

## Electrophone System

From the very first telephone, music has been transmitted over the wires. When Alexander Graham Bell was lecturing and giving public demonstrations he regularly included music. In front of Queen Victoria he demonstrated his telephone which included a singer and band music.

The Electrophone system supplies connections from Theatres, Churches etc to private residential homes or offices via telephone wires.

In the UK in 1880 and 1881 the Marr transmitter was used by Moseley and Sons, a provider of private telephone lines in Manchester, to broadcast music. Music from Manchester theatres was received on ordinary telephones. Probably one of the first live streaming services available. This system is described later on this page.

The Theatrophone system was developed in Paris, by Clement Ader, and was first exhibited at the l'exposition d'electricite in 1881. Coin in the slot machines were installed in public places, such as bars and for one Franc, listeners could hear live performances from a Parish theatre. The poster to the right was designed by Jules Cheret in 1890 for the Compagnie du Theatrophone.

This system used two transmitters, one stage left and the other stage right. The two transmitters used two lines and connected to the left and right of the listeners headset - effectively stereo. This system is described later on this page.

Music was also transmitted on telephone lines in Frankfurt, Munich and Vienna.

In the UK, in 1891, the Universal Telephone Company puts 50 microphones into the Royal Italian Opera House in Covent Garden, and 50 more into the Theatre Royal, Drury Lane, all for the sole use of Sir Augustus Harris, at St John's Wood, who even has a special extension to his stables.

In the UK the National Telephone Company trailed long distance performances in 1891 and this was between London and Birmingham. Further tests were completed from Birmingham, Manchester and Liverpool to a room in the Crystal Palace. Visitors to the Crystal Palace were charged three pence (before 18.00) and six pence (after 18.00) for a 10 minute period. Within six months approximately 60,000 people used this service.

In 1892 a demonstration telephone performance of The Mountebanks, a comic opera, from London's Lyric Theatre. The evening's revenues pay for the launch of The London Electrophone Company. The Electrophone exchange is private, housed in a building adjoining the General Post Office Exchange in Gerrard Street; there is a listening salon there.

Because of the above successes the Electrophone Company was formed in 1894 and went into service in 1895, operating until 1926. The National Telephone Company supplied the lines and the Postmaster-General issued a licence for the service.

The system relayed live theatre and music hall shows and, on Sundays, live sermons from churches. This was a subscription service and users would firstly ask the operator, by using their normal phone line, to connect them to Electrophone. The Electrophone switchboard operator would ask them which theatre they wanted to connect to. For opera, they would be connected to the Royal Opera House at Covent Garden. Other theatres were also available, The Palace Theatre, The Apollo, The Gaiety, The Garrick, The Lyric, The Palace, The Pavilion, The Empire, The Tivoli, The Savoy and The Adelphi to name a few. In 1906 an Electrophone advert advised that there were 14 theatres and 15 churches connected to the system.

Listeners would receive sound on a hand held receiver (sometimes called a "Lorgnette" Headset) which was a rod with an inverted double carpiece headset fixed to the end. At the customers premises a small table was provided and the headsets would be hung on hooks around the edge of the table when not in use. Four headsets and a Transmitter No. 16 could be connected to the table. The table top could be removed to expose the connection terminals, a Capacitor and an Induction Coil.

To use the service the subscriber would call the local exchange and ask for the Electrophone Service. The operator would connect them to the Electrophone operator who would offer the caller a number of services (up to 30 at times). Once a service was chosen the subscriber would operate an "intermediate switch" which was installed on the subscribers line and this would switch the telephone line from the telephone to the Electrophone apparatus. During the service the subscriber could speak to the Electrophone operator by means of a microphone (Transmitter No. 16) to change the service.

They would then use the supplied receivers to listen to the service. Users would invite friends around to listen and in one of the pictures below there is a stand with four receivers. There were 600 subscribers by 1908.

The Electrophone Company was based at Pelican House in Gerrard Street at the heart of London's Soho - an ideal location close to the heart of theatre land.

In 1895 the first years cost was £15 and £10 per year afterwards, this providing hearing for four persons. This was an expensive service, but later the cost was reduced to £5 a year and whilst this was not cheap, you were provided with two receivers. Extra receivers would cost an extra £1 each. Installation was free.

The area covered was relatively large, some £5 customers being in Stratford and Sidcup.

You could also pay via a coin-in-the-slot machine but if they wanted the service at home they needed to pay a subscription. The Cafe Royal and the Piccadilly Restaurant had some of these installed for customers, with a 6d charge. These slot machines worked on a clockwork principle which would keep the connection open for a couple of minutes.

The system operated with rows of microphones, installed in the theatres in front of the footlights. When installed in Churches the microphones were sometimes disguised as bibles (pictured below).



The system also had fairly good transmission quality and most subscribers thought it exceptional. But there were complaints and the GPO investigated a number of issues in 1908. Because none of the venues were the same the issues changed depending on the venue. Noise was caused by badly fitted boards, faintness by the varying distances the speakers were from the microphones. Microphones were even tested using 3 inch bell gongs as reflectors. Following the investigation the GPO compiled a specification for the maximum distance a performance could be reasonably heard. Investigation into better microphones was continued although it appears that the Angelini type was generally used.

A special switching device was used to connect and disconnect the local batteries at the Theatre end. This device was operated from the central switchboard at the beginning and end of a performance.

The Western Electrician of 21st November 1903, page 390, reported the following:-

The London Daily Mail asserts that it has made a revolution in reporting by the use of the "electrophone," which seems to be simply an adaptation of the long-distance telephone. By this means reporters for the Mail were able to hear in London every word of the recent notable speech of Joseph Chamberlain, delivered in Birmingham, 113 miles distant. The speech was printed verbatim and the papers were selling on the street 27 minutes after the speech was concluded. The "electrophone" beat the telegraph by one hour and 27 minutes.

Since the foregoing paragraph was put in type the following explanatory note, from the London Electrician has been received:-

"The 'electrophone' is no new invention, and, in fact, the employment of a microphone for the purpose of transmitting music and public speech through telephone lines dates back to the earliest days of telephony. Yet it is only recently that it has been employed for commercial purposes to replace the telegraph for transmitting newspaper reports of speeches. A demonstration of the practical manner in which it may be applied for this purpose was given by the Evening News on Wednesday night. Mr. Chamberlain spoke at Birmingham for nearly two hours, and concluded his speech at 10:05 p.m. At 10:32 p.m. an edition of the Evening News was issued in London with a verbatim report of the speech. Headgear receivers were worn by the reporters sitting in the Evening News office. All the arrangements made by the Post Office and the National Telephone Company worked without a hitch."

In 1906 the Queen requested an Electrophone service at Sandringham. The National Telephone Company was involved, along with the Post Office to supply a trunk line for testing purposes. The Trunk line went via Kings Lynn, Cambridge, Ware to TSX, where it was connected to Gerard trunk 23. In early 1907 the circuit was officially opened. The estimated line rental was £2 per annum.

By 1908 the Electrophone service had around 600 subscribers and carried performances from 30 theatres and churches. During the First World War, recuperating servicemen were given free access to Electrophone services and there was a service in the Officers mess at the Knightsbridge barracks. Generally the service was fed over War Department emergency lines to Military Hospitals, as the War Department would not pay for any additional service lines. Even No. 10 Downing Street had a service.



A London Hospital in 1917 with injured servicemen listening to the Electrophone service

In 1913 England and France collaborated and the Paris Opera could be heard in the UK and the Royal Opera House in Paris.

By 1919 there were over 1000 subscribers and just over 2000 in 1923. But by November 1924, due to the introduction of wireless radio, the number of subscribers had fallen to around 1000.

For the year ending December, 1920 the Electrophone Company had an income of £11,868, against operating expenses of £5866 and a royalty payment to the Post Office of £496. Each Theatre

received an annual royalty of 10 Shillings a year per connected subscriber.

The Electrophone company was paying very high line rentals to the Post Office (which had bought out the National Telephone Company) and faced with declining audiences in the new era of free to air broadcasting, the Electrophone exchange closed on 30th June 1925, after more than 30 years of broadcasting.

What must be remembered was all this was achieved without the need for amplification. After the 1st World War the GPO investigated using valve amplifiers to extend and improve the service, but with the new radio services taking many of the customers this idea was dropped.

On the 8th May 1921 Madame Melba was singing at the Albert Hall in London. With the help of amplification the Electrophone System connected 600 subscribers to the concert.

In the UK, Bailey and Sons, were issued with a licence in 1903 to install Electrophone exchanges in Bournemouth. Although only supplying 62 subscribers by 1924 the system continued until 1938 when the last two subscribers left the service. At that point there were no Electrophone subscribers in the UK and the service was officially closed.

The fore runners of radio and the internet, these systems became redundant after the introduction of broadcast radio except in Holland and Switzerland where some radio programmes were relayed over telephone wires. This practice continued until the 1950's.

The 1928 GPO Rate Book describes the following equipment:-

#### Tables, Electrophone, NT No. 10

A small wooden table that is C.B. but convertible to L.B. It comes equipped for 4 headset but is expandable to 8.

The table comprises of the following component parts:-

- 1 x Bobbin, Resistance 70ohm.
- 1 x Clip No. 10.
- 1 x Coil, Induction No. 3 or No. 14.
- 1 x Condenser, M.C. No. 30.
- 1 x Cord, Instrument No. 351.
- 2 x Cords, Instrument No. 419.
- 5 x Hooks No. 17.
- 1 x Plug No. 406.
- 2 x Receivers, Headgear No. 3B.
- 2 x Receivers NT No. 5.
- 1 x Transmitter No. 17.

A Hook No. 17 would be supplied for each Receiver NT No. 5.

#### Transmitters No. 16

Angelina type, Local Battery, Transmitter used on the stage circuits. Mouthpiece No. 13 included.

The later Transmitter No. 16, mark 234, was not an Angelina type, but had a Transmitter, Inset No. 9 as the main transmitter.

From The Electrical Engineer, September 10th, 1897, pages 343-344

## THE ELECTROPHONE

BY J. WRIGHT

This modern application of the telephonic principle as a means of establishing communication between a popular theatre or opera house and one's private drawing-room is only growing in public favour. By its means one can sit comfortably at home in all weathers and listen to the latest comedy, opera, or tragedy, as the case may be, by the payment of a purely nominal rental. Such being the case, a few words as to the apparatus employed, as well as the *modus operandi*, may prove of interest.

The electrophone in its simplest form is an application of that familiar and wonderful invention the telephone, and like it, has a system of transmitters and receivers, the one being stationed at the theatre and connected by a line (overhead or underground, as the case may be) with the other, which is situate in the subscriber's house.

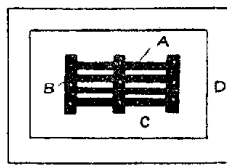
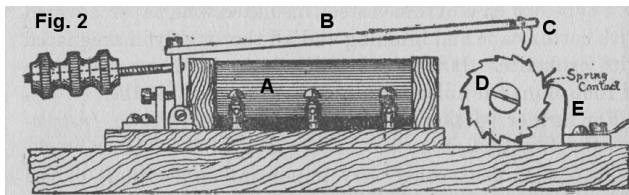


Fig. 1.

I will primarily, therefore, proceed with a description of the transmitters. These are of the well-known Ader pattern, consisting of a series of carbon rods, A (Fig. 1), smaller in diameter at their extremities than at the centre, loosely supported in a horizontal position by the carbon blocks, B, which are provided with cavities in the sides for their reception. These carbon blocks are mounted by means of screws on the under side of a thin wooden diaphragm of pine or other resonant wood, C, and the whole is supported by a massive rectangular framework of cast lead, D. The connections to this transmitter are made by pieces of flexible cord, having thin copper tabs soldered to their extremities and clamped under the small nuts or screws which hold the carbon blocks, B, in position. These substantial transmitters are susceptible to the softest strains of an orchestra, and are equally as efficient when subjected to a full chorus. They are, therefore, admirably adapted to the purpose, and very seldom get out of order. They are as a rule arranged in what is known theatrically as the "float" i.e. the part of the stage just in front of or behind the footlights, and are, on an average, from 12 to 24 in number, but this, of course, depends a great deal on the size of the stage. They are mounted in cavities of such a size as to allow a certain amount of side and end play for freedom of vibration, and the upper surfaces of their diaphragms are flush with the stage. The mounting consists of a rubber ring suspension on stationary wire hooks, this form of fixing having been found advantageous as offering immunity from actual stage vibrations, and allowing them plenty of freedom on all sides for their own individual action, which is maintained uniform and steady by the weight of the leaden frame.



It is necessary, in order prevent loss of battery power over the transmitters while idle during the day, to have a means of cutting them out of circuit until required. This is effected by a species of automatic switch, a diagrammatic representation of which is shown in Fig. 2, where A is the active electromagnet, B is a species of horizontal pivoted lever, provided at one end with a counterweight, and at the opposite, or working extremity, with a loosely-hinged pawl, C. The latter when depressed by the lever, B, under the influence of the armature of the electromagnet to which it is attached, actuates a compound ratchet wheel, D, composed of two discs - one of brass and the other of ebonite. These two discs are clamped together in such a relative position that their teeth alternate. Contact is thus made and broken with a small vertical brass spring, E, which acts as a contact brush. These switches are as a rule connected on the first line - viz., that in connection with the first transmitter, and are actuated by a current from a battery of E.C.C. dry cells, situated at the central exchange or switch-room.

The accessories, comprising induction coils, batteries, automatic switches, and so forth, are contained in an accessible cupboard in a suitable portion of the wings, or under the stage. The coils, which are the same in principle as an ordinary telephone induction coil, need no description. The battery power for each theatre is supplied by a couple of E.P.S. accumulators in teak boxes, provided with handles and portable in form.

Now as regards the switching arrangements.

From the cupboard containing the accessories the wires from the various transmitters are led to jacks similar to those used on telephone switchboards, to which in general construction, in fact, the central distributing board bears a close resemblance. The connection between subscriber and theatre jack is made by means of a two-way cord and plug in the usual manner.

Now as to that part of the apparatus situate at the subscriber's house, to wit, the receivers. These are also of the Ader pattern, and have double poles, being very similar, in fact, to the small receivers attached to the instruments of the National Telephone Company. There are two of these to each person, and they are conveniently arranged on a light metal frame, A (Fig. 3), semi-circular in form and of a convenient width to fit over the ears. The receivers are indicated in Fig. 3 by the letter B, and they are attached to the frame by the medium of a swivel joint behind, which allows of a certain lateral motion in order that they may be comfortably adjusted to the ears. A metal rod, C, attached to the frame ends in a leather-covered handle, D, by which the instrument is held when in use. The connections to the receivers are made by means of a flexible cord, which runs up through the centre of the handle and rod and subdivides to the receivers. A small flat table of polished wood is provided to carry the contact jacks. This can be stood on a convenient table and connected with the system by a wall socket and plug and a length of twin cord. The receivers are for an ordinary subscriber four in number, but extra ones can be fitted if desired. The connections from the receivers to the line are connected via a 4 wire cord. This divides the two receivers into two loops supplying respectively the right or left receivers of each set, so as in the event of one failing, the other should still operate correctly.

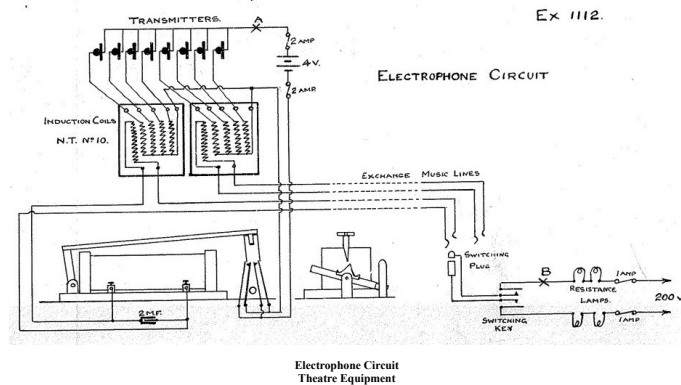
I may here state that the Electrophone Company, whose chairman is Lord Loftus, are working in unison with the National Telephone Company, so that it is necessary for a subscriber to be connected with the telephone system in order that he may be able to communicate with the switch-room. The electrophone is generally fitted as an extension to the telephone apparatus, being put in circuit by means of a switch after having obtained a connection with the required theatre.

The invention has also been adapted to a system of automatic boxes for use in restaurants and places of amusement. This modification takes the form of clock-work mechanism, which controls the contacts by means of levers attached to the driven spindle. The action of the apparatus is as follows: On the insertion of a sixpenny piece in the slot provided for the purpose it slips down a shoot and forms a rigid link between a winding, spindle and the spring barrel. On turning a handle in front of the case, the clockwork is wound up, and the receivers, which are on separate handles, and are suspended on hooks at the side of the instrument when not in use, are brought into circuit, and remain in that condition until the mechanism has run down, which it does at the end of a few minutes; the hearing can then be prolonged by a repetition of the operation. Automatic boxes of this type are to be found at the Cafe Royal, Piccadilly Restaurant, and other similar resorts. A constant supply of popular music is maintained on these boxes during theatre hours, and is denoted by an indicating arrangement fixed over each box.

These indicators are a species of electromotor, consisting of armature and field magnets with a commutating device. The movable spindle carries an index finger, which indicates on a dial the particular entertainment that happens to be connected at the time. The indicators of several boxes are connected in one circuit, the remaining terminal of each one being earthed, and they are driven by a battery of some 50 accumulators from the central switch-room.

In conclusion, I may mention that the transmitters of this system have been fitted in popular churches so that subscribers may listen to their favourite preacher at home. In such cases they take the form of a dummy bible lying in a natural position on the pulpit desk, or a hassock under the lectern and are also fitted in the galleries at points where they will readily collect the sound of the preacher's voice.

The company have reception-rooms at the Victorian Era Exhibition, Earl's Court, and also at their headquarters at Pelican House, Gerrard Street, Soho, where this invention may be tested.

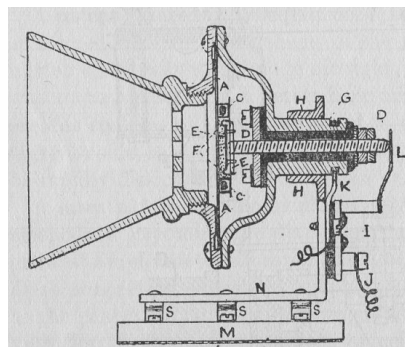
**Addendum**

The original Ader transmitters were superseded by the Angelini Transmitter and until the closure of the service, the GPO was constantly on the look out for, and testing of, different types of transmitters that gave better quality transmission. The Angelini was superseded by the Transmitter, Insert, No. 9.

The Angelini transmitter is of a similar principle to the Ader transmitter. The principle feature of this transmitter is the microphone cell which is formed on the back of the carbon diaphragm A - A, by a round rim of paper, B - B, cemented to A - A. This cell is closed by a disc of Mica, C - C, which is clamped to the end of an insulated screw, D - D, between two metal discs, E - E, the front one of which is formed with a semicircular rim of platinum, F - F, the remaining part of the front being insulated, so that only this rim comes into conducting contact with the 3 grains weight of evenly sized carbon granules filled into the recess thus formed. The Mica disc allows of a very flexible connection and the pressure can be regulated at will by the screw, D.

The transmitter is fitted to the stand by means of a recessed sleeve, G, fitting into the collar, H, of a separate stand, connection being made to the two terminals, I and J, by the springs, K and L, the latter being insulated and bearing on the end of the adjusting screw, D.

The base, M, of the stand is of thick metal and the weight of the upper part, N, and the transmitter is borne on three springs, S, S, S, the centres of which are fastened to N and the near ends clamped by screws to M, whilst the far ends are free to slide in recesses formed in M. The springs absorb vibrations from the stage.



Angelini Transmitter

**The National Telephone Journal  
March 1907**

**ELECTROPHONE WORKING; OR, MUSIC BY TELEPHONE**

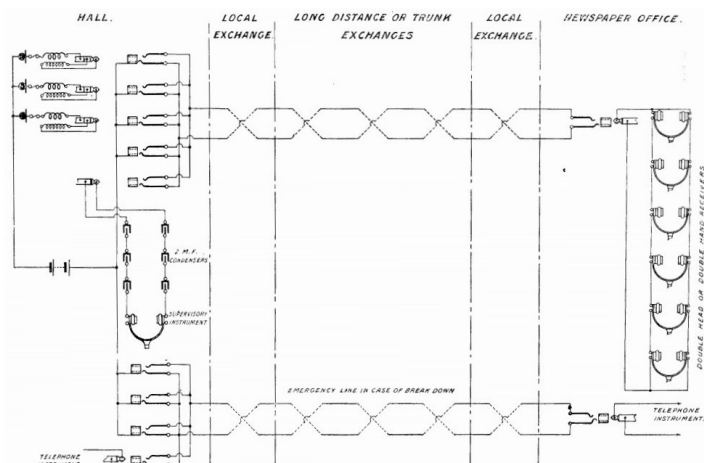
The Telephone has been and is being applied to many purposes, though now mainly utilised for the transmission of speech; its first use, however, was for the transmission of music.

It was about the year 1861 that the first record of a telephone concert occurs; this was accomplished by Philip Reis, a German inventor, who invented an apparatus which by the aid of an electric current would transmit music, but not articulate speech.

Now with the hundreds of thousands of telephones in use at the present time, which have become a business necessity, it has been a problem with the Traffic Department what to do with its plant, which becomes idle at certain periods of the day while the cost of maintenance still goes on.

It was this question which led up to the introduction of what we call the "Electrophone" (to distinguish it from our ordinary telephone service), whereby the Junctions and subscribers' lines, lying almost idle after the traffic of the day is done might be utilised.

In addition to the regular telephone lines, private lines are run direct into the "Electrophone" exchange, also party lines for non-telephone subscribers from which taps are taken to a number of residences and to these places is transmitted from the "Electrophone" exchange music, etc., from the various places of amusement to which we are connected.



Electrophone System wiring

It is about twelve years since the Company decided to introduce to its London subscribers the transmission of performances and music from the various theatres over its telephone lines.

During the first year there were only 47 subscribers to the special service, today the total number is about 600.

At present we have about 250 miles of church and theatre lines, connected to no less than fifteen churches and the same number of theatres and halls and others are now being added.

Endeavours have been made to obtain permission to place electrophone apparatus in the Houses of Parliament and Westminster Abbey, but up to the present without success.

Sometime ago, with the assistance of the Post Office officials, we very successfully transmitted, in addition to vocal and instrumental music, political speeches over a distance of 220 miles, when every word was taken down verbatim and reported by the Press, and papers were on the streets for sale a few minutes after the meetings.

On these occasions special precautions were taken to guard against a breakdown of the transmitting apparatus. In front and at each side of the speaker were placed transmitters wired to induction coils, the secondary of which, together with one side of the primary, was connected to three-way plugs and cords, the other side of the primary being connected to a strip of multiple jacks, so that the primary and secondary were connected and disconnected at one and the same time.

Constant supervision was given these lines by an attendant whose listening apparatus was bridged across the circuit with three condensers on each side wired up in series, so that should any one of the transmitters become faulty the plugs could be withdrawn one at a time until the faulty transmitter was located and another substituted in its place.

Within the last few weeks Grand Opera at Covent Garden has been transmitted to their Majesties at Sandringham over 200 miles of wire, the hearings being most satisfactorily received. London

Church Services were also listened to by Her Majesty on a Sunday when the sermons were received with perfect distinctness and without the loss of a word.

The first hearing given their Majesties was rather premature, for it was whilst we were making tests to see if satisfactory service could be given to Sandringham that Sir Dighton Probyn ordered the apparatus to be taken into the library for the King to hear Madame Melba singing in La Boheme. This was no easy task, for the distance the apparatus had to be taken was about 200 yards. But it was not a question of "can it be done?" but "do it, and do it well"; so the necessary wire was quickly run, the apparatus connected up, and his Majesty was listening to the famous opera in about three minutes after the command was received.

The delight expressed by His Majesty and his guests at the distinctness of the hearing settled the question as to whether or not a satisfactory service could be given.

On the following Sunday morning, as I was making further tests, you may imagine my surprise when certain members of the household, who were listening at the time, quickly laid down their receivers and retired, leaving me alone with Her Majesty the Queen and Princess Victoria who had just entered and desired to listen to some of the Church Services.

At the "Electrophone Central Office" there are employed about one dozen female operators whose duty it is to connect outlying exchanges and subscribers' lines working direct into the "Electrophone" exchange to theatre lines when desired. Constant supervision is given to these lines by the operators, so that should a breakdown occur at any time in any portion of the circuit, the line would be immediately changed before any inconvenience was experienced by the subscribers.

At outlying exchanges where we get more subscribers than we have junctions available for "Electrophone" working, distributing boards are fitted at which several subscribers' lines can be connected to one music junction.

At these exchanges the local operator attends direct to the subscribers' wants, tapping the line from time to time so that if one of the subscribers' lines goes out of order during the hearing, arrangements can be made to disconnect that line and thus avoid upsetting the hearing of other subscribers connected on the same distribution.

With regard to the service, we have limited and unlimited service for private residences connected to our system.

Special rates are charged for residential flats, clubs, cafes, hotels, and for temporary hearings. Party line service for non-telephone subscribers is now being given, whereby the use of condensers or a specially designed repeating coil enables twenty or more subscribers, working on one line with not less than two receivers each, to be served from one theatre line.

The condensers or repeating coils fitted at each subscriber's station permit transmission through the main circuit without interruption should trouble occur at any one station working on the circuit.

The equipment at the theatre for each line consists of one "Electrophone" transmitter, which is constructed with two carbon buttons supported on springs mounted on an ebonite button. The carbon buttons are surmounted and insulated from each other with soft wool to hold the granular carbon, which does not impede the movements of the diaphragm. The carbon buttons are made adjustable by means of the screw-threaded ebonite ring on which they are mounted. To prevent packing, the transmitter is mounted on a metal support having two springs at the back which make sliding contact on the metal rings projecting from the centre of the ebonite, by means of which the transmitter can be manually turned round, and the whole parts being rotated, the granular carbon is stirred up and falls into proper position in their containing chambers. Then we have an induction coil with a primary winding of 0.5 ohms resistance and a secondary winding of 150 ohms resistance, and a battery, consisting of two type T11 storage cells, from which several transmitters are worked.

Throwing the battery in and out of circuit is done from the exchange by sending momentarily over the switch-line a strong current. The induction coil on the first line is brought into use for this purpose, and acts both as an automatic switch and an induction coil. It is fitted with a specially constructed armature which upon a current being sent over the lines through the secondary of the coil is drawn smartly down, and striking between the teeth of the ratchet wheel, causes it to revolve at every stroke of the armature to an "on" or "off" position, every other tooth of the wheel being insulated.

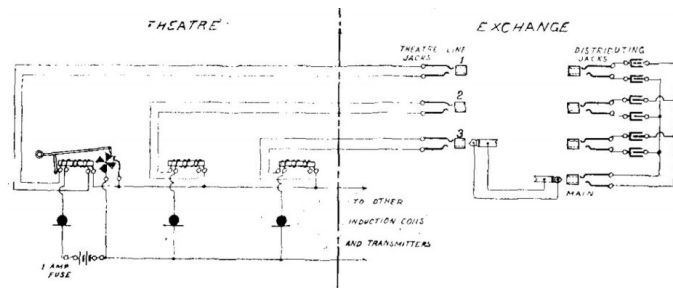
The first transmitter used for "Electrophone" purposes was the "Blake"; then a multiple electrode transmitter, called the "Ader", with a thin piece of pinewood for its diaphragm. Whilst the quality of these transmitters was good, they lacked power, and trouble was experienced when they were subjected to loud music, as then they would rattle or entirely break the circuit.

It was therefore decided to use a granular carbon transmitter, and tests were made with transmitters manufactured by all the well-known makers, but not until we constructed one of our own did we get the satisfaction desired.

With this transmitter little trouble has been experienced, whilst others gave out quickly owing to the heat generated by the current (which is constantly on for about four hours each night) and the heat from the footlights, near which the transmitters are placed.

It might be mentioned that experiments have been made with a view to centralising the power, and removing the batteries from the theatres, thus saving cost of battery maintenance at these places, but this course was found unsatisfactory for "Electrophone" working.

The question of charging accumulators at the theatres direct from the electric light service was considered, but found to be more expensive than our present system of charging them at the exchange and carting them to the theatres as required. All theatre lines coming into the "Electrophone" exchange terminate on break jacks, and are multiplied at every other panel throughout the switchboard. When it is necessary to connect several subscribers to one theatre line, connection is made from the theatre jack to a set of distributing jacks with a double flexible cord having plugs at each end (see picture below). The distributing jacks are connected up in multiple with a 2 microfarad condenser connected on the "A" and "B" side of each jack.

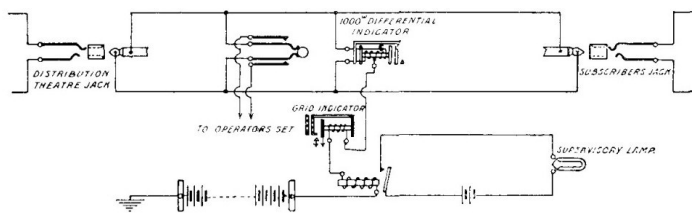


Switchboard Cross Connection

The theatre line, operator's cord and subscribers' circuits are shown in Figs. 4, 6 and 7 and the mode of operating is as follows:-

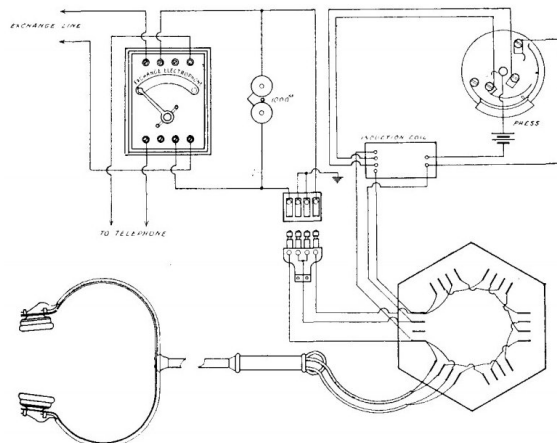
A subscriber desiring Electrophone service signals the telephone exchange. The local operator then notifies the Electrophone operator on the call wire, a junction is assigned, and the subscriber's line connected to it by a pair of flexible cords with plugs at each end. The subscriber is then connected to theatre desired.

Should he desire to change the hearing or use the telephone, he signals the operator from the electrophone table, or from the telephone; if from the table he presses the spring of the hand transmitter which closes the primary circuit and puts the "A" and "B" line to earth. A current then flows from the 22 Volt battery at the exchange through the winding of relay, through the grid indicator to the tubular drop-out on the "A" and "B" line to subscriber's station, through the secondary of induction coil to earth back to battery. This operation causes the grid indicator to drop and the relay to dose, throwing in circuit the supervisory lamp worked on a 4 volt battery.



Switchboard Wiring Diagram

Should the subscriber signal from his telephone, he would alter turning his switch from point marked "Electrophone" to point marked "Exchange", ring in the usual way, dropping the shutter of the tubular drop at the local switchboard.



Customer premises wiring

For an ideal electrophone service the following requirements should be considered:-

It is essential to have a good variety of both instrumental and vocal music to offer to avoid monotony, as people don't want to listen to performing clogs, bears or elephants.



For the operators, promptness in answering is requisite - for a delay might mean a subscriber's missing a song which he particularly desired to hear.

So also is courtesy from operators, for a little more attention is expected by subscribers when using the electrophone than is desired when hustling for business on the telephone.

Freedom from mistakes in connecting the theatre desired is another requisite, as it must be very annoying for a subscriber after listening for some time to discover he has been connected to a Salvation Army meeting instead of the Gaiety.

There must be proper supervision of lines by the operator, to ascertain that no breakdown has occurred, that the lines and junctions are kept free from noise and that the hearing is satisfactory.

Inspectors should be quite familiar with the apparatus they have to handle and be able to repair any defect without delay.

Frequent inspections should be made, when both receivers and signalling apparatus should be carefully tested and apparatus kept in first class working order.

Before installing electrophone apparatus, lines should be carefully tested to see that they are fit for electrophone working, and that no difficulty is experienced owing to their running through tress etc. No trouble is more detrimental to good electrophone working than the "earth" or "Escape"; whilst it helps us in its proper place, it becomes nuisance when it throws a little of its own in, where it is not wanted, and which we can very well do without.

And last but not least, a loud receiver or transmitter is to be desired that will enable us to throw out in a room the music and dialogue so that everyone might hear distinctly without having to place receivers to their ears; also an invention capable of transmitting scenes from the theatre to a distance. This as yet is only a dream, yet after what we have seen we cannot but regard it as something which will be realised sooner or later.

---

### An extract from The Practical Telephone Handbook By J. Poole

#### The Electrophone

This is a special application of the telephone for the purpose of supplying connections to theatres, concert halls, etc., so that the performances at such places may be listened to by subscribers in their own premises.

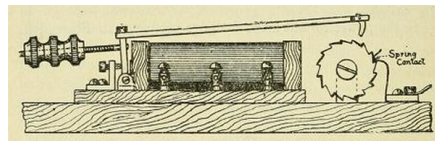
#### Theatre Arrangements

Special arrangements are necessary at the theatres for the purpose of connecting the batteries, etc., to the transmitters, as the latter have not been found to work so well by means of a battery stationed at the exchange, and it would, be very inconvenient to have to send someone to the theatres when it was desired to connect. This connecting up of the local battery (of about six cells) is done by means of the instrument shown below. It consists of an induction coil fitted with a pivoted armature, to which an arm with ratchet-tooth lever is attached. The ratchet wheel, against the rim of which the spring presses, is so constructed that every alternate tooth is an insulating one.

When it is desired to connect up, a momentary strong current is sent through the line and through the secondary coils this magnetises the core, attracts the armature and the ratchet moves the wheel one tooth round, so that the spring makes a conducting contact which completes the primary circuit in which is local battery and transmitter.

When it is desired to disconnect, a strong current is again sent through the line (taking care that it is in such a direction as to assist the magnetism due to the local battery); this again attracts the armature, and moves the ratchet wheel another tooth, so that the spring bears on an insulating part of the rim, and breaks the primary circuit.

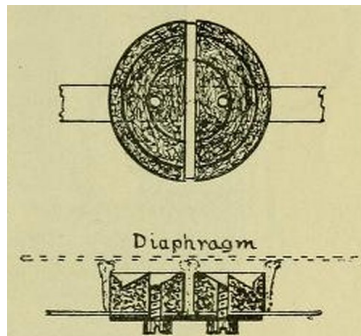
This switch must not be too sensitive, or the armature and ratchet would be kept down by the local battery current through the primary coil.



Electrophone Combined Induction Coil and Connecting Switch

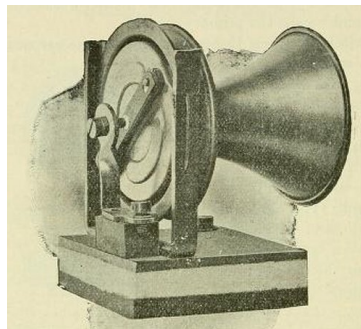
#### Transmitters

The transmitter which has been found to give the greatest satisfaction is of the granular type, the back carbon block of which has been cut in two, so as to form two blocks of the shape shown below.



Carbon Blocks

These form the two electrodes, separated from each of Electrophone Transmitter by a strip of felt, a ring of which also surrounds the two. The felt projects above the surface of the blocks, and the spaces formed between the blocks and a thin carbon diaphragm are about three-quarters filled with carbon granules. The diaphragm (which is insulated from the outer case) thus forms the connection between the granules in the two recesses. One of the blocks is connected to a central stud at the back, against which a screw on the end of a spring contact presses, and the other block is connected to a rim of the outer case and makes contact with two slotted springs, as per the picture below which shows how the instrument is mounted on a brass base, supported by a thick layer of felt, cemented to a fibre base. This arrangement protects the transmitter from vibration, and may be fitted on a bracket at the "wings" or placed on the stage of the theatre. A height of about 3 feet above the stage is found to be best for transmission.



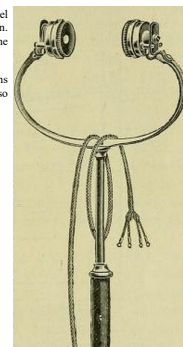
Complete Electrophone Transmitter on Weighted Base

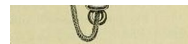
#### Receivers

The receivers used are of the Ader type, a pair being mounted on the ends of a spring fork, as shown in Fig. 499, each one being fitted with a swivel joint, so that it can be adjusted to the listener's ear. Each receiver is kept in a separate circuit, so that 4-way cords and jacks are used for connection. Several of such pairs are connected up in two circuits, one receiver of each pair being in each circuit, so that if anything should go wrong with one of the circuits a receiver of each pair would probably be still left working.

The transmission lines terminate in jacks at the central station, and when more than one subscriber is connected through to a transmitter the connections are made through a condenser inserted in each leg of every line connected. This is done to equalise the volume of sound to long and short lines, and also to prevent an earth fault on any one line affecting the transmission to the other lines connected.

An Electrophone Double Receiver is shown to the right.





From The London Times, June 17th, 1925, page 18

ELECTROPHONE LTD

LICENCE WITHDRAWN BY POSTMASTER-GENERAL

The Electrophone, Ltd., the company which for many years has run the Electrophone service last night issued the following notice to subscribers:-  
"In consequence of a large number of our subscribers having given up the Electrophone in favour of wireless, the revenue has so largely decreased that the Postmaster-General has decided to withdraw the licence granted to this company, and has served notice that the Electrophone service is to be terminated on the 30th inst. We have, therefore, no option but to hereby notify you with extreme regret that after the 30th of this month we shall no longer be in a position to continue the Electrophone hearings."

Taken from  
The Practical Telephone Handbook And Guide To The Telephonic Exchange  
Poole - 1892

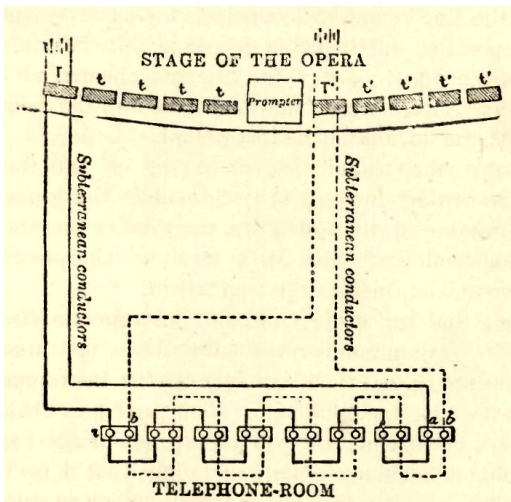
Paris, France arrangements

Much interest was evident at the Paris Electrical Exhibition of 1881 in the arrangements by which the operas performed in the Theatre Francais were transmitted to a room in the exhibition, and there listened to with delight by thousands of visitors. The picture below shows the manner in which the apparatus was arranged.

Ten Ader transmitters, T, t, t, t, t, and T', t', t', t', t' were fixed five on each side of the prompter's box. Each transmitter was connected by a double line to eight Ader receivers fixed in the room at the exhibition.

These, with eight other receivers connected to a transmitter fixed on the opposite side of the prompter's box, formed eight pairs for eight listeners. The picture below shows the connection two such transmitters T and T' to sixteen receivers arranged in pairs, "a b", "a b". A listener using a pair of receivers would thus be connected by the left-hand one "a" to the left-hand transmitter T, and by the "b" receiver to the right-hand transmitter, T'. With such an arrangement the transmitted sounds will be most intense from that one of the two transmitters which is nearest the singer on the stage, so that a distinctly different effect is obtained from the two receivers of each pair.

The effect of a singer crossing the stage is very curious and realistic, being somewhat analogous to the action of a stereoscope in giving solidity to a double photographic picture. In the case of the telephone it is difficult to imagine that the singer is not close in front of the listener.



Taken from  
The Practical Telephone Handbook And Guide To The Telephonic Exchange  
Poole - 1892

Manchester arrangements

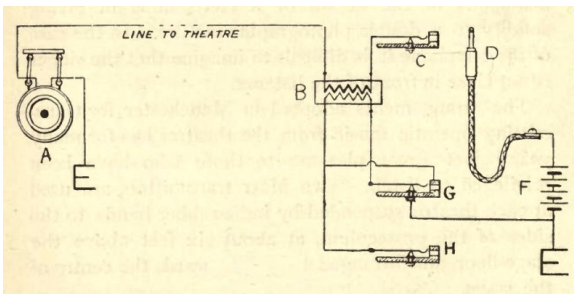
The arrangements adopted in Manchester for transmitting operatic music from the theatres has for many years given great pleasure to those who have been privileged to listen. Two Marr transmitters are used at each theatre, suspended by india-rubber bands to the sides of the proscenium, at about six feet above the stage-floor, and arranged to point towards the centre of the stage. The battery of four gravity cells for working each of the transmitters, instead of being provided at the theatre itself, as at Paris, is placed at the central office, the induction coils for working being also fixed there.

By such an arrangement the current can be switched on and off at any time without going near the theatres. The picture below shows the manner of connecting up so as to be able to connect the secondary wire of the induction coil to any subscriber's line wire: A represents one of the theatre transmitters, one terminal of which is earthed and the other connected to the line to central office, where it is joined to the primary wire of the induction coil B (resistance of about 1 ohm).

The other end of the primary wire is connected to spring-jack C, to which a battery may be connected by the plug and cord D.

The ends of the secondary coil of B (resistance of about 50 ohms) are connected to jacks G and H. Through G, one end gets earth, and by H a single wire line may be connected by a plug and cord, or a metallic circuit line may be connected and the earth cut off by plugging a double plug and cord into G.

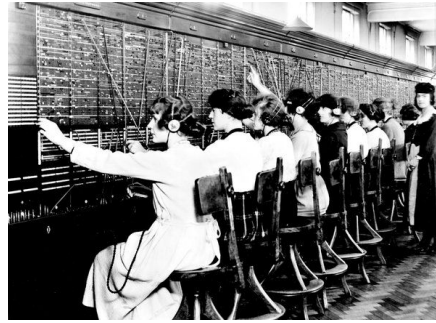
A frame is provided on which is connected twenty or more receivers, which may be joined up in various ways, such as all in one circuit, or so that alternate receivers are joined up to transmitters on opposite sides of the stage, as in the Paris installation. Thirty or forty receivers may be worked by one transmitter with very little weakening of the sounds.



Additional Pictures



Electrophone users listen to a direct relay from a London theatre.  
Scene in the Electrophone reception room, Pelican House, 36 Gerrard Street, London (1908)



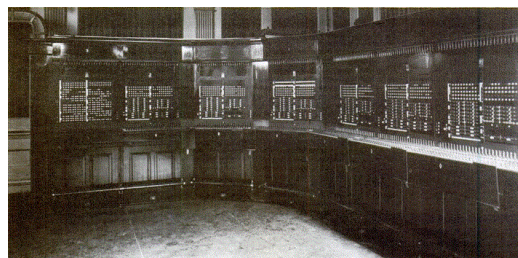
Telephonists and Electrophone switchboard at Victoria telephone exchange in Westminster, London (1922)



New Switchboard - Pelican House, 36 Gerrard Street, London (March 1920)



Portion of old switchboard, 36 Gerrard Street, London (March 1920)



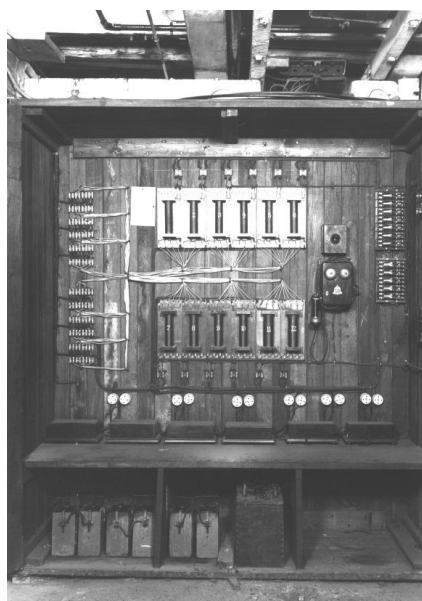
Electrophone Exchange at Gerrard Street, London (1906)



Early exchange in use - note the cords above the switchboard



Adelphi Theatre - Exchange MDF room



Adelphi Theatre - Distribution board in 1920.  
This would have been under the stage. Note the National Telephone Companies telephone.

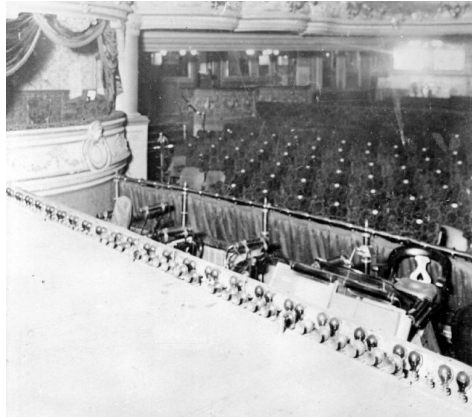


Ratchet switch fitted in theatres and used to switch the power to the microphones  
(Copyright London Science Museum)





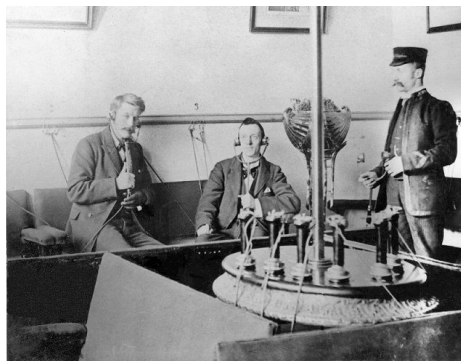
Adelphi Theatre - microphones seen across the front of the stage in front of the foot lights.



Another Theatre showing microphones and footlights across the stage



Transmitter No. 16



Early picture of Electrophone users - circa 1900



NTC Intermediate switch (Telephone to Electrophone switch)



Electrophone table with receivers



Electrophone table with receivers



Electrophone table with top removed





Electrophone user using a Transmitter No. 17 to talk to the Electrophone operator



Electrophone Switchboard - Front and rear  
(Picture taken 1907)

## Adverts





* ENTERTAINMENTS AND * PLACES OF WORSHIP ON THE ELECTROPHONE SERVICE.	
Every Night, Saturday Afternoon, Sunday Afternoon and Evening.	
ALHAMBRA LYRIC	CARON WILLIAM BARKER, M.A., St. Marylebone, W.
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Can have ALL Performances available and  
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INFORMATION GRATIS. POST TODAY. POST TODAY.

Enquiry form



[Form W.]  
[25 Service.]

No terms or conditions other than those herein referred to and set forth, or which may hereafter be agreed in writing between the Parties, are to be deemed part of this contract.

**THE ELECTROPHONE,**  
34 & 35, GERRARD STREET, LONDON, W.  
LICENSED BY HIS MAJESTY'S POSTMASTER-GENERAL.

The undersigned (the Subscriber) hereby agrees with THE ELECTROPHONE, LIMITED (the Company) as representatives of the Licensee, to make to the Company the undersigned person(s) for the hire of an Electrophone Apparatus and for the transmission of "Hearings." This Agreement is subject to the conditions endorsed hereon and may be determined by either party giving to the other in writing six calendar months' notice, to expire on the next day, and it shall terminate with the Agreement between the Subscriber and the National Telephone Company, Limited, for the Telephone Service at the Address of the Subscriber.

Possible on Completion of Work. Charge for extra installation Nil

Apparatus referred to 620 Electrophone Receivers, Reform Club as at the address of the Subscriber, viz.:

Amount Rent to be paid in advance the first day, viz. 18/- day of January 1903 - -

Signature of Subscriber.....

Address..... (OVER.)

Accepted on behalf of the Company  
Signature.....  
Date 2 2

Agreement for service (Reform Club)

Telephone No. 5211.  
THE ELECTROPHONE LIMITED.  
TELEGRAPHIC ADDRESS: "ELECTROPHONE, LONDON."

PELICAN HOUSE  
34 & 35, GERRARD STREET,  
LONDON, Jan 2nd 1903  
W.

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I would very much like you to retain the apparatus and propose a small charge of £3. yearly.

My offer could never have been made were it not that the instrument is connected.

I hope you will regard my suggested subscription as equitable.

I trust you will be able to write consenting to defray this moderate contribution towards our out of pocket expenses, and have the Electrophone for the Members.

Yours truly,  
*W. S. Smith*  
Managing Director.

The Secretary,  
Reform Club.

Letter to the Reform Club

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Last revised: February 25, 2025

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