POPULAR WIRELESS WEEKLY. August 26, 1922.

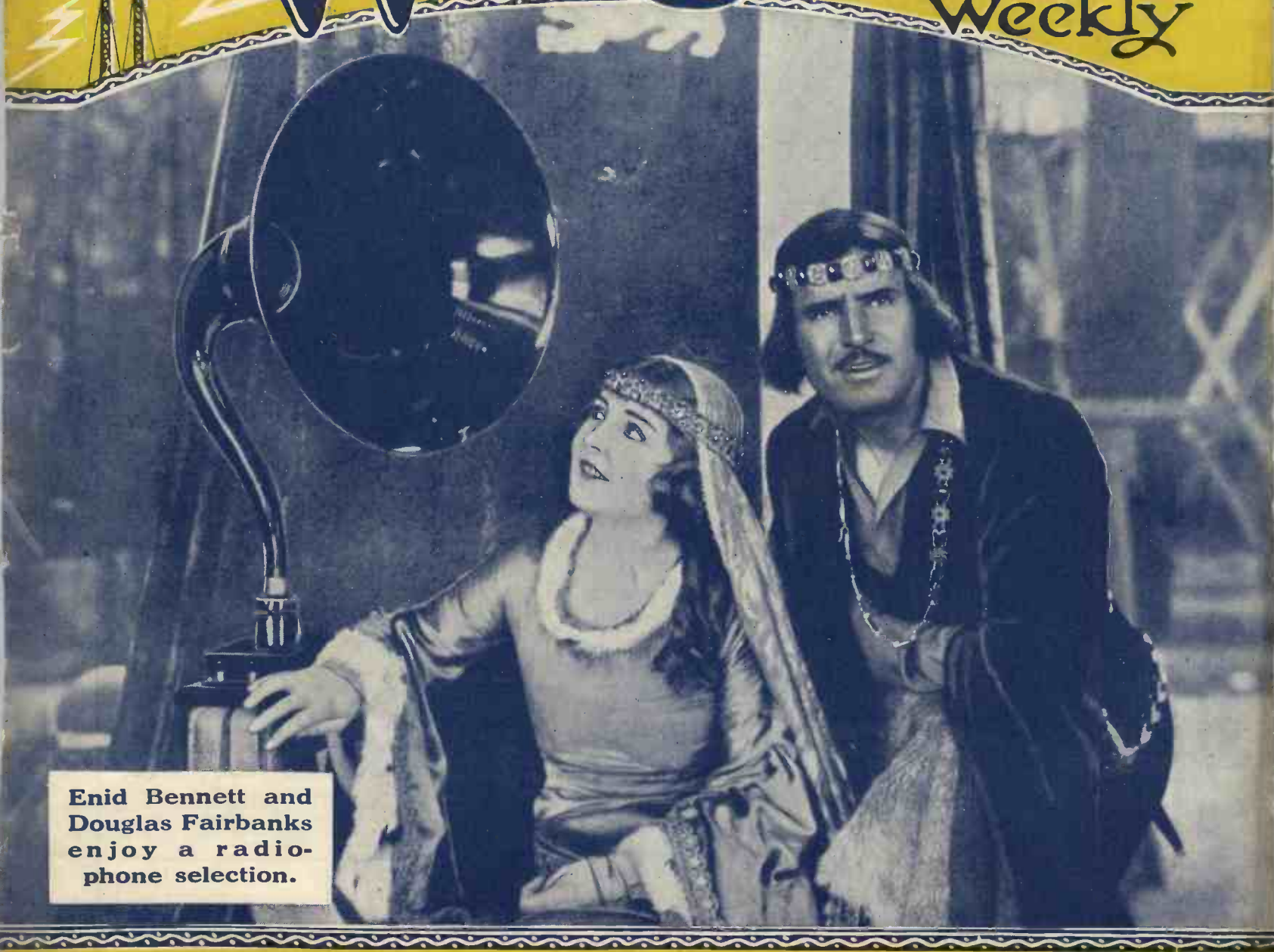
REGISTERED AT THE G.P.O. AS A NEWSPAPER.

No. 13. A HOME-MADE CONDENSER: SPECIAL CONSTRUCTIONAL ARTICLE THIS WEEK

POPULAR WIRELESS Weekly

3d.

No. 13. Vol. 1.
Aug. 26, 1922.



Enid Bennett and Douglas Fairbanks enjoy a radio-phone selection.

SPECIAL FEATURES IN THIS ISSUE

Psychic Phenomena and Wireless

Wireless Control

New Series for Beginners

Does the Eye "Wireless"?

Hints to Amateurs

How to Make a Short-Wave Receiver

"A HOME-MADE CONDENSER,"

Special article by

George Sutton, A.M.I.E.E.,

of interest to all amateurs making their own sets, appears in this issue.

Popular Wireless

TOPICAL NEWS AND NOTES.

"PSYCHIC PHENOMENA & WIRELESS,"

an absorbing article by

P. J. Risdon, F.R.S.A.,

appears in this issue.

This article will be widely discussed, as it deals with a theory of universal interest.

A Wireless Colony.

I HEAR that the Marconi Company are establishing a big wireless colony at Ongar, in Essex, which will cover over a thousand acres. Here will be built a series of stations for long-distance work; in fact, so extensive is the scheme that it will be a wireless centre of an unprecedented nature.

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A Wireless Melody.

YOU have all heard of "The Peep-Show"? Well, any of you who have seen this pretty revue will remember the echo song, which is sung in the "Valley of the Echoes" scene. This lyric was the first that has ever been transmitted by wireless, for it was composed in mid-ocean by the late Mr. J. W. Tate, and wirelessed to this country.

Major Raymond Phillips's wireless controlled airship. Major Phillips is contributing an interesting series of articles on Wireless Control to POPULAR WIRELESS.

Improvements at Boulogne.

EXTENSIVE improvements are being carried out at Boulogne, which will greatly help shipping of all sizes. At present the station has four pylons of 46 metres height, supporting two emitting antennæ and two fixed receivers of 3,000 sq. metres each. Messages can now be sent 300 miles in a northerly direction, and 400 in a westerly direction.

* * *

The Question of Licence Fees.

MR. MILTON BLAKE SLEEPER, the American radio expert, who has just left this country after a visit of inspection of English wireless methods, declared before he left that the United States found it would not be advisable to tax wireless receiving sets, and he thinks that this country is making a great mistake in imposing the present ten shilling fee.

The trouble of taking out a licence always deters a lot of people, who dislike anything in the shape of an official form, especially as it generally is more difficult than an exam. paper. As broadcasting days are still in their youth, let every encouragement be given to amateurs, and when broadcasting is in full swing, then a small licence might be imposed.

* * *

Masts over 800 Feet.

I HAVE told you before that the Government intend to erect a new transmitting station at Bourne, near Spalding, Lincolnshire, in connection with the Imperial Wireless Chain round the world. There are to be eight steel masts, each 800 ft. high.

Steel is a conductor, and therefore may easily cause loss of electrical energy, so that the masts will have to be insulated in sections. They will have concrete bases, and will be built to stand a horizontal pull of ten tons at the top, and a wind load of 60 lb. per sq. foot.

The transmitting station will be in the centre, whilst the eight masts will be grouped all round in a square formation. Thermionic valve sets capable of transmitting continuously at ninety words a minute, to be received as far distant as Poona, Johannesburg, etc., will be used. The new receiving station at Banbury, which I have also mentioned before, is the end of the imperial chain, and will be built on similar lines to the station already in existence, which deals with the Leafield-Abu Zabal (Egypt) link of the chain.

* * *

A Wireless Typewriter.

EXPERIMENTS are now being carried out at the Post Office with a machine known as the teletype, which is nothing more or less than a wireless typewriter. Messages are sent out on an ordinary typewriter keyboard, and are picked up automatically and are delivered, typewritten, at their destination on slips of paper very similar to those used in tape machines. Forty-five words a minute can easily be sent out and received.

One of the greatest attractions of the invention is that it is impossible for ordinary receiving stations to pick up these messages. There are five bars underneath the keyboard by which the operator has 120 codes at his disposal, and the wonderful part of it is that the receiving apparatus at the other end automatically decodes the messages as they arrive. This has already been tried successfully in this country before, but Morse code has only been employed.

Demonstrations are being given by the Murray Printing Telegraph Systems, at 55, Goswell Road, E.C., of this clever American invention.

* * *

Marconi Looks Ahead.

"THE new industry of wireless telephony, from which we contemplate a very considerable revenue, should provide remunerative employment for some tens of thousands of men and women who have been so long suffering from the severe depression in trade."

This statement was made by Senatore G. Marconi in his presidential address to the shareholders of Marconi's Wireless Telegraph Company at Connaught Rooms, London, W.C., the other day.

Senatore Marconi then announced that, although the profit—£275,361—was smaller than last year's, the rate of dividend would remain unchanged.

"In the early future," added Senatore Marconi, "this company and others will take part in opening up telegraph services between South and North America and between South America and European capitals."

Mr. Godfrey Isaacs, the deputy chairman and managing director, said that hitherto the company had been compelled to look to foreign Governments for support.

"We have now," he continued, "in the broadcasting system a public with whom we have every prospect of doing a very large business."

* * *

The Proposed Service.

"THE broadcasting service," says: "The Times," "is intended to provide a six-hours' programme every evening from 5 till 11, with the exception of Sunday, when the programme will occupy practically the whole day, beginning with a sermon in the morning by one or other of the leading preachers.

"Other details of the broadcasting programme are receiving consideration. No decision has yet been taken with regard to the character of the news to be transmitted. In order that the wireless may not compete directly with the newspaper, 'live' news will not be sent. As to where the line is to be drawn between 'live' news and 'dead' news, the Postmaster-General has intimated that he will take the representatives of the newspapers into his councils.

"The name of the new company will be the British Broadcasting Company. Though it has been objected that broadcasting is an inelegant term, none equally expressive has been devised, and it is the one that has now been officially adopted by the Post Office. There will probably be six manufacturers on the board of directors, with an independent chairman. A well-known public man has been invited to become chairman."

A Marconi Direction Finder (Marine type).

NEWS AND NOTES,

(Continued.)

Wireless and Cable.

OWING to the partial interruption of the cable service to the United States, caused by the Irish rebels seizing the cable stations on the west coast of Ireland, a large amount of Press work has been diverted to Leafield, the Post Office wireless station at Oxford.

This station has for some time been conducting a limited Press service to Halifax, Nova Scotia—an average of 2,000 words a night. During the past week about 8,000 words a night have been signalled to Halifax.

* * *

Humours of Wireless.

"LISTENING-IN is not without its moments of humour. There is the classic joke, hoary amongst pre-war wireless men, of the junior operator, who, muddled about call-letters and mistaking the coast station of Ushant for a ship, signalled, 'Where are you bound for?' The operators on dozens of ships hugged themselves on hearing this, but when, after profound thought, the French operator replied, 'Mister, I am Ushant. I do not budge,' they enshrined the incident in their hearts together with the story of the Japanese operator who gave a general call, and added, 'All gentlemans, honourable embarkery affixed muddily and unable to coming out,' meaning that his ship had stuck on a mudbank and could not get off.

"Working down among the ships on 600 metres can be made very interesting by the use of a frame aerial with which, as has been explained in earlier articles, one is able to determine the direction from which signals arrive. In fact, given favourable circumstances, it should be possible for an amateur with a frame aerial, a good compass, and a map, to trace roughly the progress of a ship along the coast by means of careful observations made at intervals of a few hours."—(Mr. E. Blake, in "The Daily Mail.")

The Sign on the Door!

Wireless Exhibition.

OWING to late arrival it was not possible to print an advertisement of the Wireless Exhibition and Convention, to be held at the Central Hall, September 30th to October 7th, in this issue. The advertisement will appear in the next number of POPULAR WIRELESS, giving the names of 55 exhibitors.

* * *

New Swedish Station.

THE new Swedish wireless station which is to be completed next year on the West Coast will be erected by the American Radio Corporation. There has been much competition for the work. The station will cost 3,700,000 crowns, of which the Americans will receive a little over a million for their work.

* * *

Clifden Freed.

A GALWAY message in the daily Press states that the town of Clifden and the Marconi wireless station have been freed.

National troops landed in two columns at dawn, and, after a running fight lasting thirty-five minutes, the Irregulars fled, leaving all their stores and an ammunition dump. The bridges at the approaches to the town had been mined, but none of the mines was exploded, the outposts being taken by surprise.

* * *

An Apology.

THE following appears in the issue of the "Wireless World," dated August 19th:

"To the Organisers of The Radio and Wireless Exhibition and Convention.

"We desire to express our deep regret that the advertisement inserted by us in the 'Wireless World and Radio Review' contained a very serious reflection on the Exhibition to be held at the Central Hall, Westminster, on the 2nd September, by the Radio and Wireless Exhibition and Convention. We failed to realise its full significance at the time, but we realise now the injury which it was calculated to occasion to the Radio and Wireless Exhibition.

"We undertake not to repeat it, and we also undertake to publish this apology in the next issue of the 'Wireless World,' in as prominent a manner as our advertisement, and to pay the costs.

"We are,

"BERTRAM DAY & Co., Ltd.,

"(Signed) BERTRAM DAY,

"Managing Director."

"Important Public Warning."

THE following also appears in the "Wireless World":

"We regret that in the advertisement columns of our issue of the 12th August we inadvertently published a statement under the above heading, which we now realise was a very injurious one to the forthcoming Exhibition of the Radio and Wireless Exhibition and Convention, which is to be opened at the Central Hall, Westminster, on September 2nd.

"We desire to express our regret at the inaccuracy of such advertisement, and for any injury or damage occasioned.

"(Signed) W. H. BREWSTER,

"For THE WIRELESS PRESS, Ltd.,

"11th August, 1922."

Mr. George Sutton, A.M.I.E.E., a Popular Contributor to *Popular Wireless*.

The Broadcasting Co.

JUST before going to Press I hear that the committee of manufacturers who are at present engaged in creating the Broadcasting Company state that the memorandum and articles of association of the company are in course of preparation, and as soon as these are approved the company will be registered, and the board appointed. Thereafter a full statement will be issued.

ARIEL.

Broadcasting Programmes

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

THE announcement that a broadcasting company has at last been formed brings daily telephony and music programmes within measurable distance, and it is quite possible that by the time these words are being read the Marconi station will have commenced a regular service. During any evening amateurs may be heard working. Musical selections are frequently transmitted by the latter.

At present the following stations are to be relied on for telephony transmissions:

TELEPHONY TRANSMISSIONS.

Station.	Call Letters.	Wave-length.	Remarks.
Croydon	.. GED ..	900 metres ..	Throughout day to aeroplanes.
Marconi House, London ..	2LO ..	360 metres ..	Between 5 p.m. and 6 p.m. (not regular).
Writtle, England	2MT ..	400 metres ..	Tuesdays, 8 p.m. (B.S.T.).
Paris	.. FL ..	2,600 metres ..	Daily, 5 p.m. (B.S.T.).
Königswusterhausen ..	.. LP ..	2,500 metres ..	Daily, 7 and 10.30 a.m. (G.M.T.).
The Hague	.. PCGG ..	1,050 metres ..	Sundays and Thursdays, 8 to 9 p.m. (B.S.T.).

WIRELESS CONTROL.

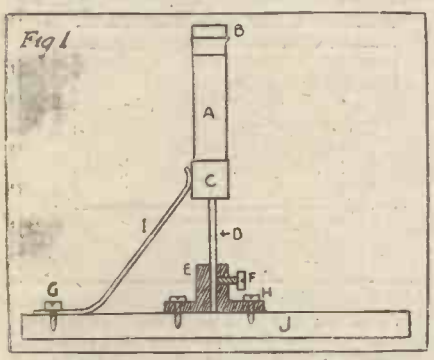
By Major Raymond Phillips, I.O.M., Late Member of the Inter-Allied Commission of Control.

PART 2.

IN my previous article I referred to a special coherer, which I designed many years ago for use in connection with my experimental apparatus.

A coherer is generally classified as an "imperfect contact detector," and though now obsolete for the detection of wireless telegraph signals, it still has many advantages for the control of mechanism at short distances.

It seems curious that, although so long ago as 1835 it was discovered that the passage of a high-tension electric discharge through a loose mixture of metal filings rendered the latter conductive to electric currents, it was apparently not until 1890 to 1896 that the discovery attracted sufficient attention to



cause serious experiments to be conducted in connection with wireless telegraphy. The term "coherer" appears to have originated from a theory that incident wireless waves caused the filings, or particles of an imperfect contact detector, to "cohere." There may probably be some truth in such a theory, as the art of "tapping" a coherer causes the filings, or particles contained therein, to decohere, thus restoring such into a non-conductive condition.

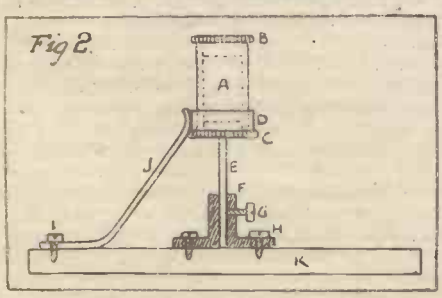
A New Coherer.

As the "tapping" device involved complications, it led to a number of inventions for "self-restoring" imperfect contact detectors. The latter appeared to need such extremely fine adjustments, that at the time the coherer with "tapper" held the field.

In the construction of a coherer for tele-mechanical control the first consideration is certainty of action.

Large contact surfaces tend to make a coherer very sensitive, but sometimes "sluggish" in de-cohering. Such a detector for experimental apparatus would be a source of annoyance when connected with a relay, on account of its tendency to develop "pumping" in the latter. The smallest electric current possible (consistent with efficient working) should be permitted to pass through the filings and contacts of a coherer.

The "selective controller" attached to the wireless-controlled airship, as described in the specification of my British Patent No. 6316 of



1910, was at first fitted with a vertical type of coherer as shown in Fig. 1. It consisted of a glass tube A, plug B, brass cap C, supporting rod D, base E, clamping screw F, terminals G and H, also contact spring I. The whole being mounted upon a non-conducting base J.

The interior contacts of the coherer are connected to the exterior of the cap C, and supporting rod D; a mixture of nickel and silver filings being contained in the glass tube A.

This coherer proved more reliable than the "horizontal" glass tube type, but strenuous conditions called for a more substantial detector, which led me to design the coherer as shown in Fig. 2. It consisted of a vulcanised fibre tube A, screwed plugs B and C, contact ring D, supporting rod E, base F, clamping screw G, terminals H and I, and contact spring J. The whole being mounted upon a non-conducting base K.

Useful for Experiments.

The interior contacts of the coherer are connected to contact ring D and supporting rod E; a mixture of nickel and silver filings being contained in the vulcanised fibre tube A.

This coherer proved most reliable, and useful for experimental apparatus. Its sensitivity could be adjusted to a nicety by simply unscrewing the plug B and adding or removing filings as desired; whilst the interior contacts could be examined without removing the filings by unscrewing the plug C, whilst holding the device with the supporting rod E pointing upwards.

This coherer has been used in connection with all my experimental apparatus, and was fitted to the selective controller attached to my wireless-controlled airship, which during its flight released imitation bombs over the artificial lake in the Empress Hall, at the Imperial Services Exhibition, Earl's Court, in 1913.

A Simple Circuit.

The coherer was connected to a relay wound to a resistance of 100 ohms, the armature of which was mounted upon a vertical pivot.

A simple circuit for use with the coherer just described is shown in Fig 3. It consists of the coherer with base A, de-cohering device B (which is similar to an ordinary electric bell with gong removed), relay C, relay contact D for closing the circuit connected with the electro-magnet E (which may, for example, operate "step by step" mechanism), contact F for closing the circuit connected with the de-cohering device B, G G, metallic rods (which represent an aerial) H, relay battery I, coherer battery J J, insulated supporting pillars for rods G G.

In operation it will be observed that on the coherer A detecting a wireless wave, current from the battery I will energise the relay C, closing contact D, thus admitting current from the battery H, which will energise the electro-magnet E, closing the contact F, and causing the de-cohering device B to tap the coherer, which latter would then be restored for detecting further wireless waves.

If the electro-magnet E were to operate "step by step" mechanism, the system would be "simple selective control," *i.e.*, control by "sequence."

If the coherer A and rods G G were removed, and the contacts of a very sensitive relay (forming part of one of the latest valve receiving sets for tele-mechanical control) were connected with the points J J, it would be possible to control the electro-magnet E from a considerable distance, provided the valve receiving set was not subjected to vibration, as I explained in my previous article.

For controlling model airships, boats, etc., the circuit shown in Fig. 3 will be found useful, more particularly so in the case of small airships, where "weight by apparatus" has to be carefully considered.

It will be observed that a "potentiometer" is not required to be connected in series with the coherer (as shown in Fig. 2) when used in conjunction with a relay wound to a resistance of 100 ohms.

It will be recognised that such a device enables an operator to keep "cool" whilst wirelessly controlling a model airship in flight.

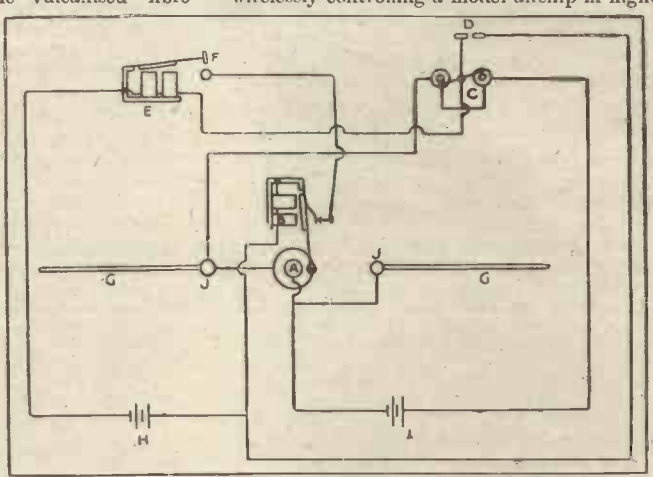


Fig. 3.

Vast Possibilities.

Another method of control is "direct selection." This involves somewhat complicated circuits. I shall show diagrams of these in subsequent articles.

It may interest readers to know that ten years ago I constructed a wireless-controlled carillon. I used a "selective wireless transmitter" which was fitted with a keyboard, and it was possible to play an "air" on the carillon by pressing certain keys on the transmitter. One afternoon in 1912 the late Professor Silvanus P. Thompson, F.R.S., tested the apparatus. The test was carried out with the transmitter and receiver 100 feet apart.

It seemed quite "uncanny" at the time, on pressing a certain key of the selective wireless transmitter, to observe the corresponding bell note, and that note only sound in the receiver.

I mention this experiment merely to indicate the vast possibilities open to wireless enthusiasts.

The first four articles of this series are intended as an outline of the possibilities of wireless control. In No. 5 the author will explain how the amateur can, at very little cost, control a toy train by wireless.

HOW TO MAKE A SHORT-WAVE RECEIVER.

By PHILIP R. COURSEY, B.Sc., F.Inst.P., A.M.I.E.E.

PART 5.

As was stated in last week's article, the reaction coil for use in this set should be in the form of a single layer solenoid of small diameter in order that its self-capacity may be as small as possible. The inductance of the winding needs to be fairly large, or there will not be sufficient coupling between the two circuits of the valve for the coil to be effective.

The single layer winding should therefore be constructed of finer wire than that used for the main tuning coil.

An ebonite, paxolin, or cardboard tube should be obtained, 1¾ inches outside diameter by 2¼ inches long by about $\frac{3}{32}$ to ⅛ inch thick. A piece of hard wood 1¾ inches square by ⅜ inch thick should be turned or cut with a chisel to a circular disc shape approximately 1½ inches diameter so as to fit tightly into one end of the above tube.

Winding of the Coil.

It should be secured in position by means of three small brass countersunk-head wood-screws through the tube into the edge of the wood disc, so that the outer face of the disc is quite flush with the end of the tube.

Next, at a distance in of approximately ⅛ inch from the open end of the tube, two small holes about $\frac{1}{32}$ inch diameter should be drilled through the wall of the tube about $\frac{3}{16}$ of an inch apart.

These should be used for securing the end of the wire for winding by passing it through one hole from the outside of the tube back to the outside through the next hole, and back inside again through the first hole. A length of four inches of wire should be left inside the tube to be used subsequently for connection purposes. A suitable wire to use for this coil is No. 28 S.W.G. double-silk-covered copper wire. A length of the order of 45 feet of wire will be required for the coil.

Eighty turns should be wound on, commencing from the above-mentioned securing holes, and the end of the wire fastened in place by passing it through two similar holes $\frac{1}{32}$ inch diameter drilled through the tube just clear of the end of the winding, so as to leave a length of wire of about 4 inches inside the tube for connection purposes.

Assembling Instructions.

A strip of wood 5½ inches long by ¾ inch wide by ¼ inch thick should now be cut, and one end screwed into the outer face of the wood disc which has already been secured into the end of the reaction coil.

Two countersunk-head brass screws can be used for this purpose (Fig. I.). When this strip of wood has been secured in place two holes $\frac{3}{32}$ inch diameter should be drilled through the wood disc at the end of the coil, one on each side of the wood strip in the positions marked A and B in Fig. I. Into each of these holes a short piece of Sistoflex insulating sleeving should be pushed so as to form an insulating tube through the wood through which the ends of the coil winding can be passed.

Next prepare a piece of ebonite 1½ inches long by ¾ inch wide by $\frac{3}{16}$ inch thick, and through it drill two holes ⅝ inch apart through which two screws and nuts can be passed as indicated at H H in Fig. I. No. 5 B.A. countersunk-head brass screws ⅝ inch long will be suitable for this purpose.

Their heads should be countersunk into the ebonite so that they sink about $\frac{1}{32}$ inch below the surface. These screws should be fitted with two nuts and a washer each. The ends of the coil winding can be secured under these nuts, taking care to thoroughly clean the wire before the nuts are screwed up tight.

The Reaction Support.

The outer nuts will serve subsequently for connecting flexible leads to the coil so that current can be led into and out of it in whatever position the coil may be used. This ebonite block with its screws should be fixed on to the wood strip attached to the coil at 2½

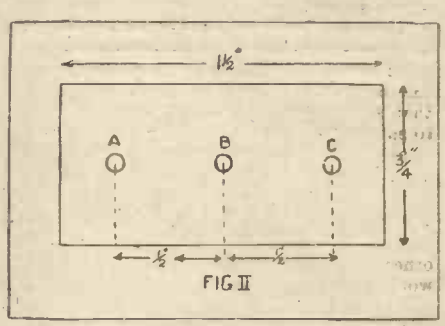


FIG II

inches in from the end of the strip furthest from the coil as indicated by G in Fig. I. Two brass screws J J should be used for fixing the ebonite block in place on the wood strip.

In order to support the completed reaction coil on to a rotatable spindle by means of which its coupling with the main tuning coil can be varied, a block of hard wood C, Fig. I, 1½ inches by 1¼ inches by ¾ inch, should be prepared.

Final Hints.

This, when ready, should be glued and screwed on to the end of the wood strip remote from the reaction coil as sketched in Fig. I, using three long thin brass screws K K K for the purpose. A hole D, ¼ inch diameter, should be drilled through this block 1 inch from the face attached to the wood strip.

A piece of brass strip 1½ inches by ¾ inch by ⅛ inch should be filed up, and have three holes drilled through it in the positions indicated by A B C in Fig. II. The holes A and C should be drilled to fit any convenient wood screws that are available of about $\frac{3}{32}$ inch diameter. These screws should have countersunk heads and be approximately ⅝ inch long.

The heads of the screws should be countersunk into the brass. This piece of brass is screwed on to the block C, Fig. I, on its face remote from the wood strip as shown at E. The centre hole B in Fig. II should be drilled and tapped for a No. 4 B.A. screw.

This hole should be continued into the wood block C, Fig. I, in order that a 4 B.A. cheese head brass screw F, Fig. I, may be screwed through the brass right into the hole D. The screw will need to be ½ inch long under the head for this purpose.

This screw will be used to secure the wood block with its attached reaction coil on to a brass spindle ¼ inch diameter which will be fitted into the hole D, the brass plate through which the screw is passed being necessary in order that the screw may be able to exert sufficient force on to the spindle to hold the wood block and coil securely in position.

(To be continued.)

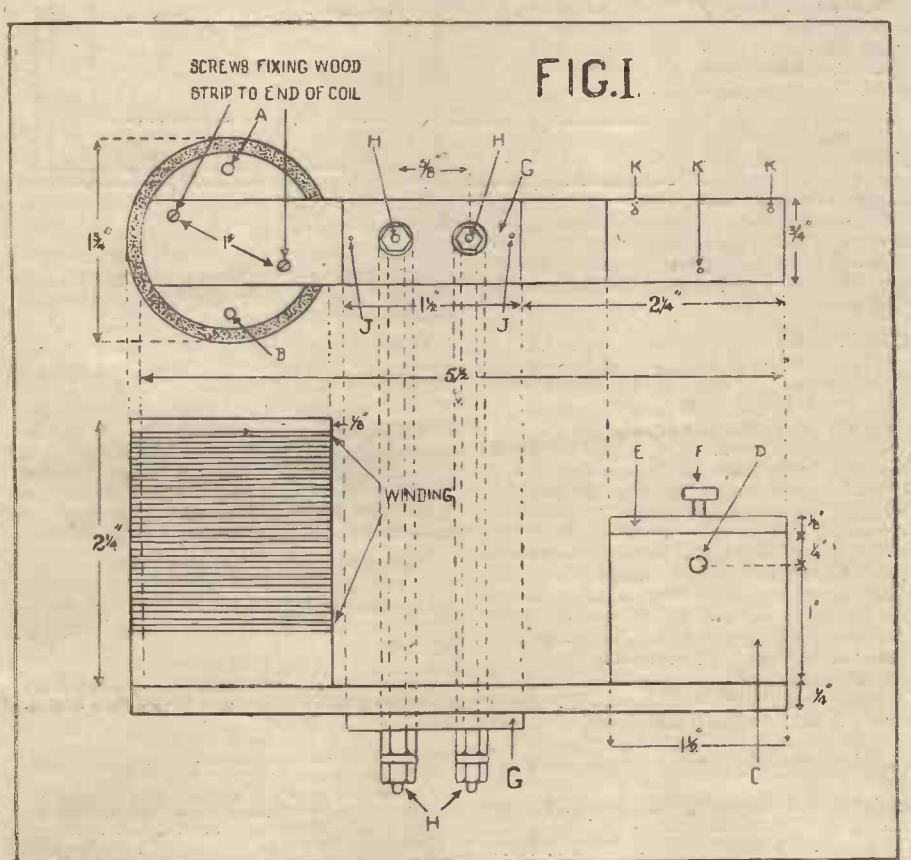


FIG.I.

PSYCHIC PHENOMENA AND WIRELESS.

Note: Mr. Risdon has written an impartial review of the theory that wireless may possibly assist in effecting communication with the spirit world, believed to exist by psychic investigators. This article must be regarded purely from a scientific standpoint. The theory is an interesting one, and as such has been discussed considerably both in this country and in America.
POPULAR WIRELESS expresses no opinion on the subject, and Mr. Risdon's article is in the light of a statement setting forth the scientific aspect of a theory lately expounded by Sir Arthur Conan Doyle and others.—EDITOR.

By P. J. RISDON, F.R.S.A.

IT is not unnatural that the now universal interest in wireless should lead to the question, "Will wireless constitute a means of communication with the departed?"

A well-known spiritualist has expressed the view that wireless is going to be of assistance in this respect, and bases his opinion on a theory that spirits are vibrations of the ether. If they are, there appears to be no reason why their images should not be recorded on photographic plates—that is one of the successes claimed by him—and if their images can be thus received, communication by means of other ether vibrations—namely, wireless—does not at first sight seem beyond the bounds of possibility, always supposing that spirits are familiar with and susceptible to such vibrations.

There is no present means of judging as to whether electro-magnetic waves would constitute the means of such communications, or whether some other form of wireless apparatus, capable of transmitting and receiving other vibrations, such as those of telepathy, would need to be evolved.

Moreover, since the existence of the ether and of spirits has not yet been conclusively proved, the whole question involves a problem bristling with difficulties, a preliminary survey of which is essential before one is able to realise even what the problem entails. Certainly it is useless to attempt consideration of the possibilities of wireless in this direction until these difficulties have been considered.

Honest Research.

Unfortunately, in the space at command, it is impossible to do more than touch upon the various aspects, but, subject to this limitation, the object of the present article is to discuss them impartially and from different points of view.

Innate in every human being is a constraint to recognise a Supreme Power responsible for the natural order of things—for every event in the universe. It matters not whether it be a case of religious upbringing or that of a poor savage "whose untutored mind sees God in clouds or hears Him in the wind." An equally spontaneous and universal belief is that the body is but a temporary abode of a soul that cannot die, even although it must suffer eclipse in a worldly sense.

It may be argued that these two beliefs prove nothing, and that they are due to "the wish being father to the thought."

The only reply to such a contention is that they are universal, and independent of any religious doctrine or belief, and of education and will-power; that they constitute, directly or indirectly, the mightiest force in human affairs, and, moreover, that the second, if not the first, is a *sine qua non* in respect of the subject under consideration.

Although, on the one hand, we find certain religious faiths nominally opposed to psychic research—*i.e.*, the investigation of phenomena, real or apparent, that do not fall under any of the other recognised sciences—on the other hand, many extremely religious persons, who are not avowed spiritualists, are firm believers in supernatural manifestations, such as visions of departed relatives with whom they claim to have held communion, and the Bible is frequently quoted in support of such events.

And since we are endowed with desire for knowledge, it is difficult to see why honest research and investigation should be condemned as contrary to the precepts of true religion. The more deeply one explores the realms of science, the more one is impressed and sobered by the wonders revealed.

There appears to be nothing inherently impossible in the conception of a spirit world, or in that of departed spirits communicating with the living. And if from the army of "spiritualists" we weed out the impostors, we still have left a few who are generally regarded as sane men of unimpeachable integrity, and whose testimony leaves us little choice but to believe that strange manifestations take place for which no conclusive scientific explanation is as yet forthcoming.

Normal and Abnormal.

Briefly, the creed of "Spiritualism" is that death merely opens the portal to another stage of existence in a sphere of which that portion nearest the world is denoted as the "Astral Plane," whence departed spirits can communicate with those left behind. It is a very ancient creed, probably as old as any religion.

Included in the alleged experiences of spiritualists are "clairvoyancy," or second sight, the mystery of the planchette, table tilting and turning, "levitation" (the raising of animate or inanimate objects by other than ordinary force or mechanical means), crystal gazing, the observation of "aura" (the seeing of coloured emanations from a human being, the different colours being supposed to represent different characteristics of the subject), "control" (such acts as writing, drawing, dancing, etc., under the influence of a spirit that temporarily takes possession of a person), and "projection," during which the spirit of a person is supposed to leave the body and become visible beside it, returning to it when the spell is broken.

The theory of Transmigration of Souls is that after death the spirit assumes another bodily form according to its deserts. Thus, a person of certain evil habits may take the form of a worm or of some other lowly creature, and undergo another course of evolution before he gets his chance again. It is claimed that this constitutes just retribution for wrong-doing, and the belief in reincarnation is largely held in India and the East.

It is quite possible for a person, other than a certified lunatic, either to dream or to imagine the occurrence of events that do not actually take place. And it must be remembered that the normal shades imperceptibly into the abnormal.

Possible Use of Valves.

Whatever the source and means of propagation may be, hypnotism is a power which certain persons are unquestionably capable of exercising over others to such an extent that the subject loses his mental identity, and the merest suggestion ensures immediate and entire obedience. That this power has been grossly abused is common knowledge.

By telepathy is meant the transmission of thought images, or sensations from one mind to another, independently of conscious sense or will-power, and irrespective of distance. Such experiences are so common that it is unnecessary to give instances. Premonition of an impending event may possibly be due to telepathy, although some prefer to class it as a communication from a spirit world. We shall presently have more to say about telepathy.

It is stated that Dr. Baraduc has already satisfied himself, as the result of experiments, that thought waves are projected by human beings, and, if this be true, there is nothing impossible in the suggestion that instruments, corresponding in their function to that of the thermionic valve, may be invented for magnifying such thought waves, either for transmission or reception or for both.

In this connection may be mentioned an invention of the late Dr. Waller, which has an important bearing upon the subject. The writer spent many hours with the doctor in his laboratory investigating and testing the apparatus which faithfully records, by rapid changes in the electrical resistance of the human body, the effects of thought and sensation.

The Sub-conscious Mind.

If we are to believe the evidence of our senses, we are forced to the conclusion that every normal person possesses a dual mind: the conscious and sub-conscious.

The conscious mind is that which regulates and governs active thought and deed. The sub-conscious is that which receives impressions either from the active mind or from some extraneous source direct.

The sub-conscious mind is capable of spontaneously imparting information to the conscious and occasionally, but not always, the conscious is apparently capable of tapping the sub-conscious.

Thus we may be asked for certain information and our active mind at once turns to our sub-conscious mind for it. It may be imparted instantly and we give the reply, or it may be that it is not imparted, although we know it is there: then we say we cannot remember. The next day—or it may be a long time afterwards, when the incident is forgotten—the sub-conscious mind suddenly and unexpectedly imparts the desired information.

If we may so express it, the sub-conscious mind lies quiescent but ever on the watch, and, when the conscious mind becomes vacant, takes possession. I leave home daily, enter a train and go to my office; but my active mind is in the ascendant. I do not consciously think of the office, but my sub-conscious mind directs my footsteps there.

Not Proven.

Walking in one's sleep may be another instance of the exercise of the sub-conscious mind, unless it be attributable to purely galvanic action. The sub-conscious mind receives and stores impressions, and it is probably the transmitting and receiving station for telepathic phenomena.

Quite distinct from the dual mind is multiple personality—the existence in the same body of two entirely different identities or personalities. It is stated that there is medical evidence of cases where there has been a prolonged struggle between two such identities for possession, resulting in one ousting the other. This may or may not be true; if it be true, it has an important bearing on the subject generally. It must not be confused with ordinary conflicting emotions that everyone (unless devoid of conscience) experiences when about to take some step that his better nature proclaims as unworthy.

(*Continued on next page.*)

HINTS TO AMATEURS

By A. W. DRANSFIELD.

DO not be careless about your lead-in tube for the aerial. A good way to lead in is to get a piece of old discarded or broken boiler gauge-glass tube, drill a hole in the window frame, and wedge the tube in with a small wedge of wood.

* * *

When drilling holes in ebonite, the drill gets very hot and "binds." This is very bad for the drill, and you are likely to break it off. The remedy for this is to keep the drill wet with cold water.

* * *

If you have trouble with your testing buzzer at the contact-breaker points, this will probably be caused by an inferior metal having been used. The passing of the current has the effect of causing fusion of the metal. This will easily be observed by looking at the contact when the buzzer is in use. Should the sparking be heavy and very bright, make a very small condenser and put it "across" the make and break; this will have the desired effect, *i.e.*, all sparking will disappear.

* * *

An article easily made, and most useful for many purposes, can be made in the following manner. Get a piece of wood about an inch wide and a foot long, and glue to each side a strip of fine emery cloth; it is better to have, say, No. 0 on one side and No. 1 on the other. You can sharpen your trimming knife, polish up the faces of terminals, or polish up any metal part requiring a clean up.

A good plan is to take the trouble to make the article out of a piece of one-inch square wood, and put a different grade of emery cloth on each of the sides.

* * *

Screws that have become very tight may often be easily removed by applying heat. A good plan is to heat up the soldering iron and place it on the metal or the head of the offending screw and screw out whilst warm. Do not apply too much to the screw if it is brass; brass breaks very easily when hot.

* * *

When using flexible wire for your leads, a good plan is to clean back the insulation for about an inch, scrape the wires as clean as possible, roll them between the fingers with powdered resin, twist together tightly, and dip them in some solder melted up on a gas-ring in an old iron spoon or ladle. This will make the ends quite solid and they may be made into the form of a hook, or left straight, as you desire. This is well worth doing, and saves a lot of bother when terminals are close together.

* * *

When melting down paraffin wax always do it in a vessel that is surrounded by water, similar to a glue-pot. Use a tin that is fairly large, to enable paper or small coils to be easily dipped in; you will find a small tin a nuisance.

* * *

If you find it necessary to drill sheet glass, you will find that it is quite easy to drill if you keep the point of an ordinary drill wet with turpentine. If a large hole is desired, say 3-8ths of an inch—get a piece of copper tube slightly smaller, about 5-16ths inch, then make a clean hole in a piece of thick wood that will act as a guide for the tube. Lay the wood on the glass, and let the hole in the wood correspond where the desired hole is to be, drop some powdered emery (No. 0) down the copper tube (which you should place in the hole in the wood after you have set it right), then drop some turpentine in the copper tube on top of the emery, and you are ready to drill the hole. Should the copper tube be too large for your drill, have the wood a good thickness, and solder a piece of wire, cranked to form a handle, to the top of the tube.

* * *

When experimenting with different methods of wiring sets up, a good plan is to make a board with a set of terminals on that will take all your various leads. Procure a piece of ebonite and place, say, 6 terminals on each of the long sides, mark each terminal and bring all your leads to the board. It will be seen how easy it would be with short pieces of flexible wire to make all sorts of combinations.

* * *

Ordinary iron wire will do for a resistance or potentiometer. Get fine wire similar to that used by florists to tie up flowers. Do not wrap it round ebonite; the wire warms up when used as resistance, and a fair amount of current is going through. A piece of slate is quite good, and is easily cut with a hack-saw. Care must be taken as slate is very brittle.

* * *

When drilling copper, always use oil. A good maxim to remember is:

Oil for copper and not for brass;
Oil for wrought and not for cast.

The last line applies to iron.

* * *

Cycle valve rubber makes a very fine insulating medium for all the "under the panel" wires. Cut the rubber a little too long; it will then spring out towards the connecting screws and stop all danger of short circuits, etc.

* * *

A small drilling machine may be used to advantage if fastened up in a vice. The chuck may be used to hold small articles, such as terminals, for re-polishing, and small things may even be turned up just as in a small lathe.

* * *

Aerial wire that is not quite straight may soon be put in order very easily by making a draw-board for it. All that is wanted is a piece of fairly stout wood with a few nails driven in not quite in a straight line. Zig-zag the wire to be straightened between the nails and pull; the wire will come out quite straight. Too many nails will make the work pretty hard if the wire happens to be stiff.

PSYCHIC PHENOMENA AND WIRELESS

(*Continued from previous page*)

Sifting all the foregoing and other considerations carefully as we may, we are still left in doubt. There may be a spirit world, and it may be possible to communicate with spirits, but neither of these things has yet been proved.

Spiritualists, whether they be right or wrong, certainly have not proved them. As we shall endeavour to show, alleged results claimed by them as proof may, with one exception, be due to what may be termed "material causes." The one exception is that, in certain cases, communication is stated to have been established with spirits of individuals, specified by name, but since no convincing evidence or satisfactory public demonstration of this is forthcoming, we are perforce compelled to relegate such assertions to the realm of doubt, and to fall back upon known facts on which to build a theory.

Let us now consider the processes that render our bodies capable of harbouring and sustaining life.

Some nine-tenths of every human body consists of pure water. The remaining tenth comprises many different substances, including acids and metals. It has been likened to an engine; but we may go further, and liken it to a combination of a motor and an accumulator for storing and supplying the energy to drive complicated mechanism that automatically collects and consumes fuel which it converts into energy wherewith to replenish the accumulator.

By some mysterious agency the accumulator is given an initial charge, which is thereafter automatically maintained. Ultimately, however, like all other accumulators, it deteriorates—largely according to the degree of care, neglect, or abuse to which it has been subjected. Then it is no longer capable of storing and maintaining the energy that we call "life," which is finally discharged, when the mechanism stops.

Whence the human accumulator derives its initial charge, and whither it departs when death supervenes, is the problem that confronts us.

It is insufficient to say that the initial charge is derived from parents—they are merely the physical and mechanical means adopted by Nature for constructing a suitable habitation for the separate life entrusted to them. Nor can we even say that they are instrumental in increasing this initial life. The virility of a newly born child is notorious, whilst a blow or a bullet in a vital spot will kill the strongest man as quickly and easily as it will a baby.

Physical development may provide greater protection, but that is another matter.

As a healthy individual, I cannot, on retrospection, think of any time, in point of age, when my virility was greater than at any other.

Regarding ourselves in this light, it is not difficult to realise that each of us may generate a species of magnetic field of force. Now magnetic fields of force are theoretically infinite in extent, the distance to which they extend, practically, depending upon the degree of sensitiveness of detecting instruments.

Again, electrical disturbances in our bodies may quite conceivably set up electro-magnetic or other waves that are also theoretically infinite in extent.

If this theory be tenable, we have at least a partial explanation of telepathy, and of most of the phenomena falling under the head of spiritualism, so that what are taken as responses and manifestations on the part of spirits may actually be those of living persons.

If we accept the Spiritualist's creed that spirits of the departed not only exist but are willing and anxious to communicate with us, what grounds are there for supposing that "wireless" is going to assist?

Surely in such case we may assume that spirits are so sensitive that they could better be communicated with by such delicate means as telepathy than by the *comparatively* clumsy methods of wireless?

Are we to imagine invisible wireless transmitting and receiving sets in spirit land? Or are we to place our own at the disposal of the spirits?

In the latter event, it would appear, on the face of it, that wireless would be superfluous and would merely add complications to a problem already complicated enough.

NEW SERIES FOR THE BEGINNER.

By E. BLAKE, A.M.I.E.E.

PART 6.

SUMMARY OF LAST ARTICLE.

An oscillating current begins in one direction at zero strength, rises to a maximum, decreases to zero and grows up in the opposite direction to a maximum, and decreases again to zero. This sequence then continues, the number of times per second the complete cycle takes place being called the "frequency" of the current. The maximum strength of the current depends primarily upon the E.M.F. producing it, and the nature of the circuit.

When the current is at a maximum, its energy is electro-magnetic (or kinetic); while the current is decreasing or increasing some of its energy is electro-magnetic and some electro-static (or potential). The direction of the electro-static field round a charged single-wire vertical aerial is almost vertical, and the electro-magnetic field appears at right-angles to the wire.

WE now come to the subject of the ether of space, the universally distributed medium in which wireless waves move and have their being. Before going further, it is highly desirable to point out that the practice of wireless is considerably in advance of the theory.; things are done first and explained afterwards, like shooting in Arizona.

In order to explain the mechanism—or shall I say mode?—of wave-propagation through space, certain theories have been made to fit the known facts, and whether those theories are quite correct or not (and it may be assumed they are not) does not matter very much, so long as they enable us to understand the subject a little better.

The question to ask of a theory is, "Does

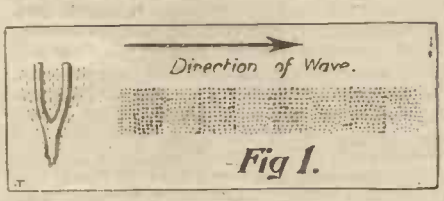


Fig 1.

it help?" not "Is it completely proven?" Theories will always be contested, and life would be very strange for scientists were they not; indeed, I think many would be impelled to go out of the business. Certainly theory making and breaking greases the wheels of scientific progress.

Now, the ether theory helps, but there may be no ether; for ether is a hypothetical thing. Sir Oliver Lodge believes mightily in the ether; Dr. Steinmetz, of the General Electric Co., apparently does not believe in it at all. Nevertheless, the great body of scientific opinion, although not unanimously agreed on all points concerning ether, yet holds to the necessity for postulating its existence. But, in spite of this, we ought not to believe that we are dealing with an axiom. We must not think that ether is as established as the sea and the air and the solid earth. It is the *name for something* which scientists think exists.

A Wrong Impression.

Further, we may not hope to achieve a clear mental picture of ether waves; and here I warn readers against the evil of imagining them to be mere hills and dales on an invisible ocean. We write and speak so glibly of them flitting across the earth; we represent them so casually by means of wavy lines, that many people are led to believe that they are actually "up and down" disturbances, just like waves on water. Nothing could be more remote from what is understood by the mathematical physicist when he refers to them. So let us clear our minds of hastily gathered ideas on the matter and begin afresh.

Transferring Energy.

One may go so far as to say that no direct communication between two points in space can be effected without the transference of energy between them. You nudge the man sitting next to you; that is communication, and energy passes from your elbow to his ribs. You speak to him; energy is conveyed from your vibrating vocal cords on sound waves in the air to his ear-drum, which vibrates in response. By the energy of light we see. Now, is this energy sent across space like a bullet or a letter through the post, or is it conveyed by the co-operation of some special medium?

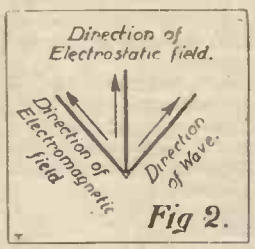


Fig 2.

Let us first think of sound waves in the air. The sound-making body vibrates and produces alternate compression and rarefaction of the air; the particles of the air are crowded together, then separated, then crowded together again, and so on in a series, as roughly shown in Fig. 1. The particles move in the same direction as the sound travels, hence sound waves are called "longitudinal." The medium which conveys the energy of sound is matter; sound waves cannot pass across a vacuum.

What is the Ether?

Now let us refer to waves of light. The glowing filament of an electric lamp is the centre of the radiation of the energy of the electrons in the filament. Between the filament and the walls of the bulb there is a vacuum. Yet the energy from the filament undoubtedly passes across the vacuum, because it passes through the glass and across the space between the bulb and your eye.

Light also passes from the sun to earth across nearly ninety-three million miles of space practically devoid of matter. Light passes through solids and liquids.

If, then, the energy of light is carried by a wave-motion, light waves must exist in *something* which completely inter-penetrates material things. If light is not a wave-motion, we are thrown back upon the old corpuscular theories, or must imagine the energy as being conveyed from place to place like a postal packet. Well, scientists are generally agreed that light *is* a wave effect, and can show conclusive experiments in support of their contention; and the medium in which the waves occur they call "ether."

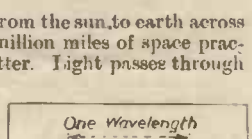


Fig 3.

The ether, according to present theory, is something underlying material creation. Several crude analogies occur to me, each one falling short of the *idea* in one respect or another.

We may compare the ether to the canvas on which all material existence is painted, but it is more than that. We may compare it to the fabric of which a tapestry is woven, but it is more than that. We may liken it to the string upon which pearls are strung, or to the mortar which holds the universe together, but it is more.

Ether is conceived as filling the universe, not only so-called empty space, but the space which is occupied at the same time by material bodies, whether planets, suns, or stars, or houses or men or molecules.

A world floating in the ether is like a sponge or net submerged in water; the ether inter-penetrates it like a breeze passing through a wood. The movements of material objects of atomic or larger dimensions do not disturb the ether; only electrons can do that.

Various Wave-Lengths.

Ether waves are described as "transverse," in contra-distinction to sound waves, the disturbance occurring at right-angles to the direction in which the waves are propagated (see Fig. 2). When we come to consider the production of wireless waves, we shall understand more about that.

Ether waves all travel at the same velocity—viz., about 186,000 miles per second—but differ in length.

Light waves are exceedingly short; waves of radiant heat are longer, but still very short compared with wireless waves, which range from 100 metres to 25,000 metres in length, according to the station. The length of the waves is controlled by apparatus in the sending station.

I have already mentioned the fact that the number of times per second a complete oscillation occurs is called the *frequency* of the wave. If we divide the velocity of the wave (300,000,000 metres per second, or 186,000 miles per second) by its length, the answer is the frequency.

$$\text{Wave-length (in metres)} = \frac{300{,}000{,}000 \text{ (metres per sec.)}}{\text{Frequency (per sec.)}}$$

$$\text{Frequency (per sec.)} = \frac{300{,}000{,}000 \text{ (metres per sec.)}}{\text{Wave-length (in metres)}}$$

Wave-length multiplied by Frequency = Velocity.

Series of Changes.

The length of a wave is often said to be the distance between its crest and that of the wave preceding or following it (Fig. 3). However, as I have been at pains to emphasise the fact that an ether wave has no crest and trough, or sides, or any physical dimensions whatever relating to shape, I must explain the term "wave-length" otherwise.

An ether wave is a regularly repeated series of changes in the condition of space. These changes occur in cycles, as I have described, and are in the nature of strains and stresses of the ether, caused by the alternation of an electro-static field with an electro-magnetic field, one decreasing as the other increases, one reaching its maximum as the other

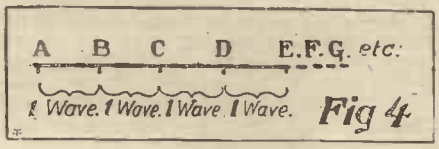


Fig 4

NEW SERIES FOR THE BEGINNER.

(Continued from previous page.)

reaches its minimum. These linked and pulsating fields are propagated in all directions with the speed of light. Looking at the matter in this way, we may understand a wave-length to be the distance between successive points in space where similar stages in the cycle of oscillation occur.

In Fig. 4 the points A, B, C, and D are separated by equal distances. Imagine the waves to be propagated along the line AD. At a given moment there exists in the ether at A a certain set of conditions, perhaps the beginning of an oscillation or the end, or some intermediate stage, such as half or quarter cycle.

By the time the wave-effect has reached B the same stage of the cycle is recurring, and the distance AB represents one wave-length. At C and D, and at equal distances DE, EF, FG, the same state of the ether thereafter recurs, always at a constant distance—namely, one wave-length.

If we consider a distance of 100 miles, and imagine that a station is sending across it waves each 10 miles long, it is clear that at any instant there will be a chain of ten complete waves over the 100-mile course. Suppose the engineer then doubles the *frequency* of the waves—that is, sends them out twice as quickly—then, at any instant over the same tract, twice as many waves will exist. Hence they must be only half as long as the first set of waves. Remember the rule, "As frequency *increases*, wave-length *decreases*, and *vice-versa*."

With next week's article will commence a general survey of wireless communication, but we shall return to the subject of waves when the principles of transmission and reception are studied.

CORRESPONDENCE.

To the Editor,
POPULAR WIRELESS WEEKLY.

Dear Sir,—In the issue of the POPULAR WIRELESS for July 29th, one of your contributors very kindly refers to my work in connection with the production of rectifiers for charging accumulators from alternating current supplies, and I note that by some mistake I am suggested as indicating that ammonium sulphate solution would be satisfactory for use in an aluminium rectifier.

I would ask you to correct this mistake by indicating that the solution should be a concentrated but not quite saturated solution of either sodium, potassium, or ammonium phosphate.

In the interest of historical truth, I should also like to make a further correction by stating that I am not the author of the "Grisson" valve, and that the improvements which I have introduced took place some considerable time after the "Grisson" valve had been placed on the market, which was in itself a considerable improvement over the older "Noden" type.

I should also like to take this opportunity to compliment you on publishing Mr. Sutton's article, and also to thank Mr. Sutton for his article on Wireless Club Rules. It is very inspiring to me to know that the rules which were drawn up for the "Wireless Society of London," by Mr. Klein, the late Mr. Russell Clark, and myself, have stood the test of time.

I think that it would be of great help to the amateur wireless experimenters in this country, if they would give very careful consideration to Mr. Sutton's remarks.

Yours faithfully,
L. F. FOGARTY,
Hon. Treas. Wireless Society of London.

DOES THE EYE "WIRELESS"?

MOST of us have heard it stated that it is possible to hold a wild lion in check by a steady gaze from the human eye. Whether that be true or not, it is a fairly safe statement to make without fear of contradiction, since there are exceedingly few who have the opportunity or inclination to put it to the test.

Conceivably it may have been done and placed on record as a feat that may be practised with impunity. For our part, we should certainly require an ultimate safeguard before trying it.

Nevertheless, many readers will have noticed that it is almost impossible to "catch the eye" of a lion in captivity for more than a fraction of a moment, which seems to show that the human eye is capable of exerting an influence that the lion cannot endure.

To bring the matter nearer home: there is probably hardly a man, woman, or child who has not experienced an intolerable sensation under the prolonged stare of another person's eyes. Even the knowledge of being watched is almost unbearable in many cases. If two persons look into each other's eyes, one or other of them will at last be obliged to avert his gaze.

It is interesting here to note that certain ancient philosophers believed that some power or even particles proceeded from the eye to an object seen, although how they made their report and returned to communicate it to the brain was not clear.

Interesting Experiments.

Having studied the effect of the gaze of one person upon another, a certain London physician set himself to ascertain whether or not emanations are thus projected.

It is, of course, evident that light rays are reflected by the eye, otherwise we should not see the eye of another person at all. It is also known that light is the effect of energy, and possibly consists of almost infinitely small material particles, since Einstein has definitely proved that it can be deflected by certain influences. Moreover, light produces certain chemical effects in addition to those on photographic plates. Finally, in the spectrum we have ultra-violet and X-rays, and X-rays, though invisible, will, as everyone knows, penetrate 12 inches of wood or a bar of steel, and even then light up a fluorescent screen.

It seems, therefore, within the bounds of possibility, and even probability, that the eye may be capable of refracting and reflecting, and, perhaps, modifying rays of energy other than those we call "light rays." This theory appears to be more or less borne out by Dr. Russ's experiments, but our readers should not confuse it with what daily newspaper reporters have given the public to understand is the power of the human eye to project rays or waves of force independently of other influences.

In a Lady's Eyes.

For instance, if that were possible, the influence of the eye should be felt in utter darkness, but Dr. Russ does not appear to have yet succeeded in obtaining any definite results in darkness, although he has experimented in that direction.

In this connection, the writer personally made quite a simple and interesting experiment with the help of a lady, who was unable to return his gaze for more than a few moments under ordinary conditions. By arrangement beforehand, whilst looking into her eyes, he switched off the light. This was repeated several times, and curiously enough every time she guessed wrongly as to whether he had moved his eyes or not. A similar test with another lady had precisely the same results.

It would be tedious to relate details of the whole series of Dr. Russ's experiments, and we therefore confine ourselves to the following description of a simple form of the apparatus he employs, gleaned from his own technical report on the subject. It is interesting to note that he describes it as "an instrument which is set in motion by vision," and that he lays no further claim at present for his invention.

In a metal box 36 inches long by 8½ inches by 7 inches, a delicate solenoid is suspended, consisting of fine copper wire wound upon a celluloid cylinder. Above the box is a glass tube with a cork stopper. From this stopper an unspun silk fibre depends, with a small metal yoke at the lower end, on which the solenoid is hung.

Eye Waves.

Above the yoke, or attached to it, is a fine wire magnet, the object of which is to bring the solenoid to rest after it has been set in motion. One end of the box is covered by a pane of glass, but at the other end only a narrow slot, covered by thin glass or celluloid, is provided, through which the observer looks. If his gaze be directed to one end of the solenoid, that end begins to move—generally away from him. If he look at the other end, it is that end that moves away. If he look at the centre, the solenoid remains stationary.

Doubt at first was expressed as to whether the effect was not influenced by the radiation of heat from the body of the observer, or by electric influence other than that produced by the gaze. This doubt was enhanced by the fact that, when the hands were placed in contact with the box, movement of the solenoid took place. Various experiments were made that disposed of the idea of external electrical disturbance and heat influence. Another instrument was made in which a jacket of water or liquid paraffin was interposed between the solenoid and the observer, and the apparatus was coupled up with a Leyden jar and earthed. By this means, *after passing through the fluid*, the observer's gaze, directed on to the motionless solenoid, caused it to move through an angle of more than 30 degrees.

Another Mystery.

To enable the observer better to watch the effect, light from a condenser is focused upon a tiny mirror attached to the yoke on the silk fibre. The beam is directed on to a graduated scale, the whole being placed in front of a mirror before the observer.

Although in an experimental stage, the invention has aroused considerable interest among medical men and physicists, who, so far, have been unable to refute what Dr. Russ claims to have done. Should further tests in utter darkness prove successful, the natural conclusion would be that the eye is a transmitter of a form of energy wave generated in the body, and we should be faced by a phenomenon akin to the mystery of telepathy, and one with which wireless may some day be associated.

A HOME-MADE CONDENSER.

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

A VARIABLE condenser, though not indispensable with a crystal receiving set, is always a very desirable acquisition, and often brings in signals otherwise unobtainable, or renders those you have more readable.

Several reasons may prevent some of my readers from purchasing a ready-made article of the standard pattern, but provided care is exercised in the process, a reliable one of home manufacture is not at all difficult to construct.

Fortunately the required amount of variable capacity in wireless practice is usually very small, and a couple of pieces of zinc about three or four inches square, with a thin sheet of mica in between, to prevent metallic contact while lying flat on the table, so that the top piece of zinc may be slid about relatively to the other, and have a varying surface opposed to it, is quite sufficient for most needs.

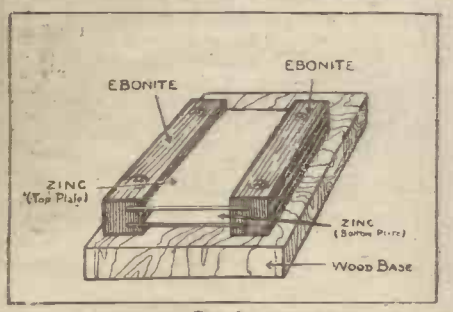


Fig. 1.

Such an arrangement, though efficient, is inconvenient, untidy, and suffers from the disadvantage that by touching it with the fingers while adjusting, or even by bringing the hand near to it, you may make a lot of difference in the resultant effect. This may be got over by moving the top zinc plate with an ebonite knitting needle. This needle might be fastened to the top plate, and then the increment or decrement of capacity may be made very gradually. Take care to see that your fine and finished adjustment is not upset as soon as made by an inadvertent knock on the long handle.

Simple and Efficient.

To avoid this the top plate might be made to slide in grooves in a frame, the bottom one being fixed in the frame. Then you may leave the space in between occupied only by air, or the capacity could be increased by filling in the space with mica. The air condenser would have less capacity, but the mica might have other less desirable qualities with its increase of capacity.

Such a condenser is illustrated in Fig. 1.

The slips in which the zinc plates slide had better be made of ebonite if at all possible.

One of the more easily made variable condensers is of tubular form. This consists of two tubes of brass, one sliding inside the other,

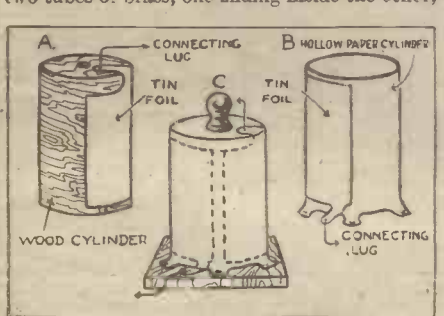


Fig. 2.

and kept from contact by means of thin ebonite or waxed paper, wrapped round the inside one. An old telescope might easily provide the concentric tubes, and with thin ebonite between them they would slide in and out of one another without metallic contact. If paper is used it should be pasted on to the outside of the inner tube, and when thoroughly dry, dipped into hot melted paraffin wax. The outside tube should be provided with lugs soldered on, so as to fasten it down to a board, and the inner tube should have a handle to permit of its being moved in and out of the larger tube.

One of the writer's most successful little variable condensers was made from the thin ebonite cylinder of an electric gas lighter, lined with tinfoil, and sliding in and out of a zinc tube. It made a tight sliding fit on the outside.

Another easily made condenser is built up as follows. A cylinder of wood four inches long and about three inches in diameter (see A, Fig. 2), has a piece of tinfoil pasted upon one side, and covering half of its cylindrical surface. The tinfoil has a lug which is connected under a round-headed screw and washer to a flexible copper wire connection. The cylinder is now wrapped round tightly with two thicknesses of thin, tough paper pasted on. When the paste is quite dry, dip it into hot melted paraffin wax, and your movable part is finished.

Now wrap a piece of dry paper round the movable cylinder, and take care that it does not stick, as this is the packing upon which you are to build the stationary portion of your condenser.

Varying the Capacity.

This stationary part is now built up by, first of all, two thin sheets of similar paper to that used for covering the tinfoil on the movable cylinder being pasted together so as to form a complete casing

On the outside of this casing paste a piece of tinfoil, similar to that on the inside cylinder, leaving a lug for attachment of the wire as before (Fig. 2, B). Then paste a few more sheets of stiff paper on the outside of this, making lugs as shown in the figure, and these lugs fortified with rag, so as to fasten the case, when completed, down to the base board as shown. You will see that by turning the one cylinder round inside the other you will vary the capacity very gradually.

When the two sheets of tinfoil are lying one inside the other close together, the capacity is

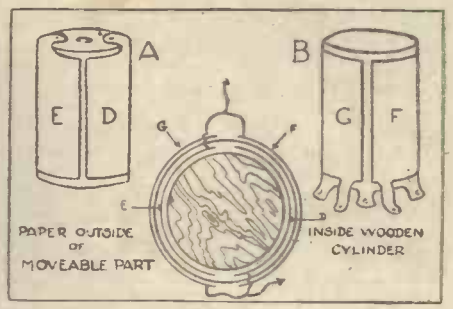


Fig. 3.

at its maximum, and when on opposite sides of the cylinder, the capacity is at its minimum, shown diagrammatically at C, Fig. 2.

Now by a slight alteration of the same method of construction, you may double the capacity of the condenser at its maximum, without greatly increasing its minimum, a very desirable quality in a condenser.

Take two pieces of tinfoil slightly smaller than the one you pasted on the movable cylinder (A, Fig. 2), and paste them on opposite sides of the cylinder with lugs coming out on top as at A, Fig. 3.

In making up the case as before (B, Fig. 2), use two pieces of tinfoil instead of one, but be sure that they do not touch, B, Fig. 3. A space of a quarter of an inch should separate the nearest edges of the two sheets of tinfoil both on the cylinder and also on the case.

Care Needed.

When connecting up with flexible wires, D and G should be connected together, and E and F should also be connected together. When in the position as shown in the diagram their capacity is at its minimum. If the inside cylinder is now turned round half a revolution, so that D is closest to G, and E closest to F, the capacity will be at its maximum. The flexible connections will allow of the rotation of the inside cylinder, and you will have a piece of apparatus which will be efficient, and which will show to advantage if care be exercised in its manufacture.

In bringing down your connections from D and G and E and F to terminals on the base, see that the terminals are well insulated. Do not rely on the wood, but use a strip of ebonite in which to mount the terminals, or "bush" the holes in the base with ebonite bushes, to prevent the metal from coming into contact with the wood. All such carefulness as this is amply repaid by the results obtained.

BOOK REVIEW.

"The Construction of Wireless Receiving Apparatus." By Paul D. Tyers. (London: Radio Press, Ltd. and Sir Isaac Pitman & Sons, Ltd. Pp. 76, illustrated. Price, 1s. 6d. net.)

THIS little book is perhaps the only complete collection of constructional details which has ever been published. Every component of a valve and crystal set is given very full consideration, and the author has not in any case confined his remarks to one method of construction alone. He states that he has written for the amateur who has neither lathe nor expensive tools, and many of the methods described are extremely ingenious.

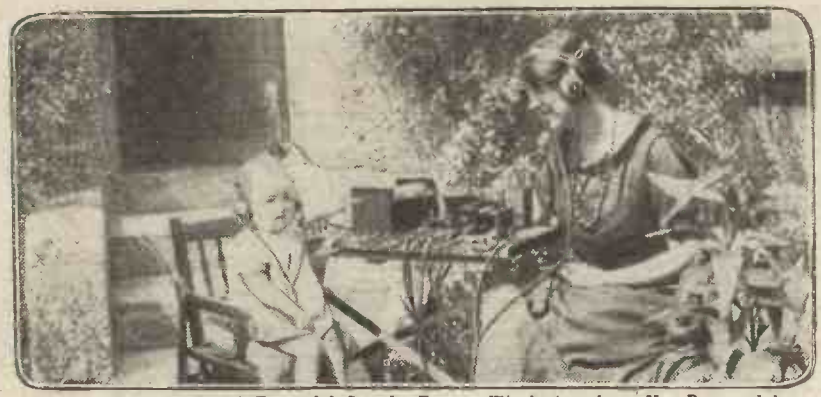
In Chapter II., which deals with inductances, no less than eleven different types of coils are discussed, and a winding machine for each is discussed. Chapter IV. contains some very useful hints on the maintenance and use of filament accumulators, and this should prove very helpful to those who are using cells for the first time. Three forms of filament rheostats are dealt with in another chapter, the type for panel mounting being most interesting. The wire is wound on a plaster circular former, over which a contact moves. The complete resistance can be made for about a shilling, and the necessary tools are a fretsaw, file, and soldering iron.

Another interesting feature of the chapter is a potentiometer made from a lead pencil.

It is not often that one finds constructional details of high tension batteries, but here again four types are fully described.

The author is to be congratulated on this excellent little book, which appears to be ideal for the man who wants to make his own wireless components. Every reader who spends the modest sum of 1s. 6d. will be more than amply rewarded.

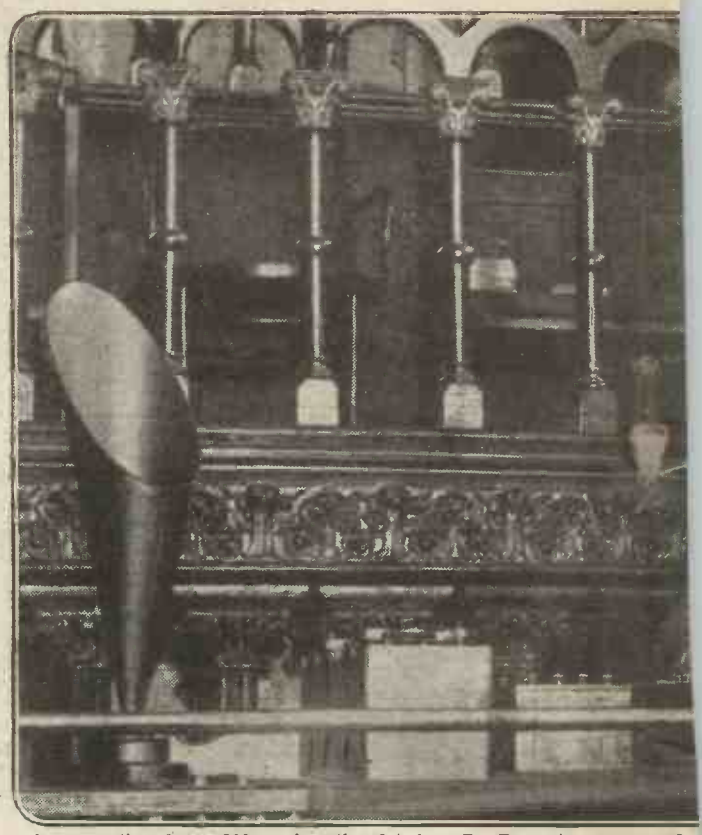
THE INITIATION



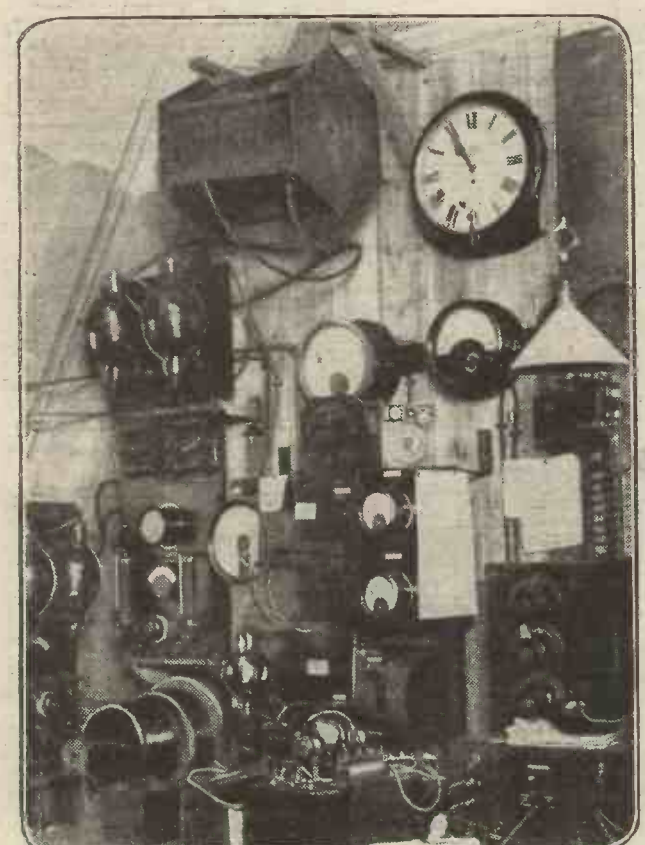
This photo, sent in by Mr. G. Dyer, of 9, Crowden Terrace, Winchester, shows Mrs. Dyer and her little child listening-in on a home-made crystal set.

Mr. F. E. Ives and his friends listening to "The Daily Mail" concert from the Hague at the National Sanatorium, Benenden, Kent. Mr. Ives, who is recruiting his health and is debarred from the pleasures of town, finds wireless a great boon.

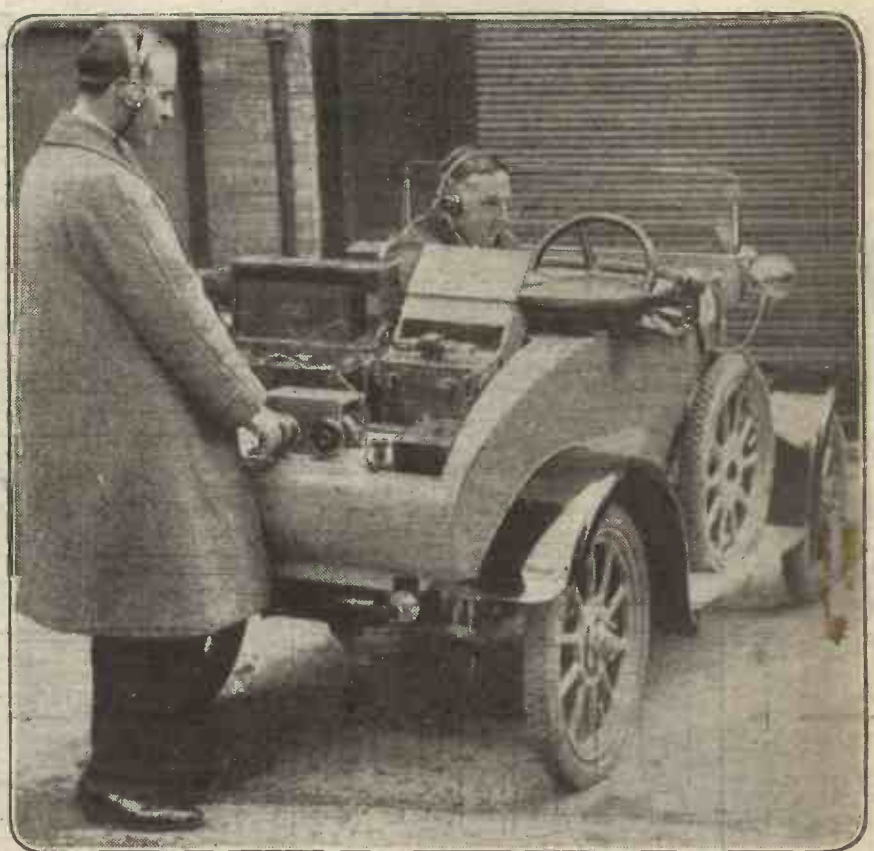
A SERMON BY W



A congregation of some 300 people gathered to hear Dr. Boon give a sermon by Blackheath, and people in Bexhill heard every



The India House wireless telephone set. The call sign of this station is G F A—familiar to listeners-in.

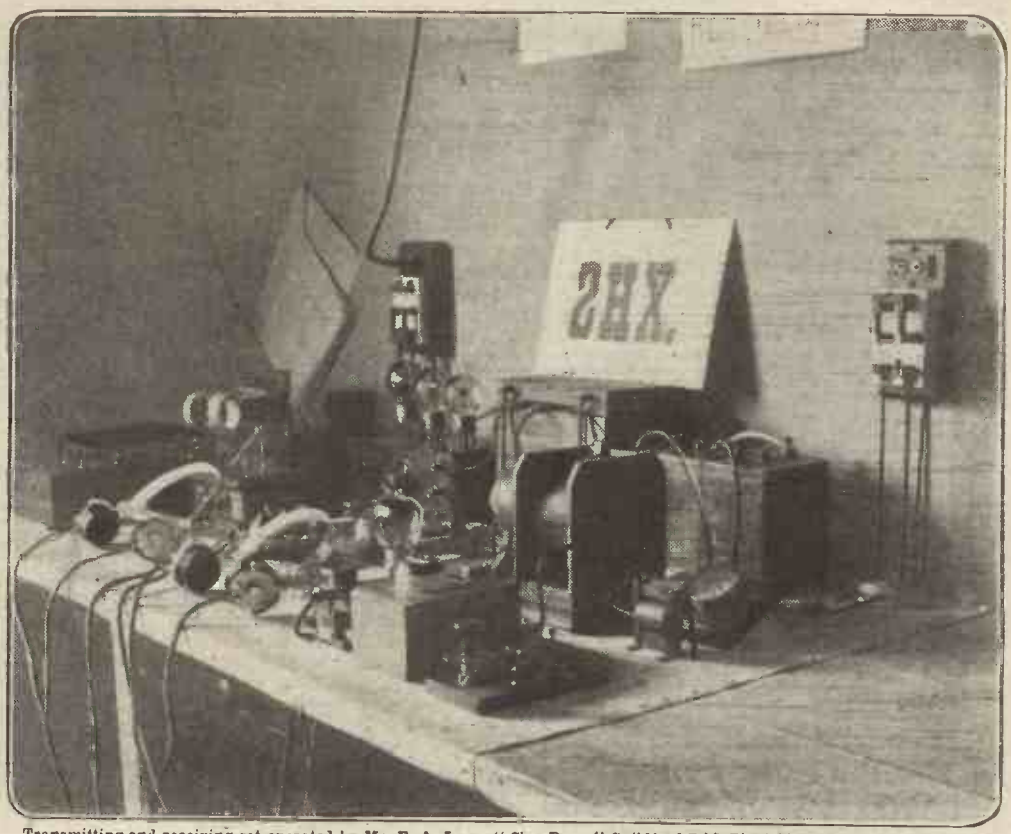


At a demonstration given by the Jowett Light Car Social Club the other day, a wireless set was fitted to a two-seater, and experiments were carried out. Good signals were received while the car was travelling at a fast speed.

IRELESS

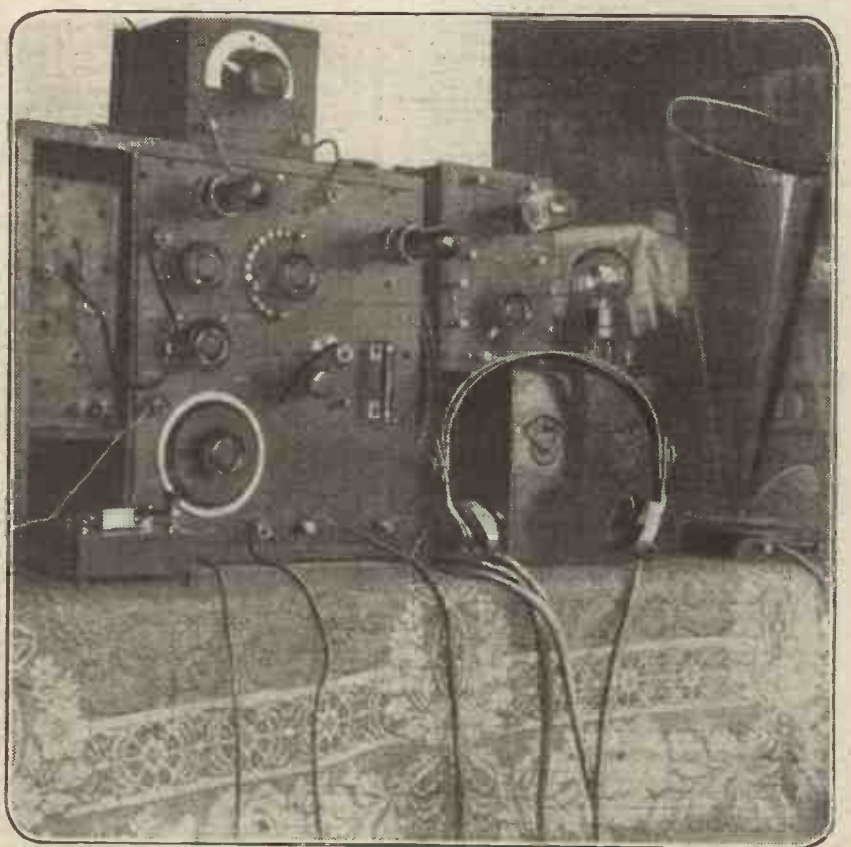
AN AMATEUR TRANSMITTING SET

wireless the other day. Dr. Boon spoke from word of his address.



Transmitting and receiving set operated by Mr. F. A. Love, "Clay Dene," Guildford Park Road, Guildford, Surrey. Power is supplied for the transmitter by a 600-volt generator, and modulation is effected by the grid control system. The set was originally installed to check the transmissions from 2 A Z—Mr. William Le Queux's set.

This photo, sent in by Mr. C. Smith, of 55, Sheals Crescent, Maidstone, shows a wireless set fitted on a scooter by a Boy Scout. Although the receiving range is limited, good telephony has been heard.



Mr. W. T. E. Crief's set, at 40, Manor Park Road, Harlesden, N.W.10. Good telephony is received from the Hague, Brussels, etc., using two valves only. Although resistance coupled H.F. amplification is employed, Mr. Crief gets excellent results on 350 metres.

SUBMARINE WIRELESS.

THE next naval war will be decided by the submarine, says Thomas Edison, the great American inventor: and in anticipation of the fulfilment of his remark America is paying particular attention to the development of this type of marine craft.

The latest from "over there" is the discovery of a method for sending wireless messages to and from submarines while they are submerged. Previously, it has always been necessary for submarines to come to the surface in order to use the wireless, and during the late war the very warm reception which they frequently received on appearing at the surface was not in accordance with their desires.

A New Discovery.

For many years now it has been known that wireless waves on striking the surface of the sea are stopped and reflected back in the direction from which they came. This is founded on the wireless law that all electrical conductors, such as water and metal, interrupt the passage of wireless waves.

If, for instance, your transmitting apparatus upsets the sensitiveness of the receiver, you place a metal screen between the two—with the result that the transmitter will no longer affect the receiver's sensitivity. This is because the metal screen reflects back the wireless waves of the transmitter, just as a high stone wall will throw back your voice if you shout against it; or as a metal reflector in a motor-car lamp reflects back the light from the lamp. In this respect it is interesting to note that sound waves, light waves, and wireless waves are all subject to the law of reflection.

It has been discovered, however, that the amount of waves reflected back from the surface of the sea is not as great as it should be—some waves are missing. After much investigation these waves were found to be penetrating beneath the surface of the sea, and herein lay a new discovery in wireless. The reason why this phenomenon has not been found out before is because the instruments used have never been sensitive enough to detect the presence of these waves, which are very minute.

Peculiarities of the New Waves.

Experiments have proved that these waves will penetrate further into non-electrical conductors, such as glass, than they will into electrical conductors, such as the sea.

A more useful discovery, however, is that long waves penetrate further beneath the surface of the sea than do short waves. For example, a wireless wave measuring 1,000 metres from the crest of one wave to the crest of the next penetrates to a much greater distance than a wave measuring only 100 metres from crest to crest

A Unique Aerial.

Except that a long wave-length is used the wireless apparatus for sending to the submarine from a ship or shore station is practically the same as that of the ordinary wireless transmitter, but the apparatus for the submarine is rather unique.

In the first place, the submarine uses as an aerial its own metal body, and, in addition, two copper wires which run from the wireless installation up a short mast erected on the outside of the periscope, to either end of the vessel. One wire is electrically connected to the body of the submarine at the stern, and the other wire is electrically connected at the bows. These wires run through insulated tubes and make no connection with the sea. This peculiar type of aerial has the same properties as the ordinary loop or frame aerial.

Perhaps the strangeness of this aerial will be realised when it is remembered what infinite precautions are taken to prevent ordinary aerials from touching chimney-pots and drain-pipes and consequently "earthing"; whereas the submarine aerial is always touching "earth"—if for once we may call the sea "earth."

By means of this type of aerial and by employing valve amplifiers (for increasing the strength of the wireless waves received) it is possible to hear land and ships stations some considerable distance away.

Most Marvellous of All.

Many doubtless know that the loop aerial is rarely used for sending on land or sea, even under the best conditions—principally because it will not radiate wireless waves at all well. Yet, although the aerial on the submarine is, to all intents and purposes, the same as a loop, it is possible to send from one submarine to another while both are under the water. This is done by employing exceptionally high power and the longest convenient wave-length.

With the advent of submarine wireless new problems have naturally arisen. Amongst many others, one of the most interesting is the question of the ether of space, and whether it is confined to space alone.

In our use of the word space, the belt of atmosphere around the earth is usually included, and as the difference between our atmosphere and the sea is only a matter of density (there is also a very slight chemical difference), ether may also be intimately connected with the ocean of water just as it is with the ocean of air or space.

WIRELESS BEFORE WIRELESS.

THE wireless of to-day is not the first means by which messages have been sent across immense distances without the aid of wires, messengers, or any other visible means of transmission.

A person with any knowledge whatever of Africa will tell you of the almost incredible rapidity with which "bush wireless" will carry news between natives in widely separated areas.

Sometimes the method employed can be partly understood. Drumbeats are frequent signals, smoke is also employed, and, in some parts of the Gold Coast, whistling. But there are other means which are neither visible nor audible, which Europeans have never been able to explain, by which tribes can "broadcast" news over very large areas with a speed that has actually been known to be quicker than line telegraph!

Their wireless messages are secret—at least from the ears of white men. Even the European who has heard the far-away drums swelling out their sound over the vast countryside has tried in vain to sort out the unintelligible beats that mean so much to the natives.

Yet by "bush wireless" the natives know when the White Baas starts on his tax-collecting round; that same tax-collector may meet a crowd of natives on their way to a distant village, where, they have learnt by wireless, there will be a night of celebration at the next full moon; he may be warned to beware of lions who—so the bush wireless says—are making their way towards the neighbourhood.

The natives have put their wireless to many purposes of daily utility for a great number of years past. We have got to go a long way before our wireless is so completely at the disposal of the "man in the kraal"

STEP BY STEP IN WIRELESS.

Note: Under this heading will appear a weekly article for the more advanced amateur.

No. 13.—THE HETERODYNE.

IT is the purpose of this article to instruct the amateur to graphically represent exactly what takes place when an alternating current of a certain frequency is superimposed upon another alternating current of a slightly different frequency. If these instructions be conscientiously followed, and a careful drawing made, the underlying principle will be thoroughly understood; moreover, owing to the fact that the work has been personally done, the reason for the electrical phenomenon known as the Heterodyne need never be forgotten.

It must be pointed out that the most common and, in fact, the best idea of the "frequency" or "beats" of an alternating current is obtained by visualising the current as acting in the form of a wavy line, the "beats" being represented at each "wave-crest" and "wave-trough."

In Fig. 1 is illustrated two alternating currents, the one having a slightly different frequency to the other; it will be seen that for every five "beats" in current A, there are six "beats" in current B. Thus the two currents exactly correspond at certain regular intervals, and at these points they are said to be "in phase."

The Curve.

Now in the diagrammatic representation of an alternating current it must be understood that the value of the current *above* the imaginary line XY is positive, while *below* the line the value is a minus one. Wherever the line of current crosses the XY line, the current has no value at all.

At any point on the line representing the current, a definite value of the current at that point may be determined; this is obtained by measuring the vertical distance from that point on the current line to the XY line, always remembering that above XY values are plus, and below XY values are minus. (In actual practice a current curve would, of course, be set down to a known scale, so that a measurement taken would mean a definite value.) All such vertical distances are called vertical ordinates of the "current line," or, as we shall henceforward call the latter, "the curve."

In Fig. 2 will be seen our two curves, which we shall call A and B, these curves representing two alternating currents of a slightly different frequency; and it is our purpose to illustrate the curve or current resulting when these two currents are superimposed or combined with each other. It will be seen that parallel lines have been drawn through the two curves, these lines being perpendicular to and crossing the XY lines of A and B. They thus form vertical ordinates wherever they cross the curves.

For the actual draughting out of these curves, squared paper may be used, and is, in fact, indispensable where the drawing-board,

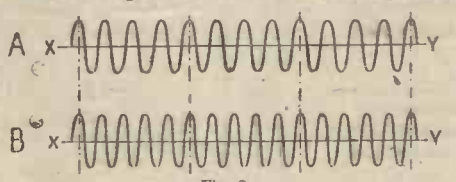


Fig. 2.

T square, and set square are not available; but if the ability of the draughtsman warrants it, he would be well advised, and perhaps his instruction more complete, if he uses plain paper and all drawing done by means of the T square and set square.

For greater accuracy and clearness, all straight lines should be drawn with a fairly hard pencil, say HH, sharpened to a chisel edge; for the drawing of the curves, however, a softer pencil may be used to advantage, say HB or F, sharpened to the usual point.

The three XY lines should first be set down in much the same relative positions as indicated in Fig. 1. Proceed by opening the dividers to a convenient measurement, and prick off equidistant points along the XY line of Curve A; through all these points draw perpendicular lines, standing slightly above the XY line of Curve A and continuing downward, crossing the XY lines of Curves B and C.

The First Section.

Now as to the drawing of Curve A; make a careful drawing of one section of this curve, comprising the crest of the wave (above the XY line) and the trough of the wave (below the XY line). This complete wave must occupy four spaces between the perpendiculars already drawn; commencing on the extreme left on the XY line (Curve A) and rising to the crest of the wave exactly on the first parallel line, which now becomes a vertical ordinate, dropping down and crossing the XY line exactly on the second parallel line, continuing below the XY line and forming the trough of the wave exactly on the third parallel; the curve now rises and once again crosses the XY line on the fourth parallel.

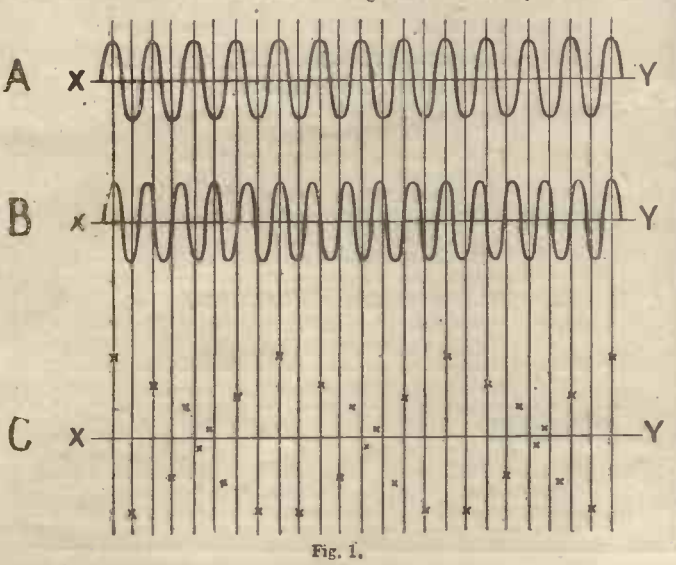


Fig. 1.

The measurement of the plus vertical ordinate at the crest of the wave must be equal to the measurement of the minus vertical ordinate at the trough of the wave, thus making the curve symmetrical about the XY line.

The first complete section of the Curve A having been satisfactorily drawn, the continuance of the curve may be most conveniently done by tracing this first section and repeating until the required length of curve is obtained.

Curve B may be drawn in an exactly similar manner, remembering that a fresh set of equidistant points must be pricked off along the XY line (Curve B), six of them exactly occupying the same space as five of those in Curve A, since six beats correspond to five beats in B and A respectively. Let the height of wave-crest and depth of wave-trough be equal to those of Curve A.

Our two Curves A and B are now drawn complete, and are relatively perpendicular to one another. Curve C may now be plotted, showing how the independent and varying values of Curves A and B are combined, and the form of the resulting curve. This must be accomplished in the following manner:

At the first vertical ordinate both curves show a plus value; these two vertical ordinates must be added together (by means of the dividers) and their combined measurement be plotted on the corresponding perpendicular line on Curve C. Thus the first point of our required curve has been obtained.

Joining Up.

In this first measuring of the ordinates of curves A and B both of them happen to be of the same sign, and are therefore *added* together; further along the curve, however, one ordinate may be plus and the corresponding ordinate on the other curve minus, in which case the lesser measurement must be *subtracted* from the greater, and the *difference* plotted on the Curve C. If the greater measurement be a plus one, then the difference must be plotted on Curve C *above* the XY line; if the greater measurement be a minus one, the difference must be plotted *below* the XY line.

If the two ordinates are both minus, their *sum* must be plotted *below* the XY line on Curve C.

If this method be carefully followed throughout the whole curve, the plotted points of Curve C should appear as in Fig. 2. On these plotted points being joined up by a curved line, the Curve C illustrated in Fig. 3 should be the result.

A Fundamental Principle.

In a nutshell, the principle may be stated thus: When two alternating currents are superimposed, at certain definite regular intervals the energy of the resulting current is much increased by the fact that the two individual currents at these points are of like sign, and their energy is therefore added; at other definite regular intervals the currents are of unlike sign, the energy of one neutralising the energy of the other; thus the resulting energy at these points is zero.

This causes very pronounced periodic beats in the resulting current, occurring at a much lower frequency than the original frequency of either of the two currents employed.

Needless to say, if two currents be used, whose frequency differs very little one from the other, say of the order of 99 compared with 100 (instead of 5 to 6), the resulting frequency is very low indeed.

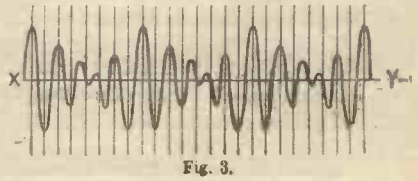


Fig. 3.

WIRELESS CLUB REPORTS.

The Editor will be pleased to publish concise reports of meetings of wireless clubs and associations, reserving the right to curtail the reports if necessary. Hon. secretaries are reminded that reports should be sent in as soon after a meeting as possible. Reports sent in cannot appear in this paper in less than ten days after receipt of same. An asterisk denotes affiliation with the Wireless Society of London.

The Durham City and District Wireless Club.

The third meeting of the above club was held in the Rose and Crown on Friday, August 4th. Considering the fact that a large number of the members were on holiday, the attendance was quite large. Several new members were enrolled.

The meeting was a great success. The chair was taken by Mr. F. Sargent, F.R.A.S., of the Durham Observatory. After the minutes were read and passed, a lecture was given by Mr. G. Barnard on "The Electro-Magnetic Theory and Its Application to Wireless Telegraphy."

The lecturer commenced at the very beginning, so that no one would be left behind. At the termination of the lecture a hearty round of applause was given, after which the hon. secretary made some important announcements, among which were the following:

The headquarters are definitely fixed at the Y.M.C.A., Claypath, Durham, where a receiving station will be very shortly installed.

Affiliation with the Wireless Society of London is well under way.

A question box is to be fixed in the club-room for the benefit of members too shy to speak at the meetings.

A full list of officers, it is hoped, will be ready to submit to the next meeting.

Membership cards are now ready.

Mr. Kelly (hon. treasurer) presented the club with a very fine, loud-sounding buzzer of the open type. This kind action was greeted with hearty applause. Mr. Nurthon, who is on the committee, has undertaken to take charge of the buzzer class, having had considerable transmitting experience. The chairman here made some very interesting remarks. He was glad the lecturer had mentioned Dr. Gilbert as one of the founders of electro-magnetism, and pointed out the wonderful achievements of Britishers in the science of wireless.

The hon. secretary takes this opportunity of inviting all who are interested to come along to the next meeting, failing which he will be pleased to receive any names and addresses of any persons, of either sex, desirous of becoming members, so that he may submit them as candidates for election to the club. The hon. secretary's address is 3, Sowerby Street, Sacriston, Durham.

Blackpool and Fylde and Lytham St. Anne's Wireless Societies.*

Thanks partly to the interest taken by the general public in the broadcasting scheme, but chiefly due to the energy of the executive committee, the society has now entered upon an era of prosperity. Membership is still going up steadily, and an assistant hon. secretary was appointed a short time ago to help to cope with the business side of the society's affairs.

In June last a branch was opened in the south-west area of the Fylde district for the benefit of members who otherwise would have to cover upwards of ten miles to reach the Blackpool headquarters; and although Blackpool is comparatively of humble proportions, the society finds support from a district quite as extensive as either Manchester or Liverpool.

This departure, when made, was very much overdue, and twenty-five members were automatically transferred from the Blackpool headquarters. This number has since been doubled by new members joining.

The society is well upholding their town's motto of "Progress." A transmitting licence for the Blackpool headquarters is daily expected, and, when it arrives, a broadcasting service is to be inaugurated for the benefit of its members and others, and also for an interchange of messages with the Lytham St. Anne's station.

On July 13th Mr. B. D. Taylor, the hon. librarian, submitted for inspection a home-made loud speaker, an adaptation of a motor-car petrol-filler; and on July 20th Mr. Taylor demonstrated the capabilities of a home-made but very well constructed and compact one-valve set.

On August 3rd Messrs. J. V. Potter and B. D. Taylor, after considerable trouble and patience, evolved an ingenious three-valve amplifier which should equal, if not excel, the well-known four-valve variety, as the clarity and intensity of the signals heard by means of this instrument amply justify the claims made on its behalf.

The society believe they are the first in this country to require and open out what is really a branch. The executive committee, whilst fully realising that mere numerical strength is not everything, encourage the bashful but enthusiastic amateur to their doors.

One of the many problems which the society is tackling is the evolving of a circuit, the use of which will prevent badly manipulated amateur stations causing interference, which at the present time is causing so much trouble and annoyance to other amateurs, as well as to the powers that be.

If this disregard for the consideration of others continues, the amateurs generally will undoubtedly find themselves in disrepute, due to the unsportsmanship of a few, and eventually some of the privileges which they now enjoy may be curtailed.

Hon. sec.: C. S. Doeg, The Poplars, 6, Seventh Avenue, South Shore, Blackpool.

Fulham and Chelsea Amatuer Radio and Socia. Society.

On August 1st an informal meeting took place at the Stanley Ward Conservative Club, 428, King's Road, Chelsea. Mr. Oliver explained the reasons of the meeting. Discussion was then invited as to the advisability of forming a local wireless society, and finally the following proposition was proposed by Mr. Scutt and seconded by Mr. Paterson:

"That this meeting take the necessary steps to form an amateur wireless society in Fulham and Chelsea."

This was carried unanimously, on the proposition of Mr. Cox, seconded by Mr. Wood.

A committee of management was then formed of the following gentlemen: Messrs. Scutt, Flood, Fildes, Martin, Paterson, and Roberts. This committee being elected unanimously, a discussion then took place on a suggested title, and finally it was agreed to call the society The Fulham and Chelsea Amateur Radio and Social Society.

It was then agreed that the next general meeting be called after the committee had sat to consider the necessary rules and details. A vote of thanks was then proposed by Messrs. Gray and Gauntlet to the Stanley Ward Conservative Club for allowing us their room. Messrs. Martin and Roberts proposed a vote of thanks to the chairman, both of which were duly carried, the meeting then being closed with expressions of appreciation on the forming of a local wireless society.

Attendance, 70, ladies also being present at the above meeting.

Hon. sec.: Mr. R. S. V. Wood, 48, Hamble Street, Fulham, S.W. 6.

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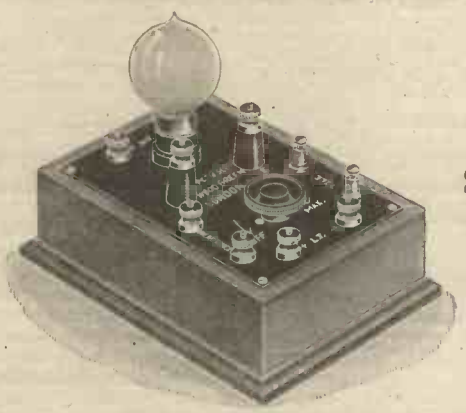

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Crystal Tuner auto-coupled, complete with condenser and crystal	1	18	0	Valve Legs, with nuts and washer Each Set	3
Crystal Tuner Double Slide, auto-coupled, complete with condenser and crystal	2	13	6	Valve pin	2
Ebonite Valve holders, 4 legs, with nuts and washers		1	0	Terminals, complete, small and medium, per doz.	1 8
Ebonite Valve holders, complete, best quality		1	9	Terminals, complete, large, per dozen	2 0
Ebonite Slider and Plunger			8	Square Brass centre rods for Condenser	6
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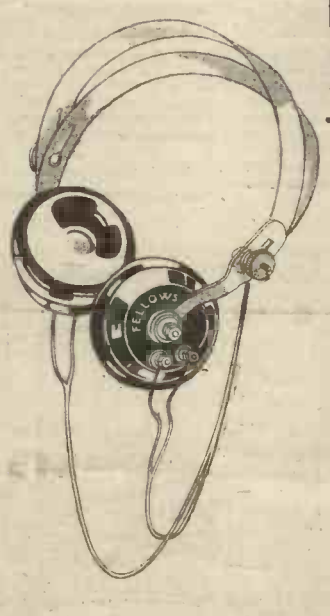

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RADIOTORIAL

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

It may be said that patience is a virtue possessed by at least some thousands of wireless amateurs.

The exasperating delays in the formation of a broadcasting combine, and the contradictory reports issued from time to time in the daily Press with regard to the future of broadcasting, have been enough to try the patience of a Job, let alone wireless amateurs, who have studied the art of patience when listening in for P C G G.

However, a general sigh of relief has risen from the radio ranks at the welcome, if belated, announcement that the broadcasting company has at last been formed.

Its members, no doubt exhausted by arduous debates and passionate appeals for "protection," certainly deserve a long holiday.

Let us hope the broadcasting service will be set fairly on its legs first.

As I write these words—some five days before my readers will be able to scan them—it has been stated in the Press that broadcasting will commence at Marconi House in one week's time.

So that by the time these words are read the service should have been sampled from the Marconi House station by some thousands of amateurs.

And from what I know of the activities at 2 L O, the service will be an exceptionally good one. However, there is many a slip 'twixt cup and lip, and I can only hope that another last-minute delay will not crop up and disappoint the expectant thousands.

To all responsible amateurs I would again issue a word of advice: Do everything in your power to instruct the novice in the proper adjustment of his valve.

Interference from amateur valve adjusters will have disastrous consequences unless the evil is quickly remedied.

THE EDITOR.

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: POPULAR WIRELESS, Queries Dept., Room 131, The Fleetway House, Farringdon Street, London, E.C.4.

Readers are requested to send necessary postage for reply.

C. E. L. (Palmer's Green).—To what wave-length will an inductance 4 in. diameter by 11½ in. long, wound with gauge 21, tune to with a 70 ft. long 26 ft. high aerial?

About 1,200 metres.

* * *

B. D. (no address) gives details of his crystal set, asks from what distance he should receive telephony and spark, and how he should improve his range.

Range of reception depends upon so many factors, not the least being the power of the transmitting station, that it is impossible to give definite figures. Generally speaking, a crystal set is limited to 15–20 miles or so for the reception of telephony. In the case of signals from spark stations, however, the range of such a set is most elastic. Hundreds of small stations equipped only with simple crystal detector receivers receive Eiffel Tower time signals at night over distances of thousands of miles. Ships in the far Atlantic and small outposts in the deserts of Egypt can all hear F L's mathematically precise signals on "carborundum" or "perikon." That is at night, when every amateur station—in Great Britain, anyway—should be able to receive these and numerous other signals from spark stations on their home-made sets with the greatest of ease.

As the sun gradually rises in the east, so will signals become gradually weaker, until only the more powerful stations can be heard. This phenomenon has been the cause of much annoyance in the past. During the days of the Great War the news transmitted by the now retired Poldhu was the cause of much winding of milk and cocoa tins, these being the basis of a series of loading coils to step up the wave-length of the now famous Mark 3 short-wave tuner.

It was not difficult to hear Poldhu when he started over ranges of two or three thousand miles even with this primitive apparatus, but towards the end of his carefully transmitted Press messages the sun would begin to rise and signals would become unreadably weak, finally becoming inaudible, the last readable words generally indicating that the "chef d'œuvre" had been contained in the last unobtainable few words.

* * *

F. H. O. (Ealing).—I wish to re-set a crystal; will the heating of same be harmful?

Most harmful if ordinary solder is used. Use "Wood's Metal," an extremely soft solder, and no flux. Carefully clean the cup, and run in a few drops of the metal, melting it over a small spirit lamp, and carefully press in the crystal.

* * *

T. I. (Bradford).—Can you tell me what size wire to wind my inductance with if I use 1,000-ohm telephones, and what should I use if I have 4,000-ohm telephones?

There is no particular rule to be observed. In any case use 22 or 24 S.W.G. for the inductance coil. The 4,000-ohm telephone receivers will be the more useful.

* * *

F. G. L. (Colchester).—Mr. Blake states in his articles that the electrons flow from the negative pole of a battery through the circuit to the positive pole. I have always been given to understand by all the standard text-books on the subject that the current flows from the negative element in the battery itself to the positive element and thence leaves the cell by positive pole.

You mean from the positive element to the negative element, the latter being the positive pole. Mr. Blake is quite correct in his statement from the point of view of the electron theory. It is much more consistent with the practical applications of this latter to say that the current or stream of electrons flows from the negative point. Although for years past, and indeed many years before the electron theory was evolved, it has been said that current invariably flowed from a positive point, there is really no reason why a statement to the effect that the current leaves a primary cell from the negative pole should not be a fact.

* * *

W. R. G. P. (Barham).—If the aerial goes to a two-way switch, one of the contacts of which is connected to the aerial terminal of the set and the other to the earth, will it be sufficient for earthing?

Yes, but the switch must be mounted upon an ebonite base to prevent leakage from the aerial to the earth lead that would be brought into such close proximity.

* * *

H. D. (Rotherham).—What will be the wave-length of a coil 4 in. in diameter by 12 in. long wound with 380 turns of 28 S.W.G. used with 100 ft. aerial?

1,600 metres.

Is it better to have one or two sliders on the coil?

Two, if no variable condenser is used.

(*Continued on page* 251.)

LITTLE WILLIE IS LUCKIER THAN MANY AMATEURS!

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 250.)

"SHORTWAVE" (Middlesbrough).—My short wave set ranges from 160—600 metres. The primary is wound with 3 oz. of Number 24 S.W.G., D.C.C., and the secondary with 1½ oz. of Number 36 D.C.C. How can I increase the range of this set to about 10,000 metres?

You could place loading coils in series with both the primary and secondary inductances, but that would be both inefficient and we should think unnecessary. Apparently it is a crystal set, and there is little that would be received upon a wave-length above 3,000 metres. In any case, if you desire to range to a wave of such length and still be able to receive the shorter wave-lengths, it will be necessary to have interchangeable inductances, because one coil wound to tune to 10,000 metres would not tune down to 160. This is due to the fact that the turns not in use and generally styled the "dead end" of the coil will have very considerable capacity effects.

* * *

"KNOW NOWT" (Manchester).—I propose fitting a single aerial about 100 ft. long. The receiver to be in an old house, rather damp and not quite weather-proof. Is that unsuitable?

Highly unsuitable. Damp and deterioration, without mentioning the fact that current leakage will be serious, go hand in hand.

What sort of crystal will be best?

The "perikon" combination of zincite pressing against copper pyrites is as good as any.

The nearest water pipe is about 24 ft. away. Is that suitable, or could I do without an earth?

An earth of some description is essential. Judging by your first question, it would necessitate but a very short lead to enable you to obtain a direct earth by burying a metal plate or driving a metal rod into the ground. Such an earth is always to be preferred.

The telephone wires to a private house are about 10 ft. away. Will that cause trouble?

Using a crystal set there will be little or no interference, but in case you intend to extend to valves in the future it would be as well to erect the aerial as far from the parallel to these wires as possible.

* * *

"READER" (Earlsfield).—Will a cardboard former answer the purpose as well as ebonite or wood for the inductance coil to be used with the simple valve set described in Number 3?

That can be used, but it must be well shellacked or soaked in paraffin wax before winding.

Is Gauge 22 wire suitable?

Quite.

* * *

"AMATEUR" (Brighton).—I heard a station call the enclosed stations all at the same time; for what purpose would this station wish to communicate with so many other stations and yet not be in a position to send out a "C Q" signal?

If the list of 50 or so three-letter groups were station calls we find that the stations would extend from Australia (V K A) to China (X S C) and various other rather distant parts of the world covering several continents, so we therefore come to the conclusion that it was merely a code message that you intercepted.

* * *

"COBBY" (Keighley).—I have obtained two coils to make a loose coupler and I have been informed that the reaction coil must be placed so as to be in opposition to the other coil. How do I do this?

A reaction coil in a valve circuit would be coupled with the secondary coil. It would, however, be in no way in opposition, but must on the contrary be so arranged that the turns of wire wind in the same direction as those of the coil to which it is coupled.

* * *

T. A. S. (Chadwell Heath).—Is it possible not to use tinfoil with silicon crystal?

Certainly, but some method must be adopted whereby the crystal is held firmly in the cup with a good metallic connection to the external circuit. Small set screws can be used. Better still, the crystal can be embedded in "Wood's Metal," an extremely soft solder. Ordinary solder should on no account be used, as the heat necessary to melt it will burn the crystal and render it useless. It is not advisable to use even "Wood's Metal" in the case of galena.

How do I fix a 4-volt battery to a carborundum detector in a simple crystal circuit?

A potentiometer is necessary. Place this by one end of the winding and the slider in series with the crystal and 'phones. The 4-volt battery will be connected across each end of the winding. Do not forget to disconnect the battery when the set is not in use, otherwise it will continue to discharge through the winding of the potentiometer.

* * *

R. G. H. (Hammersmith).—I contemplate the erection of a twin aerial 60 ft. in length on a flat-roofed building about 50 ft. high, but I shall require a down lead of about 60 ft. Will this be too long?

It will not only be too long, but will not be allowed. For an aerial such as you describe the P.M.G. limit is 140 ft. of total wire used, including all the down lead to the terminal of the set. It will be advisable to endeavour to instal the apparatus in an upper room. The lead-in should follow the straightest line possible to the set, being kept well away from walls and other likely points of leakage.

* * *

H. T. (Birmingham).—When I hang my telephones on the wall the diaphragms go rusty. How can I prevent that?

Obviously you should not hang them on the wall, but should discover a drier and safer place.

* * *

"SPARKS" (Torquay).—I wish to take the aerial and earth leads to a plug so that I can plug my set on in either of two or perhaps three rooms. Will that be possible?

Certainly it could be arranged, but you should not expect any but the very poorest of results. Such essential rules as taking the aerial lead the straightest line from the aerial to the set, reducing the earth lead to a minimum, keeping the aerial and earth leads and other wiring as far apart as possible, would all necessarily be broken and contribute to inefficiency.

* * *

C. E. H. (Barnes).—Where can I obtain a list of the amateur stations in and about London?

There is no complete list obtainable. The Wireless Year Book gives a fairly good list.

(Continued on page 252.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page 251.*)

D. W. B. (Ricky).—Can you tell me the capacity of a variable condenser having 12 fixed plates 3¼ in. in diameter and 11 2½ in. diameter, the fixed and moving plates being separated by 1-16th of an inch ?

·004 mfds.

Also, the maximum and minimum wave-lengths of an inductively coupled tuner having a primary of 3¼ in. diameter and wound with 92 turns of 28 D.C.C., S.W.G., copper wire, and a secondary 2½ in. diameter wound with 175 turns of 36 D.C.C., S.W.G., with the above condenser and an aerial whose natural wave-length is 95 metres ?

It is presumed that the above condenser will be placed across the secondary. The capacity of this, by the way, is too great for a tuner of the dimensions mentioned; ·0005 mfds. would be more in proportion. Without knowing the actual values of the aerial it is impossible to give but a very approximate figure, as everything will depend upon the capacity and inductance in relation to the inductance of the leading coil. Thus a single wire aerial of a certain length will have more inductance and less capacity than a double aerial of slightly less length, although the natural wave-length may be the same. An inductance loaded upon the aerial with the greater capacity will give a greater wave-length range. Assuming the aerial in question to be a single wire of some 70 ft. in length, the wave-length range would be up to 630 metres.

* * *

"Amateur" (Sheffield).—Will the using of a potentiometer in conjunction with a crystal detector and a 21 plate condenser be of any advantage ?

Unless the potentiometer is used with dry cells in order to apply an initial potential to a detector consisting of a carborundum and metal combination, no useful purpose will be served by its addition to the set in question.

What wave-length signals will be received on a crystal detector set the tuning coil of which is formed of a 3½-in. former with 11 in. of wiring, the wire being 26 S.W.G. ?

Assuming that the wire is single cotton-covered or enamelled and that there are some 450 turns and that the aerial is the standard single P.M.G., 1,600 metres.

Of what advantage is a filament resistance ?

It has several very great advantages. Perhaps the most important and the least known is that by gradually applying the current by means of such a variable resistance to the filament the useful life of a valve is very much lengthened. As more and more current is allowed to pass through the wire of the filament, so does the temperature of the wire rise gradually. If no resistance is used and the full current allowed to pass through the wire of the filament, immediately the accumulator is placed in circuit, the sudden rise in temperature will have a weakening effect on that wire. Also it might well be mentioned that it is not conducive to the long life of the accumulator to start its discharge at maximum, but this point is of minor importance. The second useful purpose the filament resistance serves is to regulate the temperature of the filament so that the valve functions to its greatest advantage. There is a point in the rise of temperature, evidenced by the brightness of the filament, above which a further increase would be disadvantageous. That is known as the saturation point.

* * *

T. F. (Chiswick).—Have aerials ever been patented ?

Yes ; there are numerous patents covering various arrangements of aerial systems. These are mostly in connection with wireless direction finding.

I notice that there is very little actual metallic connection between the two sets of lines on a railway. Would it not be possible to use these for communication by means of high-frequency currents, thus saving the expense of erecting at least a number of telegraph lines ?

No; it would not be possible unless the lines were properly connected at each fishplate as are electric railway lines, and highly insulated. Even were this done it is more than probable that the friction of the wheels of the trains would generate such a quantity of electricity that communication over even short distances would be impossible.

Printed and published every Friday by the proprietors, The Amalgamated Press (1922), 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. Saturday, August 26th, 1922. Y/Y