RECEIVER MUST BE IN HARMONY WITH THE SENDER

Novice at Radio Dials Must Learn Theory of Tuning.

TO understand what he is doing when he moves the dials of his set to certain positions, the novice in the radio art must learn a little bit of the theory of tuning. To receive a desired station the receiver must be in "harmony" with the sending station.

The wave length, or vibration period, must be identical for both stations. For the most part the vibration period is governed by the effective length of the antenna. In the sending station the wave length is always the same—having a fixed value. But in the receiving set certain variable units are used which add to or deduct from the wave length of the antenna.

Change at Will

The dials of the set are attached to these variable units, and by moving the dials one way or the other the period of vibration or frequency of the set is changed at will.

The degree marks on the dials show the degree of variation in the units inside the set. They do not necessarily represent the wave lengths of broadcasting stations. The position of the dials for a certain station depends more or less on the antenna attached to the receiving set. With two different antennas, that is, of different lengths, the positions of the dials for a certain wave length will be different. It is because of this that it is impossible to know beforehand at what positions the dials are to be set for a certain station. It all depends on the antennas.

No two sets are alike. The dials on one set will have entirely different positions for a certain broadcasting station tha nthose of another set even with the same antenna, because the values of the variable units are different for every set.

At the present stage of radio with any receiver there is only one method of tuning. After the set has been installed the owner must begin to hunt for the desired stations.

Log Positions

Once he has located them he should "log" the positions of the dials for each station. After a week or two he will then be able to set his dial at the degree numbers which he has found will bring in the station he desires. But if he makes a change in the length of his antenna he will find that the positions of the dial for each station also will have changed.

With receivers that use a loop antenna, and thus may be carried around to different locations without a change of conditions, the listener even may mark down the different stations, call letters opposite the degree marks on which they are brought in. But until he learns by the "pick and hunt" method where the different stations are found, the receiver cannot be marked for the stations. Nobody several hundred miles away can tell him where to set his dials for any station. He must find the stations himself by searching for them.

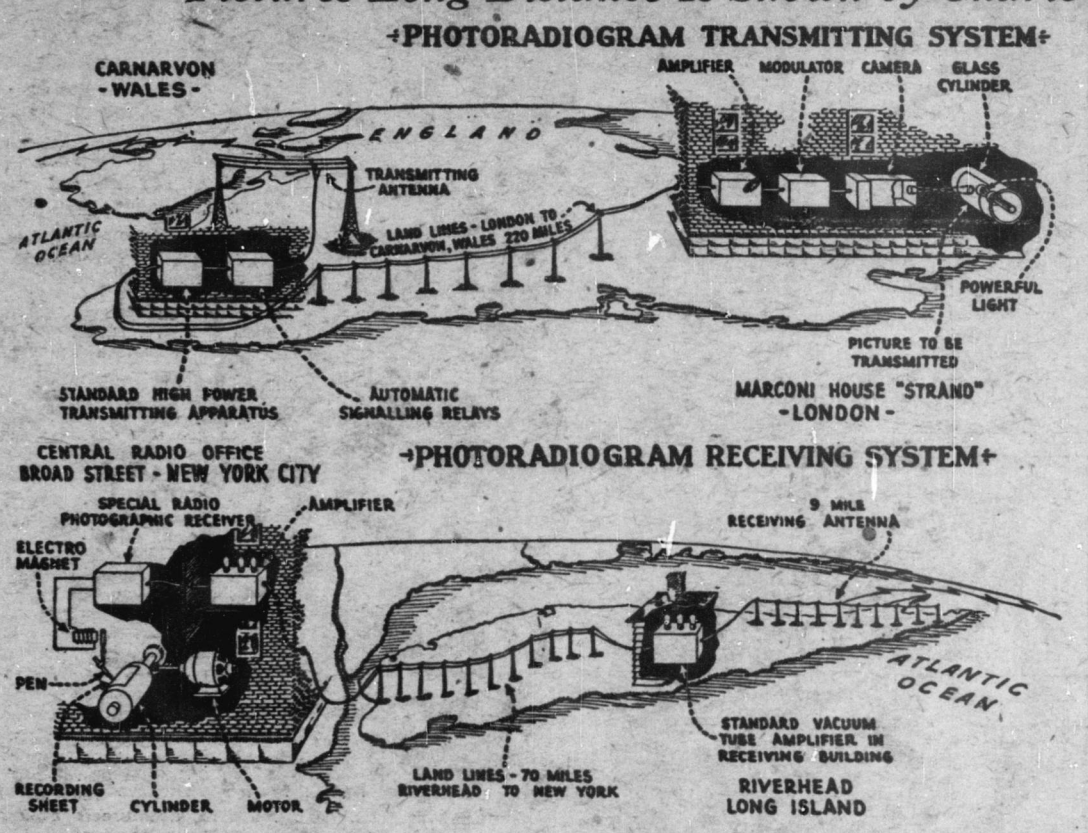
Coil Winding

The easiest way taps may be taken off is by winding on a certain number of turns and the wire twisteded together at th epoint so as to make a five or six-inch loop and a certain number of turns again wound on the tube and the next tap made in a similar manner. Or, a neater looking job is made by winding on a certain number of turns before making a tap and then allow six inches for a tap; push a hole in the tube and push the wire through it; push another hole in the tube about a quarter inch from the other and close to the last turn of wire and allow six inches for a tap and join the two six-inch ends together on the inside of the tube.

Difficulties From Bent Wire

Wire that has been bent is apt to break if an attempt is made to straighten it out, and even if it does not break it will be weak where the bend occurred or, due to crystalization at this point, it may cause high resistance.

Photoradiogram Process of Transmitting Pictures Long Distance Is Shown by Charts



For the actual operation of the transmitter, the picture, printed matter or whatever is to be sent, is first photographed on an ordinary camera film. This is developed and placed on a glass cylinder, held in place by metal clips. The picture is then ready to be transmitted.

Inside this glass cylinder is an incandescent lamp, the light from which is focused in a minute beam on to the film as the cylinder is set in motion. As the light and dark portions of the picture are transversed by the light beam, the intensity of the ray is changed. This ever changing beam, after having passed through the film, is again focused through another lens outside the cylinder on to the sensitive element of a photo-electric cell, a recent development of the General Electric Company, which transforms the light waves into electrical impulses or waves, which can be transmitted by radio much the same as a regular dash and dot message.

Electrical Resistance Changed

This photo-electric cell is commonly spoken of in the laboratory as the "eye" of the transmitter. The electrical resistance of this cell changes in accordance with the amount of light which falls upon it, and in this way takes care of the shading of the picture in transmission.

The photo-electric cell functions practically without any lost motion. When the slightest change in the amount of light reaches the cell, a corresponding change in the output current of the cell takes place. The "eye" sees and records electrically millions of different current impulses as the film sweeps by the light beam from inside the cylinder.

The photo-electric cell is, responsible for reproducing an infinite number of different electric current values which correspond with the light or dark areas of the picture being transmitted.

Electric Camera Used

In order to cover all of the original film, the glass cylinder is rotated back and forth, exposing the entire surface to the piercing light beam. The film rotates through an angle equal to the width of the picture and the electric camera itself advances down the length of the picture one notch at a time. Thus, line upon line, the whole picture is covered.

After the signal impulses or electric waves from the photo electric cell pass through a series of vacuum tube amplifiers, they are fed into a modulating device ready for transmission. The electrical interpretation of the picture is then transmitted over land wires from the London laboratory to the Carnavon, Wales, high power transmitting station of the Marconi Wireless Telegraph, Ltd. Here the electric impulses on the land wire operate small relays which turn on and off the high value currents flowing from the 200 kilowatt generator to the antenna system. This high power electrical energy leaving the antenna in interrupted impulses, similar to dots and dashes of the telegraph code, creates the ether waves which carry the photograph through space 3,000 miles to the receiving station on this side of the Atlantic, located at Riverhead, Long Island.

Special Circuits Not Needed

The development of the photoradium transmitter has purposely been carried on in connection with the established radio transmitting stations now engaged in sending radiograms daily between Europe and America. Thus the new device does not require the preparation of any special radio circuits for efficient operation.

At central receiving station the operator tunes in to the Carnavon station and receives the picture the same as he would a radiogram, but instead of dots and dashes which he can read he receives an undecipherable series of impulses. These pass through a bank of vacuum tube amplifiers and are then sent by land wire to the laboratory of the Radio Corporation, located in the building in Broad St.

Here this unintelligible code, carrying the photograph, is translated back into black and white, recording the original picture much in the style of a stippled engraving.

Picture Is Reassembled

This device in RCA Laboratory (the final operation involved between transmitter and receiver) decodes or unscrambles the complex photo message, giving each individual electrical pulse of energy a definite task to perform in reassembling the picture.

The picture is reproduced in duplicate at the receiver, both on a paper record and on a photographic film. The paper upon which the record is made is wrapped about a rotating cylinder, which resembles the early type wax phonograph record. A special fountain pen bears against this as the needle of the phonograph does. The pen is attached to an electrically controlled lever so that very pulse of electrical current which passes through the magnet coils of the relay lever draws the pen to the surface of the paper, making a fine ink mark. A changing current fed through the magnet coils causes the pen to wiggle in step with the current impulses, thus giving the artistic stippling effect in the reproduced picture.

Absolute synchronism of the sending apparatus with the receiving device, is necessary otherwise distortion will occur. If the receiving apparatus should lag the slightest particle of time behind the transmitting set, the picture would be unrecognizable.

Same Speed Maintained

This necessary synchronism is maintained by the use of special driving motors, one geared to the transmitting cylinder and the other to the receiving cylinder. These motors, although separated by 3,000 miles, maintain the same speed. To check against any change which might occur, special controlling mechanism is attached to the receiver, based upon the constant pitch of the tuning fork.

The making of the ink record is visible in all its operations. The wiggling of the fountain pen can be watched as the cylinder rotates back and forth, gradually building up the picture. The photographic record is made on an ordinary camera film inside a specially constructed camera, a beam of light playing upon the film in place of the pen upon the paper. This is developed as any film and as many prints can be made from it as desired.

It's a Nerve Cure

British hospitals look upon radio as a treatment for nervous cases and insomnia. Several wireless installations have been made in the hospitals for this purpose.

Radio Remarks

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Recent Pronouncements by Leaders in Wireless.

THE day is fast approaching when the practical range of this science will be enormously increased, and American stations will be heard with clearness and regularity even during the day and afternoons. It is also quite reasonable to expect that it will soon be possible for a speech to be broadcast to the most distant parts of the world during day or night.—Guglielmo Marconi, famous Italian radio inventor.

The transoceanic radio telephone, now under development, bids us to expect that before many years it will be possible and convenient for any one of us to pick up his telephone and in a short time be connected with his party in Europe, or with his stateroom, on some liner on the ocean.—General James G. Harbord, president, Radio Corporation of America.

I venture to predict that 10,000,000 new radio fans will be added to the army of listening public during the new year.—Edward H. Jewett, radio manufacturer.