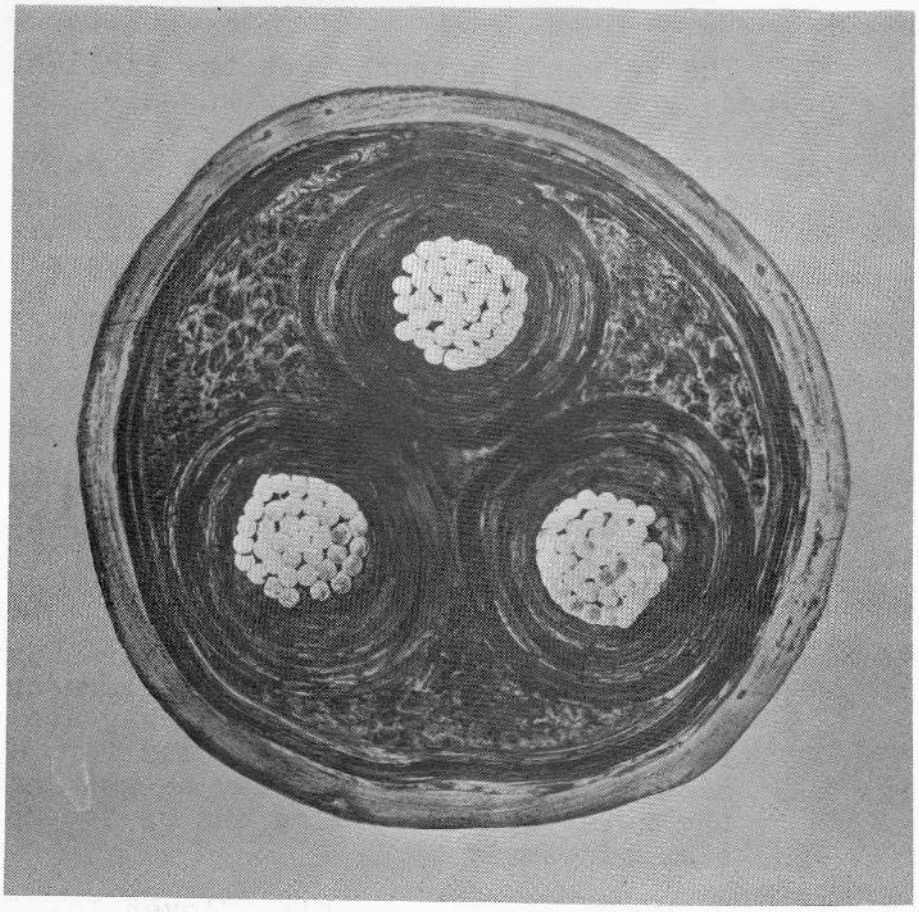


Figure 2. 3-Core, 25 kV Paper Insulated Cable for Montreal. National Conduit and Cable Co. 1900

As the National Conduit and Cable Company were only equipped to strand the wires forming the conductors and apply the paper insulation, the insulated cores were transferred to the Kerrite Company who possessed a cabling machine. Here the cores were cabled together and a belt and bedding applied after which the cable was then transferred to John Robertson Company's plant for lead sheathing. Although the cables were not put into service until 1902 it is thought that they were manufactured about two years earlier.

St. Paul's, Minnesota

At about this time, comparative field trials were carried out with two 25 kV three-core cables at St. Paul, Minnesota. These cables were each three miles in length and were of relatively small conductor cross section (0.05 square inch). They were used to connect the generating station at St. Paul's with the overhead line to Minneapolis. One of the cables was insulated with vulcanized india-rubber while the other was insulated with impregnated paper and was made by the Safety Cable Company. As was the usual practice at that time, the paper dielectric was impregnated with a mixture of rosin and rosin oil. The dielectric thicknesses to earth were 0.38 in and 0.40 in for the rubber and impregnated paper respectively and both cables were sheathed with a lead-tin alloy and, on laying, drawn into earthenware conduits.

Although these cables remained in service for at least eight years, they did not prove entirely satisfactory. This was due partly to the particularly onerous conditions to which they were subjected. The cables were in series with an overhead power line and so exposed to lightning surges.

Charing Cross Electricity Supply Company

In 1900, the Charing Cross Electricity Supply Company of London commenced the construction of a new power station at Bow, some 4 miles from the City and from where cables carrying 3-phase current (50 Hz) and 11 000 volts were laid to various sub-stations ranging from Fenchurch Street in the City to St. Martin's Lane in the West End. The three-core cables were in ten sections, the greater part being supplied by Siemens Brothers of Woolwich, but the cable from the generating station at Bow to the junction box opposite No. 110 Mile End Road was supplied by Felten and Guilleaume. From this point westwards Siemens' cable was used. The six City sub-stations were connected by 0.1 sq.in cables while 0.14 sq.in cables were used for the West End sub-stations. In addition to these main feeders there was a ring main linking the City sub-stations and another linking those in the West End.

The Siemens' cables were insulated with impregnated paper a noteworthy departure from their previous predilection in favour of rubber and jute. The shape of the individual cores was something between sector shaped and circular and the resulting spaces both in the crotch and at the periphery were roughly filled with coarse jute strands. This feature of the construction was to be the cause of much trouble in the future.

There is some indication that all the cables for this contract were laid in sheet steel troughing which was subsequently filled with bitumen. A few of the earlier joints were filled with bitumenous compound, but most of them were filled with rosin-oil compound which was later found to give trouble. The rosin-oil worked back up the cables leaving many of the joints half empty. This resulted in frequent breakdowns across the face of the porcelain separators used in the joint between the three individual cores.

Later a new type of joint was introduced with an improved design of separator, the joint box being filled with ceresin wax. These joints were much better than those with rosin oil but suffered from the disadvantage that if they were filled too quickly, air pockets due to shrinkage of the wax on cooling would be formed. This also resulted in a number of breakdowns.

The joints made in the Felten and Guilleaume section were in general satisfactory. These also were filled with a stiff compound which resembled beeswax.

(to be continued)

Word Square

By the closing date a total of eight people had sent in their lists of words compiled from the nine lettered anagram set last month. Not one of the entrants failed to spot that the nine lettered word was TELEGRAPH.

In verifying the lists it was decided that the Shorter Oxford English Dictionary would be used as this was readily available in the Library. This meant that the winner had his list cut by 20 words, however this did not effect the result which is given below:

1st Place	Ron Hall	93
2nd Place	Peter Walton	76
= 3rd Place	Eleanor Tarbox	64
= 3rd Place	Paul Shuttleworth	64

So Ron wins a copy of the Oxford Paperback Dictionary, and our thanks go to all the others who entered.

For interest, combining the lists of all the entrants and an odd addition or two from the compiler a grand total of 103 verified words was reached.

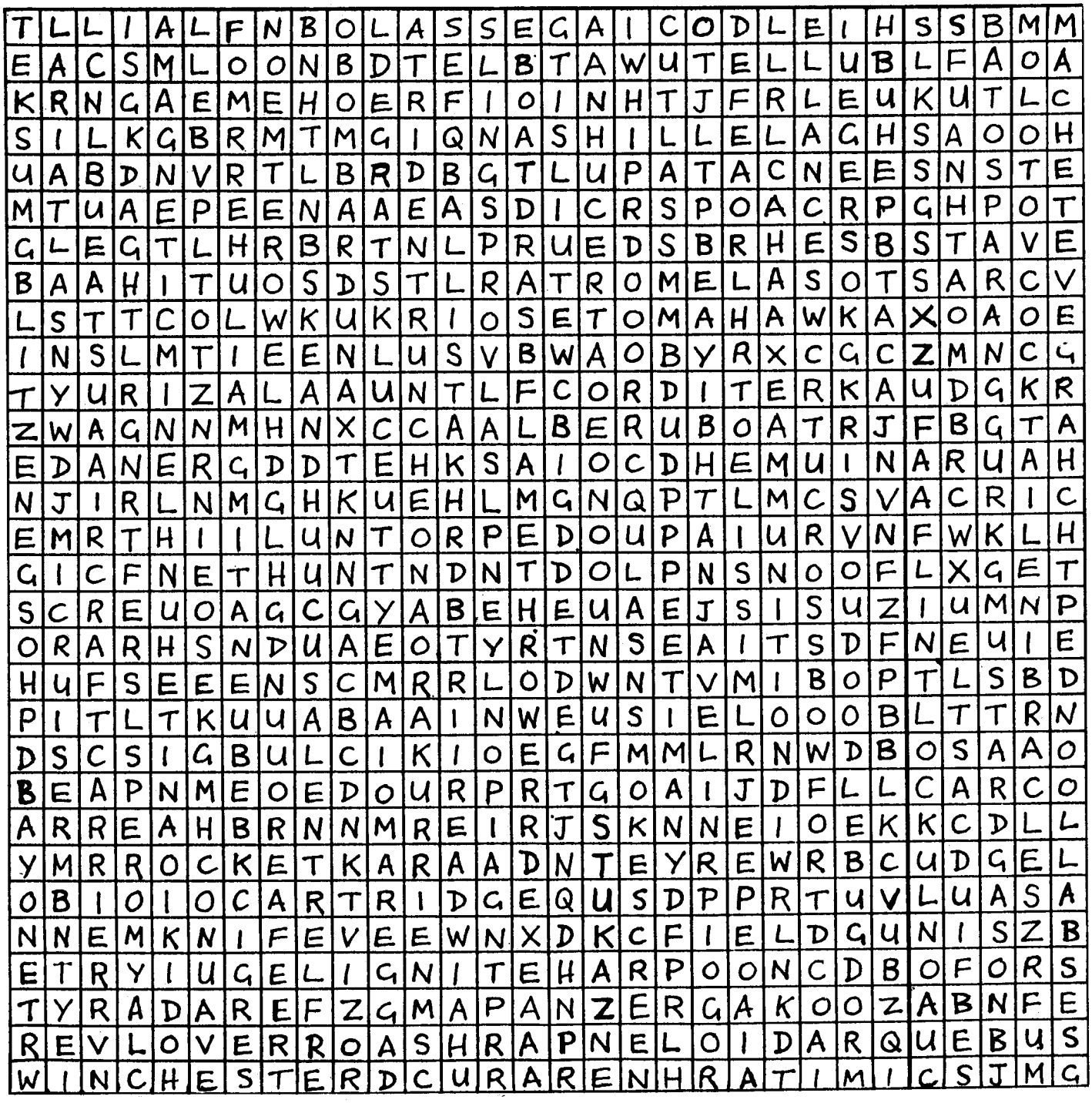
Competition

Have a shot at this

As promised, here is another word puzzle similar to the popular "Bird-in-the-Hand" which appeared in the April issue. This time the theme is "WEAPONS", from the most primitive to the most sophisticated, both defensive and offensive, and including "weapon systems" - for want of a better definition - in part or in whole. Thus anything which could be construed as part of a system of defence or offence could be included. (You'll see what I mean when you've found some of the words!). Sport, crime and "civil commotion" are covered, as well as war. There are some abbreviations, and some slang-words, but only those which have become "household names", so to speak, will be allowed. Some weapons have long been known by the name of their inventor or manufacturer (in the same way as a "Hoover" is a vacuum cleaner, and a "Morris" a motor-car) and some of these appear. Where a word is repeated, maybe several times, it will be counted once only on its own, but as many times as necessary as part of other compound names. Thus supposing the theme was "clothing", then "morning suit", "lounge suit" and "birthday suit" would all count separately, but "suit" on its own would count once only.

Send your list to reach Geoff Holder not later than Friday 6th July, when the senders of the 3 longest lists will receive first, second and third prizes of £3, £2 and £1 respectively - not to establish any precedent but by way of celebrating the B.T.'s 25th anniversary.

How many "weapons" are there? After last time, probably more than I thought, but again the number is well over the 100. (In fact, less than 10 per cent of the letters are unused).



Diary of Events

Date	Event	For Information
30th June	Balfour Beatty Sports Day	Roger Roberts
4th July	Sea Angling, Brighton Marina	Andy Platt
19th July	Sea Angling Competition vs BKI Brighton Marina	Andy Platt
6th July	Last day for contributions for BT	Editorial Board
20th July	Publication Day for BT	Editorial Board
Regular Events		
Tuesdays and Thursdays	Badminton	Vic Banks
Thursdays	Air Pistol Shooting	Peter Walters or Denis Groombridge
Weekends	Hot-Air Ballooning	Roger Millward or Denis Groombridge

Dysphagian Diary

(the occasional column with no sense of occasion)

A diarist's life is not easy. He (or she) is supposed to write wittily about whatever event happens to be in the news. So why not a "Silver Jubilee Diary"? Well, if you can find anything topical and humourous connected with 25 or Silver or the year following the 7th year of the 7th cycle of 7 years then you're a better man than I am, Gunga Din! Let's stick to our usual snippets instead.

* * * * * * * *

This column is completely neutral on all matters of race, colour, creed, religion and national idiosyncrasy, but we had to raise a chuckle at the item in the Daily Telegraph on 6th June. Under the heading "EIRE ARMY PLAN" from "our Dublin Correspondent" was the fearsome news that, "The Irish Republic's 12-strong Regular Army is to be enlarged.....". And further, "The country's small Air Corps and Naval Service are also to be enlarged".

It is rumoured that Whitehall has responded by putting Arthur Lowe on full alert.

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One of the best features of British Rail in recent years has been its energetic marketing efforts with Awayday, Economy Returns, Senior Citizens Railcard. But Simon Stannard-Powell came across another arrangement recently when travelling on the 07.45 Euston-Glasgow, when the guard announced, "Would the young lady travelling to Glasgow without a ticket please come back to the guard's compartment and collect her trousers". Simon reports that a nun in an adjacent seat could scarce forbear to chuckle.

* * * * * * * *

Following a visit to Inspex 79, Mike Fox received a letter from Mr. I. Hunter of Hunter Equipment Sales Ltd. The letter was signed on behalf of Mr. Hunter by a Mr. Smallbore! Obviously should be a double barrelled name.

* * * * * * * *

Funeral Directors have been mentioned before in this column, but until now they have been British. The American way of death, as Waugh portrayed so delightfully in "The Loved One", is a different beast altogether, and firms advertise for business as though they were selling toothpaste or Vodka. Here's a delightfully disgusting example which is apparently sung on TV and Radio.

Chambers' caskets are just fine
Made of sandalwood and pine;
When your loved one has to go
Dial Columbus 390;
When your loved ones pass away,
Speed them on the Chambers' way;
Happy customers all sing,
Death, oh death, where is thy sting?

Star Dance

Captain's Log: Stardate 1.6.79 Earth Time

In our five year mission to boldly go where no man has gone before and seek out strange new amusements, Mr. Spock and myself beamed down to investigate the rumour of yet another Disco at BREL.

We found ourselves in a dark and gloomy place where, indeed no man had been before.... with haste we made our exit from the Ladies (I'll see Scotty about that later). Spock tuning his ears to the sound of "I lost my heart to a starship trooper", immediately directed us to the scene of the crime.

Entering through the West door, we decided not to approach the bar directly, but to persuade somebody to buy a drink for us. Eventually, only after the threat of phasor attack did we cajole a small thin man to prize open his purse for some money. He disappeared into the crowd, never to be seen again.

The throng seemed to be divided into two main groups, those moving at a very slow pace at the bar, and those moving at a faster rate in front of a curious set of flashing boxes, behind which stood a shiny headed man, we suspected was in control.

Stories of past Disco's at BREL flitting about the galaxy, suggested to us that the attendance at these affairs was a little sparse tonight however, seemed to be an exception. Representatives from all departments were present.

Many people were doing different things, one man however, seemed to have acquired a pattern. He would, at various times, visit a table, put all the empty glasses on a tray and proceed to tilt the tray in such a way that the glasses would slide, fall and smash on the floor.

Even though there was no shortage of drink on draught or in bottles, one particular girl was keeping a possessive eye on her can opener all night....

Now things were beginning to warm up, I decided it was time for me to venture into the fast moving crowd in front of the flashing boxman, so I asked a lonely telephonist if she would join me in a dance. She agreed.

Everyone was now in high-spirits, in their mind or in their glass, it appeared. Spock flashing his tricorder around, assured me all were enjoying themselves.

Twice I had to explain to Spock that "Singing in the rain" was not a weather forecast.

Still no sign of the thin man and the drink.

Now to our surprise, the unco-ordinated movements on the floor turned to a rehearsed complex tribal dance. Spock and I retreated as a large circle formed only to constrict and expand in time to the music.

At the end of the evening the organiser made up her mind that everyone wanted to go home. This was the beginning of the end. Perplexed people began to leave as the lights were ordered on and the music ordered off.

It appeared that the success was mainly due to the efficiency of the bar staff (although we never did get a drink), the rhythm of the flashing boxman and the vast amount of time and effort put in by the organizer.

D.P. Kirk & J.A. Spock out.

Thirty Years of Research at Wood Lane

By R.M. Black

With the Bush Telegraph celebrating 25 years of existence with this issue, the Editors thought it appropriate also to include a look back at the work of the laboratories over a similar period, but 1954 did not seem to be suitable starting point. However, the B.T. had been preceded by a broadsheet known simply as "The Bulletin", which first appeared 5 years before, and the year in question, 1949, seemed to offer more scope for such a review. It was about this time, after all, when Britain was at last beginning to recover from the trials and restrictions of the war years - rationing was being lifted, rebuilding was getting into its stride, and from our point of view, the old "Outside Testing Department" tag had been dropped and "Research" was the thing. The growing emphasis on Research as a worthwhile activity was given added impetus when an Open Day was held at Wood Lane later in 1949 - but first, a little "pre-history" about the site itself.

Thirty years ago, Wood Lane was rather different from that which we know now. It had started upon the process of post-war expansion, but only just, and much of its old charm was still firmly embedded in the rather uneven surface of the site.

When Callender's first arrived at the site in 1931, it comprised two main power station buildings together with the associated sidings, cooling ponds, an economizer house and the chimney. These were soon modified to accomodate the work to be carried out. The spaciousness of the old engine rooms made them ideally suited as high voltage laboratories and it was not long before two 500 kV, 5000 kVA Ferranti transformers were installed. The engine rooms thus became known as H.V.1. and H.V.2. and in these laboratories high voltage life tests on cables and auxiliary equipment were carried out together with flashover tests on porcelain sealing ends.

The second of the two buildings was partly converted into a cable life testing laboratory while its north-western half was made into a medium size laboratory for general purpose investigations at voltages up to 120 kV on joint and sealing end designs, short lengths of cable and for the elucidation of the mechanisms of dielectric breakdown. The remainder of the building was divided into three smaller laboratories for Dielectrics, Chemistry and Physics together with a constant temperature room, an oven room and a dark room. The new laboratories were formally opened by Lord Rutherford on the 22nd June, 1934, a luncheon being held in H.V.1. to celebrate the occasion.

In 1945, after the merger of Callender's Cable and Construction Company with the British Insulated Cable Company, the laboratories entered into a period of expansion both of staff and facilities. Some time previously, towards the end of the war a rubber and plastics laboratory had been built over H.V.1. and part of the floor space occupied by a wire enamelling shop. The increased interest in rubber and plastics resulted

in some part from the war-time activities associated with the assembly of the electrodes for buoyant cables and the manufacture of flexible waveguides, radar aerials and coaxial cables.

In 1946, work was started on the construction of a new three-storey building to be named 'Faraday'. The boiler-house section of the building was completed that year and the remainder of the building by 1948.

So we come to the start of the period under review. But more and bigger changes in the appearance of the old Power Station and its surrounds were still to come.

In 1949, the coal storage bunkers above H.V.1. which had served as a roosting place for pigeons, were removed and the upper floor rebuilt to house administrative offices and improve the Rubber and Plastics laboratory. The following year saw the provision of the much needed space for the expansion of the Chemistry Section. This was the Kelvin laboratory, which also provided space for work on ceramics, in connection with the BDR capacitor work, X-ray diffraction and electron microscopy.

In 1955, the work being carried out on the radiation processing of polymers had reached the stage that it was proposed to install a 2 million volt Van de Graaff particle accelerator and the Rutherford laboratory was built to contain the concrete radiation shield for the accelerator and to provide further accommodation for the Chemistry Department.

By 1959 the expansion of the laboratories was such that the available accommodation was still inadequate. It was therefore decided that extra laboratory space should be provided to bring together the principal laboratories, which were distributed over the site, into "one versatile unit capable of handling any research project arising within the BICC Group". The new, McFadzean, laboratory was to be used primarily for those activities in which atmospheric cleanliness and stability of conditions were very desirable. A flexible 'Module' construction was adopted to facilitate future changes in space allocation.

The six-storey McFadzean Laboratory was opened by HRH The Prince Philip, Duke of Edinburgh on 16th May, 1961 in the presence of a distinguished gathering of guests representative of Government, Industry and the Universities.

Since then, there have been only minor alterations on the Wood Lane site, such as the construction of peripheral garage and storage accommodation. In 1970 an additional 20 000 sq.ft. of floor space was leased at Alperton so that the Project Engineering Department could be set up with the necessary facilities for overhead line testing and other plant-scale activities.

It is against this changing background that the research activities of the last thirty years have taken place.

Research at Wood Lane

To give an adequate account of the various researches which were carried out during the past thirty years would require far more space than is available in this issue of the Bush Telegraph or indeed in the issues of the Bush Telegraph for many years to come. It should however be possible to indicate some of the highlights without taxing the reader unduly.

On October 4th 1949 an open-day was held to which Head Office was invited and the relations of the staff came towards the end of the day. This was in the days before the formation of the Research Organisation when the Research Laboratories were very much as they had been since the thirties. There were:- Power Cables, High Voltage, Dielectrics Laboratory (with Mathematics in the form of 'Prof' Hall) Chemistry including Rubber and Plastics and such sundry activities as the Jointing School, the Runways where E.J. Keefe was looking at aluminium welding, the Dowtherm plant where rubber and PVC latices had been applied to wires and where later was a glass blowing shop, the plating shop or cottage, Sid Salvages' upper room and a number of small huts on wheels which served as offices. In the Mill room, where the present stores are situated, studies on the design of a heat pump were carried out and great excitement was occasioned by signs of temperatures either rising or falling in accordance with theory. Early experiments in aluminium sheathed M.I. Cable were also made here.

In the Chemistry department, under G.M. Hamilton, beside the normal analytical service activities, Dr. F.L. Sos was pulling silicone fluids apart and building them up from methyl chlorosilanes, work was going on on the solar deterioratic of polyethylene insulated radio relay cables, the hydrogenation of rubber and the determination of antimony and tin in alloy E. It was around this time also that we were called upon to produce substantial quantities of amyl mercaptan for leak location in impregnated gas pressure cables. Those involve recollect the peculiar anti-social effect of this activity which paralysed our own olfactory sensitivity while apparently stimulating that of others.

When the Research Organisation was formed in 1952 a new research programme was drawn up to cover:- oil/paper dielectrics, rubber, plastics, mineral dielectrics, metallurgy, corrosion, and special techniques. This was to remain unchanged until 1962 when the programme was revised and sections added on Resins and enamels, Instrumentation and Control Engineering, Mathematics, Electric Traction, Other Researches and Miscellaneous. With the formation of the Central Research and Engineering Division on 1st November, 1964 the existing programme continued. Over the years the emphasis has changed from fundamental, long-range, short-range, applied, development, service duties, trouble shooting, way-out in varying combinations depending upon our sponsors and upon the 'state of the art' at that particular time. Life was always interesting and work never dull.

Work on radiation crosslinked polyethylene started around 1952 when samples of pile irradiated material were received and examined to see if their non-melting, rubber-like properties at elevated temperatures could be utilized in cables. It was at this time also that we started using radio-isotopes at Wood Lane for radiography, void detection and in the form of radio-active dimethyl selenide for leak location in impregnated pressure cables. Aluminium was again being considered for use as cable sheaths, a phenomenon which occurred whenever the prices of copper and aluminium approached each other.

1956 saw the sponsoring of post graduate work at King's College, London on powder rheology in connection with MI cables, but probably the most important work at this time was that on the extinction of discharges in cavities in cable dielectrics. Corrosion research was active, phenol corrosion

and the underground deterioration of textiles being subjects for scientific papers.

By 1960 the work on radiation chemistry had been extended to cover the range of polymeric materials in which we were interested both as regards the beneficial effects that irradiation could bring as well as the damage that could be caused by prolonged exposure in a nuclear environment. It was at this time that work on fault detection using eddy current techniques was started and work on fire-detecting cables based on aluminium with an impregnated anodized coating. Various gaseous discharge phenomena were studied and a start made on attempting to understand the behaviour of the cells proposed for the gassing test for oil-filled cable oils.

In the following year the Tolworth model, a scaled down model for the study of overhead line railway electrification and in particular the behaviour of the pantograph during current collection from the conductor at speed, was reported. This was to lead to a study of the techniques for obtaining useful information from the model and in later years to the replacement of the model by a series or suit of computer programs all relevant to railway practice.

In 1962 there appeared accounts of the work on the measurement of the electrical conductivity of metals, of importance in conductor design and of that on extrusion by hydraulic pressure. This latter work was to lead to the installation of the hydrostatic extrusion press. Meanwhile work on radiation chemistry had involved studies of the effect of radiation on the molecular weight distribution of polymers and the effect of unsaturation both in the polymer structure and as added unsaturation. Mention of a flowmeter for helium in 1964 was indicative of the work in progress on superconductivity in which we were again in the forefront, on the frontiers of science!

It has often been said that fundamental research is better pursued in the universities while applied research and development is the province of industrial R & D establishments such as Wood Lane. The distinction is not in practice so well defined and much of the more fundamental aspects of our work has been of direct application. This was certainly the case with the studies on the crystal orientation in copper which tied in with the work on the parameter known as the 'spring elongation number'. 1966 also saw the beginning of a series of experiments on busbars insulated in vacuum which initially behaved as oversize X-ray tubes!

In the following year the work on high temperature insulation for aircraft cables was summarized, work which had led to the synthesis of a number of 'brick-dust' like materials which did not live up to the claims of other workers in the field. Published designs for superconducting power cables were well received but the time was not yet ripe for their introduction.

In 1969 the work on MIG welding was published. The jointing of aluminium conductors has always required special attention due to the nature of the metal and with the increasing interest in its use in power and even in domestic wiring cables considerable attention was paid to it both at Wood Lane and at the factories. Test boards containing the full range of wiring fittings were set up and precise measurements made of the resistance changes between the wire

and the grub-screw and tunnel. This involved consideration of various aluminium alloys and substitutes for copper such as copper-clad aluminium.

Metrication began to rear its ugly head, enlivened by a published apology for S.I. units with epistles to the Imperialists and Grammarians.

1970 saw the publication of the work on the ultra-violet display of corona fields in air a particularly elegant technique made possible by highly sensitive TV cameras originally designed for air-field surveillance. Much effort was also devoted at this time to the phenomenon of treeing in polymeric insulation and various types such as water trees and sulphide trees were identified depending upon the environment to which the cable had been exposed in service.

In the early seventies new factors were entering our lives. The environment and its preservation free from contamination of many kinds and the conservation of energy resources. The former led to a consideration of alternatives to polychlorophenyl capacitor impregnants and the latter to consideration of the energy consumption and waste products in the conversion of high electrical conductivity copper wire bars to wire.

New technologies were also of considerable interest and work on waveguides and optical fibre cables was soon started and is still, particularly the optical fibre work, of major importance.

As was said, the wide range of investigations undertaken at Wood Lane during the past 30 years could not be reduced to a single article. Nor can the work be divorced from those who carried it out, for Wood Lane is very much the people who have moved through the department and who have made it what it is. Much that is noteworthy, such as the gas injection process for cellular polyethylene has been omitted, or was until just then, and each reader will no doubt have his, or her own list of outstanding projects. Suffice it to say that when writing of Wood Lane:-

> "Age cannot wither her, nor custom stale
> Her infinite variety; (other women cloy
> The appetites they feed, but she makes hungry
> Where most she satisfies; for vilest things
> Become themselves in her, that the holy priests
> Bless her when she is riggish)".

Memory Lane

or BACK IN THE DARK(room) AGES.

In the early part of 1950 producing a social club magazine, then known as the Bulletin, containing photographs was not achieved easily and relied on a dedicated group to hand print a photograph for each copy. The following account written by Graham Wills, tells how the early photographs were produced.

The original "Photographic Production Team" consisted of, from left to right, John Anderson (now at Erith), myself, Denis Thomas (now with AERE) and Robert Black and is shown opposite (top right hand corner) preparing for an eight hour session in a makeshift darkroom situated in the dungeon below.

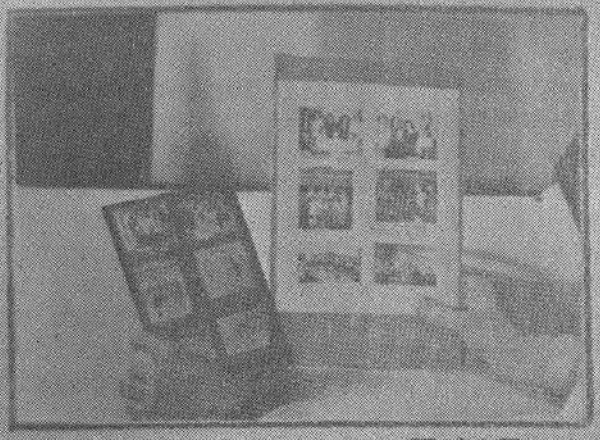
The somewhat fixed expressions are not due to the quality of the victuals, although they were pretty indigestible as I recall, but to the use of a self-timer on John's camera which was set up to record the occasion.

The event took place in the Autumn of 1950 when a number of enthusiastic amateur photographers mostly from the Chem. Lab., suggested that it might be a good idea to brighten up the social club magazine with photographic illustrations. The audacity (stupidity) of this idea may be judged from the fact that in those days photographic materials were relatively much more expensive than today and the only means of illustrating any paperwork from Wood Lane was to hand print photographs and to affix them to the text with adhesive or staples. The time and labour involved was, to judge by modern standards, colossal. Norman Davis, now retired, used to spend most of his time doing this in the official Photographic Section which was housed in a large wooden hut where Kelvin now stands.

The suggestion to illustrate the magazine was received enthusiastically but translating the idea into practice was the problem. Dr. L.G. Brazier, who was then Director of Research, gave the idea his blessing and agreed that Norman Davis could prepare the master negatives but that all other printing operations would have to be done elsewhere, out of sight, and out of working hours! The materials would have to come out of the Social Club fund which as I recall amounted to a total of about £150 that year. This sum had to cover a 50 per cent share in the hire of a football pitch (with Pyrene on the Great West Road) the running expenses of a Football, Cricket and Darts team as well sundry other Club activities. After much deliberation with the Hon Treasurer (Harry Charman) the sum of £7.50 was allocated to the enterprise! The Production Team was formed and were then faced with the task of finding the subjects for the illustrations, preparing the composite master plates with Norman, and then finding the materials and a darkroom in which to print and process about 300 separate prints. The circulation of the magazine at the time was about 140 copies and we hoped to include two pages of photographic illustrations.

The actual photography did not present much difficulty with people more than willing to become part of this unique venture.

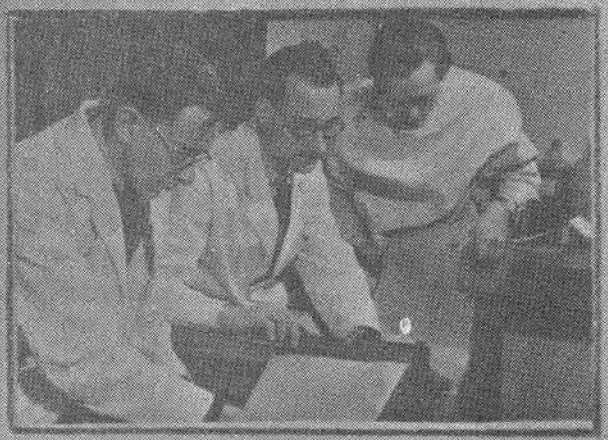
PRODUCING THE SUPPLEMENT



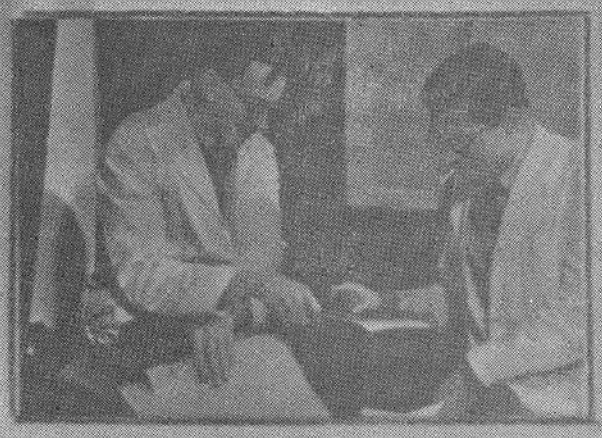
MASTER - NEGATIVE & FORMAT.

LOADING UP

GOING DOWN



CUTTING UP THE PAPER



PRINTING

DEVELOPING

Materials presented the greatest problem but here the Services came to our rescue, though not quite in the manner we had intended. In those days the "Amateur Photographer" was full of advertisements for "Ex Govt" printing paper and chemicals which were sold at knock down prices. As chemists the preparation of developer and fixer from the basic ingredients presented little problem and we soon prepared a few gallons of each. Paper, at a price we could afford was the real problem until we saw an advertisement for 100 ft rolls of paper used for printing aerial reconnaissance photos. We spent the last £5 on two of these and were all set to go.

The darkroom was rigged up in a small dungeon-like room under the Chem. Lab. (now Met. Lab.) to which access was gained via a trap door and ladder. The trap door had to be replaced to keep out the light but at the same time this cut out almost all of the ventilation With 4 people in this dungeon, one cutting paper to size from the roll, one operating the home made printing box and the other two sloshing about in developer and fixer the air supply was sufficient for about an hour. Beyond that time the concentrations of sulphur dioxide and carbon dioxide reached levels which threatened to asphyxiate us and all unexposed material had to be hastily packed away so that the trap could be opened to vent the space.

The first blow to our endeavours occurred within half an hour when, after cutting off 50 sheets of paper and exposing them we attempted the developing process. Nothing happened! Even after five minutes in the developer there was still no sign of an image. A lightning analysis of the "developer" by tasting a finger moistened with the liquid confirmed that it was not "fixer". Then someone noticed that the paper in the developer was becoming very "shiny". At once the penny dropped. We had sensitised paper coated with a waterproof layer which had first to be removed before the developer would act! A ten per cent solution of sodium hydroxide was required to remove the waterproofing layer, so a further set of dishes were added to the already cramped environment and a further two minutes was added to the processing time per print!

Time passed, Robert had to leave to catch his last train and the remaining three soldiered on. Periodically we returned to the surface, dragging containers of slimy goo and spent fixer and developer, gulped air, replenished the containers, and returned to our task. By 2 am the sinks were full of prints and three weary people crept home to bed.

Arriving early the next morning we hastily transferred the prints to buckets and carried them across to Norman who kindly finished the washing process and dried them. By the time the "boss" came round the lab presented its normal appearance although some of its inhabitants looked distinctly the worse for wear.

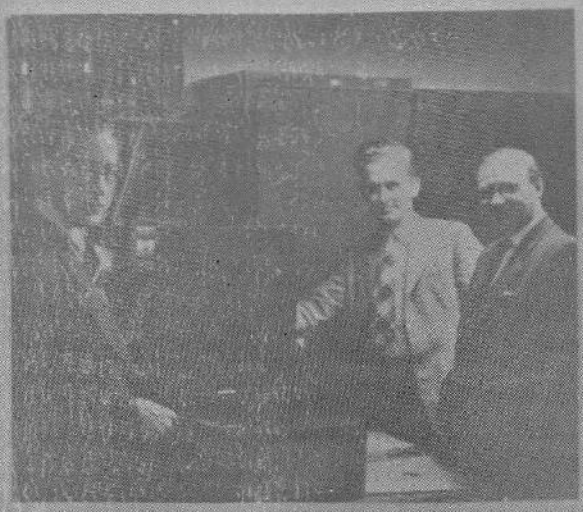
As always in this sort of enterprise there were many others who rallied round weeding out the less acceptable prints and helping to bind the remainder into the first ever illustrated addition of the "B.T." The results of our endeavours are shown on the opposite page.

Graham Wills

THE GENERAL OFFICE.

THE TYPISTS.

NETBALL SECTION.



MESSRS. **BLACK, GREEN** AND **PRIOR** AFTER A RECENT MEETING OF THE MUSIC SECTION.

TEA AND TOAST ——— THEN ——— THE MUSIC

Executive Council

The Executive Council meeting was held prior to the AGM. The minutes of the previous meeting, that had been circulated, were approved without alteration.

Matters Arising

Badminton Court. Concern is still being expressed regarding damage caused by tables and chairs being pulled, rather than lifted, over the new surface.

Financial Statement

It was concluded that the year had been satisfactory with most sections staying within their budget.

Concern was expressed regarding the money tied up with empties from the bar as the brewery appears reluctant to collect them. It was agreed that further attempts should be made to get this situation resolved so that the credit could be obtained.

It was also decided that a more frequent and better review of the bar prices was required especially in connection with the Disco's which provide most of the bar profits.

New Members

Three further members gave a total membership of 240 since the subscription review was carried out.

Childrens Christmas Party

A date has been fixed and Eileen King has kindly offered to assist in the organisation as she has successfully done in the past.

Other Items

The Pitch and Putt competition will be held in July. The meeting closed at 17.40.

Dave Green

28th Social Club AGM

The meeting started promptly at 6.00 pm on Thursday 17th May 1979 with the new Chairman Dr. G. Moore in the Chair. Also present were Stuart Castle, Vice Chairman,Pat Donovan, Hon-Treasurer and Pete Walton General Secretary also nine other club members were in attendance. The Chairman asked if the minutes were correct. The meeting agreed that they were with one

spelling mistake, this was rectified and the minutes duly signed. The Vice-Chairman then gave a resumé of the clubs activities during the past year, in which the majority of sections had had a high level of interest. He then mentioned the club piano which had been sold to a member and the money obtained used to purchase a Casseiver which was installed in the Bar.

The Hon. Treasurer then gave his report in which he stated that the club had enjoyed a very successful year with the majority of sections keeping to their budgets. He then mentioned several items in the accounts: a) Billiards - over budget by £26 due to recovering the table. b) Balloon - sum of £31.21 shown as a profit but shows an underspent situation in reality c) Small functions - made up of several non-Budgeted items including £19 trip to Balfour Beatty Sports Day, £5 cost of five a side football match, £7 cost of the Pitch and Putt Competition. d) T.V. Rental, this account was increased due to the change in model last October. He then went on to say that the Club's income for the coming year had improved due to the Company's increased grant and the extra income from Members Subscriptions. Their being no questions he then asked that the accounts be accepted, the meeting agreed to this.

The General Secretary informed the meeting of the officers for the coming year.

President	-	Vacant
Vice-President	-	Mr. C.A.B. Pipkin
Chairman	-	Dr. G. Moore
Vice-Chairman	-	Vacant
Treasurer	-	Mr. P.T. Donovan
Secretary	-	Mr. P.T.J. Walton

He then said that a ballot was necessary to elect a Vice-Chairman, who would hold office for the next three years. Ballot papers were distributed and after voting the following result declared. 11 Votes had been cast, 10 Votes for Mr. S.M. Castle and 1 Vote for Mr. D.J. Green. Mr. S.M. Castle was declared the Vice-Chairman.

The General Secretary then explained that as only seven nominations had been received for the seven vacancies on the executive council the seven were duly elected.

The new Executive Council members are:-

Mr. C. Buchan
Mr. R.A.G. Fraser
Miss Y. Ferrier
Mr. D. Goff
Mr. D.R. Groombridge
Mr. D.J. Green
Mr. R.G. Maidlow

He then told the meeting that he had received only four nominations for the bar committee which should number five, he therefore declared the four duly elected:-

Mrs L.C. Buchan
Miss Y. Ferrier
Mr. L.P. Lou
Mr. D. Goff

The Chairman then asked if we could vote on the rule changes "en bloc". Mr. R. Maidlow proposed that the rule changes be accepted, this was seconded by Mr. E. Cooke and was duly carried.

The main points altered by the changes are:-

1. Members of the Executive Council shall have been members for two years.

2. Rules concerning a finance committee have all been removed. The other changes all stem from the removal of the finance committee and therefore subsequent rule renumbering and also the inclusion of the Bar Secretary as a member of the Executive Council.

There being no other business the Chairman closed the meeting at 6.20. At 6.21 the Bar duly opened for another Year's Service to the Club's thirsty membership.

Section Reports

AIR PISTOL SHOOTING

Shooting Averages as on 31.5.79.

Member of

Name	Highest Score	Average	Position	Name	Highest Score	Average	Position
L.P. Lou	50	44.0	1	P. Walters	46	30.0	5
S. Verne	48	40.2	2	P.T. Donovan	44	29.0	6
R.G. Maidlow	48	37.3	3	Y. Ferrier	33	28.3	7
J. Walters	44	36.2	4	J. Graves	33	23.5	8

For the first time in many months Denis Groombridge's name doesn't appear in the averages - a result of bridge matches and holidays rather than a drastic loss of form. Joe Lou has returned to re-occupy his position at the top, pushing Stefan Verne into second place. Bob Maidlow has slipped a little, his position now seems to be in danger from Janet Walters, whose shooting has shown a dramatic improvement over the past month (she increased her highest score twice in successive weeks). If it can be proved that this improvement is due to her being pregnant (the usual handbooks on such matters do not indicate that pregnancy affects shooting accuracy and consistency) the committee may have to consider handicapping her for having an

advantage not available to male shooters! Janet's improvement may, however, have been a result of competition from Yvonne Ferrier who shot her highest score and obtained her highest average on returning to shooting after a long break.

Following last months note on falling attendances at shooting sessions I am pleased to report that the trend seems to have been arrested and reversed to a small extent, long may it continue!

Sea Angling

The sea angling trip on 18th May aboard Brian Condon's "Quickfire" from Brighton Marina proved to be the highlight of the year so far. Following a day of gales we were fortunate to have a day when, after a wet and breezy start, the sun shone continually and the sea gradually became calmer and calmer as the wind moved from S.W. to W. Good catches of Spurdog together with some lesser spotted dog fish, whiting, and pouting were made. The six members weighed in a total of 169.5 lb (excluding pouting) with Gene Nalon (50 lb) and Alan Bangay (47 lb) making excellent catches.

C.A.P.

Littlehampton 1st June

The planned trip took place on Friday 1st June despite a last minute change of boat caused by double booking. However, this "forced" re-arrangement gave the club an opportunity to sample the fish-locating skills of skipper David Fellick of "BBC Fishing-Race" fame and to experience the performance of his well known boat "Pathfinder" which we had often noted on previous trips. The weather smiled kindly on our nine-strong party and we were treated to glorious sunshine and a calm sea, a rare combination in recent months.

After "steaming" out about 8 miles, David put down the anchor and told us "the fish are down there so now it's up to you!" He was so right on both counts, an abundance of the beautiful, but beguiling black bream who can quickly and neatly strip a hook of its bait leaving the poor fisherman with only his bated breath.

The bream catch followed an interesting pattern with most of the best fish being taken in the period 2 hours each side of high water; these were generally characterised by solid knocks followed by hook contact on a slow retrieve. Mackerel or squid baits produced equal results. However, as low water approached, the frequency of lighter bites increased with hardly any fish being hooked despite recourse to even smaller hooks and baits. From the one or two caught during this time, it was apparent that the culprits were baby bream of about ½ lb. We ended the day with about two dozen bream around the 2 lb mark, the highest individual catches going to Alan Bangay (6), Adrian Cole (6) who also had the heaviest fish at 2¾ lb, and Graham Taylor (5).

For those who left their bait too long on the bottom there was a plentiful supply of good-size "doggies". Eight different species were caught from this mark, the others being tope, smooth hound (spotted), scad, plaice, whiting and a baby conger which, at about 2 lb, was some way short of qualifying its captor Bob Maidlow for the conger club. The other members of the party were Chris Buchan, Dave Cole, Derek Glockner, Gene Nalon and Steve Wilson - end of report.

A.J.B.

CRICKET

MATCH REPORT: v. ROSSER AND RUSSELL (Thursday 17th May)

The 1st round of the Hammersmith K.O. Competition brought Wood Lane a "home" match against Rosser and Russell, the local firm of heating and ventilating engineers, and everybody agreed that our opponents could have used their expertise to provide a bit more heat and a lot less ventilation for the Alperton Sports Ground.

Terry Alleyne won the toss and elected to field, and the opposition were soon in trouble, particularly against Peter Raw. Bowling down the slope, into the wind, with the setting sun behind him, Peter's accurate left-arm medium found a nice damp patch on a length around leg stump, with the result that he claimed six wickets for hardly any runs and a lot of bemused expressions on the faces of departing batsmen. Bob Lewis and Clive Carroll provided steady support and Terry Alleyne snapped up two wickets although suffering ignominy of being hit for six over a long mid-wicket boundary. Despite a sore shoulder Mike Kendle's wicket-keeping was sharp enough to effect a run out and so, even allowing for three chances slipping through cold fingers, R and R could only reach 50 all out.

With the light fading Vic Banks and Bob Lewis set about the task of making the runs but Bob was soon needlessly run out. The same fate befell Terry Alleyne, but Peter Raw nudged the ball quietly around the field and Vic imparted some lusty blows to get Wood Lane home by 8 wickets and with about 5 minutes to spare before the rain came.

In the 2nd round we are due to play Unigate, probably on Tuesday 19th June.

GENEALOGY SECTION

We have recruited some new members recently (some as a result of the "Family History" series on BBC-2 - due to be repeated in January 1980) and we are hoping to hold a teach-in soon to explain some of the practical steps in tracing a family history.

We have also welcomed a member from BGCL, Leigh (Chris Furmston from Data Processing) who is also a member of the Cheshire F.H.S. He has written to say that he would be delighted to help anyone at Wood Lane who wants enquiries made in the Manchester area. He hopes members might offer help in the London area in return.

Molly Nalon is compiling an easy reference card index of information about County Record Offices, Family History Societies, Libraries and other sources of material related to family research. If you have any information please pass it to Molly (ext 384).

Mike Hagger

G-BREL

Gabrielle at Southampton University

On Sunday May 13th an unsuperstitions group of six gave their time at the week-end to take Gabrielle to a publicity display at Southampton University. The University was holding an annual event, involving the display of handicrafts, stalls and side shows, with other attractions such as drum majorettes and morris dancing, specifically intended for the students, staff and their families. This meant that a high proportion of the adults attending the event were of direct interest to us with regard to publicising BICC to potential graduate employees.

Anyone who can think back to that day will remember it as being extremely warm with temperatures into the 80s (sorry high 20s centigrade), virtually ideal for an out door display, but as regards flying a hot-air balloon on the end of a rope, a somewhat different matter. The laying out and inflation was rather hot work with gusts of thermal winds trying to blow the balloon envelope anywhere but where it was meant to be. Just after 2 pm our pilot for the day Ian Culley (an air traffic controller from Heathrow) performed a tethered display for just under half an hour in front of a large crowd. The total period of activity from laying to deflation was over twice this time.

Following the tether publicity brochures describing BICC were made available at the event organisers' table and also copies were put into the Students Union library. A littl later in the afternoon, after the thermals had died down a bit, a second tethered display was performed for somewhat longer than the first and again in front of a fair sized audience.

I feel that from the point of view of bringing BICC to the attention of potential graduate employees the event was successful, the balloon provided the attraction drawing attention to the name, whilst the available literature supplie the background information.

The whole task involved setting off from London before 10 am and finally returning at about 10 pm, quite a long day for the crew. The Balloon Section would like to thank Ian Culley for piloting at the event and the crew, Yvonne Ferrier, Denis Groombridge, Joe Lou, Dave Green, Charlie Williams and Ian Fennemore, for their time and efforts.

DRG.

The Film Column

Film Poll to be Revived

Older readers will remember, and the rest of you will have read in the "History", that for a number of years in the early seventies we held an annual Film Poll in which all staff were asked to assist in selecting the films to be shown at Wood Lane by taking part in a Film Poll. The poll is being revived this year, and should be issued within the next two or three weeks. Please help us by returning the Poll form within a week.

New Film Section Secretary

Ted Cooke is the new secretary of the Film Section in succession to Annette Mattock. Ted has agreed to combine the duties of secretary with those of his present position as treasurer. His phone number is 313.

National Film Theatre

Hollywood: The New Generation brings together some of the best-known films of Francis Ford Coppola (THE GODFATHER) George Lucas (STAR WARS), John Milius (DILLINGER), Brian de Palma (CARRIE), Martin Scorsese (TAXI DRIVER) and Steven Spielberg (JAWS, CLOSE ENCOUNTERS). Also in July, a tribute to Jean Renoir, Terence Rattigan films, and films with child stars from Baby Peggy Montgomery in 1924 to Tatum O'Neal and Jodie Foster today.

Film Recommendation

Joan Micklin Silver's HESTER STREET, a likeable picture of immigrants in New York in the early years of this century. Showing at the NFT on Friday 29th June at 6.30 and 8.45 p.m.

Congratulations

Having just celebrated our own silver jubilee, all of us in the Film Section would like to extend our heartiest congratulations to the Bush Telegraph on attaining its 25th anniversary. Long may it prosper!