No.1 "All about Wireless" - A New Paper for ALL

POPULAR WIRELESS

3d.

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Weekly

THE WORLD'S LATEST HOBBY FULLY EXPLAINED

PUBLISHED EVERY FRIDAY

ORDER IN ADVANCE

PACKED WITH PICTURES AND EXPERT ADVICE

Popular Wireless

TOPICAL NEWS AND NOTES

Wireless in Ireland.

"WIRELESS telephone licences are not to be issued in Northern Ireland until conditions are more settled," said Mr. Kellaway, the Postmaster-General, in a written Parliamentary answer to Major O'Neill.

In any case, if permission is eventually given, Ulster will be well within range of the Glasgow broadcasting station.

* * *

Journalistic Enterprise.

WIRELESS telephonic journalism was started in Holland as far back as last February, and so far the results have been very good. Fifty different newspaper subscribers of the Vasdiar Agency at Amsterdam, equipped with receiving sets, receive news throughout the day.

This is a good commencement, and although this service has not been welcomed over here, there is no denying the fact that it will eventually come—and come to stay.

* * *

The "Boom" in Canada.

WIRELESS is booming in Canada, as in the States. Many hundreds of receiving sets are in regular use in such places as Montreal, Toronto, and Winnipeg, by enthusiastic amateurs. Business concerns, specially in lumber operation, have been working over wide stretches of forest, using the wireless telephone with excellent results.

In the reporting of forest fires the radiophone has proved invaluable, and lumber companies are installing powerful apparatus connecting their offices with portable sets placed in the woods, thus opening up a wide field of commercial usefulness in the vast forests of Canada.

* * *

Recording Signals.

MESSAGES received by your wireless set when you are not present need not be lost. Signals can now be recorded on a special form of tape machine, or can be made to reproduce themselves on a gramophone record.

* * *

Broadcasting.

AN agreement has been arrived at between the Radio Communication Co. and the Metropolitan-Vickers Electrical Co. whereby these concerns propose to establish and jointly operate broadcasting stations. Big things are expected of these two firms.

Schoolboy's Enterprise.

THE record for erecting the first amateur wireless station in North Devon has fallen to a schoolboy at the Devon County School, West Buckland, Master John B. Joyce, son of the Rev. Walter W. Joyce, Rector of Charles. The rector is the holder of the licence, and Joyce junior is the operator, the latter having been largely responsible for the construction of the apparatus, which consists of a single valve set, with necessary running coils, etc. The aerial is a single wire "inverted L," 80 feet long, height 35 feet, with 25 feet lead-in. The most interesting receptions are telephony and time signals from the Eiffel Tower. Both the 1,800 and the 2,600 metre transmissions of music and speech are plainly audible. The operator would be pleased to communicate at any time with any other genuine wireless amateur in the district.

* * *

Come, Birdy, Come!

"WHAT effect will the establishment of several new broadcasting stations have upon the birds?" asked one of our contemporaries a few days ago. "It is strange," thought the writer, "that an unseen influence, manipulated by man, can deflect the sure, instinctive flight of the birds. Nevertheless, it is a fact that our feathered friends are disturbed in a singular way by the wireless waves.

"Gulls appear to be the principal sufferers but large numbers of doves are in some way prevented from finding their way home when there are wireless stations in the line of flight. This strange phenomenon is attributed to some effect of the ether waves not yet understood."

I suggest the doves take out a licence at the nearest post-office and erect a direction finder at the earliest possible moment.

* * *

Amateur Wave Lengths.

THE decision of the committee which the Postmaster-General appointed has now removed some of the restrictions on the operations of wireless amateurs. A new wave length of 440 metres has been sanctioned for transmission, and the wireless amateur is to be exempt from inspection of his receiving station, and will no longer be restricted as to the length of receiving aerials.

* * *

Wireless on Trains.

THE Chicago, Milwaukee, and St. Paul Railway has equipped its trains with a radio system for the benefit of passengers. Arrangements have been made for the installation of complete radio systems in the club cars of the Pioneer Limited trains between Chicago, St. Paul, and Minneapolis. All news of the day will be received.

* * *

WHY WIRELESS IS POPULAR.

A fair amateur "tunes in" the Marconi concert.

Wireless and Fishing Boats.

QUITE a number of North Sea trawlers and steam drifters are fitted with wireless telegraphy. Although their transmitting radius is small, the receiving capabilities are good. The purpose of the installations is said to be receiving, and most of the messages handled by them are in relation to the state of the fish market. When the market is glutted and the price of fish is low they are instructed to stay out and continue their fishing for another day or two. Similarly, when conditions force dealers to sell fish as manure, the fishing hauls can be diverted to other parts more fortunately situated.

* * *

Our Australian Confreres.

IN Australia to-day there are between 1,500 and 2,500 wireless experimenters, and it is anticipated that the number will grow very rapidly. It is

NEWS AND NOTES
(*Continued*)

a well-proven fact that the private experimenter has made valuable contributions to the advancement of this art, while his services in the war were invaluable because the ranks of experimenters provided a large number of men who could be quickly brought up to the stage of experts for naval and military purposes. There has been a tendency in Australia to legislate against the private experimenter, but that has been happily overcome, and regulations were recently passed through the Federal House which provide for licensing privately-owned experimental stations.

* * *

The s.s. Leviathan.

THE steamship Leviathan, when she starts again in the transatlantic service next year, will have a wireless telephone in every state-room. The plans for the reconditioning of the huge liner call for the finest wireless equipment ever put on a passenger vessel.

* * *

The Leafield Radio.

THE wireless station at Leafield is about 600 feet above sea-level. The power plant consists of two 250-kilowatt arcs and auxiliaries. The main aerial system is supported on ten tubular steel masts, each 300 feet high. The ground wires are buried

Constance Talmadge, the famous film star, broadcasting film gossip.

at a depth of about 9 inches. For reception a separate aerial, supported on 75-foot poles, is to be used. It is necessary for this aerial to be grounded and the receiving apparatus protected during transmission on the main aerial. This operation is performed by a remote-controlled switch, which is operated by the stop on the arc controller immediately preceding the stops operating the 1,000-volt contractors of the arc supply current.

* * *

Charabancs and Wireless.

A SOWERBY Bridge charabanc proprietor has had one of his vehicles fitted with a complete wireless installation, the preliminary tests with the instrument having proved quite satisfactory. While on a trip the passengers will be in constant communication with the home station, while, when the broadcasting scheme is in full swing, the charabanc party, when out on the moor tops, will be able to stop and be entertained with wireless concerts.

* * *

An Odd Thing.

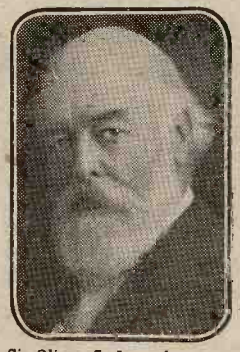
AN odd thing happened the other day in America in connection with a sermon being delivered as part of a radio programme. By what is known as "jamming" the ether, some man, evidently a rabid atheist, cut in and literally blew the sermon out of the air.

* * *

Wireless to Lonely Outposts.

WIRELESS news that will reach lonely Canadian outposts thousands of miles beyond telegraph lines is being broadcasted in Alberta by the "Edmonton Journal" to demonstrate the possibilities of bringing remote areas into the civilised zone.

What this means to fur traders of the north is shown by the fact that last winter in the Mackenzie River basin, which stretches beyond the Peace River country for more than 1,000 miles to the Arctic Ocean, a fur trading company lost £100,000 because its buyers had been instructed to pay the Indians a certain price for raw furs and there were no means of informing them that in the meanwhile the furs had dropped to a quarter of their former value.



Sir Oliver Lodge whose experiments and inventions have proved of the greatest value in wireless problems.

Others who will benefit by the wireless news will be the lonely trading posts along the banks of the Mackenzie River and the pioneers of trade development as far distant as 1,200 miles north of Edmonton.

* * *

For the Farmers.

THE Central Landowners' Association have asked the Postmaster-General to allow a wireless telephone news service to be broadcasted. They are particularly anxious that, for the benefit of farmers in areas remote from towns, the service should include weather forecasts, now broadcasted by wireless telegraphy, besides market reports and general news.

* * *

The "Early Bird" Radio.

AN interesting wireless development has been reported at Croydon, where a young amateur has installed a home-made receiver at his bedside, and is wakened sharp at six-thirty every morning by the first call-up at the aerodrome.

His instrument is a very cheap and simple set, and is fitted with a crystal detector.

* * *

Private Wireless?

CONSIDERABLE speculation has been caused in the wireless world by the announcement that Mr. John Hays Hammond, son of the well-known engineer, has perfected an invention to make wireless messages private.

Such an invention would have very far-reaching effects, particularly in the commercial world.

It would mean that the sending of news, by great national and international agencies, by wireless would become a practical proposition.

The same applies to business houses where absolute secrecy is necessary. The invention would also be of immense value for police work. Experts, however, are sceptical about the invention.

* * *

Future of Telephony.

SIR Oliver Lodge is devoting himself largely to wireless and the telephone amplifier since he left Birmingham and settled upon Salisbury Plain. He was able recently to contrive an appliance by which he could hear a watch ticking seventy feet away. He thinks that we stand upon the threshold of amazing developments.

* * *

A Music-Hall Innovation.

Listening-in sets are to be installed in the Palm Court of the Palladium Music Hall, London.

Here some 300 people, waiting for the commencement of Mr. Harry Day's revue, "Rockets," will be able to hear, through the loud-speaker apparatus, news and music from all parts of the world.

If the innovation is appreciated, Mr. Gulliver intends to extend it to all his theatres throughout the country. Mr. Harry Day will do the same.

ARIEL.

Within a month, it is hoped, the national wireless telephony broadcasting scheme will be in operation.

Already much preparatory work has been done towards the preparation of a scheme. The financial side has been thoroughly investigated, and it has been ascertained that the cost of the daily programme from each station will be about £20,000 a year—that is, £160,000 a year for the eight stations. In addition, there will be the cost of the equipment and maintenance of the stations.

All expenses are to be borne by the manufacturers. The sole cost to "listeners-in" will be that of the installation in their homes or offices, which may vary from £5 5s. to £105.

I understand that twenty-three firms have applied to the Government for broadcasting licences, and it is these firms which have been requested to present a scheme to the Postmaster-General.

The daily programme, which will be regularly sent out on Sunday afternoons on different from each station, will include, a wave length of 2,600 metres. The official according to present arrangements, vocal and call of this station is F L.

and musical entertainments at intervals during the day, addresses by experts on their own particular subjects.

At the time of going to press there are two regular weekly concerts which the amateur may pick up.

One is from The Hague (official call P C C G) on Sundays, from three to five p.m. on a wave length of 1,070 metres. Music from this station has been clearly heard in Aberdeen, using three valves. Good results, however, may be expected using only two valves, providing a good aerial system is employed.

The Marconi Co. broadcast a twenty-five minute concert every Tuesday evening from Writtle, near Chelmsford, at eight p.m., B S T, on a wave length of 400 metres.

Amateurs in Scotland have had excellent music and speeches from this station (official call sign 2 M T), using three valves.

Telephony from the Eiffel Tower is

Wireless Wonders to Come

Shall we ever see by Radio? And can Nature's wireless supply us with an unlimited source of power? Both these great ambitions are within the realms of practical possibility.

By THE EDITOR.

THE radio telephone has brought speech and music to our homes on the back of wireless waves. That alone is something to marvel at—the fact that we can hear a man singing to a piano accompaniment fifty or a hundred miles away. But what will the general public think when they instal apparatus which will enable them to *see* as well as hear by wireless? To the novice in wireless work this suggestion must savour very much of black magic or the ravings of a second Munchausen and De Rougemont rolled into one. Jules Verne himself would have paused before suggesting such a possibility.

Photographs have already been successfully transmitted by wireless, but the fascinating problem of transmitting living pictures by wireless is still in its undeveloped stages. Yet it is a possibility—a distinct possibility, amazing as it may seem.

Inventors have already made crude attempts at the accomplishment of this great feat, and there is little doubt in the minds of scientists that a radio telephonic vision will be an actual fact before very many years have passed us by.

The first step in the realisation of this invention has already been reached by the transmission of wireless photographs.

Mr. Edward Belin, a French scientist, recently invented a system of telephonic telegraphy which has thrown light on many dark problems surrounding wireless vision, and Knudsen, a Dane, has made interesting experiments in sending pictures by wireless. Creed has done even better in helping to rend the veil and reach the desired goal of radio vision.

Another interesting wireless experiment lately carried out in the United States was connected with the battleship Iowa.

She was manœuvred at sea entirely by radio during bombing tests.

The captain, safe on shore, had only to transmit waves in a certain sequence, and the ship would answer to her helm as readily as if a man was actually controlling her from the bridge.

Will naval battles of the future be fought by crewless ships — the respective commanders controlling the vessels from wireless stations ashore? It is quite possible.

And what if we could harness Nature's wireless to do our bidding? Whenever lightning flashes, a terrific radio signal is being sent out. Can we use this energy to drive motors and other machines?

The problem is to find a way to drain the vast atmospheric reservoir of electricity that exists all about us. Undoubtedly the man who invents a means of doing this will die a millionaire many times over.

He will revolutionise civilisation. Imagine the millions of machines we now drive by artificially-generated current being supplied indefinitely by Nature's natural storage battery! Think of the effect it would have on our everyday life!

But however fantastic this may seem, remember the principle is a sound one, and that the harnessing of lightning is a proposition which scientists are seriously studying. If they solve the problem—— But it is a big "if," and, meanwhile, one's imagination is apt to fail when considering the results.

When you have installed your receiver and are getting along with your wireless studies, and the approach of a thunderstorm is heralded in your telephone-receivers by loud, incessant atmospheric "crackers," just pause and think of the titanic energy Nature is letting loose, and try to feel that, however far man has progressed with wireless research, there is still a problem left which will tax his ingenuity to the utmost and will cry shame on his so-called "high-power" wireless transmitters.

Nature's wireless!—people hear it working a lot nowadays—but I wonder if they realise exactly what it means, and what are the possibilities it has in store for us?

THE EDITOR.

Our artist depicts a scene in the wireless future. A breakfast, the owner of the radiophone listens to the latest news; at his office, to the latest stock market quotations; but back home again in the evening he sees, as well as hears, the opera being performed at Covent Garden.

A Badly Insulated Aerial Means Weak Signals in Your 'Phones

Write to Our Technical Expert if in Doubt —*Editor.*

How to Erect

By STANLEY G. RATTEE.

WHATEVER type of receiver you buy you will want an aerial. Even the portable receivers—which do not have an outside aerial wire—will give far better results if connected up to a good aerial.

The aerial is really a "feeler"—it is sometimes called an "antenna"—because it detects and conveys to the receiving apparatus the current set up in it when wireless waves are sent out.

The aerial is a wire which "picks up" the wireless waves and utilises some of their electrical energy.

It is an accepted fact that the higher your aerial, the better the resultant signals in your receiver, and, therefore, it is always as well to have your aerial as high up as possible.

Indoor aerials are usually wound round a wooden frame, but when used in conjunction with a crystal receiver, they are practically useless. With valve sets the results are better.

When erecting the aerial, see that it is free from contact with the branches of trees and that it is well insulated.

Wherever there are two buildings or one building and a tree, or two trees, one of which is near to the house, the erection of an aerial pole is unnecessary. (See diagrams.)

For the best results the aerial should be a fair height from the ground—say, not less than 40 feet, whilst its overall length, in order to comply with the Post Office regulations, must not exceed 100 feet.

Wherever possible a plane not less than a horizontal position should be maintained for approximately 75 feet (see Fig. I), the remaining 25 feet being used for the drop-wire, or "leading-in" wire, to the terminal marked "aerial" or "A" on the receiver.

Should the distance between the two chosen points for swinging the aerial be greater than 75 feet, any surplus distance can be made up by increasing the rope at B; any increase at A would, of course, tend to lengthen the "lead-in" F, which is undesirable.

In so far as fittings are concerned, two supports of rope should be made at A and B, to which are attached two porcelain insulators, one to each support, as at C and D.

These insulators are obtainable at most electrical shops. One end of the aerial wire should now be secured to the insulator D. The other end should be fixed to the insulator C until there is 75 feet of wire between C and D.

The remaining aerial wire constitutes the "lead-in," F, and should be long enough to reach the "leading-in" tube G, with a few feet to spare in order to reach the receiver.

The tube G is used as a suitable means of carrying the aerial wire into the room where the receiver is to be used and can be purchased at any of the many shops selling wireless apparatus.

A good "leading-in" tube can be made from several thin pieces of cardboard, about 6 inches long and 4 inches wide, rolled together so as to form a hollow cylinder, and then bound with string, the whole being soaked in paraffin wax after completion.

The end of the lead F should be attached to the terminal of the receiver marked "aerial" or "A."

In the majority of cases the erection of a good aerial depends on back garden space, and if it is impossible to erect a 100-foot horizontal aerial, a twin aerial is a good alternative (see Fig. 2).

In this case 140 feet of wire may be used.

(NOTE.—The Postmaster-General has stated that amateurs will be allowed to erect aerials more than 100 feet long, but for practical purposes 100 feet of wire will suit the average amateur quite well to begin with.)

The wires of a twin aerial should not be less than 5 feet apart. Better results will be achieved if they are separated by 7 or 8 feet. Bamboo spreaders are recommended on account of their strength and lightness.

The twin aerial must have a down lead from each wire. These can be made to meet as they enter the house via the lead-in tube.

Copper or phosphor-bronze wire is the best for aerials. Iron or steel wire should not be used.

The aerial *must* be well insulated, and the down leads should be soldered at the point where they leave the aerial.

Scrape the end of the down lead wire before attaching it to the aerial terminal of the receiver.

Do not keep the aerial taut, but allow it to sag a little.

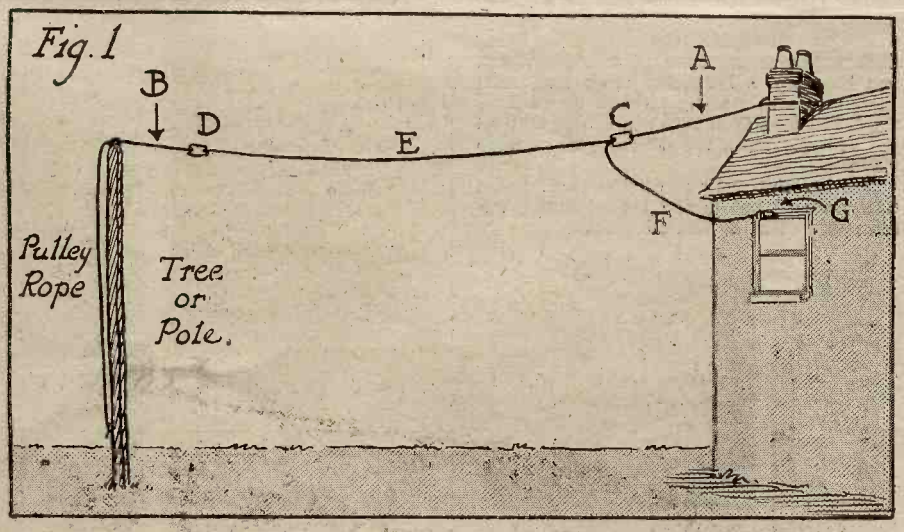
On the receiver will usually be found a terminal marked "E," or "Earth." From this must be led by the shortest possible way a wire to an earth connection. A good *soldered* connection to a water-pipe makes the best "earth" in the majority of houses.

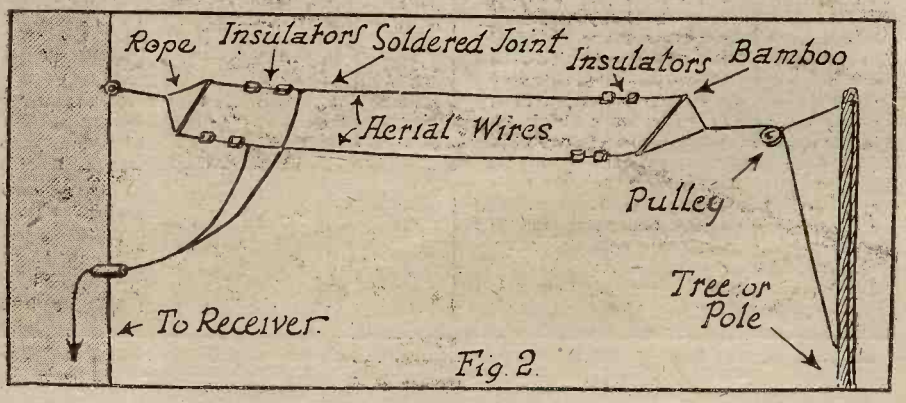
The approximate cost of a single wire aerial is as follows:

	s.	d.
100 feet copper wire (No. 14 gauge) ...	7	6
2 insulators	3	0
1 lead-in-tube	5	0
Rope	0	6
	16	0

This price will vary, of course, with the facilities afforded by the amateur's own collection of materials, which may, with a little ingenuity, be utilised for aerial construction.

Note.—Next week an expert will deal with the construction of a frame aerial, with full details of how it may best be used for wireless reception.





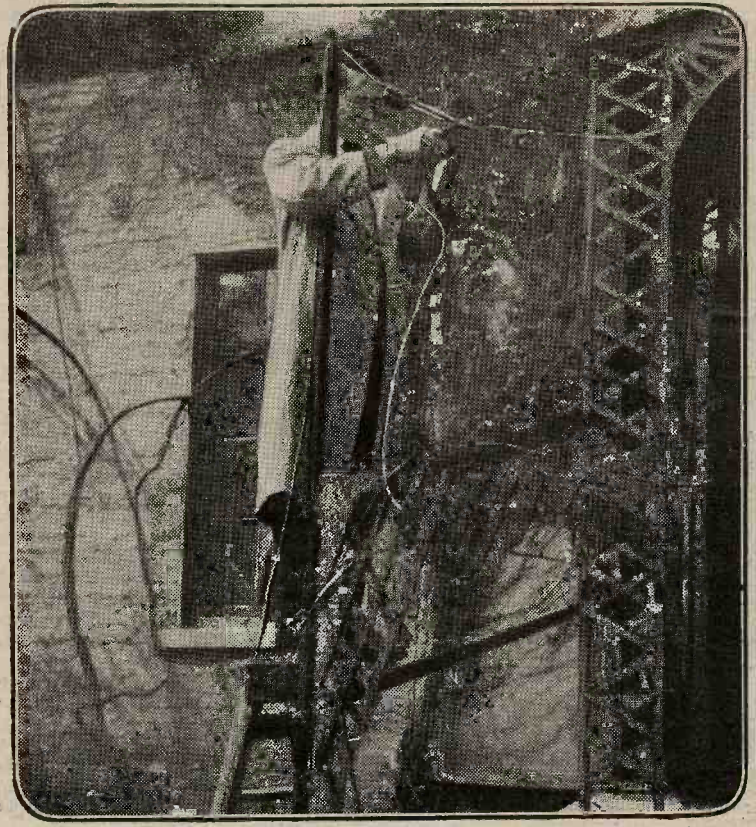
an Aerial

The Higher Your Aerial the Better the Signals You will Receive.

Keep the Wire Free from Tree Tops and Neighbouring Roofs.

A chimney stack will make a good support for your Aerial. Care should be taken that the rope does not fray against the brickwork.

When you are hauling up your aerial, see that the wire is not too taut but sags a little to allow for stress and strain.



The insulation of the lead in wire is very important indeed. A fault at the lead in tube means a "Short" to earth, and consequently your received signals will be dead weak, if any get through at all.

Attach the Aerial securely to the insulators. When the aerial is aloft it will have to take a big strain, and a bad connection will mean a collapsed aerial when you wake up one fine morning.

HOW TO MAKE A RECEIVER FOR 35/-

This set is purely an experimental one. It has a receiving range of only a few miles, but will make clear to the novice how easily signals can be detected.

By GEORGE SUTTON, A.M.I.E.E.

THE construction of a very simple receiving set capable of "picking up" the wireless concerts is an interesting and instructive pastime.

Except for the telephone headpieces, which cost anything from 25s. upwards, the set described here can be made for a few shillings.

Carefully made, it will give good results, and when completed will prove an amusing example of a "rag-and-bone" type of receiver which, at present, is not to be found on the market!

A few yards of enamelled copper wire, a broken bottle or two, a piece of silicon crystal, a sheet of cardboard, a piece or two of wood, a strip of brass, and a thimble will complete the requirements for making this set.

Roll the cardboard into a tube five inches in diameter and six inches long, and glue it together. If you can get a piece of cardboard postal tube to these dimensions, save yourself the trouble of making it.

Buy at a shop where electrical sundries are sold one pound of Gauge No. 20 enamelled copper wire (about 2s. 6d. per lb.). Wind this closely, tightly, and evenly, each turn side by side, on the outside of the tube, for about 120 turns. This will occupy a space of about five inches in length, so you will start half an inch from one end and leave off half an inch from the other end.

Make both ends of the wire secure by threading through a small hole in the cardboard tube, and the part called the inductance is done. The drier this is kept the better the signals will be.

Now take a piece of wood six inches long and five and a half or six inches wide and one half to one inch thick. Screw the cardboard tube to this through the free half-inch at either end.

Take a piece of springy brass, half an inch wide, one thirty-second of an inch thick, and four inches long; screw this through one end to the middle of the side of the board and bend it in such a way that the free end scrapes over the enamelled wires on the cylinder from end to end, as indicated in Fig. I.

The idea is that the brass strip must press firmly upon any selected turn of wire on the whole cylinder. At first the coating of enamel will prevent metallic contact between the brass strip and the wire, but this will soon remedy itself with use, as the brass will rub the enamel off in time and a neater line be made than if the enamel were scraped off by any other means.

Now take a piece of silicon crystal, which you have bought for a few pence at a wireless material shop, and a small metal sewing thimble, into which it will easily go. Get some tinfoil from a chocolate or tobacco packet wrapping, and pack the crystal tightly into the thimble with this after you have screwed or otherwise fixed the thimble on to another piece of wood about three inches long by two inches wide.

Six inches of your Gauge No. 20 copper wire should now be coiled into a spring, one end fixed to the board and the other end just touching the crystal where it is bare (see Fig. II.).

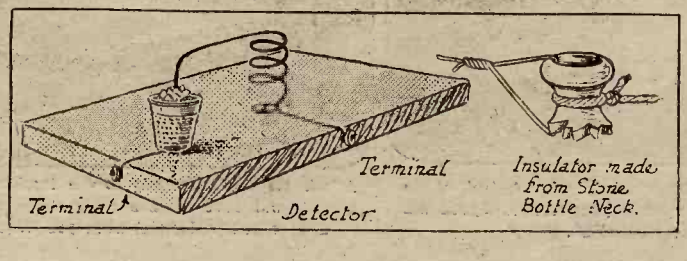


Fig. II. This shows method for mounting the crystal detector and the economic way in which a bottle neck may be used as an insulator.

Next take the neck of a broken ginger-beer bottle (being careful not to cut yourself), and tie a piece of rope or string round it by which you can attach it to your aerial pole or the highest point of the house. Thread the end of the remainder of your enamelled wire through the neck, keeping rope and wire from touching. This will make quite a good insulator. If desired, you might buy one which would look nicer.

Now, from this bottle-neck attached, we will say, to your chimney stack, run the wire to a pole, clothes-post, or tree in the garden, or on to an accommodating neighbour's chimney, insulate with another bottle-neck, and then continue the wire down to where you are making your wireless cabin.

The whole length of the wire so stretched must not exceed 100 ft. Where the wire enters the cabin it must not touch bare woodwork or brickwork. Thread it, if possible, through a glass tube for insulation.

Scrape the enamel off the end of a spare piece of your wire and twist it tightly round a clean brass water-tap, or, if the lead water-pipe is clean, round that. This becomes your "earth wire."

Then attach the lower end of the aerial to the wire at one end of the cylinder, scraping off the enamel where they meet. Attach the other end of the earth wire, one end being on the water-pipe, to the brass strip, also being sure that the enamel is scraped off the wire where it touches the brass (see diagram).

Connect by a piece of wire the junction of the aerial and the "inductance" to the thimble carrying the crystal. Connect the wire which presses on the crystal to one wire which goes to the telephone receivers and the other wire from the receivers to the junction of the brass strip and the earth wire.

Move the brass strip gently and slowly over the copper wire on the cylinder, being sure that it touches the bare copper where the enamel has been scraped off by the movement of the brass strip.

Lastly, listen carefully in the receivers which you have now placed on your head.

Wireless signals should be there in plenty, but if at first you don't succeed in hearing them, try again. This is the most elementary single set which will work. It may be elaborated to any extent by the skilful.

Ebonite may be used instead of wood with advantage. A light spring carrying the tip of an old gold fountain pen nib may replace the copper wire touching the crystal, but in this case remove the usual iridium point from the gold.

Experience will suggest many other improvements, but with the set above described, properly made, you should receive the wireless concerts, and it will be equal in all respects to sets retailed at five pounds.

EDITORIAL NOTE.—POPULAR WIRELESS will deal week by week with the methods of constructing wireless receivers from the elementary to the advanced types.

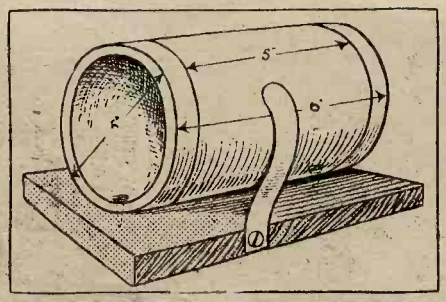


Fig. I.—This shows the inductance former without the coiled wire but with brass arm in position.

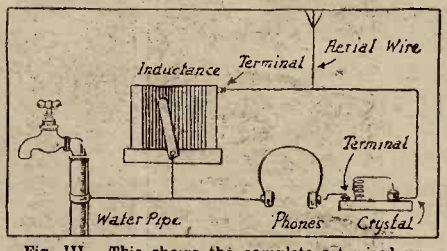


Fig. III.—This shows the complete set wired up in diagram form ready for you to listen-in.

HAVE YOU A WIRELESS?

Points for the Novice

FIRST, take out a licence. In a week or so this may be obtained direct from any post office, but at present you must apply to the Secretary, the G.P.O., London. The licence will cost you 10s.

If you are within a fifteen-twenty mile radius of a broadcasting station and only wish to receive the concerts sent out, a £5 crystal set will suit your needs. A £5 crystal set requires no upkeep. Batteries are not used.

If you are some distance from a broadcasting station, you will require a valve set. This type of apparatus will cost about £10, inclusive of batteries, which consist of a 6-volt accumulator and a 60-volt dry battery.

The accumulator can be recharged for about 1s. 6d.; the dry battery cannot be recharged. A new one must be purchased, price 15s.

These dry batteries, however, last for several months.

The valve type of receiver will cost a few shillings annually for upkeep of batteries. For increased strength of signals and clarity of telephony, the valve is recommended.

The buyer of wireless apparatus need have no fear about its correct manipulation. Full instructions are usually sent out by wireless manufacturers with every set, and as the various types of receivers now on the market have various ways of tuning, etc., it will serve no good purpose by picking on one particular receiver and describing its adjustments, etc.

Crystal sets are usually the easiest to operate, although the crystal itself requires very sensitive handling.

Readers who are still in doubt as to what type of apparatus they require should state their wants to a wireless manufacturing firm, who would then know exactly the kind of receiver that would prove most suitable.

Write to me if you want to know anything.—Editor.

MR. SELFRIDGE EXPRESSES HIS VIEWS

Most enthusiastic about future of wireless, but does not think it will supersede telephones.

The Business Man and Radio.

By Gordon Selfridge.

THE wireless age is upon us. To-day the fantastic romances of Jules Verne seem a little insipid when we think of the wonderful progress made in the science of wireless communication and the vast possibilities it has in store for us. Within a very few years the wireless telephone will play an enormous part in the life of every man and woman in this country, and certainly, if the problem of interference is overcome, it will affect business life considerably. Nevertheless, I do not think the radiophone will ever supersede the telephone.

Many wild predictions have been made on this point, and it has even been said that before long the man in the street will have his pocket wireless transmitter with which to call up friends and business colleagues.

That particular prediction is very far-fetched indeed. The pocket radiophone will never replace the telephone, because it will always be limited by the number of messages that can travel through the ether at the same time.

At the moment, American amateurs are realising the bad effects of unlimited radio transmission. The ether is crammed with their messages, which consequently get so mixed up that it is impossible to hear a coherent sentence when "listening-in." This "jamming," as it is called, has assumed such sinister proportions that laws will shortly be in force limiting the number of amateur transmitting stations in the United States.

With the wireless telephone at its present stage of development, not more than one hundred conversations could be carried on in the London area in any single minute, even assuming that a special wave length was set aside for the sole use of private radiophone subscribers, and that conversation carried out on this wave length did not suffer from interference by ship stations or Government land stations.

This is the great drawback to wireless communication. The service is a restricted one; it can never wholly supersede the ordinary telephone service, which is only limited by the number of wires or cables that can be laid under the streets or between telegraph poles.

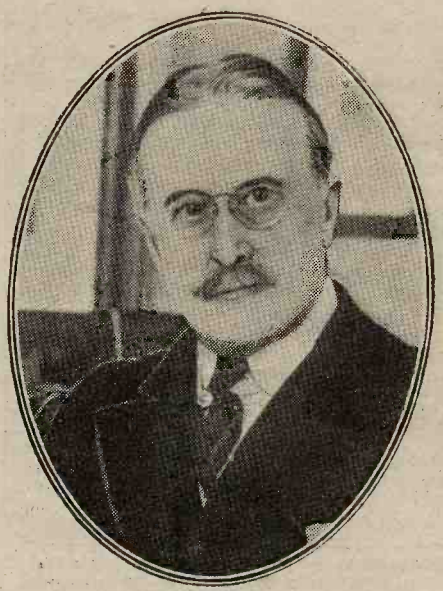
But as a means for cross-Channel telephonic communication the wireless telephone has already won its spurs.

Speech by the ordinary telephone, when the wires pass under the sea, is nearly always distorted, and no amount of experiment has yet revealed a way of eliminating the bad effects of under-water cable communication on the clarity of the human voice.

Also, in America, the telephone company operates a radio service between Long Beach, California, and Santa Catalina Island, some twenty-eight miles off the coast. This service has proved extraordinarily successful.

Colonel Carty, a famous American experimenter in long-distance telephonic communication, gave a dinner a few months ago at the Waldorf-Astoria Hotel, New York, at which every guest was provided with a telephone receiver.

Colonel Carty called up relay points across the continent from New York to San Francisco, and finally to Los Angeles, and then spoke from Los Angeles to Santa Catalina.



MR. SELFRIDGE.

This experiment was of more than usual interest, because it showed that ordinary telephone speech, after being relayed from New York to Los Angeles, could be transmitted again, via the ether, to another station, and yet still retain clarity of tone and perfect modulation.

Senatore Marconi has already transmitted and received readable speech by radiophone between London and Rome, and very shortly he expects to bridge the Atlantic in the same way. As a business utility, this will prove very great indeed.

At the moment, wireless telephony broadcasting has created a popular craze, and the man in the street will soon be able to enjoy a unique form of entertainment.

He will have a constant supply of music, lectures, and sermons, etc., "on tap"—a variety of entertainment, by the way, of far greater scope than that offered by the average gramophone in the home.

Our store in Oxford Street has for some time had its own special wireless department, and judging by the interest taken in the various concerts, etc., which our wireless experts receive for the benefit of customers, the boom in wireless in this country bids fair to equal the American brand in popularity.

By careful adherence to the official regulations we should escape the chaotic "jamming" now rife in the States, and yet still enjoy a fascinating new hobby to its utmost.

Romance, after all, is the spice of life, and in the radiophone receiver we have romance personified.

Whether you buy a £5 set or a £50 set, the romance is there just the same, and no one should be without this wonderful adjunct to the home.

Many people are asking how great a part wireless telephony will play in the future, but to answer that question off-hand is difficult, and, for me, entirely impossible.

But one thing is certain, as H. G. Wells once declared in one of his books: "This 'ere Progress—it goes on."

GORDON SELFRIDGE.

Here's a youngster with a wireless apparatus fixed to his bicycle. He is able to receive messages on his way to school or play.

CLUB AMATEURS AT WORK.

Amateurs enjoy a little ragtime, via the ether, at the Stoke-on-Trent Wireless Club. Note the valve amplifiers on the extreme left, and the loud speaker in the centre. If you are interested in wireless, one of the first things you should do is to join a wireless club.

POLITICS BY RAD

Wireless will be used at the next General Election for casting the speeches of prospective M.P.'s. The polit the photo is getting a little practice in by an impromp speech on Free Trade.

A WIRELESS KISS.

This young lady is sending a kiss by wireless. This seems to be rather a dangerous game. Before long every engaged couple will be filling the ether with osculations as well as oscillations.

BROADCASTING.

This lucky amateur possesses a transmitting licence and is allowed to send out speech and music. There are about two hundred and eighty amateur transmitters in this country, and between the hours of eight and twelve on any evening you will hear their merry chattering.

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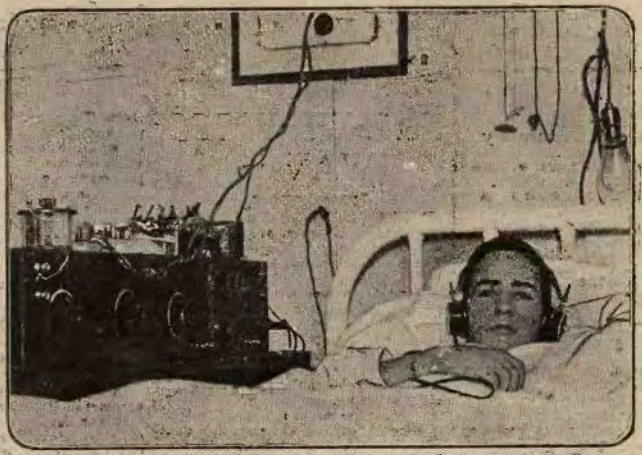
THE 'PHONE GIRL.

The ladies find the wireless telephone more fascinating than bargain sales. This fair amateur prefers to spend her luncheon hour listening-in to a concert instead of "doing" the shops or having a lengthy meal.

A PLEASANT CONVALESCENCE.

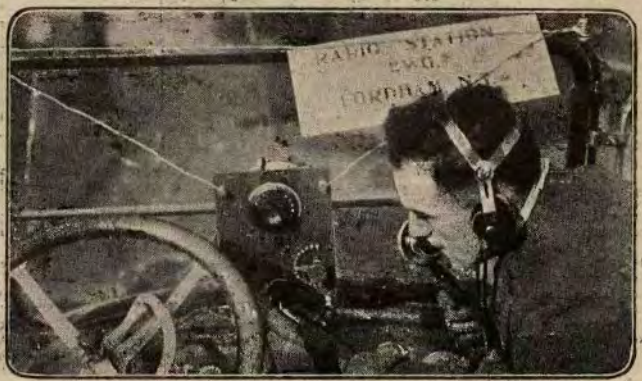


If you are laid up in bed with a broken leg or an attack of radio 'flu, the weary hours will pass the quicker if you have your set close to your bed. "Music hath charms"—especially wireless music, and it certainly is more fascinating than the gramophone.

THE RADIO GLIDE.

The latest American craze is the "Radio Glide." According to official instructions all you have to do is:—"Take two steps forward, then scuffle, clap your hands in the air, and then hesitate." If this is the most difficult danse by radio, amateurs won't have much trouble. Sounds easy!

Important experiments have been carried out by the London Fire Brigade in connection with wireless telephony. The picture shows a motor fire engine fitted up with transmitting and receiving apparatus during a recent test in the country.



This is another American novelty of considerable interest. The motorist has equipped his car with a portable receiver and transmitter, and good speech can be sent and received on using a wind screen type of frame aerial. This will come in handy should you have a breakdown on the road.

Step by Step in Wireless

An Elementary Series of Articles in Non-Technical Language for the Beginner.

No. 1.-WIRELESS WAVES

ONE of the first questions that flash across your mind as you listen to a wireless speech is: "How is it that I can hear a man talking by wireless telephone?"

Many years ago a similar question puzzled investigators. They asked the question: "How is it that light is transmitted to us?"

They saw the sun, the stars, and the moon, but between them and the earth was an immense space. How did the light from the heavenly bodies reach this planet?

Obviously, it was not the air that transmitted the light.

In the end it was assumed that some curious medium afforded the link—a medium that permeated the atoms and molecules of mountains and houses and—everything. It was decided to call this medium "ether."

Later on, experiments were made which proved that light is a wave motion in the ether medium. Atoms in the sun, the stars, and the moon are constantly vibrating, and in doing so generate waves in this mysterious ether.

Practically all energy reaches us in wave shape, and these waves are set up—in some medium—by a body that moves alternately backwards and forwards.

These "alternations" or "oscillations" or "vibrations," as they are sometimes called, create waves.

In wireless we deal with waves set up in the universal sea of ether—waves which, although they resemble light waves, cannot be seen. They can, however, be detected, and made to actuate contrivances whereby they are converted into sound. The radiophoned speech you hear in your telephones has first been transformed into ether waves and then back into human voice sounds by means of the receiver.

Let us, by means of an analogy, show how wave motion may be generated. Imagine a calm surface of water—a pond will do—and a tap, half shut off, allowing drops of water to fall into it.

Each drop starts a little wave as it smacks down on the surface under it, and these waves travel outwards in ever-widening circles until they waste themselves on the edge of the pond, or are reflected back.

We may have two taps side by side, and the two systems of waves will add together or modify each other.

Take the simile further and discharge a machine-gun in a series of shots. The noise travels out in the same way. Two machine-guns could perform, and the series of reports be kept distinct in the listeners' ear. Or again, in the orchestra, each instrument, by means of its tone, which depends on the form of its sound wave, can be picked out of the performing band; or the music can be considered as a whole.

Now, in wireless, we store up electrical pressure and then let it go suddenly in a prearranged manner, just as we did the drops of water in the pond and the gun explosions in the air.

The accumulation of pressure, when suddenly released, travels outwards in the ether until it comes to a stretched wire—the wireless aerial, to be exact—and is there detected and made appreciable to one or other of our senses.

If we are sending a wireless signal, the series of wave impulses follow one another at the rate of 186,000 miles per second.

Like water waves, wireless waves have crests, and it is the distance between the two crests which determines the "wave length." In wireless, wave length can be artificially regulated. The reason for this will be shown.

In the case of what is called "continuous wave" work, the series of waves is continuous and not separated by periods of inaction.

It is on the back of these continuously vibrating waves that wireless speech or music is carried, and experts use the term "modulating" to describe the effect, because, by suitable means, they set up the continuous waves and then mould or modulate them to carry the irregular waves which we depend upon in the air for the propagation of understandable noises.

To send or receive a wireless message we must take account of wave length.

Wave length in wireless work is always measured in metres. A metre is equivalent to about 3.28 feet. Radio waves may vary from about 100 metres to 30,000 metres in length.

The big transatlantic wireless stations employ wave lengths that measure 30,000 metres from crest to crest—about eighteen miles—and it will be easily seen that such a wave length is not needed when communicating over short distances. Ships usually work on a 600 metre wave length. Wave length in wireless corresponds with pitch in sound and colour in light. Sounds move through the air in the form of waves, and if they come regularly, a musical note is the result.

The pitch depends on how many waves reach us in a second, and this in turn depends on how often the sounding body vibrates in the air.

When we tighten or loosen a violin string, we alter the pitch. This is called "tuning." In wireless it is almost the same.

By wireless tuning we mean that we are adjusting the radio pitch of the receiver to the pitch of the transmitter. As pitch is entirely a matter of wave length, it follows that, if a transmitting station is adjusted to send out a 600 metre wave, we must "tune" our receivers to that wave length before we can hear the signals.

No. 1. LEARN TO SOLDER

IF you are going to experiment with your wireless set, and add to it, and realise the joy of making your own instruments, you will need a working knowledge of the art of soldering.

Again, if your aerial wire snaps in the night, it is a bad policy to make a rough join. The two strands should be soldered together. Bad "joins" are fatal to good results on your receiver.

The most important thing in soldering is to have the ends you wish to connect, clean.

The presence of dirt will retard the fusion of the two metals, and so, before heating either of them, ascertain that they are both scrupulously clean.

You will require the following articles for your soldering outfit:

A soldering-iron, tin of Fluxite, a file, a stick of solder, some emery paper, a pair of small, clean pliers.

With these materials in hand you are ready to start. First, heat the iron. This can be best done in a plumber's blow-lamp.

There is a certain temperature to which to heat the iron, and it is most important that this exact temperature is reached.

This is the most difficult thing the beginner will be called upon to judge. Experts can tell by the amount of green flame round the hot iron; others withdraw the iron and judge by the "feel" of it when the palm of the hand is placed a few inches away.

Probably the most reliable method is the following:

Withdraw the iron from the flame and dip it for a second in the Fluxite. Note whether the paste burns off at once or merely melts and runs about the surface of the hot iron. If the iron is ready for use, the paste will begin to fizzle at once, and the iron should not then be made any hotter.

The next thing is to "tin" the iron. Take a file and file up one of the faces of the iron from the point for about half an inch until it is clean and bright.

Do this as quickly as possible, so that the hot surface does not have time to be affected by the air. Next dip the prepared part in the Fluxite and rub it with a stick of solder which has also been dipped in the Fluxite.

You will then have a coating of bright, melted solder, into which you can melt more and apply it to the work in hand as it is required.

Replace the iron in the flame

Now take the two wires to be joined and smear them with Fluxite; then remove the iron from the flame and make sure that the tinning is still clean and bright.

Prepare enough solder to enable you to dip in it both pieces of the wire. Twist them about until they are well tinned. Dip the tinned ends in Fluxite and with the clean pliers screw them tightly together. Finally, dip them in the melted solder again for a few minutes and the job is done.

(More Workshop Hints next week).

Messages from Mars

MARS, the Red Planet, is whirling towards us at the approximate speed of 1,000,000 miles a day, and at midnight on June 18th it will be nearer the earth than it has been for a considerable time.

Even then it will be 42,500,000 miles away; but that is close enough to make the astronomers polish their telescope lenses and conjecture about canals.

But astronomers are not the only people who await June 18th with impatience.

Nine months ago, Guglielmo Marconi, from his yacht Electra, the best-equipped floating radio laboratory in the world, picked up impulses of wave lengths estimated as high as 150,000 metres—about five times higher than any produced by man-made apparatus.

This opens up most fascinating and romantic possibilities, as the mind pictures the Electra, anchored in the Mediterranean, a little speck holding the highest inventive development known to man, receiving mysterious signals from the unknown.

Mars has always intrigued the imagination. Is it another world like ours, peopled by superior intelligences who have so far improved upon our knowledge of wireless that they can bridge the 42,000,000-mile gulf that lies between us? Are they trying to communicate with us? If they are, they will surely make a great effort in June, for if their knowledge of wireless so far exceeds ours, their astronomy must have advanced in proportion and they will know how favourable the conditions will be.

Before we are carried away by the romance of possible interstellar communication, let us examine another theory which has been advanced to account for the mysterious impulses.

Briefly, it may be stated in two words—sun-spots. If the sun is examined through a dark glass and an ordinary telescope, it looks like a molten blob of lava; but sometimes on this blob may be seen a darker speck or two—large at times—often small.

These specks are sun-spots, and are due to violent storms in the surface layers of the sun.

The sun is not a great, red-hot ball of earth, but a whirling mass of gaseous matter, whose atmosphere consists of blazing incandescent flames.

The temperature of the sun's surface is calculated to be, roughly, 6,000 degrees centigrade, besides which the hottest thing devised by our scientists—the crater at the end of one of the carbons of an electric arc—is only moderately hot.

In this inferno of heat, naturally the clouds of boiling gas are perpetually surging, veering backwards and forwards with millions of times the velocity of earthly winds.

But the sun, like the earth, has storms, and sometimes a tremendous tornado sweeps upwards from its surface—a huge, ascending pillar of white-hot gas.

Astronomers have seen these columns of fire and have calculated their height at 300,000 metres above the surface.

But they are formed of gas which cools rapidly, and in cooling becomes incandescent and consequently darker, hiding with its darkness a portion of the flaming gas beneath.

It is then that a sun-spot becomes visible, and it is important to realise the gigantic state of these results of solar storms. They are as much as 100,000 metres in diameter sometimes, or more than four times the circumference of the earth, and the winds which drive the gas columns upwards blow sometimes as fast as 600 miles an hour.

Now comes a significant fact: these sun-spots are known to be electrical. When their magnitude is taken into consideration it will be seen that they are inconceivably powerful electric sparks which can send out wireless waves as any electric spark can do.

They are the antennæ of the sun's radio system, and so vast a sending station cannot be ignored.

It might be imagined that the 92,000,000 odd miles which separate the earth from the sun would completely cut us off from all possible influence, but meteorologists have proved beyond doubt that solar storms have a great influence upon the storms we experience, and upon the electro-magnetic condition of the earth.

There is a direct connection between the number of sun-spots and the magnetic storms which disturb the ease of wireless communication so seriously.

We have, therefore, a tremendously powerful transmitting station whirling round, whose wireless waves are known to affect the earth. The question now arises, has Mr. Marconi intercepted some of those waves, or can we go back to the more fascinating theory that the planet Mars is peopled by scientists who wish to communicate with us?

The strangest point about the waves which Marconi picked up is that they ended abruptly, and that surely furnishes ground for belief in the Martian theory.

Had they been the result of sun-spots, they would have continued indefinitely, unless it happened by chance that their wave length was abnormal. But it would seem as if these Martian scientists had tried to "call up" the earth, and receiving no reply, had switched off.

But of conjecture there is no end, and perhaps on June 18th we shall be able to give a more decisive answer to this most fascinating question.

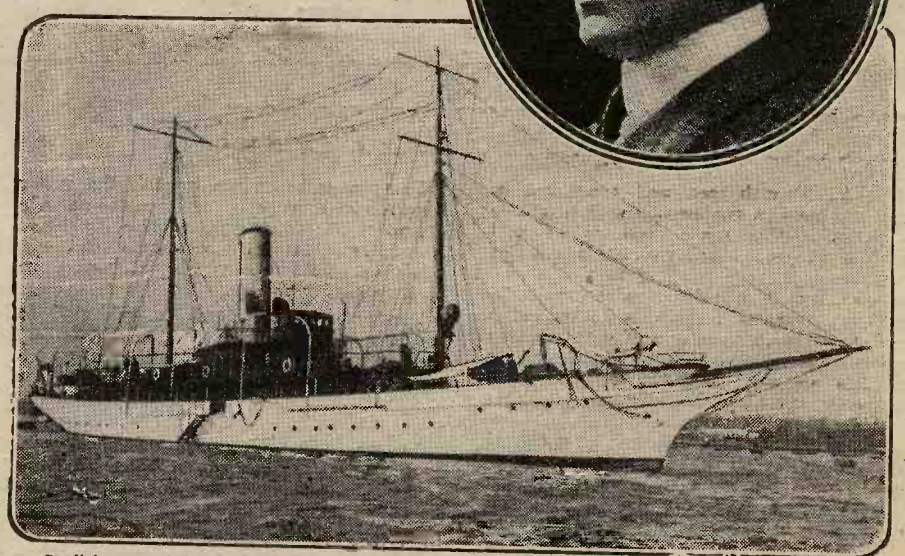
MR. MARCONI'S VOYAGE.

Mr. Marconi proposes to carry out experiments on the Atlantic with direction finders on short wave and long wave transmission.

At New York he will conduct a number of tests in co-operation with some of the modern American stations, and demonstrate to the Americans what can be accomplished in the high speed despatch and reception of messages.

Over long distances, such as from America to England, messages are now received at a rate of eight to ninety words a minute, and Mr. Marconi will use improved instruments by means of which speed can be increased up to one hundred words a minute and over.

Besides his other experiments, Mr. Marconi will carry out tests for the Meteorological Office in London during his voyage. These will have special reference to the collection of reports of the weather in the areas of the Azores and the Bermudas. He expects to be absent from England until the middle of July. On his return journey, he hopes to visit Canada and Newfoundland. The Electra, a steam yacht of 700 tons, will make the Azores her first objective, and thence will proceed to America, or, if the weather proves bad, to Bermuda.



Guglielmo Marconi has left England on his yacht Electra. He will make some very important experiments during the voyage in connection with the mysterious signals supposed to emanate from Mars. The Electra is the finest equipped floating wireless laboratory in the world.

WIRELESS PRODIGY

ANY boy who is enthusiastic about radio will surely start to work very seriously to study it when he reads the official confirmation by the U.S. Radio Inspector at San Francisco of Robert Garcia's success in passing the amateur's examination in America, with a percentage of ninety-two. For Robert is only seven years old! A licensed radio operator at seven—his career, to put it mildly, promises to be interesting!

His father, Allen Garcia, is Charlie Chaplin's director, and in November, 1920, began to take an interest in radio which proved to be infectious, for young Robert, then four years old, found a wireless catalogue lying about—and read it.

Ideas started in his young brain, and he began to study everything he could find in the mass of advertising matter his father brought home.

The names of various parts of the instruments puzzled him, but by deluging his father with questions on oscillations and frequencies and everything else he couldn't understand, he soon found that the mysteries were becoming simple.

From theory he passed to practice, and during the daytime he listened—sometimes for hours at a stretch—on his father's set, trying to learn the code so that he could copy. The code he mastered in twenty-four hours, and then waited for signals at speeds which he could follow.

Soon his father took out a transmitting licence, and Robert became so interested that he would not rest until he had been shown the workings of every part of the transmission set.

Circuits next demanded his attention, and the house was covered with drawings of them—his father's stiff shirts had to be jealously guarded—and he showed an amazing memory.

He was so interested that he begged his father to let him take the amateur test, although he had only four weeks to work for it, and could not copy even five words a minute.

It seemed hopeless, but his father thought that such enterprise ought to be encouraged, and decided to give Robert a chance. He put him through a strict course of training, and, by using a buzzer, gradually improved his morse until he could copy from fifty to a hundred words in succession.

Of course, it was not easy to explain the intricacies of technicalities to so young a child, but by using simple illustrations, he conveyed the meaning of all the technical terms, as well as the theory of both transmitting and receiving sets to the avid Robert.

Then Robert's memory came to his aid again. It was necessary for him to know the regulations about the transmission of signals, etc., and his father gave him a copy of them. He not only learnt them by heart so thoroughly that he could write them down word for word, but, even more important, he understood what they meant. His father was astonished, but he was not to be alone in his astonishment.

The four weeks passed and the test came—an examination of three hours' duration.

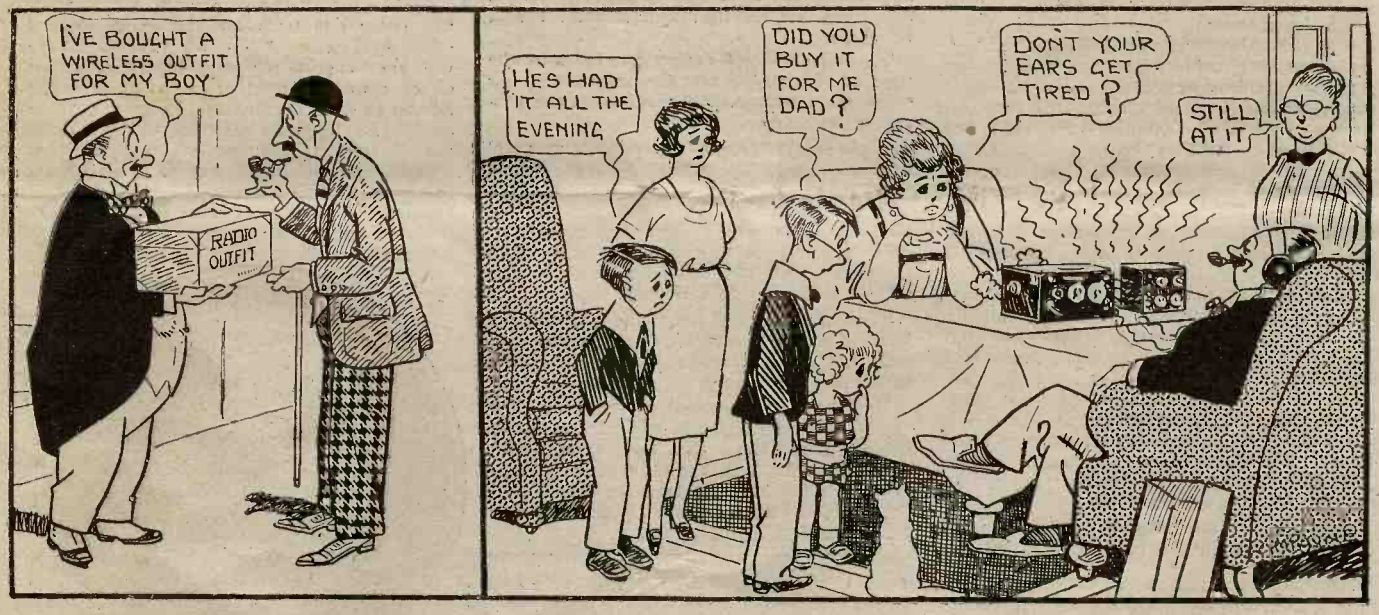
Robert caused a great deal of quiet amusement—to see him sitting among grown men must have been more like watching the fulfilment of a bet than a serious attempt to pass.

Several men—and many youths—failed; but young Robert did not. He smiled all through the examination and passed with ninety-two per cent marks to his credit!

He has now filed an application for a station licence, and is going to put it up himself.

When Sir James Barrie made his speech about the power of youth the other day, he must surely have heard about young Robert!

FATHER BUYS A WIRELESS OUTFIT FOR THE BOYS!



CRYSTAL DETECTORS

TREATED with care and consideration, and used in conjunction with a reliable tuner, the much scorned crystal detector is capable of really sound and efficient work.

Nowadays, it is valves, valves, valves—and the poor crystal is apt to be left out in the cold, as the majority of amateurs have valves on the brain—this, despite the fact that many of them are only interested in getting the Marconi concerts, and that they are well within "crystal range" of Writtle.

The writer has found the use of a crystal detector more than sufficient for clear reception of speech and music from Writtle—which is, roughly, twenty miles distant from his receiver.

A "stand-by" valve set for long-distance work is, of course, useful, but why waste battery current on a valve for short distance reception?

Using a carborundum crystal, the writer has received very clear signals—on the ordinary 100-foot single wire aerial—from Paris, Nauen, Dover, Cullercoats, Chelmsford, Cadiz, and Poldhu, etc. Ship stations come in very clearly indeed.

The crystal should not be subjected to rough handling; grease, dust, or dirt of any form will rob it of its sensitiveness, but once a good adjustment is made, the little fellow in the brass cup will respond nobly for weeks at a time.

During the war, the writer, using a Marconi type 16 crystal receiver on board a Naval transport, found one perfect gem of a carborundum crystal.

For two months it remained in one position, guarded against the designs of careless cabin-boys and other evil spirits.

Using a 200-foot twin wire aerial, barely sixty-feet high, signals were received clearly from Paris while anchored in Montreal Harbour, at Ashar, on the Tigris, and in the Suez Canal. The radio station at Rinella Bay, Malta—BYZ, neé S D—could be clearly heard at a distance of 3,000 miles. This with a crystal detector, mark you!

Now that the amateur is to be allowed to erect an aerial more than 100 feet long, the crystal detector will perhaps come into its own again. At any rate, it deserves to.

There are many minerals that may be used for the crystal. Galena is the best—with the possible exception of carborundum—but it has the disadvantage of being produced in such a way that it is impossible to tell the bad from the good except by actual experiment.

The easiest way is to get several specimens and test the lot until the beau ideal is found. When you *have* found it, look after its health as you would your own. It will repay you in the long run.

WIRED WIRELESS

Experiments are being made for using the ordinary House Electric Light System for the conveying of messages.

GENERAL GEORGE O. SQUIER, the Chief of the Signal Corps of the U.S. Army, has made a discovery which, if it fulfils all its promises, will give to broadcasting an even greater number of possibilities and double its value to the general community.

He has been experimenting with a view to using the ordinary electric-light system fitted to a house for lighting or heating purposes for the conveying of messages.

Before a number of experts he gave a demonstration in his office in which he had fitted a radio receiving telephone set to a socket of an electric lamp on his desk.

By merely pulling the plug in and out of the socket, General Squier started and stopped the messages.

During the course of the demonstration news, music, and conversation were received from a distant room in the building, where a radiophone transmitter had been fitted to another part of the lighting system of the building.

The invention is a further adaptation of the general's scheme of "line radio," or "wired wireless," which he first considered in the days of the war.

Ordinary wires used for the transmission of electric light current are used as a guide, although the message does not go through the wire, but on wireless waves, which merely follow the line. The turning of a switch will cut the circuit, and the sound ceases at once.

This system, perfected and applied for practical purposes, will permit of an hotel giving every guest music in their bed-rooms, one orchestra playing in a basement at the sending station being all that will be required.

Moreover, the tape-machine will become out of date. All the guest at the hotel will have to do is to connect his radiophone receiving set to the electric standard lamp near his bed and listen to all the latest news as it is received at the hotel by wireless and passed into the electric-lighting system.

"*Every home and every room where there is an electric lamp can now keep in touch with the world*," claims General Squier.

At present, however, a word of caution is necessary. Experts are not quite convinced that the system can be used over the large lighting cable systems under city streets. Amateurs are advised not to experiment with this new idea until it has been further tested.

It is interesting to read how General Squier first made this discovery. During the war he was confronted with the task of supplying 100,000 miles of insulated telegraph and telephone wire a month. The task was impossible, chiefly owing to the lack of the necessary machinery to make the braided covering for the wire.

"Then," said General Squier, "let us try a substitute instead. I will try electron tubes. I will give you an unlimited quantity of electro-magnetic waves instead."

He ran a bare wire across a river from the Army War College to the opposite shore. The wire was allowed to sink to the bottom and lie with no protective covering at all. A radiophone set was connected with each end of the wire. Transmitting was done from one side of the river, and receiving at the other.

At the receiving end the bare wire was connected directly to the grid terminal of an electron tube of the receiving set. The usual ground connection was left open.

A wire was tuned to a frequency of approximately 600,000 cycles a second, and the results were all that were desired.

General Squier continued his experiments with submerged wires and then tried to direct a message along a wire lying on the ground. A bare wire was laid on the earth connecting two stations, one mile and three-quarters apart. Radiophone instruments were attached and excellent telephonic communication was achieved.

The wire was next buried in soil of a moist and sandy loam nature about eight inches beneath the surface, and a few feet above water level. Electro-magnetic currents were conveyed along the line as before, and good telephonic communication was again effected.

To test the experiment still further, the buried wire was not laid in a straight line, but erratically, turning at varying angles. The message conveyed to the line, however, did not leave it, but completed its journey from transmitter to receiving set.

"Wired wireless" was now more than a theory—it was an accomplished fact. By this method several messages can be sent along one wire if different wave lengths are used, and further still, each message can be made indistinguishable except to the particular instrument tuned to receive it.

Such, in brief, is the story of General Squier's invention.

It must be thoroughly understood, however, that the message does not pass *through* the wire as an ordinary electric current does, but, for a reason that is unknown, follows a channel of ether that is like an invisible tube *round* the wire. The message is thus directed to a particular goal instead of being sent, willy-nilly, into the air in every direction.

There will be no possibility of waves conveying different messages interfering with each other. Unlimited broadcasting in America has lead to that confusion, but "wired wireless," by keeping the messages to special channels—ordinary electric light wires, whose origination and destination is known—will do away with this dilemma.

Your local power station in the near future will be able to distribute news, music, and other entertainments as well as light, and aerials will not be necessary.

But at present amateurs are not advised to experiment with electric light wires in an attempt to achieve "wired wireless."

General Squier has himself advised amateurs to keep to outdoor aerials for the present, as his new invention is still in its early stages, and its perfection will naturally take time.

THE MORSE CODE

MANY amateurs enjoy reading the messages constantly being sent out in the Morse Code by ships and land stations.

The Continental Morse Code is universally used in radio work, and is given here.

Practice can be had by using an ordinary bell, minus the gong. This will produce "buzzes" similar to the Morse signals received in the telephones.

When practising, do not attempt to send or receive too fast until the code is learnt by heart.

Two forms of Morse Code are in use—the "Continental Morse Code," and the "American Morse Code." The latter is used chiefly for use in American land line telegraphs, and the Continental in wireless work. The rules for the formation of Continental Morse Code signals are:

1. The time occupied by a dash should be equal to that occupied by three dots.
2. The time occupied by the interval between elements of one letter or other sign should be equal to the time occupied by three dots.
3. The interval between two letters in a word should be equal to the time occupied by three dots.
4. The interval between two words should be equal to the time occupied by five dots.

Continental Morse.

a	. —	m	— —
ä	. — . —	n	— .
á }	. — — . —	ñ	— — . — —
a }		o	— — —
b	— . . .	ö	— — — .
c	— . — .	p	. — — .
ch	— — — —	q	— — . —
d	— . .	r	. — .
e	.	s	. . .
é	. . — . .	t	—
f	. . — .	u	. . —
g	— — .	ü	. . — —
h	. . . .	v	. . . —
i	. .	w	. — — —
j	. — — —	x	— . . —
k	— . —	y	— . — —
l	. — . .	z	— — . .

(Next Friday's POPULAR WIRELESS will contain the Figures, Punctuation, and other Signs for Continental Morse.)

WIRELESS LIGHTHOUSES

RECENTLY, in a lecture on "Short-wave Directional Wireless Telegraphy," Mr. C. S. Franklin described many interesting experiments.

He has proved to complete satisfaction that wave lengths of twenty metres are capable of providing point-to-point directional communication over considerable distances. Moreover, these short waves have increased possibilities of secrecy as compared with the usual non-directional method of transmission.

The range of wave lengths at which it is possible to send messages is rapidly becoming fully occupied, and once the range is full, the only way to enable a further increase in the number of possible services will be by employing systems of directional control.

Senatore Marconi began experiments in this direction in 1916. He tried waves of only two or three metres' length, but found that, although they were satisfactory in many ways, they were disturbed by waves from motor-cars and motor-boats.

The ordinary motor engine apparently creates waves from near nought to approximately forty metres in length Possibly, in the future, these engines will have to carry a Post Office licence for transmitting!

In 1919 further experiments were carried out at Carnarvon with valve transmitters and a fifteen-metre wave. Speech of a strong and clear nature was obtained at Holyhead, twenty miles distant, and after a little adjustment communication was effected with Kingstown Harbour, a distance of about seventy nautical miles.

The centre of experimental action was then transferred to Hendon, and tests were made over all-land distances from a reflector, and with a transmitter of fifteen-metre waves. The reflector was pointed in the direction of Birmingham.

A portable receiving set was then fitted up in a motor-car, and messages were sent from Hendon and received in the car. Very good speech was heard up to a distance of 66 miles, and quite fair results in the neighbourhood of Birmingham.

In the autumn of last year a reflector station was erected near Birmingham at a place called Frankley. This is about ninety-seven miles from Hendon, but speech of strong and good quality was received. Reflectors were used at both ends.

The transmitter consisted of two medium-sized power valves working in parallel, and the power used was roughly 700 watts.

So good have been the directional effects obtained with reflectors that are large compared with the waves length that suggestions have been made that this method might be of use for ships for finding their positions when they approached dangerous localities.

(Continued at foot of right hand column.)

Useful Radio Terms

AERIAL, or "ANTENNA."—A term used to designate the wire from which electro-magnetic energy is radiated into the ether, and also the wire by which the radiated energy is "picked up" and conveyed to the receiving apparatus.

ALTERNATING CURRENT.—A current which flows, not like water in a pipe in one direction, but first in one direction and then in the opposite. A single alternation is called a cycle. The number of cycles in the alternating currents used in radio is many thousands per second.

AMPLIFIER.—A term used to designate the means of amplifying the electrical effect detected—*i.e.*, an electron valve.

AMPLITUDE.—Every wave grows from zero to a minimum value at its crest. The maximum value is the amplitude, and is found by measuring the height of the wave crest.

AUDIO FREQUENCY.—Vibrations may or may not be audible to the human ear. When they are audible they have audio frequency. Frequencies below 10,000 cycles a second are called radio frequencies.

AUDION.—A name given to a form of electron valve.

BATTERY.—A primary or secondary cell for producing electric current, or a collection of such units.

CAPACITY.—A term used chiefly in connection with condensers. A condenser stores up electricity, the amount of which depends upon its capacity. Capacities are measured in farads, but as the farad is much too large for practical wireless purposes, the unit generally employed is the micro-farad (m.f.d.) or one millionth of a farad.

CASCADE AMPLIFICATION.—One electron valve may be added to another, so that the second amplifies the effect magnified by the first, and the third that magnified by the second, etc. Valves used this way are said to be in cascade.

CHOKE-COIL.—A coil wound to have high self-induction. The "choking'" action is called "impedence"

CLOSE COUPLING.—When mutual inductance is caused by mounting the primary and secondary of a tuning coil very close together, the effect of "close coupling" is obtained.

CONTINUOUS WAVE.—A continuous wave is a wave in the ether which has a constant amplitude. It is a wave which travels very far, and is used to "carry" radio telephoned speech, etc.

CRYSTAL DETECTOR.—A form of detector in which a rectifying crystal is used to receive electrical impulses in such a fashion that they become audible in a telephone receiver.

DETECTOR.—Any contrivance whereby electrical vibrations are transformed into visible or audible vibrations.

DIRECT CURRENT.—An electric current with a constant flow in one direction only.

ELECTRON.—The elementary basis of electricity. All electrons are negative.

E.M.F.—Electro-motive force. The unit of "E.M.F." is the volt.

ETHER.—A mysterious medium supposed to permeate all space. It serves as a medium whereby radiant energy may be transmitted in the form of wave motion.

FREQUENCY.—The number of oscillations per second.

GRID-LEAK.—A high non-inductive resistance connected across the grid condenser or between the grid and the filament of a valve. Its function is to permit excessive electrical charges to leak off to an external source, thus assuming good control under working conditions.

HARMONICS.—Every tone is composed of a fundamental and overtones or "harmonics." Harmonics vary in length and frequency from the fundamental. Sometimes amateurs will hear the harmonics of high-power stations on a long wave length, although the amateur set is tuned for short wave lengths.

HENRY.—The unit of inductance.

HERTZIAN WAVES.—Electro-magnetic waves in the ether named after the German scientist who discovered them.

INDUCTANCE.—Inductance is the name given to the effect of transferring a current from an electrified to an unelectrified conducting body without actual contact.

KILOWATT.—One thousand watts. Amateurs are allowed 10 watts for transmitting purposes.

LOUD SPEAKER.—A contrivance for magnifying received signals so that they can be heard without the use of telephone ear-pieces.

RADIO FREQUENCY.—Frequencies corresponding with vibrations beyond audibility. All frequencies above 10,000 cycles per second are termed radio frequencies.

RECTIFIER.—A device which suppresses one of the pulses of alternating current so that the resultant current consists of a series of jumps in one direction only.

RESISTANCE.—Opposition to the flow of currents.

RESONANCE.—Resonance exists in a given circuit when its natural frequency has the same value as the frequency of the current introduced in it.

SELECTIVITY.—The ability of selecting any wave length to the exclusion of other wave lengths.

TRANSFORMER.—Any contrivance for transferring electric energy from one state to another.

TUNING.—The selection of a certain wave length, effected by the alteration of capacity or inductance.

WAVE LENGTH.—The distance between the crests of two waves.

"X's."—Abbreviated sign for "atmospherics" or "static" disturbances caused by Nature's own wireless transmitter.

'RADIO' OR 'WIRELESS'?

WHAT is the difference in the meanings of the two words "radio" and "wireless"?

Radio is wireless—up to a point, but the latter word applies to so many other kinds of free communication that the former word was coined to describe more accurately the particular activity of the broadcasting stations as they function to-day.

Radio applies specifically to electric communications by means of ether waves. The novice may have been under the impression that all wireless messages were conveyed by ether waves. This is not so.

Electric discharges may be conducted through water or through the earth, and even through light waves. Ether waves can be employed for a similar purpose.

Telegraphic communication has been established between a moving train and the telegraph wires running alongside the track by simply placing thin metal sheets on the roof of the train.

Also, communication has been established between balloons fitted with a covering of tinfoil.

All these methods may be called by the name of wireless. Radio may also be so termed, but it has its specific meaning as well.

WIRELESS LIGHTHOUSES

(Continued.)

With this object in view trials are being made at Inchkeith Island with a transmitter and revolving reflector. The machine installed forms a kind of wireless lighthouse.

Its range of utility at present is not intended to be great, but the suggestion is that reflectors should be put up in position such as are occupied to-day by fog signals, and that wireless warnings of position should be given to ships when they are within ten miles of the danger-point.

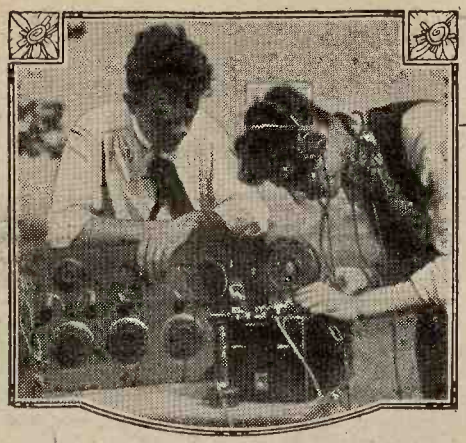
In 1920 tests were made between Inchkeith Island and a lighthouse tender of the Northern Lights Commissioners, the Pharos. A working range of seven nautical miles was obtained, using a four-metre wave, a spark transmitter, a reflector of eight-metre aperture, and a single valve receiver on the tender.

The reflector made a complete revolution once in two minutes, and clear and distinct signals were easily sent to every point of the compass.

From the tender it was found that the bearing of the transmitter could be determined to within one quarter point of the compass, or within 2.8 degrees.

Further experiments are being made and a new and larger reflector has just been finished.

NOTE. In a subsequent issue a Marconi Company expert will write a special article on wireless direction finding.



About Your Set

THE tuner is an instrument by which we are able to receive signals from a desired station to the best advantage—that is to say, to be "tuned in," to the exclusion, as far as possible, of all other signals.

The detector then converts the electric impulses received into currents which will actuate the diaphragms of the telephones. A valve amplifier inserted between the detector and the telephones may be used to increase the intensity of signals.

Recently, the crystal detector was generally used for reception. This detector consists of a metallic contact touching lightly a small piece of galena, silicon, or carborundum. A test buzzer circuit with dry cell, to indicate the correct sensitive adjustment of the detector, is essential when this type of detector is used.

Among the recent radio developments come the more sensitive valve type of detector which is now in general use. It consists of an exhausted electric bulb which needs a source of filament current, generally supplied by a six-volt accumulator, and a high-tension battery to furnish the plate voltage, which usually consists of a number of small dry cells assembled in a unit.

For detection purposes either a gas content valve (or "soft" valve), or a highly-exhausted valve (or "hard" valve) may be employed.

Many amateurs prefer the less-sensitive hard valves, as they do not require such delicate adjustment as the soft.

Naturally the accumulator needs recharging periodically, and since most electron valves used for reception need a filament current of about one ampere, a six-volt sixty ampere accumulator, for instance, supplying filament current for a two-valve amplifier and a detector, would have to be changed completely after every twenty hours' constant use.

If large size dry cells are used for intermittent operation of valve detectors, it will be as well to use two or three cells in parallel for each valve employed, consisting in turn of four cells connected in series. Eight or twelve dry cells would thus operate a valve receiver.

It has been found possible, by using special radio amplifiers, to amplify, or magnify, the received impulses before they reach the detector.

Novices, however, are not recommended to use these amplifiers, as the study of them is still developing, and not much is known about them as yet.

The term receiver is variously used. Sometimes it means the combined tuner and detector; sometimes it also includes the amplifier; and sometimes it denotes the tuner only.

One or more electric circuits are contained in the tuner, which are so adjusted that they catch impulses of the desired wave length only.

A coil of wire, cylindrical in shape, with one or more sliding contacts, is the simplest form of tuner, of which there are two general types in use—the single and multi-circuit tuners.

The former are the less expensive and more easily operated, though the latter give greater freedom from interference, and are, therefore, preferred by the experienced amateur.

Everyone knows the standard telephone detector—which is essentially the same as the receivers used for radio telephone reception, though their type is distinctive.

Made in the watchcase form, they are attached to bands which pass over the head, and hence derive their name—head-receivers.

In order that they may follow and respond to rapid pulsations of current, the diaphragms are very light—while a far greater number of wire turns are round the magnetic pole.

This causes a proportionally greater magnetic field with a feeble current, and the result is an extremely sensitive receiver.

Comparatively high resistance telephones are desirable for valve reception.

The two receivers are generally connected in series, those of fair sensitiveness having 1,000 ohms resistance in each receiver, while 1,500 to 2,000 ohms are found in the better ones.

One or more stages of amplification, each needing an additional electron circuit, will further increase the strength of signals received and thus the range of "picking up"

The same accumulator which operates the detector valve filament will operate the amplifier valve filaments, and, if proper connections are made, an ordinary sixty-volt high-tension battery may be used for the plate in both amplifiers and detectors.

Except in cases where exceptional signal, intensity is needed, two stages of audio-frequency amplification will suffice.

HINTS TO AMATEURS

Don't meddle with the electric light mains when erecting your receiver. You will only blow a fuse, and perhaps treat yourself to an unpleasant shock.

* * *

Leave your receiver alone when there is thunder about. A ground switch in your aerial circuit is well worth while. It may save your set from utter destruction.

* * *

Keep your accumulators upright. Sulphuric acid has an undesirable effect on one's best carpet.

* * *

Look after your accumulators. Don't "drain" them utterly. Have them charged regularly, whether they want it or not.

* * *

Use clean rainwater for them if you can't get distilled water. *Don't add* acid to water. It's bad for your health.

* * *

If you are very close to a transmitting station, don't tune in for loudest signals. It is not good for the 'phones.

* * *

Keep your high-tension batteries well ventilated or they will begin to "sweat," and, consequently, deteriorate.

* * *

Hang the 'phones on a wall when you have done with them. This allows the moisture on the diaphragms to dry. Never tap the diaphragms with a pencil. Once they get bent they are useless.

Keep an eye on your lead-in tube. Damp will cause bad insulation and poor signals.

* * *

See that your valve circuits are not causing radiation. By this is meant, don't experiment with strange circuits until you know what you are doing.

* * *

Don't varnish or paint your apparatus. It won't look any the handsomer in the end, and will probably spoil it.

* * *

Avoid a gas-pipe earth—especially if you have a transmitter. The reason is obvious.

* * *

If you have a valve set and it suddenly ceases to function, don't jump to the conclusion that it is a "dud." Probably your filament accumulator wants charging.

* * *

Keep your earth lead as short as possible. This applies to aerial down leads as well.

* * *

Don't confuse Greenwich mean-time with British summer-time.

* * *

Refrain from taking your receiver to pieces in order to satisfy your curiosity as to how it works. If you are a novice the results will probably be fatal, and you will be none the wiser in the end.

* * *

Don't jump up suddenly when you hear wireless concerts. Remember, you will have the telephones on, and a sudden jerk will probably upset the whole of your apparatus.

RADIOTORIAL

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.

The first number of **POPULAR WIRELESS** has made its appearance in response to the great demand for a paper devoted to the interests of the wireless amateur.

POPULAR WIRELESS is in no sense a technical paper, although, of course, as my readers progress in their study of wireless they will become more familiar with the many technically interesting radio problems of the day.

But the boom in wireless has created a large public —hitherto not very interested, from a personal point of view, in wireless work—which now realises the absorbing fascination of the wireless telephone.

And the fact that broadcasting stations will soon supply them with a constant programme every evening has had the effect of stimulating interest to an enormous degree.

Many people will install receiving sets purely for the sake of the broadcasting programmes. They will not have the time or the inclination to make a deep study of wireless. Nevertheless, **POPULAR WIRELESS** will be indispensable to them, because it will, week by week, give the latest broadcasting news, with full particulars as to the times of the various items to be transmitted and the adjustments necessary to "tune in" to the particular wave length employed.

The experimenter—the man or woman who is handy with his or her fingers—will find fascinating constructional articles by the best experts available.

* * *

The receiving set dealt with in this week's constructional article will interest many, not only because of its cheapness, but because of its unique simplicity of design. Above all, the set works!

From time to time useful constructional articles will be given for the benefit of amateurs, so that they will be able to see the various stages between a very elementary set and a first-class receiver.

The amateur who has advanced in his study of wireless will not be forgotten, and from time to time experts will cater for his needs.

In fact, **POPULAR WIRELESS** justifies its title. After all, "popular" is a word only to be applied to something in the majority, and I feel that the majority of my readers will find this paper very popular indeed.

* * *

Everyone is talking about the broadcasting stations shortly to be in operation, and I find a good deal of argument going on about the types of programme which will be supplied.

What is your ideal of a wireless concert programme? I will award three prizes of £5 each, or the present of a £5 receiver, to the three best examples of programmes submitted to me. Write your suggested items on a postcard, and address to The Editor, **POPULAR WIRELESS**, The Fleetway House, Farringdon Street, London, E.C.

Only one list may be sent. The Editor's decision must be final. Postcards should be sent not later than Friday, June 16th.

I have retained the services of several experts to answer queries sent in by my readers. If you are in doubt, or have any difficulty at all with your set, no matter how little or how big, let me know your troubles, for troubles shared are troubles halved, especially in wireless work, although I hope they will be more than halved when you send them to me!

THE EDITOR.

WIRELESS QUESTIONS ANSWERED

The questions dealt with on this page are ones that our Technical Experts received recently from the readers of a well-known weekly journal. Naturally, subsequent issues of **POPULAR WIRELESS** will deal only with questions received from its own readers. It is thought, however, that we could not do better for a first issue than show readers the kind of questions that we are prepared to answer.

Q. I am unable to put up an outside aerial, but I have a room forty feet above the ground, and I am wondering if I would get any results if I put up an indoor aerial in it. I am only ten miles from one of the proposed broadcasting stations, and that is all I care about hearing.

A. You should expect to have very fair results with an indoor aerial, using a valve.

* * *

Q. Will I be able to receive on a frame aerial with a crystal detector set?

A. No. You will require two or three stages of amplification in order to increase the weak signals that are received when using a frame aerial.

* * *

Q. What is the best kind of a set to purchase for valve reception?

A. We suggest that you write to concerns that advertise in this and other magazines, and to others if you care to, and send for catalogues and quotations. Study these carefully with your own requirements in mind. Also communicate with radio amateurs in your district and have them tell you about local conditions. Apparatus that works in one part of the country may not work so well in other parts. Of course, you will want to bring in the short wave concerts, lectures, and other entertainments. Sets for this purpose have a tuning range of from 150 to 600 metres. The receiving range varies with atmospheric conditions. One night you may hear a station two thousand miles away with one valve, and the next night you may not be able to get it with six stages of amplification.

* * *

Q. Why are inductances for crystal receivers wound so that they are in single layers, whereas in valve sets the inductance wire is in bundles of layers?

A. Crystal receiver inductances are wound in single layers to keep down self-capacity losses.

Valve *receiver coils* are always bound in single layers, and not in "bundles." Don't get mixed up with high or low frequency amplifiers, in which super-imposed coils may be used.

A single layer coil is used when strong signals on a particular wave length are required.

* * *

Q. Please give me list of parts for a fairly good receiving set.

A. For building the valve detector receiver you will need:

100 to 150 feet No. 14 gauge copper wire, for aerial, and usual insulators and lead-in tube.
1 tuner, 180-2,000 metres.
1 filament rheostat.
1 accumulator, 6 volts and as many ampere-hours capacity as you want to pay for. Smaller ones need recharging oftener.
1 high tension battery, 60 volts.
1 pair 4,000 ohm 'phones.
1 valve holder, with valve.
1 grid leak and grid condenser, .00025 microfarad capacity. Wire for connections should be insulated. Stranded wire has better conductivity. The larger it is, the less resistance, but don't get it so large and stiff that it is hard to manage. Look at a ready-made set and see how it is wired.

If you are going to build a set we suggest that you read radio advertisements, secure catalogues, compare goods and prices.

* * *

Q. I am situated midway between two stations to which I listen every evening. When these two stations are both transmitting telephony I hear an extremely high-pitched whistle going continuously; when either of them stops the whistle ceases. Both stations are listed as transmitting on a wave length of 360 metres. Is there something wrong with my receiver or is this some unexplained electrical phenomena?

A. The trouble is not in your receiving set. All modern stations now use the valve tube oscillator for generating the extremely high frequency currents that are used in radio telephony. The frequency of these currents lies above the frequency that the human ear can detect; that is why we hear nothing when the speech stops, although the radio wave is still being sent out. When two stations are generating two sets of currents of nearly the same frequency, the two currents interfere with each other and produce the peculiar whistle that you hear in the receivers. At present there has been suggested no remedy for this phenomenon except to change the wave length of one of the transmitting stations.

Q. Can a 120 volt A.C. supply be used for a valve filament, with a suitable series resistance?

A. No; there would be too much induction in the 'phones.

* * *

Q. Would four Leclanche cells do for a carborundum crystal?

A. We should say one too many.

* * *

Q. Can I really hear a man speaking by wireless?

A. You can. Try it and see.

WIRELESS CLUBS

Publicity in the columns of POPULAR WIRELESS is open to all Amateur Wireless Clubs in Great Britain and the Colonies.

Secretaries are invited to send weekly reports of their clubs activities to the Editor, together with photographs of interest to amateurs.

The latter will be paid for at our usual rates.

Q. Can I reduce the wave length of my set by putting a variable condenser in series with the aerial?

A. You can. We suggest putting the condenser in series with your earth as more preferable.

* * *

Q. Is a condenser of 0.00045 mfds. suitable for use with a crystal?

A. Yes.

* * *

Q. Which is best for reception, a single wire aerial or a twin wire aerial.

A. A single wire aerial. See article on how to erect an aerial in this magazine.

* * *

Q. Can small pancake coils be used for a loose coupler for a crystal receiver?

A. Yes.

* * *

Q. Will telephones of 2,500 ohms do for wireless telephony reception?

A. Moderately well; 4,000 ohms would be best.

* * *

Q. Can you give a formula for working out the dimensions for capacities of variable condensers?

A. For a condenser with equal parallel plates, the capacity is approximately given by the formula:

$$c = \frac{kan}{41.1d}$$

where c = capacity of condenser.
k = dielectric constant of material between the plates (air = 1).
n = total number of plates, minus 1.
a = area of overlap of plates.
d = distance between plates.

* * *

Q. Is it possible to hear Australian stations with one valve?

A. It is not.

* * *

Q. Do you think I could learn morse code at fifteen words a minute over the week-end?

A. We don't.

Questions should be clearly and explicitly written, and should be numbered and written on one side of the paper only. All queries must be accompanied by the full name and address of the sender, which is for reference and not for publication. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume." Address The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon St., London, E.C.

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POPULAR WIRELESS, June 10, 1922.

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No. 2 — of the Great Wireless Paper

POPULAR WIRELESS

3d.

Weekly

No. 2. Vol. I.

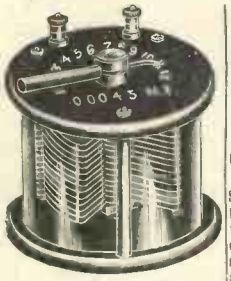
June 10, 1922.

RIVER WIRELESS

Why not fit your canoe with a receiver?

EVERYTHING FOR THE AMATEUR

PACKED WITH PICTURES—EXPERT ADVICE
AND ALL THE LATEST WIRELESS NEWS



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Of a quality that has made them famous amongst every wireless experimenter throughout the country.

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Capacity to .00036 mfds. Each 17/6 post free.

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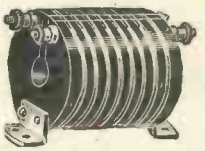

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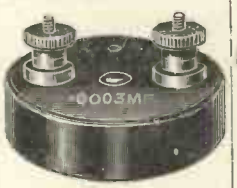

Blocking and Fixed Condensers

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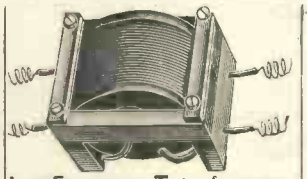
MHW

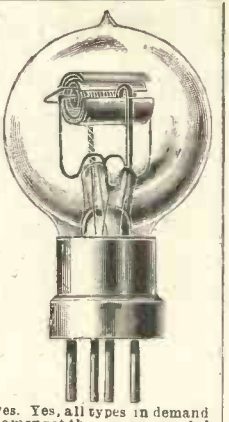
MITCHELL'S *of* PECKHAM

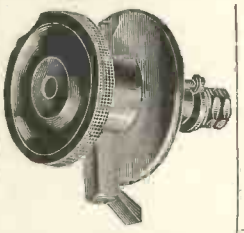
Wireless Headgear

wound to a total resistance of 4,000 ohms, recommended highly for crystal or valve sets without having to use a telephone transformer, 35/- per pair, postage 1/- extra. You will find these exceedingly comfortable to wear, and compare with very expensive types favourably.



Low Frequency Transformers. Not as illustration, but our latest "Hedgehog" design, free from noises, and powerful amplification, with lowest losses.
Price, each, 17/6 & 21/-. Thoroughly recommended; money back if you are not satisfied. Two, three, and four - valve amplifiers, of course, are stocked.





Control Knobs

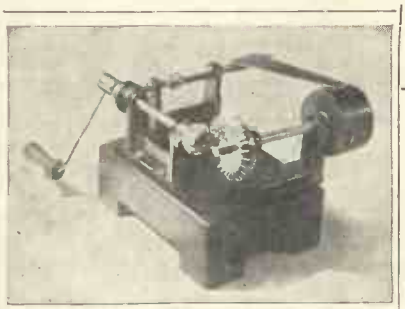
For making up your Tuners, etc., 1½ in. diameter ebonite knob, fitted with laminated sweeping arm (Radius 1¼ in.), as fitted to our instruments. Each 2/6, postage 3d. extra. Many other patterns also stocked. The Ebonite knobs only are 1/- each post free. Cheaper if taken in half-dozen lots

Valves. Valves. Yes, all types in demand stocked, and amongst those recommended are "MARCONI—OSRAM" "R" Type Receiving Valves at 26s. 6d. each, postage 6d. extra. Mullard "ORA" Valves at 15s. each, postage 6d extra. The V. 24 in. Marconi valve at 24s. 6d. Please bear in mind that valves are rather short at present, but we will advise when same can be forwarded. High Tension Batteries are stocked for all valves at competitive prices. Your enquiry should accompany your other valve queries

Valve Panels. The No. 16 Valve Detector Panel is our standard, and at 37/6 post free, represents the finest valve in Great Britain. Make a point of inspecting this when in London. Valve Panel No. 17 is our low frequency amplifier for attaching to the No. 16 with four brass straps. This is priced at 55/-. To convert both simultaneously into high and low frequency amplification, have our "Duo-Amplion" (patents applied for). More about this wonderful invention in the course of a week or two.

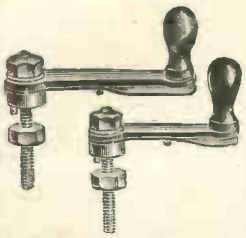
Valve Tuners

Built from solid ebonite, and finished in the Mitchell way. All wiring silk insulation and the design such to recommend them for use with valve circuits only. Not suitable for crystal work. No. 1 Tuner, having a range from 300 to 1800 Metres. No. 2 Tuner having a range from 1600 to 6000 metres. Price either type, £4 15s. Postage 1s extra. A No. 11 condenser should be used in conjunction.



The "Lokap" Machine

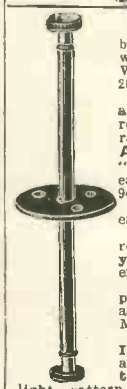
For full particulars write for pamphlet, or refer to last week's advertisement in this journal. It is the only machine in the world of its kind which enables amateurs to make their own lattice inductance coils for the price of the wire only. Price 25/-, with everything necessary. Postage 1/- extra.



Switch Arm 1 in. radius 1s. 9d.
Switch Arm 1½ in. " 2s. 3d.
Switch Arm 2 in. " 2s. 6d.
Postage 3d.

CONTACT STUDS to suit above arms:—
No. 163 ¼ in. Head, ¼ in. long, dozen, 1s. 6d., postage 2d.
No. 164L, 3/8-in. Head, ¼ in. long dozen, 1s. 6d., postage 2d.
All complete with nuts and washers.

Over 15 pattern contact studs stocked. Make a point of comparing our types with others.



Aerial Material, etc.

Flag Masts, Bamboo Masts, Bamboo Spreaders see "blue slip" which accompanied our catalogues. WE ERECT MASTS WITHIN A 20 MILES RADIUS OF LONDON.

6-foot selected bamboo spreaders, average 1½ ins. diameter 1s. 6d. at retail stores. Carriage forward when railed.

Aerial Insulators. Mitchell's "Chain" type, recommended 1s. each, or 10s. 6d. per dozen, postage on six costs 9d., on one dozen costs 1s.

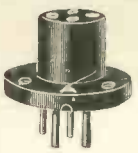
Aerial Pulleys. Heavily galvanized, 1s. 6d. each, postage 5d. extra.

Rope for Halyards, heavily 'doped,' with anti-rot compound which will not come off and spoil your hands, 1s. 6d. per dozen yards, postage 9d. extra.

Aerial Wires. Stranded 7/23 enamelled wires 6/0 per coil of 100 feet, postage 9d. Stranded 5/24 enamelled coil of 100 feet 5s. 6d., postage 7d. extra. Many other lighter and heavier gauges stocked.

Lead-In Insulators, as illustrated, light pattern 4s. 6d., heavier pattern 5s. 6d. postage 6d. extra, either pattern. **HIGH TENSION CABLE** for leading in from insulator, 1s. per yard.

Valve-holders, 1/6, 1/9, 2/6, 3/6, 6/6 each



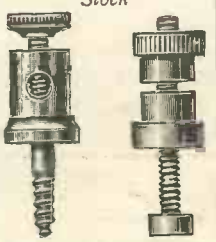
Also supplied mounted in groups of two or three, on ebonite, or also fitted in hard-wood cases.

"Dot" Grid Leak for Valve Circuits.

as illustrated, 4/6 each, or larger and superior pattern 7/6 each. Leak units, and high resistance units also stocked in many sizes and qualities.

Filament Resistances, for Panel or Ordinary Mounting. Panel mounting types, each 5/6 post free, or the standard "MEW" Highest Grade ordinary types at 9/6 post free. When ordering state if required for 1, 2, or 3 valves.

TERMINALS
Large Selection in Stock



No. 1 Wood Screw	1/-	doz.
No. 2 " "	2/3	"
No. 3 " "	2/9	"
No. 4 Illustrated	3/9	"
No. 16 "	2/6	"

MITCHELL'S FAMOUS ACCUMULATORS.
REDUCED PRICES

4 volt 20 amp.,	17/6	and	21/0
4 volt 40 amp.,	22/6	"	27/6
4 volt 60 amp.,	25/6	"	37/6
4 volt 80 amp.,	35/6	"	47/6
6 volt 20 amp.,	27/6	"	35/0
6 volt 40 amp.,	36/0	"	42/0
6 volt 60 amp.,	45/0	"	59/0
6 volt 80 amp.,	55/6	"	75/0

Carriage extra on all above at cost; see that you enclose sufficient to cover; this prevents delay in dispatching

MITCHELL'S ELECTRICAL & WIRELESS, LTD.

Pioneers of the Home Wireless Outfit at £5 (carriage paid Gt. Britain). Complete with 4,000-Ohm Double Headgear, Aerial Wire & Insulators.

188 RYE LANE, PECKHAM, S.E.15

48-*Page Illustrated Wireless Catalogue, post free, 6d.*

Wholesale & Export Section: McDermott Rd., Peckham, S.E.15. Telephones: New Cross 1540 & 1541.

Popular Wireless

TOPICAL NEWS AND NOTES.

"Be Prepared."

WIRELESS will now occupy a prominent part in the training of Boy Scouts. Amateurs in many parts of the country report that they have formed regular classes for young Scouts, who are taking to the work as only youngsters can.

* * *

The "Father of Wireless"!

PROFESSOR BRANLY, regarded by France as the father of wireless telegraphy, because of his coherer which makes possible the practical use of Hertzian waves, is said to have refused 20,000 francs offered him by the French Chamber of Deputies for the purpose of continuing his radio research work. It has lately been reported that Professor Branly would soon discontinue his laboratory work because of lack of funds.

* * *

Another Prodigy!

MRS. ROSINA KNIGHT, of Peckham, states that she has been experimenting with wireless at home since 1913, and is now training the youngest member of the local Wireless and Experimental Association, Master Eric Knight, aged 2½ years, to become efficient.

Another enthusiast, who uses wireless to relieve the monotony of her household duties, resides at Cheltenham, where she has been indulging in her hobby for the last two years.

It would seem that young Robert Garcia, of the United States, is by no means the youngest amateur in the world.

* * *

Pigeons and Wireless!

A PIGEON flight recently organised during the voyage from New York aroused much interest among the passengers of the White Star liner Baltic.

Six pigeons, each of which had previously flown in five hundred-mile races, were lent to the ship's purser by an American friend, and the birds were liberated when the ship was a hundred miles out from New York.

According to a wireless message received on board next day, five of the birds, which had each been named and numbered, were back in New York within a few hours of their liberation, the first home accomplishing the flight in three hours ten minutes.

* * *

Wireless on Aeroplanes.

AN agreement which is being drawn up with the British aircraft companies operating on the recognised air routes between England and abroad under the subsidy scheme will include a clause providing that all approved fleets of aircraft shall be equipped with wireless.

The agreement containing this clause has not yet been signed, but at present all the large aircraft, fifteen in number, trading regularly between London and Paris and London and Brussels, are fitted with wireless, and communicate regularly with the Air Ministry ground stations.

As regards foreign machines on the London-Continental route, one French machine is at present fitted with wireless, and the French companies have agreed that all their large passenger-carrying aircraft on this service shall be similarly equipped by the middle of August. The Dutch are also arranging to equip with wireless their aircraft on the Holland-England route.

* * *

The "Lonely Island."

FOR the first time news from the lonely island of St. Kilda has been received by wireless telegraphy. This is made possible by the installation of wireless on board the s.s. Hebrides, the steamer which carries mails, etc., to St. Kilda during the summer, and which has just made its first call since August, 1921. Mr. Blair, purser of the Hebrides, states that the population of the island remains at 73, there having been one birth and one death during the winter. Mr. Barlow, of the Education Department, was enabled, through the steamer's visit, to accomplish the annual examination of the island school-children.

* * *

Effect of the Boom.

MAKERS of wireless receiving sets and their component parts are unable to meet the enormous demand which has suddenly arisen and is daily growng.

One firm alone has received an order for 10,000 sets. Applicants for sets are receiving polite notes from the retailers explaining that their orders will be dealt with in rotation.

A GREAT INVENTOR.

Professor J. A. Fleming was the first man to see the possibilities of the electron valve in connection with radio communication. For some years he was consulting engineer to the Marconi Co., and his researches in wireless work have given him a world-wide reputation.

The number of people who are ordering the various parts of a wireless receiving equipment and putting them together themselves is remarkable. It is my belief that the average Englishman, when he takes up a new hobby, wants to master it thoroughly. This is certainly the case with wireless.

* * *

Bad Luck.

THE Manchester Wireless Amateurs Association had very bad luck with their new eighty-foot mast the other day.

A party of members went out to erect the 80-foot metal mast which had been delivered. But with such tackle as was available, the strain on the mast was too great, and it buckled and broke in three parts.

The club is not disheartened by this failure, and a new mast has already been ordered.

That is the right spirit. "Nil desperandum" is not a bad motto for a wireless association!

* * *

The Progressive Spirit.

THE Manchester Association is one of the largest in the provinces, and now that the prospects of "listening-in" have become much more promising new members are being daily enrolled.

To provide the club with the widest possible facilities is the object of the Baguley station. A site in the midst of pleasant country has been obtained from an interested enthusiast and is

Master Eric Knight, of Peckham, aged 2½ years, is the youngest wireless amateur in Great Britain. He will sit for hours with the 'phones on listening in, and greatly resents his mother's call when it is bedtime.

NEWS AND NOTES

(Continued.)

is proposed to make up week-end parties for a country jaunt, with the added attraction of being able to "listen-in" to the world.

The Editor asks me to remind club secretories that he will be pleased to publish weekly accounts of wireless amateur associations together with any photographs of interest.

* * *

The "Daily Mail" and Radio.

THE "Daily Mail" proposes to provide its readers possessing wireless sets with good music and other entertainments by wireless.

* * *

From the Sad Land.

THE radio creates a new world. It's a wonderful invention. Think of the joy of being able to connect up with Cuba and hear our friends drink!—"Evening Telegram," New York.

* * *

Still Growing.

THERE are now in the United States 71 licensed broadcasting stations, of which 7 are department stores. Of the 7, Philadelphia is the location of 3; New York of 1; Newark, N. J., of 1; St. Louis of 1 and Los Angeles of 1.

* * * *

Railway Radio.

MR. PIKE PEASE, Assistant Postmaster-General, has stated that permission was given in 1920 to the Midland Railway Company to establish wireless communication between certain points of their system, and to the Marconi Company to conduct tests of sub-communications on the system of the London and North-Western Railway Company.

So far as I am aware, no experiments in wireless communication on railways have been carried out beyond preliminary tests.

* * *

Wireless to Switzerland.

TEMPORARY permission has been given to the Marconi Company to commence a service between London and Switzerland, but this is subject to withdrawal if a suitable agreement is not arrived at between the Government and the company as to the conditions on which such licences may be granted.

* * *

Signals in a Coal Mine.

A SUCCESSFUL experiment in wireless communication between the earth's surface and places in coal mines was recently made in the Blue John Mine, Castleton. A receiving set was taken into the cave known as the Lord Mulgrave's Dining Room, about 280 ft. from the entrance and a quarter of a mile in any direction from the open. Here a 50 ft. aerial was suspended across the cave, and with a small apparatus signals were received clearly from Poldhu, in Cornwall, from Nauen, and from other high power transmitting stations.

* * *

Broadcasting for South Africa.

I HEAR that the Marconi Company has forwarded to the South African Union Government proposals which, if accepted by the Government, will mean the early establishment of a broadcast wireless system in the Union.

The company requests control of transmission, or broadcasting licences in certain areas. The company offers to sell receiver sets at from £5 to £50 apiece.

* * *

Egypt and Wireless.

THE wireless station at Abu Zabel (twenty-five miles north of Cairo) is at last open for full wireless public service between Egypt, the Sudan, Syria, and the British Isles and the Continent of Europe.

The call sign of the station is S U C, and 4,500 and 5,400 metre wave lengths will be used.

Radio in Russia.

SOVIET Russia will soon have a wireless station capable of trans-Atlantic service.

The station is in progress of erection at Bogorodsk, near Moscow, and is expected to be one of the most powerful in the world. Its towers will be more than 900 feet high, which is 300 feet higher than the great German wireless station at Nauen. The new Russian station will have a power of 500 kilowats.

Soviet Russia has made great progress in wireless communication in the last four years. The station at Moscow is able to hold telephone conversations with another at Chita, Siberia, 3,000 miles distant. Russia now has about thirty-eight sending stations and 290 receiving stations.

New wireless stations will be erected within

This amateur gets quite good signals from local stations using a portable "fan" aerial.

the next few months at Tashkent, Kharkov, and Novo-Nikolaevsk, as well as at the radial points of the Siberian water basin and along the Arctic sea coast, where nine stations were installed in 1921.

* * *

A Penniless Inventor.

THE "Times" correspondent at Budapest learns that a Hungarian engineer of the name of Szabo has invented a device for printing at limited distances by electric current as well as by wireless. This apparatus can be fitted to any telegraphic transmitter.

The process is described as follows: Complete sentences are set up in lines and columns in the transmitting apparatus, and a corresponding impression is conveyed to the receiver either by electric current or by wireless waves. The invention, it is said, will make it possible for newspapers to appear simultaneously in different parts of the world without making use of the post or telegraph.

Szabo gave a lecture yesterday to a company of scientists in the workhouse, where he is at present living, as he has no means of subsistence.

* * *

A Big Belgian Radio.

A 500-KILOWATT radio station is being erected at Ruysselede, near Bruges, by the "Société Indépendante Belge de Télégraphie Sans Fils." It will be able to communicate with North and South America, as well as with the Congo in Africa. It will be possible to receive four messages simultaneously. Another big radio station is to be erected by the government in the Congo.

* * *

Harrods' Enterprise.

A WIRELESS "listening-in" lounge has been opened for the benefit of shoppers at Harrods. There is accommodation for about forty persons, who will be able to hear the latest news from all parts of the world, and also to obtain expert advice on any question relating to wireless.

* * *

Something to be Thankful For.

WE understand that steps are to be taken to prohibit the ether being made a chaotic Bedlam by wireless advertising.

In America the broadcasted concerts are mixed up with discreet recommendations to buy So-and-So's tooth-powder, and So-and-So's boot-polish.

That sort of thing is enough to kill wireless broadcasting right away.

* * *

"Talking Films"

A NEW method of producing talking films has been tried successfully in a Chicago studio.

An actor talked into a wireless telephone while watching his movements in a film on the screen. The film was a "master reel," which controlled the projection of a number of identical films at various other places. All the films were running at the same moment under a new system of electrical timing.

At the same time the wireless telephone transmitted the actor's voice, and sounds, such as those of revolver shots, bells, and whistles, as they occurred in the picture.

ARIEL.

Broadcasting Programmes

The things you can hear every evening of the week on your set.

Although the regular broadcasting stations are not yet in operation, there is no need for the interested amateur to delay in purchasing a wireless receiver.

Apart from the weekly concert sent out by the Marconi Co. from their Writtle station, near Chelmsford, and the music and speech from The Hague, on Sunday afternoons, there is a fairly regular supply of music and speech any evening of the week between the hours of eight and twelve.

Quite a number of amateur stations may be heard any evening working on wave lengths of 180 and 1,000 metres, and some of the gramophone items and piano solos are excellently transmitted.

The great drawback at present is, of course, the fact that no specific time-table can be given for these impromptu amateur concerts; but amateurs listening in between eight and twelve on the wave lengths mentioned are sure to hear speech or music of some kind. Saturday evenings, in particular, are favourites with the lucky ones who possess transmitting licences, and they usually do their best to entertain their less fortunate brethren who do not have transmitting sets.

Eiffel Tower Radio (call sign F L) usually transmits telephony on Sunday afternoon on a wave length of 2,600 metres. The Hague Concert begins at 3 p.m. and ends at 5 p.m. The station call sign is P C C G, and the wave length 1,070 metres.

The Marconi station at Writtle (call sign 2 M T) broadcasts a concert every Tuesday evening on a wave length of 400 metres, commencing at 8 p.m., B S T.

Catching Crooks by Wireless

Never has so large a net, or net with so fine a mesh, been made as that which the police of the world are now throwing over criminals by adapting wireless to the cause of justice. Hundreds of miles can be covered, and the criminal tracked to the very house in which he is working.

A SHARP, cold wind blew up the St. Lawrence from the east, and with it came the fog from the Atlantic. Four masts and a funnel loomed up indistinctly, away out on the waters where, a few minutes before, sunshine had held sway.

From the shadow of the wharf at Father Point a skiff shot out, and lost itself in the mist. The dismal horn of the steamer hooted, and the bell from the lighthouse buoy sent out its warning message.

In the skiff four sailors—pea-jacketed, brass-buttoned, visor-capped officers of the pilot service—rowed hard with grim determination.

On the steamer Montrose, five or six miles down the river, a nervous, careworn passenger paced the deck. "Half-speed!" rang the bells from the bridge.

"What are we doing now?" inquired the passenger of Dr. Stewart, the ship's surgeon.

"This is Father Point, Mr. Robinson, and we take the pilot aboard here," replied the doctor. "You can see the boat coming out to meet us—yes, over there!"

"There seem to be a good many pilots in the boat, doctor," remarked "Mr. Robinson." And as he scanned the approaching craft there was evident anxiety stamped on his face.

"Yes," replied Dr. Stewart; "there are four."

"Stop!" clanged the bell from the bridge to the engine-room. The men in the skiff rested on their oars, a rope uncoiled neatly, and the little craft was drawn alongside the larger vessel.

A second later and Inspector Dew, of Scotland Yard (disguised as a pilot) and his companions, including the real pilot, stood on the deck of the Montrose.

The little party stood chatting with the captain of the Montrose—Captain Kendall. Dr. Stewart and "Robinson" were walking up and down the deck. Inspector Dew glanced sharply at "Robinson." Yes, there was no mistake; he was his man.

Quietly the inspector went up to "Robinson."

"I want to see you for a moment below," he said; then, turning to Chief-Constable McCarthy (also disguised) who had accompanied him, said "That's the man."

"I arrest you in the name of the King," said McCarthy to "Robinson." "You are my prisoner. Anything you say will be taken down in writing and used against you at your trial."

And Dr. Crippen, the murderer and mutilator of his second wife, Cora Crippen, was an arrested man.

A few minutes later a woman's scream from below told that Miss Le Neve, still in her disguise as "Mr. Robinson's" son, had also been discovered and arrested.

These arrests had been entirely brought about by wireless. Two hours out from Antwerp, Captain Kendall had had his suspicions that amongst the passengers on his ship he numbered the wanted Dr. Crippen and Miss Le Neve. He made astute investigations, and two days later was so sure that he was right that he wirelessed to his owners. They communicated with Inspector Dew, and the Scotland Yard detective rushed off to Liverpool to catch the next boat to Canada. It happened to be the Laurentic, and landed him in Canada just before the Montrose arrived.

On the morning of the arrest the following wireless had reached him from Captain Kendall of the Montrose:

"Crippen is having breakfast. Suspects nothing. Your instructions carried out to the letter. Le Neve not out yet. Kendall."

Inspector's Dew's instructions had been sent by wireless, and entirely owing to the then practically new invention, and to the clever handling of the situation by Captain Kendall, Crippen was arrested.

Captain Kendall told Dew afterwards:

"Crippen would often sit out on deck and look up aloft at the wireless aerial and listen to the cracking electric spark as messages were sent out by the Marconi operator. He said 'what a wonderful invention it was.'"

That is the story of the first arrest ever made by wireless. That was twelve years ago, but it gives a hint of the possibilities of using wireless in catching crooks.

Since then the American police have officially "adopted" wireless. A new radio section of the Police Department has been inaugurated, and new ways of using radio for the apprehension of criminals are being devised.

The following case happened only a few months ago.

A powerful two-seater touring car sped swiftly along the perfect white concrete road of a state in America. Ahead stretched a line of blue-black hills, and as the great car sped onwards, the miles rolled under its heavy wheels with steady monotony.

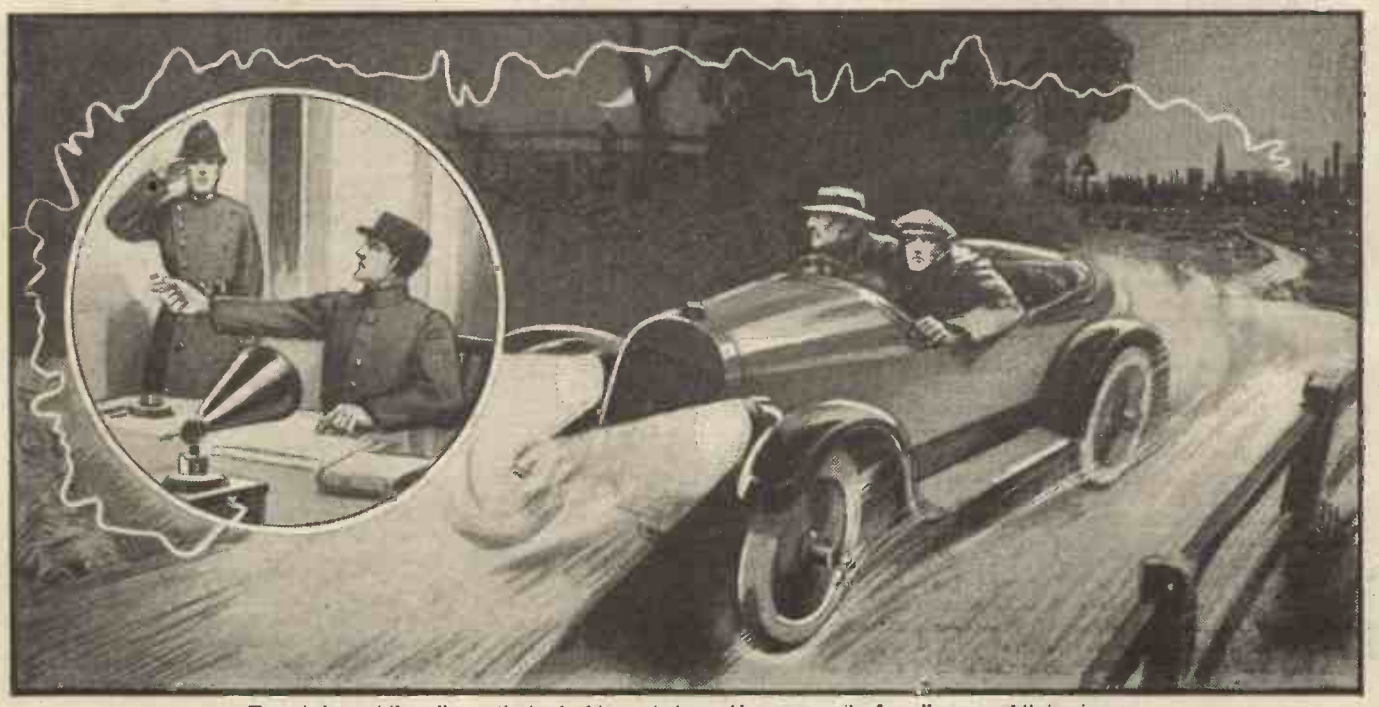
In the front seat of the car there were two figures. One, with his hands on the steering-wheel, peered anxiously ahead, his whole attention centred on getting every ounce of speed out of the engines, and keeping the car to the road. The other, not without signs of anxiety, glanced from time to time over the back of the car, at the road unwinding behind them, at the distant country through which they had passed, and even at the skyline on either side of the open road.

Suddenly, across the hillside in front of them, a shaft of light flashed. For a moment it shone brightly, then disappeared, only to appear three times more before it finally faded away.

"Good!" muttered the driver of the car. "Jerry has not failed us. That was his signal. The telegraph-line has been cut. No one can now get through, even if we are seen and recognised, to warn the police by telegraph. We can go slower now."

Speed was reduced by half, and the car proceeded at a more leisurely pace.

(*Continued on page* 20.)



How wireless put the police on the track of two notorious robbers many miles from the scene of their crime.

PAST AND PRESENT

I DON'T suppose that there is a more annoying thing to the enthusiastic young wireless amateur when he is "listening in" himself, or, worse thing still, when he is proudly "showing off" his apparatus to his friends, than to have his set give trouble in the middle of an interesting conversation or a pleasant musical selection that is being sent out from a distant station.

The glory of triumph is turned to the mockery of failure. And yet if this happens to the reader, I ask him not to get wild and blame his receiving set. His friends may smile sarcastically, and say that they always *had* believed wireless had been over-estimated; but never mind, speak up and defend your set.

In all probability the fault does not rest with the receiving set itself. Perhaps you have overlooked some trivial adjustment. At any rate, the instrument is a far, far better thing than you could have obtained a very few years ago.

Those of us who have been associated with wireless since its early days of development realise what marvellous strides have been made. Nothing short of miracles in the way of manufacturing have been accomplished to achieve the production of the precise, finely tuned, simply adjusted wireless sets that are placed on the market to-day at such cheap and reasonable prices.

I can remember my first wireless set. The only detector that existed in those days was the coherer, so-called, I think, nowadays because of the incoherence of the messages it received!

It consisted of a small glass tube filled with a number of iron filings between two silver plugs. This primitive detector was placed directly in the secondary circuit. When the electro-magnetic waves were caught by the aerial, they were carried into this detector, where they caused the iron filings to cohere together and form a path for a current from a local battery to pass through the local circuit. By this means the recording device was operated.

My little coherer was so sensitive that it used to be affected by the vibration of the ship. I worked with one for over nine months, but there were times when I was not quite sure whether I was receiving real wireless messages from some other ship, or just listening and puzzling over our own ship's groans and complaints as it rocked in the toils of the sea.

Nevertheless, I thoroughly enjoyed "nursing" my first wireless. It was a baby compared with the instruments of to-day, but even those meaningless strings of dot and dash messages were interesting, and helped to while away the monotonous time of the pioneer wireless officers' life.

In those days there were probably not more than a dozen or two ships fitted with wireless apparatus. I have sat at my instrument for hour after hour without receiving a message, or even dreaming of hearing actual speech by wireless.

The ether was in those days, compared to what it is now, one great silent sea, and that was not so very long ago—only eighteen years, to be exact.

Compared with the little wireless room, the rest of the ship, its parts and its method of working, were the acme of simplicity. One of my laymen friends in those days told me once, when I took him in to see my "wireless H.Q.":

"I've a hazy idea, although I have no technical knowledge at all, what the various parts of the mechanism of a ship are, but I'd go mad if I was shut up in your wireless den, alone! Gadgets here, coils there; hundreds—millions of them!"

So, please, if now and again your receiving set "lets you down," and you spend hours trying to discover "what is wrong with the beastly thing," cut out your grumbling. The present-day receiving set is simplicity itself, compared with the pioneer set, and will work wonders with a little care, understanding, and patience.

A Compact Modern Receiver.

CATCHING CROOKS BY WIRELESS.

(*Continued from page* 19.)

His companion laughed a nervous but relieved laugh.

"Splendid!" he said. "That does the trick. I think we have thrown off that fool patrol of policemen on motor-bicycles. Our détour led them astray; they are well off on a wild-goose chase south. Good riddance to them!"

"Thirty is my speed from now on," agreed the driver. "In three hours we'll be in the heart of the hills. Then, if anybody can pick us up and connect us with the robberies in Johnstown and Pittsburgh they're magicians, not policemen."

Half an hour later the man beside the driver started suddenly.

"Douse the lights, Jim," he said, "and turn up the next side-road you come to; there's something following us behind."

Jim obeyed; a side-road appeared, and he turned the car up it. A hundred yards drive and they were completely hidden from sight of the road. They stopped the car, and crossed to a sheltered knoll from which they could watch the main road for a mile or more in either direction.

A strong wind, sweeping from the direction in which they had just come, carried a sound which made them curse. Faintly, but clearly and unmistakably, came the purr of the super-powered motor-cycle.

"The patrol!" snarled Jim.

"Coming like blazes, too!" agreed his companion. "And they would have overtaken us in another ten minutes. I wonder what the deuce put them on our tracks again?"

In the distance, a mile back along the road they had just come, one, two, three figures topped a hill and swept towards the watching fugitives with the speed of an approaching train.

They were the police patrol, searching for the two men in the two-seater touring car. It was midnight now; any car out at this time of night on these deserted roads would be at once suspected.

"It's the cow paths for us the rest of the night," announced Jim. "Every highway and main road in the country will be marked, and by morning every man in the police force will be watching for us. We've got to find a hiding-place before daylight, and keep off the main roads doing it, too. We're all right as long as we can keep clear of the police."

They returned to their car, and blessing their silent-running engines, started along their fifty-odd miles of broken country roads and cart-tracks.

The rose-tint of dawn was fading, and the first shaft of sunlight was striking the morning sky when Jim steered the car over the last mile of road which separated them from a place where they knew they could hide without fear of discovery until it was safe for them to venture forth again.

Throughout the whole night they had not seen a single soul, except for the police patrol, which had now doubtless sped on another wild-goose chase along the main road. Only half a mile more and the fugitives would be in their place of refuge.

Suddenly turning a corner they came upon a farm, and there, chopping wood in the yard, was a lad. He stopped working as they passed and gazed at the dust-covered car. But he was only a farmer's boy, and they paid no heed to him.

"And the house hasn't any telephone," remarked Jim, to his companion's unspoken query. "We're safe now. I don't suppose the police have been down this valley for the last fifty years."

Two hours later three policemen on motor-bicycles came down the very road the two-seater had traversed. They stopped for a moment at the farm where the boy had been chopping wood when Jim and his companion had passed, then proceeded after the car at full speed.

* * *

"Just for the good of my soul," requested George Cantilly, leader of a notorious gang of bank robbers and motor-car thieves, as less than half an hour later the handcuffs were snapped on his wrists in the hiding-place he had thought so secure, "tell me how you followed us. Where did you pick up our trail? For fifty bloomin' miles we've followed cow-paths and cart-tracks; we'd like to know how you stuck to us so close."

The officers smiled knowingly; then one of them replied:

"We didn't trace you by tyre-marks or any means like that. Three hours ago we had no idea that you were within a hundred miles of here. We'd heard from police-headquarters that you had gone towards Philadelphia. Scores of policemen are probably scouring that road now."

"Then is it sheer bad luck you've just tumbled on us here?" demanded Jim.

"Luck—and wireless! A farmer's boy has fitted himself up a radio-set in the farm half a mile back. He got the news broadcasted from H.Q. giving your description. He saw you pass two hours and a half ago, and informed the police. We were on your track in a jiffy. Any more questions? I suppose it is bad luck—for you—that kids, even out on remote farms, have got the wireless craze and spend their time listening-in. But best step forward, please; we'll take those handcuffs off when we've got you safe in a police-cell."

Cantilly and his confederates are now working off a fairly long sentence of imprisonment.

(Other interesting stories of crook catching by wireless next week!)

MODERN MAGIC

Our contributor pays a visit to a twentieth century wizard and is delightfully disappointed.

DURING the period of my extreme youth I suffered from the dual handicap of a lively imagination and the tongue of a loquacious nurse whose fertile brain could conjure up giants, fairies, gnomes, hobgoblins, witches, pixies—in short, the whole galaxy of imaginative beings in whom our medieval forbears so firmly believed.

It is, therefore, not surprising that when I journeyed forth with my guide in search of the home of modern wizardry, my mind was obsessed with the vision of a little old man bent of back and grey of beard, with little bright black eyes and hooked nose, whose walnut-tinted face was prodigiously wrinkled, and whose claw-like hand stirred a fearsome brew in a steaming cauldron, the while he muttered incantations into the ear of a big black cat with green eyes.

Dr. Nikola Up to Date.

It was at dusk, too—"'twixt lights"—the time when the most potent philtres were mixed for men and maids, and the most deadly palsies and other misfortunes called down upon the unsuspecting heads of those folk who had unluckily evoked the seer's displeasure. My mind had followed the art of things mystical through the centuries as far as crystal-gazing, when I was aware that my guide was speaking, and, guiltily hurrying forward, I entered a small room.

My first feeling was one of disappointment. No huge black cat greeted me with arched back and hissing tongue; there was not even a tabby kitten. The room was innocent of stuffed owls and crocodiles, and the big black cauldron was only conspicuous by its absence.

There was no little old man in a sugar-loaf hat, with half-moons and stars plentifully besprinkled over his long gown. There was not a beard in the room.

Instead, I saw a spruce, clean-shaven young man in a well-cut lounge suit, whose hair, brushed straight back from his forehead, was surmounted by a shining steel band which terminated in two discs covering his ears. Anything more unlike a dabbler in the black arts—even a twentieth century wizard—I have never seen. On a small table before him stood an intricate arrangement of switches, of little black circular discs and tiny brass arms which rotated over a series of brass studs, and an oblong case into which half-a-dozen small electric light bulbs had been fitted.

A wire rose perpendicularly from some part of the apparatus, and disappeared into a black tube which vanished through the roof—a modern wireless set.

A telephone filled that position upon the table which should have been occupied by a grinning skull, and the only wand carried by my magician was a lead pencil. I began to feel resigned.

In a few murmured words I was introduced to this disappointing wizard, and to wireless telegraphy. Suspecting nothing, I was prevailed upon to take a chair and a cigarette, and to adorn my head with one of the shining steel bands which fixed the two innocent-looking discs over my ears.

I have said that it was becoming dark. My companion reached forward in the gloom in front of him and touched a switch. The half-dozen little electric eyes sprang into being in the gloaming and fixed their steady, unwinking stare upon our faces.

It was not, however, until my sorcerer began slowly to move the various little brass arms that I realised he was a wizard, after all. For suddenly there came a voice in my ear, clear and distinct: "Hallo! hallo! Croydon aerodrome speaking; your speech is good, but weak." And I realised that I was many miles from Croydon and that the phantom voice was speaking into my ear from out of the darkness.

The Magic Circle.

The little brass arms were moved again, and also a small black circle—surely the magic circle—which protruded from an instrument upon the table. Another voice was speaking, coming to me across the infinite spaces of the heavens. It spoke in French, and seemed greatly concerned about the weather.

"Eiffel Tower, Paris," said my magician "giving out a meteorological report."

I said nothing. Paris was even more distant than Croydon. Suddenly the voice ceased, and a burst of music took its place, followed by a song from the French capital. But this was not enough to satisfy the craving for annihilating distance which now possessed my entertainer.

The Elfin Bell.

Once again his fingers moved over the little discs, and a peculiar sound, possessing beats like notes struck from an elfin bell, and yet containing something suggestive of a whistle, came to my ear.

"Continuous wave Morse telegraphy from Berlin," I was informed.

Then I was suddenly switched off from Berlin to Rome, and from Rome I came home so swiftly to Oxfordshire that I was left breathless. Two more small lights were added to our apparatus, and the manipulation of the discs and knobs and circles continued.

Again I heard the elfin bell, but this was a whisper only, as if the fairies had muffled the tongue.

"New York," said my wizard, in exactly the same tone of voice as he would have said "Next-door."

When eventually I rose to leave, the room had assumed a different aspect. Someone had switched on the electric light, but even this could not disperse the fascination and mystery of that silent chamber. I backed to the door, murmuring such thanks as the spell under which I had laboured would allow. I had a strong desire to search an adjacent cupboard, which I felt positive contained a horned bat or two, and perhaps a toad or a frog.

Then, as the influence of my early education began to assert itself, I knew that in the dark corner behind my back lurked the grinning shade of an old, old man in sandals, gown, and a sugar-loaf hat, who chuckled to himself and rubbed his skeleton hands together as he winked his approval over my shoulder to the modern magician who had stretched my ears all over Europe and the Atlantic

Wireless Heroes

By The Editor.

ONCE again the public have been thrilled by the miracle of the S.O.S. and the heroism of the gallant operators of the ill-fated Egypt. Truly, the Marconi Company must feel proud of the long list of operators who have made the wireless service one of the most honoured in the world. To the long list of operators who have given their lives for the safety of others must be added the names of Arthur Robert Curtis and Arthur William Hardwick, 2nd and 3rd wireless officers respectively of the S. Egypt.

They are now added to the imperishable roll of honour which includes such names as Flying-Officer Wicks, who perished last summer on the R38; Jack Binns, of the Florida and Titanic; young Gardiner, of the Ben Ledi, who was decapitated by a shell while sitting at his operating table; and brave young Douglas Harris, of the Floandi, who died while taking down a message in his signal-log.

The deeds of such heroes are enough to send a thrill through the nerves of any man.

Much has still to be written of the part played by wireless men in the war—how some of them, although torpedoed five or six times, still carried on with unquenchable optimism and cheery disregard for danger.

The sinking of the Egypt, like all maritime disasters, called forth many examples of high courage, and these two young men did their duty with a simple nobility that will command admiration the world over. Mr. Donnington Graves, the senior wireless officer, himself narrowly escaped death. He stood by the wireless gear until the last moment, sending out the S.O.S.

Mr. Graves is probably the most experienced operator in the service of the Marconi Company.

He has been with the company for more than ten years. His first appointment was on the Arlanga, and afterwards with the Vandyck, the Middlesex and, for a period during the War, on the hospital ship Liberty.

Mr. Graves was operator on the Merchant Star when the ship was torpedoed by the Germans, but fortunately the vessel did not sink.

We congratulate him on his recent escape and on the splendid courage he showed in the face of peril and disaster.

Mr. A. HARDWICK. Mr. A. CURTIS. Mr. D. GRAVES.

THE POWERS AND LIMITATIONS OF YOUR SET

THE wireless "boom" has been so sudden, and so much mystery surrounded radio apparatus previous to it, that the present great desire for knowledge has resulted in a large amount of misunderstanding and, possibly, misinformation.

People want results from their receiving sets which they cannot in fairness expect. There is considerable misunderstanding as to the range in miles over which the various types of receiving sets will prove effective.

We read from time to time in the daily Press accounts of little wonder receiving sets, complete in a watchcase or thimble, or which will fit into a matchbox. All that, we are told, is necessary for the holder of one of these Tom Thumb pieces of apparatus to hear signals from infinitely great distances, is for him to place his foot against a water-pipe and hold an umbrella over his head.

Accounts are also told us of frame aerials being used to pick up wireless concerts from the transmitting station at Writtle, near Chelmsford.

The midget sets do exist, and some of them operate very effectively. There are also some stations at which reception over hundreds of miles with a frame aerial is accomplished. But the conclusion some people jump to that these two schemes may be combined is, at present, unfortunately very far from being correct.

The small crystal set may be used over comparatively short distances to receive from a transmitting station. It is safe to say that the average maximum distance for such an instrument is 15 to 20 miles.

When the frame aerial is employed for receiving over long distances, special accurately designed valve amplifiers have to be used. This apparatus cannot be made to work satisfactorily by an inexperienced amateur.

Another popular belief, which is quite inaccurate, is that a loud speaker attached to a simple crystal receiving set will magnify the sound sufficiently to fill a whole room.

The loud speaker of a wireless set is similar in action to a gramophone. The volume of sound issuing from the machine can be regulated so as to produce loud, medium, or soft tones.

A great vibration of the diaphragm produces a great sound and, in ratio, the smaller the vibration of the diaphragm, the lesser the amount of sound volume.

In wireless the volume of sound produced by a loud-speaking attachment must depend upon the strength of sound received from the transmitting station.

With the ordinary simple receiving set loud speakers cannot be used directly except when the receiver is located within a very close range of the transmitting station.

This distance from the transmitting station may be increased to a certain extent if a valve detector or a valve amplifier in conjunction with the crystal is employed. But no matter what type of receiver is used, if the distance between the receiving and the transmitting station is more than a few miles, an amplifier will be necessary if a loud speaker is to be used with good results.

An amplifier is a piece of apparatus which, as its name implies, is used to amplify or magnify the strength of the received signals.

Modern amplifiers comprise one or two valves with the requisite connecting equipment and controls. The battery operating the apparatus is generally a 6 volt 40 or 80 "ampère-hour" accumulator and one high tension battery of about 60 volts. For one valve, however, about 30 volts high tension will be found sufficient.

When two valves are used, the amplifier is generally termed a two-stage amplifier. In this case, arrangements are usually made for transferring signals from the first to the second valve, or by using one valve only, as desired. In this way the volume of sound produced can be controlled.

The action of this type of amplifier is quite easily explained. The incoming wireless message passes through the tuning gear of the receiving set into the detector valve or crystal, whichever is being used. Thence it passes into the first amplifier valve.

This amplifier valve adds to the strength of the incoming waves. If the incoming waves are of strong energy, then the action of the amplifier is strong; but if the incoming waves are small, the action of the valves is small. All signals are made louder in direct proportion to the strength of the received signals.

Every variation in the aerial current causes a very considerably augmented variation in the plate circuit, and the resultant signal is increased considerably.

When a second stage of amplification is employed, the signals resulting from the first stage are used to control the valve action of the second amplifier, and the energy resulting therefrom is directed from that plate circuit to the telephones or loud speaker.

By means of suitable connecting apparatus, several valves can be linked together and so amplify received signals tremendously. This will easily be understood if one imagines four amplifying valves connected together and each valve magnifying the strength of signals say, 5 times.

The second valve will magnify the original signal 25 times, the third 125 times, and the fourth 625 times. Theoretically, there is no limit to the number of valves which can be employed for amplification. Practically, however, the use of any number above six will give but indifferent results. The effect sometimes means such a chaos of noises as quite to defeat the object in view.

The following notes may help to give a novice an idea of what he may expect from the various classes of receiving sets:

Simple Crystal Receiver.

	Range.
(*a*) With outdoor aerial	20-25 miles
(*b*) With indoor frame aerial ..	1-3 miles
(*c*) With outdoor aerial and loud speaker	2 miles

Two-Valve Receiver.

(*a*) With outdoor aerial	150 miles
(*b*) With indoor frame aerial ..	10-12 miles
(*c*) With outdoor aerial and loud speaker	20 miles.

Three-Valve Receiver.

(*a*) With outdoor aerial and loud speaker	150 miles
(*b*) With telephones	250 miles
(*c*) Using frame aerial and 'phones	50–100 miles

The above distances are, of course, often exceeded, and, in fact, can vary considerably.

Also, the distance over which a message may be received depends on the power of the transmitting station.

EARTH PLATES

IF you are unable to connect your earth lead to any house piping, a good "earth" can be made in the following manner.

For amateurs who instal their apparatus in a shed at the end of a garden, this alternative earthing system will prove useful:

Procure a fairly large piece of sheet copper. Don't let it be less than eighteen inches square; let it be larger if possible.

Choose a suitable spot in your back garden where the ground is most frequently inclined to be wet, and dig a hole there about three or four feet deep.

Be sure that the spot chosen is likely to retain its dampness, even during long dry spells. If there is any doubt as to this, it is a good plan to dump a bag of charcoal into the hole.

Charcoal holds moisture very well, and if it is packed carefully about your copper plate, will safeguard you against your set being put out of action by lack of dampness at the crucial spot.

Having packed the charcoal suitably, pour a pail or two of water over it, then fill in the hole, packing the earth tightly back into its place.

Be sure that you have a good strong copper wire securely soldered to the plate before filling in, and take care not to pack the earth so tightly as to break away the soldering.

By the way, copper tubing, such as is used in motor-cars, is even better than the above-mentioned strong copper wire.

Then connect with your receiving set, and you are ready for the next message that comes along.

A GREAT PIONEER

ONE of the greatest pioneers in wireless work was the late Professor David E. Hughes.

Years before Senatore Marconi had begun to experiment in wireless, Hughes struggled along, firm in the belief that wireless communication was possible.

His rough-and-ready apparatus may be seen to-day in the Science Museum at West Kensington. Crude as his instruments are, they are historical relics, for with them Hughes "picked up" signals from a clockwork transmitter up to a distance of 300 yards. In the days of his early experiments Hughes, like many other great inventors, received but little sympathy or help, and once, in 1880, when he was explaining his experiments before the President and some Fellows of the Royal Society, he was laughed at, and told that "the whole business is absurd."

PROFESSOR HUGHES

If Hughes could have seen the effects of the present-day wireless boom he would, perhaps, have felt that his life had indeed not been lived in vain.

The Construction of a Frame Aerial

By GEORGE SUTTON, A.M.I.E.E.

Using a Valve Receiver good signals can be had in conjunction with a frame aerial. This article tells you how it should be done.

MUCH has been done recently, and a great deal more has been said, on the subject of making wireless receptive apparatus extremely portable, and what at one time was really the least mobile part of the equipment is now apparently the most amenable to easy removal.

The aerial, at one time inevitably a contraption of tall masts and strong guys, can now be so inconspicuous as to be carried in a handbag.

Very early in the days of amateur experiments, it was found that an iron bedstead in an attic made quite a good aerial. Then were successfully tried such common things as an open umbrella, wires tucked round inside a hat, wireless antennae in the form of a chest protector, and other freakish devices too numerous to mention. One thing they had in common. They were not nearly so receptive as an outdoor aerial.

It would be a pretty hopeless proposition for a novice to try to tune in signals upon a crystal receiving set with anything so diminutive as an ordinary frame aerial. There is no reason, however, why quite good signals should not be received if the run of a good attic were available, and little skill and ingenuity applied to the problem of stretching wires along under the rafters.

No Earth Wire Needed.

For the amateur who can use an electron valve, or perhaps two or three, the frame aerial has much to commend it. Most of the noises not proper to wireless signalling, called "parasitic" noises (because they come in on the backs of the signal wave) are due to stray currents being led into the receiving apparatus by way of the earth wire. Earth connection is unnecessary with a frame aerial and these noises are eliminated to a great extent.

The two ends of the wires wound on the frame are taken to the aerial and earth connection respectively of the detecting set, which otherwise needs very little modification. An ordinary room door, or even a cupboard door, if it can swing round half a circle on its hinges—that is, if on opening it lies flat against the wall in which it is set—will make quite a good frame for the aerial, and will not need a lot of knocking about in fitting the wires to it.

We had better perhaps first describe the make-up of a smaller affair, so that the experimenter may be led on by easy and successful stages.

Enamelled copper wire, not smaller than gauge No. 24, is the best to use, and if the notches into which the wire is laid cannot be made in a piece of ebonite, wood well soaked in hot paraffin wax had better be used.

The spacing of the wires in their adjacent turns is an important matter, as a crowded

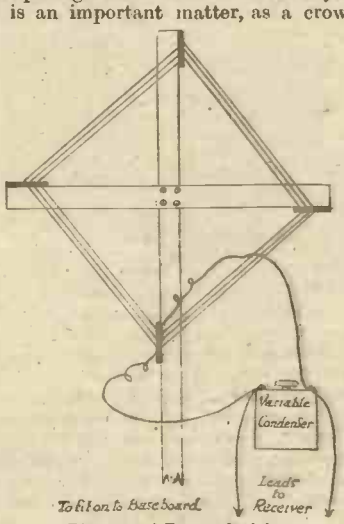


Diagram of Frame Aerial.

"loop" is not nearly so efficient as one with the wires properly spaced. As a guide, if the frame is a square of 4-feet sides, the wires should be spaced $\frac{1}{4}$ of an inch apart. If 6-feet sides, $\frac{7}{16}$ of an inch; 8-feet sides, $\frac{9}{16}$ of an inch; 10-feet sides, $\frac{3}{4}$ of an inch, and 12-feet sides, $\frac{15}{16}$ of an inch.

Making the Frame.

Suppose we have decided to try a 4-feet rectangle; two pieces of wood, deal "slate battens" will do, planed up 2 inches wide by 1 inch thick, one piece 8 foot long, and the other 6 feet long will be required. Make of these an upright cross and secure where the pieces cross one another with two or more brass screws.

Less wire will be needed than for the construction of an efficient outdoor aerial as will be seen by the following table, and it must not be forgotten there is one "best" wave-length for any winding, though the frame aerial is sensitive over a fairly wide range. A variable condenser is essential also, as the frame aerial itself takes the place of the usual tuning inductance and has to be turned to the waves it is required to receive.

The table in Column I. gives the number of complete turns on a square frame of 4-feet sides. Column II. indicates the length of the wave to which it is most sensitive, and Column III. the range over which the frame aerial is reasonably efficient.

I. Complete turns of wire.	II. Best Wave Length in Metres.	III. Efficiency Range in Miles.
3	250	200–350
4	300	250–400
6	350	300–800
10	600	350–1000
20	1200	900–1800

All that is now necessary in order to use the frame aerial is to attach a couple of wires to the ends of those on the frame; put your variable condenser across them, and carry on the wires to the aerial and earth terminals of an ordinary receiving set.

The bottom end of the upright may be shaped to stand in the hole of a large inverted flower-pot, or a block of wood may be used instead.

There is one advantage possessed by a frame aerial which cannot be made too much of, and that is its directional effect. An outdoor aerial is put up pointing any way, depending upon the conveniences for attaching to the house or planting a pole in the garden, and it receives signals from some quarters better than from others.

With a frame aerial reception is best with the plane of the coil pointing in the direction of the station it is desired to receive from; that is, according to our diagram, with the arms of the cross pointing that way.

If at right angles, the received signals dwindle down to zero, and if the frame is rotated upon its upright axis, there are two loudest and two most silent positions as the frame turns round the complete circle.

This property is made use of in direction-finding stations, where two stations separated by a known distance communicate their angular divergence to one another.

The point of intersection of their projected planes indicates the position and the distance away of the station, such as a ship or aeroplane which is signalling. The advantage of such guidance in foggy weather is obvious.

This method was used during the War for "spotting" enemy stations, and it is conceivable that it will be used in peace time for the same purpose, for should an amateur be so misguided as to disturb the ether by badly adjusted valves, or attempt to signal when he hasn't a licence, running the offender to earth will be an easy matter.

If you contemplate constructing a frame aerial, but still feel a little puzzled on how to set to work write to 'Popular Wireless' without delay.

The advantages of a frame aerial will be seen in this picture. No outside wire is necessary, and it can be easily mounted on a desk.

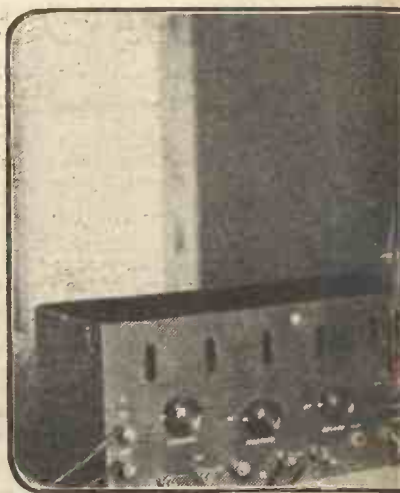
A FINE SHIP SET.

Our photograph shows the wireless installation on the s.s. Arundel Castle. Note the three transmitting valves on the extreme left, and just below them the seven-valve Marconi Amplifier, and the Type 31 Crystal Receiver. On the extreme right is the "spark" transmitter. A quenched gap is used. The "change over" switch for connecting one or another transmitter to the aerial is seen a little to the left of the first clock.

Jack Dempsey, the heavy-weight boxing champion of the world, who recently visited this country, is a keen wireless amateur. At his home in America he has a first-class wireless set installed, and receives messages "from all over the world" according to the admiring New York Press.

This is Miss Mona Morgan, a young American actress who has played Juliet, from Shakespeare's tragedy, to an audience of 500,000. Miss Morgan is seen speaking into the microphone transmitter at a New York broadcasting station, which sends out extracts from Shakespeare's plays several evenings a week.

THE M



If Darwin were alive to-day, what would he
wireless concert, and is

Just how easy to manipulate are some of the
this photograph. The girl on the left is tuning
able condenser. This

The wireless boom in America has had its effect
has a special wireless 'phone installation, and
players can dance to wireless music. 'Agnes A
with soft m

ISSING LINK?

say to this? Anyway, Master Monk seems to be enjoying the quite unconcerned about the missing link.

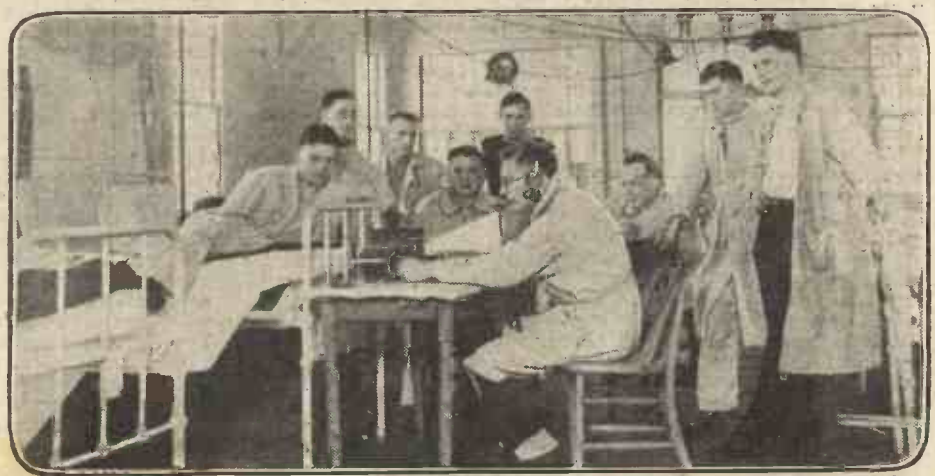
wireless receivers on the market can be seen by glancing at in to the correct wave length adjustment by means of a vari- set is a portable crystal type of receiver.

on the great film studios at Los Angeles. The Paramount studio by using amplifiers in conjunction with a loud speaker, the yres and Milton Sells are seen here in an impromptu love scene, nusic for effect, by wireless.

A FAMILY CONCERT.

The delights of a wireless receiver in the home are well shown in our illustration above. Father is tuning in a little music, while granny and mother both listen with evident pleasure. The two boys seem rather envious of father, who certainly seems to know "what's what."

This couple prefer a quiet evening at home in the armchair listening to opera by radio than travelling up to town and booking seats at a theatre. The set shown is an American portable valve receiver, and by sharing a 'phone ear-piece each, the "stay-at-homes" can both enjoy the music.



Wireless in hospitals may have its drawbacks, but in the convalescent wards there can be little doubt that it would prove a wonderful boon. The patients in the picture are already looking better for a little wireless treatment. Doctors should make a note of this.

Step by Step in Wireless

An Elementary Series of Articles in Non-Technical Language for the Beginner.

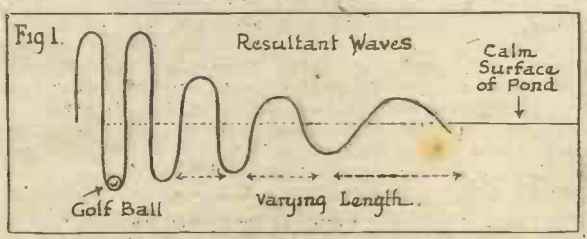
No. 2.—HOW WIRELESS WAVES ARE FORMED

ALTHOUGH water waves are invariably quoted when an analogy is required for the pressure or ether waves used in radio communication, wireless waves do not conform in every particular with those propagated by a disturbance in water. Caution should, therefore, be exercised when referring to a water wave as a means of understanding wave formation used for radio work.

We have already seen that a wireless wave travels at a uniform and enormous speed. Now, this is true of all wireless waves, irrespective of their length. This is not characteristic, however, of water waves, because if we take two tubs of uniform size, both filled with water, and drop a golf ball into the centre of one tub and a small pill into the centre of the other, the waves created by the golf ball will, if both operations are performed simultaneously, arrive at the side of the tub in a much quicker space of time than those propagated by the pill.

We thus see that the rapidity with which water waves travel depends upon the force with which the calm water is originally displaced, and that waves of different sizes will travel at different speeds. The importance of this point is apparent when one considers the actual formation of a wave.

Let us refer once again to a still, calm pond. If we drop our golf ball into the pond, a succession of ripples or waves are created, and each wave possesses length, amplitude, and velocity. These three factors also govern other waves. Wave length we have already considered. The amplitude of a wave is the height to which its crest is elevated above the calm surface of the pond, and velocity can be stated as the distance over which a wave will travel from any given point in one second.



As a water wave proceeds away from its source of generation the amplitude will be found to decrease, and the wave length will gradually become greater, as in Fig. 1.

In wireless transmission use is made of two kinds of waves, one in which the amplitude varies and one in which the amplitude remains constant; and here we come to the important difference between water waves and other waves.

Any alteration in the amplitude of a wireless wave will not affect its length, and the speed at which it travels is always the same, namely, 186,000 miles per second. It is just as well, also, in an elementary article of this description, to dispel the erroneous impression held by so many people that an actual flow of electric current is broadcasted in all directions from the transmitting aerial of a wireless station.

An electric current of an oscillating nature—*i.e.* one that oscillates, or rushes backwards and forwards—is employed, but only in the actual aerial wire or wires of the transmitting station; and it is this current which propagates the waves in the ether in a similar manner to that in which the golf ball propagates waves in a pond.

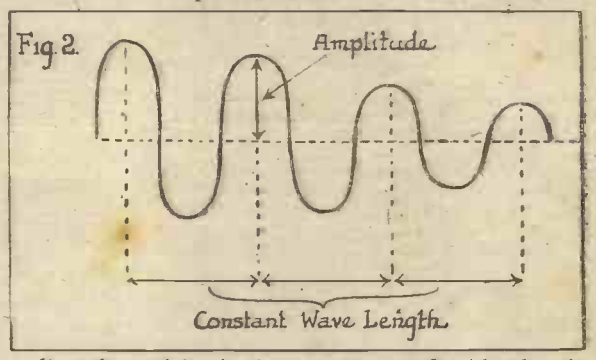
The actual wave is a "pressure" wave in the ether, that mysterious medium which, as explained in a previous article, is presumed to permeate everything.

It should also be understood that waves do not travel radially. The golf ball, when it strikes the surface of the pond, displaces a certain volume of water which cannot extend outwards, owing to the pressure of the surrounding water, unaffected by the initial impact. It therefore rises upwards into the air all round the ball, and when the original energy imparted by the impact is expended, falls again.

The highest point to which it rises gives us the crest or peak of the wave, and the distance to which the water has been elevated, the amplitude. The water, however, does not immediately resume its normal position. If it did, we could not create "ripples" in a pond. It falls below the point it previously occupied, thus making the "trough" of the wave, and in its turn acts exactly as the golf ball did, and displaces the water immediately adjacent to it.

A series of waves are, therefore, created which gradually become smaller and smaller as the energy necessary to overcome the resistance of the water is expended. If a light piece of wood or a straw is thrown into the pond, so that it lies on the water in the track of the waves created by the ball, it will not be carried away by the first wave when it comes along. It will rise and fall with the water on which it is floating, according to the explanation given.

Now let us consider Fig. 2, in which wireless waves, also of decreasing amplitude, are shown. This kind of wave formation is known technically as a "damped wave." If this type of wave varied in wave length with alteration of amplitude, it would be useless for radio communication, because, as described previously, it is essential to know the length of the wave we wish to receive in order that we can "tune" or adjust the receiving instruments to respond to that length.



The oscillating current which it is necessary to generate in order to create the pressure waves is caused by the discharge of a condenser across an air gap. A simple form of condenser, known as a Leyden jar, is composed of a glass jar, about one-eighth of an inch in thickness, which is covered internally and externally with tin-foil or thin sheet copper, to within two inches of the top. The glass, which is sandwiched between the two sheets of foil, will not conduct electricity, and is known as the dielectric.

If the jar is connected in a simple electrical circuit, one side of which is attached to the outer sheet of foil and the other side to the tin or copper lining of the jar, no current can pass because of the glass.

A current can, however, flow to one side of the jar, and it will be found that a considerable voltage can thus be stored up in the foil. If we now take two wires, one from each sheet of foil, and so arrange them that the two free ends are in close proximity, the pent-up electricity, provided it is of sufficient strength, will jump across the air gap in the form of a spark and make its way to the foil on the other side of the jar; then, like the wave created in water by the golf ball, it proceeds to return to its original position or plate, and so it continues to alternate or oscillate between the two plates. If this current is now carried into the aerial, it will create pressure waves as stated.

We have seen that the energy creating water waves is gradually expended by overcoming the resistance of the water, and, in a similar manner, wireless waves created as described above will gradually expend the original energy created by the condenser discharge in overcoming the resistance of the wire in the electrical circuit. The spark will then cease, and the result is a group of oscillations of decreasing or decaying amplitude, as shown in Fig. 2.

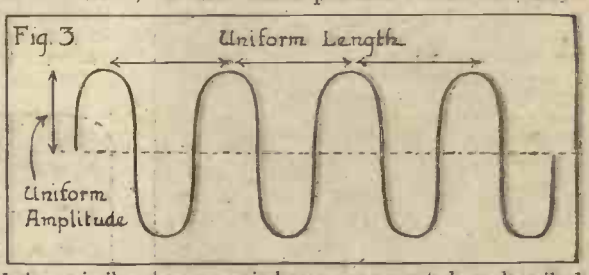


Fig. 3 shows a group of "continuous waves," or waves in which the amplitude remains constant. Two well-known generators of continuous waves are the Poulsen arc generator and the Goldsmidt arc alternator. The thermionic vacuum tube is also used for generating waves of this nature, but details of the various methods will be dealt with in future articles.

However, the purpose of these pieces of apparatus is to create waves which are of constant amplitude and continuous formation, as distinct from the waves generated by a Leyden jar, or other form of condenser, which occur in groups of 200 to 1,000 every second, according to the rate at which the condenser charges and discharges itself across the air gap.

(To be continued.)

The second of a series of articles on constructing wireless receivers.

A Home Made Receiver

By a Member of Marconi's Wireless Telegraph Company.

THE cost of a wireless receiving set, like that of a motor car, depends upon how much you require of it. To an amateur, however, just entering the fascinating field of "wireless endeavour," a simple set at little cost is attractive, always provided he does not expect it to receive signals which could only possibly be heard by an elaborate set costing anything from fifty pounds upwards.

We will consider first of all the pieces of apparatus which are necessary to give us not only signals, but signals propagated on different wave lengths.

We do not wish to emulate the unfortunate parrot who could only say one word, and that word was a naughty one. In short we do not want to find ourselves limited to one wave length, and that wave length one on which no signals are being sent.

The Hertz Resonator

The apparatus, then, that we shall need is a variable inductance, a variable condenser, a crystal, and a pair of telephones. The aerial down lead will come to the variable inductance, shown in Fig. 1.

Now, Heinrich Hertz, a German scientist, as far back as 1887, discovered that electro-magnetic waves could be propagated through space, and he was even able to measure their length and the rate at which they travelled.

Hertz employed as a detector of this electric wave a simple, nearly closed circuit of wire called the "Hertz Resonator," and it is upon the discovery of Hertz that the circuit (in Fig. 3) using two coils of wire, one of which *induces*, or *transfers* energy to the other without actual contact, is based. Let us consider the coil shown in Fig. 1, which possesses two sliding contacts, one on either side of it.

We have here a coil which will give us almost the same results as the two coils shown in Fig. 3, because if we place one slider at the base of the coil, and the other at the top, by looking at the dotted line it does not require a great deal of imagination to picture it as two coils, one on top of the other, each with a variable handle.

When two coils, not in actual contact, are used, as in Fig. 3, the circuit is said to be "inductively coupled," because the current is "induced" from one coil to the other, and the strength depends upon how closely the coils are "coupled"; i.e., one coil moved nearer to the other.

When two coils are coupled directly, or joined metallically by wire, as in Fig. 1, we say that the circuit is "directly" coupled. The coil we are employing then has one of the variable handles connected to the aerial wire, and the other is taken by means of a wire to the crystal.

The bottom end of the coil is continued to a water pipe leading to earth.

Crystal Detectors

We next come to the crystal. A crystal possesses the property of allowing the passage of a current through in one direction only. As the currents generated in the aerial wire are of an oscillating nature, and each wave arriving is composed of a negative and positive half, the crystal will only permit of the passage of one half of each oscillation or wave, and not the other.

A current is therefore set up in the wire on the side of the crystal farthest from the aerial (see Fig. 3), which consists of impulses of current flowing in one direction.

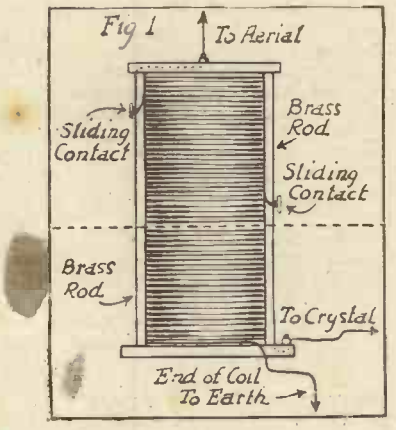
We therefore see that the swiftly oscillating current—which is inaudible owing to the rapidity with which it alternates—has been converted into a current going in one direction only.

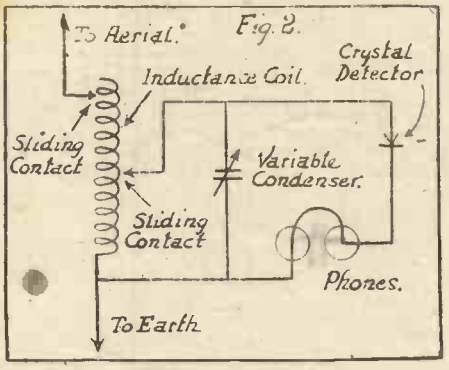
This current can be detected if we include a pair of telephones, as in Fig. 2. The current should be led on to the crystal by a very fine adjustable wire.

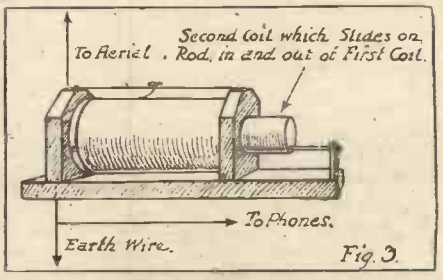
If a fine but strong wire is wound into a spring, and the end bent so as to make contact with the crystal, the necessary pressure to ensure a good connection will be supplied. There are many kinds of crystal used for this purpose, some of the commonest being galena, silicon, zincite, bornite, and carborundum.

The other side of the crystal, which is usually soldered into a metal cup, should then be taken to the telephones and back to the lower end of the inductance, so as to complete the circuit.

The circuit is now complete, and we can expect to hear signals. The inclusion of a condenser, which could be connected across the circuit, as shown in Fig. 2, however, would enable us to have a larger range of reception. In other words, it will enable us to hear more stations working than we could have done without it. Selectivity or sharper tuning is made possible by its inclusion.







Altering Wave Length.

A variation of the "capacity" of this condenser, or an alteration of the inductance handles, will change the wave length to which our circuit is "tuned," as was explained in a previous article.

We can therefore alter our wave length within limitations, and hear any station that may be working on the wave lengths which come within our range.

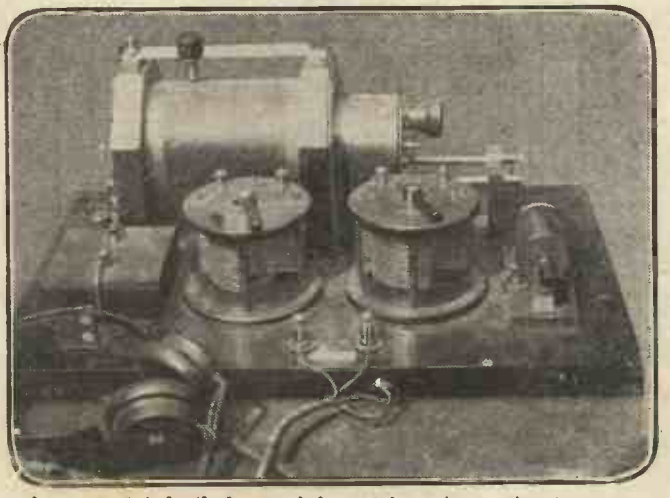
Number twenty or thirty copper wire is a good gauge to use for winding the aerial tuning inductance. About sixty turns of the latter, wound on a former about eight to ten inches in diameter, would give a range of wave lengths from about 350 metres up to 1,200 or 1,500 metres.

The variable condenser should possess a capacity of approximately ·001 or ·003 microfarads.

If a good sensitive crystal is used, and well-made telephones, the set should have a range of several miles.

You may not do all that your enthusiasm would like to do with the above set, but its cost is under five pounds, and that is a great consideration. Also, as an interesting and instructive experiment, this set gives a wide scope.

In next week's issue of "Popular Wireless" our expert will deal with the construction of the more sensitive valve receiver.



A very neat inductively coupled crystal receiver, using two condensers for tuning purposes.

THE STORY OF THE TELEPHONE

DR. GRAHAM BELL'S GREAT ACHIEVEMENT.

DR. GRAHAM BELL

WHAT would the world do to-day if the whole telephone system were suddenly destroyed?

Incalculable delays would result: business would be choked, and commerce held up. And yet very few pause to consider how this essential factor of modern life came into being.

The first faint cry of the baby telephone was heard, not in a spacious experimental laboratory, but in a poorly furnished garret, nearly fifty years ago.

In Boston there was an electrical shop, and in the attic of that shop, on June 2nd, 1875, two men were working and puzzling over a clumsy piece of electrical mechanism.

They had in mind a telegraph which, instead of merely sending out clicking signals, would transmit musical notes, so that a large number of messages could be sent over a single wire at the same time.

It was no good. For weeks they had been trying, but, despite every effort, they could obtain no results.

Alexander Graham Bell and his assistant, Thomas A. Watson, were the baffled men; but their labours were most unexpectedly to be crowned with success.

Clock-spring reeds, vibrated by electro-magnets, were part of their experimental telegraph set, and when Watson, who was sending, pressed down the key to cause the clock-spring at the sending end of the wire to vibrate, the contact points fused together. Consequently, the spring was held down by electro-magnetic force, and Watson tried to pluck it free, with the simple result that it vibrated over the magnet.

But, though the result was simple, the developments were wonderful indeed. The telephone had spoken!

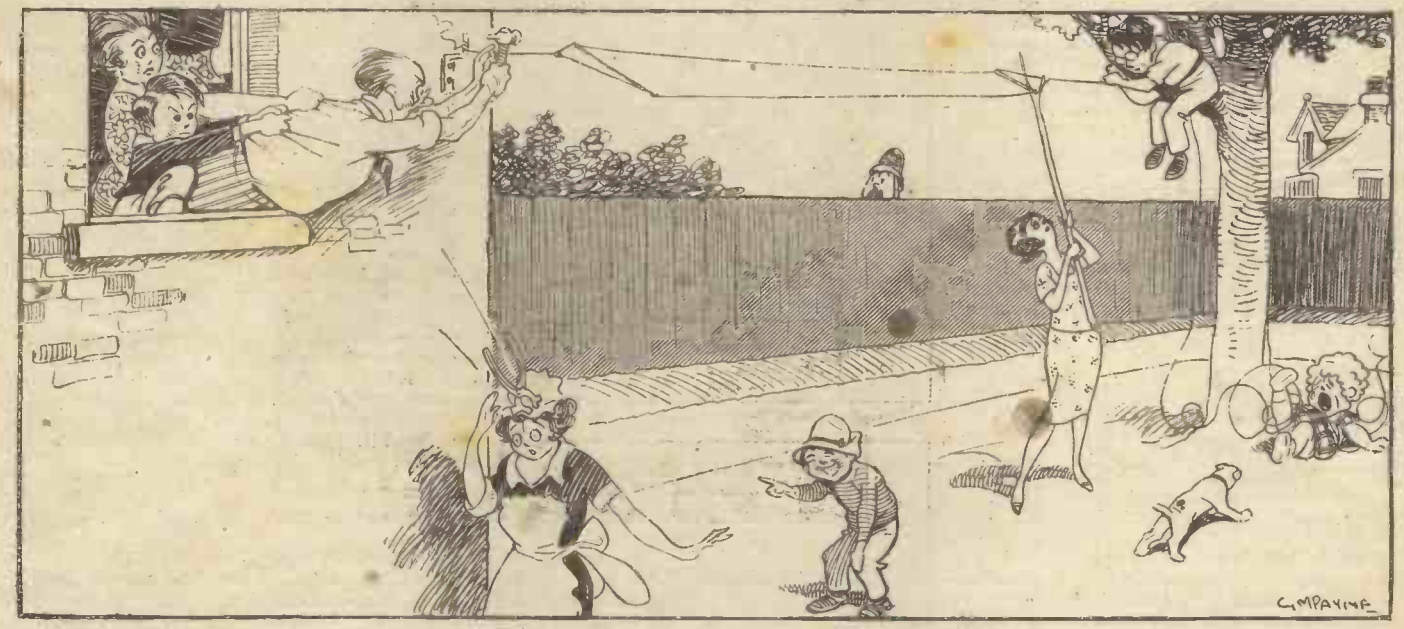
Bell, in a frenzy of excitement, dashed into the room, for his ear had caught the feeble sound which passed over the wire.

"What did you do then?" he shouted at Watson. "Don't change anything. Let me see."

By accident, the fundamental principle of the modern telephone had been discovered. It happened that the current was flowing continuously through the line and the electro-magnets, and therefore the plucking of the spring had caused a variation in the current intensity, thereby throwing the corresponding clock-spring at the receiving end of the line into vibration. The rest was mere mechanical adjustment.

But the sound had been transmitted—and there was a new force in the world!

EXCITING TIMES WHEN DAD ERECTS AN AERIAL.



THE MORSE CODE (Continued from last week.)

Punctuation and Other Signs	
Full stop (.)	· — · — · —
Semicolon (;)	— · — · — ·
Colon (:)	— — — · · ·
Comma (,)	· — · — · —
Question mark (?) ..	· · — — · ·
Exclamation mark (!)	— — · · — —
Apostrophe (')	· — — — — ·
Hyphen or dash (-) ..	— · · · · —
Fraction bar (/) . ..	— · · — ·
Brackets. *This sign must be made before and after the words which are to be bracketed* ( )	— · — — —
Inverted commas. *Must be made before and after words to be quoted.* (" ") . ..	· — · · — ·

Underline. *Must be made before and after words to be underlined* ..	· · — — · —
Preliminary call. *To precede every transmission*	— · — · —
Double dash. *Generally called the "break sign," i.e. to break up address of message from the text.* (=)	— · · · —
End of message . ..	· — · — ·
Error, or "Erase" ..	· · · · · · · ·
Invitation to transmit	— · —
Wait (A S)	· — · · ·
"Received" signal (R)	· — ·
Distress call (S O S) .	· · · — — — · · ·
"All stations" (C Q)	— · — · — — · —
End of work (S K) ..	· · · — · —

Continental Morse Figure Signs	
1	· — — — —
2	· · — — —
3	· · · — —
4	· · · · —
5	· · · · ·
6	— · · · ·
7	— — · · ·
8	— — — · ·
9	— — — — ·
0	— — — — —
Abbreviated Form	
1	· —
2	· · —
3	· · · —
4	· · · · —
5	·
6	— · · · ·
7	— · · ·
8	— · ·
9	— ·
0	—

The New Aladdin's Lamp

A Series of Articles on the Wonders of the Electron Valve.

The valve is the keystone to modern wireless communication. This article explains in simple language the electron theory, upon which the action of the valve is based.—Editor.

BEFORE actually dealing with the part played by the thermionic or electron valve in radio work, it will be as well to briefly indicate what is meant by an electron.

It is believed by scientists that every "atom"—which until recent times was thought to be the smallest particle of matter—consists partly of an enormous number of "electrons," or "fragments of electricity" as someone once expressed it.

Each atom possesses a definite number of electrons, and some authorities think that the difference between gold and lead, for instance, is probably only due to a difference in the number of electrons contained by these two metals.

So long as the atom retains the correct number of electrons no electrical phenomena are caused, and in consequence we are not conscious of any electrical effects about the poker with which we stir the fire, or any other object we make daily use of.

But, by interfering with the electrons that go to make up atoms, we can obtain an electrical effect, and, if we vary the number or arrangement of electrons contained in our poker, it will exhibit such tendencies.

Making Electrons Flow

We can steal from or add electrons to atoms, and when this is done electrical effects are produced. Among other devices used for this purpose is the battery or storage-cell. In the case of batteries, the electrons are presumed to be put into motion by chemical action which takes place inside a cell.

Two dissimilar elements, like a strip of zinc and a carbon rod, if immersed in sal-ammoniac solution, will immediately commence a current of electrons flowing from the carbon to the zinc inside the cell.

The zinc soon collects sufficient electrons to give it a negative charge, while the carbon, which is deficient of the number of electrons that have gone over to the zinc, becomes positively charged. If the two terminals of the cell are now connected together, all of the electrons taken by the zinc will rush back to the carbon by the passage provided.

When the carbon has once more regained its normal quantity of electrons the cell is said to be discharged.

Early scientists, tentatively prying into the mysteries of that unknown force electricity, found that rubbing a piece of amber with a silk cloth produced in the amber a certain power of attraction, and extremely light objects, such as cork fragments or sawdust, could be attracted to it.

The amber, in fact, contained a "static" or stationary charge of electricity. It was also found that by rubbing a piece of sealing-wax with fur similar properties were acquired by the wax. If two pieces of amber, both treated in the manner mentioned above, were brought into close proximity, they were found to repel each other, and two sticks of similarly prepared wax evinced the same tendencies.

If, however, one of the pieces of amber was then placed near to one of the sticks of sealing-wax, an immediate mutual attraction between the two became evident.

Investigators, therefore, came to the conclusion that there were two kinds or "signs" of electrification—that generated upon amber by friction with silk, which they called *positive* (+) electricity, and that produced upon sealing-wax was called *negative* (—) electricity.

It is presumed that the electrons in the atom are attracted by a proportionately large positive core or centre, round which the electrons cluster, all electrons being of the negative "sign." These negative electrons neutralise the positive core, and the atom, therefore, shows no magnetic or attractive tendencies.

The Two Signs

But if we remove some of the electrons from the atom, the positive core will predominate, and the atom becomes what is known as a positive "ion." Likewise, if we add electrons to a normal or neutral atom, the excess of the negative electrons gives it a "negative" value, and it is known as a negative "ion."

When we rub sealing-wax with fur, electrons are removed from the fur and attached to the sealing-wax, which, because of its additional electrons, has now become "negatively charged." When we rub amber with silk electrons are transferred from the amber to the silk, and the amber, being deficient in electrons, is said to be "positively charged."

As all electrons are negative, we must look to the negative terminal of our battery previously mentioned, to give us our supply of electrons, and if we join the negative terminal of a cell to the positive one with a piece of wire, the negative terminal expels electrons along the wire to the positive terminal, as we have seen. The electrons, while in movement along the wire, cause what is called an electric current to flow in it.

Now, a knowledge of the electron theory just briefly outlined is essential if we are to understand in a non-technical way the working of the electron valve. The valve plays a very important part in wireless work of to-day; in fact, it may safely be said that it is a wonderful invention without which wireless telephony would not have made such rapid strides towards perfection.

(Next week we shall deal with the application of the valve to wireless reception.)

BASE-BOARDS and PANELS

THE recent great increase in popularity of the wireless telephone has introduced many types and styles of receiving apparatus, all of which are advertised as being specially designed and fitted for this novel and interesting branch of radio.

The public demand for simple designs has been large, chiefly because of the compactness with which they are constructed, and the amount of detailed information supplied with each pattern.

That these plans fill a much-needed want is quite obvious when it is considered that every day there are joining the ranks of wireless amateurs many with no mechanical experience or knowledge of the purely mechanical side of wireless.

The amateur should first of all have before him definite plans before attempting to build a set. By correctly laying out the work on paper, clearly marking thereon the required dimensions, cost of apparatus, and a diagram of wiring, a great help to the task in hand will have been accomplished, and the actual construction made much simpler.

The majority of the panels used for mounting apparatus on are of bakelite, formica, or ebonite. Failing any of these, hard wood makes a fairly good substitute.

The tools required in laying out the markings for the holes to be drilled in the panel are a centre punch, a light hammer, and a scriber. A hard pencil can be used in place of a scriber.

If two adjoining edges of the panel are true, they can be used as a straight edge on which to base the other measurements. Or, as an alternative, centre lines can be drawn across the length and breadth of the panel, and these used instead of the straight edge, all holes being laid off from the centre point.

If a scriber is employed, scratch the panel as lightly as possible with it, so that later the markings can be removed when finishing off the surface. The advantage will here be seen of a hard pencil as the lead markings are quite easy to rub off after all holes have been laid out.

Some amateurs find difficulty in cutting panels of various sizes. An easy method is as follows: Take a saw with a fine-toothed blade. Place a piece of wood with a square edge upon the panel with the true edge lying directly along the line drawn on the panel where it is to be cut. Clamp these two pieces of wood together. The second piece of wood will act as a guide for the saw, and a straight-cut edge will result upon the panel.

To smooth off any possible rough and unfinished edges on the panel, place the panel in a vice, then with a sharp file remove the roughened parts.

A neatly mounted panel—whether it be used for switches or receiving apparatus of a delicate nature—should always give a handsome "set off" to your gear. Nothing spoils a set more than a crude, badly made baseboard or panel.

MOONLIGHT WIRELESS.

CAREFUL observations have disclosed the fact that the changes of the moon have a considerable effect upon the suitability of the atmosphere for the transmission of wireless communications.

Curves and other diagrams are being drawn which will shortly be published for the benefit of experimenters. By this means it will be possible to discover at a glance what atmospherical and celestial conditions affecting wireless messages must be expected on any particular date in the future.

The Adriatic is the part of the world where, according to the most recent reports, the changes in the atmospheric conditions are the most influenced by the world's relation to the moon.

Ships in that quarter, receiving their directions by wireless, will, in consequence, greatly benefit by these "moon charts."

The land stations, by using great power, can overcome bad atmospheric conditions caused by the moon's turns, but ships necessarily carry apparatus of a more moderate strength and find the interference more serious.

RADIO CENTRAL.

The World's Biggest Radio Station.

THE erection of the greatest radio station in the world is well under way at Port Jefferson, Long Island, New York. The plant is being installed by the Radio Corporation of America, and will be ready for operation about the first week in September. Twelve steel towers, each 400 feet high, comprise the first unit of the station, which will have the appearance of a huge wheel when completed. The circumference formed by the twelve towers will be about three miles.

This new station will be the future hub of International radio communication. It will be equipped with the Alexanderson high frequency alternators, the machines which have made wireless across the oceans possible.

Port Jefferson was selected for the station because its situation, near Oyster Bay, is particularly attractive. It is close to Long Island Sound on a high stretch of unobstructed ground level and open. No other spot on the Atlantic coast affords so perfect a position.

Messages will be received at this station from the far-away plateaus of the Andes, from Hawaii, and from the busy marts of Europe. The radio enthusiasts who have played, eaten, and talked radio for the past fifteen years—men, not so long ago boys, who have seen Marconi's crude ten-inch spark coil and the unreliable coherer grow into the highly effective present-day valve, transmitter, and receiver, are keenly interested in the progress of this great station, which will be called Radio Central.

Symbols Used in Wireless

MEANING OF CURRENT STRENGTH.

THE flow of water may be expressed in gallons per second, which indicates to us the *rate* of flow or the *strength* of the current.

The term "coulomb" has been given to the unit for quantity of electricity and roughly corresponds to the unit "gallon" in the case of the water.

It could be said, then, that the strength or rate of flow of electric current may be expressed in coulombs per second. If one coulomb of electricity flows past any given point in a circuit every second the strength of the current is said to be one "ampere." The ampere is the practical unit of current strength or rate of flow.

If there are three coulombs of electricity flowing past a given point in a circuit each second, the current strength is three amperes.

At the end of sixty seconds the quantity of current which has passed the point chosen is 180 coulombs (sixty seconds times three coulombs each second). It must be particularly noted that during the sixty seconds the current strength remained constant, a value of three amperes (equals three coulombs per second). In other words, the current strength is entirely independent of the length of time the electric current flows.

Instead of using the words "current strength" or "rate of flow," it is customary to say that the "current" is so many "amperes."

There are subdivisions of an ampere, which find considerable practical use in radio work. One is the "micro-ampere."

Micro means one-millionth, so a micro-ampere is one-millionth of one ampere.

Another is the "milli-ampere," and the word "milli" meaning one-thousandth, a milli-ampere is one-thousandth of one ampere.

The current in a radio circuit is quite often only a comparatively few milli-amperes, and, indeed, may be only a few micro-amperes in some cases.

A VALVE HINT.

ARE you annoyed with disturbances affecting the clearness of speech, or music, etc., in your receiving set? There are disturbances in the air other than wireless waves, and these sometimes spoil the delights of listening in even if the best receiving set is employed.

Here is a hint worth trying. Procure some tinfoil, and line your receiving set with it. Do not use glue. Glue is not an insulator. Apply shellac to the interior of your receiving set, and stick the tinfoil in whilst the shellac is still wet.

Tinfoil can be obtained at any store, or, if you like to economise, the tinfoil in cigarette packages will effectively answer the purpose.

In addition, place aluminium sheets between the valves and connect these to ground.

How to form a Wireless Club

A few Simple Hints on the formation of a very necessary Association.

ONE of the early needs of the newly-equipped wireless man is an association with others of like tastes, not necessarily that he may be able to tell tall stories of the wonderfully loud signals he gets with his headgear telephones lying on the table in the next room, but because it is not very long before he is up against some problem which refuses to be solved.

The "other man" also has difficulties; not perhaps of the same kind, but an exchange of ideas is the best thing that can possibly happen in the circumstances.

Three men might mutually and amicably thrash out their problems in company without getting at loggerheads; but a larger group would soon need some sort of organisation, with a properly elected and recognised leader whose duty it would be to keep the discussion in the right channel.

Our daily and weekly newspapers are giving quantities of advice on wireless subjects, but if one expert did not occasionally contradict the other we might have more confidence in the special wireless columns of the lay Press.

Even in the plentitude of counsel and advice they give their readers there must, of necessity, be very large gaps which they cannot fill, as they cannot hope to anticipate all individual needs.

Get Together.

The very best thing to do, if you have an established Wireless Society in your neighbourhood, is to join up and help to make it an even greater success; but, failing that, and knowing some half-dozen others in like predicament, the next best thing is to form a society of your own, and then seek affiliation with the Wireless Society of London.

It is only by the joint action of wireless societies in the past, in spite of the claims of several daily papers, that we older wireless men have been able to bring pressure to bear upon the authorities and obtain the concessions we now enjoy. But we want a great deal more pressure still, and new men and new societies will help to obtain it.

Our potential new society men must get together and ask one of their number to act as secretary, *pro tem.* This temporary post is almost invariably made permanent, so a careful first choice should be made.

The Duties of the Secretary.

The success of the projected association depends so much on the secretary that we had better give some little consideration to setting up an ideal at which to aim. If you can think of any superlative qualities and qualifications which you or anyone else possess, these should be common to the secretary. He must have knowledge of his subject and your hobby, be courteous but firm; for he, though the servant of all, really runs the show.

Not only the minutes of each meeting must be written in a crisp and accurate précis, but he must be able to intrigue the editor of the local newspaper and keep the association in the public eye for advertisement purposes.

For the society that has not a constant influx of new members is already moribund, and, after all, what subject could furnish more acceptable copy than our common hobby, as the Press is now beginning to call it?

The chairman should next be elected, and a most careful choice must again be exercised. There is no better government than that of a beneficent autocracy; but as soon as a mere man becomes an autocrat he begins to lose some of his beneficent qualities.

So you want a good chairman who will be able to keep the secretary in order, not by checking him, but by leading him along those lines of conduct that will conduce to the greatest happiness for all.

Rules must also be devised, and they should be made definite and unequivocal. They will not need to be read aloud at every meeting, or brandished before an expected defaulter. They should be there, however, to apply *when they are needed.*

A treasurer is another necessary and important official. He can save the secretary a great deal of worry. He needn't be a rich man, though the possession of a private cheque-book often helps matters greatly.

A committee should be appointed, but, as the writer is of opinion that most routine work is accomplished by a committee of one, it will be found most profitable as a rule for the whole club to go into committee when anything important is about to be discussed, and if they are unable to come to a decision, then appoint a special committee, if necessary, to consider the question and report before any action is taken. A rule should be framed to cover this aspect of affairs.

Keep Order.

It will be found that a member may absent himself for a time and then desire to attend regularly again. If the rules compel him to pay up all subscriptions in arrears, this may keep him out. Let a member become a "country member" upon payment of a nominal fee, and be free to take up full membership again at any time he desires.

A club receiving set, or even a transmitting set, if a licence is obtainable, is not a *sine qua non.* Nearly all members will possess their own sets and will get sufficient listening-in practice at home.

The meeting will break up into groups to listen into headgear receivers, and the remainder chatter in groups. If a loud speaker is going, the result is even worse than the chattering which inevitably accompanies a concert performance.

A demonstration by a chatty and discursive member or an informative lecturer is, of course, another matter, as the lecturer "has the floor." But, generally speaking, much more good will accrue to the members at ordinary meetings by keeping to properly controlled discussions of knotty points.

Whether gleaned by means of a "question-box," or the much more lively and fruitful agenda committee, the special difficulties of the members should be canvassed and discussed.

It has been found a good working plan for the first hour to be devoted regularly to more or less elementary matters, and the second hour to more advanced subjects.

Do not discourage the candidature of professional or trade members; they may become very useful in more ways than one, and will, in any case, tend to keep the discussions from turning back on themselves, so to speak, or arguing in a circle.

Monthly Subscriptions.

A half-crown a month fee on commencing, and when the membership is low, may be reduced later on to eighteenpence, or even a shilling a month.

The main expense will be rent of meeting room and lighting. The secretary will have a bill for postage and stationery, but beyond this there will not be much to pay out. Don't attempt too much at first. You can grow if needs be.

Have your meeting nights regularly once a week on the same night and at the same time each night, and begin the proceedings punctually.

You can start the meeting with ten minutes or a quarter of an hour buzzer reading practice, or the reading of the minutes of the previous meeting.

Above all, let the members remember that the association is for their benefit, and that its success will be in direct proportion to their organised efforts.

GERMAN WIRELESS.

Developments at Nauen.

The wireless plant at Nauen is about to undergo an extensive development, according to a statement in the "Telefunkenzeitung."

It is said that seven more masts 210 metres high are to be erected, while four of the existing masts will be scrapped. Work is already proceeding, and the Transradio Company has increased its capital by 25,000,000 marks to obtain the necessary capital.

WIRELESS CLUBS.

Publicity in the columns of POPULAR WIRELESS is open to all Amateur Wireless Clubs in Great Britain and the Colonies.

Secretaries are invited to send weekly reports of their clubs' activities to the Editor, together with photographs of interest to amateurs.

The latter will be paid for at our usual rates.

RADIOTORIAL

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

The wonderful success of No. 1 of POPULAR WIRELESS has indeed made me feel that all the months of preparation necessary for its production has not been wasted, and that I was correct in my belief that such a paper would find immediate favour with thousands of readers. The aim of POPULAR WIRELESS is to cater for the needs of the amateur who is interested in wireless as a hobby, and as such I intend to keep it free from complicated formulæ and difficult mathematical problems. After all, the average amateur has no desire to wade into the realms of mathematics when he takes up a hobby, and although I shall publish from time to time formulæ of general interest and use, it seems to me that such a policy, if overdone, would hardly justify the title of this magazine.

I would like to remind the amateur who has advanced in his study of wireless that it is his duty to help and assist the thousands of new amateurs who are daily flocking round the wireless banner.

We all had to begin at the beginning at one time or another, and it is for our own common good that we should extend a helping hand to the rather bewildered novice.

The great majority of wireless associations, I notice, are fully alive to this, and are starting elementary courses and lectures in a way that speaks volumes for their keenness to aid and assist in every way the new members, who are increasing their membership to such solid and satisfactory numbers.

Unity is strength, as a contributor to POPULAR WIRELESS points out, and if amateurs bear this in mind their cause will not be a lost or hopeless one.

This week I propose offering my readers the chance of winning a six-volt forty-ampere accumulator.

I will award three accumulators or three receiving sets to the three best examples of broadcasting programmes submitted to me.

Write your suggested items on a postcard and address to the Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

Only one list may be sent. The Editor's decision must be final. Postcards should be sent not later than Friday, June 23rd.

Lastly, remember that the services of the POPULAR WIRELESS technical experts are at your disposal, and that any questions you want answering will receive their instant attention.

THE EDITOR.

WIRELESS QUESTIONS ANSWERED

The questions dealt with on this page are ones that our Technical Experts received recently from the readers of a well-known weekly journal. Naturally, subsequent issues of POPULAR WIRELESS will deal only with questions received from its own readers. It is thought, however, that we could not do better for the first two issues than show readers the kind of questions that we are prepared to answer.

Questions should be clearly and explicitly written, and should be numbered and written on one side of the paper only. All queries must be accompanied by the full name and address of the sender, which is for reference and not for publication. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume." Address The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

Q. Can I use an electrolytic detector for good reception of signals?

A. Yes; but unless you are quite *au fait* with its working we do not advise you to use it. It requires skilful handling.

* * *

Q. Would a 50-ft. twin wire aerial suspended from two chimney-pots prove suitable for reception with a one-valve receiver?

A. Providing your roof is not lead-covered, and that your house is at least 25 feet high, the aerial you describe should be quite suitable.

Q. An "Old Operator" asks why, when he was at sea and passing through the Suez Canal, he could hear the Aden wireless station quite clearly, but when the ship entered the Red Sea signals became almost inaudible?

A. This phenomenon has been noticed by many wireless men, and it is thought that the real explanation lies in the fact that "screening" effects are the cause of the fading away of the signals. The Aden wireless station is badly situated in this way. In certain parts of the Red Sea ships can receive the signals from Aden quite clearly; in others they are inaudible.

* * *

Q. If an inductance wound with No. 22 s.w.g. on a tube 6 x 6 x 4 ins. in four layers with suitable tappings would be O.K. for a one-valve receiver?

A. The inductance would not be suitable if layer-wound. If pile-wound, it should function quite well.

* * *

Q. What is a suitable resistance for a grid-leak?

A. From 1 to 5 megohms, according to circumstances.

* * *

Q. What is the capacity of a tubular condenser, the outside tube being 4 ins. long by 1½ ins. diameter, the dielectric being $\frac{1}{16}$ ins. ebonite?

A. 0.00016 mfds.

* * *

Q. What would be the cost of a two-valve amplifier exclusive of batteries, etc.?

A. Consult advertisers in this magazine.

* * *

Q. Is an earth lead of 34 feet too long for good reception on a crystal set?

A. We should say that you would get very poor signals using such a long earth lead. Cut it down as much as possible.

* * *

Q. What are the best relative proportions for the A.T.I. and reaction coil?

A. There is no fixed value; it varies with types of apparatus and wave lengths, etc.

* * *

Q. What is the cause of the crackling noises in the telephones using amplifier reception?

A. Probably due to either atmospherics or induction from local electric-light mains.

If the former, this can be ascertained by noting whether the crackling varies with the weather conditions. Atmospherics are at their worst in thundery weather and during the summer months.

* * *

Q. Is a variometer a good substitute for a variable A.T.C.?

A. For short and medium wave lengths, yes; for long, no.

* * *

Q. Which is the best way to couple a separate heterodyne to a resistance coupled amplifier?

A. Connect a coil in the grid circuit of the first valve, to couple directly into the heterodyne.

* * *

Q. What wave length can be got using a coil 3½ ins. diameter wound with 250 turns of No. 23 s.w.g.?

A. Used with a standard 100-ft. aerial the wavelength range will be, approximately, 1,400 metres.

* * *

Q. Would interference be caused by using a public telephone line as an aerial?

A. We should imagine there would be a good deal of interference. In any case, the practice of using a telephone wire for an aerial is not recommended.

Q. Is it best to use a separate heterodyne or reaction for telephony?

A. Reaction is best for telephony.

* * *

Q. When speaking of No. 30 D.W.S. wire, what is exactly meant?

A. No. 30 D.W.S. wire means wire of No. 30 gauge wound with a double covering of silk.

* * *

Q. How can an accumulator be charged using the A.C. lighting supply?

A. By using a British Thomson Houston "Tungar" thermionic rectifier, or a Nodon valve. The former method is the most expensive.

* * *

Q. What is the capacity for a blocking condenser for 4,000-ohm telephones?

A. 0.0005 to 0.001 mfd.

Are you having trouble with your set?

If you are, consult the Technical Experts on the staff of POPULAR WIRELESS, who will give your questions the full benefit of their long and varied experience.

No trouble is too great providing we can help you.

Q. Does the Marconi Co. control the Admiralty wireless station at Whitehall, and what is the station's call sign?

A. (1). No; the Admiralty control the station. (2). B.Y.A.

* * *

Q. Can I add apparatus to my set so that several persons may listen to signals simultaneously?

A. A double-note magnifier, 3 low-frequency valves, and a loud speaker can be used. This will cost at least £10 beyond the price of your existing set.

* * *

Q. Is a telephone transformer necessary when using telephones of 120 ohms resistance on a valve set?

A. Yes; a telephone transformer is essential if your 'phones are only 120 ohms.

* * *

Q. What is the cost of a wireless telephony receiver?

A. It is necessary to know the distance from the broadcasting you wish to hear, also whether you have facilities or not for suspending an outside aerial wire. If you are near to a broadcasting station the cost of apparatus may be only £6 or £7; if you are over 50 miles away the cost may rise to £50.

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Y/Y

POPULAR WIRELESS, June 17, 1922. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

No. 3. PACKED WITH PICTURES AND EXPERT ADVICE

POPULAR WIRELESS

3d.

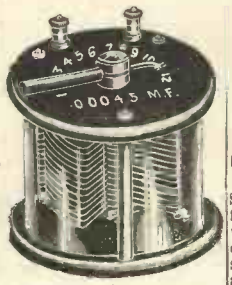
No. 3, Vol. 1
June 17, 1922

Weekly

WIRELESS NOTES AND NEWS
BROADCASTING PROGRAMME
A SIMPLE VALVE SET
THE NEW ALADDIN'S LAMP
WHAT TO BUY, ETC., ETC.

CONTENTS OF THIS :: ISSUE ::

ARE YOU SETTING UP WIRELESS? BY WILLIAM LE QUEUX
WIRELESS QUESTIONS ANSWERED BY EXPERTS



Variable Condensers

Of a quality that has made them famous amongst every wireless experimenter throughout the country.

No. M.W.2.
Capacity to ·00036 mfds. Each 17/6 post free.

No. W.M.3.
Capacity to ·0004 mfds. Each 25/- post free.

No. 10.
Capacity ·0003 mfds. Each 25/- post free.

No. 11.
Capacity ·0045 mfds. Each 36/- post free.

High Frequency Inter-Valve Transformer

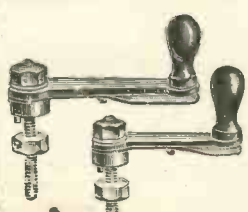
Suitable for wave-lengths from 800 to 4,000 metres, without any taps. Wound on solid ebonite former with silk-covered wires. Originally marketed 1920 Price each 22/6 post free.

Blocking and Fixed Condensers

Over 100 types of various capacities—anything supplied quickly in stock at time of this advertisement ·002, ·003, ·0002, ·0003, ·0004, ·0005 mfds. All one price, each 6/9 post free.

Valve Tuners

Built from solid ebonite, and finished in the Mitchell way. All wiring silk insulation and the design such to recommend them for use with valve circuits only. Not suitable for crystal work. No. 1 Tuner, having a range from 300 to 1800 Metres. No. 2 Tuner having a range from 1600 to 8000 metres. Price either type, £4 15s. Postage 1s extra. A No. 11 condenser should be used in conjunction.



Switch Arm 1 in. radius 1s. 9d.
Switch Arm 1½ in. „ 2s. 3d.
Switch Arm 2 in. „ 2s. 6d.
Postage 3d.

CONTACT STUDS to suit above arms:—
No. 163 ½ in. Head, ¼ in. long, dozen, 1s. 6d., postage 2d.
No. 164L 3/8-in. Head, ¼ in. long dozen, 1s. 6d., postage 2d.
All complete with nuts and washers.

Over 15 pattern contact studs stocked. Make a point of comparing our types with others.

Valve-holders.

1/6, 1/9, 2/6, 3/6, 6/6 each

Also supplied mounted in groups of two or three, on ebonite, or also fitted in hard-wood cases.

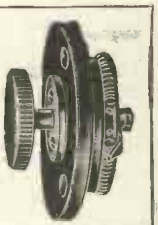
"Dot" Grid Leak

for Valve Circuits.

as illustrated, 4/6 each, or larger and superior pattern 7/6 each. Leak units, and high resistance units also stocked in many sizes and qualities.

Filament Resistances

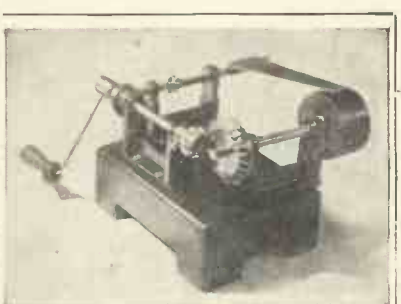
for Panel or Ordinary Mounting. Panel mounting types, each 5/6 post free. or the standard "MEW" Highest Grade ordinary types at 9/6 post free. When ordering state if required for 1, 2, or 3 valves.



MITCHELL'S of PECKHAM

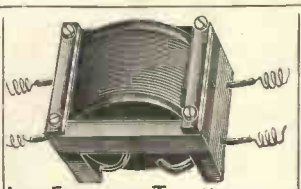
Wireless Headgear

wound to a total resistance of 4,000 ohms, recommended highly for crystal or valve sets without having to use a telephone transformer, 35/- per pair, postage 1/- extra. You will find these exceedingly comfortable to wear, and compare with very expensive types favourably.



The "Lokap" Machine

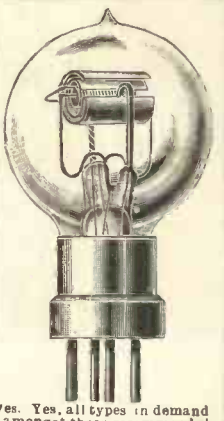
For full particulars write for pamphlet, or refer to last week's advertisement in this journal. It is the only machine in the world of its kind which enables amateurs to make their own lattice inductance coils for the price of the wire only. Price 25/-, with everything necessary. Postage 1/- extra.



Low Frequency Transformers.

Not as illustration, but our latest "Hedgehog" design, free from noises, and powerful amplification, with lowest losses.

Price, each 17/6 & 21/-. Thoroughly recommended; money back if you are not satisfied. Two, three, and four-valve amplifiers, of course, are stocked.



Valves. Valves. Yes, all types in demand stocked, and amongst those recommended are "MARCONI—OSRAM" "R" Type Receiving Valves at 26s. 6d. each, postage 6d. extra. Mullard "ORA" Valves at 15s. each, postage 6d extra. The V. 24 in. Marconi valve at 24s. 6d. Please bear in mind that valves are rather short at present, but we will advise when same can be forwarded. High Tension Batteries are stocked for all valves at competitive prices. Your enquiry should accompany your other valve queries

Control Knobs.

For making up your Tuners, etc., 1½ in. diameter ebonite knob, fitted with laminated sweeping arm (Radius 1½ in.), as fitted to our instruments. Each 2/6, postage 3d. extra. Many other patterns also stocked. The Ebonite knobs only are 1/- each post free. Cheaper if taken in half-dozen lots.

Valve Panels. The No. 16 Valve Detector Panel is our standard, and at 37/6 post free, represents the finest valve in Great Britain. Make a point of inspecting this when in London. Valve Panel No. 17 is our low frequency amplifier for attaching to the No. 16 with four brass straps. This is priced at 55/-. To convert both simultaneously into high and low frequency amplification, have our "Duo-Amplion" (patents applied for). More about this wonderful invention in the course of a week or two.

Aerial Material, etc.

Flag Masts, Bamboo Masts, Bamboo Spreaders, see "blue slip" which accompanied our catalogues. WE ERECT MASTS WITHIN A 20 MILES RADIUS OF LONDON.

6½-foot selected bamboo spreaders average 1½ ins. diameter 1s. 6d. at retail stores. Carriage forward when railed.

Aerial Insulators. Mitchell's "Chain" type, recommended 1s. each, or 10s. 6d. per dozen, postage on six costs 9d., on one dozen costs 1s.

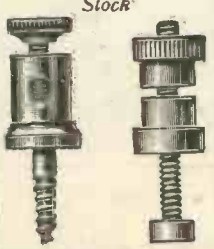
Aerial Pulleys. Heavily galvanized, 1s. 6d. each, postage 5d. extra.

Rope for Halyards, heavily 'doped,' with anti-rot compound which will not come off and spoil your hands, 1s. 6d. per dozen yards, postage 9d. extra.

Aerial Wires. Stranded 7/23 enamelled wires 6/0 per coil of 100 feet, postage 9d. Stranded 5/24 enamelled coil of 100 feet 5s. 6d., postage 7d. extra. Many other lighter and heavier gauges stocked.

Lead-In Insulators. as illustrated, light pattern 4s. 6d., heavier pattern 5s. 6d. postage 6d. extra, either pattern. HIGH TENSION CABLE for leading in from insulator. 1s. per yard.

TERMINALS
Large Selection in Stock



No. 1 Wood Screw	1/-	doz.
No. 2 „ „	2/3	„
No. 3 „ „	2/9	„
No. 4 Illustrated	3/9	„
No. 16 „	2/6	„

MITCHELL'S FAMOUS ACCUMULATORS.
REDUCED PRICES.

4 volt 20 amp.,	17/6	and 21/0
4 volt 40 amp.,	22/6	„ 27/6
4 volt 60 amp.,	25/6	„ 37/6
4 volt 80 amp.,	35/6	„ 47/6
6 volt 20 amp.,	27/6	„ 35/0
6 volt 40 amp.,	36/0	„ 42/0
6 volt 60 amp.,	45/0	„ 59/0
6 volt 80 amp.,	55/6	„ 75/0

Carriage extra on all above at cost; see that you enclose sufficient to cover; this prevents delay in dispatching.

MITCHELL'S ELECTRICAL & WIRELESS, LTD.

Pioneers of the Home Wireless Outfit at £5 (carriage paid Gt. Britain). Complete with 4,000-Ohm Double Headgear, Aerial Wire & Insulators.

188 RYE LANE, PECKHAM, S.E.15

48-Page Illustrated Wireless Catalogue, post free, 6d.

Wholesale & Export Section: McDermott Rd., Peckham, S.E.15. Telephones: New Cross 1540 & 1541.

Popular Wireless

TOPICAL NEWS AND NOTES.

A New Station for Denmark.

A DANISH commission of experts have recommended the construction of a large wireless station capable of communicating with Greenland and America.

It is suggested that the Poulsen system of transmission be employed.

* * *

French Amateurs.

WIRELESS has its thousands of devotees in France as in England and America.

The post and telegraph authorities in France are preparing a scheme which will enable the ordinary citizen to have a receiving apparatus, by which he can "listen in" at a cost of a few francs a year.

* * *

"Blow, Blow, Thou Wireless Fuse!"

SINCE Major-General Squier announced his method of operating a wireless set through a lamp, fuse wire manufacturers have reported a remarkable boom in their business. Operation by the new method requires a lot of experimental work—and a lot of fuses.

* * *

Private Wireless.

THE opening of auction offices and sale rooms in Coney Street, York, with a private wireless installation for communication between London and York will take place shortly. This new departure is being undertaken by Messrs Duncan B. Gray and Partners, Mount Street, W., owing to their extensive estate managements in Yorkshire.

* * *

Moving a Station.

HITHERTO, the use of the wireless telephone between aerodromes and planes flying on the London-Paris airway has been rendered difficult by the fact that the station at Le Bouget was too close to the wireless telegraph station, thus rendering the sounds confused.

The French wireless telephone station at Le Bouget will shortly be transferred to Louvres (Seine et Oise), when it will be possible to remain in constant communication with aeroplanes travelling to and from London.

* * *

"Over There."

OUR American friends are certainly interested in wireless. In fact, one might *almost* suggest they had it on the brain.

I picked out the following headlines from various American newspapers sent to me by a friend. They are decidedly full of "pep."

YELL "S.O.S." WHEN YOU WANT "A C.O.P."

"PAGLIACCI" FOR OPERA-HUNGARY RADIO FANS.

"RADIO RALF," THE LIVE WIRE, ANSWERS ALL QUESTIONS.

MAN IN THE MOON BY RADIO NAMES BRIGHT TWINKLING STARS FOR LITTLE BOYS AND GIRLS.

* * *

A Sleep Maker.

"VOROS, a Hungarian hypnotist, will carry on his lethal work via radiophone," says the Brooklyn Daily Eagle, and adds, "He has already succeeded in putting people to sleep by telephone." I know people that can put whole audiences to sleep without either telephone or radiophone. Voros has nothing now.

* * *

London-Paris Wireless.

MR. PIKE PEASE, the assistant Postmaster-General, recently stated that no formal licence had yet been issued to the Marconi Company to conduct a wireless telegraph service between London and Paris. The conditions under which a permanent licence should be granted were still the subject of negotiations. The Marconi Company's service had withdrawn a certain amount of traffic from the cable service, but the loss of revenue involved was not appreciable.

* * *

The Egypt's Operator.

THE Mayor of Battersea, where Mr. William Arthur Hardwick, the heroic wireless operator of the Egypt, lived, has placed a private grave space in the council's cemetery at the disposal of the parents. He also suggests that the funeral expenses and the cost of providing a suitable gravestone might be defrayed by public subscription.

* * *

A receiver in the form of a pocket-book, and capable of picking up readable messages, has been put on the market by R. M. Radio, Ltd.

An African Station.

A WIRELESS station is to be erected at Ain-el-Hadjar, near Saida, on the railway line from Perregaux to Colomb-Bechan.

The station will be an important link between France and her African colonies.

* * *

Broadcasting at Vancouver.

A WIRELESS telephone service has been established at Vancouver for British Columbia. The range will be as far as 2,500 miles seawards.

Transmissions will include news, concerts, etc.

The tests have given excellent results, and the service is now in regular operation.

* * *

The Very Latest.

A FRIEND of mine asked me the other day, apropos of the article on seeing by wireless, which appeared in the first number of POPULAR WIRELESS, if it would ever be possible to *smell* by wireless. I referred him to the Editor, who referred him to the door. Well, it was a funny question!

* * *

Russian Radio.

RUSSIA is keeping to the fore in wireless progress. A powerful radio station, capable of direct communication with Germany, England, Denmark, and Norway, is nearing completion at Dietskoye Selo in Russia. It has been planned entirely by Russian engineers, and erected by Russian labour.

* * *

Hastings and Wireless.

HASTINGS town council, in committee, have sanctioned the erection of a public wireless receiving station in the town. This example of public enterprise should be copied by other seaside resorts, for there can be little doubt that wireless concerts will prove a very attractive holiday feature. My congratulations to go-ahead Hastings.

* * *

Wireless Telephony in Sweden.

THE telegraph authorities of Sweden are making experiments with a view to linking up the ordinary land line telephone with the wireless telephone, so as to effect "through calls." This system of linking up the land line 'phone with the wireless 'phone has proved very successful in America, especially in connecting up Santa Catalina Island and the mainland.

* * *

A New "Haerial."

AN enterprising barber in Leeds has attached a wireless aerial to the striped pole over his door.

Inside the shop he has a loud-speaking receiver to entertain his customers.

He hopes it will not be long before his customers may learn the result of a race or hear Yorkshire's latest score while reclining in the barber's chair for a shave.

NEWS AND NOTES

(Continued.)

The P.M.G.'s Vision.

MR. KELLAWAY, the Postmaster-General, recently said to an "Evening News" representative:

"If wireless broadcasting becomes as popular in this country as it is in the U.S.A., there should be something like 500,000 receiving sets here in a short time, instead of the 7,000 or 8,000 at present. There is no doubt that we are at the beginning of the creation of a considerable new industry.

"By the use of multiplicrs it will be possible for large numbers of country people in public halls, or in market places even, to listen to speeches made in London or elsewhere many miles away.

"At election times the leaders of the great political parties will be able to address their supporters in every part of the country simultaneously. The U.S. President has already addressed millions of people in America, and has been heard with clearness from the Pacific to the Atlantic.

"The question of broadcasting ordinary news is most important. It is obviously impossible that the Post Office should allow the broadcasting firms to circulate news which has been collected at great expense by the newspapers and news agencies.

"I propose that as soon as the firms have come to an agreement of which I can approve, a conference of their representatives and those of the Press and news agencies shall be called. I have no doubt that in that way a solution can be found."

Mr. Kellaway hopes that by Christmas a wireless receiving set, costing anything from £6 to £60, practically fool-proof, will be a popular present.

* * *

SIR WILLIAM NOBLE, who has just retired from the position of Engineer-in-Chief to the Post Office, might well be termed the "Father of the 'Phone."

Telephones are his pet hobby, and he has fathered them, and has been closely identified with their development throughout the whole

SIR WILLIAM NOBLE

of his twenty-seven years service to the Post Office. The hardest task he ever tackled was the "telephoning of London."

When he entered the Post Office in his native town, Aberdeen, he received the princely wage of twelve shillings a week as a telegraphist. At that time the telephone had not become a commercial proposition. To-day, there are a million of these instruments in the United Kingdom.

Who is the young wireless amateur to-day who is only receiving a small apprentice's wage, but who will rise to do for wireless what Sir William has done for the telephone?

Sir William is still loyal to his "old love," but he admits that, from the point of view of entertainment, education, and propaganda, wireless has a distinct part to play.

The Wireless Lover.

Dear heart, the message that I send
Is from no high aerial hurled;
Your modesty it would offend,
Should I broadcast it to the world.
From "yon blue Heaven above us bent"
It comes to you, and you alone,
Having been most discreetly sent
Upon a wave-length of our own.

Four little words are all I need
My simple meaning to convey;
For I express myself, indeed,
In quite the most old-fashioned way.
Yet these are they you joy to hear
In all their sweet simplicity;
So when I breathe, "I love you, dear!"
My darling, listen in for me!

C. E. B.

(By kind permission of the Editor of "The Evening News.")

Newspapers and Wireless.

NEARLY two hundred daily newspapers in the United States are now running wireless news supplements, and the number is constantly growing. The great majority of them are published on the Atlantic Coast. Nearly two score newspapers in New England publish such supplements, fifteen in the Southern States and eleven enterprising newspapers on the Pacific Coast.

* * *

An Arctic Station.

A WIRELESS station has been established on Jan Mayen Island, in the Arctic Ocean. It is operated by Norwegians, and communicates with English, Norwegian, and Swedish meteorological stations. As the island is visited by sealing and whaling vessels, this communication is of extreme value to them.

More Concessions to Amateurs.

IMPORTANT concessions have recently been made by Mr. Kellaway to wireless amateurs.

The Wireless Society of London, the central body to which are affiliated most of the provincial bodies, made a number of recent recommendations to Mr. Kellaway, with regard to amateur transmissions, and received a most encouraging reply.

The Postmaster-General has agreed to the following concessions: The regulation forbidding an amateur to transmit to more than five other stations is withdrawn, providing that experimental data, and not news, is alone exchanged; the definite two hours' allotted period per day for transmission is cancelled, and, as long as amateurs will make sure they are jamming no one, they may fill in their two hours at any time they like.

The recommended wave-lengths are adopted by the Post Office, who agree to withdraw the confusing 1,000-metre wave, and to permit 150–200 metres and 440 metres for amateur work. Spark may only be used on the smaller, but very useful and elastic wave-length band, but continuous wave and telephony transmission is permitted on both ranges.

* * *

An Audience of 200,000!

"IT was my privilege recently," writes the American representative of "The Daily Telegraph," "to receive an invitation to visit one of the largest broadcasting stations in the United States—I refer to Newark, New Jersey—about ten miles from New York, popularly known as W.J.Z.

"I was escorted to a quiet room, where I sat upon a table for the best part of an hour, spoke into a vulcanite mouthpiece, which, without wires of any kind, broadcasted my 'talk' to an audience of 200,000 people. There was no apparatus within sight, but every word was heard by houses with receivers over vast tracts of territory hundreds of miles apart, chiefly in cities, but often in lonely country farmhouses, where receivers had been constructed in some cases by an ingenious boy at the cost of a few dollars. The thought occurred to me that here was I in a cosy room, far from the madding crowd and with no distraction whatever, reaching more people in one evening than a politician on a platform can reach in a year!"

This should convince the scepties!

Broadcasting Programmes

What you can hear every evening of the week on your set.

MANY readers of POPULAR WIRELESS have asked where the broadcasting stations will be erected. So far, it is proposed to erect them at places centring on London, Cardiff, Plymouth, Birmingham, Manchester, Newcastle, Edinburgh or Glasgow, and Aberdeen.

This will enable amateurs in all parts of the country to be quite certain of receiving a good supply of music, speech, etc. Crystal sets will operate quite well within a radius of 15–20 miles of one of these broadcasting stations, but outside this radius valve reception will have to be employed for good results.

Many important points connected with the establishment of broadcasting stations have already been thrashed out, and the scheme progresses day by day, so that before long we may expect the stations to be in full working order.

The Postmaster-General, Mr. Kellaway, who is enthusiastic about the future of wireless, has already held several conferences with the firms who wish to erect broadcasting stations, and many details have already been settled.

For the present the amateur will find "plenty doing" every night of the week from amateur transmitting stations.

The Paris station, Eiffel Tower (call sign F L), transmits telephony irregularly each day on a wave-length of 2,600 metres, generally between four and five o'clock of an afternoon.

The Hague concert is sent on Sundays on a wave-length of 1,070 metres (call sign P C C G) from three to five p.m.

The Marconi station at Writtle (call sign 2 M T.), near Chelmsford, broadcasts a concert every Tuesday evening at eight p.m. on a wave-length of 400 metres. This concert lasts about half an hour.

How to Make A Loud Speaker

By GEORGE SUTTON, A.M.I.E.E.

THE first thing the newly-equipped wireless man does, if you are standing at his side when he gets good signals, is to snatch the headgear telephones off his own ears and thrust them hurriedly on to yours. Then, immediately he is all impatience till he gets the receivers back again, for he doesn't know what you are hearing and what he is missing.

The more ingenious man, rather than hand on the complete headgear, unscrews one of the ear-pieces from the band and hands it to you, while he retains the other. Then you both listen with one ear each, like two small boys with one pair of roller skates between them.

Finding this inconvenient he gets a second pair of telephones, and the trouble then is how best to join them up to get the greatest effect. In nearly all cases it is better to join them up in "series" fashion rather than both in "parallel." (See Fig. 1.)

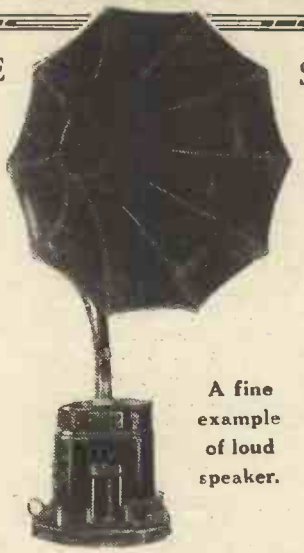
The possession of a "loud speaker" instrument will, however, obviate the necessity of choosing either method. The loud speaker, however, cannot usually be put into a crystal receiving circuit, for, as the signals received in such a set depend entirely on the amount of energy you are able to intercept from the sending station, they are usually very faint, and a loud speaker by itself cannot increase the signal strength.

Nevertheless, if you are living near the sending station, and you get strong, loud signals in your headgear telephones, you can substitute a loud speaker with some hope of success, and instead of deafening yourself you can make the signals audible to all present in the receiving room.

The easiest way is to combine the tone arm of a gramophone and a single telephone receiver in the following way:

Take the mica diaphragm from the sound-box of the gramophone, leaving nothing in the way from the front of the sound-box to the entrance into the tone arm.

Now take the single telephone ear-piece receiver and clamp it tightly against the front of the sound-box of the gramophone, as though the sound-box were your ear.



A fine example of loud speaker.

Place the sound-box in position on the tone arm of the gramophone, and the air in the horn will spread the sound of the signals over the room in the direction in which the horn is pointing. All joints must be airtight. (See Fig. 2.)

Alternatively, the horn may be a straight-sided, cone-shaped construction of sheet metal, wood, or even thickly-pasted paper, varnished inside and with the small end fastened tightly to the hole in the ear-piece of a single receiver. (See Fig. 3.)

The great point about this, and, indeed, any other sound-reproducing horn, is that it must not vibrate itself to the sounds which are passing through it. It must be stout and strong, and not the thin metal contraption that the old gramophone horn used to be.

If you do use a thin metal horn much of its natural resonance can be removed by winding several bands of insulating tape round it, inside and outside. This is not recommended, however.

If it is desired to make the most of a pair of receivers, a short hollow cylinder of wood, metal, ebonite, paper, or practically anything handy, should be obtained about six inches long and about two inches outside diameter. A hole must be made in the middle of one side into which should be securely fitted the small end of a horn. (See Fig. 4.)

Now, if the headgear telephones are clamped tightly to the open ends of the cylinder, as though over your two ears, the horn will considerably magnify the sounds in the receivers.

The instrument suggested will be considerably improved if the cylinder is thick in the walls; that is, if it has the hole in the middle no larger than the opening in the ear-piece of the receiver and is very smooth inside. Before fixing the horn into the hole in the side of the cylinder, carve out a piece of hard wood to the shape indicated at Fig. 5, and fit it into the tube opposite the hole as shown at C in Fig. 6.

Sounds emerging from the opening in the ear-pieces E will be guided upwards into the horn as shown by the arrows, instead of travelling straight along and interfering with the sounds emerging from the other ear-piece.

This type of loud speaker is used by a great many successful English amateurs, and is well worth the time spent in making it properly.

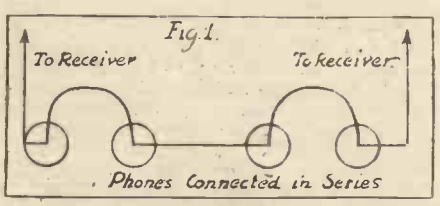


Fig. 1.

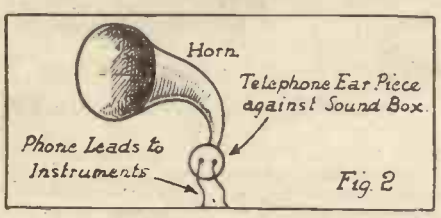


Fig. 2

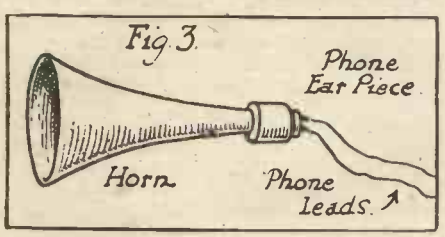


Fig. 3.

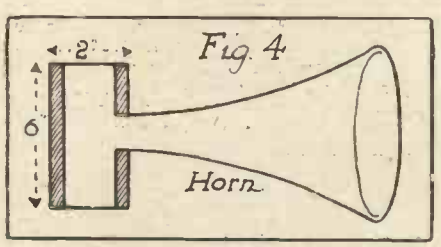


Fig. 4

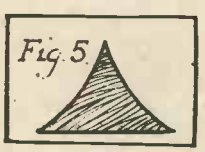


Fig. 5.

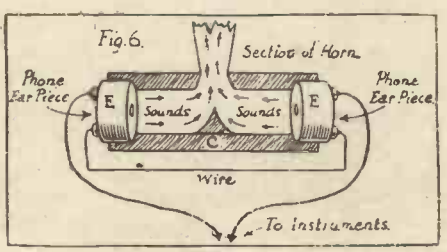


Fig. 6.

WHAT TO BUY

THE cheapest kind of receiver is a "crystal" receiver.

Crystal receivers are quite unsuitable for use with a frame aerial, but with a good outdoor aerial, telephony may be received within a radius of about 15—20 miles from a broadcasting station.

"Screening" effects, *i.e.*, the proximity of trees, other buildings, etc., will reduce this range accordingly.

Crystal receivers can be purchased, complete with telephones and aerial, for £5.

Using a one-valve receiver and frame aerial, telephony may be heard within a radius of 10—15 miles of a broadcasting station. With an outdoor aerial the approximate standard range is 50 miles; but the writer has received good Morse signals from Malta and Bucharest, using only one valve.

The receiving range of a station cannot be stated definitely because the range must depend, to a considerable extent, on the power of the transmitting station.

With two valve, or more, receivers, good telephony can be received from the Hague up to a distance of 100—150 miles. Morse code signals can be heard over much greater distances.

Speech and music can be magnified by adding to the apparatus just dealt with.

For this purpose an amplifying valve, or valves, must be used, in conjunction with a loud speaker. Loud speakers cost anything from £3 upwards, and one valve amplifiers from about £5 upwards.

For practical purposes crystal receivers will not receive continuous wave Morse signals, but are effective for the reception of telephony and "spark" signals.

Valve receivers will function for C.W., "spark," and telephony reception, provided they are designed for those purposes. This point should be borne in mind when purchasing apparatus. If you want to receive C.W.—or continuous wave—signals, don't purchase a set only designed for "spark" and telephony reception.

How Marconi Discovered Wireless

**"There is a tide in the affairs of men,
Which, taken at the flood, leads on to fortune."**

THERE is a time in the affairs of men when they come to a halt; a time of hesitation.

When one wave of great men is falling back, finishing their years of activities, and the next wave, the wave of young men, the inventors and creators of the future, is not quite ready to burst. Watch the waves of the sea beating on the shore. There is just that same moment of hesitation, as if the whole sea was falling back.

Such a time was the years of the middle 'nineties. Our great scientists—Darwin, Tyndall, and Huxley, had lived their three-score and ten years; given to posterity the fruits of their labour, and had passed on. Clerk-Maxwell and Hertz had lived shorter, but intensely useful lives; Lord Kelvin and Sir William Crookes had given many amazing theories which have had a lasting effect upon human thought; but they were at the end of their strength. The old wave was spent, and there was no sign of the new.

We rocked upon that halt, that time of hesitation between two waves.

The Wave of Progress.

And what a grand wave that last had been, breaking upon the shore of knowledge, crumbling down one obstacle after another, showing a marked progress inland. All around sounded the crackling and tumbling of little hillocks that had seemed as if they must for ever stop the sea of human thought from getting any further.

Tyndall showed us a new path forward with his theories on radiation; Clerk-Maxwell and Hertz opened up tremendous possibilities through their studies of electro-magnetic waves; but the greatest rock of all came hurtling down when scientists' knowledge of the atom was burst in twain, and the electron theory was conceived.

The atom was, as it were, the last barrier upon the little ridge on which the men of the 'nineties had been storming. When there came the knowledge that there was something 2,000 times smaller than an atom of hydrogen—Johnstone Stoney called it an electron—there lay exposed a vast valley of probabilities.

The existence of ether was already realised, and with it the fact that it exists everywhere, not only in the space between worlds, but in the space between the atoms of matter.

Scientists had dealt with solids, liquids, and gases, but here was a hitherto unknown medium, to be investigated and harnessed to the uses of civilisation. What a tremendous valley of possibilities! And the wave was spent—was falling back . . . .

A Great Scientist's Forecast.

Some little trickle of thought had found its way down into this unknown valley just beyond the ridge. As early as 1892, Sir William Crookes had foreseen wireless telegraphy. He then wrote:

"This is no mere dream of a visionary philosopher. All the requisites needed to bring it within the grasp of daily life are well within the possibilities of discovery, and are so reasonable and so clearly in the path of researches which are now being actively prosecuted in every capital in Europe, that we may any day expect to hear that they have emerged from the realms of speculation into those of sober fact. Even now, indeed, telegraphing without wires is possible within a restricted area of a few hundred yards, and some years ago I assisted at experiments where messages were transmitted from one part of the house to another without an intervening wire. . . . . ."

In 1877, Professor Hughes, and in 1894, Lodge, laid their hands on the secret of wireless, but did not recognise the full value of discoveries they made.

Wireless discovery was in sight, but it was just beyond the reach of that wave of grand old men. They were unwillingly relinquishing their hold, falling back from the possibilities of the future, when the first of another wave—can we hope as grand a wave as that just spent?—swept on and past them, over the ridge and on, in the person of Guglielmo Marconi.

Leading the Way.

It was in 1895, when he was only just twenty-one years old, that Marconi first began to experiment with the waves Hertz had discovered.

In 1896 he came to England with a complete patented system of wireless telegraphy, submitted his inventions to the British Government, and in 1897 the Marconi Wireless Telegraph Company was founded.

Marconi absorbed the knowledge and experience of his forerunners, and brought to bear upon their theories a young and extraordinarily keen brain.

Wireless telegraphy is the transference of electrical energy across space by the creation of etheric vibrations. These vibrations are received by stretching in their path a wire, or other metallic body, sensitive enough to absorb sufficient of the radiated energy to be recorded on a receiver, either in the earpieces of a telegraph or telephone set, or on the recording tape machine.

Marconi realised, only six months after he first began his investigations, that the transmitter then evolved was strong enough—in fact, was far stronger than many of his contemporaries realised—to send messages over distances much greater than any that had up to that time been attempted.

SIR WILLIAM CROOKES.

Early Detectors.

He was not quite so confident of the detector or receiving set, and spent considerable time experimenting with possible improvements. The instrument then in use was the Branly coherer. Marconi eventually evolved a much more reliable and sensitive receiver.

He also modified the type of transmitter as originally invented by Hertz, and by experiment he tried to discover the distance at which a given transmitter can affect a given receiver.

He experimented with aerial wires, and he discovered the important fact that the range of transmission increases as the height of the aerial is increased.

That was one of his great secrets which enabled him to come to Great Britain as master of the problem that had been holding science back for years. His other secret was that he had discovered that transmission was greatly facilitated if there were earth connections between stations, which could be obtained merely by running wires to ground at both receiving and transmitting stations.

In 1899 signals by wireless were transmitted across the English Channel. Two years later he succeeded in establishing communications by wireless over a distance of two hundred miles, when a message transmitted from the Isle of Wight was received at the Lizard.

Facts are Facts.

The world was now noticing. Wireless had ceased to be the plaything of scientists; it was now talked about everywhere as the ideal means of communication in the future. Its value in the preservation of life at sea was blared forth in every newspaper.

That same year, Marconi, as if nothing could stop him now that he was the first man to have successfully "burst into the ether," and to have understood as well as used its unlimited possibilities, established communication by wireless between Cornwall and Newfoundland.

People were incredulous; there were many who believed the performance was a "fake." But facts are facts, and there is no disputing them. In 1903 commercial messages were being transmitted to America by wireless.

A Belt Round the World.

But still Marconi was continuing his experiments with receiving and transmitting sets. The man who had bridged the Atlantic was not satisfied that his instruments were perfect, and in 1910 he produced a new receiver, developed a duplex system of transmission, and in the following year installed his apparatus in most of the large ocean liners.

In 1919 a wireless station at Carnarvon was communicating directly with receiving stations in Australia, and Marconi had fastened a belt round the world.

And yet his activities did not cease. Throughout the years of the War he was in charge of the wireless operations of the Italian Government, and was continually experimenting in directional wireless.

And thus he goes on, from step to step. There is no means of knowing what his next discoveries may be, for he keeps silent about them until he can disclose them to the world as accomplished facts.

What Marconi Did.

Nevertheless, all the laurels—and Marconi himself would be the last one to claim them—must not be given to the clever Italian scientist, or even to the efficient band of helpers he has gathered around him.

LORD KELVIN. HEINRICH HERTZ.

It is not even true that Marconi "alone discovered" wireless. As has been shown, he absorbed and weighed and valued the years of research of many great scientists. All the terms of wireless do not bear Marconi's name; the Hertzian waves are still spoken about; the Branly coherer will always be remembered, although it has long passed its day.

The study of electro-magnetic waves did not originate with Marconi, but from the theories of Clerk-Maxwell and Hertz he evolved a commercial reality.

The electron was so named by Johnstone Stoney, in 1891, and Von Helmholtz, in a lecture in London, ten years before that, had hinted at the existence of the electron.

Sir William Crookes investigated it further and to greater benefit, and the three of them in so doing revealed the existence of the hitherto undreamt of medium-ether.

Marconi applied the astonishing properties of ether and electricity to serve the highest works of civilisation.

The last wave of great men had prepared a mighty stretch of land, and cleared many obstacles, and to all the great men of the nineteenth century must be accredited the honours due to them, and a certain amount of sympathy, for they got so near to the great discovery before their years of usefulness had run their course.

A Practical Dreamer.

But to Marconi will ever belong the chief glory of "inventing" wireless, for he took the discoveries of predecessors and showed the world how to derive benefits from them.

Marconi was born near Bologna in Italy on April 25th, 1874. His father was an Italian, and his mother was Irish. He was educated at the university at Bologna, and at an early age became interested in the discoveries by Hertz regarding the possibility of wave transmission.

Yet, although Marconi has given so much of his life to study and thought on wireless matters, he is by no means a dreamer. On the contrary, he is very much a man of action—a *practical* dreamer if you like.

He is not content to sit and turn his ideas over in his mind. Once he conceives a new idea he is restless until he has put it to a practical test and proved its feasibility.

Prior to his great Trans-Atlantic experiment he spent many days in Newfoundland in the middle of winter in order to test his aerials suspended from kites and balloons, when the first faint signals from the Poldhu station crossed the Atlantic.

Marconi wins honours easily; he is a Freeman of Rome, a Nobel prize winner, and the recipient of many decorations.

First into the ether! He stands like Columbus once stood when he gazed for the first time upon the Pacific, with an apparently limitless, unexplored ocean before him. It is impossible to say what the Ether Ocean contains, or to prophesy with any degree of certainty the rôle it will play in the advancement of civilisation.

What Next?

The discovery of ether is the greatest achievement of human progress. We have shaken off the fetters that tied us down to experiments on matter, and we are now at liberty to investigate a super-sensitive and elusive medium whose powers have revolutionised commerce already, and whose possibilities seem infinite.

Our thoughts are now transferred by our mere desire from one side of the world to the other with the speed of light. Are the days coming when the power of our arms and of machinery can be generated round the world; when the range of our vision will be extended to the same extraordinary extent our hearing has been extended?

Impossible? So less than thirty years ago would we have said that it was impossible for the human voice to be transmitted hundreds of miles by wireless.

The Last Word.

But it can be said with safety that the possibility of seeing by wireless is very real indeed.

Photographs have already been transmitted by wireless with considerable success, and scientists and experimenters all over the world are slowly, but surely, striving towards the goal that seems so elusive and yet so near.

And Marconi himself recently stated that he believed it quite feasible to suppose that the Martians were trying to signal to us.

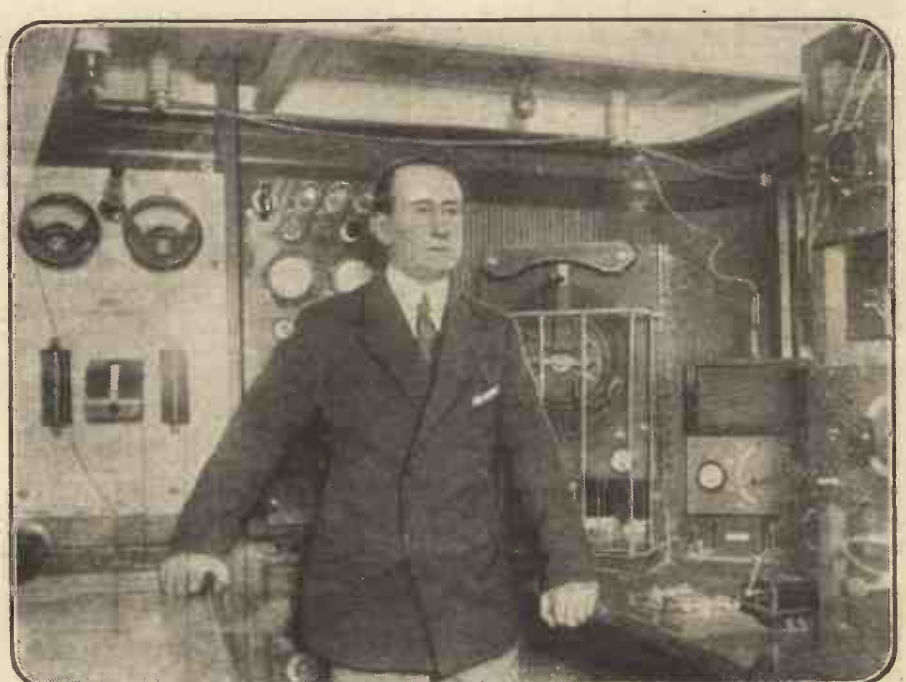
Perhaps when he has returned from his present voyage of experiment, Marconi will be able to clear up this fascinating question once for all.

Should it really be true that the mysterious long-wave signals emanate from some Martian wireless set, what stupendous prospects will open up before the wireless experimenter of to-morrow!

But posterity will certainly benefit—and never will forget the name Marconi.

Can we communicate with Mars? But only time will answer this question.

Our photograph shows Mr. Marconi with one of his earliest transmitting and receiving sets. Note the 10" spark coil, and the old-fashioned tape recorder used in conjunction with the coherer detector.



This photograph shows Mr. Marconi on board his yacht, the Elettra, which is equipped with the latest and most sensitive apparatus. The difference between the early wireless gear and the latest is apparent.

MAKING A SIMPLE VALVE SET

By A Member of Marconi's Wireless Telegraph Co.

THE "cult of wireless" as a hobby is becoming more and more popular among those people who are possessed of a practical and mechanical turn of mind, but who, at the same time, have sufficient of the romantic in their natures to be attracted by the undoubtedly fascinating field of wireless.

Just as a hansom cab fails to satisfy the taxi-riding generation of to-day, so the numerous devices used for the detecting of wireless signals fails to satisfy the progressive amateur who has tired of the limited capabilities of the "crystal detector," and must use a valve receiver or nothing.

The *sole purpose* of this article is to remove any mistaken ideas which may exist regarding the installing of a valve as a detector and amplifer of wireless signals.

A valve can be installed for wireless reception quite as easily as a crystal detector, and is, in many respects, easier to adjust to the point of sensitivity required for the reception of Morse telegraphy or of wireless telephony.

The greatest danger in manipulating a valve is that to the filament. It is always advisable to insert a filament "resistance" in the circuit between the lighting battery, which is usually one of 6 volts, and the filament itself, as in Fig. 1.

By this means a gradually increasing current of electricity can be applied to the filament, and its increased brilliancy as the resistance is gradually removed will give an approximate idea of its approach to the danger of "burning out."

Valves are expensive to buy, and once the filament has been "burned out," the valve, like an ordinary electric light bulb, is useless for further work. Do not make the common mistake of imagining that the more "high tension," or plate voltage, you apply to the plate of the valve, the stronger the resultant signals. The same ruling applies to the filament.

The sensitivity of the valve, either as an amplifier or as a detector, depends upon the relative values of plate and filament current, which should be adjusted simultaneously, when the set is being "tuned up" to receive signals.

Look at Fig. 1. The grid, or inner plate, between the filament and the outer plate to which the high tension voltage is applied, is connected to the variable inductance slider which makes contact with the Aerial Tuning Inductance. The aerial itself needs no description.

The variable inductance consists of No. 22 gauge wire wound on an ebonite or wooden former eight inches long and four inches in diameter. The variable condenser is connected to the set across the aerial tuning inductance as shown in Fig. 1, and will enable very small adjustments of capacity to be made in the receiving circuits, which helps the operator to "tune" the required signals to their maximum strength.

It will be observed that the inductance is one of the two "slider type," the other slider being connected to a wire which is attached to the earth plate.

By varying the position of the two inductance sliders, and the condenser pointer, signals transmitted on wave-lengths from 100 metres up to about 1,000 metres will be heard in the telephones.

This will cover the wave-lengths upon which most of the wireless telephony of to-day is being transmitted. Now let us return to the valve connections.

We have accounted for the "grid" connection, and the filament connections, and only the plate remains to be placed in circuit. Connect the plate direct to the positive terminal of the high tension battery, which may have a voltage of anything from 30 to 50 volts. Do not include the telephones between the plate and the plate battery, which is a method some amateurs are apt to use.

The telephones should be connected between the negative terminals of the two batteries, *i.e.*, filament and plate, and if used without a telephone transformer, should have a resistance of at least 1,000 ohms, higher if possible, for each ear-piece.

If a telephone transformer is used in the circuit, telephones with a resistance as low as 120 ohms can be employed with satisfactory results. If a lead is then taken from the negative terminal of the filament battery to the wire attached to the slider of the Aerial Tuning Inductance last mentioned, the circuit is complete, and signals should be heard.

The wave ranges given must only be considered as a rough approximation, because of the varying types and sizes of aerials, which will affect the receiving wave-length before signals reach the Aerial Tuning Inductance.

The variable condenser should have a capacity of not more than ·001 microfarads, and should, for preference, be smaller still. If the inclusion of a small "blocking" condenser is desired across the telephone terminals, it should be inserted directly between the two points where the telephone leads are connected, and not to one side of the telephone terminals.

The inclusion of a second variable condenser in series between the end of the inductance and the earth will enable you to come down to very small wave-lengths, if the inductance of the circuit is sufficient to warrant it. Such a condenser would be unnecessary with the coil detailed.

Hints on Connecting.

Be certain that when you are about to connect up the valve batteries you do not reverse them, and place the high tension voltage across the filament. It will be a costly mistake if you do. Make certain that your filament battery is well charged. An accumulator of at least 40 ampere-hours should be used for this purpose.

Remember that you must have a certain degree of filament brilliancy before any signals can be obtained. It is not sufficient that the valve be "alight."

Always handle your valve or valves carefully. If the filament is shaken on to the grid, your valve, although it will light, is as useless as if it were burned out, and rough handling will sometimes cause this unpleasant state of affairs.

The cost of the apparatus will depend upon how much is purchased ready made and how much is self-constructed. It is advisable to purchase a variable condenser ready made. A condenser of this type is difficult to make unless one is possessed of technical knowledge and skill. It can be done, however, but details of its construction will be given in a subsequent article. A good reliable instrument, calibrated, and cased, of a suitable capacity for use with the set shown, would cost between £1 16s. and £4 10s.

The variable inductance could be made at home provided the interest and patience necessary were devoted to the winding of the wire.

The valve and its attendant batteries must of course be procured from the manufacturers of these articles. The valve socket or holder can be purchased ready made, with connecting terminals, for about 3s. 6d.

This is a very simple type of receiving circuit, but will give good results if carefully adjusted. Longer wave-lengths than those given can be received by the inclusion of more inductance.

Do not expect to hear signals from all over the world on the circuit just described: remember its limitations, and that something of efficiency has always to be sacrificed to simplicity.

As a last word of advice, do not leave your filament and plate batteries connected to the valve when it is not in use. It is a waste of current and does not improve the "life" of the valve.

The novice is not advised at this stage to attempt the construction of the variable condenser, because it will only mean money wasted.

With a practical knowledge of wireless will come experience, and then it will be possible to take on the task of constructing difficult apparatus. But "go slow" is the best advice I can give the beginner, especially from a valve set constructional point of view

(To be continued.)

EDITORIAL NOTE.

The above article gives the novice an idea of the apparatus required to fit up a simple valve set. If the various parts are purchased they can be connected up quite easily. Next week our expert will give full details for the construction of a valve detector panel, showing how a socket and mounting baseboard, with terminals, may be made at home for a few shillings. Subsequent articles will complete the instructions for making the apparatus of a simple valve receiver.—EDITOR.

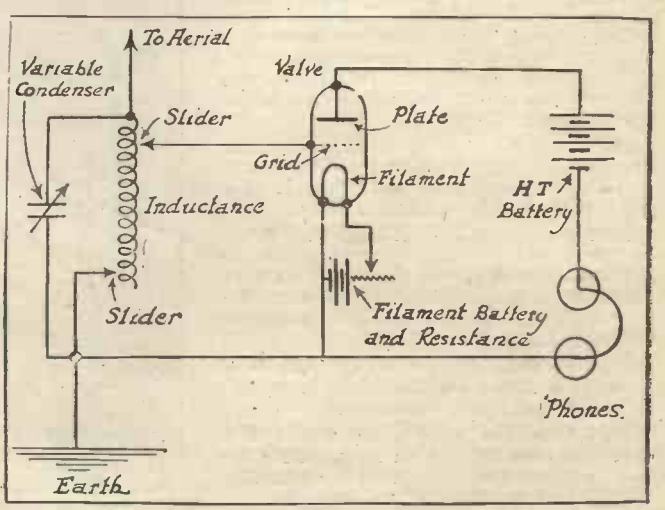


Fig. 1.

The New Aladdin's Lamp

The concluding article describing the wonders of the Electron Valve.

A WELL-KNOWN scientist found that when he inserted a little metal plate in an electric bulb, and passed a current through the filament wire so that it glowed white hot, a curious thing happened.

A galvanometer (which is an instrument used for detecting the passage of electric currents), when connected in the plate circuit as shown in Fig. 1, registered the passing of a current by means of a deflecting needle or pointer, which moves under the influence of electricity.

As there was no metallic connection between the filament and the plate, he believed that a current leapt the gap between the filament and plate. He also discovered that the "leaping effect" could only be produced when the connections to the valve from the battery were made as in Fig. 1.

When the battery connections were reversed, as in Fig. 2, the galvanometer needle did not move.

Now, when the filament was heated, a stream of electrons were shot off it towards the plate (see Fig. 1), being attracted to it because it possessed a charge of the positive "sign," while the electrons were all negative.

We have seen previously how these charges of unlike "sign" attract one another.

The electrons, upon arriving at the plate, continued on their way through the wire to the positive terminal of the cell, and in passing through the galvanometer on their journey caused it to register their passage as described.

When the circuit was altered so that the metal plate was connected to the negative side of the battery, no attraction was offered to the electrons in the filament, because charges of a like "sign" repel each other. The electrons did not, therefore, travel to the plate; but once we give the plate a charge of the opposite sign, as in Fig. 1, the attraction becomes evident.

The fact that two negatively charged objects will always repel each other, but that a positively charged object attracts a negatively charged one, is thus carried out, and if the plate is connected as in Fig. 1 it will collect a good proportion of the negative electrons.

In view of what has already been said regarding electricity of different signs, it is easy to understand that if, instead of merely intercepting the electrons, we *attract* them by giving the plate a charge of the positive "sign," a greater number of electrons will be induced to leave the filament and travel to the plate.

We know that this can be accomplished by connecting the plate to the positive side of the battery from which the filament is heated.

It should be observed that the flow of electrons is possible in one direction only, namely, from the filament to the plate, and is in the opposite direction to that in which electric currents are generally presumed to flow.

Let us now add a much larger battery to the circuit, the strength of which can be varied by a "resistance," and attach its positive terminal to the plate so as to attract almost all of the electrons possible from the filament, as in Fig. 3. Then, when we have succeeded in setting up a flow of electrons dense enough to suit our purpose, let us insert another plate—a perforated one this time—known as a "grid" (see Fig. 3) to act as

The thermionic or electron valve—the keystone to modern wireless communication.

a barrier to the electrons trying to get to the outer plate from the filament.

The perforated plate, or grid, under the influence of the electrons, becomes "negatively" charged; but as there are holes in it, some of the electrons will continue to pass through to the outer plate. If we now connect the grid to a wireless aerial, what effect does the incoming oscillation or wireless wave have upon the valve?

We must bear in mind that a complete incoming wave is composed of one negative and one positive half, and it therefore sets up oscillating currents in the receiving aerial, *i.e.*, currents which swing or oscillate to and fro, and in so doing vary from a positive to a negative potential with inconceivable rapidity.

So swiftly do they alternate, in fact, that the diaphragm of the human ear cannot move quickly enough to keep in time with them, and they are therefore inaudible to human beings.

When oscillations of this nature arrive at the grid of the valve from the aerial, they immediately cause a change of current values in the plate circuit of the valve. The steady flow of electrons between the filament and plate still takes place, despite the shielding influence of the grid, and any variation of the negative character of the grid will increase or decrease the number of electrons constituting the "flow."

As the incoming signal varies from a negative to a positive value, the "screening" effect of the grid is alternately strengthened and weakened by such signals.

When the negatively charged grid is strengthened, less electrons are passed to the plate than normally, and when it is weakened, a greater electronic flow to the plate takes place.

The action of the grid might be likened to a leaky sluice gate, which is opened wide one instant and closed tightly the next, thereby regulating the flow of water, which can be likened to a flow of electrons.

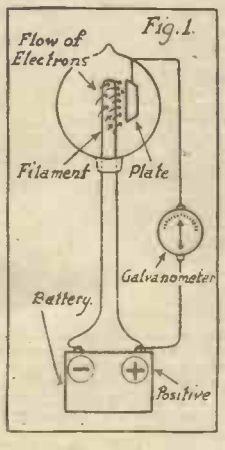
If certain relative values of plate and filament current are placed on the valve, the amount of electrons passing through the grid to the plate can be so regulated that one half of the incoming oscillation will influence the plate circuit to a much greater extent than the remaining half, which will have almost no effect at all.

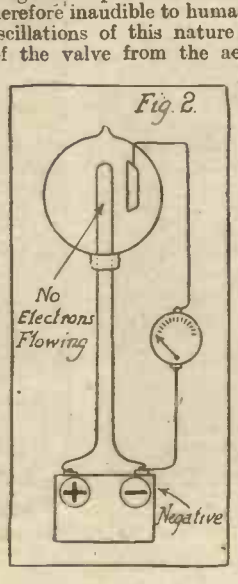
What is tantamount to a series of unidirectional "pulses" are therefore induced into the plate circuit, and these can be rendered audible by the inclusion of a pair of telephones at a suitable point.

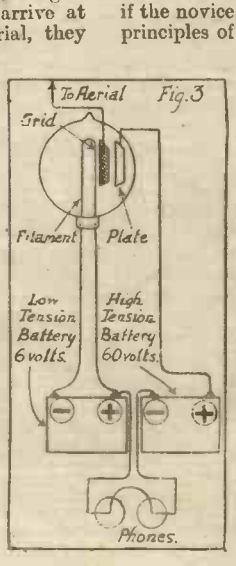
Fig. 3 shows a fundamental circuit for the reception of Morse signals or wireless telephony. The various pieces of apparatus required to form a complete wireless set in conjunction with the valve do not, however, come within the scope of this article.

In endeavouring to place before the reader the elementary theory of the three electrode vacuum tube or valve, and the manner in which it functions, as a detector of wireless waves, much has necessarily been omitted.

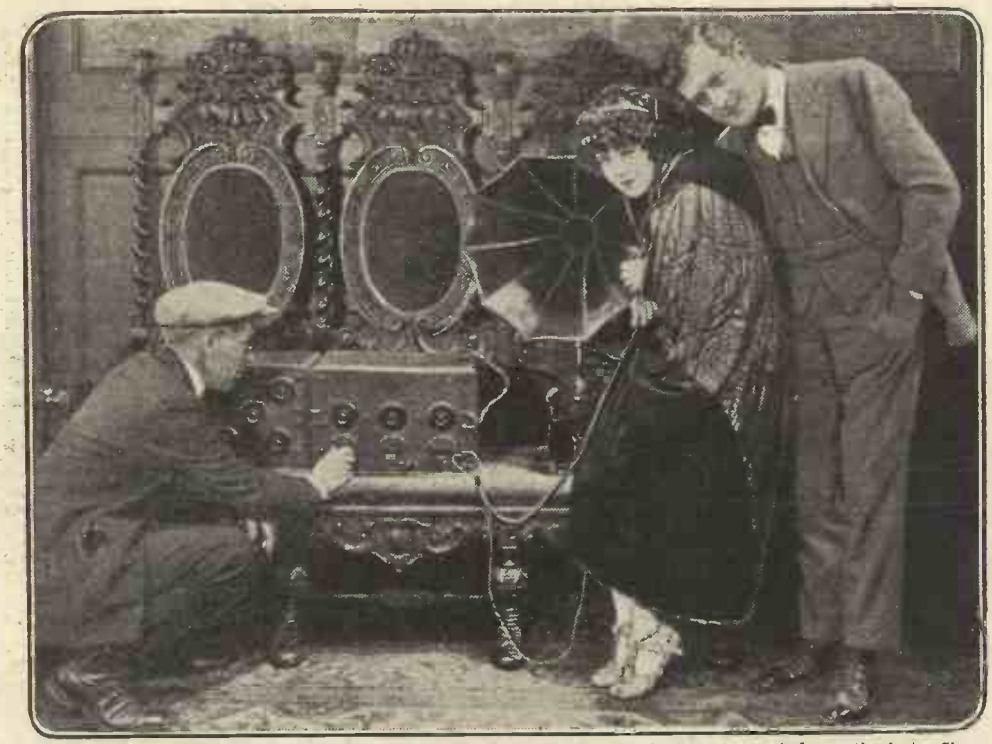
It has only been possible, with the limited space at my disposal, to deal with the subject very briefly, but articles will appear from time to time in POPULAR WIRELESS dealing with the various ways in which a valve may be used in radio work. At present, it should be sufficient if the novice gathers an idea of the elementary principles of the wonderful wireless "lamp."







FILM STAR'S NEW LOVE

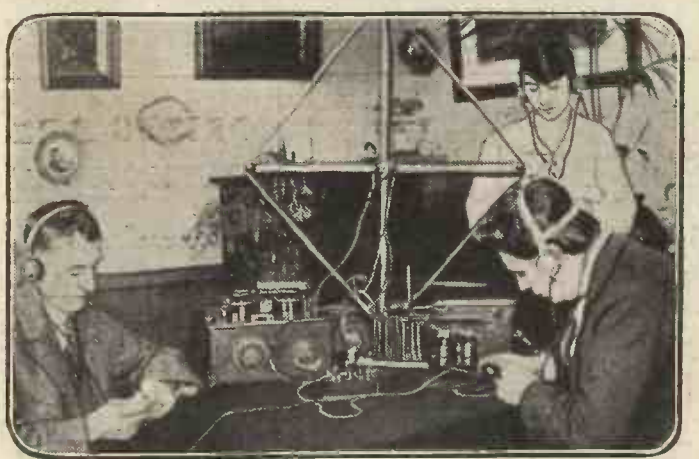


Marie Prevost, originally a bathing beauty and now a popular film star, is also a keen wireless enthusiast. She is seen here with her director listening in to a gentleman who calls himself "The Man in the Moon by Radio"—which is not bad for an American.

PRINTING B

Using the Creed system, it is possible to print messages illustration shows the wirelessed messages on perforated Printer, whence they pass ou

A wireless telephony set on a motor-boat is a handy thing to have, especially if the shrimps are elusive and one is late home for tea. Our picture shows the gentleman, who has obviously been paddling, talking to a friend on shore.



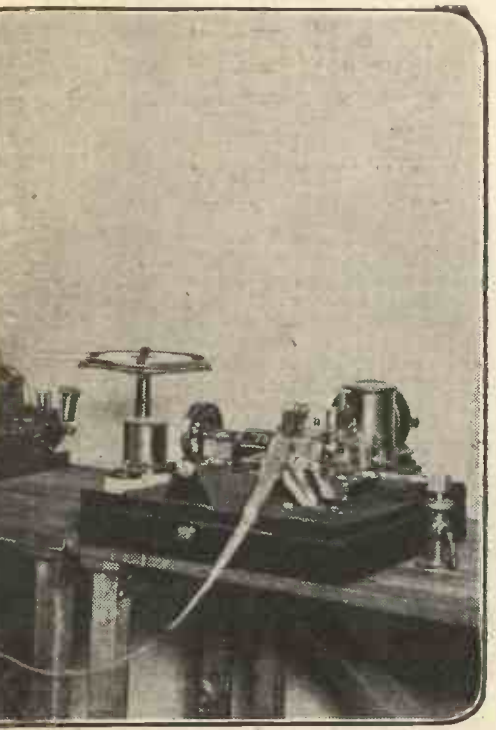
Wireless in the drawing-room without an aerial! Our photograph shows a wireless set which requires no outside wires. The frame aerial shown, when used in conjunction with valve amplifiers, picks up excellent signals from the Eiffel Tower and many other wireless stations.

This compact and portable suitcase wireless outfit receives music, news of the day, time signals, weather reports, etc., from most of the big British stations, as well as from the Eiffel Tower and other high-power transmitters. The aerial is of a frame type, and is wound inside the lid of the suitcase.

Our illustra
The service
valve

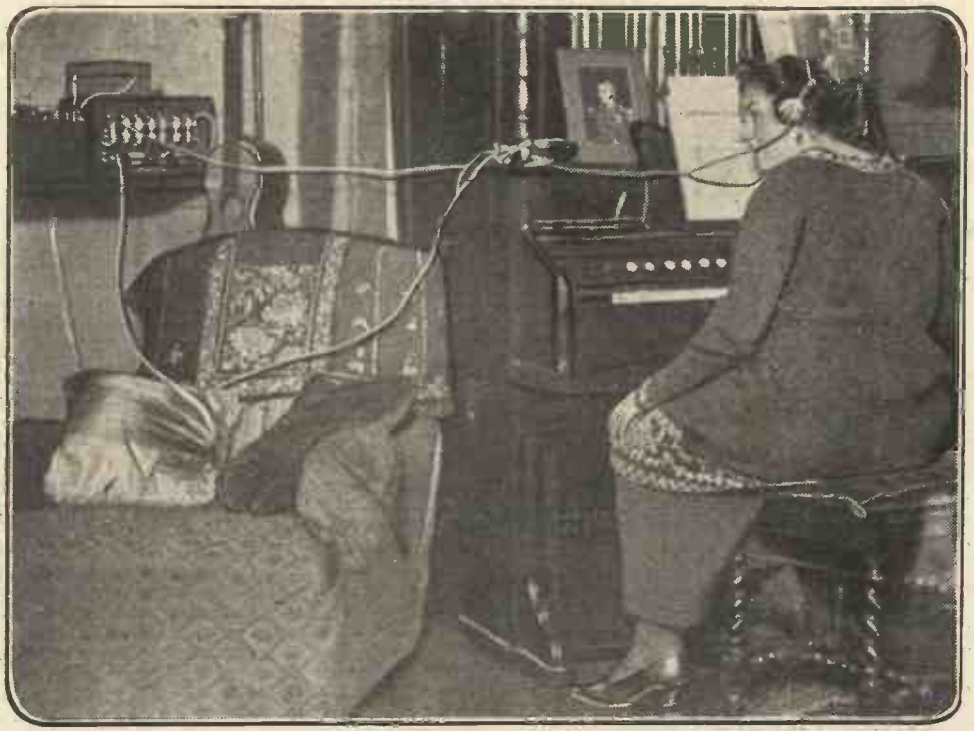
These comp
and transm

Y WIRELESS

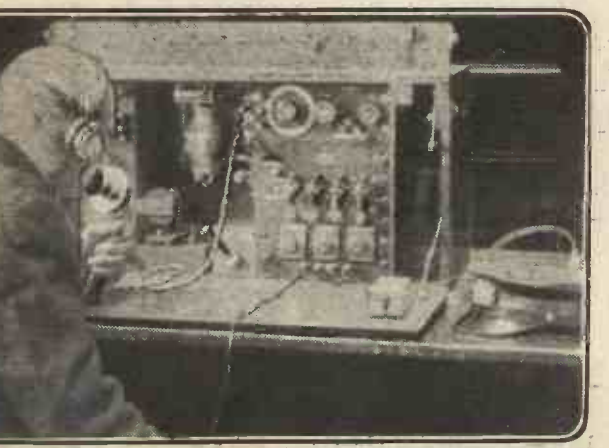


by wireless and to send them at a very high speed. Our paper issning from the receiver (right) and passing into the t on a typewritten slip of paper.

A LADY AMATEUR



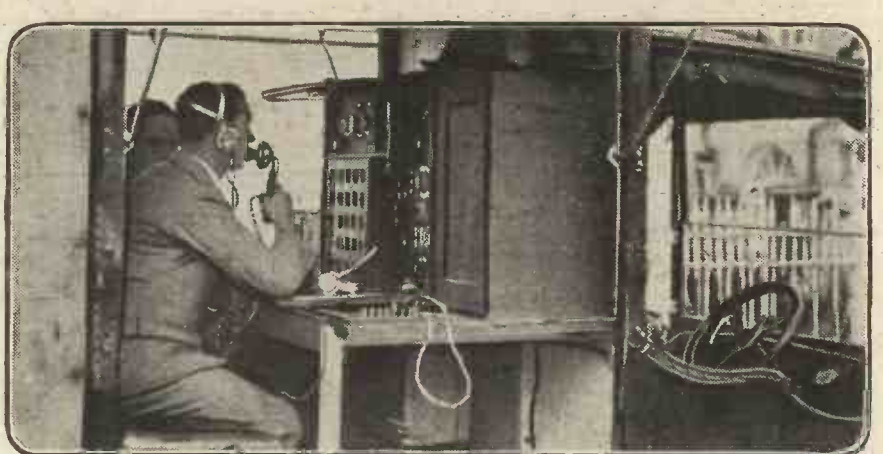
Miss Florence Parbury is a member of the Wireless Society of London, and the first woman to have a wireless installation fitted up in her aeroplane and studio. At a dinner recently given by Miss Parbury, at which Senatore Marconi was the guest of honour, the great Italian inventor agreed that Miss Parbury had done a lot for wireless. She is seen here accompanying wireless selections on her organ.



ion shows speech being transmitted from the Bar Lightship, Liverpool. between ship and shore is almost continuous, and has proved of immense to the great port, where the sea traffic is particularly congested.

An excellent way of learning wireless telegraphy is by means of a gramophone. A large number of records of lessons in the Morse code and in various foreign languages have been specially prepared by the Wireless Press, Ltd. The photograph shows a student taking down Morse recorded by a gramophone.

act wireless telephone sets emphasise the possibilities of portable receivers tters. The miniature loud speakers shown in our illustration function just as efficiently as their larger brethren.



This mobile wireless telephony installation was fitted on a motor-van by the Marconi Company. A power of 500 watts is employed, and excellent results have been obtained. Our illustration shows an operator speaking from Epsom to Marconi House.

Step by Step in Wireless

An Elementary Series of Articles in Non-Technical Language for the Beginner.

No. 3.—CONTROLLING WAVE-LENGTH

THERE are many enthusiastic amateurs possessing simple or complex wireless sets who are fully aware that by altering the inductance, or turning the handle of a condenser, they can "cut out" certain stations, and at the same time render audible other signals previously unheard.

They are not so certain, however, as to *why* this variation of capacity and inductance produces the results mentioned above, and it is the purpose of this article to explain briefly and as non-technically as possible the reason.

We have already seen that the speed or velocity of wireless waves is a constant one, and if we therefore refer to Fig. 1, we can, by counting the number of waves propagated in one second, and dividing the sum total into this constant rate of speed, easily ascertain the length of each wave.

To give an example, let us imagine that the first wave creates nine other waves in the space of one second, the ten waves will, as we know, cover a distance of 186,000 miles.

If we wish to find the length of one wave, it is obvious that we need only divide 186,000 by ten to find it, and each wave will be 18,600 miles long. The number of waves passing any given point in one second is known as "wave frequency."

A simple formula governing wave-length can thus be deduced from the foregoing, namely, that the velocity will equal the length of the wave multiplied by its frequency, commonly shown as "Velocity = wave-length × frequency."

We have studied the manner in which the wave is generated, but obviously we must go beyond that, because we have to produce waves of different lengths. We know that the wave-length will not alter once the wave has been started, but the problem of determining the initial length still remains to be solved.

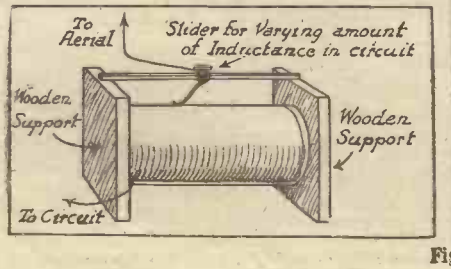
There are two factors contained in all wireless circuits by which the length of a radio or pressure wave is governed. These are Capacity and Inductance.

To try and understand these two qualities, we will deal with them separately, commencing with capacity. We all know that water, steam, or air can be so compressed into a limited space that considerable pressure will result on the interior walls of the receptacle containing such a compression, and it is easy to imagine what would happen if a hole were pierced in such a container.

Electricity can be stored in a similar manner in a condenser, reference to which has already been made. The difference between the amount of electricity a condenser will hold normally, and that which can be forced into it by a continued application of electrical pressure, is known as its "capacity."

A pint of water passed into a gallon jar would not affect the capacity of the jar for containing water. But if a pint of water is forced into a container which normally holds half a pint, a state of strain immediately becomes evident in the walls of the container.

The amount of electricity we can force into one foil plate of the condenser, therefore depends upon the size of the plate. If we use more than one plate in a condenser, each plate adds to the sum of its capacity.



Condensers of large capacity are constructed upon the same principal as the Leyden jar. They are made by taking a number of sheets of tin-foil or brass, and, in order to prevent actual contact between them, separating them by sheets of glass or other insulating material. Alternate sheets of the foil are then connected together on either side.

As the storing properties possessed by the condenser depend upon interaction between the plates and the dielectric, or glass, its capacity can be varied by sliding the metal plates from between the glass sheets or vice versa. A sketch to illustrate this is given in Fig. 2, which is a simple type of variable condenser. Obviously, a large condenser, when it discharges across the air gap, will cause a wave of a different length to that produced by a small condenser performing the same operation, and the length of the initial wave is therefore governed by the size of the condenser used to create it.

Let us now turn to inductance. Inductance in an electrical circuit is that quality which offers opposition to any change of the flow of current in a circuit. An inductance is formed by winding a wire, the gauge of which varies according to the functions the inductance has to perform, round an insulated former or tube. The resultant close spiral of wire, if connected in an electrical circuit, will then possess the property of retarding any alteration of current value as mentioned above.

Inductance may be compared to "mechanical inertia," as a means of distinguishing it from the most unenviable quality in an electrical circuit, namely, resistance. When a motor-car is started from a stationary position, a certain amount of energy is required to move it. Once it is moving, however, less energy will be required to keep it going at a uniform speed than was necessary to start it, and eventually, if we shut off the supply of energy altogether, the car will continue to move for some distance before coming to a standstill.

The opposition offered by the car in the first instance is due to its "inertia," and the difference between the energy required to move it, and that necessary to keep it moving, is given back when it is "travelling under its own momentum." Inductance possesses similar characteristics, in so far as energy supplied to it in the form of electricity is not wasted, but only retarded. What happens then, if we place such a coil of wire in the circuit through which our condenser is to be discharged? The current created, as we are aware, is continually altering in value, as it oscillates between the condenser plates, and, as we have just considered, it is this variation which the inductance opposes.

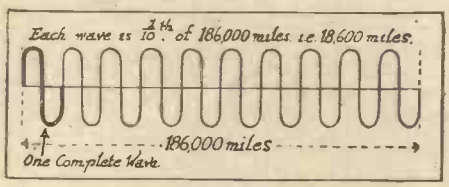


Fig. 1

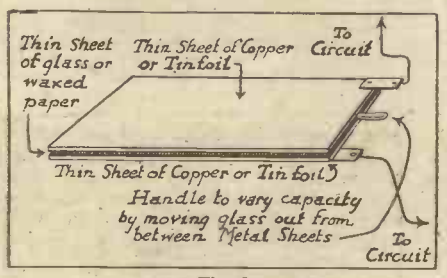


Fig. 2

We might consider the inductance as acting like a brake upon the frequency or speed with which the current oscillates in the circuit. The more inductance we include, the slower will become the frequency. A previous article has shown how the length of a wave is dependent upon the frequency with which the condenser charges and discharges itself across the air-gap. Therefore, if this frequency is reduced by the inclusion of inductance, the wave-length will be altered.

Suppose we add sufficient inductance in the circuit to halve the frequency which is responsible for the wave shown in Fig. 1? A simple calculation will serve to show us that the length of the wave will be doubled. We shall only have five waves now, covering a distance of 186,000 miles, and one-fifth of 186,000 gives us 37,200. The length of each wave is therefore twice as long as those shown in the diagram.

Fig. 3 shows an inductance, the value of which may be varied, either by means of studs, to which tappings are taken from the coil, or by the use of a "slider," which can be moved along the entire length of the inductance from end to end, so as to alter the amount introduced into the circuit.

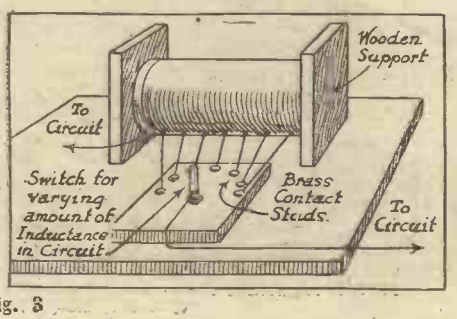


Fig. 3

It is now but a step to see how receiving stations are "tuned" to the exact wave-length of the sending station. The amount of capacity and inductance used by the transmitting station creates a wave of a certain length, and the operator of the receiving station adjusts the capacity and inductance of the receiving circuits until they are in resonance or "tune" with the "frequency" of the oscillations creating the wave. Until the receiving station is properly in tune with the transmitting station, no messages can be audibly received.

Are You Setting Up Wireless?

Things you should know by WILLIAM LE QUEUX

In this article, specially written for POPULAR WIRELESS, Mr. Le Queux gives valuable advice to the wireless amateur. A member of the Institute of Radio Engineers, Mr. Le Queux has a wide knowledge of wireless subjects, and has been experimenting with his fine private set for fifteen years. He was one of the first to broadcast music, and to-day is actively assisting in the present official broadcasting scheme.

—Editor.

RADIO has been surrounded by mystery for so many years that the present stimulation has naturally brought about an amazing amount of conflicting information. The result is that people are expecting results from cheap wireless receiving sets which can never be justified.

Those who, like myself, have been experimenting in radio—as well as writing novels, by the way—for the past fifteen years, feel that we should raise our voices to advise the public on this point.

I am only an unimportant unit among hundreds of experimenters, but I was one of the earliest of them, and while the Marconi Company at Chelmsford were carrying out experiments in wireless telephony in 1920, I, too—with their help—was carrying out my own researches. And to-day I am told that I hold the record of long-distance telephony upon low power generated by the house electric supply, projecting my voice over 500 miles.

The First Stepping-Stone.

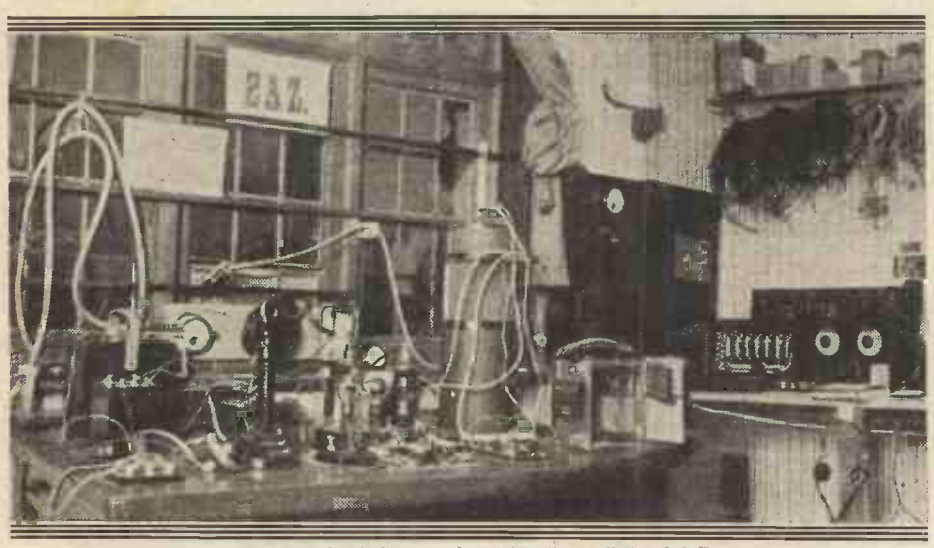
But this does not interest the public, except that to-day they are benefiting by the years of the spade-work of experimenters. Once, indeed, I devoted nearly a whole year, neglecting my own profession entirely, before I was successful in transmitting my voice across fifty miles of space.

And judge my delight on that well-remembered night, when my fellow experimenter at Ipswich rang me up and told me that my voice and my gramophone music at Guildford were very clear. It was one of the stepping-stones to the broadcasting of to-morrow.

That the public are interested in the new science is palpable. But certain warnings are now necessary. Do not imagine that "freak" receiving sets, *i.e.*, those in a ring with an old umbrella frame as an aerial, and one's foot at a fire hydrant as "earth," the set in a thimble, in a hat, or in a watch-case, are of any great use for the reception of good telephony and Morse signals. I have one fixed in a little tobacco box, but it has a crystal detector, and with an ordinary aerial one can hear the time-signals. But such sets are merely interesting curiosities, and are only valuable as showing how easily signals may be detected.

Mr. William Le Queux.

To receive broadcasted news an outdoor aerial is really essential, together with electron tubes, or thermionic valves as they are called, in place of the time-honoured crystals of zincite and bornite. The tyro will be assured, and I have seen it in print, that he can obtain radio-telephony upon a crystal set. It certainly is possible to hear the strong telephony from Paris, or if the broadcasting station is within a radius of 15–20 miles. But *over* a distance of 20 miles the crystal is practically useless for telephony reception.



Mr. Le Queux's wireless experimental station, call sign 2 A Z.

A Chance for All.

To receive telephony over long distances accurately and without distortion the amateur must have valves—one, two, or three—or, even better, four—and an outdoor aerial wire strung up, the higher the better.

Many amateurs have, strangely enough, welcomed the reduction of the transmitting wave-lengths allowed by the Postmaster-General from 1,000 metres to the band of 350 to 450 meters. But there is a problem before them which they have overlooked.

The broadcasting programme may be successfully carried out in summer upon the lower wave by this, and now especially at the hour of sunset—as my own experiments have proved—but in wireless the amateur will find that broadcasting on the lower wave-lengths will be much interfered with by what is known as "fading," a phenomenon for which we cannot yet account, but which is comparatively absent on wave-lengths of 1,000 to 1,500 metres.

The use of short wave-lengths will greatly diminish the reliability of broadcasting, which, if it is to enjoy the marvellous future predicted for it, must be stabilised in every possible manner. Here is genuine research work for the amateur, as well as the professional research worker.

To make broadcasting other than a fad of the moment, like ping-pong or roller skating, it must be made dependable, and upon its dependability in our homes rests the future prosperity of the many industries built up on it, and which are now growing so rapidly.

To readers of POPULAR WIRELESS who desire to "listen in" I would say: first get a reliable opinion; consider the suitability of your house as regards position and freedom from "screening" from electric cables, trams, and light circuits, and then think *well* before you instal your set

Points to Remember.

There are many cheap and quite reliable sets of apparatus on the market, but I have recently seen a good many highly-polished, imposing-looking, and complicated contraptions for which twenty guineas or more—"less valves," of course—are asked, and which, built apparently by carpenters, have never been calibrated, and are only fit for the junk-box.

When people assure you that you can instal a aerial wire wound upon a twenty-inch rotating wooden frame, instead of an aerial outside, recollect that "loops," as they are called, are practically useless with a crystal receiver; but with a "one-valve" receiver, you may possibly hear telephony from a station from seven to ten miles distant. Yet the same valve set, working on an outside aerial, will receive telephony 50 miles distant.

It should be remembered that the cheap crystal sets will only receive "spark" and not C.W. stations, hence the Morse signals of ships and a few high-power land stations will be heard, while valve receivers will receive everything in the other.

I have conducted a large number of experiments with the indoor or "loop" aerial, and while they are very interesting in the laboratory, this type of aerial is, I find, up to the present very unsatisfactory, unless one desires to hear comparatively loud signals from a short distance, without the interference of other stations.

(*Continued on page* 44)

Catching Crooks by Wireless

This is the second article describing how wireless has helped the arm of the Law.

NOWADAYS, in the U.S.A., directly a crime is reported to the police, the great Westinghouse transmitting station at Pittsburg is circulating the news over a five-hundred-mile radius, and every motor-cycle policeman, every local authority, every garage, and hundreds of isolated houses and farms, have been warned to look out for the escaping criminals.

Many cities in America have equipped their police with a wireless outfit. Already it is being used to transmit photographs and Bertillon measurements of criminals escaping from justice.

In the past, the fugitive who had evaded the police authorities in the neighbourhood in which he had committed his crime, stood a very big chance of escaping altogether. With the greatest of ease, by changing the direction in which he was fleeing as soon as he threw off immediate pursuit, he could completely fog the police.

But wireless flashes its messages in all directions, and they are picked up far and near, simultaneously. The speeding train or the steamboat is just as easily warned as the big city's police-station.

But if the police are studying wireless, so are the law-breakers. Transmitting licences are granted more readily in America than in this country, and the up-to-date American criminal will send out false wireless reports to put the police off the track.

A message purporting to have information of the fleeing criminal comes in from a confederate in the north whilst the fugitive speeds merrily away east, south or west.

The police's first step is to locate the transmitting station from which the false reports are emanating. Naturally, the sender of the message will give no information on this point, and at first sight it would appear that, as each transmitting station can broadcast news hundreds of miles, the police are tackling an impossible task.

But it is not so.

When a false report is broadcasted, the police set out immediately to discover its source. It is a race against time, for the criminal is somewhere amongst millions of people, probably in the most popular part of a big city, and he must be caught whilst still actually engaged in spreading the deliberately confusing reports. The police, therefore, have probably only a matter of minutes in which to locate and confront the man.

From the police headquarters, with a special direction-finding apparatus, the position from which the messages are coming is ascertained. Let us say they come from the south.

A police-station in that direction is communicated with by 'phone, and a motor-car, specially equipped with a wireless set, is put into service.

A frame aerial is used, wound spool-like around a wooden former. This spool is only one wire in thickness, and there are, in consequence, several inches between each loop of the wire.

By this arrangement, when the narrow edge of the aerial is pointing towards the source of the message, it will catch the transmitted wave best, but when the aerial is pointed east and west, the message is barely audible. Therefore, it must be either north or south of the instrument.

Leaving the aerial in position, the police set off in a motor, either north or south. Having covered a distance of, say, two miles, they listen in again, and by the fact whether the report can now be heard more clearly or less clearly, they know whether or not they are going in the right direction.

On the right track they continue moving forward until they can judge by the greatly increased clearness of the message that they are in the neighbourhood of the transmitting machine. Then they venture a turn to the right or left, followed, after travelling a little distance, by another "listening-in" test.

Thus they make their way nearer and nearer to the unsuspecting criminal, until at last they arrive in the very road in which the house containing the secret transmitting station stands.

As was suspected, the road consists of great blocks of office buildings, but working down the road quickly, it soon became apparent that the strongest wave is received when the aerial is in front of one particular house. The messages now stop; but the local police are quickly called up to assist, and a search of every roof in the neighbourhood is at once made.

The cordon of police is rapidly forming round the block in the meantime, and a few minutes later a very surprised criminal is arrested, either red-handed, or so near the incriminating set as to be unable to explain his movements satisfactorily.

Such is the far-flung wireless net from which there is no escaping.

It has just been announced that in this country a wireless sending and receiving apparatus is to be fitted in the motor-car of every member of the Scotland Yard Flying Squad, so that the criminal in England will shortly be in a very much tighter "hole" than his confréres in America.

No. 3.—WIRING

WELL-INSULATED wire, and firm, clean, soldered connections—those are the secrets of good wiring. Among other advantages, they add materially to the interior appearance of a home-made set.

Wire of a fairly thick cross-sectional area—say ⅛ inch diameter—is a good wire to use for all general connections in a wireless receiving set.

If it is rubber-covered, so much the better. It is always advisable to use covered wire, especially for internal connections, as these are usually boxed away once the joint is made, and the chances of a short circuit occurring in an inaccessible position are lessened.

If the joint is not a soldered one, but is connected to a terminal, and screwed down under the terminal head, a final firm connection should be made by giving the nut a twist with a pair of pliers to ensure that it will not slip and release the wire.

If bare wire is used, care should be taken to see that two wires do not cross each other if it can possibly be avoided, and are always taut.

There is always the chance of the upper wire sagging and touching the lower wire, thus placing the whole of the apparatus out of order.

With soldered joints, cleanliness, prior to the welding of the actual joint, is imperative. If the wire is dirty, the solder may adhere for a time; but it will inevitably come away from the wire if the piece of apparatus in which it is used receives a slight bump.

Joints to the aerial system—i.e., connections made out of doors, should, after being soldered, be bound with insulating tape or thin strips of rubber, stuck over the joint with sealing, to keep out the "weather."

Aerials also are liable to strain, and joints of this nature should always be made as firm as possible, and, if necessary, bound with wire before being covered with the waterproof tape or rubber strip.

Soldering-paste or muriatic acid—both of which stick to the metal parts—should be used to solder the various wires to the units of the home-made set.

Don't allow the connecting wires between your various units to hang about in festoons all over the place. Tuck them away neatly, and the set will be far more presentable in the end.

ARE YOU SETTING UP WIRELESS?

(Continued from page 43.)

The Future of Broadcasting.

A twin-line outdoor aerial is best for all purposes. String it up anywhere so long as it is not enclosed. I saw an experimental one of double wires only ten feet long operating upon an aeroplane at Croydon recently, and giving marvellous results.

To the public wireless is a new hobby, though for years experimenters have worked at it, and brought it to the present stage of being able to project the human voice through space across the Atlantic. Before long radio broadcasting will no doubt be utilised in most of our homes, and play a part in our lives equalled only by that of the daily, weekly, or monthly periodical.

Proper programmes must be provided, for it is quite conceivable that, in the near future, with millions of people, either at home or in trains, motor-cars, or at sea, listening to a single voice, the popularity of a political party in office may hinge upon the evening broadcast, and even Kings themselves may speak personally to their subjects.

If you intend to be one of the many thousands of listeners, be careful what you purchase, and be first assured that the apparatus will function as you require it, for during the past week I have had a host of complaints from enthusiasts who have bought apparatus without first stating their exact requirements and the other details I have already mentioned.

(Look out for further articles by Mr. Le Queux, which will appear from time to time)

A WIRELESS TRAGEDY

By H. T. LEED

ALL this happened as long ago as 1935, and if the radiophone had never been invented, this story would never have been written.

The happenings depicted took place prior to the invention of the radio-wave-adjustor, which is now used for the alteration of wave-lengths in the ether.

In those days, once a wireless wave had been started, its length could not be altered, so that one had no option but to listen in on the wave-length of one transmitting station. The radio wave adjustor has altered all that, however, and now, thanks to the wireless exchange, we can be placed in communication with the butcher and baker, and I would say candle-stick-maker, if such a person existed in these days of wireless electrical lighting.

But I transgress. I was saying that in 1935 private communication was possible by radio-phone between two persons only because of the handicap of having to work on a definite wave-length.

When Alicia Reval-Greystone applied—or, rather, detailed her fiancé to apply, because she was too busy at Westminster—to the General Post Office for a licence for a private line of radio communication between the said fiancé and herself, she was allotted the wave-length 1978½ metres for her exclusive use, and two sets were calibrated and delivered accordingly.

Alicia, who had expensive tastes and a limited income, lived in the rapidly declining centre of Park Lane, while her fiancé, whose education had cost a small fortune, and who consequently knew and was worth nothing, was forced to reside, much against his inclinations, at Richmond.

The wireless 'phone was therefore a necessity, but an indiscriminating Government official had allotted them a most unsatisfactory wave-length. The directional propagation of wireless waves was, of course, in vogue, but Alicia and the negligible fiancé could, by a careful adjustment of their instruments, occasionally intercept the conversations of their immediate wireless neighbours; the persons, in point of fact, who had been allotted wave-lengths 1978 and 1978½ metres respectively.

1978 was a stockbroker, and from the point of view of wireless telephony, at any rate, his typist took precedence over his wife. 1978½ was a gentleman who dealt exclusively in second-hand furniture and antiques, which he turned out in prolific numbers and variety from his own factory.

We are, however, immediately concerned with Alicia, who, on a hot summer afternoon, sat in her flat in Park Lane, and envied the impecunious fiancé his abode on the banks of the Thames.

The flat was large and airy, as one would naturally expect it to be, considering that the rooms which composed it had originally been part of a mansion erected in the once fashionable and selective locality.

Alicia was bored, and looked it. The first wave of love for the Richmond resident had passed over her head and left her with a clearer outlook upon the matter. Rodney, regarded as a lover, did not appear quite so alluring as he had done in the past. Rodney, by the way, was the unfortunate fiancé. And then Rodney only had £7,000.

£7,000 before the Great War of 1914 would have represented a considerable sum. To Alicia of the expensive tastes and outlook, the income derived from it represented something akin to poverty. Of course, as her mother had pointed out, there was Sir Gerald Bloggs. Bloggs was certainly not the nicest of names to have and to hold for the entire duration of one's life; but Bloggs, plus a solid million and a half, became bearable.

Then, again, very few people remembered that the money had been accumulated by Sir Gerald's father, who had viewed the Great War through eyes which saw only tinned meats and bloater-paste.

Sir Gerald had been very liberal in the matter of compliments; flowers, chocolates, and the suggested amount of pin-money which would be the portion of the fortunate lady who became his wife. Sir Gerald, in fact, if we overlook aspirates, was in possession of practically everything, and the mere thought of him reduced the affianced Rodney to the size of a monkey, and his £7,000 to about fourpence.

Alicia sighed languidly, and reached for the wireless 'phone. She could speak to Richmond, even if she could not go there. She was about to press the electric button, which would ring a bell on Rodney's set, when she heard the voice of 1978.

Alicia hated stockbrokers in general, and 1978 in particular, and the impression had been conveyed to 1978 more than once. He was only a number to Alicia, but she visualised him as a fat, red-faced man, who wore top-hats and black bob-tailed coats all the year round, and who was kept awake all night by "bulls" and "bears" dancing on the eider-down.

1978 was in Paris dictating letters to his secretary in London, and Alicia was impatient. She interrupted: "1978; will you kindly vary your wave-length an eighth of a metre, please? I wish to get through to Richmond."

There was silence for a moment, and then the throaty voice of 1978 could be heard mumbling across the ether—and it was not Richmond to which he consigned Alicia. "Just one moment, '78½ please. I'm nearly through. Won't keep you long." And the voice went on with its mournful sequence of figures.

Alicia listened and fumed, and then passed from indignation to interest in a second. The apoplectic voice was speaking of the Dollard, Martin & Dollard Clothiers' Combine, the company which held the £7,000 and all the worldly hopes of Richmond Rodney:

"Dollard, Martin & Dollard of London, New York, and Paris, ceased business to-day, with liabilities of over two and a quarter millions. Shares only valuable as waste paper."

Alicia waited for no more. She pressed the bell. Poor Rodney, unaware of his fate, switched on his apparatus and languidly asked, "Hello?"

"Hello, Rodney," said Alicia, "did you get my letter this morning?"

Considering that no letter had been sent, the reply was a foregone conclusion.

"Oh, dear," said the greatly distressed voice of Alicia, "and it would have made things so easy." It made the lackadaisical but good-natured Rodney distinctly uneasy.

Some hours later the dismissed suitor ruefully regarded a diamond ring, and some weeks later the diamond ring had been converted into a new boathouse. So much for Rodney.

Alicia, however, who believed in making hay while the sun shone, had dropped the packet containing the ring; and incidentally all hopes of an alliance with Richmond, into a pillar-box, and called upon Bloggs.

(*Continued at foot of page 46*)

Alicia listened and fumed, and then passed from indignation to interest in a second.

WILL BROADCASTING PAY?

MANY people have been wondering how the broadcasting stations are going to pay.

No charge can be made to owners of receiving sets, and it is pretty certain that, even if it were possible to devise some scheme whereby amateurs receiving the broadcasted concerts paid a quarterly subscription, the public interest in the wireless 'phone would very quickly die a natural death.

The more important firms who are seeking licences believe that a broadcasting station can only be profitable in a sense, so far as it offers an inducement to the public to purchase receiving sets.

And it is only natural to suppose that the station that supplies the best broadcasting programme will get the most publicity.

The various firms which are to operate broadcasting stations will, of course, advertise as attractively as possible their intended *modus operandi* as regards concert items, etc., and this being so they will, in honour bound, have to keep to their promised standard when their stations commence broadcasting.

But, in any case, it is apparent that only firms with considerable financial resources will be able to control broadcasting stations in a manner both efficient and sufficiently attractive to induce people to instal receivers.

The upkeep and general running expenses of a station will be exceedingly heavy; and one cannot but wonder what will happen when the first rush to buy apparatus is over, and firms find a slackening off in sales.

A solo via the ether.

But large firms, with a reputation to uphold, such as Vickers, Ltd., the Radio Communication Co., and the Marconi Co., will not dare to break a moral obligation of such a nature, even if the sale of their manufactured wireless apparatus falls so considerably that they cannot run a broadcasting station with profit.

Many big firms believe that the steady sale of receiving apparatus will continue until the wireless 'phone reaches a high degree of public utility, and when such a degree is reached, there will be no need to worry about the maintenance of a station or stations. Where there is a big public demand, the public usually gets what it wants.

This may sound decidedly speculative, but it can be taken for granted that the various firms contracting to run an efficient broadcasting service will not enter into such a responsible moral obligation with their eyes shut.

The whole question of broadcasting has been viewed from every conceivable standpoint, and the public may at least rest assured that, if certain firms undertake to carry out an efficient and attractive broadcasting programme, they will keep to their original promise at any cost.

Their reputations would not permit them to do otherwise.

FATHER'S CURIOSITY LEADS TO TROUBLE.

A WIRELESS TRAGEDY (Continued from page 45.)

Sir Gerald was at home, and would see the lady. Sir Gerald was perturbed. So was the whisky decanter. At the moment of Alicia's entry, Sir Gerald was carefully pouring a small soda on to the hearthrug, the while he gazed fondly at a glass held upside-down in his hand.

Alicia departed precipitately, and re-entered her flat, to the accompanying tinkle of the Wireless 'phone bell. Rodney was full of it.

"Say, Alicia—sorry, s'pose I should say Miss Reval-Greystone these times. Isn't it hot? Heard about that poor feller Bloggs? Uncouth chap, o' course, but still he couldn't help it——"

"*Heard what?*" said Alicia.

Rodney continued:

"'Pears he had a grudge against me—'jealous rival' business, you know. Tried to smash Dollards' Combine—people who handle my little bit of this world's blessing, you know. Came an awful cropper. Broke himself, silly ass! Whatever made him do it I can't imagine. Why, if he had only waited until to-morrow——" But Alicia was already in her bedroom indulging in a fit of hysterical weeping against a totally irresponsive bed post.

* * *

"It appears," said Alicia's mother, "that John Cullin, the stockbroker man, you know, who has the next wireless 'phone number to you, made a mistake while dictating from Paris to his secretary in London. He had got the story the wrong way round. Fortunately, he cancelled the news ten minutes after sending it, so the mistake did not become public.

"I hear that those Dollards' shares are going up tremendously on account of it. I met young Rodney in the Park, and he is worth thousands, they say. He is going to buy a—whatever is the matter, my dear?"

It had just dawned upon Alicia that if she could hear the stockbroker talking to his secretary, the stockbroker could certainly have heard her talking to Richmond. The stockbroker had undoubtedly heard her conversing with Rodney on the question of £7,000, and the company in which it was invested.

The stockbroker had taken his revenge, and was probably at that moment agitating his numerous chins as he chuckled over the success of his scheme.

She hated stockbrokers. But all this happened in 1935.

Safety at Sea

By A Wireless Officer.

The writer of this article is an experienced wireless officer who has an intimate knowledge of the methods employed at sea for the keeping of wireless watches. Readers of POPULAR WIRELESS will agree that only competent operators should be employed, as the responsible nature of the duties of a wireless officer cannot be ignored, much less relegated to cabin boys or cooks' bottle-washers.

Since the sinking of the Egypt there has been much heart-burning about the methods at present in use for the keeping of wireless watches at sea.

There can be little doubt that the use of "watchers" is undesirable and likely to result in disastor at times of crisis and distress.

A "watcher" is one who has learned to recognise the S.O.S. (distress call) and T.T.T. (navigation warning signal), and has a certificate declaring that he can do this. Such certificates may be obtained from the Post Office for a fee of 2s. 6d. after an examination has been passed. The duty of the "watcher" consists simply in listening for these two calls when the regular ship's operator is not on duty.

Wireless men believe that the employment of watchers is undesirable because the risk of life at sea is too great a thing to be so casually guarded against; and of necessity, a wireless watcher is not a reliable person in whose hands the responsibility of receiving distress signals should be placed.

Cabin-boys as Watchers.

On some ships the watcher may be a cabin boy or a cook's assistant, or even an ordinary seaman, and on the face of it, this arrangement is highly unsatisfactory.

According to the instructions issued by the Postmaster-General regarding danger and distress signals, all ships must suspend wireless communications for three minutes every half-hour and listen for distress calls and the danger signal on the 600-metre wave. During this period no transmission is supposed to take place on that wave-length except distress calls, messages relating to dangers to navigation, and messages arising directly therefrom.

But some of the big ships work for such long periods off the 600-metres wave length that they might be within 30 or 40 miles of a vessel in distress and never hear her S.O.S. call.

Use is made of watchers purely in the cause of economy, and the question as to whether economy is more important than the adequate safeguarding of life at sea seems to offer a problem which has caused considerable contention.

A Grave Risk.

To my mind the system of employing watchers is a distinctly dangerous one, and a practice that should be discontinued immediately.

The risk is too big to be cavilled with.

There are approximately 3,500 ships fitted with wireless in the Mercantile Marine, 247 of which carry three qualified operators each. The remainder carry one operator, and in the cases of ships with over 50 but less than 200 persons on board, two watchers are employed.

"The Times" recently published a letter from Mr. Thomas Hesketh, M.I.E.E., A.M.I.M.E., M.A.I.E.E., a wireless amateur, who made some suggested reforms and, incidentally, called attention to the disregard of S.O.S. signals.

The latter question is one that calls for investigation. Whether it is true that S.O.S. calls are carelessly watched for or not, is too serious a matter for discussion in this article, but the writer in "The Times" seemed emphatic on the point.

Hearing the S.O.S.

To quote an extract from his letter with reference to the S.O.S. call sent out by the Egypt:

"My receiving station is at Folkestone, and on the evening of the Egypt's collision I happened, by chance, to be listening in. From the midst of the normal traffic, which in this part of the world is very dense, I distinctly picked up two or three separate S.O.S. calls, and deduced that they were west of the Isle of Wight.

"Continuing to listen in, I came to the conclusion that I must be mistaken, for amidst the jamming of normal traffic no further distress calls were heard for some time.

"Later, at about 7.25 (summer time) Niton Wireless Station, in the Isle of Wight, and a distant French station, probably Ushant, began to call upon all stations to keep silence, as they were listening in for S.O.S. signals. Despite dozens of calls to this effect, stations in the Folkestone vicinity continued to fill the ether with normal commercial working, so that it was only by means of specially tuned circuits and sensitive receivers I could concentrate my attention on the more distant stations.

"Despite the local jamming, I picked up fragments of the position of the ship, and was amazed and distressed that one home and several foreign stations continued commercial working, rendering the selective reception of this otherwise clearly receivable message almost impossible.

Urgent Attention Wanted.

"A further lapse of time of approximately a quarter of an hour or 20 minutes took place, when the British Government station at the North Foreland asked Boulogne if they had heard S.O.S. calls. Boulogne promptly replied with 'No.'

"Immediately after this exchange of communications, a ship, whose call letters I did not get, informed North Foreland that she had received S.O.S. calls, and gave them the latitude and longitude sent out by the ship in trouble.

"Then, and only then, did North Foreland call for silence.

"I regret to say that this call for silence was only partially responded to; but, in any case, after this lapse of time, I assume it would have been too late to have rendered the assistance which was so urgently required. I think it is a moderate estimate to say that from thirty-five to forty-five minutes were wasted owing to lack of suitable receiving apparatus or inattention to specific orders as to the dropping of commercial traffic when S.O.S. calls are reported in the air; or, owing to the fact that commercial messages occupy too great a proportion of the time of the official Government stations, there is not sufficient latitude for them suitably to attend to this most vital use of wireless telegraphy."

In any case, the whole question of wireless watches at sea is one that calls for immediate attention and a more comprehensive system for ensuring a constant wireless watch by qualified wireless officers.

WIRELESS CLUB REPORTS.

The Editor will be pleased to publish concise reports of the meetings of wireless clubs and associations, the Editor reserving the right to curtail the reports if necessary. An asterisk denotes affiliation with the Wireless Society of London.

North Middlesex Wireless Club.*

At the 92nd meeting of the Club, held at Shaftesbury Hall, Bowes Park, N., Mr. D. Macadie gave a lecture on "Direct Current Measuring Instruments: their Design, Construction and Use."

Mr. Macadie had brought to the Hall a large number of measuring instruments, both ancient and modern. These were displayed on the lecture table, and made a fine and imposing show. He started with the ordinary linesman's galvanometer, and explained the various types that were in use. The lecturer said that it was now considered preferable to use instruments that read direct in volts or amperes to an instrument that gave a purely arbitrary reading, and showed examples of these instruments of the moving coil, hot wire, and the electrostatic types, and by means of large, clear diagrams attached to the blackboard he explained the characteristics of each.

A very interesting instrument was the "Avometer," which was one of Mr. Macadie's own design. By an ingenious arrangement it was made to read amperes, volts, and ohms, as required. The instrument was of neat and compact design, and was much admired.

The Chairman moved a vote of thanks to the lecturer, which members responded to in a hearty fashion.

New members continue to come along, and full particulars may be had on application to the Hon. Secretary, E. M. Savage, Nithsdale, Eversley Park Road, Winchmore Hill, N.21.

Leeds and District Wireless Society.*

A General Meeting was held at the Leeds University, on May 26th, Mr. G. P. Kendall, B.Sc. (Vice-President), taking the chair at 8 p.m. The Chairman called upon Mr. T. Brown Thomson to deliver a paper entitled "Types of Valves."

Mr. Thomson commenced his paper with an exposition of the Electron Theory of Matter, showing its particular applications to the study of vacuum tubes as used in wireless work. He emphasised the necessity for the amateur to attain a thorough knowledge as to what his valves require, if maximum efficiency is to be derived from the apparatus.

He explained the two main properties of valves, namely, their uni-directional and non-uniform conductivities. Two-electrode-valves or diodes were then considered, the characteristic curve and other features being examined closely. The lecturer then explained the principle of the three-electrode-valve or triode, showing very clearly the function of the third or control electrode. Characteristic curves of various valves, including such tubes as the French "S," the British "R," "Q," "A.E.G." and the De Forest "Audion" types, were exhibited, explained and compared in detail.

An interesting discussion followed, and the meeting terminated at 10 p.m.

Hon. Secretary, Mr. D. E. Pettigrew, 35, Mexborough Avenue, Chapelton Road, Leeds.

The Wallasey Wireless and Experimental Society.*

At the meeting of the Society held on Thursday, June 1st, the Secretary gave a short lecture on "Landline Telegraphy."

He dealt with the progress of an ordinary commercial message from the time of its handing-in to the final transmission along the submarine cable, and gave a short description of the instruments used at each stage.

The Society still has room for a few more members, and the Secretary will be pleased to forward particulars to anyone who wishes to become a member.

Hon. Secretary, Mr. C. D. M. Hamilton, 24, Vaughan Road, Wallasey.

RADIOTORIAL

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

The tremendous interest evinced by readers of POPULAR WIRELESS in the world's greatest hobby has been shown in the most tangible form. Letters from all parts of the country continue to pour in with every post.

I have found it quite impossible to print all the questions and answers on this page, and, therefore, after careful consideration, I have decided to reply to queries by post.

Each week I shall publish a general selection of questions and answers on this page for the benefit of all, but every query sent in, providing that the necessary postage is enclosed, will be answered direct.

I think this new arrangement will find favour with readers of POPULAR WIRELESS.

One or two readers have written in to say that in "Hints to Amateurs" in No. 1 of POPULAR WIRELESS, it was stated that acid should not be added to water. If this is purely a question of diluting the acid, of course it should be "don't add *water* to acid," but readers will find that in hot weather the *solution* in their accumulators will drop below the plates. In this case, distilled water *should* be added until the plates are just covered at the top.

The water will evaporate from time to time and the solution drop as explained, but this does not mean that extra acid has to be added. It is the water which evaporates, not the acid. If acid is added, the specific gravity of the solution will be altered, and this is undesirable.

This week I propose offering three more prizes for the best post card criticisms of No. 3 of POPULAR WIRELESS.

Prizewinners may take their choice of a five-pound note or a five-pound receiving set.

Post cards must be addressed to POPULAR WIRELESS, Gough House, Gough Square, London, E.C. 4, and must reach there not later than June 30th.

THE EDITOR.

WIRELESS QUESTIONS ANSWERED

Owing to the enormous number of queries received daily from readers of POPULAR WIRELESS, I have decided to reply individually by post. A weekly selection of questions will, however, be printed on this page, together with the answers, for the benefit of readers of POPULAR WIRELESS in general. Questions should be clearly and explicitly written and should be numbered and written on one side of the paper only.

Readers sending in questions are requested to bear in mind the fact that it is not practicable to describe in detail the construction of, say, a three-valve amplifier. Such a question would require many pages of this paper in order to clearly deal with the question in detail. Every attention will, however, be paid to readers' queries, and a staff of experts will deal with letters from readers in strict rotation, and do everything in their power to help those in need of advice.

Readers are requested to send necessary postage with their queries, otherwise their questions will have to be dealt with on this page, and this will mean delay.

All questions to be addressed to: The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

H. C. V. (Brighton).—I am thinking of purchasing another pair of telephones, but as my receiving set is only fitted with two terminals, how is the second pair attached?

Each pair of telephones has two leads; fix one lead of the first pair of 'phones to one terminal, and one lead of the second pair of 'phones to the other terminal. Join the two remaining leads together by wire or a metal clip and the circuit will be complete, enabling two people to listen in at once. Each pair of 'phones should be of similar resistance.

* * *

"S. PARKS" (Putney).—I propose making an outdoor aerial, two wires sixty feet long. Will galvanised iron wire answer the purpose, as, if so, I find that it is much cheaper than copper wire.

It would be bad practice to use galvanised iron wire for your aerial. Single-strand copper wire, or stranded phorphor bronze wire, will give you infinitely better results.

* * *

"SWITCHER" (Croydon).—When receiving instruments are not in use, should the switch for connecting aerial to earth be near the instrument indoors, or should it be outside the house?

The switch should be just outside the window of your operating-room, and when the switch is closed the aerial should be in contact with a separate earthing wire, the lower end of which is soldered to an old bath, or a six-foot metal rod or tube, or other metal, well buried in the earth.

* * *

L. M. (Dundee).—I have just made a tuning coil with a single slider for adjusting the wave-lengths, but often I hear several stations at once. How can this be remedied?

The interference can often be cut out, or partially so, by making two tuning coils, one sliding within the other. The signals are picked up by the slider on the outer ("primary") coil, similar to the one you already have. The current is induced in the movable sliding coil (or "secondary"), and if jamming is heard, the movable coil should be drawn out until the desired station is alone audible.

* * *

P. W. (Hounslow).—Will a crystal detector set, in London, receive the wireless concerts sent from Writtle every Tuesday?

Yes, the concerts may be heard if tuned in carefully on 400 metres wave-length, but your telephones should be of high resistance, and you must have your detector nicely adjusted.

* * *

R. M. T. (Durham).—I am constructing a single valve set. How much current shall I require from the "B" or Plate Battery?

The amount of current depends upon the type of valve chosen. Some valves work well with about 28 volts, and others require up to 60 volts or more.

* * *

L. C. T. (Clapham).—Frequently, whilst "listening in," I get loud crackling and scraping noises in my telephones. What is the cause of them?

Such noise may be caused by a fractured telephone lead, or condenser plates out of truth, or may more likely be due to electrical discharges in the atmosphere during thundery weather. These discharges are known as "Static," or "X's."

* * *

"NOVICE" (Caterham).—When are the "Dutch Concerts" transmitted, and on what wave-length?

Every Sunday, from The Hague, speech, song, and orchestral selections are transmitted between 2.30 P.M. and 5.30 P.M. on a wave-length of about 1,070 metres.

"WANDERER" (Clacton).—I travel a good deal all over Great Britain, and think of carrying a small portable receiving set so that I may listen in to the Broadcast concerts in my spare time. Supposing I am in any part of England or Scotland, which Broadcast Station should I be likely to hear?

Broadcast concerts by wireless will be heard at various times from stations in London, Cardiff, Plymouth, Birmingham, Manchester, Edinburgh or Glasgow, and Aberdeen.

* * *

"PUZZLED" (Liverpool).—When tuning in certain stations on my valve set, directly I remove my hand from the apparatus, the signal immediately alters its note, and sometimes entirely vanishes until I readjust the tuning knobs. How can I obviate this?

You can make or buy special ebonite extension arms, which may be attached to the condenser, and tuning inductance knobs, respectively. The use of these will do away with the capacity effect which is otherwise produced when the hands are close to the apparatus.

Are you having trouble with your set?

If you are, consult the Technical Experts on the staff of POPULAR WIRELESS, who will give your questions the full benefit of their long and varied experience.

No trouble is too great providing we can help you.

"NEW HAND" (Bristol).—Is there any difference between a Thermionic valve and a Three Electrode valve?

A Three Electrode Valve is a Thermionic Valve, and is so called because it contains three electrodes—the Filament, the Plate, and the Grid.

POPULAR WIRELESS ADVERTISEMENTS

Reprinted from the "Daily Mail," June 2nd, 1922.

WIRELESS DAY BY DAY.

One of the reasons for occasional disappointment in receiving wireless with a valve set is the failure of the accumulator—the battery providing the current for heating the filament in the valve. This is especially the case where a receiving set is only used at odd times, as accumulators have the well-known habit of running out or losing their charge even when not in use.

IT is most disappointing to find that, just when they are wanted, the accumulators have lost their charge whilst not in use.

You need never fear such an occurrence if you INSIST on

FULLER "BLOCK" TYPE ACCUMULATORS

THEY WILL HOLD THEIR CHARGE WHEN NOT IN USE.

THEY ARE FOOL PROOF AND LESS LIKELY TO BE INJURED THROUGH UNSKILFUL TREATMENT.

ALL REPUTABLE WIRELESS DEALERS CAN SUPPLY

TRADE ENQUIRIES SOLICITED.

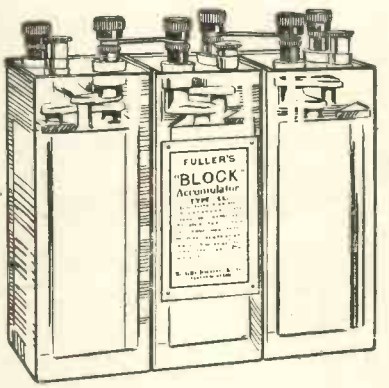
which we are supplying for a limited period at 33⅓% below maker's prices.

This Block Accumulator was used for WIRELESS PURPOSES by the Army, Navy and Air Forces. They have no plates to buckle. DO NOT BE PUT OFF WITH A PLATE TYPE BATTERY. Internal shortcircuiting is impossible. Sulphating cannot occur to any serious extent.

All Voltages supplied at 16/3 per 2-volt unit.

40 ampere hours capacity.

20,000 IN STOCK.



The CITY ACCUMULATOR CO.,

79, Mark Lane, E.C.3. *Wireless Department.* (*Phone: Avenue 91.*)

Also supplied by—Selfridge & Co., Ltd., Wireless Section, Oxford Street, W.1 ; A. W. Gamage, Ltd., Wireless Dept., Holborn, E.C.1 ; . Barnsley British Co-operative Society, Ltd., Radio Section, Barnsley.

(*Send for Pamphlet and name of nearest Agent.*)

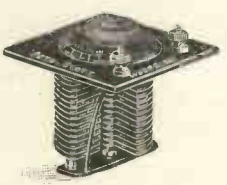
Build Your Own Sets!!

We are the PIONEER FIRM to specialise in sets of parts for any type of Wireless Apparatus.

All **PANELS** are drilled and tapped ready to receive fittings.
All **FITTINGS** are ready made.
All **YOU DO** is assemble and connect up.
BLUE PRINTS and **INSTRUCTIONS** are supplied.

Send right now for our 24-Page Illustrated Catalogue "P," with list of Transmitting Stations.

CONDENSER VALUE



Complete Sets of Parts for VARIABLE CONDENSER ready to assemble.

No Drilling or Fitting required.

·0015	·001	·0005	·0003	·0002	·0001
27/-	21/-	14/-	11/-	8/-	7/-
Cabinets :					
4/9	4/6	4/3	4/-	3/9	2/9

The above are supplied with Ivorine Scale for panel mounting or engraved Ebonite top 4¾" x 4¾" for panel mounting.

We can substitute Ebonite Bevelled dial in place of scale for 3/6 extra.

PLEASE STATE WHICH YOU REQUIRE.

PARTS FOR TUNING COILS.

IMPREGNATED TUBES, 3", 1/9 ; 4", 1/9 ; 5", 2/3, perfectly round, per ft.
SLIDES, fitted with 14" square brass rod and terminal, 2/3.
ENAMELLED WIRE, per lb., 22 gauge, 2/8 ; 24 gauge, 2/8 ; 26 gauge, 3/2.
CRYSTAL DETECTORS, 3/6. **CRYSTALS**, Galena, Bornite, Carborundum, 9d. per packet.

COMPLETE SETS OF PARTS.

to build the following :

Short Wave Tuner with switch, studs, wire, etc., 18/6 ; Cabinet 4/6, single valve receiver, 15/9 ; Cabinet, 3/6 extra.

Send for particulars of our Unit System Complete Sets or Parts. By this System you can build a most powerful 5- or 7-valve set in easy stages. Each unit is complete in itself, and can be added to at will.

Call at Holborn and hear sets demonstrated.

PETO SCOTT (The Condenser King),

7, FEATHERSTONE BUILDINGS, HIGH HOLBORN, LONDON, W.C 1. (**Turn up by No. 63.**)

Also at Stores : 17, Frome Road, Wood Green.

CQ Std bi

for ERICSSON PHONES

WHEN you instal your wireless set —crystal or valve—you'll get maximum results if you fit Ericsson Phones—clarity, sensitivity, strength of signals and absence of "click." Specially suited to telephony.

Ericsson Phones embody the accumulated experience of telephone manufacture for a generation.

Easy to the head, light and comfortable. The magnets never lose their strength and "shorts" are non-existent.

Write for Particulars

The BRITISH L.M.ERICSSON MANUFACTURING Co., Ltd.

Head Office :

60, Lincoln's Inn Fields, E.C. 2

Ericsson Telephones

Printed and published every Friday by the proprietors, The Amalgamated Press, Ltd., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices, Messrs. J. H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Registered as a newspaper and for transmission by Canadian Magazine Post. Subscription Rates: Inland and Abroad, 17/4 per annum; 8/8 for six months. Sole agents for South Africa, The Central News Agency, Ltd. Sole agents for Australia and New Zealand, Messrs. Gordon & Gotch, Ltd., and for Canada, The Imperial News Co., Ltd. Y/Y

POPULAR WIRELESS, June 24, 1922 REGISTERED AT THE G.P.O. AS A NEWSPAPER.

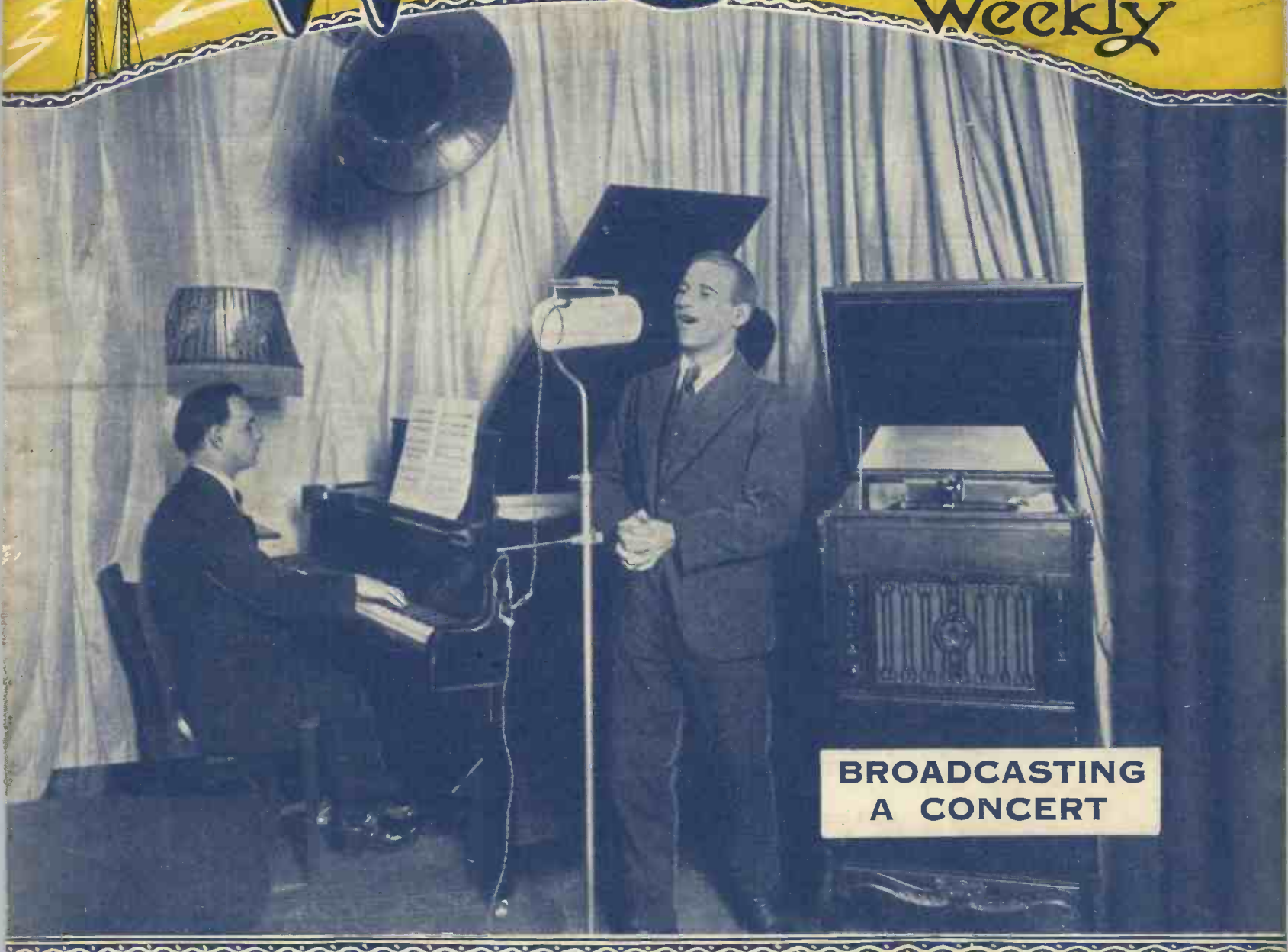
No.4—of the Great Wireless Paper

POPULAR WIRELESS

3d.

No. 4. Vol. 1.
June 24, 1922.

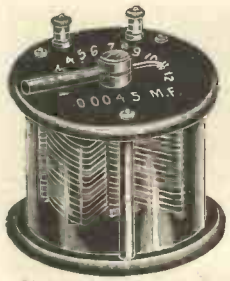
Weekly



BROADCASTING A CONCERT

ALL THE LATEST · WIRELESS NEWS

WIRELESS QUESTIONS ANSWERED FREE BY POST



Variable Condensers
Of a quality that has made them famous amongst every wireless experimenter throughout the country.

No. M.W.2.
Capacity to ·00036 mfds.
Each 17/6 post free.

No. W.M.3.
Capacity to ·0004 mfds.
Each 25/- post free.

No. 10.
Capacity ·0003 mfds.
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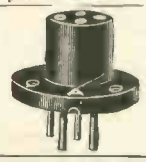
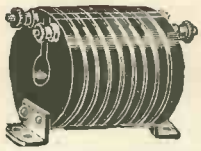
No. 11.
Capacity ·0045 mfds.
Each 36/- post free.



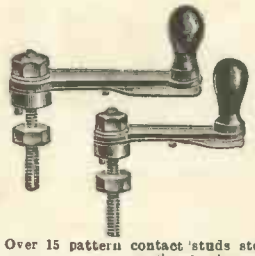
Valve-holders,
1/6, 1/9, 2/6, 3/6, 6/6 each.



High Frequency Inter-Valve Transformer
Suitable for wave-lengths from 800 to 4,000 metres, without any taps. Wound on solid ebonite former with silk-covered wires. Originally marketed 1920. Price each 22/6 post free.

Blocking and Fixed Condensers
Over 100 types of various capacities—anything supplied quickly in stock at time of this advertisement ·002, ·003, ·0002, ·0003, ·0004, ·0005 mfds. All one price, each 6/9 post free.

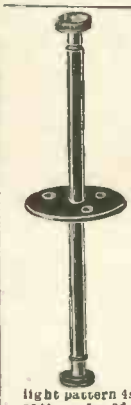
Also supplied mounted in groups of two or three, on ebonite, or also fitted in hard-wood cases.



Switch Arm 1 in. radius 1s. 9d.
Switch Arm 1½ in. „ 2s. 3d.
Switch Arm 2 in. „ 2s. 6d.
Postage 3d.

CONTACT STUDS to suit above arms:—
No. 163 ¾ in. Head, ¼ in. long. dozen, 1s. 6d., postage 2d.
No. 164L, 3/8-in. Head, ¼ in. long dozen, 1s. 6d., postage 2d.
All complete with nuts and washers.

Over 15 pattern contact studs stocked. Make a point of comparing our types with others.



Aerial Material, etc.
Flag Masts, Bamboo Masts, Bamboo Spreaders, see "blue slip" which accompanied our catalogues. WE ERECT MASTS WITHIN A 20 MILES RADIUS OF LONDON.
6½ -foot selected bamboo spreaders, average 1½ ins. diameter 1s. 6d. at retail stores. Carriage forward when rail'd.

Aerial Insulators: Mitchell's "Chain" type, recommended 1s. each, or 10s. 6d. per dozen, postage on six costs 9d., on one dozen costs 1s.
Aerial Pulleys. Heavily galvanized, 1s. 6d. each, postage 5d. extra.
Rope for Halyards, heavily 'doped,' with anti-rot compound which will not come off and spoil your hands, 1s. 6d. per dozen yards, postage 9d. extra.
Aerial Wires. Stranded 7/23 enamelled wires 6/- per coil of 100 feet, postage 9d. Stranded 5/24 enamelled coil of 100 feet 5s. 6d.; postage 7d. extra. Many other lighter and heavier gauges stocked.
Lead-In Insulators, as illustrated, light pattern 4s. 6d., heavier pattern 5s. 6d. postage 6d. extra, either pattern: HIGH TENSION CABLE for leading in from insulator, 1s. per yard.

Wireless Headgear
wound to a total resistance of 4,000 ohms, recommended highly for crystal or valve sets without having to use a telephone transformer, 35/- per pair, postage 1/- extra. You will find these exceedingly comfortable to wear, and compare with very expensive types favourably

No. 4 Illustrated 3/9 doz.

MITCHELL'S FAMOUS ACCUMULATORS.
REDUCED PRICES.

4 volt 20 amp.,	17/6	and	21/0
4 volt 40 amp.,	22/6	„	27/6
4 volt 60 amp.,	25/6	„	37/6
4 volt 80 amp.,	35/6	„	47/6
6 volt 20 amp.,	27/6	„	35/0
6 volt 40 amp.,	36/0	„	42/0
6 volt 60 amp.,	45/0	„	53/0
6 volt 80 amp.,	55/6	„	75/0

Carriage extra on all above at cost; see that you enclose sufficient to cover; this prevents delay in dispatching.

MITCHELL'S ELECTRICAL & WIRELESS, LTD.

Pioneers of the Home Wireless Outfit at £5 (carriage paid Gt. Britain). Complete with 4,000-Ohm Double Headgear, Aerial Wire & Insulators.

188 RYE LANE, PECKHAM, S.E.15

48-Page Illustrated Wireless Catalogue, post free, 6d.

Wholesale & Export Section: McDermott Rd., Peckham, S.E.15. Telephones: New Cross 1540 & 1541.

CQ Std bi
for ERICSSON PHONES

WHEN you instal your wireless set—crystal or valve—you'll get maximum results if you fit Ericsson Phones—clarity, sensitivity, strength of signals and absence of "click." Specially suited to telephony.

Ericsson Phones embody the accumulated experience of telephone manufacture for a generation.

Easy to the head, light and comfortable. The magnets never lose their strength and "shorts" are non-existent.

Write for Particulars

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Head Office:
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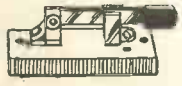
Ericsson Telephones

J.E. EARTHING CLIPS
1 in. 4/6 doz.
1½ „ 6/- „
1½ „ 7/6 „
Other sizes on application FROM STOCK.

J.E. AERIAL INSULATORS
3/6 per doz.



J.E. 3-CELL POCKET BATTERIES
5/- per doz.

J.E. SWITCHES ON PORCELAIN BASES

1 way - - -	2/11 each
Double-throwover	4/6 „
D.P. - - -	5/- „
D.P. Throwover	7/- „

The JEARY Electrical Co. LTD
8, LAMBETH HILL, Queen Victoria Street, London, E.C.4.

List Post Free 1d. stamp

ACCUMULATORS AT 40% OFF LIST

	SALE PRICE	Postage and Packing	
4V 22A	12s.	2s. 0d.	THESE ARE
4V 44A	18s.	2s. 6d.	ALL OUR 1st
4V 66A	24s.	3s. 0d.	QUALITY
6V 22A	18s.	2s. 6d.	"O" TYPE
6V 44A	27s.	3s. 6d.	CELLS
6V 66A	36s.	4s. 0d.	

SPECIAL LINE: 2V 50A GLASS STORAGE CELLS 9s. 11d. Postage and Packing 2s.

2 Volt 10A GLASS CELLS 4s. 6d. Postage 1s. 3d.

RICHFORD & Co., 153, Fleet St., London, E.C.4.

Popular Wireless

TOPICAL NEWS AND NOTES.

Broadcasting in Australia.

RADIO broadcasting is gaining a foothold in Australia. I hear that a transmitting station is now in operation at Dunedin, New Zealand. Plans are under way for increasing the power, so that the present range of 400 miles may be considerably extended.

* * *

Reduced Wireless Rates.

A reduction in the rate for deferred wireless messages via Marconi, from Great Britain and Ireland to the eastern zone of Canada, from 4½d. to 4d. per word, is announced. The reduction is as far as messages handed in at Marconi offices in London are concerned. It will also apply to messages handed in at post-office counters throughout the country, at an early date which will be notified in due course.

* * *

A Record?

THROUGH the daily operation of its Cavite station to Honolulu, a distance of about 4,200 miles, which has maintained a 24-hour a day service for some time, the United States Navy believes it holds a record. Using a 500-kw. arc-transmitter, even San Francisco has heard Cavite's messages. When it does, Honolulu is notified and does not relay the message, as is ordinarily done, in transmitting 7,000 miles over the Pacific.

* * *

New Wireless Law.

UNDER the Wireless Telegraphy and Signalling Bill, introduced by the Post master-General in the House of Commons on Tuesday, it becomes an offence to send, or attempt to send, by wireless telegraphy, a message or communication of an objectionable character, or a signal of distress of a false or misleading character, or a false or misleading message as to a vessel in distress, or improperly divulge the purport of any message sent or proposed to be sent by wireless telegraphy.

* * *

Wireless for the Deaf.

IT has been discovered that by increasing the number of thermionic valves in a receiving instrument it is possible to make the deaf hear comfortably.

A case is mentioned in the "Medical Press and Circular" by Dr. Dan M'Kenzie of a man to whom the ordinary electrical hearing aids were useless, who by wireless can hear a man in Holland more plainly than a person sitting beside him.

He uses five thermionic valves in his receiver, and this has had the further curious effect of improving his ordinary hearing.

More Boom Effects.

AERIALS are springing up in the suburbs like mushrooms. They are of every height, length, and shape, and no trouble has been spared in their rigging. Some conform to the simple method of attachment to the roof and to a piece of wood nailed on to the fence at the farther end of the garden. Others are fixed between two chimneys or short roof-masts.

Still other types are those which stretch from one house to another, and are, presumably, jointly owned.

In any case, as far as I can see, the novice has a good idea of where and how to put up his aerial.

* * *

Einstein and the Ether.

"IT is the fashion sometimes to disbelieve in the ether, and some of the newspapers think that Einstein abolished it," said Sir Oliver Lodge at a recent meeting of the Wireless Society of London.

"Einstein did not think, however," said Sir Oliver, "that he had abolished the ether. His theory does not say anything about the ether, but a thing does not cease to exist because you refrain from speaking of it.

"You use the ether in many ways besides signalling," continued the veteran scientist. "It is used in telephoning, and even in driving an electric tram; in fact, it is used in every electrical experiment."

* * *

A Universal Wireless Language.

DISCUSSING the conference of linguistic experts from the various universities in the United States which is to consider the advisability of establishing a universal language for the purpose of communication by wireless, Professor Sir Israel Gollancz, of London University, recently said he did not think a universal language possible.

"I do not believe in any international language becoming a living force unless it is one of the living languages, such as English or French, or possibly even Latin," he said. "You might create a language for the elements of commerce, but I do not think it would even be useful for the science of commerce."

Mr. Godfrey Isaacs, managing director of Marconi Wireless, said: "We are keeping in view, in connection with the scheme now under consideration for the establishment of wireless broadcasting stations, the possibility of teaching languages by wireless telephony."

* * *

Looking Ahead.

THE Walturdaw Film Co. have secured from the Marconi Wireless Telegraph Co. the exclusive rights to exploit for cinemas, theatres, halls, and all places of entertainment the "Marconiphone," a very portable instrument, occupying no more space than a cabinet gramophone, and which will convey to the ears of an audience, large enough to fill the Royal Albert Hall, or small enough for a tiny cinema, music, speeches, news, and, indeed, everything a "broadcasting" station can supply.

The range over which the wireless waves will come from some half a dozen "broadcasting" stations will run to some 300 or 400 miles, and the message of voice or music received will, it is said, be clear to every person in the hall or theatre, without the least exaggeration.

* * *

Helping the Farmers.

THE North Essex Wireless Club, of which Mr. F. T. Smith, of Felsted, is hon. secretary, recently organised a demonstration of wireless telegraphy and telephony, in conjunction with the Institute of Agriculture, of which Mr. Smith is a past gold medallist in agricultural science.

The club gets weather reports each morning at nine o'clock from the Air Ministry, and has found them of great assistance in regulating the arrangements for farm work. Accurate information for twenty-four hours ahead is thus secured.

His Master's Voice, 1922.

NEWS AND NOTES

(Continued.)

The club's idea is to encourage farmers to adopt wireless, not only for the sake of the weather reports, but for keeping in touch with the outside world, especially where they happen to live in out-of-the-way places.

* * *

A Startling Announcement.

SIR A. CONAN DOYLE announces his conviction that wireless would greatly aid psychic investigations in the future. He has given orders for a set to be installed in his home, and intends to conduct experiments.

* * *

Wireless in India.

SEVEN wireless telephone sets have been ordered by the Madras Government. They will be used by the police in the Moplah rebel area (S.W. India). The Madras Government is therefore the pioneer of broadcasting in India.

* * *

Telephony for West Indies.

THE West India Committee announce that a system of wireless telephony has now been established in the British West Indies.

The island of Grand Turk has been connected up with South Caicos and Salt Cay, distant twelve and eight miles respectively.

* * *

Archbishop and Wireless.

A MESSAGE from the Archbishop of Canterbury was sent by wireless telephony from Marconi House last Friday evening to the Actors' Church Union Hostels Fund for children of touring actors, at Caxton Hall, Westminster. The speech was excellent in every respect.

* * *

Street Aerials.

THE Manchester Corporation Committee had a curious problem to solve the other day. A firm in Market Street wanted to erect an aerial across one of the busiest streets in the city in order to get the best possible results when the broadcasting commences.

After fully considering the question, the Committee refused permission.

* * *

Marconi's Experiments.

SENATORE MARCONI arrived at New York on June 16th on his yacht Elettra. He informed Press representatives that his experiments had achieved important results in two directions. Senatore Marconi has succeeded in transmitting messages at 100 words a minute without any blurring of signals. His other experiment was in the direction of eliminating atmospherics. He believes that in the near future "X's" will be eliminated completely when sending and receiving messages. Senatore Marconi also reports hearing the mysterious long-wave signals, and is still puzzled as to their origin.

* * *

Sir Oliver Lodge.

SIR OLIVER LODGE, England's veteran scientist, celebrated his 71st birthday on June 12th by making wireless experiments at his beautiful home in the country near Salisbury.

"I spend a good deal of my time on wireless research now," he told a "Daily Mail" reporter, who offered his congratulations.

"With an assistant, I have been carrying out a number of interesting experiments, but for the moment I am keeping them dark.

"I have been particularly interested lately in what the 'Daily Mail' has been saying in regard to broadcasting. I expected broadcasting would become popular a long time ago, for I then thought, and still think, that there is a wonderful future for it.

"A great deal of good has been done for the cause of wireless by the encouragement given to amateurs. It is through them, in their enthusiasm, that new developments in wireless are to be looked for. Means should be devised of placing apparatus cheaply on the market."

* * *

Temptation!

WIRELESS headgear is at present very scarce, not only in Great Britain, but in the United States of America and Canada, and drastic steps have to be adopted to ensure the public being dealt with in order of priority.

Wireless in a Nutshell!

In a communication from an electrical friend in Canada, many wireless experimenters, I am informed, have their wireless receiving licences, and the whole apparatus, excepting the wireless head-gear, and consequently in some cases dealers are profiteering by demanding high prices for cheap and shoddy 'phones.

Also, owing to the ear 'phones disappearing from the public telephoning boxes, the authorities have been compelled to affix strong locks to the doors, and in some districts you have to line up to take your turn at the telephone box, as many are minus the essential fitting.

I sincerely hope the Postmaster-General will not have to take such measures in this country!

* * *

The Pope and Wireless.

WHAT is believed to be the first use of wireless by the Vatican in transmitting an official message to America is that received from His Holiness Pope Pius XI. through Monsignor F. Borgongini Duca, papal pro-secretary of extraordinary ecclesiastical affairs, to James A. Flaherty, of Philadelphia, supreme knight of the Knights of Columbus. The wireless message contains the full, formal approbation of Pope Pius of the Knights of Columbus one million dollar American welfare work in Italy now operating under the auspices of the Holy See, and the explicit donation of pontifical land to the Knights for their work.

* * *

Scotland and Wireless.

FOR some considerable time telegraphic communication between Islay (one of the Inner Hebrides, Scotland) and the mainland has been suspended, due to a defect in the submarine cable. Since the breakdown, telegrams from Islay have been conveyed to the mainland at Tarbert (Lochfyne) by steamer and then wired from there, a most inconvenient arrangement, as it caused much delay. The difficulty has, however, now been surmounted by the installation of wireless communication between Port-Ellen (Islay) and Portpatrick (Wigtownshire), and this system is giving every satisfaction.

* * *

To 2 S. Q.

Your voice is good, your microphone ditto, but best of all were the extracts you read from this paper a few days ago!

* * *

The Latest.

GRID: "I hear they have established a home for wireless fiends."

LEAK: "What do they call it?"

GRID: "Listen Inn."

ARIEL.

Broadcasting Programmes

What you can hear every evening of the week on your set.

THE delay in the forming of a working agreement by the various firms contracting to run broadcasting stations is exasperating, but typical of this country. Sooner or later, I suppose, we shall hear that an amicable arrangement has been arrived at, but the latest news from the broadcasting quarters seems to indicate that it will be nearly two months before the stations are in operation.

However, amateurs, in the meantime, will not be entirely left out in the cold, and, as I have pointed out before, there is "plenty doing" in the other any evening.

There are about 280 amateurs in the country who hold transmitting licences, and they may be heard working at all times now that the Postmaster-General has given them permission to make use of their two-hour transmitting periods at any time of the day or night they choose.

Apart from amateur transmissions, Croydon and other aerodromes may be heard at all times speaking with various aeroplanes on the Continental air routes (900-metre wave).

Every Sunday afternoon the Nederlandsche Radio Industrie, a Dutch wireless firm at the Hague, in Holland, broadcasts a concert from 2.30 to about 5 p.m. The second part of the programme is sent in English for the benefit of amateurs in this country.

The wave-length used is 1,070 metres, and the station's call sign is P C G G.

These concerts have been clearly heard in Scotland using three valves.

The wireless station at the Eiffel Tower, Paris, transmits telephony every day at about 6.10 p.m. (Sundays and holidays excepted) on a wave-length of 2,600 metres. The station's call sign is F L.

Paris occasionally transmits a concert later in the evening, or on Sundays. Notice of these special concerts is given during the usual evening broadcast, which combines speech and music with a weather forecast and other items.

WIRELESS AND THE PUBLIC.

By a Special Representative of "POPULAR WIRELESS."

SIR WOODMAN BURBIDGE,
Managing Director of Harrods.

RECOGNISING the tremendous possibilities in wireless telephony, and in order to meet the demands of the public now that the post-office authorities have lifted the ban on wireless generally, nearly every one of the large stores in this country has organised a wireless department, retaining the services of an expert on the subject as its nominal head.

One of the foremost and perhaps the most luxurious in its arrangements is Messrs. Harrods Ltd., where the public may hear at any time of the day demonstrations of both wireless telegraphy and telephony.

The biggest aid to any science is popularity, and the spirit with which our big stores have accepted the wireless telephone, the efforts they are making to show its simplicity of working, and utility to the general public, does them considerable credit. Were it not for these stores, how many of us would ever have heard a human voice speaking hundreds of miles away, with a clearness and volume as if the person were speaking at one's side ?

The Voice from Nowhere.

Some few weeks ago, the writer was agreeably surprised to receive an invitation to the reception of a concert transmitted from the Marconi Research Station at Writtle, Essex; the reception to be given in the Georgian Restaurant of Harrods Stores.

My imagination portrayed a stupendous machine with hundreds of listening pieces attached; but so much for imagination! The spacious room, arranged with chairs in concert-hall fashion, showed nothing of machinery save that on one small table, in a position where one would expect to find the stage, were two or three boxes and a gramophone trumpet.

After a few minutes' waiting, a voice coming from the trumpet, and seemingly emanating from the air, announced in clear tones that the concert would begin.

Then followed a number of songs, sung by a famous operatic singer. The voice was good, the music clear and perfect, just as one would have wished it to be.

Still another invitation from "Harrods" came my way on the occasion of the Carpentier-Lewis fight, and "red-hot" news from the ringside reached us in less time that it takes to tell. It was mysterious. It was wonderful. It showed as nothing else could show that time and space have gone for ever; that the word remote must in time apply only to those towns where no wireless telephone is installed.

Seeing is Believing.

A walk through "Harrods" will convince one of the possibilities open to the wireless telephone. One of the displays is given in the "Wireless Lounge," and throughout the day one hears conversations conducted between the Aerodromes, the London and Continental aeroplanes, Marconi House and Chelmsford. In addition, one may listen to the Paris time signals amplified to such an extent that even in the rooms next to the Lounge they are still audible and clear.

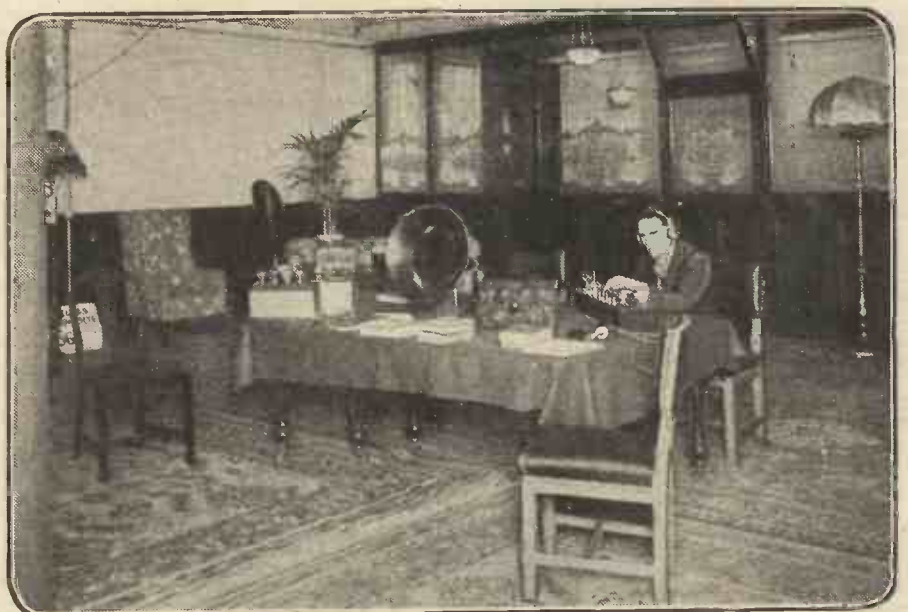
In the Electrical Department one comes across another apparatus receiving further speech, Morse and time signals on sets ranging from a few pounds value to considerable amounts.

The visiting public become obsessed with interest, rivalling each other with their many questions. And all this enthusiasm aroused within a few short weeks!

To most of us the wireless telephone was, until lately, an instrument of which we had read and never seen, but to-day a visit to most of the leading stores "puts one wise" to the fact that one can speak from here to there without the aid of a connecting wire.

The daily newspapers tell us much of Wireless that is interesting; we read it, we enjoy it, but seeing the little boxes and actually hearing them produce in faithful tones the human voice speaking miles away is an enjoyment we had never expected.

The wireless demonstration stand in the Electrical Department of Harrods, Ltd., where hundreds of people daily make first acquaintance with wireless telephony.



The wireless demonstration lounge where the public may "listen in" to wireless concerts and "conversations" between aeroplanes.

Britain's Greatest Station

THE greatest wireless station in Great Britain is situated on the side of the bleak Cefndu mountain in Wales.

As you pass along the Ceunant road at the bottom of the land belonging to the Marconi Company, the ten tall masts, rearing up into the sky, cannot fail to inspire in the passer-by a feeling of wonder and—shall I say awe?

To the wireless man there is something noble about a well-erected wireless mast; something that, although inanimate, suggests pulsating life and high, lofty endeavour. Kipling could explain this in a few strokes of his pen, but for myself I can only vaguely write of my feelings when I first set eyes on the tall sentries on the wind-swept Welsh mountain.

The ten masts are made of steel, and each rises 400 feet into the air. The last row are about 1,400 feet above sea-level and this, together with the fact that the station is admirably situated from a wireless point of view, makes the Carnarvon wireless plant the greatest station in the country.

Each mast is held in position by a complicated system of guy ropes of steel, anchored to 100-ton blocks of solid concrete.

The stress and strain due to wind pressure is enormous—but however out the weather, those tall masts are "masters" of themselves.

Duplex Working.

There is something extraordinarily thrilling about tall objects erected by man.

The skyscrapers of New York—the Great Pyramid of Cheops—they are indeed wonders of the world; but somehow they sink into obscurity when compared to the slender masts of a great wireless station.

Perhaps it is the romance of their usage that causes this feeling; perhaps it is their comparative modernity; but whatever the cause, they invariably arrest the attention of the casual passer-by, and set him pondering on the mysteries of wireless communication.

The transmitting station at Carnarvon is known to wireless men by the call letters M U U—the receiving station at Towyn, some sixty-three miles distant, M U V.

So great is the power used at the transmitting station that for convenience of working the actual operating and receiving is conducted at the Towyn station. By this means duplex working is made possible.

The operator on duty at Towyn can cause messages to be transmitted at the Carnarvon station by means of his Morse key, which is electrically connected to the transmitting gear at M U U.

Directly he presses the key the circuit between the two stations is closed; the apparatus at Carnarvon is set into operation, and wireless waves, 14,500 metres in length, are radiated into space.

The Carnarvon station is in almost constant communication with the New Brunswick station in America, and these two stations handle an incredible amount of Transatlantic traffic.

Sending a Message.

Let us suppose you are a business man in the City. You wish to send a wireless message to a business colleague in New York.

If you are close to Fenchurch Street, you hand in your Marconigram at the city offices of the wireless company situated in that street.

It is checked, the number of words counted, and the contents sent direct by private line to the Towyn wireless station.

It is received there at the rate of 100 words a minute. At Fenchurch Street the message is "punched" out on a Wheatstone machine.

The result is a long strip of "tape" paper, full of little holes, spaced out at various intervals.

This tape is next passed through an apparatus driven by a little high-speed motor.

As it passes through the machine the spaced holes are resolved into comprehensible dots and dashes of the Morse code and are transmitted at a 100 words a minute and more at the Towyn station, where it is automatically received.

Here it is again checked, and then handed to the operator, who may send it by hand—that is, "tap" it out in the Morse code on his key—or it may be automatically sent out by passing the tape through apparatus connected to the transmitting plant.

Heard in Australia.

The apparatus employed at Carnarvon consists of a 200-kilowatt continuous wave transmitter, using 56 valves, as shown in the illustration.

This type of transmitter has been installed in place of the old "spark" transmitter, which was both noisy and less efficient in working than the present C.W. type.

The amateur who knows his subject will realise the power of the station when it is stated that aerial currents up to 350 ampères have been registered, and that, with certain additions, 1,000 ampères may be obtained.

Messages are clearly read from Carnarvon in Australia, and, in fact, almost every part of the world.

At present Australia cannot reply direct to Carnarvon, but a station is to be erected in New South Wales which will be able to accomplish this.

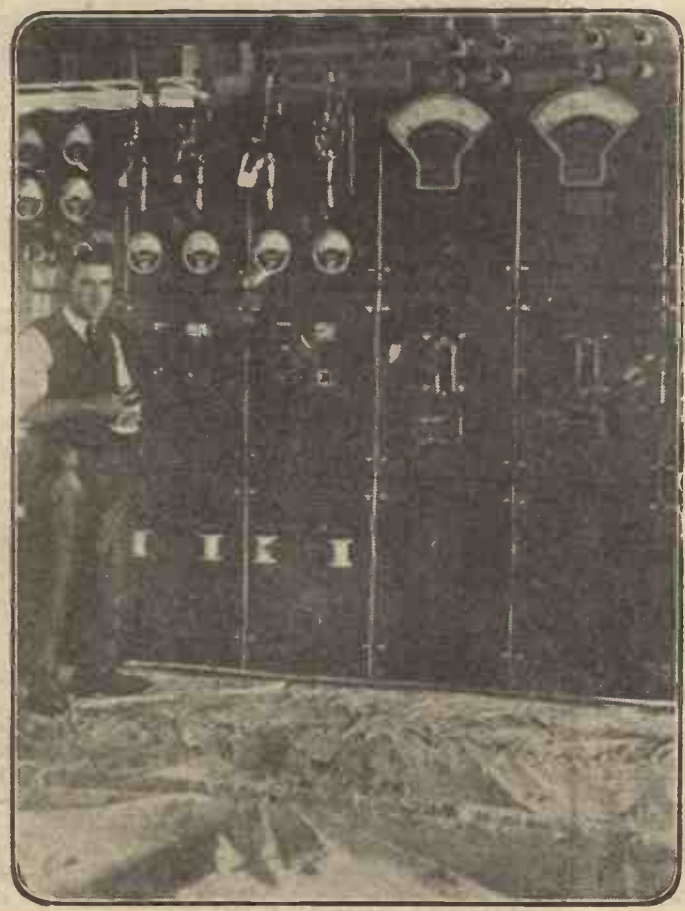
A Big Difference.

Even to the hardened wireless man there is a romantic thrill to be had when it is realised that before long the operator at Carnarvon will be able to have heart-to-heart talks with his confrère in Australia, while the fastest P. and O. liner will be plodding along with the mails at, say, 18 to 20 knots against the 186,000 miles a second speed of wireless waves!

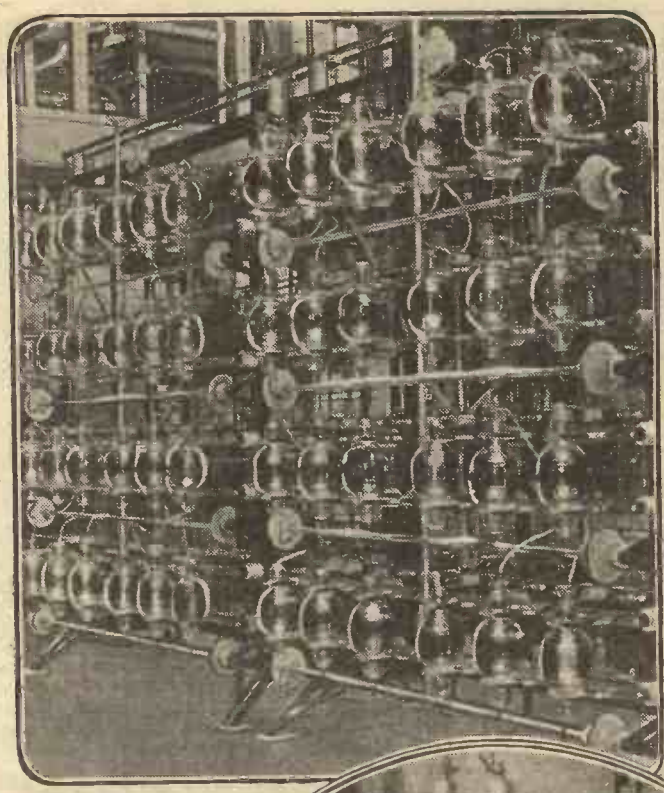
There certainly is a difference!

The accompanying photographs will give the readers of POPULAR WIRELESS some slight idea of Great Britain's greatest wireless station; but to actually appreciate the wonders of Carnarvon the station must be visited in the flesh, and not via the ordinary printed wods of this article.

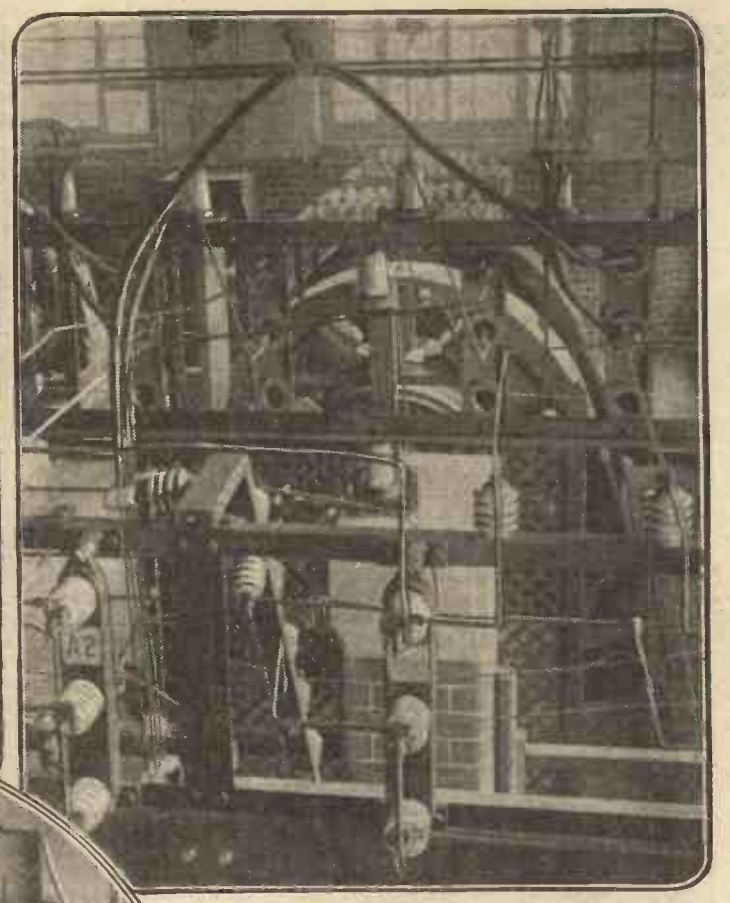
The next best thing perhaps is to get a longwave receiver and listen to the proud note of M U U as she talks with the land "across the pond."



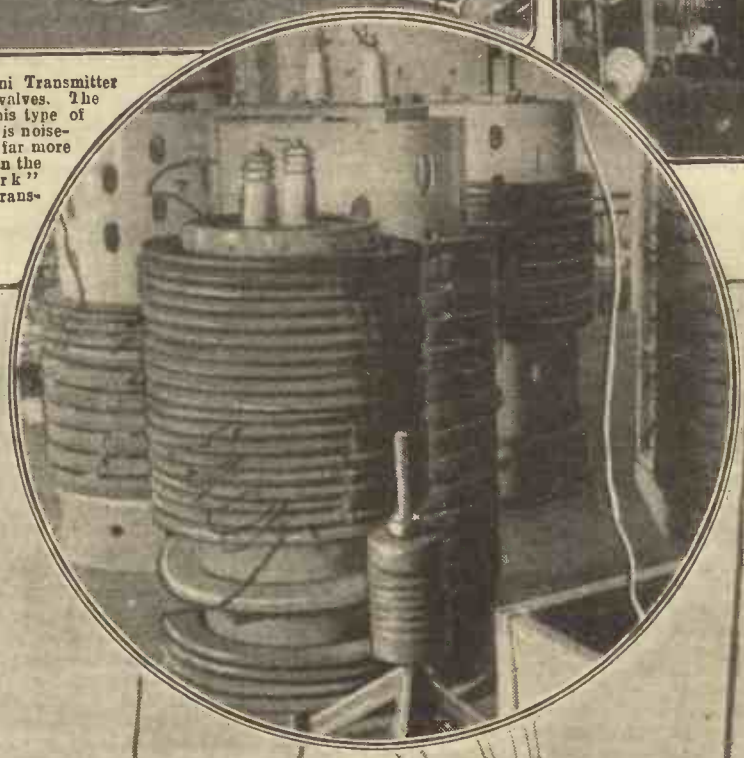
A section of the main switchboard at Carnarvon.



The Marconi Transmitter bank of 56 valves. The action of this type of transmitter is noiseless, and is far more efficient than the old "spark" method of transmission.

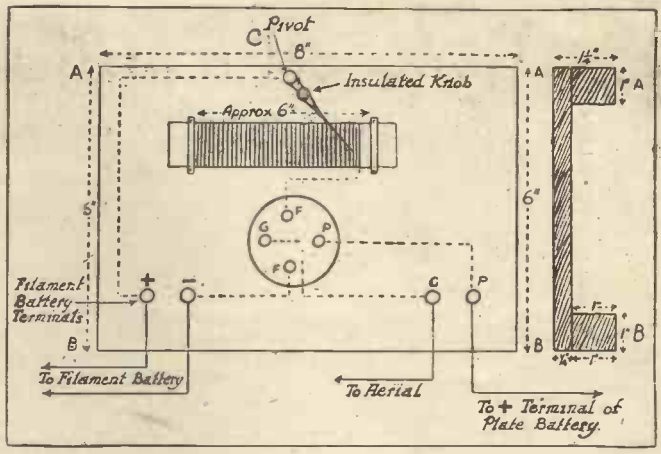


This photograph shows the maze of leads and connections above the main power plant. Note the heavy insulators used. A power of 200 kilowatts is generated at Carnarvon and messages can be sent which are clearly readable as far distant as Australia.



Our photograph in the circle above shows the choke coils used in connection with the old "spark" transmitter. Below, the photograph shows some of the ten steel masts, each 400 feet high, which support the aerial system. The guy ropes are anchored to massive 100-ton concrete blocks and are capable of withstanding an enormous strain.

CONSTRUCTING A VALVE PANEL



THE construction of a panel or base board into which the valve of a receiving set can be fitted, together with the variable resistance for the filament current, is quite an easy matter. The necessary wiring to the terminals shown in the illustration is quite simple to perform, but great care must be exercised when the connections are taken to the four sockets into which the valve is plugged. The valve socket itself should be purchased ready-made. Its cost is under half-a-crown, and it will be found that this portion of the panel is cheaper to buy than to construct.

The panel itself can be made of hard wood; a piece about 8 inches long, 6 inches bread, and ¼-inch thick will do, although any dimensions that will allow the necessary component parts to be fitted upon it without undue crowding, will suit. Two more small pieces of wood 8 inches by 1 inch by 1 inch should be screwed to the bottom of the panel at positions A and B.

This will keep the hidden wiring on the back of the panel free from the operating table and give the board itself stability. Procure four terminals and sink them through the panel about 1½ inches from the front of the board, as shown, so as to clear the wooden support beneath. The terminals should have lock nuts to clamp them tightly to the under part of the panel and also to enable the wire connections beneath to be firmly joined to the respective terminals.

Connecting Up.

The valve socket should be let into the board at an equal distance from each side, as shown, and as near to the front of it as possible. The filament resistance can be made by winding a small gauge hard bare wire, about No. 21, on a circular former, and should have a resistance of about 1.7 ohms. The ends of the former can be clamped to the board. A pivoted brass arm, as shown at C in the illustration, should be fixed over a brass terminal, and screwed down until there is just sufficient "play" to permit of its being moved over the coiled resistance. An insulated knob for varying the resistance should be attached to the brass arm, as shown. Where the arm makes connection with the coil, it should be cut or filed into a thin strip. This will permit of easier variation, and will allow finer adjustments of filament current to be made. The wiring at the back of the board should be carried out with insulated wire, as a precaution against short-circuiting when the board is mounted on the operating set and the wires hidden. Having sunk the five terminals through the board, reverse it, and screw the wire connections firmly in place by means of the lock nuts. One wire is taken from the positive terminal of the filament battery shown on the left of the illustration to the terminal upon which the variable resistance pointer is mounted, a further connection being made between one end of the filament resistance and one of the sockets marked F.

The Complete Circuit.

Another wire from the negative terminal of the filament battery is taken to the remaining valve socket marked F, and firmly connected. The two external terminals will then be ready for connecting up to the filament battery. When this is done, it will be seen from the illustration that a current from the battery will flow through the filament of the valve, when it is inserted into the socket, via the resistance.

A small cut-out switch for breaking the circuit altogether might be included in series between the positive terminal and the variable handle if so desired. Another insulated wire should then be taken from the valve socket marked G to the lock nut of the terminal marked G. The external wire of this terminal goes to the aerial by way of the grid leak and condenser, and aerial tuning inductance. In a similar manner, the valve socket marked P is connected to the back of the terminal marked P, which is shown on the extreme right of the panel. The wire taken from this terminal on the face of the board is taken to the positive terminal of the High Tension or Plate battery. The wiring is quite simple if due care is exercised to see that the right valve sockets are connected to the right terminals.

Temporary connections should first be made from the terminals of the filament battery circuit to the corresponding valve sockets, and the filament battery connected up. If the valve lights up your connections are right and can be permanently secured. Do not have any plate voltage connected up to the panel while making the test. For the benefit of those readers who would rather purchase the variable filament resistance ready-made, a good article can be purchased for about 3s. 6d. When making the connections on the back of the board do not make use of long pieces of wire, and "tuck it under." Coiled wire loads of this description are apt to exert undue strain upon the lock nuts, which may work loose and open the circuit.

No. 4.— TOOLS AND SUNDRIES FOR EXPERIMENTERS.

TO those of you who are not content with turning knobs and listening in, perhaps the following advice will be of use if you are thinking of constructing odd bits of apparatus.

If you are not already a handy-man, you will probably require a few necessary tools, and a start can be made by obtaining a pair of square-jaw cutting pincers. A round-nosed pair will also be of use when wiring up your connections.

Two screwdrivers are desirable, one with a driving edge one-eighth inch wide for small screws, and another with a half-inch driving edge for larger screws.

A hand drill taking ⅛-inch and ¼-inch drills will be very useful when you want to make clean-cut holes in ebony panels, wood, or metal.

Compasses or dividers are handy for marking out the correct positions for switch studs, and a 12-inch steel rule, marked in inches and metric sizes, will enable you to measure and align your work.

A copper-bit, or "soldering iron," a tin of Fluxite and some solder will be invaluable when making wiring connections or fixing up aerials.

An 8-inch hacksaw, a smooth file, and some fine emery cloth often enable you to make and finish off various pieces of metal work to your own design, which otherwise might cost as much as your tools.

A small bench vise is quite cheap, and can be obtained so that it clamps temporarily to the kitchen table. To cut up your ebonite or wood for bases and panels you will require a tenon saw, and at the same time you might obtain a light hammer, with one end of the head ball-shaped, for riveting.

A supply of screws for metal and wood should be kept in boxes according to size. All screws used in wireless work should be of brass, and not of iron or steel. A number of nuts and washers to fit the various sizes of metal screws should also be kept at hand.

In addition, collect various gauges of copper wire which may be either bare, enamel insulated, silk or cotton covered, or insulated stranded wire. Also a few pieces of ebonite, and some springy brass strips for switch arms, etc.

You will often be glad of such a collection as mentioned above—especially after you get home when shops have closed.

The novice will do well to include fuse wire in his battery circuits. Fuse boxes are cheap, and so is fuse wire. A stock of the latter is well worth keeping.

A roll of insulating tape, odd terminals, a good knife, a bradawl, and a pocket galvanometer for testing circuits will also come in handy if you are keen on experimenting with your set.

All About Batteries

IN these days of wireless progress, when the thermionic valve is being used in increasing numbers by amateurs for the reception of wireless speech and telegraphy, the batteries utilised in conjunction with it are often regarded as being of no importance at all.

Little thought is given to the fact that an inefficient battery means inefficient valves, and valves which are inoperative mean a useless wireless set.

At the best, faulty batteries create an enormous amount of trouble, and many hours have been wasted in dismantling perfectly good apparatus in an endeavour to trace a fault which, but for the neglect of the batteries, would never have existed.

When a number of cells are connected together for the purpose of supplying an electric current, they are known as a battery. This naturally invites the query from the novice, "What is a cell?" and this is the point from which we must start.

A "primary cell" is a piece of apparatus which, by means of chemical action between dissimilar metals and certain acids, produces electricity. A primary cell can be constructed from an ordinary jam jar, a sheet or rod of copper, a similar rod or plate of zinc, and a quantity of sulphuric acid.

If we fill the jam jar to within an inch or two of the top with sulphuric acid, and insert our two rods, as in Fig. 1, the acid will attack the zinc, which will commence to dissolve, and in the process produce a substance known as zinc sulphate.

The disintegrating action of the acid upon the copper rod is practically nil; but hydrogen, which is released in the form of bubbles from the acid when it attacks the zinc, is attracted to the copper rod, which gradually becomes covered with globules of the gas.

As the process continues, the potential of the zinc rod in relation to the copper rod gradually increases, the copper collecting more and more bubbles of hydrogen, which is a non-conductor of electricity.

If we now connect a wire between the tops of the two metals, the energy contained by the cell will cause an electric current to flow between the two plates.

If no such connection is made, and the bubbles on the copper are sufficiently numerous, they will, despite the fact that many of them reach the top of the liquid and escape into the air, so completely cover the copper rod that any further chemical action between the zinc and copper is impossible owing to the barrier of the hydrogen.

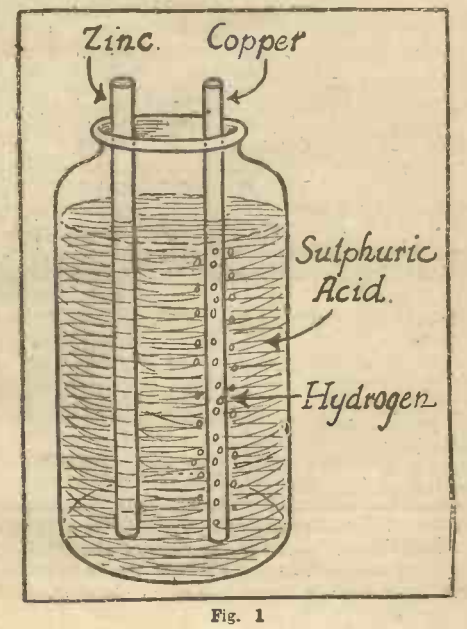


Fig. 1

The cell is now "polarized," and, incidentally, of no further use as a producer of electricity. This cell, in the simple manner given, is therefore of little use for electrical work, because of "polarization."

One method of nullifying the effect of the hydrogen produced on the copper plate is that used in the primary cell of the "Leclanché" type, in which the hydrogen is chemically combined with oxygen to form water directly it is produced.

These cells are extensively used, especially where small voltages are required, such as for ringing an electrical bell, etc. Dry cells are also primary cells, but it is not necessary to enter into a detailed explanation of them here. Suffice it to say that their action is the same as that of the "Leclanché" type, the liquid, *i.e.*, acid, being introduced in the form of a paste.

As the dry cell is much cleaner and smaller than the Leclanché type, it is very popular whenever a "high tension" or plate voltage has to be considered in constructing a valve receiving set.

The "storage cell," or "accumulator," like a primary cell, consists of plates of metal immersed in acid. The chemical action which takes place inside the cell, however, is of a different nature.

In the case of the primary cell, chemical action produced a charge of electricity. With an accumulator it is necessary to have an external source of electric supply to create chemical action. In this instance lead plates are commonly used; one plate is of pure lead, while the other, which is of lead also, contains several holes, which are filled with a mixture of red-lead and sulphuric acid.

If these two plates are connected to the + and — terminals of a source of electrical supply, the current passing from the submerged part of one plate to the other causes chemical action of a certain nature to take place between the two plates. When the flow of electricity is discontinued, and the two plates are connected together at the top, above the acid level, a current will flow in the connecting wire. This is due to the two plates endeavouring to return to their original condition.

When this eventually happens, no further electricity will flow between them, and the secondary cell is said to be "discharged." This cell, however, can be repeatedly recharged from a source of external electrical supply.

It is apparent that if more than one plate of each type is used, the greater will be the resultant chemical action, and commercial accumulators usually consist of several alternate negative and positive plates, separated by thin sheets of glass or wood, which are introduced into the container holding the acid, as shown in Fig. 2.

It will be seen that every positive plate has a negative plate on either side of it, and an easy method in which to determine the positive and negative terminals of a cell which bears no indication in this respect, is to refer to the plates. The terminal attached to the larger number of plates will be the negative one.

The expressions "storage cell" and "accumulator" are somewhat misleading, because, as has been seen from the foregoing, the cell does not actually store or accumulate electricity. Electricity starts chemical action in the cell, and when the influence of the electricity is removed, the cell commences to produce electricity in exactly the same manner as a primary cell, *i.e.*, by chemical action.

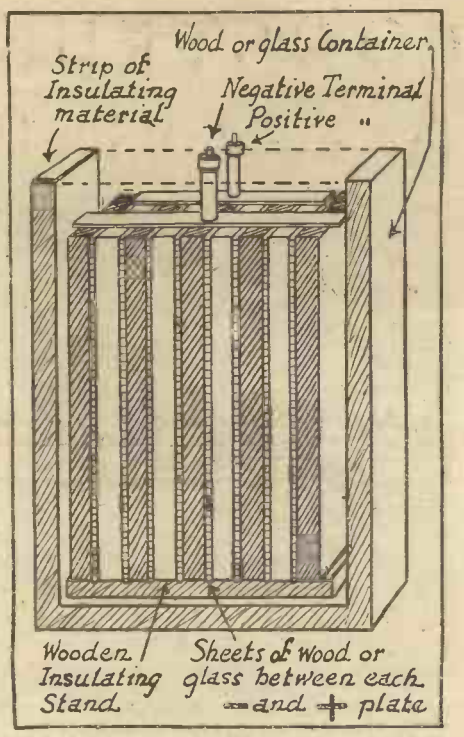


Fig. 2

It is this type of cell which is generally used for supplying the electric current to the filament of valves. The average voltage given by any one cell is 1·5 to 2 volts volts.

(*To be continued.*)

COMPETITION RESULT.

The number of entries for the Broadcasting Programme Competition announced in our first number exceeded all expectations, but after careful adjudication I have awarded a prize to: **MR. C. BULLOUGH, 10, Honywood Road, Colchester.**

The suggested programme approaches the ideal, although the expense of such a programme would be very heavy. I have printed it below.

The second prize has been awarded to Mr. Arthur H. Bird, 35, Bellward Road, Waverley Park, Nunhead, S.E.15; and the third prize to Mr. C. W. L. Hunter 2, The Park, Penketh, Warrington, Lancs.

MR. BULLOUGH'S SUGGESTED PROGRAMME.

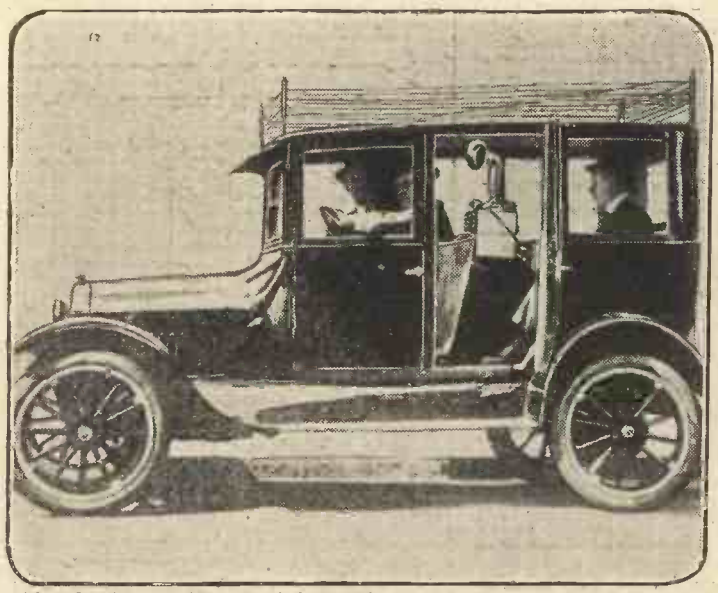
1. OVERTURE "Raymond" *Ambroise Thomas*
LONDON SYMPHONY ORCHESTRA.
2. SONG "Mary of Argyle"
SIR HARRY LAUDER.
3. HUMOROUS ADDRESS—
GEORGE ROBEY.
4. VIOLIN SOLO "Melody in F" *Rubinstein*
KREISLER.
5. PIANO SOLO "Nocturne in C Minor" *Chopin*
MARK HAMBOURG.
6. ADDRESS—"Results and How to Get Them in Wireless."
BY AN OFFICIAL OF THE MARCONI CO.

Ten minutes' interval, after which dates and wave lengths of future transmissions are given.

7. ARIA "My Heart at Thy Sweet Voice" *Verdi*
DAME NELLIE MELBA.
8. ADDRESS—
"The Commercial Possibilities of Wireless"
MR. KELLAWAY, P.M.G.
9. QUARTET "Humoresque" *Dvorak*
LONDON STRING QUARTET.
10. PARODY
"What are the Wild (Wireless) Waves Saying?"
GEORGE ROBEY.
11. SELECTION "Pirates of Penzance" *Sullivan*
HIS MASTER'S VOICE RECORDS.
12. MARCH "War March of the Priests" *Mendelssohn*
LONDON SYMPHONY ORCHESTRA.

"THE KING" and closing down.

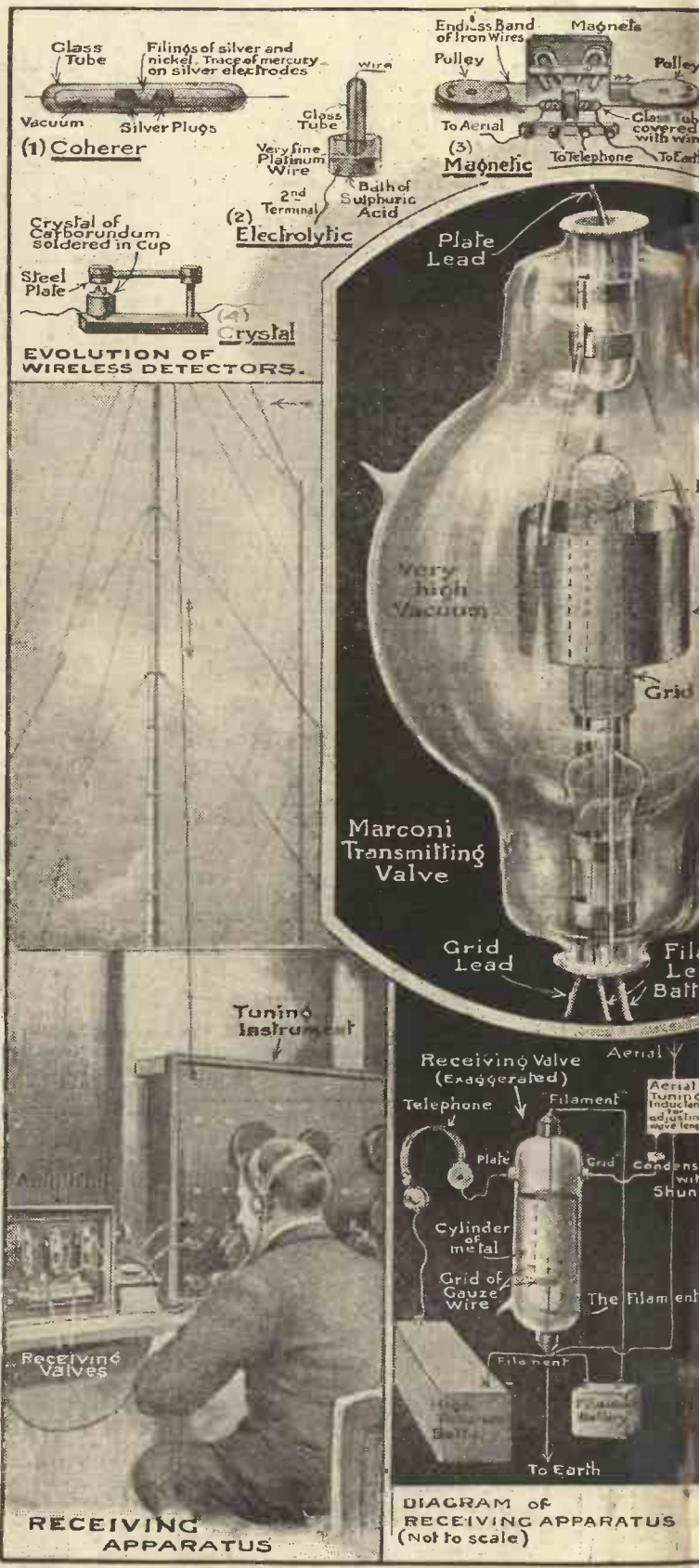
A WIRELESS MOTOR!



The advantages of having a wireless receiver on your motor are obvious. If you take a spin in the country, a loud speaker will inform you of weather conditions and other items of interest. The aerial on the car in the picture is of the "frame" type.

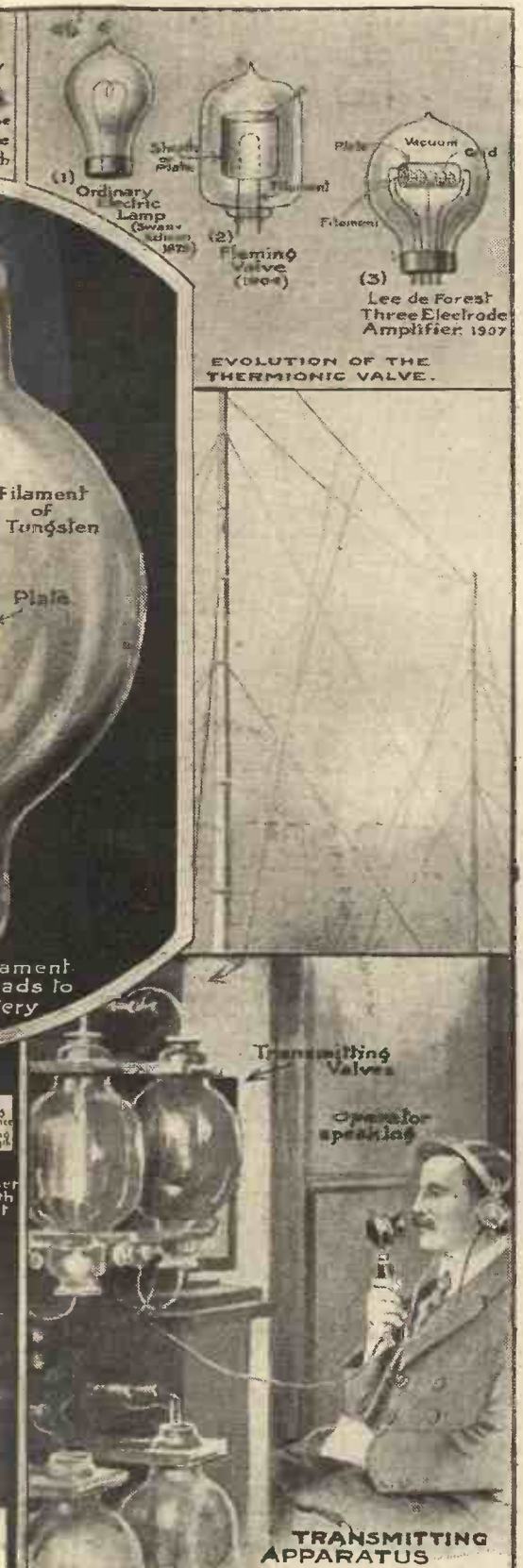
This is another edition of the "Belle of New York." Photographs by the dozen are to be had from America which clearly indicate the enormous popularity of the wireless 'phone with the kiddies.

THE PROGRESS OF WIR



Our illustration shows the wonderful progress made in wireless since the early days of the the left, are to be seen the detectors, which the wonderful electron valve has practically sup only type still in any general use. The day of the coherer and the magnetic detector is in transmitting valve used for continuous wave and telephony. This type of valve is again speaking into a wireless microphone t

ELESS SCIENCE.



eld-fashioned and crude coherer. At the top of the picture, on perseded all over the world. The crystal detector is probably the deed passed. The centre picture shows a modern type of Marconi shown in the bottom right-hand picture, showing the operator ransmitter.

TWO FAIR AMATEURS.

These two girls use an inductively coupled crystal receiver for "picking up" the Marconi concert sent out from Writtle every Tuesday. Judging by the expressions on their faces, they have just "tuned in." Readers will note that two pairs of 'phones are connected to the set, which is within a 20-mile radius of Writtle.

This photograph will give readers a good idea of a home-made wireless station. The amateur constructed practically all the transmitting and receiving gear himself. Part of his workshop and home-made lathe can be seen on the right.

EDISON'S WIRELESS

THOMAS A. EDISON, the great inventor, has armed himself with a wireless receiving set. But the invention is not new to Mr. Edison.

He has always been experimenting with anything that held possibilities of this sort. As far back as the 'eighties he was engaged in tests for the transmission, without the aid of wires, of the ordinary Morse dot and dash signals.

He had an idea in mind for an apparatus to enable people in a moving train to talk to friends on a land station.

However, he was advised at that time to drop the subject as it then promised no particular advantage. Fewer people travelled by railroads then, and it was thought that they would not be inclined to spend extra money on sending messages by wireless when they could send one, at a cheaper rate, from the first stop that the train made. The difference of time saved would not be worth the money.

Edison's wireless was achieved by induction between metal strips placed on the roofs of the train, and a wire stretched between poles in a line running parallel to the railroad

INSULATING MATERIALS

BAKELITE and formica are coming into common usage on wireless sets, taking the place of wood for insulating purposes.

These substances may be sawed, filed, drilled and milled, but care must be exercised in handling the substances, or splitting will result.

When using either bakelite or formica for panel boards, mark on a piece of bristol board, or good cardboard, dots for every hole to be drilled. The dots should then be labelled as to the size of the drill. "Layout" having been made, it is placed over the panel. Punch through the dots with a sharply pointed nail.

Do the drilling slowly from the front, so that if there are any surface chips they will be on the rear of the panel. When drills over an eighth of an inch in diameter are used it is advisable to start a small hole first.

If you want to dress the surface of bakelite or formica to prevent finger marks from showing and to give your work a finished appearance, sandpaper the surface, using first a medium paper and then a fine grade.

ABBREVIATIONS USED IN WIRELESS SIGNALLING

"Listeners in" will often hear these abbreviations used in Morse code signalling. They are used by ship and land stations in order to ask and answer certain questions which occur in general practice.

EDITOR

Abbreviation	Question	Answer or Notice
PRB	Do you wish to communicate by means of the International Signal Code ?	I wish to communicate by means of the International Signal Code.
QRA	What ship or coast station is that ?	This is.....
QRB	What is your distance ? ..	My distance is.....
QRC	What is your true bearing ?	My true bearing is..... degrees.
QRD	Where are you bound for ?	I am bound for .....
QRF	Where are you bound from ?	I am bound from
QRG	What line do you belong to ?	I belong to the.....Line.
QRH	What is your wave-length in meters ?	My wave-length is ..... meters.
QRJ	How many words have you to send ?	I have.....words to send.
QRK	How do you receive me ?..	I am receiving well.
QRL	Are you receiving badly ? Shall I send 20 ? . . . — for adjustment ?	I am receiving badly. Please send 20. . . . — for adjustment
QRM	Are you being interfered with ?	I am being interfered with.
QRN	Are the atmospherics strong ?	Atmospherics are very strong.
QRO	Shall I increase power ?....	Increase power.
QRP	Shall I decrease power ?....	Decrease power.
QRQ	Shall I send faster ?	Send faster.
QRS	Shall I send slower ?	Send slower.
QRT	Shall I stop sending ?	Stop sending.
QRU	Have you anything for me ?	I have nothing for you.
QRV	Are you ready ?	I am ready. All right now.
QRW	Are you busy ?	I am busy (or : I am busy with.....). Please do not interfere.
QRX	Shall I stand by ?	Stand by. I will call you when required.
QRY	When will be my turn ? ..	Your turn will be No.....
QRZ	Are my signals weak ?	Your signals are weak.
QSA	Are my signals strong ? ..	Your signals are strong.
QSB	Is my tone bad ? ..... Is my spark bad ?.....	The tone is bad. The spark is bad.
QSC	Is my spacing bad ?	Your spacing is bad.
QSD	What is your time ?	My time is.....
QSF	Is transmission to be in alternate order or in series ?	Transmission will be in alternate order.
QSG	.....	Transmission will be in series of 5 messages.
QSH	.....	Transmission will be in series of 10 messages.
QSJ	What rate shall I collect for ?	Collect.....
QSK	Is the last radiogram cancelled ?	The last radiogram is cancelled.
QSL	Did you get my receipt ? ..	Please acknowledge.
QSM	What is your true course ?	My true course is ..... degrees.
QSN	Are you in communication with land ?	I am not in communication with land.
QSO	Are you in communication with any ship or station (or : with.....) ?	I am in communication with .....(through .....).
QSP	Shall I inform.....that you are calling him ?	Inform.....that I am calling him.
QSQ	Is.....calling me ?.....	You are being called by .....
QSR	Will you forward the radiogram ?	I will forward the radiogram
QST	Have you received the general call ?	General call to all stations.
QSU	Please call me when you have finished (or : at .....o'clock) ?	Will call when I have finished.
*QSV	Is public correspondence being handled ?	Public correspondence is being handled. Please do not interfere.
QSW	Shall I increase my spark frequency ?	Increase your spark frequency.
QSX	Shall I decrease my spark frequency ?	Decrease your spark frequency.
QSY	Shall I send on a wave-length of..... meters ? ..	Let us change to the wave-length of..... meters.
QSZ	.....	Send each word twice. I have difficulty in receiving you.
QTA	.....	Repeat the last radiogram.

* Public correspondence is any radio work, official or private, handled on commercial wave-lengths.

When an abbreviation is followed by a mark of interrogation, it refers to the question indicated for that abbreviation.

A "BIG" WIRELESS MAN.

DR. CHARLES P. STEINMETZ is the chief consulting engineer of the General Electric Company, America, and is one of the "big men" in the wireless world. His recent experiments with artificial lightning are described in this issue of POPULAR WIRELESS.

Dr. Steinmetz thinks it is difficult to look into the future of wireless because it is "such a big thing."

One thing, however, he does feel certain of, and that is that universal world communication is a reality, thanks to wireless.

Dr. Steinmetz broadcasted a lecture on artificial lightning in America recently which was heard by thousands of amateurs with a good deal of incredulous amazement. Nevertheless, future experiments in the doctor's laboratory will be well worth watching.

A BABY CAN "WIRELESS."

IF you have bought this magazine because you are interested in wireless telegraphy, but have not yet bought a set because you are afraid that your lack of knowledge will prevent you from working one, read on !

You need not even possess a mechanical turn of mind to enable you to operate your own set, adjust it yourself, and be able to "listen in" within a few hours of having bought it.

With almost every set sold nowadays there are given complete and simple directions how to fix and manipulate your instruments, and you will find these instructions no more difficult to understand than your first lesson on how to work a gramophone.

Also, do not be alarmed by any foolish report you may hear that your outside aerial will catch lightning flashes and the wire from that to your receiving set will carry the flash into the room and cause disaster there.

If you do not possess an earth switch—that is, a switch whereby you can "short" the aerial by connecting it to earth—do so. An alternative way is to connect the aerial lead-in wire to the earth terminal of your receiver when you have finished listening in.

The fear of electric shock when your set is "charged" with a message is another baseless rumour, born of lack of information.

Step by Step in Wireless

An Elementary Series of Articles in Non-Technical Language for the Beginner.

No. 4.—FURTHER REMARKS ON TUNING

LAST week I showed that wireless waves are controlled by capacity and inductance, and that by altering them we could effect "tuning." Now the tuning of a wireless set is very important, and in this article I propose to run over last week's article in more detail, so as to make quite sure that readers of POPULAR WIRELESS grasp the full significance of the effect caused by the alteration of wave length.

We know that, generally speaking, wireless waves radiate in all directions. Certain types of apparatus can, however, send out waves in one direction only, but this effect is only obtained by specially constructed stations, and need not be dealt with in this article.

We have seen that, like a water wave, a wireless wave has a crest. In both cases the distance between the crest of one wave and the next is called the wave-length, and, therefore, when you read that the Eiffel Tower station transmits telephony on a wave-length of 2,600 metres, you know that the distance between the crest of one wave and the next is 2,600 metres.

We also know that when the transmitting key is pressed and a train of waves is sent out, if one hundred waves are transmitted during the first second after the key has been pressed, the distance covered by the first wave will be equal to one hundred times the length of one wave. This distance is called the velocity of the wave, and the number of waves sent out per second is called the frequency of the wave.

Therefore it is easy to see that the velocity equals the frequency multiplied by the wave-length.

Also, as we know that the velocity, or speed, of wireless waves is the same as the velocity of light waves—186,000 miles a second—it is easy to find the unknown value if the wave-length or frequency of a wave be known.

For practical purposes, wave-length must be taken into account when we transmit a wireless message.

To-day, the wave-lengths employed vary from 180 metres to 25–30,000 metres in length—a metre roughly equalling 3·28 feet.

The 180-metre wave is used chiefly by amateurs who have transmitting sets; the 600-metre wave by ships; and the 25,000-metre wave by the very high-powered stations like Lyons and the Lafayette station at Bordeaux, in France.

As a 30,000-metre wave means that the distance between the crest of one wave and the next equals something like eighteen miles, the limited use of such long wave-lengths will be understood. For long-distance work they are excellent; for short-distance work quite unnecessary.

Now, a wireless wave may be said to correspond to pitch in sound and colour in light. As we already know, sound is produced by something that moves backwards and forwards—that oscillates or vibrates.

Therefore, it will be clearly seen that if wireless waves come regularly, the resultant sound in your telephones will be also steady, and, in fact, of a clear and musical *pitch*.

Pitch is the same as frequency, and depends, as we know, on the number of waves per second.

For example, take a violin string. Tighten it, and the pitch is higher; loosen it, and the pitch is lower, because in the latter operation the string vibrates at a slower speed. The sound is therefore the result of the frequency with which the string moves.

This is called tuning by musical people, and when the piano next door does not correspond to *your* sense of tune, you say, "Oh! why don't those people get their piano tuned?"

In other words, the piano next door is a transmitting station, and you are a receiving station. The sound waves you receive are out of tune—or vice versa, the sound waves received by you are *in tune* and you are *out of tune*, in which case your sense of harmony is poor.

Tuning in wireless means the correct adjustment of the wireless pitch of the receiver to the wireless pitch of the transmitter, but in wireless work *pitch is entirely a question of wave-length.*

It has been already stated that apparatus used for the generation of wireless waves includes capacity and inductance. The meaning of capacity and inductance has also been explained in last week's article, but it should be remembered that wave-length can be controlled by either capacity or inductance alone, or by both together.

For fine tuning both capacity and inductance are used, the capacity being altered by means of a variable condenser.

The capacity and inductance in a wireless circuit can be compared to the shortening or lengthening of the violin string. Variation of either the string in the case of the violin, or of capacity or inductance in the case of the wireless receiving circuit, will alter the frequency, and therefore the resultant wave-length.

ARTIFICIAL LIGHTNING

DR. CHARLES P. STEINMETZ, consulting engineer of the General Electric Company, U.S.A., with the help of two assistants, and after two years' experimenting, recently produced an indoor thunderstorm.

It was a storm complete in every detail—except for the actual thunder.

But these experimenters are not content with one storm. They have a laboratory in New York, where they have constructed a lightning generator, which enables them to test the efficacy of lightning conductors more thoroughly than they have ever been tested before.

120,000 Volts.

Dr. Steinmetz was given an excellent specimen of the effects of lightning when his summer camp was struck in 1920, and the photographs and other data he collected were very valuable to him in his experiments.

The result is that he has now produced the electric generator, which really is a solidified thunder-cloud, for exactly what the thunder-cloud in the sky does to produce lightning the generator does in the laboratory.

It gradually stores up electrical energy until it becomes overcharged. Then the inevitable happens. The energy, which can no longer be contained, escapes, and the result is a flash of lightning.

Dr. Steinmetz chose a tension of 120,000 volts for his artificial flash—though he estimates the genuine flash at fifty million volts—and while the artificial represents, while it lasts, more than a million horse-power, the estimated horse-power of the genuine flash is 500 million horse-power.

It sounds tremendous, but since the flash only lasts about a hundred-thousandth of a second, neither would be very useful for practical purposes.

An Electrical Goliath.

The experts maintain that, while it would neither be practical or safe, it is *theoretically* possible to construct a machine which would produce lightning of a natural size; for the same applied principle would hold good, as it does in the present generator.

It would be interesting to examine this generator for a moment.

It consists of a large capacity high voltage condenser, with 200 large glass plates, for dielectrics arranged in two rows of groups of fifty.

In these condensers is stored the rectified direct current. They are so connected up that they can hold 120,000 volts.

In a thunder-cloud, an electric charge is stored and increased by degrees by the intermingling of the rain drops, and one end of the condenser corresponds to this thunder-cloud, while the other end corresponds to the earth.

On a similar principle to the safety valve, when the electric energy becomes more than the condenser can hold, the discharge takes place. The thunder is represented by a loud snapping sound.

The storing of electrical energy in a condenser, and its sudden release across an air gap, is also used in the system of wireless telegraphy, commonly called "spark." A miniature flash of lightning in the form of a blue streak can be seen travelling across the air gap, when the condenser in a wireless transmitting circuit is discharged.

It is well to remember that mere high voltage is not lightning—unless it is backed by very large power, with the result that it gives explosive effects.

Lightning and Wireless.

In Dr. Steinmetz's generator, however, there is a discharge of ten thousand ampères, at over a hundred thousand volts, which means a power of more than a million horse-power, lasting for a hundred-thousandth of a second.

The difference between mere high voltage and high voltage backed by power, is the difference between a pint of petrol and a pound of dynamite.

The petrol, since it contains more energy, can do more work than the dynamite, but it fires its energy off slowly, while the dynamite gives it all off at once in an explosion—causing destruction to everything round it.

The importance of this generator lies in the latitude for experimenting it affords.

The application of the lightning generators to wireless opens up interesting possibilities, and experiments in this direction are well under way.

WIRELESS CLUB REPORTS

The Editor will be pleased to publish concise reports of the meetings of wireless clubs and associations, the Editor reserving the right to curtail the reports if necessary. An asterisk denotes affiliation with the Wireless Society of London.

Brighton Radio Society.*

At a meeting of this Society, held at the residence of Mr. Magnus Volk, vice-president, a most interesting and instructive paper was read by Mr. Norman R. Phelp entitled "Inductance and Methods of 'Tuning,'" during the course of which the lecturer lucidly explained the various methods adopted to receive short wave telephony, etc.

Many useful diagrams were given on the Society's blackboard for the benefit of members.

Any gentlemen interested in wireless work are invited to communicate with the Hon. Secretary, Mr. D. F. Underwood, 68, Southdown Avenue, Brighton, who will be pleased to furnish full details as to membership, etc.

Wireless Society of Highgate.*

PROGRAMME OF SERIES OF ELEMENTARY LECTURES TO BE GIVEN AT THE HIGHGATE LITERARY AND SCIENTIFIC INSTITUTION.

June 23rd.—Construction of Wireless Apparatus, Part I. Mr. F. L. Hogg.

June 30th.—Theory of Wireless Telegraphy and Telephony, Part III. Mr. J. Stanley.

July 7th.—Practical Hints on Soldering, etc. Mr. W. A. Saville.

July 14th.—Theory of Wireless Telegraphy and Telephony, Part IV. Mr. J. Stanley.

July 21st.—Construction of Wireless Apparatus, Part II. Mr. F. L. Hogg.

July 28th.—Theory of Wireless Telegraphy and Telephony, Part V. Mr. J. Stanley.

August 4th.—Construction of Wireless Apparatus, Part III. Mr. F. L. Hogg.

August 11th.—Electrical Units and the Relations Between Them. Mr. D. H. Eade.

Stockton-on-Tees and District Amateur Wireless Society.

A meeting was held in the Jubilee Hall, Stockton-on-Tees, on Thursday, June 1st, which was attended by a very large number of interested persons.

It was unanimously agreed that a Society should be at once formed under the above name. The meeting was under the presidency of S. G. Marston, Esq., Borough Electrical Engineer, who was supported by a large number of interested gentlemen.

It was decided that the Society should be open to any person of any age who, as an amateur, wished to take up the study of Wireless.

Forty-two members were enrolled and a further large number sent in their names, but were prevented from attending, which will make the membership one of the largest in the district.

Mr. J. Mulcaster of Eaglescliffe was appointed President and Mr. S. G. Marston was appointed Vice-President.

Mr. W. Wood was appointed Secretary (pro tem).

Communications should be addressed to Mr. E. Barnes, Bishop Street, or to Mr. G. Dean, Dovecot Street, both of Stockton-on-Tees.

Bradford Wireless Society.*

A meeting was held in the Club-room at 7.45 p.m. on Friday, June 2nd, with Mr. W. C. Ramshaw in the chair. At this meeting we were to have had the pleasure of hearing Mr. H. F. Yardley, of Leeds, lecture on Short Wave Reception, but unfortunately he had to go away on business. However, we hope to have the opportunity of hearing this lecture later on. In the absence of the lecturer, a discussion on members' experiences in connection with wavelengths below 600 metres was opened and taken part in by Messrs. J. Bever, A. Liardet, A. Bever, W. C. Ramshaw, and N. Whiteley, each of whom related what experience he had had to date.

The proceedings closed at 9.30 p.m.

Hon. Sec.: Mr. J. Bever, 85, Emm Lane, Heaton, Bradford.

Organising Sec.: Mr. N. Whiteley, 8, Warrels Terrace, Bramley, Leeds.

Leeds and District Amateur Wireless Society.*

A general meeting was held at the Leeds University on Friday, June 9th, Mr. A. M. Bage, vice-president, taking the chair at 8 p.m.

The chairman called upon Capt. F. A. Whitaker, R.E. (vice-president), to deliver a lecture describing a six-valve cabinet set for reception on all wave-lengths.

Capt. Whitaker exhibited a complete receiver, entirely assembled in cabinet form at home. The set may be used for practically all wavelengths, the short-wave and the long-wave sets being complete separate units. A separate heterodyne is included in the cabinet, for use if necessary on all wave-lengths. The switching and mounting arrangements of the various inductances and capacities are unique; practically any circuit can be set up in a very few moments by the combination of switches, plugs, etc. If all valves are in use, the first three, of the E.S. 2 type, amplify at radio frequency, these valves being coupled with either transformers, resistance-capacity, or reactance-capacity couplings, according usually to the wave-length. Rectification is attained by means of the cumulative grid condenser and leak method with an R valve. Radio frequency currents from the separate heterodyne, are introduced into the grid circuit of the rectifier with magnetic coupling when receiving continuous wave signals. The rectified signals undergo two further magnifications at audio-frequency, before application to the telephone transformer, and so to the telephone or loud speaker. Elaborate precautions to guard against stray static fields have been taken, copper sheet being used extensively throughout the cabinet for shielding purposes. Separate filament and anode batteries are used for the H. F. side, the rectifier, the L. F. side, and the heterodyne. Capt. Whitaker explained the function, construction, etc., of practically every component in the set from aerial to earth.

At the close of Capt. Whitaker's remarks the chairman opened a discussion, which proved very interesting and instructive. The performance of the set on the shorter waves was criticised particularly. After the discussion a vote of thanks was proposed to Capt. Whitaker, and was duly seconded and carried in the usual manner.

The set is undoubtedly one of the finest receivers existing in this country.

HINTS TO AMATEURS

Switch on your filament current slowly, *not* suddenly, as the latter is bad for the filament, and may also stop detection for a few seconds.

* * *

If your valves are not *sunk* in the receiving set, carefully remove them when not in use. Keep them in a box lined with cotton-wool, out of reach of the youngsters.

* * *

After continued use, a crystal detector may appear to lose its sensitivity. This may be caused by a coating of dust, or by too much fingering. Take out the crystal and dust it lightly.

Keep a log-book in which to record interesting things heard by radio—date, time, stations, wave-length, particulars of what is heard, etc.

* * *

Don't overlight your valve. Less light may give stronger signals, and the valve will last longer.

* * *

Don't "spin" the variable condenser, otherwise you may pass over an important sharply-tuned station without hearing it.

* * *

See that the ebonite caps on your telephones are screwed tightly home. If they are not, you may be losing signal strength.

The Warning in the Air

IN the County Hall at Spring Gardens, Chief Constables from all the police forces in the country were assembled. Suddenly, so suddenly that the man next to me seemed to jump out of his skin, a voice filled the room.

The clearness of the words spoken was extraordinary; it seemed as if a man with a deep voice was speaking from a platform at one end of the room.

Every syllable could be heard distinctly:

"Wanted at Chesterfield on a charge of obtaining food and money, value 5s. 2d., by false pretences with intent to defraud, William Stiggles, on May 17, 1922, Frank Beecraft, alias Bennett, alias Marchant; no fixed abode, age 32, ship's cook; height 5 ft. 4½ in., brown hair, inclined to be curly; hazel eyes, mole under right eye. Warrant issued. Information to Chief Constable Chesterfield, at Spring Gardens."

All eyes were immediately turned in the direction of the speaker, and everybody imagined that a new arrival had entered the room, but the sound unmistakably came from a trumpet-shaped horn which was the loud-speaker amplifying a wireless message received from Marconi House.

The time was ten-twenty in the morning, and for half an hour the loud-speaker was quiet; then came the voice again, as clear and distinct as before:

"Your information about Frank Beecraft was received at 10.20 on my portable set at Broomfield. Fugitive being tracked. Will report later."

This second message was received from Broomfield, a village near Chelmsford in Essex. The first warning had been received there by a detective in a motor-car, who had at once hurried to the nearest post-office and sent his acknowledgment of the report by ordinary wire to Marconi House, from whence it had been broadcasted once again, to be received and given out by the loud-speaker in the room at Spring Gardens.

The Chief Constables assembled at Spring Gardens, a "detective" in a motor-car at Chelmsford, and countless wireless amateurs all over the country who had "sets," therefore had all received instantaneous warning of the addition of another man to add to the list of those wanted by the police.

At places as far distant as Birkdale, near Southport (213 miles from London); Otley, Yorkshire (197 miles); Withington, Lancashire (184 miles); Crediton, Devon (160 miles); and Llandaff, Glamorgan (158 miles), the message was picked up and understood.

The description of the "wanted" man was also known to "listeners-in" at St. Neots, Eastbourne, Bury St. Edmunds, Oxford, Abingdon, Dover, Kenilworth, Fulwood (Sheffield), Halton Camp Barracks, Gloucester, Clifton (Bristol), Birmingham, Grimsby, Rugby, Derby, Reading, Stafford, and all the suburbs of London.

Instantaneously upon the report at a headquarters that a certain man was "wanted" his description had been broadcasted over a wide area of England, and had been received at all the above points. Big towns and small towns on railway lines, villages on roads, all had suddenly been wakened into life to be on the look-out for a man fleeing from justice.

The fugitive, instead of leaving his danger further and further behind, knew not whether at any moment he might not fly right into a keenly vigilant outpost of the law, warned with his description and authority to detain him on suspicion.

As he sat in the express speeding north, he could not be sure but that at the next stop—Birmingham, Sheffield, or Stafford—a keen-eyed police official, warned by wireless, might not come down the platform closely inspecting every compartment of the train.

Or as he sped by car along a road he felt no longer safe in avoiding the big towns. Any little village might hold just as much danger for him if it possessed a listener-in. Everywhere and all round him the danger of arrest lurked, not only in one direction, but in each and every direction he might try, within a circle of two hundred miles.

Fortunately for the "fugitive" in the case here described, he "did not exist." The description was only of an imaginary man sent out as the great "Daily Mail" test of the use of wireless in capturing criminals. Many a criminal in the future will wish that he was like this imaginary man and had never been born.

Great as was the number of people who had received the warning, it was not as large as it could have been. Eventually, every police-station all over the country will be fitted with a receiving set. Apart from the chief testing people at Marconi House, at Spring Gardens, and the "detective" in the motor-car at Chelmsford, it was left to chance on this occasion to prove the wide area over which the messages would be received.

And the hour chosen for the broadcasting of the messages was not a good one for proofs relying on pure chance. The police were not endeavouring to prove the widespread power of this new development of science to police work, but only its feasibility as a working scheme at all. That was proved beyond all doubts.

Many amateurs at that hour of the day were not able to attend to their wireless sets, but were at business. In one case a keen owner of a receiving set tuned his instrument for the requisite wave-length, and his wife picked up the message after he had been forced to leave the house for his day's work.

Another wife was herself proficient in the use of the instrument, adjusted the receiver herself, and listened in and caught the message.

In a few cases, reports have reached "The Daily Mail" that "atmospherics" were bad, and others have stated that the Marconi House message was "jammed" by other messages coming from ships, and were therefore received imperfectly; but the number

An impression of the wonderful test so successfully carried out by the "Daily Mail."

THE WARNING IN THE AIR

(*Continued from page 61.*)

of clear and distinct reports received augurs well for the time when such messages, sent out about real and not imaginary criminals to ready and waiting police-stations, instead of chance "listeners-in," will help to throw a net about an escaping crook.

From the written copies of the description of the "wanted" man, taken down at the time of receiving, the chief lesson learnt concerns the proper names used.

Ninety per cent. of the messages were received quite correctly, but in some of the remaining cases the recipients had experienced difficulties with the name and aliases of the "wanted" man.

Names are most easily apt to be misheard on the ordinary telephone, and it will probably be necessary—or, at least, advisable—for all names of towns and people to be spelt out.

A second trial was made whilst the Chief Constables were assembled at Spring Gardens. The loud-speaker in the County Hall gave warning that the following message was being sent out from Marconi House to the "detective" in the Essex village:

"The apprehension of John Muggins, who is known to you, is urgently required in connection with the great pearl mystery. Muggins was known to be in Danbury on Thursday night. Proceed there and convey Muggins to Chelmsford for interrogation."

The "detective" in Essex received the message, and at once changed from the direction he had intended taking and proceeded to the village of Danbury. Beecraft could wait, he had been warned from his headquarters, but Muggins's arrest was imperative, and so the detective hurried at a moment's notice to the arrest of the greater criminal.

Proofs were convincing that, had the criminals and the detective been real, wireless telephony would have scored a great triumph as an unprecedented aid to police work.

Before the party broke up a wireless message was received from the Home Secretary, the voice filling the room as before:

"I am glad that the Chief Constables are having this opportunity of being present at a demonstration of the use of wireless. We are watching this means of communication very closely, and shall hope to make every use of it.—SHORTT."

The above "The Daily Mail" has accomplished; now let us look into the future and view an England whose every police-station is fitted with a wireless receiving set.

At Scotland Yard news comes in of a crime freshly committed. The officer receiving the report immediately makes the "general call" to every police-station in the country.

The Marconi Company have already foreseen the necessity of a "calling-up" device, and have introduced a wireless bell operated by a transmitter at any distance. Therefore, by turning a handle at Scotland Yard, a bell will ring at every police-station.

In answer to all these thousands of bells a station sergeant will don the wireless receivers and commence to tune his instrument to the requisite wave-length.

He will know that it is his headquarters calling, for the Marconi wireless bell has been made so as to be insensitive to all signals except those actually intended to operate it.

Within five minutes of the general call, Scotland Yard could have constables sent out from any station in Great Britain with a full description of the wanted man.

This bell system has been working for the past twelve months between the offices of the Mersey Docks and Harbour Board in Liverpool and the Bar Lightship, which is stationed beyond the mouth of the Mersey.

Between the most important stations "duplex" wireless telephones will be fixed, and between them uninterrupted conversations will be possible exactly as in line telephony.

The police on country patrols will probably be equipped after the fashion which proved successful after experiments recently made by the London Fire Brigade.

A car was driven to Putney Heath, the aerial was tied to a convenient tree, and excellent wireless communication was established with an aerial above a fire station at Southwark.

On the way home another test was made which also proved successful. The car was turned into a side street, and stopped, and the aerial tied to a lamp-post, and again communication was established with the fire station at Southwark.

For police work wireless telephone sets for both sending and receiving can be fitted in motor-cars or motor-bicycles with side-cars or special side carriers. The aerials for receiving only could be of such a light and portable nature as to be easily carried on the handle-bars of a man with a pedal machine; for sending it would be necessary to have the aerial wire on a reel from which it can be easily unwound and thrown over a tree or a lamp-post. A type somewhat similar to the aeroplane sets now in use would probably bring satisfactory results.

The range of this little set would of necessity be strictly limited. In the case of the smallest, probably the greatest distance at which a message could be received would be one mile, and the officer receiving the message would have no means of telling his headquarters that he had received their instructions.

Sets weighing about 10 lbs., and using a fishing-rod as an aerial, however, would enable speech to be heard at a distance of about thirty miles.

Sets that would fit into a leather case about the size and shape of the cases used for field glasses would with a large aerial have a range of approximately ten miles.

A system of aerials might also be placed around certain beats, and the patrolling officer be instructed to report "all clear" to headquarters every hour or two hours.

This would be useful in the case of the country beats, and with the assistance of farmers would not be an expensive outlay. On reaching a farm at the most distant part of his beat the constable would ring up his headquarters and make his report, and ask if there were any special instructions.

He would have a time-table telling him at what times to ring up from different points, and connection could be quickly established. In towns, too, if thought advisable, the police officer on point duty could communicate in the same way. The aerials and earth terminals could be placed in a small box attached to the aerial pole, the box being kept locked and each officer having a key.

All it would be required to do would be to open the box, connect the aerials and earth terminals to his receiver, and "await instructions." Five minutes later, with headquarters' words still ringing in his ears, he could proceed on his way to the next wireless box, or back to his position on point duty.

WHEN FATHER FIXED THE EARTH LEAD!

POPULAR WIRELESS Readers are not advised to meddle with the gas mains using a lighted candle.

RADIOTORIAL

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

Readers of POPULAR WIRELESS are evidently pleased with my decision to answer all questions by post. Letters continue to pour in with every mail, and judging by the questions which the POPULAR WIRELESS Technical Staff have to deal with, thousands of readers have decided to instal wireless receivers after reading an issue of this paper. That is the right spirit. The more the merrier; especially so if amateurs will bear in mind the fact that unity is strength, and that by joining a wireless club they can do themselves and the amateurs' cause a tremendous amount of good.

In this issue of POPULAR WIRELESS I have published a list of the chief wireless clubs and associations in the country. Application to the various secretaries will result in all the particulars an amateur may want.

Readers are evidently keen on winning the receiving sets offered as prizes in POPULAR WIRELESS, so I am continuing the competition. This week I am offering three £5 Wireless Receivers (with an alternative choice of a £5 Note) for the three best suggestions for making a broadcasting station pay its way without charging fees for the concerts sent out.

Suggestions should be sent on postcards and must be addressed to:

POPULAR WIRELESS,
Gough House,
Gough Square,
London. E.C.4.

Postcards should be sent not later than July 7th.

QUESTIONS ANSWERED

Owing to the enormous number of queries received daily from readers of POPULAR WIRELESS, I have decided to reply individually by post. A weekly selection of questions will, however, be printed on this page, together with the answers, for the benefit of readers of POPULAR WIRELESS in general. Questions should be clearly and explicitly written and should be numbered and written on one side of the paper only.

All questions to be addressed to: The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

Readers are requested to send necessary postage for reply.

"DON ACK" (Staffs) says he is making a crystal set. Would this be more sensitive and work better with two detectors?

You will find that one detector, either valve or crystal, will give better results than two.

* * *

"DON ACK" also states that he has a small mica and foil fixed condenser of .0002 mfd. capacity, and asks what capacity of variable condenser would be best to work with this. He has a two-slider tune, 9" x 3½".

Connect your fixed condenser in parallel across the telephone leads. A variable condenser, not exceeding .001 mfd. capacity, could be used with advantage if joined in parallel across the aerial tuning inductance.

* * *

H. W. L. (Suffolk) asks if an aerial from his house to a friend's house can be used by both of them. Also, would insulated wire, as used for electric lighting purposes, do for a "lead in?"

You cannot use the aerial in the way you suggest with good results.

The wire you mention would do fairly well.

* * *

G. E. R. (Watford) asks where the nearest broadcasting station to Watford will be erected; (2) whether it will be possible to enjoy concerts using a crystal receiver; (3) if POPULAR WIRELESS could start a showroom; (4) what are the advantages of a valve over a crystal?

Your nearest broadcaster will probably be Marconi House. You should get good results using a crystal. Thanks for the showroom suggestion. We will think about it. Valves are more sensitive than crystals and give greater range.

* * *

K. D. MURRAY (Holywood).

The aerial diagram is O.K. Two people cannot use the same aerial in the way you mention.

* * *

"BEGINNER" (Stretford) asks: (1) Would a single line aerial of about 65 feet be satisfactory? (2) Would the aerial give good results at a height of about 30 ft. at one end and 25 ft. the other? (3) If special poles are necessary, what would be the lowest price? (4) Can POPULAR WIRELESS give list of Manchester firms supplying wireless gear?

(1) Use two 50 ft. wires in preference to a 65 ft. single wire aerial. (2) The height should be O.K.: better results if height increased. (3) Consult advertisers in POPULAR WIRELESS. (4) As in (3). Poles should not be needed in the case you mention.

* * *

J. T. M. A. (Newcastle-on-Tyne) asks: (1) Would three Leclanché cells be needed for a steel and carborundum detector, and would a potentiometer be necessary? (2) Would a single wire aerial 70 ft. long and 35 ft. high do for crystal detector? (3) Would enclosed specimen of wire do for aerial?

(1) Two dry cells would be best for use with carborundum detector, although Leclanché would do. Potentiometer is necessary. (2) You should get fair results with this aerial. For crystal work it is always best to get the aerial as high as possible and the full length as allowed by the P.M.G. (2) We could find no specimen of wire in your letter. You probably forgot to enclose it.

* * *

H. J. S. (Cambridge) asks: (1) Which is the nearest broadcasting station to Cambridge? (2) How far can signals be received using the crystal set described in POPULAR WIRELESS No. 1?

(1) London will be the nearest broadcasting centre when the station is in operation. Birmingham will be the next nearest. (2) Depends on power of transmitting station. Roughly speaking, 5 to 10 miles.

* * *

E. E. K. (Acton) asks: (1) For details of the King Radio Set as advertised in POPULAR WIRELESS No. 1; (2) if an aerial 75 ft. long and 35 ft. high would function; (3) if electric trains passing the bottom of his garden would effect receiver.

(1) Write to H. Stanley Prince & Co., the advertisers of the King Radio Sets, for full particulars. (2) The aerial should function very well. (3) The trains will give you trouble if valve reception is employed. Everytime the spark occurs at the overhead trolley wire you will hear a loud click in the phones. There is no way of eliminating this trouble, as the spark at the overhead wire is really a form of "plain aerial" transmission.

* * *

"ANTENNA" (Nottingham) wishes to rewind two telephone watch receivers for use with a single valve receiving set. What resistance would be best, and what gauge and how much wire should he want?

Your questions are not clear. Do you intend to use the watch receivers as telephones and the valve as a rectifier? Why not use the same gauge wire as was used previously? If you intend to re-wind your telephones, the resistance of each piece should be at least 1,000 ohms if no telephone transformer is employed. In any case the re-winding of telephones is a difficult business, and we advise you not to attempt it unless you have had practical workshop experience.

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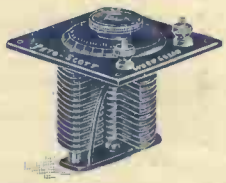

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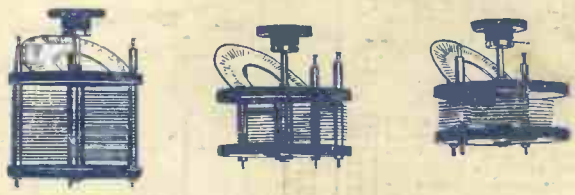

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