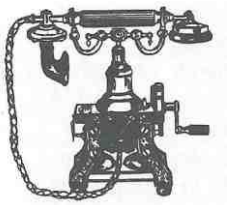


The introduction of the telephone to Bristol

Monty Ellis

It is fitting that this history of the telephone in Bristol should be presented on the anniversary of the opening of the city's first telephone exchange in December 1879, but it would be as well to begin by reviewing briefly the events which led to the commercial introduction of the telephone in the first place.

Credit for the invention is generally accorded to Alexander Graham Bell, a native of Edinburgh who emigrated to the USA and became an American citizen. However, Elisha Gray applied for a patent on the same day as Bell, and, others contributed in considerable measure to its practical development. The electric telegraph had been established for some 40 years and naturally, at first, both Bell and Gray thought of telephony in terms of telegraphic techniques. The breakthrough was the discovery that the speech signal could be transmitted as an 'undulatory current' which was the electrical analogue of the speech wave itself.

Bell's transmitter generated a continuously varying current which was the electrical counterpart of the sound waves impinging on it. It comprised a light iron diaphram close to the pole of a permanent magnet which carried a coil of fine wire. The diaphram vibrated in response to the sound waves; this caused a corresponding variation in the magnetic flux passing through the winding; and induced an alternating voltage in the coil. The power generated was extremely . small, and in fact one of Bell's difficulties was that he did not realise how sensitive the ear is, and how little power is sufficient to stimulate it. The receiver worked conversely with the incoming alternating current varying the flux, and in consequence the degree to which the armature was attracted. Bell filed his patent application on 14th February, 1876, and was granted US Patent No 174,465 on 7th March. He lost no time in developing the commercial possibilities of his invention, although at the outset it was thought of as a kind of electrical speaking-tube for communication between two specific locations. However, by the latter half of 1877 the idea of a switching centre or exchange had become current, and it was in this direction that major development took place. The idea of a central switching agency was not new; it is known, for example, that a telegraph exchange system using Wheatstone's ABC instrument (which did not require a skilled operator) was in use in the coal industry, at Newcastle-upon-Tyne in 1873, with 60 subscribers.[2]

In 1878 the Telephone Company Ltd was formed in Great Britain to exploit Bell's system. its first exchange was opened in London at 36, Coleman Street in 1879, and steps were taken to promote the invention in the provinces.

The Telephone in Bristol

The first news of activities in Bristol comes from the Bristol *Times & Mirror* and *Bristol Mercury & Post* for 30th October, 1879. The company's representative, Capt J P Cox had come to Bristol, and a demonstration telephone line had been set up from the Commercial Rooms to the Dock Office at Cumberland Basin. Another circuit was open for public trial between the offices of Mr B Perry in Redcliffe Street and Temple Street, and St Philips Goods Station. Benjamin Perry was a warehouseman and forwarding agent, with premises at 127 Redcliff Street and 11-13 Temple Street, and it could well be that like Mr Carpenter who is mentioned later, Mr Perry had had a private telephone line installed even before the public telephone exchange was mooted. On 13th November it was reported that the company had erected a demonstration line from their offices at 16 High Street to the Commercial Rooms.

The company proposed to open an exchange as soon as sufficient support was forthcoming. It evidently was, for an advertisement on 8th December stated that 'a central telephone exchange will be opened during the course of the week.' On the same day the *Bristol Times & Mirror* printed an article reproduced below describing the forthcoming service.

> **A Telephone Exchange for Bristol**
>
> Mr F W Pope-Cox of the Telephone Company Limited has been for a short time in Bristol superintending the formation of a telephone exchange. He has secured commodious premises in the Victoria Buildings, High Street; thirty two of the leading tradesmen of the city have given their names as subscribers, and it is expected that fifteen of them will be in communication with the exchange within the next ten days. There is a switchboard erected, which is for the purpose of putting one line in through communication with any other line. The line wire is first put through what is called a spring-jack coil, and thence to the instrument table.
>
> When any of the subscribers wish to communicate with the exchange they press a bell-button, which rings a bell upon the instrument table. A red disc then falls upon the switch-board which is numbered, thus showing the clerk at the exchange who it is that is calling. He then asks what other ' firm they want to communicate with, and on being told puts the two firms into communication by means of connecting-lines through the spring-jacks and switchboard. The firms can then converse in perfect privacy, for they are isolated from the exchange by means of the connecting lines. Any number of conversations up to 74 can be carried on by means of the apparatus now being erected in High Street. The subscribers have one of Bell's patent transmittees [sic] erected in their offices by the company. This instrument is a combination of the telephone, microphone, and bell-switch. and is worked by Fuller's bichromate battery of small power, and these are erected, put in communication with the exchange, and kept in repair for £20 per year if within a radius of one mile. The advantage of this means of communication is far greater than that of the telegraph, for not only is perfect privacy secured but the expense is smaller.
>
> The longest wire in Bristol for the first batch of subscribers will be from the top of Pembroke Road, Clifton, through the exchange to the Broad-plain, . . .The office hours at the exchange are from 9 a.m. until 6 p.m., but when gentlemen have them from their houses to their places of business they can, by special arrangement with the Company, be left in communication after the exchange is closed, and also on Sundays. The company are also erecting instruments in several private houses in the city.

The following are the instructions for the use of the telephone when in communication with the exchange:

To call the central office press the push-button leaving the telephone hanging on its switch-hook, and wait. The call will be answered by the ringing of your bell. Then remove the telephone from its hook, and state the name of your own firm, and also that of the firm you wish to communicate with. On being told you are through, speak at once. Use the voice as usual in conversation, at a distance of eight to twelve inches from the instrument.

A very low tone should be employed from two to four inches away, and a whisper may be conveyed by putting the mouth close to the transmitter. A rattling metallic sound results from speaking in too loud a tone, and pains should betaken to avoid it.

CAUTION: Subscribers must be careful to hang the telephone on the hook provided on the bell, otherwise the battery will soon become useless; and, moreover, the central station will be unable to call you up. Subscribers are requested to report promptly to this office any trouble with wire or instruments.

A number of interesting points arise in this announcement. The reference to the 'line wire' shows that the subscribers' lines, like telegraph circuits, consisted of one insulated wire only with earth return. While economical, and perhaps not over-troublesome to begin with, this system eventually gave rise to serious over-hearing (despite the claim of 'perfect privacy'), and the cure for this evil although known at the time did not come into general usefor twenty years.

When the subscriber pressed his button, a current flowed from his local battery to the exchange, the circuit being completed via the earth. The piece of equipment which the reporter describes as the 'spring-jack coil' was a drop-indicator, an electro-magnetic device operated by the line current. The 'spring-jack', usually called a 'slipper-jack', consisted of a flat brass spring which normally pressed upon a brass plate some 1 in x ½ in x ¼ in thick, from which it was otherwise insulated. The plate was connected to earth.

To connect a call to or from the subscriber's line, a flexible cord was used. At one end of the cord was a flat plate of insulating material, faced on its upper side with brass. This was inserted under the jack-spring. The other end of the cord terminated in a round peg, which could be inserted in one of a number of holes in a horizontal insulated metal bar. The called subscriber would be rung, and his line connected to the same bar in a similar way. Other horizontal bars could be used in the same fashion for connecting other pairs of subscribers together at the same time. At the end of the call the caller again pressed his button; the indicator now gave the clearing signal, and the operators cleared the connection. This is the origin of the long-obsolete, but still current, expression, 'to ring off'.

The operating procedure is of interest, in that calls were set up on a revertive system. After being ousted from favour for very many years by the 'step-by-step' method of connection, this principle has recently come back into use in the modern common-control systems of automatic switching.

The operator is referred to as a 'clerk' in accordance with telegraph practice, and was male, but it was soon appreciated that female operators were able to deal more effectively with subscribers.

The plaque commemorating Bristols first telephone exchange to be seen on the Norwich Union Building, in High Street, which occupies the original site

The correct name of this historic exchange building was Queen Victoria Buildings. lt was numbered 16, High Street, and stood on the southern corner of St Mary-le-Port Street, opposite the entry to the covered market. The site is now open space in front of the Norwich Union building. When the company first occupied the accommodation it was one of six tenants, the first District Superintendent being Mr Cothill.

The circuit from Pembroke road to Broad-plain was, in fact, two exchange lines which could be connected through to one another at the exchange when it was closed. One was to Winifred House, 110 Pembroke Road, Clifton, the home of William Lant Carpenter, while the other was to the works of his firm, Christopher Thomas & Bros, Soap Manufacturers, at Broad Plain. Their building is now used as Gardiner's showrooms. Mr Carpenter became convinced of the value of the telephone whilst on a visit to the USA, and after his return to this country he advocated it enthusiastically. He had installed four internal telephone circuits in the works, which had been giving every satisfaction for several months prior to Capt Cox's arrival in Bristol.[3]

It is particularly interesting to note that although terminations were numbered on the switchboard for the domestic use of the operators, the subscribers were instructed to use the names of firms when making calls. That this was indeed so is confirmed by the company's London directory for 1880, in which the subscribers are listed without any - numbers at all. Mr Cothill's post as District Superintendent was taken over by Mr A F A Hervey at the end of June, 1880.5 Mr Hervey had had thirteen years experience in the Indian telegraphs, and his salary was £11.18.4 per month. Business flourished, and by April, 1881 the number of subscribers had grown to 100.

London Negotiations

Our attention can now be diverted to events in London. In the course of competitive development in the United States, Thomas Alva Edison had become involved in the invention of a telephone system which did not infringe the Bell patents. He devised a carbon transmitter (British Patent No 2909 of 1877) which was more sensitive than Bells' because it actually amplified the power provided by the speaker's voice.

In 1879 the Edison Telephone Company started business in London with an exchange at 11 Queen Victoria Street. In order to circumvent the patent for Bell's receiver the

resourceful Edison devised an ingenious alternative. His receiver worked on the principle that the friction between a rotating porous cylinder moistened with an electrolyte (potassium iodide solution) and a stationary contact is reduced when a current passes through the contact. If the contact is connected to a diaphram the device will reproduce speech very efficiently; indeed, excessively so Another disadvantage was the need to turn a crank continuously to hear anything at all. The situation thus existed, whereby the Edison company possessed a first-rate transmitter but a troublesome receiver, while the Bell interests had a good receiver but an indifferent transmitter Fortunately they had the good sense to see where their best interests lay, and abandoning their rivalry, combined to form the United Telephone Company on 13th May, 1880

Their troubles had only just started however, for no sooner had they sunk their differences than a new and more formidable enemy emerged, none less than the Post Office Prior to the amalgamation a test case for infringement of the Postmaster General's telegraphic monopoly had been instituted against the Edison company. The United Telephone Company accepted service of the action, and in historic judgment on 20th December by Mr Baron Pollock and Mr Justice Stephens, it was held that the telegraph encompassed any system of communication which employed wires, even if it was not electrical, and also any system which used electricity, even if there were no wires. However, once he had established his rights, the PMG let it be known that he was willing to permit the company to continue its operations under licence, provided that it paid the Post Office 10 per cent of its gross revenue.

The Post Office, elated by victory, could not resist the temptation to take advantage of its position. The following advertisement appeared in the *Bristol Times & Mirror* on 23rd December:

> **Telephone Intercommunication**
>
> The Post Office has for some time provided a means whereby the Renters of wires into Postal Telegraph Offices may be placed at will in direct communication with each other. Such a system has been in operation in Newcastle-on-Tyne, Hull, Middlesbro', Stockton, and other towns for several years.
>
> The instrument used in these calls up to the present has been the ABC instrument. Henceforward, in order to meet the convenience of the Public, the Post Office will be prepared to provide for such a system either the ABC or the Telephone Instrument. In the case of the Telephone Instrument the annual charge to each Renter will be £14.10s if his premises be within half-a-mile of the Telegraph Office, £18 if they be more than a half but not more than a mile distant, and at proportionate rates for greater distances. The Renters will not only have the facility afforded them of communicating direct with each other, but they will also be enabled to send Messages by wire to the Telegraph Office, to be thence transmitted at the ordinary charge to other towns.
>
> Application should be made to the Postmaster, and when several persons have agreed to take Wires immediate steps will be taken to establish a system of intercommunication by Telephone instruments.
>
> By order of the
> POSTMASTER GENERAL
> December 1980

If the Postmaster General thought that the company would take this lying down he was mistaken; in fact the telephone interests came to be well known for their aggressive policy. Immediately below the Post Office advertisement the following riposte appeared, conspicuously lacking any spirit of Christmas goodwill.

> Telephones
>
> The attention of the Directors of the United Telephone Company (Limited) having been called to certain ADVERTISEMENTS by the POSTMASTER GENERAL, offering to supply the Public with Telephone Instruments in connection with private wires and upon the exchange system, Notice is hereby given, that the Patent Rights in this country of Professor Graham Bell and Mr Thomas Alva Edison are the exclusive property of the United Telephone Company (Limited) and that PROCEEDINGS will be TAKEN against ALL PERSONS USING ANY FORM of CARBON TRANSMITTER, or any form of Magneto or Electro-Chemical Receiver, whether such Telephones are supplied by the POSTMASTER GENERAL, or by any other person not authorised by the United Telephone Company (Limited), all such Transmitters and Receivers being infringements of the said Patents.
>
> By order of the Board
> JAMES BRAND Chairman.
>
> Dated this 21st day of December 1880
> 36, Coleman-street, London, EC.

The instruments which the Post Office contemplated using were made by the Gower-Bell company, and were manufactured under licence from the patentees, but although Post Office exchanges were established in a number of towns, its proposals at Bristol do not appear to have gone any further.

Bristol Developments

In June, 1881 a subsidiary exchange was opened at 27, Oakfield Grove, Clifton presumably to serve the private houses of city gentlemen.[6] So far, the exchanges had only been open during business hours, but in March, 1886 continuous service was introduced, apart from 9 am Sundays to 8 am Mondays.[7] The company was now feeling the need for more accommodation. In 1884/85 it took over the whole of the building apart from the ground floor which was occupied by the Victoria Tea Company. The United Telephone Company (Limited) decided that its interests would be served best by devolution to local subsidiaries. Accordingly, we find that in 1884 the business in Bristol was being operated by the Western Counties & South Wales Telephone Company Ltd, with Mr H F Lewis as manager and secretary.

Later on, perhaps because it had come to appreciate the potential of the telephone as a nation-wide means of communication, it reversed this policy, and 1892/3 the parent company absorbed its progeny and assumed the name of the National Telephone Company Ltd. We have already noted how one archaic expression has persisted. Although, as will be seen later, the National Telephone Company ceased operations at the end of 1911, the Police still speak of getting a call 'by the National', that is, over the public system as opposed to their private wire network.

Every new invention goes through a period of experiment and uncertainty before settling down to develop along lines which the experience of the first few years shows to be the best, given the technical resources of the time. The primitive switchboards, of which the slipper-jack type was only one variety, worked; but they had serious disadvantages which

became more and more apparent as the number of connections increased. Because a subscriber's line had only one termination at the exchange, which was used for both originating and incoming calls, the services of two, or more likely three, operators were needed to set up even a local call. This was a very serious limitation, and the result was that by the mid-1880's the magneto multiple system had emerged as the favoured line of development. It was to remain unchallenged for close on twenty years.

In the magneto system, (which, incidentally, is still used in undeveloped countries on account of its extraordinary robustness) the subscriber calls the exchange by turning the handle of a generator. This sends an alternating current and releases the shutter of a drop-indicator at the exchange. The operator like-wise uses a generator to ring a magneto (AC) bell at the subscriber's end. The 'multiple' consisted of an array of jacks on the vertical face of the switchboard, which repeated regularly in numerical order. All the jacks in corresponding positions in the array gave access to one particular subscriber's line. Two other important changes had also taken place. The jacks had become of the familiar round type which are still in use, and subscribers' lines were identified by their telephone numbers. The multiple was invented by Leroy B Firman of Chicago, who patented it in 1881. Its great advantage was that it gave every operator sitting at the board outgoing access to any number on the exchange without intervention of any other operator.

Another radical improvement was in the equipment for connecting calls. Eighty-five drop-indicators serving subscribers' lines appeared on an operator's 'position' below the multiple, and she was provided with fourteen pairs of flexible cords, each of which constituted an independent connecting circuit. Each cord ended in a plug, and when the cord was out of use, a weighted pulley drew it down through a hole until the plug came to rest against a shelf of the switchboard. Associated with each cord circuit was a three-position key. In the central position, the cord circuit was disassociated from the operator's telephone entirely. The backward position enabled her to speak and hear on the cord circuit, and the forward position allowed her to ring on it. When a subscriber called, his indicator dropped, whereupon the operator inserted the plug of an answering cord in a jack corresponding to the indicator. At the same time, she threw the speaking key to answer the caller. She connected him to the number he required by inserting the corresponding calling cord in one of the jacks in the multiple, and rang the called subscriber's bell using the key in the ringing position. The subscribers were supposed to signal the end of the call by 'ringing off' with their generators, but as often as not it was left to the operator to monitor the call and take down the connection when the subscribers had finished speaking. The 'ring-off' signal was received on indicators which formed part of the cord circuit equipment.

This method greatly improved the efficiency of the operators, but it was only made possible by sacrificing the perfect privacy which had been stressed in-the company's original publicity.[8] There can be no doubt, however, that the gain greatly outweighed any loss. Complaints that an operator has violated the fundamental duty to observe secrecy about telephone messages have always been extremely rare.

A magneto multiple board was installed, one might think rather belatedly, in 1894 to replace the slipper-jack board. It was situated on the second floor of the same building in High Street and had an initial capacity for 1200 connections. By this time the need had arisen for additional sub-exchanges. The January 1894 list of subscribers, the earliest known still in existence, and held by the City Museum, shows them at; Bishopston (5); St George's (6); Kingswood (6); Fishponds (5); and Westbury-on-Trym (5). The figures in brackets are the number of subscribers.

As these exchanges were very small, the company did not at this stage acquire its own premises, but farmed the exchanges out to established tradespeople. In the case of Bishopston and Kingswood it cannot be asserted beyond all doubt that the exchanges were at the premises mentioned, but the circumstantial evidence is strong. There were certainly 'call rooms' for the use of the public at the addresses shown, and these were normally in the same premises as the exchange. This practice would certainly have benefitted the shop-keepers by helping to attract custom. The situation of these sub-exchanges was as follows:

Bishopston 1894. G H Bryant, 307 Gloucester Road, Apparently a dwelling-house.
1895. Amos J Wills, Tea Dealer and Grocer, 195 Gloucester Road.

Fishponds Daniel Bawn, Grocer and Fly Proprietor, 744 Fishponds Road.

Kingswood B J S Houndsell, Supply Stores, 2 and 3 Whitefield Place. The premises were on the opposite corner of Hanham Road from the Kingswood Hotel, now the British Legion Club. They were demolished for road widening, and by coincidence, Kingswood automatic exchange now stands on the same site.

St George Edmund Harvey, Grocer, 195 Church Road, Redfield

Westbury-on-Trym William H Mogford, Plumber, 2 High Street. Still trading as an ironmonger's shop under the same name. Mr Wiltshire, the present proprietor, states that the switchboard was behind a partition to the right of the shop as one enters, some 15 ft from the door. Mrs Mogford was the operator.

By 1895 an additional sub-exchange had been opened at Stoke Bishop. This was_unusual in being situated in a dwelling house occupied by George Sutton at 10 Rockleaze Road, although it may well have been connected with James Howe's cab business at No 11. Mr C Bigwood of F Bigwood and Sons Ltd who now occupy No 11 states that the front room was divided by a partition, and the switchroom was to the left looking at the front of the house, and that his aunt, Miss Pidgeon was the operator. Henry Pidgeon, House . Decorator, lived at No 13. James Howe, Fly Proprietor, had his business premises at No 11, but lived at Elm Cottage, (now Nos 3/5). The Avenue, where a call room was later provided.

These exchanges were all almost certainly of the magneto type. In 1894 the subscribers' numbers were shown in the normal way, for example, Bishopston 2, but in the 1895 directory the numeration had been changed to a linked numbering scheme in which the two initial digits of a four-digit number were characteristic of one particular exchange. It seems likely that this change was made in conjunction with

the opening of the new magneto central exchange. Details are given below,[9] and the increase in subscribers, coupled with the fact that Stoke Bishop did. not open until 1894/5 suggests that the other sub-exchanges had been established not very long before.

Exchange	LNS Prefix Digits	No of connections at 1895
Bishopston	67	16
Fishponds	73	7
Kingswood	65	8
Stoke Bishop	75	12
St George	69	9
Westbury-on-Trym	71	8
Clifton	55 & 56	

At this time all subscribers' circuits ran across the housetops. At the main exchange they terminated on a large and ugly structure known as the 'derrick', from which routes of wires were carried on poles or gantries of H-formation to the north, south, east, and west. The southern route came down and crossed the Floating Harbour in a cable attached to Bristol Bridge, taking to the air again on the other side.[10] A route of gantries following the line of Redcliff Street served the Bedminster area, and communication with Bedminster was cut off when it was damaged by a fire in Redcliff Street in July, 1890.

The author was privileged to talk to an old gentleman, Mr Phil Shipp, who worked as a fitter for the N T Co while this exchange was still in operation. He said that the telephonists were 'a very nice lot of girls' and stated that the company made a practice of recruiting seamen as linesmen, since they were accustomed to working at a height in the rigging on board ship.

The growing tangle of overhead wires became such an eye-sore in the cities that it gave rise to public complaint. Some improvement came in the case of Bristol when the magneto exchange was replaced in 1900 by a new exchange, in a new building, in a new street, heralding the new era.

Regional Growth

It had not been long before a demand for a service had arisen and had been met in neighbouring towns. An exchange was opened at, 11a Union Passage, Bath in 1886. On 11th August, 1886, the *Bristol Times & Mirror* gave the news that 'the first of a series of long-distance [sic] wires' had been opened from Bristol to Bath on the preceding day. A total of three circuits was provided. The press had further good news on 6th April, 1887; four circuits from Bristol to Gloucester would probably be completed during the ensuing month. To augment the system, on 25th April a circuit was set up to Cardiff by way of Sharpness, the Severn railway bridge, Lydney, and Newport.

In 1890 the company broke new ground at Weston-super-Mare. The *Weston Mercury* announced on 17th May that about thirty subscribers had already been connected to the new exchange at 18 Wadham Street, and that the line from Weston to Bristol would be completed in the course of the next few weeks. On 7th June it gave its readers further encouragement with the news that 'Bristol is already connected with Bath, Portishead, Avonmouth, Sharpness, Gloucester and Cheltenham on this side of the Channel, and with the chief places in South Wales as far as Llanelly.

At the outset the Post Office had not permitted the companies to provide service on other than a strictly local basis; the licences restricted the area of telephone communication to a radius of three to five miles from a central point. The Post Office reserved to itself the right to provide trunk service, but as it would only do so on prohibitive terms, developments did not go very far. A more enlightened policy was adopted in 1884 by the then Post-master General, Mr Fawcett, who gave companies a much freer hand in developing the service between different towns and cities, including the right to erect their own trunk routes. However, his successors continued to regard the increasing trunk traffic with unease, and not without reason, for every trunk call that was made meant at least one, and more likely two, telegrams less. The GPO did cooperate with the company in providing facilities for the transmission of telegrams to and from telephones. The *Bristol Mercury* recorded on 20th February 1895 that two telephones had been sanctioned at the Bristol Head Post Office for the purpose of receiving and delivering telegrams.

Eventually, on 4th April 1896 The Post Office took over all the trunk routes which the company had been working and operated them from separate trunk exchanges,[11] adding many new trunk links and improving company lines. At Bristol, the Trunk Exchange was situated in the Head Post Office in Small Street. There were now circuits to London, Bath, Birmingham, Cardiff, Exeter, Gloucester, Sharpness, Newport, Taunton, and Weston-super-Mare. Twelve circuits connected the trunk exchange with the NT Co's local exchange and the Post Office is stated to have employed seven operators.[12] This probably means that seven operating positions were in use, including one record position where the operator would have recorded the called and originating numbers on a ticket. This was then taken to the operator working the appropriate outgoing route, who kept it until its turn came to be connected. It was, of course, necessary to call the originating number back when the call matured. Because trunk line time was at a premium, trunk calls were considered to be more urgent than local calls, so if the called number was found to be engaged on a local call when a trunk call was ready for it, the incoming operator would interrupt the conversation in order to offer the trunk call. It was considered ill-mannered to refuse, since the caller was charged for the call whether it was accepted or not.[13] The trunk circuits were worked by a combination of DC and generator signalling.

Subscribers who had a substantial number of trunk calls could rent lines direct to the trunk exchange. These lines were published in the N T Co's directory in the form 'PO Bristol 9. Elders & Fyffes, 25 Welsh Back'. It is convenient to mention at this point that by December, 1906 the number .of trunk circuits and local junctions had both increased to 47.[14]

Extension of Facilities

An aspect of the service which developed in the early years was the provision of facilities for the use of people who had

no telephone of their own. On 29th January,1886 the *Bristol Evening News* carried an advertisement that Call Rooms would be opened the following week at

16 High Street. (The Company's offices)
27 Oakfield Grove, Clifton (Clifton Sub-exchange)
C K Pullin's Cricket Depot, Blackboy Hill
E G Field's Library, Whiteladies Gate
J Baker & Son, Booksellers, 34 The Mall, Clifton

The charge was 2d for three minutes conversation. As time went on, these services were extended, so that by 1895 there were 17 call rooms in the city, 8 in Clifton, and one in Kingswood.

At this time, also, a form of broadcasting over telephone wires, known as the electrophone. was available. Amongst the facilities on offer was the ability to listen to the services at Broadmead Chapel.

The New Era

1900 marks a new era in the history of the telephone in Bristol, since it locates the introduction of a modern system of manual switching which was only finally superseded by automatic working in this country within the last few years. The company acquired a site to the south of Baldwin Street, on which it erected a three-storey building to the design of Edward Gabriel, of the firm of Gabriel & Edmeston, London and Bristol.[18] In this was installed a switchboard of a completely new type; so new, in fact, that it was the first of its kind in Europe. It was almost as much of an improvement over the magneto type as that in its turn had been on the slipper-jack. The exchange was of the Western Electric Central Battery type in which the whole of the power was supplied from one large secondary battery at the exchange. This eliminated the maintenance liability of the small primary batteries required to energise the transmitter of every subscriber's telephone under the magneto system. Signalling was now entirely automatic. When a subscriber lifted his receiver a small lamp glowed in the switchboard in front of the operator; and when the subscribers hung up after their call two small supervisory lamps associated with the cord circuit lit to show that they had finished. (That expression 'to hang up' is another which is no longer literally true since the combined hand-set superseded the candlestick type of telephone.)

An important change which was introduced with the opening of the new exchange was the replacement of the single-wire overhead subscribers' circuits by metallic loops in paper-insulated lead-covered underground cables. They contained a total length of 4300 miles of subscribers' circuits, and were protected by 17½ miles of 3" diameter iron pipe. Since the speech currents in the two wires of the loop are equal and opposite, they cannot interfere with adjacent circuits. At the same time, the fault liability was much improved. It is likely that in the latter days of earth return some trouble had been experienced from stray currents in the earth from the electric tramways, which had started in 1895.

The new switchboard was brought into service on Easter Sunday, 15th April, 1900.[19] With its opening the Bishopston, Clifton and St George exchanges were closed, and the subscribers transferred to the new exchange. A new street, Telephone Avenue, was laid to serve the exchange and other buildings. Power to charge the battery was taken from the mains, although there was also a gas engine in the basement. The opening of the new exchange was celebrated on 2nd July, 1901, when the Lord Mayor, High Sheriff, members of the Council and Corporation officials were given a tour of the building followed by a celebration lunch.[20]

Although strictly speaking Filton is outside the city area, it may be mentioned that a magneto exchange was established there at 1 Bellevue Cottages (facing the roundabout) in 1900.[21] The exchange was in the care of Mr Collins, whose grandson, Mr David F Sully is an Area Engineer at Bristol. Unlike the other exchanges which have been mentioned, Filton took its own charges for calls.

To begin with, there was ample accommodation in the new building in Telephone Avenue, and the company let off the first floor as offices. In the basement were the stores, test room, engine room, battery room and heating chamber. The ground floor housed the local offices, switchroom, dining room, and kitchen. The second floor was used for the company's Bristol district offices. A considerable number of ten-party line circuits were connected to the exchange, providing a very economical form of service to small concerns.

About this time, the provision of telephone service was thought to be the sort of activity in which municipalities might profitably engage, and the Telegraph Act, 1899, was meant to encourage them to do so. The Bristol corporation contemplated the idea in 1901, and set up a committee under the chairmanship of Alderman Pearson to look into the matter.[22] They invited Sir William Preece, engineer-in-chief to the Post Office to come and advise them. Sir William was an enlightened and progressive man. Amongst other things he had taken a keen interest in the telephone from the very beginning, and also gave all the encouragement he could to the young Marconi when he was still unknown and struggling for recognition. However, he could give no encouragement to the corporation, producing figures which proved conclusively that it would be hopeless for them to set up in opposition to the N T Company, whose charges were not in any way unreasonable. After some objection by the committee the project was dropped; wisely so, for of six municipalities which did set up telephone undertakings, all but two were glad to give them up within five years, and only one, (Kingston-upon-Hull Corporation), has survived to the present day.[23]

About this time the company changed its policy with regard to the sub-exchanges, which, of course, had steadily increased the number of their connections. As opportunity offered, it took up leases on dwelling houses of the less pretentious sort, in which it opened new exchanges of magneto type. The details of these second-generation sub-exchanges are as follows[24]

Fishponds	3 Brook Road. Leased at £18.4s. pa from 24th June 1902. Caretaker-operator, Mrs Mary Williams
Kingswood	2 Claremont Place (379 Two Mile Hill). Leased at £20 pa from 29th September 1902. Caretaker-operator Daniel Parker.

Stoke Bishop 15 Lockleaze Road. Leased at £25 pa from 24th June 1902. Caretaker operator, Mrs M Hagley.

Westbury-on-Trym 1 Hill View (32 Westbury Hill). Leased at £20 pa from 29th September, 1901. Caretaker-operator, Mrs Emily Harris.

In 1903 the linked numbering scheme was dropped, perhaps with the opening of the new exchanges, and the sub-exchange subscribers were listed as, for example, Peckett & Sons, Fishponds 6; or Fishponds Coal Company, Fishponds 2x3. Numbers of the latter type occur in profusion, and indicate that (a) the subscribers' lines were metallic loops, and (b) party-line service was in extensive use. In fact, something like half the subscribers had service of this sort.

The company leased 4 Wick Road Brislington at £19 pa from 25th December, 1905, and opened another magneto exchange there on or about 20th March 1906.[25] The caretaker-operator was Arthur Ringwood.

On or about 7th January 1908 an exchange, very probably of the magneto type, was opened at Warmley.[25] Although an N T Co exchange, it was situated in the sub-post office, which was kept by James Norman.

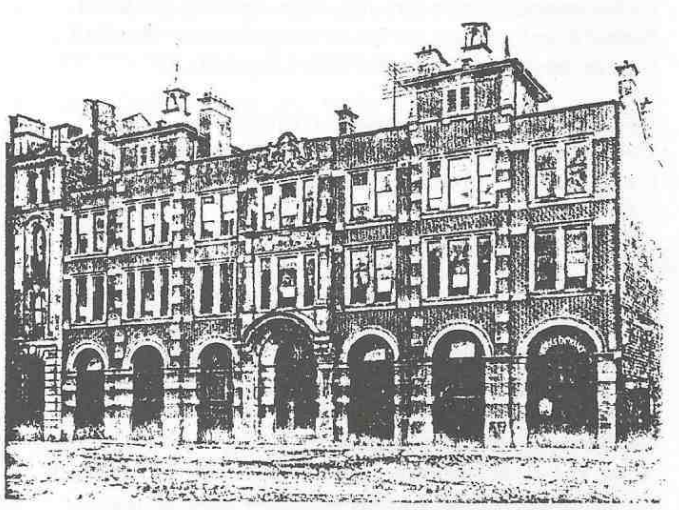
Finally, the last of the sub-exchanges at this time was opened at 1 Seymour Road, Staple Hill on or about 17th March 1908.[25] This was also a magneto board, and the caretaker-operator was William Burgess.

Post Office Control

The next important landmark was 1st January 1912. Rightly or wrongly, public dissatisfaction had arisen because of the National Telephone Co's virtual monopoly over most of the country (although the Post Office did operate a number of exchanges, mostly in London), and its alleged autocractic behaviour.

It was decided that the Post Office would take over the Company's system when its licence expired on 31st December, 1911. The organisation continued very much as before under public ownership, apart from the fact that the company's employees had now become civil servants. In particular, the distinction between short-distance and trunk calls was maintained for many years, although the Post Office was, of course, now responsible throughout.

An exchange was opened on 23rd February 1914 at Whitchurch.[25] situated in the sub-post office, now 117 Bristol Road, where Robert Clark was sub-postmaster. Prior to the introduction of automatic working the switchboard was of Central Battery Signalling No 1 pattern,[26] and it seems likely that this was the one originally fitted. Had the first exchange been magneto, there would have been no better case for changing it than there was at the other sub-exchanges, which remained magneto throughout, Fishponds apart. The Central Battery Signalling (CBS) system was developed to call the exchange, so doing away with magneto generators, but subscribers still used local batteries to energise their transmitters. The subscribers thus enjoyed automatic signalling, but the cost, and difficulty of charging, a secondary battery at the exchange were avoided.



The new building opened in Telephone Avenue in 1900

In 1921/22 the magneto exchange at Fishponds was replaced by a new board on the first floor of the post office (now a wool shop) at 766 Fishponds Road.[27] This exchange was of a different CBS type (CBSm) which permitted a subscribers' multiple. The Staple Hill exchange was closed on 1st December, 1921, and the subscribers transferred to Fishponds.[25] It is probable that this took place in conjunction with the opening of the new Fishponds exchange. Warmley exchange closed on 12th April 1922, the subscribers being transferred to Kingswood.[25]

On or about 1st October, 1924 the Brislington exchange was also closed, and the subscribers served from the main exchange.[25] The name 'Brislington' was nevertheless retained as that of a 'hypothetical' or ghost exchange. It used to be standard practice to set up a hypothetical exchange before a new automatic exchange was hived off from an existing manual exchange, since this greatly facilitated the number changes. However, the author knows of no other instance of an exchange retaining a hypothetical identity after physical closure. The reason in this case was apparently to avoid number changes. As old 'Brislington' subscribers ceased, their numbers would disappear, while new subscribers would take Central numbers. As we shall see shortly, one number change was going to be inevitable, and there was no point in provoking Brislington subscribers by subjecting them unnecessarily to two in succession.

Coinbox telephones in wooden kiosks had been introduced by 1908, when the N T Co's directory lists them at Broad Quay; 303 Stapleton Road; 511 Fishponds Road; and High Street, Staple Hill. These first coinboxes were of the Hall pennies-only type, which were later replaced by the prepayment type with buttons A and B[28]

As time passed, the demands on the switchboard at the Central exchange increased to the point where it not only filled the whole of the original switchroom, but the first floor as well. New measures were needed at Bristol. Automatic switching, after going through the same sort of experimental stage as manual switching had done, had become completely practicable by the 1920's, and the decision was taken to convert the whole of the Bristol area to automatic working within a linked numbering scheme. of five digits.

In addition to the central automatic exchange, which was installed in an extension to the building, Strowger equipment was used at new satellite exchanges at Bedminster, North (Montpelier), South (Totterdown), Easton, West (Clifton), Kingswood, Stoke Bishop, Westbury-on-Trym and Whitchurch.

The linked numbering scheme was arranged as follows[29]

Central	20-25	West	33-36
Bedminster	63,64	Kingswood	73
North	44-46	Stoke Bishop	81
South	76,77	Westbury-on-Trym	66,67
Easton	56,57	Whitchurch	41

Code-dialling was also provided to the adjacent manual exchanges in the local (five-mile-circle) charge area.[29]

Filton	89	Keynsham	87
Fishponds	84	Long Ashton	86
Frenchay	88	Pill	85

It will be noticed that Fishponds was not included in the automatic system at this stage; in fact the Fishponds automatic exchange was not opened in a joint postal telephone building until 19th March 1941.[30]

In conformity with standard arrangements, subscribers dialled

0 for short distance operator-controlled (toll) calls and emergency calls.
91 for enquiry and directory enquiry.
92 for the Service PBX
90 for telegrams.
94 for long-distance trunks.
Coinbox users dialled 0 for all operator services.

In an operation which had taken two years of careful and detailed planning, the whole of the automatic system was brought into use at midnight on 28/29th November, 1931.[29] Mr A Rattue, the sectional engineer, was in charge of the operation, in which over 300 men took part. The total number of connections changed over was 11,557, and 1732 junction circuits were involved in the transfer.

The automatic equipment was manufactured and installed by the Automatic Telephone Manufacturing Co of Liverpool and had the distinction of being the first automatic equipment installed in Great Britain mounted on single-sided racks.

As trunk circuits became cheaper, it became possible to consider the improvement of the long-distance service to the point where calls could be connected on demand in the same way as the shorter-distance junction calls.

It was found that by changing the operating procedure, a demand service could be given, and the circuits still exploited efficiently. Under this procedure, an operator answers a call and records the details on a ticket. Instead of releasing it, she then proceeds to make an intensive search for 60 seconds over the circuits on the appropriate outgoing route, and also, (if it is economically feasible to designate one), over those on an alternative route. By this means, it was possible to connect 90% of calls on demand. The remaining 10% were kept in hand if the caller so wished, and circulated to a delay position for completion.

In 1908 a new trunk switchboard had been installed on the top floor of the Head Post Office.[31] As at 1930, there were 36 trunk positions in two suites face-to-face, with what looks like 8 record positions in the intervening space.[32]

There were at least 31 outgoing trunk routes, including circuits to

Barnstaple	Leicester	Oxford	Taunton
Birmingham	Liverpool	Plymouth	Torquay
Bournemouth	London	Reading	Totnes
Cardiff	Manchester	Salisbury	Weymouth
Glasgow	Minehead	Southampton	Yeovil
Ilfracombe	Newcastle	Swansea	
Leeds	Nottingham	Swindon	

Before such a service as demand trunk working could be introduced, it was highly desirable to have a new, purpose-designed, type of switchboard. Such a switchboard became available during 1930, and was known as the 'Sleeve-control' type. The name derives from the fact that the signalling functions take place over the third conductor of the cord circuit, which terminates on the sleeve of the plug, that is, the cylindrical part which fits into the 'bush' of the jack. This allowed one type of cord circuit to be used universally for making connections between any types of junction or trunk circuits; the electrical condition on the sleeve conductor being translated into whatever might be the appropriate line condition by the terminal relay-set of the junction or trunk circuit. The sleeve-control board was the result of a complete re-appraisal of switchboard design, and made the old patterns of board look almost ludicrously old-fashioned by comparison.

To serve the Bristol automatic area, a suite of thirty-three sleeve-control toll positions were installed in a new switchroom on the top floor of the building extension. A temporary suite of 46 CB1 (common-battery manual type) positions was also installed, and to this the 261 trunk circuits at the trunk exchange in the Head Post Office were transferred on 10th October, 1931. It was not yet possible to introduce demand trunk working; this had to await the installation of a second sleeve control suite in the same switchroom, after which the CB1 positions could be recovered.

Party-line service did not entirely disappear with the introduction of automatic working. Some rural party lines remained. The subscribers' numbers all began with 93, and these digits were used to route their incoming calls to the toll switchboard, from which the operator completed them by code-ringing.

In writing a brief account of this sort one of the difficulties is in deciding what must be left out, and the author is conscious that many aspects of the telephone service have been ignored entirely, while others have only been briefly touched upon. It has been impossible to go into any technical details; the field of telephony is so extensive. It is no easier to decide at what point the telephone may be considered to have emerged from the domain of industrial

archaeology. The introduction of automatic working appears to be as good a time as any, for although there have been important changes since, it does bring us up to the point where we are talking about installations which are still in existence.

But even if the story were brought completely up-to-date, there are still possible developments stretching far into the future; the revolutionary departure from electrical forms of transmission promised by glass-fibre optics; digital switching; fully electronic exchanges; and ideas yet unborn.

References

Because of space limitations this article has been extracted from a more detailed account by Mr Ellis. Where relevant, his notes and references have been retained with their original numbering, and in consequence these do not follow consecutively.

2 J E Kingsbury, *The Telephone and Telephone Exchanges*, p 83.

3 Testimonial in N T Co's *London Directory*, 1880. P O Records Department

5 Cutting from Bristol paper in Mr A Perkins' scrapbook, 28th October, 1880. P O Records Dept, Telecomms 3.7.

6 ibid. (*Bristol Evening News*, 11th August, 1886).

7 ibid. (*Western Daily Press* advt, 22nd March 1886).

8 The Taunton Telecomms Museum has an early pattern of magneto board on which the speaking and ringing positions of the keys are the same as those described above.

9 N T Co's *Directory*, P O Records Dept,

10 Mr Phil Shipp's recollection.

11 P O Circular, March 28th, 1896. P O Records Dept.

12 *Western Daily Press*, 26th December, 1906.

13 J Poole, *The Practical Telephone Handbook*, p 259.

14 *Western Daily Press*, 26th December 1906.

18 *Bristol Mercury*, 11th July, 1898.

19 F C G Baldwin, *History of the Telephone in the United Kingdom*, p 345.

20 *Western Daily Press*, 3rd July 1901 .

21 *National Telephone Journal*, December, 1907, p 184. P O Records Dept.

22 Bristol Records Office, 04957.

23 P O Records Dept Historical Summary, Telephones 1876-1911.

24 N T Co Sites and Buildings, 1908. P O Records Dept.

25 The dates are those of the Post Office Circulars in which the changes were announced, where a precise date is not quoted.

26 I P O E E *Journal*, No 25, 1932, p 51.

27 List of Exchanges (Tp 60), 1921 & 1922, (Telecomms 1.38 and 1.39), P O Records Dept.

28 Mr E H Smith's recollection.

29 I P O E E *Journal*, loc. cit.

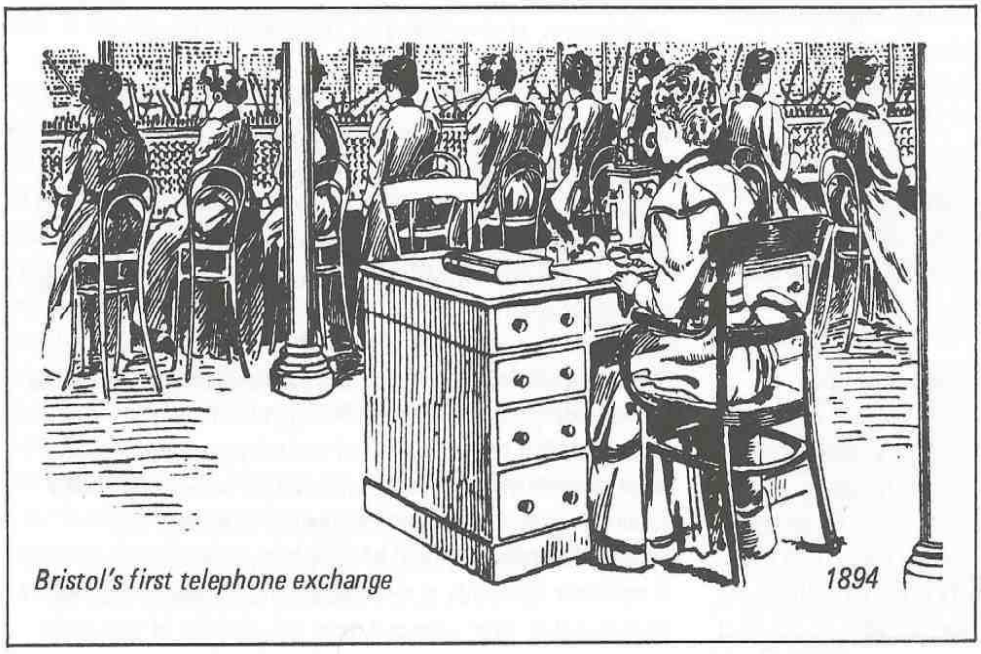
30 From a note on the Post Office Trunking Diagram, G M O Bristol.

31 From a paper by D M Rennolds 'Bristol's First Telephone Trunk Line Exchange.'

32 From a scrutiny of photographs in Miss E L Bradfield's possession.

Acknowledgements

The staff of the Post Office Records Dept and the L T R Historical Telephone Directory Library, London; the Bristol Reference Library The Bristol Records Office; the Head Postmaster, Bristol; and all those whom I have inadvertently omitted to mention, together with a host of kind people, who, although they could not contribute directly themselves, put me on the track of those who could, grateful thanks. M J H Ellis.



Bristol's first telephone exchange 1894

The breast transmitter