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Popular Wireless

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No. 87. Vol. IV.

SCIENTIFIC ADVISER: SIR OLIVER LODGE, F.R.S., D.Sc.

January 26th, 1924



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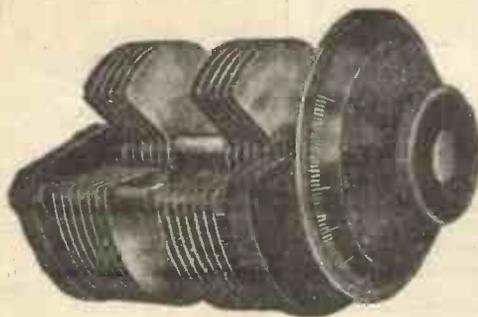
FEATURES IN THIS ISSUE.

Some Dull-Emitter Hints.
 A Visit to the Cardiff Station.
 Handy Terminals for your Set.

Ideas for the Home Constructor.
 Simplified Reinartz Receiver.
 Paris to Brighton on 5 Watts.

The Transmission of Photographs by Wireless.

Get America EVERY night



THE "DUANODE"

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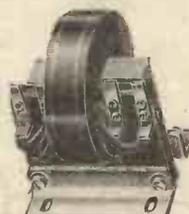
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POPULAR WIRELESS

THE WIRELESS WEEKLY WITH THE LARGEST CIRCULATION.

January 26th, 1924.]

SCIENTIFIC ADVISER, SIR OLIVER LODGE, F.R.S., D.Sc.

[Every Friday]

TOPICAL NOTES AND NEWS.

Another Amateur Achievement.

ANOTHER amateur achievement has been accomplished by Mr. J. Dixon, of Southfields. His speech and music were heard distinctly by a Mr. A. White, of Kansas City, Missouri, a distance of about 4,500 miles.

* * *

Low Power Work.

ONLY using 10 watts and transmitting on 195 metres, Mr. Dixon is inclined to think that the favourable weather conditions were responsible for the wonderful results. Mr. Dixon's call sign is 2 X J.

* * *

The King's Speech.

SINCE the Cabinet refused to allow the broadcasting of the King's speech, perhaps the ambition of the B.B.C. will be satisfied when the King opens the Wembley Exhibition. It would be possible by this means to carry the King's words to millions of his subjects.

* * *

Improved Dance Music.

I WONDER if new microphones have been placed in the Savoy Hotel for the transmission of the Havana and Orphean Dance Music, as a great improvement has certainly taken place in the tone and general broadcasting of these bands. The "drowning" of the soft instrument has not been so noticeable of late.

* * *

Broadcasting Progress.

THE most satisfactory feature at the present moment is the steady progress that is being made on the programme side. Those concerned are working with enterprise. More money is obviously being spent now that more revenue is coming in, a satisfactory state of affairs. The dramatic side is receiving special attention, and dialogues are being specially written.

* * *

Pins of Interference.

I WAS looking at the B.B.C.'s map of London the other day, and a very interesting map it is, too. It is studded with black, white and green headed pins, which signify "Morse," "oscillation," and "amateur transmissions" respectively. Interference reported by "listeners" from such sources is registered in this way, and one can tell at a glance which areas are most affected.

* * *

Tracking Down Interference.

NATURALLY, when clusters of pins of certain colours begin to grow thick,

investigations are carried out, and attempts made to locate the "offender." Sometimes it is a very difficult task, but it is seldom that the engineers of the B.B.C., with the assistance of the local radio society, fail in their object.

* * *

Capt. Lewis's Work.

TALKING to Captain C. A. Lewis, I learnt that he has just completed a book on Broadcasting, and the first edition will be out some time in February. I have not—up to the moment—seen a copy, but I am looking forward to the pleasure, as Captain Lewis is a very interesting personality at the B.B.C., and is exception-

Cannot Guarantee Range.

THE science of broadcasting is undoubtedly making remarkable progress. I can foresee the time when every court of justice will possess a station," said Judge Sir Thomas Granger, at Southwark County Court, recently.

Sir Thomas, in an action to recover the cost of a wireless set, found that there was no warranty by the seller in respect of the instrument's sensitivity.

* * *

New Wireless Service.

DIRECT and continuous duplex wireless telegraphic service has recently been inaugurated between London and Vienna. This enables Radio House, London, to communicate with Vienna via the Marconi station at Ongar and the Austrian station at Laaerberg. Transmissions take 10 to 15 minutes, and are at present being carried on at the same rates as those for land-line telegraphy.

Aerial Slashers.

THE Aberdeen police are investigating much damage done in the west of the city by wireless aerial slashers. Poles have been broken down after the cutting of guy wires. In one case a ladder was carried a considerable distance so that the wreckers could reach an aerial halyard. It looks as though wireless has bred a new type of "Jack the Ripper"; but Aberdeen is such a peaceful place

that the news of the rampings of an aerial fanatic is almost unbelievable. Now, if it had been in—No, I won't write the name of the town. I paid a visit there recently!

* * *

Radio Grand Guignol.

THOSE of us who saw the Grand Guignol play, "A Sister's Tragedy," by Mr. Richard Hughes, produced by Mr. José G. Levy at the Little Theatre a year or so ago, anticipated something pretty thrilling when Mr. Hughes' Radio play, "A Comedy of Danger," was announced the other evening. The play was a great success; the B.B.C. have never done anything so thoroughly or so realistically. The singing of the miners "off stage" was particularly impressive, as indeed were all the other "effects."

Whether three people buried in a mine would philosophise on life and death to such an extent as did the characters in Mr. Hughes' play, I should doubt; but the atmosphere of sheer panic was thrilling and convincing, though I thought the constant

(Continued on page 798.)



Wireless in the far north. An explorer's temporary radio station erected on the Spitzbergen fiords.

ally well informed on matters relating to the art of broadcasting.

* * *

Amateur Transmissions.

THERE is a certain amount of controversy as to which is the best amateur transmitting station in the London area now that our old friend 2 Oh! Emma! has forsaken us for a better clime (?).

£5 FOR AN IDEA.

The Editor offers a prize of £5 for the outline of a suitable plot for a broadcast radio drama. For particulars, see the Editor's "Radiotorial" in this issue.

Listening-in recently at a spot about 25 miles west of London. 5 Pip You came in remarkably clearly. Six William X. 6 J Emma, 5 S U, 5 V R, 2 S Z, and 5 V T also came through very well. In fact, amateur transmissions have so improved of late that it is difficult to pick on any special one and say that it is of outstanding merit.

NOTES AND NEWS.

(Continued from page 797.)

repetition of "My God! and "Dama!" rather over-emphasised the players distracted terror.

One at a Time.

IT was rather a mistake to broadcast four plays all in one evening. The "Comedy of Danger" alone could have done excellently as a start, and as a tentative "feeler" for public opinion. But the possibilities of radio drama are so alluring and so interesting, that it is to be hoped that the B.B.C. will arrange for more plays to be broadcast, though not all at once next time.

An Indo-China Service.

DIRECT wireless communication between France and Indo-China is now possible. Until recently the cables, which served this quarter have passed through foreign lands.

A Boom in Licences.

THE number of new wireless licences issued recently has exceeded all expectations. During the months of November and December more than 85,000 were issued, and at the end of the year 598,000 in all had been issued.

An Edinburgh Station.

IT is rumoured that Edinburgh is to have a relay station and "listeners" residing in that city are viewing the possibility with varied feelings. Whereas owners of valve sets declare that it is totally unnecessary, crystal set enthusiasts are highly in favour of the suggestion.

Improvements at Brussels.

THE programmes of the Brussels broadcasting station are improving nightly. I have been listening to Brussels lately, and have really enjoyed the concerts. The station is shortly going to broadcast operas from the Théâtre de la Monnaie. Concerts from England and Paris will also be relayed.

Transatlantic Test.

MORE attempts are to be made to relay American broadcasting by the B.B.C., and it is possible that these will take place in the course of the next week or so. Notice will be given in the daily papers. Captain A. D. G. West is the assistant chief engineer of the development department, and it is his intention to make the reception of America and the relaying of their programme a permanent and reliable feature.

Two Concerts at Once?

NOW that the new studio at 2 L O is in order it is possible to accommodate larger bands. The new studio has four times the capacity of the old one and damping is only carried out at about a quarter of the extent. Before long it may be possible to use both studios at the same time for concerts on different wave-lengths.

The New Transmitter.

THE B.B.C. have at last secured permission to proceed with the erection of the new London Transmitting Station, the site of which was passed by the P.M.G. some six months ago. I understand the site is in Wardour Street, and

IMPORTANT NOTICE.

Readers of POPULAR WIRELESS are informed that, commencing with our next issue, our companion paper, "The Wireless Review," will amalgamate with this journal. The special facilities enjoyed by "The Wireless Review" in obtaining the latest information concerning wireless progress, both at home and abroad, will thus benefit readers of POPULAR WIRELESS, and in many other ways, details of which will be given in next week's issue, on sale Friday, price 3d. as usual.

that there is a possibility of the new transmitter being much more powerful than the one at present in use.

Nigel Playfair.

MR. NIGEL PLAYFAIR, who was responsible for the thrilling radio drama night at 2 L O, recently told me that he had produced many difficult plays, but never had he met with such



Dr. Marx, the new German Chancellor, broadcasting a message to the German nation by wireless.

difficulties as those which were met with in the broadcasting of radio plays. The circumstances, he said, were totally different in every respect to stage work. Many more plays of a similar character, I understand, are to be produced.

Room for New Authors.

IN giving congratulations for the success of the Play Night, one must not forget the work that was done by Captain C. A. Lewis. He has always taken a keen interest in plays and literature. He is no mean scholar in foreign languages (I know that he is able to speak French and Russian almost as well as English), and this knowledge bears on the detail and the selecting of suitable plays for the microphone. He told me that there is plenty of room for young authors in the field of radio drama.

The Metro-Vick Tests.

THE Metropolitan-Vickers Company have received a telegram from Mr. H. P. Davis, vice-president of the Westing-

house Company, of Pittsburg, correcting a possible impression that might be gathered from statements made to the Press that the Westinghouse K D K A station was making no special effort to be heard in Great Britain. The telegram continues: "Westinghouse, America, have co-operated with Metro-Vick daily since early October to improve transmission reception conditions so that re-radiation from K D K A may be possible."

Night Distortion.

THE Metropolitan-Vickers Company state that there appears to be considerable misconception on another point also. The power of the K D K A station, while small in comparison with commercial radiotelegraphy stations for long-distance work, is now greater than the combined power of all the B.B.C. stations.

Preliminary Tests.

IN the preliminary experimental work it was found that the strength of the reception improved with the use of increased power, but that the increase of power raised fresh difficulties, as the reproduction of speech and music was usually so distorted as to render it unintelligible. This was due to the phenomenon of "night distortion," which is caused by slight changes of wave-length.

Successful Re-radiation.

TO overcome this difficulty the associated companies arranged special experimental transmissions in the early hours of the morning after 4 a.m. Greenwich time, when the normal American broadcast programme had ceased. By this means the best adjustments of the transmitter were arrived at, with the result that the first intelligible programmes began to come through in time for successful re-radiation here before the close of the old year.

An Entire Programme.

THERE is still, of course, a great deal to be done in the way of improving the quality of the speech and music, and of eliminating static interference, but on Saturday, January 5th, the entire evening programme from Pittsburg was re-radiated. A large number of letters have been received by the Metropolitan-Vickers Company from listeners in all parts of the Continent, commenting on the surprisingly good quality of the re-radiation.

A Conundrum.

"WHEN is a political speech not a political speech?" asks the "Daily News."

The answer seems to be (says that journal): "When it is made by a Dominion Premier."

Mr. Bruce's speech (recently broadcast from 2 L O) was distinctly political. We even had to listen to Mr. Bruce telling us that we were "abysmally ignorant," and that the Dominions should have Imperial preference. And yet the Cabinet recently refused the B.B.C. permission to broadcast the King's Speech! Yes, what is a political speech?
ARIEL.

A SIMPLIFIED REINARTZ RECEIVER.

By 2 O Z (of America).

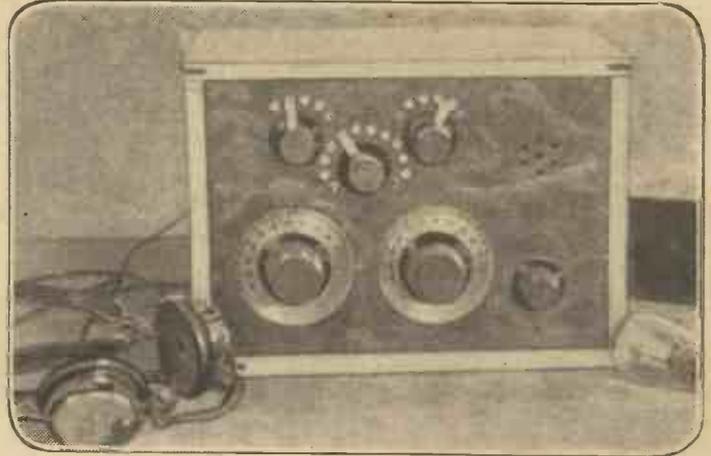
This article has been specially written for "Popular Wireless" by this well-known American amateur. The Reinartz circuit is very popular in the United States, and the set described here is well worth serious consideration by all wireless experimenters.

ONE of the most popular and most efficient modifications of the original Armstrong regenerative circuit is the Reinartz tuner. It was first made public in the early part of 1921, and it is the results of the experiments of Mr. John L. Reinartz, a young amateur and experimenter in South Manchester, Connecticut.

The theory of the operation of the tuner has been carefully reviewed by American and European periodicals, so that it is fairly well understood to-day. This article will, therefore, not take up the theory of this interesting circuit, but will deal only with constructional details of a complete set.

Slight improvements have been made from time to time, and modifications have been published at various intervals, but the instrument about to be described varies somewhat from the usual designs in that it employs the ordinary single-layer solenoid winding instead of the spider-web coil as originally made by Mr. Reinartz. Besides, the tuning controls have been simplified

are a little close, but it is found that the efficiency is in no way decreased. The panel is laid out as follows: the left-hand top switch varies the inductance of the plate circuit; the right-hand one varies the grid winding, while the centre switch is to tune the antenna coil. The two dials and knobs at the bottom control the "feedback" condenser on the left and the antenna tuning condenser on the right. The rheostat knob is on the right and directly beneath the "peep-holes" for watching the valve filament. Terminals for connecting to the aerial and earth are shown at the left, while those necessary for connecting the high and low-tension batteries and the output of the set are all at the right hand edge (Figs. 1 and 2).



A photograph of the set.

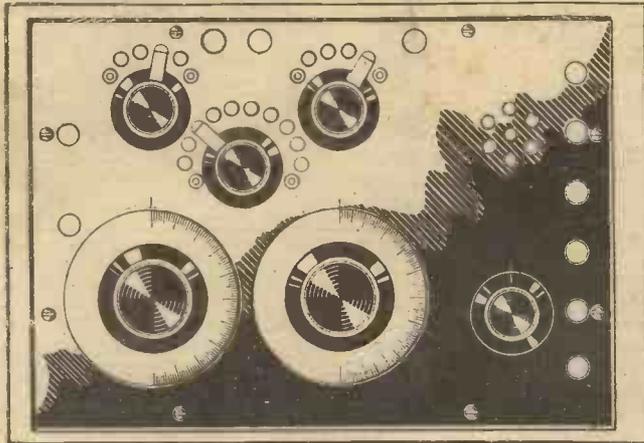


Fig. 1. Diagrammatic representation of the panel face.

somewhat, so that although it differs in construction, its working is exactly the same. The construction, however, is thereby extremely simplified, and is such that every amateur will be able to make the set without much trouble, or with as great ease as they would make an ordinary regenerative receiver.

Compact Arrangement.

The Reinartz set described herein does not take up much space. The cabinet is about 7½ by 10 by 6½ in. with a panel 7½ by 10 in. in size. Within the cabinet, and mounted directly on the panel, are the various tuning instruments and the necessary apparatus for the control and observation of the detector valve. This compact assembly adds to the appearance of the set, and also increases the operating efficiency of the unit.

It will be thought that perhaps the arrangement of the controls on the panel

mounted on the ebonite panel, as shown. Interest in this tuner centres about the unusual Reinartz coil, which, instead of being of the usual spider-web type, assumes the shape of a single-layer winding. This is much easier to wind and tap than the other type, and just as good results can be obtained. This coil constitutes the only inductance used in the circuit. It consists of two distinct windings: one, A, for the antenna inductance, and B, the plate winding. Part of the antenna coil forms also

the grid inductance. These two coils are wound upon an insulating tube about 3 in. in diameter and 2½ in. long. Starting at one end of the tube, and ¼ in. in from the edge, the wire is passed through a small hole drilled at this point, and the winding is begun. Forty turns of No. 26 gauge wire are then wound, a tap being taken at the 15th and the 30th turns, and another 10 turns are added before this plate winding is complete. Thus there will be 40 turns of wire, two taps, and a beginning and an end.

At about ¼ in. above the end of the plate coil winding, the antenna grid coil is wound. This consists of 40 turns of wire, tapped at the 2nd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 26th, 33rd, and last turns.

The Aerial Coil.

(Continued on page 800.)

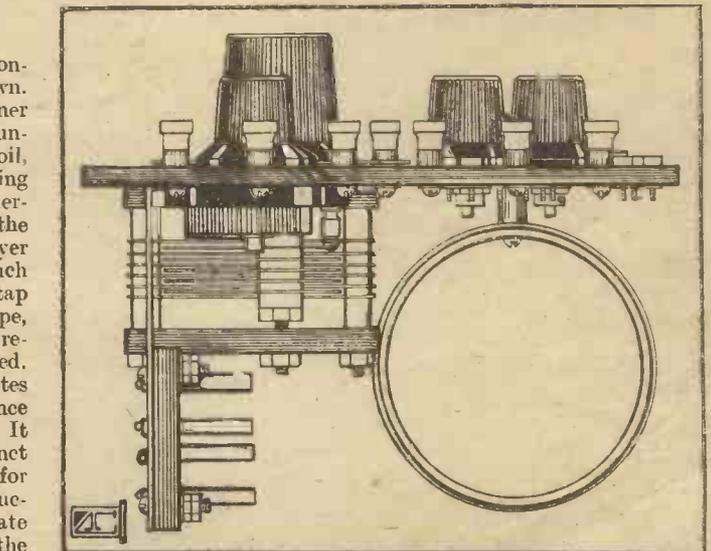
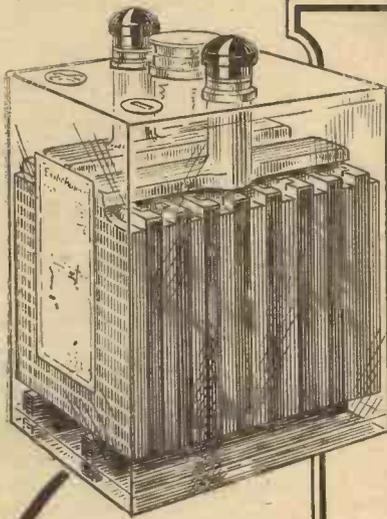


Fig. 2. A side view of the receiver, showing the positions of the components.

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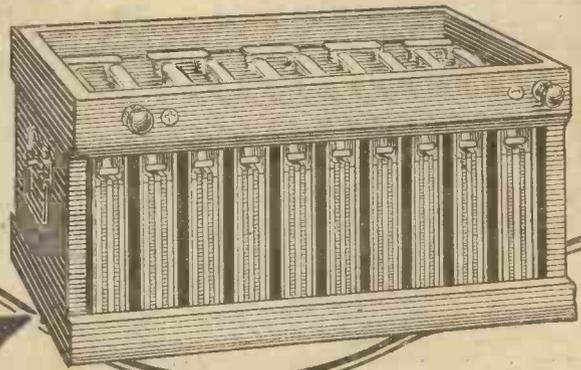
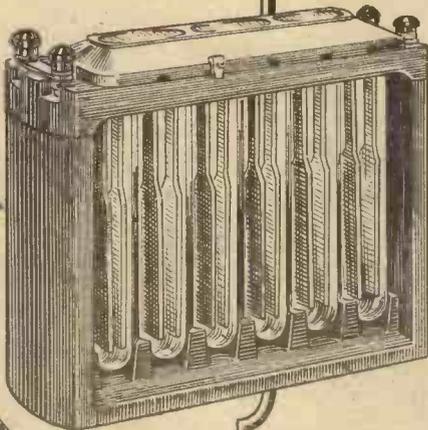
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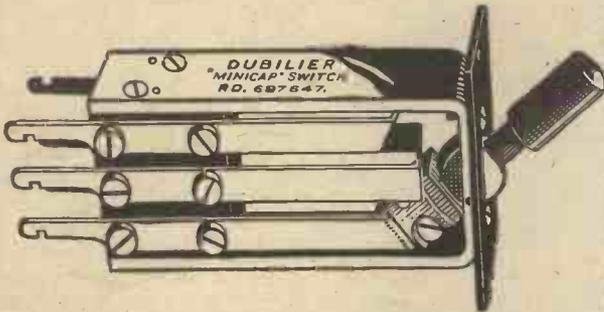
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In addition the "Minicap" can be used as a series-parallel switch, and, in fact, wherever a double pole, double throw switch is now employed.

The design and workmanship are in keeping with that of other Dubilier products, and the price is - - 8/-

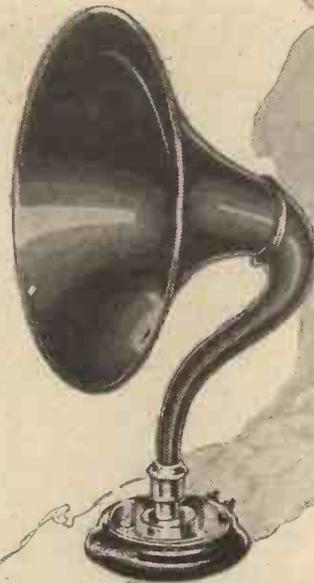
Write to department E for list A 9, which gives full details and diagrams showing the Minicap Switch incorporated in various wireless circuits.

THE DUBILIER CONDENSER CO. (1921), Ltd.,
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WIRELESS TELEVISION.

By T. THORNE BAKER.

With the amalgamation of Wireless Review with this journal next week, the articles on Wireless Television which have appeared from time to time in that journal will be published in our columns, as well as full details concerning the claims for the £500 Television Prize. In this article the reader will find some interesting details concerning Television, written by an authority.

IN the latter part of 1907 I went to Paris to study the new science of phototelegraphy under Professor Arthur Korn, a former colleague of Professor Rontgen, of X-rays fame, at the university of Munich. His system of sending a picture by wire was the first to be tried on a commercial scale, and quite a number of photographs were sent from Paris and Manchester to London by his selenium system. Wireless was then in a somewhat early stage, but the possibilities of transmitting pictures by wireless were already fully realised.

More than this, the idea of transmitting a picture instantaneously had already been conceived, which is merely another way of describing television. Belin in Paris, Ruhmer in Berlin, and Rosing in Petrograd were at work on the idea. Numerous experimenters are occupied with the problem to-day. Will television ever be accomplished? It is an interesting question because upon its answer depends the possibility of accomplishing the much advertised feat of transmitting cinematograph pictures by radio.

Phototelegraphy.

A little thought will show us that the transmission of a picture by wire or wireless depends on breaking the picture up into thousands of tiny fragments of various densities, and sending electrical impulses of corresponding intensity or duration which are their equivalent, which must be built up into a fresh picture by the receiving instrument. In the writer's telegraph—which some years ago telegraphed some hundreds of photographs from Manchester and Paris to London, two hundred separate impulses per second were sent through the telegraph line.

The time of transmission was about fifteen minutes, so that some 180,000 distinct impulses were required to form a photograph. Now in order to "see" by wire, or by wireless, it will be necessary to transmit something like 200,000 impulses in less than $\frac{1}{15}$ of a second; it need not be done instantaneously, because the persistence of vision will enable the eye to retain an image for the fifteenth part of a second.

Number of Cells.

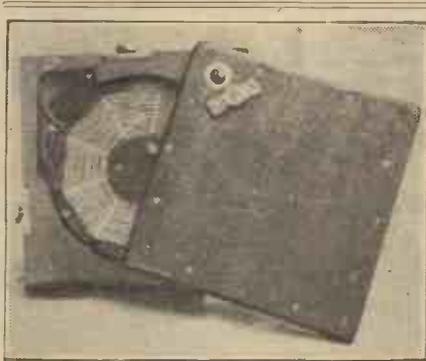
The lines on which television by radio will probably be first worked out—the lines on which the problem is indeed now being attacked—will be the use of a number of selenium cells, set closely together to form a mosaic, upon which the image to be transmitted will be cast by a lens. The resistance of selenium, as is well known, varies with the intensity of illumination thrown upon it, so that each cell will vary in resistance in accordance with the intensity of the image at each point.

A current passed through each cell in rapid succession will vary in strength by an amount proportional to the tones in the image, and the whole of the variations pro-

duced by the effect of the whole number of cells will be transmitted by wireless to the reconstructing instrument. Remarkable progress has been made recently by an English experimenter in the construction of selenium cells of great sensitiveness and extraordinary freedom from their usual great fault—sluggishness in action.

Use of Selenium.

Laboratory tests made with some of these cells show that the problem of television has been brought measurably nearer. The moment the illumination falling upon these cells ceases—or changes in strength, an instant response is seen in the cell, which means that if the image of a person were being transmitted, any movement on the part of that person would be seen "at the other end."



The finished receiver, the construction of which is described below.

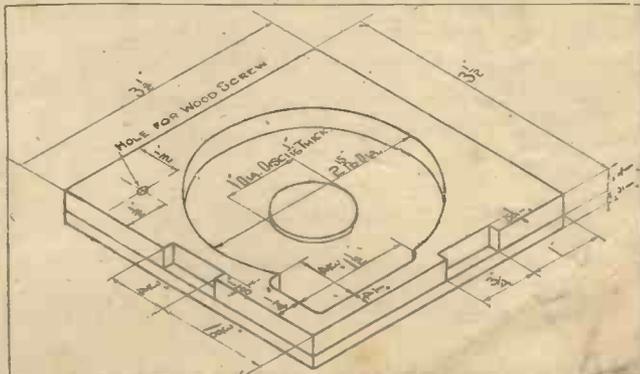
A VARIOMETER-TUNED POCKET CRYSTAL SET.

ALTHOUGH, owing to its convenient shape, this compact little broadcast receiver may be comfortably carried in the pocket, nothing has been sacrificed to obtain mere reduction in size, and its performance is equal to that of other more elaborate sets employing the same simple circuit.

The photograph gives a general idea of the construction.

The variometer consists of two basket coils, wound on shellacked cardboard formers $2\frac{1}{2}$ inches outside diameter, having nine slots $\frac{1}{8}$ in. wide, cut down to a $1\frac{1}{10}$ in. diameter centre circle. These are wound full of 28 gauge D.C.C. wire.

The sketch illustrates the construction



of the case, which is built up of two thicknesses of wood, $\frac{1}{4}$ in. and $\frac{1}{8}$ in. respectively. The top and bottom halves are similar, except for the arrangement of the terminals, and that the recess for the detector is required in the bottom half only.

The terminals are made from brass strips $\frac{1}{8}$ in. by $\frac{1}{4}$ in. by $\frac{3}{4}$ in. long, sunk in suitable recesses in the case, and fixed by small wood screws. In the centre of each a hole is drilled and tapped for a $\frac{1}{8}$ in. diameter knurled headed screw.

Compact Detector.

The detector consists of a small piece of ebonite, $\frac{1}{4}$ in. by $\frac{1}{2}$ in. by $\frac{1}{16}$ in. long, in which a $\frac{1}{16}$ in. diameter hole is drilled lengthwise, and 2 brass plugs $\frac{5}{16}$ in. diameter and $\frac{5}{16}$ in. long, pointed at one end and countersunk at the other, inserted with their countersunk ends innermost.

Two small pieces of crystal, zincite and bornite are held in contact between these plugs. The pointed end of one plug is carried in a small hole drilled in the small L-shaped clip shown in the photograph. The other plug makes contact with spring brass strips along which it is moved to regulate the pressure on the crystals.

The aerial terminal is the one on the left in the photograph. It is connected to the crystal clip and the outside of the bottom coil. The inside of this coil is connected to the outside of the top one, and the inside of this is taken to the earth terminal, the one on the top of the case. The 'phone leads bridge the earth terminal, and the remaining one on the front of the case, which is wired to the spring brass detector contact.

Wonderful Results.

For the connection between the two coils a short length of rubber-covered flex is used, the ends of which, together with the leads from their respective coils, are soldered to the heads of the brass screws with which the card formers are attached. The object of this is, of course, to avoid continual bending of the single 28 gauge wire of the coil, which would soon lead to breakage.

Tuning is effected by swinging the two halves of the case around their wood screw hinge until the desired signals are heard.

In spite of its size the results obtained on this receiver are truly surprising, and very clear telephony can be heard up to a range of 10 miles, or even further, from the broadcasting station. The usual aerial and earth are required, of course, but for portability in conjunction with efficiency this little set is hard to beat.

SOME DULL EMITTER HINTS.

Amateurs changing over from ordinary valves to the more economical dull emitters, are very often at a loss to know how to handle the new valves. The hints given in this article will be very useful to those who are doubtful about the results they are getting with this type of valve.

MANY amateurs are finding that the increased price of dull emitter valves over those of the ordinary type is more than compensated for by the economy in working resulting from their use. Therefore, a few hints as to their operation may not be out of place, since the characteristics of dull emitter valves differ somewhat from those of the high temperature types.

Importance of a Fil. Rheostat.

In the first place a word of warning regarding the new valves taking only sixty milliamperes through the filament at a potential of from 2.5 to 3.0 volts. Now it is obvious from a simple application of Ohm's law that the resistance of the filament of these valves is of the order of 50 ohms. Now the ordinary filament rheostat has a maximum resistance of about four ohms, and unfortunately will not be suitable for use with these valves.

Supposing, for instance, that a four-volt accumulator is being used, the extra four ohms will scarcely appreciably diminish the potential applied across the valve filament (and therefore the current flowing through same). The filament will thus have an unfair strain imposed on it, with consequent shortening of the life of the valve. Also the value of the filament rheostat in altering the operating characteristic and grid potential of the valve will be almost nil.

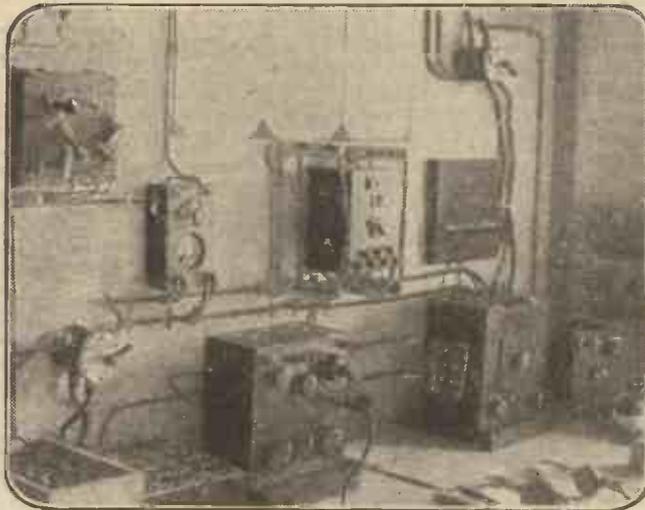
Where the dull emitters are used in conjunction with high temperature valves on a multi-valve set working from a six-volt accumulator (it is not possible in most multi-valve sets to tap off different filament voltages to each valve) the case is even more aggravated, and the expensive "bottles" would probably be very short lived. The correct thing to do, of course, is to use a filament rheostat of about 60 ohms resistance maximum. This will provide ample variation, whether the valves be worked off a four or six volt accumulator, or from dry cells. There seem to be very few of these special filament resistances about, however, and the writer has already come across several amateurs working '06 ampere dull emitters from four and six volt accumulators with the ordinary type of rheostat.

Grid Bias Beneficial.

When used on the note-magnifying side of a receiver, dull emitter valves do not on the whole equal their older brethren. The volume obtained is in most cases quite good, but in every type the writer has yet tried (with the exception of the D.E.V. valve), there has been considerable distortion in amplifying fairly strong speech and music. This distortion is not apparent on weaker transmissions, and appear to be due to the shortness of the straight part of the character-

istic curve of the valves. Of course this distortion is of no consequence when Morse signals are being received. In the case of all the valves tested the effect was tried of varying the grid potential between two volts positive and several volts negative, and in most cases it was found to be very critical for good low frequency amplification. This perhaps explains why many amateurs are disappointed on plugging a dull emitter valve in their low frequency amplifiers; the writer found the potentiometer necessary for anything like maximum results to be obtained.

The majority of dull emitters are quite



A wireless telephony and C.W. aircraft installation.

"A COMEDY OF DANGER."

"Behind the Scenes" at 2LO during the recent broadcast drama.

By "ARIEL."

BEFORE the broadcasting of the radio drama, "A Comedy of Danger," listeners-in who suffered from neurasthenia were advised to switch off for twenty-five minutes as a "play was about to be performed of a Grand Guignol character." Those who wished to listen were advised to switch off the lights, in order to get the right atmosphere.

The play, however, was produced in a brightly lit room, although the broadcast effects were very realistic and provided a real thrill for thousands of listeners.

I was one of few who watched the secret devices which produced the sounds of thunder and rushing water.

Mr. Whiteman, who was in charge, sat on the stone steps outside the studio door with the lines of the play and tele-phones on, to follow the action of the drama. Just

good high-frequency amplifiers, although perhaps slightly more inclined to self oscillation than the high temperature variety, and some of them really excel as detectors, especially when used with reaction in single valve autodyne sets. Certain types are prone to be very microphonic, that is they produce a loud "pong" in the 'phones if the table is struck, or the valve subjected to vibration in any other way. But, after all, this is not a serious disadvantage, and cannot be said to be very detrimental to good reception.

Many Advantages.

In conclusion, the writer would say that in his opinion the advantages of dull emitter valves in the way of economy and longer life (although very few valves die of senile decay; most meet with an untimely "accidental death") easily outweigh any disadvantages they may have, and especially is this the case when head telephones are to be used, and therefore signals are not required to be of very great strength.

below the steps was a large table over which a sandpaper sheet was laid, and beside the table was a sieve containing thousands of lead shots. When the sieve was moved it produced the sound of rushing water, and the sandpaper, when scraped by a piece of wood, gave the effect of the mine being flooded. Near by was a large drum, similar to a water wheel, and over this was fixed a piece of American cloth. This device is known as the "wind machine" or, as the stage hands call it, a "breezer."

I was unfortunate enough to be near by when a gun was fired, and the noise in the studio was terrifying and made us all deaf for some time after.

Having described the effects I will briefly relate what was going on in the studio. The characters, played by Joyce Kennedy, Kenneth Kent, and H. R. Hyneth, had received special rehearsals and instructions from the author of the play, Mr. Richard Hughes, several days prior to the actual performance. Mr. Hughes assisted in the effects. The Gwalia Singers were singing two Welsh hymns outside the second door of the studio. They also called out during the performance through glass lamp chimneys, thus giving the hollow, far-away effect.

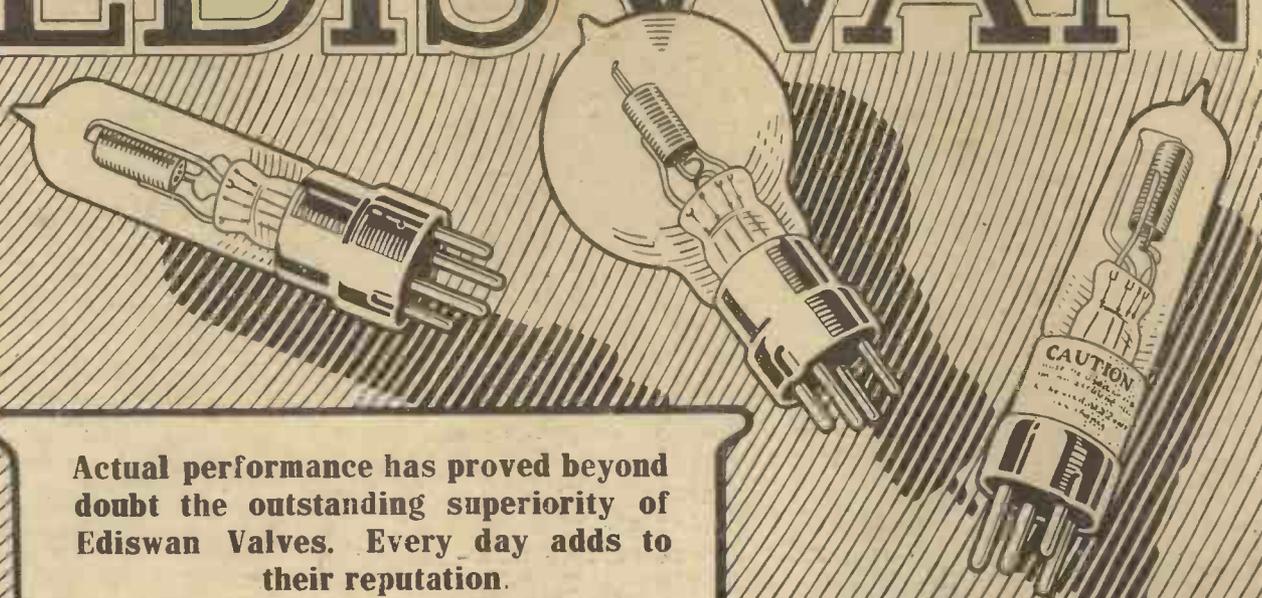
A "Grand Performance."

The most amusing device to produce distant sound was the simple bucket, through which the author and another shouted giving the effect of voices coming from a distant quarter of the mine.

The artistes rushed backwards and forwards behind the microphone with their parts or scores in their hands. This continual movement was, of course, necessary and performed according to the notes.

The next morning I received a letter from Miss Ellen Terry, the great tragedienne, saying: "No greater performance have I ever heard which has produced such a thrill on an unseen audience. Another step forward has been taken by the B.B.C."

EDISWAN



Actual performance has proved beyond doubt the outstanding superiority of Ediswan Valves. Every day adds to their reputation.

21st December, 1923.

Type A.R. '06.

Allow me to compliment you on the excellent performance and satisfaction which they give. Using three valves, 1 H.F. D. 1 L.F., with filament voltage 2.5 and plate voltage 50, I can receive all the B.B.C. stations on a large loud speaker without any distortion or microphonic effect from the valves.

FRANK S. VALENTINE.
Hon. Sec. Exeter and District Wireless Society.

Tring, Herts.
23rd December, 1923.

I received the full dance programme this morning from W.G.Y. The set is an home-constructed one, three valves, 1 D. and 2 L.F., and I am using "Ediswan" "A.R." valves. I have previously tried three times to pick up American stations with other well-known makes of valves, but did not meet with any measure of success. I received this morning results on both 'phones and loud speaker, and considering the fact that I did not employ high frequency, I cannot speak too highly of your "A.R." valves, for it is to these that I acknowledge my success.

R. J. KETTLE.

Type "A.R." and "R." 12/6

Type "A.R.D.E." 21/-
(Dull Emitter).

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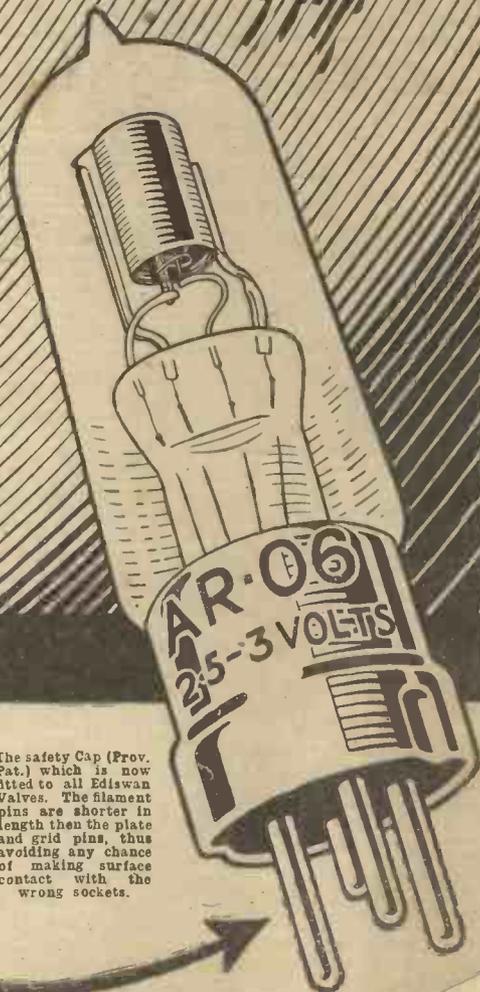
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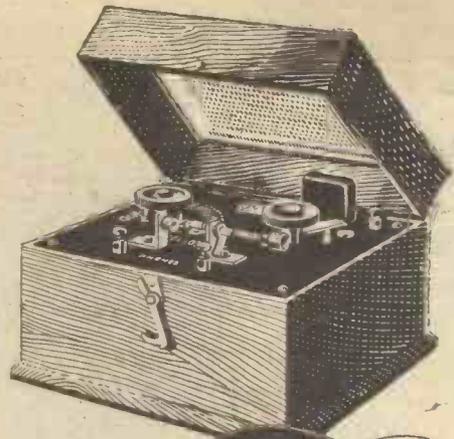
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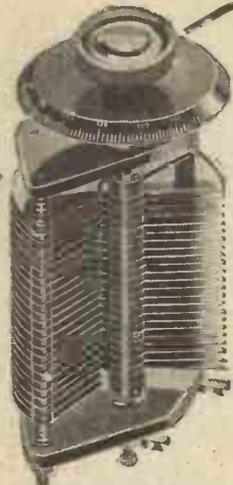
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THE FUTURE OF WIRELESS.

SIR OLIVER LODGE'S VIEWS.

A very interesting article on the future of wireless, by our Scientific Adviser, Sir Oliver Lodge, was published recently in the "Observer." By the courtesy of the Editor of that journal we are able to reproduce extracts from Sir Oliver's article for the benefit of readers of "Popular Wireless."

IN the course of his article, Sir Oliver writes:

"The two things which the human race can effectively attend to, and achieve with some success, are locomotion and communication, both developed enormously and in an almost revolutionary manner during the nineteenth century; and this development has continued during the early years of the twentieth. A few people still living can remember the introduction of railways. Some can remember the introduction of telegraphy, and many more the beginnings of signalling by means of cables; while electric means of transit and wireless telegraphy, that is, electric signalling across empty space, are developments of our own time.

"All electrical applications—from electric bells to the telephone, from the transition of power by the dynamo to the latest messages across the Atlantic—represent the harnessing of the ether in the service of man. Whether a cable is used for the transmission is a mere detail. It is like using a speaking tube instead of shouting across the street. Air conveys the sound in both cases: but in one case it is guided, and so to speak focused on a definite receiver; in the other case it is broadcast.

Causes of Screening.

Electricity and magnetism and light are the affairs of the ether primarily, though they are controlled, initiated, and directed by material appliances. But so far as mere transmission is concerned, matter is of no assistance, except that it can act as a guide, like the walls of a speaking-tube. These things can go on equally as well in a vacuum: except for its guiding power, matter is mainly an obstruction. Fortunately, however, the air in its normal state has very little effect. It does not take the slightest part in the conveyance of ether waves.

"It is possible, however, to ionise the air, that is, to split up into electrified particles the positive and negative ingredients of which it is composed. It thus acquires electrical properties, and is able to react upon the ether. Such air, like any other electric conductor, is partially opaque to ether waves; and, like other opaque materials, it can either obstruct those waves, absorbing them and turning them, first into electric currents and then into heat, or it can reflect them somewhat as a mirror reflects light.

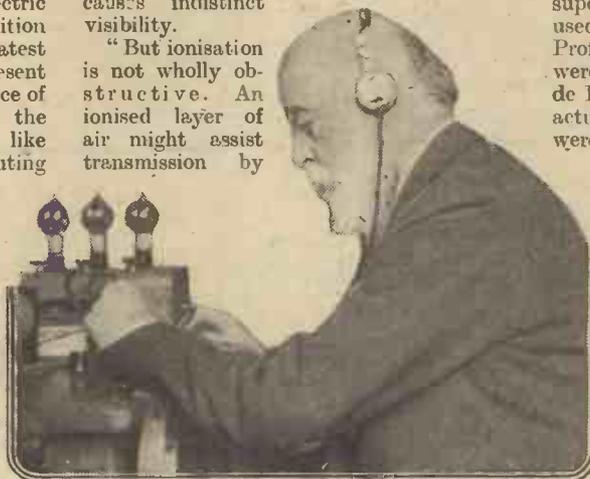
"Many causes are capable of ionising the air; radioactive substances do it, though they themselves are a recent discovery. But the sun is a radioactive substance on a large scale; and undoubtedly some ionisation of the atmosphere is due to solar radiation. But other causes there are, such as splashing and spraying of water

and the breaking of water drops, which by some eminent physicists are considered to be capable of accounting for most of the electrification of clouds, and the consequent occurrence of thunder storms.

Atmospherics.

"Electric discharges in the atmosphere on a small scale are very frequent; and they are known in wireless telephony as "atmospherics." And one of the problems to be solved is how best to eliminate their disturbing effect on the reception of messages. Moreover, when ionised air exists extensively between a sending and receiving station it acts as a partial screen, and renders communication difficult, in the same sort of way that a light fog or mist causes indistinct visibility.

"But ionisation is not wholly obstructive. An ionised layer of air might assist transmission by



Sir Oliver Lodge at work in his laboratory.
[Photo by Hoppe]

its reflecting power. It might, for instance, cause the rays to move in a curved instead of a straight path. Such a helping layer is believed to exist in the upper regions of the atmosphere; for it is those upper regions which receive and consume much of the specially active rays from the sun. Waves generated at a sending-station are therefore liable to be reflected and curved round the earth by this ionised layer, when it is placid and not too corrugated, somewhat after the fashion that a whispering-gallery acts in the case of sound."

The Heaviside Theory.

Continuing, Sir Oliver writes: "The discovery of electric waves was made in the latter third of the last century by that tremendous mathematical genius, Clerk Maxwell, on the purely theoretical side. After twenty years, Hertz showed how to produce them practically; and, what was more, how to detect them at a distance, in an elementary and purely laboratory fashion. Further improvements in detecting appliances were soon devised by many people; and in due time they were made amenable to practical and

commercial uses by the energy and enterprise of Senatore Marconi and his co-workers.

"To a public ignorant of the work of Clerk Maxwell and Hertz, this application came as a great surprise, and seemed very novel and mysterious. To physicists it did not seem so; it was a natural application of what was known. But when, later, Mr. Marconi found experimentally that the waves would actually curve round the earth and reach the American continent, physicists were surprised. It was an important discovery; and the mathematician Mr. Oliver Heaviside showed how an ionised layer of air in the upper regions must be operative, and could explain it.

"Then came a method of detection far superior to any that had previously been used, namely, the vacuum valves of Professor Fleming, improved, as they soon were, into their present form by Dr. Lee de Forest of America. In these valves the actual electrical particles, the electrons, were employed as the detecting agency, and proved themselves far more perfect than any material mechanism could be. They responded instantaneously to every fluctuation: so that it became possible to transmit, not Morse signals only, but microphonic or telephonic speech.

Recent Achievements.

"For some time it seemed as if speech could only be transmitted over moderate distances. But now, through the energy and enthusiasm and inventive genius of a great number of workers in all parts of the world, but especially in England and America, it has been found possible to hear the human voice across the Atlantic. Not that the voice travels any farther than it did before, any more than it travels along a telephone wire: the voice generates electric waves, with all its peculiarities accurately represented in those waves; and when those waves are collected by a distant aerial, the electrons in the receiving valve respond with precision to all the fluctuations, and enable a telephone to reproduce the speech and the tones of voice of the distant speaker. The achievement of speech across the Atlantic in this indirect way is certainly a marvellous achievement, one that excites the admiration, and to some extent the astonishment, even of physicists. Nor is this likely to be the limit. The waves that have begun to curl round the earth can go on, even to the Antipodes; and in a short time it is likely that the human voice in this way can reach Australia and New Zealand.

"Thus humanity will be welded together in a manner more intimate than ever before; and the beauty and the simplicity of the arrangements, and the comparative ease
(Continued on page 808.)

THE FUTURE OF WIRELESS.

(Continued from page 807.)

with which the result is effected, are very surprising.

"It used to be thought by the early experimenters that to get waves to travel effectively over enormous distances, the apparatus used must be large and powerful and the waves very long. Long waves can certainly get through obstacles which would stop short ones. Why? Because in going through a slightly opaque medium, a certain percentage of energy is wiped out at every swing. The crest of each wave will be slightly weaker than its predecessor. So if in a given distance, say 100 miles, there were twenty crests—which would mean that the waves were five miles long—there would be a chance of a sufficient portion getting through, even though each wave was 1 per cent. weaker than the one before it.

Loss of Energy.

"But if the waves were only a quarter mile long, there would be four hundred such crests in the 100-mile distance, and the proportion of energy which got through would be very slight. While if the waves were each only a hundred yards long, the oscillations in the given distance would be so numerous that no trace could be detected, unless the opacity were insignificant. Hence it appeared that long waves had the advantage.

"But to the physicist it always seemed that short waves ought to do better, if space were as reasonably transparent as one might expect it to be; that is, when the air is hardly ionised at all, a condition to be expected in the absence of light. And now it is found that, at any rate during the night, short waves are quite efficient. And the great size of sending and receiving stations will probably in due time be found unnecessary. A short-wave or small station is just as energetic as a big one, within limits. For the true wave starts, not at the actual radiator, but at about a quarter-wave length distant from it. Hence the shorter the wave, the nearer, and therefore the more energetic, is the place from which it starts. A radiator no bigger than a dumb-bell can emit waves of 100 horse-power. This was known long ago, in 1890. A great big radiator under the same conditions is not more intense, though it is true the emission would last longer: that would depend on its capacity.

Value of Short Waves.

"Hence recent experiments have redirected attention to the advantages of short wave transmission; and short waves are much more amenable to discipline. They can be projected by parabolic mirrors of reasonable size; that is, they can be directed, as light waves are directed from a light-house, so as to economise them and concentrate them in any required direction. There can be little doubt that this power of focusing and

directing waves will be applied more and more: so that, except for broadcasting purposes, it will not be necessary to send out waves in every direction.

"Another improvement which is to be expected is the attainment of greater power of control over distant things like aeroplanes and steamers, or other self-propelled floating bodies. The rudders of such machines can be actuated by people on the spot, but they may also be actuated wirelessly by people at a distance: so that an operator at a sending-station, manipulating his keys, may guide a distant floating body to any desired destination, so long as he can see what it is doing, and adapt his control accordingly.

Wireless Control.

"An aeroplane is not so easy to control as a floating body, because it has another degree of freedom. It can move up and down, as well as right and left. To control it perfectly is therefore not so easy. But none of these things is easy. Difficulties are things to overcome: and the ingenuity

of metallic screens because metals are opaque to the waves, and will ward off or reflect them harmlessly.

"Contrivances for doing damage are dangerous until the antidote is found. There always is an antidote; but meanwhile damage may be done: and it is lamentable that the ingenuity of man is thus capable of being misdirected for reasons supposed to be patriotic and justifiable.

"Other things can be suggested of a damaging character; though it is hateful to dwell upon them.

"Attempts have been made recently, and are still being made, at what is called "television," that is to say, seeing at a distance, either by wireless or by wired means. If one is done, doubtless the other will follow. But at present neither can really be done. Pictures can be transmitted after a fashion, by a code, signalling the position of dots in a process block, or something of that kind. Or they may actually produce a picture, as a sort of mosaic of such dots.

Possibilities of Television.

"But this is not really vision at a distance. It is only a modified form of printing-telegraph. For myself I am not sanguine of seeing anything that can be properly called television for a good many years yet, perhaps not for a century: though any invention which humanity really wants to devise will probably sooner or later be accomplished, by means perhaps at present unknown and unsuspected.

"However great have been our improvements in locomotion and communication during the past hundred years, that is but a small period. And who can say what will be accomplished in the next hundred years? Material progress, however, is not everything. And if there were any signs of our getting to the end of our tether—which there are not at present—there would be nothing to lament.

"Locomotion is a purely physical thing: but communication, whether by speech, writing, or telegraphy, is not solely a physical thing. It is a psychological thing too. There were these in the '60's and '70's of last century who lamented that many of the messages sent through the recently achieved Atlantic cable were either deleterious or rubbishy.

Steady Progress.

"It is no use enlarging our powers of communication if we have nothing worth while to say. The moral and spiritual development of mankind ought to keep pace with its material achievements. And if they do not, it is possible to regard even those achievements with gloom and apprehension. That, however, would show a lack of faith. The real progress of humanity is necessarily slow, while material achievements may be rapid. It rests with ourselves, however, whether or not one can keep pace with the other. There should be no feeling of supine self-satisfaction in what has been done, but a girding-up of our energies to see that the progress is not too lop-sided and unbalanced: and to contrive that the reign of good shall keep pace with the reign of power."



Mr. Arthur Burrows arranging the wireless apparatus at King's College during the recent Exhibition.

of those who are working at the subject is more than competent to deal with a difficulty such as this. It is interesting to find that the old-fashioned coherer seems specially useful in these distant-control experiments, as demonstrated recently by Major Phillips at the POPULAR WIRELESS meeting, Central Hall, Westminster.

"Unfortunately a certain amount of energy in the present state of civilisation is directed to the opportunities for doing damage; that is, directing things for deleterious purposes. And if people wish to do those things, no doubt they will be able. It has been surmised that aeroplanes can be stopped in mid-air. Well, as Hertz found long ago, ether waves are powerful enough to generate little sparks in metal conductors; and as the explosions of oil vapour in a motor are regulated by little sparks, it seems quite likely that such sparks can be generated at wrong times by the action of waves generated at a distance; and, if so, the engine may be brought to a standstill by the generation of unexplainable engine trouble. Such disturbances can be guarded against, when foreseen, by the proper use

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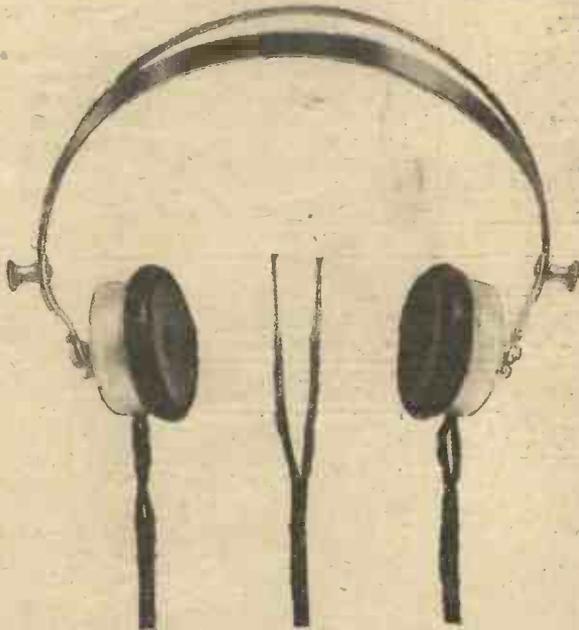
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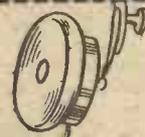
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HINTS FOR THE HOME CONSTRUCTOR.

By 2 G M.

Experience is a most valuable asset, but not one that all desirous of constructing wireless receivers will possess. Our contributor, who has many years of practical radio work to his credit, gives to "P.W." readers, in this article; the benefit of his experience in the choice and purchase of suitable frame aerials, filament resistances, and grid leaks.

ON the subject of frame aerials little need be said as, owing to the fact that only Armstrong "supers" or receivers of abnormal sensitivity can be used with them in ordinary circumstances, such will not find a place in the workshop of the average constructor.

However, a frame aerial should not be too small, three feet square is a fair minimum of size. The turns should be well spaced and wound over insulating material and preferably each turn should be of equal size and not wound spiders' web fashion.

The question of shape is rather more important than is generally believed, but the writer has discovered that for general efficiency the square frame standing on one edge cannot be beaten.

"One Hole" Mounting.

Now we come to an item of which there are so many types and makes, and general varieties, that we consider that we can be very useful to the amateur constructor, owing to the fact that the component in question, the filament resistance, has received our very close attention for some considerable time.

Roughly speaking, there are two types of filament resistances in general, the resistance wire and carbon compression. Of the former there are innumerable makes, the cheaper of which should be left severely alone. The two-shilling filament resistance whose ohmic resistance is but two or three ohms, whose moving contact is clamped to the spindle by two nuts, which invariably work loose, should be strictly avoided.

Pay five shillings or so for an Igranic, Burndept, or some other such filament resistance, and one can rest assured that the panel of the receiver will not require constant removal because of trouble in that direction.

A filament resistance must have an easy, smooth adjustment and connections that are readily accessible. Six ohms maximum resistance leaves but a narrow margin of safety. Eight is better, and if dull emitters are to be used, twelve is not too much. A Vernier adjustment is useful if "super" circuits are to be handled, and this is incorporated in the more expensive types.

"One-hole" mounting is highly desirable, and greatly facilitates ease of construction, more especially in the case of multi-valve circuits. Always allow a separate resistance for each valve, and do not couple two or three valves through one resistance.

Several new types of wire filament resistances have recently made their appearance on the market, and in the case of one the writer has in mind, very great improve-

ments have been made. It is so made that any resistance up to some 13 ohms is possible with complete vernier action, and it is possible to use either ordinary or dull emitter valves in any position on a multi-valve set, using a six-volt accumulator. The advantages of this are obvious.

The carbon compression type of filament resistance, when of good make, provides an

variable. Individual valves, even apart from the different makes and types, will function at their best in a rectifying capacity when a certain value grid leak is employed. And so that this value can accurately be obtained it is necessary to vary the resistance of the grid leak whilst the circuit is in operation. This is possible with a variable grid leak, and it is as well to point out that there are quite a number of circuits with which the constructor is likely, at a future date, to come into contact in which a variable grid leak is essential.

There are four types of variable grid leaks, the one in which a number of contact studs and a switch are employed in order to "tap" the resistance required: one which makes a varying contact in a groove with a blacklead line: the compression type, which is similar in principle to the carbon compression filament resistance except that small fabric pellets soaked in Indian ink or something similar are used instead of carbon: and finally the graphite paste type which consists of a small cylinder of graphite paste into which a needle can be dipped at varying depths.

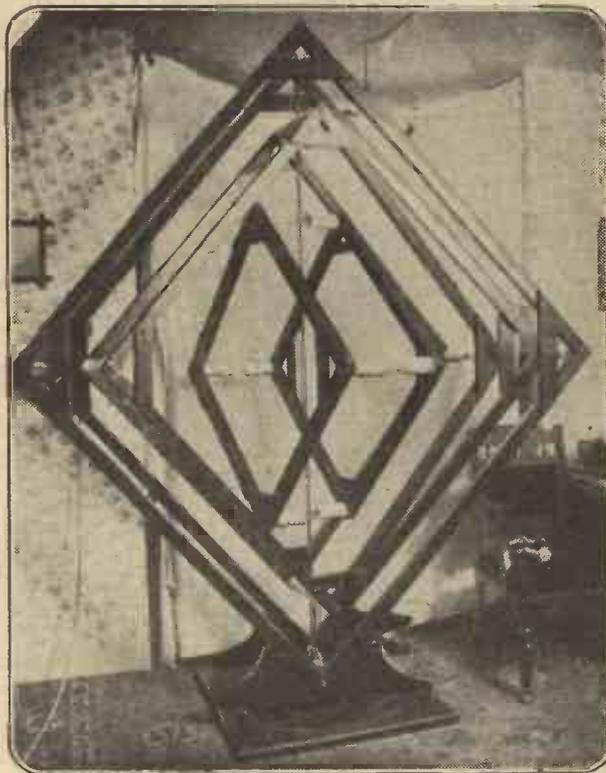
Personal Experiences.

In an article of this nature one must quite impartially give the benefit of one's experience to brother amateurs, even at the risk of treading on the toes of well-meaning but misguided manufacturers of wireless apparatus. After all, without constructive criticism in certain quarters things would be liable to stagnate, and all fair-minded members of the wireless trade will admit that their successful progress depends upon unbiased criticism from those who

use their goods.

Of all the variable grid leak resistances that the writer has handled in a long acquaintance with amateur wireless work, only two stand out as being really useful when it comes to a "super" circuit, the correct functioning of which depends very greatly upon such a component. These are the compression and the "blacklead type." The former, of which the "Lissen" is a good example, is preferable to the latter, owing to the more stable value obtainable, and the neater appearance and more compact shape.

A grid leak always requires careful handling, as it takes little to put any one of the many different types completely out of commission. The "Bretwood," for instance, suffers seriously if the knob is so far unscrewed that the needle completely leaves the paste into which it dips. Purchasers are warned against doing this.



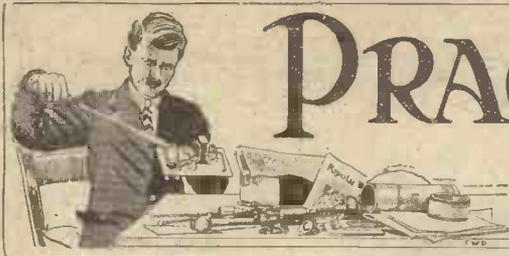
A revolving frame aerial, with which it is possible to employ a double circuit with reaction.

excellent control through an almost infinite variation of resistance. Moreover, this type lends itself to a very simple and compact design and for several reasons, not the least being that wonderful smoothness of action is possible; we prefer them to the wire type.

An Efficient Rheostat.

For the low price of 2/9 there is an excellent little instrument of this nature on the market which seems bereft of the faults inherent with the majority. As a matter of fact, the constructor cannot go far wrong if he purchases any make of filament resistance of this type, as of the two or three on the market there is not one that could prove the disappointment that a cheap wire resistance can.

Grid leaks are items that require careful selection, and the writer is of the opinion that whatever the circuit under consideration, it is as well to invest in one that is



PRACTICAL IDEAS for the AMATEUR.

EASILY CONSTRUCTED EARTHING PLUG.

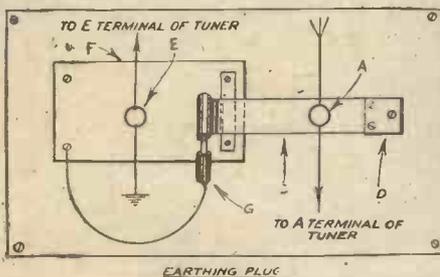
THE necessary parts are a thin brass plate measuring two inches by one, two inches of brass strip, a thin piece of mica, half a dozen small screws, two terminals, and a small piece of ebonite.

The accompanying diagram explains the device, which is fixed as near the leading-in point as possible. A and E are aerial and earth terminals respectively, where the connections to the tuner are made. The thin brass strip, C, is drilled at one end to take the small screw which secures it to the ebonite block, D, which has been fastened on to a baseboard with two small countersunk screws.

Direct Earth Connection.

A second hole has been drilled in the strip just large enough to take the shank of the terminal, A, which is secured underneath by a locknut. F is the brass plate mounted on a level with C, but fastened to the baseboard without insulation, and carrying the double terminal, E, which is also not necessarily insulated from the base.

Under one of the screws securing F to the baseboard is fastened a cord, to the end of which is attached a plug, G, which can be made from a short length of stout bare wire, say No. 16 S.W.G., and which has an ebonite handle or knob.



The end of the strip, C, is bent over to form a socket for the plug, which when inserted would be held in position between C and F by the springiness of the strip C.

At the edge of the plate, F, is fixed the strip of mica, which should be as thin as possible, and should only just prevent C and F from touching when the plug, G, is withdrawn. The operation of the device will be apparent. When the plug, G, is inserted the aerial is connected direct to earth and the instruments are protected from lightning.

Safety Sparking Gap.

When it is withdrawn the aerial is disconnected from earth by a small gap which is kept open by the strip of mica. Received signals would be unable to cross this gap,

and would therefore pass through the tuner in the ordinary way; but even with the plug, G, hanging loose the gap acts as a protector, because lightning would spark across the gap in preference to the less direct pathway which is afforded by the coils of the tuner. The area where C overlaps F should be kept small or a condenser effect would be formed by the adjacent surfaces, which would be undesirable when tuning.

A FEW HINTS.

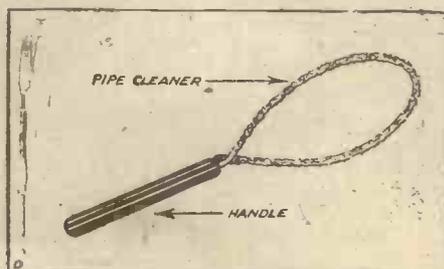
If you are using a stage of H.F. in your set, and suddenly one of your valves "pegs out" and you have no other at hand, do not despair, but connect a small fixed condenser across the plate and grid sockets and your valve-holder. You will be surprised what results one can obtain in this manner.

When you see a blue glow in your valves it is a sure sign that you are using too much H.T. This should at once be reduced, as it is harmful to the valve.

Head telephones should always be handled with the greatest of care, as every knock or jolt will decrease the sensitivity of the magnets.

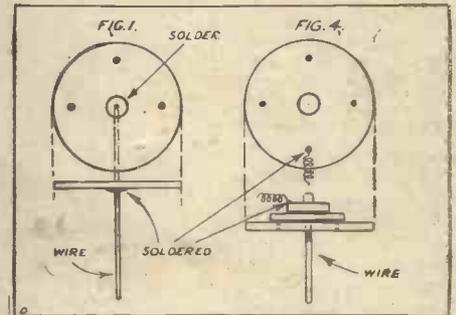
USEFUL CONDENSER ACCESSORY.

KEEP your condenser vanes clean. Remember that every speck of dust is a point from which there can be static discharge with its consequent losses. The writer uses a novel instrument for this purpose which is extraordinarily efficient. Firstly obtain one of the woolly type of pipe-cleaners and bend it into a long loop. Twist the ends together and if desired glue into a handle made by drilling a hole in the end of a piece of dowelling. The finished gadget is shown in the sketch and is used by being passed between the vanes, and is guaranteed to remove every speck of dust.



HANDY TERMINALS.

MANY experimenters will probably have found it a tedious process screwing and unscrewing terminals when using or trying out different circuits. Therefore if the following instructions are carried out, a great deal of time will be saved. Procure from a draper's shop a card or two of rustless dress-fasteners known as snap or pop fasteners. Each card holds one dozen and costs about a penny or so, or



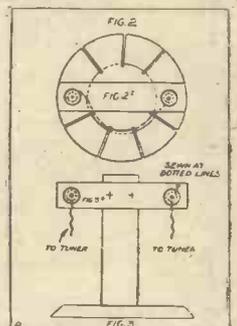
very often a search in that very useful receptacle the domestic work-basket brings forth a supply.

Many Uses.

Having obtained these first divide the fastener and take the bottom half and solder to it a piece of wire, as in Fig. 1. Then the insulator to which this is attached, is prepared. Drill four holes corresponding to the four in the fastener, and one hole through which is pushed the wire just

soldered on. The fastener is then sewn with cotton to the insulator. A glance at Figs. 2 and 3 gives an idea of how this is done. The beginning and ending of the winding on a coil is soldered to the projecting wire of the fastener as in Fig. 2b. In Fig. 3 and 3b it shows the stand and insulator, 3b being the tops of the fasteners sewn on, and wire soldered to the sides.

Of course, there are many ways in which these fasteners may be used, but the rough sketches will suffice. Fig. 4 shows a fastener for a loose wire, the wire being pushed through one of the holes and soldered. The above have been tried out, and work very well.





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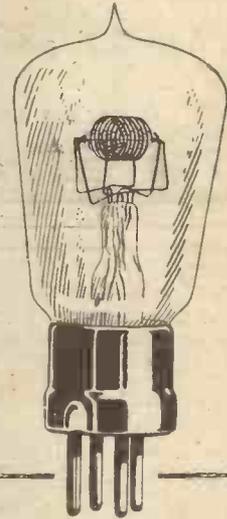
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Two Minutes Interval-Please!

By E. Blake A.M.I.E.E.

A Moving Story.

I HAVE read in the newspapers the moving story of a gentleman, of sound instincts but impulsive action, who hurled the family wireless set upon the family pyre. "The children were heart-broken," said the story. What a tribute to the B.B.C.!

But there is more in this ungarished, stark recital than meets the eye. Let us apply the calm, dispassionate methods of analysis. First, the man had made, or borrowed, or stolen, or, in the last extremity, bought a wireless set and installed it in his home. Mark you, not in a club, or the scented abode of the vamp. No, in his home, where little children kicked the furniture and love manipulated the teapot. There is beneficence—paternal care.

Then, says the evidence, he wished to listen to the "wireless." How a man can hear "wireless" (what is "wireless") passes my feeble comprehension, but we will let it go at that. Well, at least we may credit our man with love of home, music, John Henry, and "sinister motives in wood wind," as exemplified by the great symphonists. Is that a crime, my brothers?

Finger of Scorn.

Let us pass on. The lady in the question was a competitor of the B.B.C. Not a loud speaker was she, but she played the piano, or, as I believe it is sometimes termed in the best proletarian society—the Joannah.

Thus Greek met Greek and squeak met squeak, and turned aside. Yes, the "Battle of Prague" on the Joannah would not blend with the Moonlight Sonata from 2 L O, and so in despair, in agony, in exquisite artistic agony, the wireless was hurled upon the sacred hearth. And the children were heartbroken.

Can we blame him? Can we point at him the finger of scorn and say "Destroyer of children's toys"? That gives rise to the thought that the wireless set may usurp in fiction the place so long occupied by the pathetic figure of the broken doll. The man who would cast upon the floor and rend a child's doll is without the pale of decent human society. He is outside with those other outcasts authoritatively described as "dogs and sorcerers." Personally I have found the society of sorcerers extremely attractive, but perhaps my taste has lost some of the pristine beauty which it enjoyed when I was a fluff-chinned adolescent. But that is another story. (Beg pardon, Mr. Kipling. You will coin such useful phrases).

Modern Drama.

Harking back, may we not expect to hear in future the agonised cry of the mother whose darling has gone—a gone—a forever—as follows: (Of course the little blighter has only slipped off for ten minutes to play "cherry-hogs" down some low street).

"Come, Henry, let us gaze upon his little room. Ah! Oh heavens, there is his

little bed, with its little pillow and little sheet. And here is his little wireless. Aha! Here is his little crystal, which he so loved. And there is his little valve, so cold and still, and his little what's-its-name, which he made from his grandma's bustle. Three hundred and sixty metres, it is, I think he said. How it all comes back. Wah-hoo!"

Henry: "Um-yes! There's my new variometer. I thought Geary had pinched it. There, there, my dear, he'll come back. Guess he's round at Aunt Alice's. She had a new wire clothes-line last week. Just the thing for an aerial."

The Brotherhood of Wireless.

One of the favourite tropes of the freelance journalist, when writing of the blessings (I am one day going to write of the opposite things) of wireless, is that radiotelegraphy is a beneficent force, linking nation with nation, breaking down the barriers, etc. There is something in that, but the really striking barrier-breaking is accomplished amongst the people of any one nation.



Miss Wanda Hawley listens-in.

Men who once would not speak to each other, now argue like the friendliest of friends about the relative merits or demerits of this, that, and the other. The sign of the outstretched aerial is as potent as the outstretched hand. One sees an aerial. It is rotten. One feels sorry for the misguided wight who (one imagines) vainly strains his tympani for signals which could be so much stronger if that aerial were only designed in such and such a fashion. One speaks about it; one finds a new acquaintance, and one learns that one's methods of tuning are as faulty as the other's aerial. Then the wives get together—and there you are; a new drain on the Tantalus, a new borrower of one's lawn-mower. In effect, a new friend.

Broadcast Pronunciation.

Why, were it not for wireless, we might be ignorant that the Uncles have such Jove-

like utterances, and the Aunties such sweet voices. (Talking of that, I notice still a headlong tendency at 2 L O to horrors of this kind: "After being burnished the harness will be put on the horsisz, who will then be driven to the biggest furniss in England, Merrie England, by German.")

It is conceivable that the loan of a two-noughts one condenser might put an end to a feud older and deadlier than that which existed between the Capulets and the Snookses, whilst the gift of a dry-cell at the siko mo might well bring maudlin tears to the hardest-fisted clam that ever a man had for a neighbour. You wait until that day comes, as come it will, when the non-card-playing but auriferous uncle and aunt drop in, seeking entertainment—and the juica gives out just in the middle of the song which is causing the old creatures to wag their noddles, tap their toes on the carpet, and say "Tum-tumpty-tum"; when they are way back in '66, dreaming of unspeakable polkas, elastic-sided boots, crinolines and negus-parties. Then you will fly to the nearest house with the outstretched wires, and grovel, not in vain, for primary or secondary batteries, or even a hand-generator.

Mutual Interests.

There is a camaraderie, a *que se yo*, an understood coalition, an unwritten what's-its-name, a *je ne sais quoi*, between all those who follow the cult of radio, which is stronger and far more useful than any other league, bar Freemasonry.

You cannot introduce yourself and your trouble to a stranger because you happen to know that he, like yourself, collects French Colonials or Blue Mauritii. But if you have a moving tale of crystals, or "peanuts," or rheostats to tell, behold, you are a stranger to none who practises radio. No! The lion of the seven-valve receiver shall lie down with the lamb who confesses to a seven-and-sixpenny crystal set, and the sucking-babe with more ducats than knowledge shall sit down (not however without an element of risk) upon the transmitting, willy and needy cockatrice's den. What he shall gain in wisdom he may lose in honey-comb coils. Selah. Likewise S.O.S.

Various Ways.

There be—or grammatically speaking—there are, or, historically speaking, there were, three ways. To wit, that of a ship on the sea. The way of a ship in dry-dock, or on a lee-shore appears to have been overlooked. And the way of a man with a maid. Gaspers and raspberry sundaes, usually. The converse, or the infinite ways of a maid with a man are the copyright of the novelists. And finally, the way of an eagle in a dell.

But—a large but—the ways of acquiring a wireless set (and the sooner we drop "listening-in" and "set," the quicker) are as numerous as the sands on the floor of the bar-parlour. "Bar-parlour," my friend, is a partitioned-off portion of a hostelry, where 'Erry tells Bill £1 about kepitalists.



The transmitting plant at the power station.

IN the first place, I was surprised at the luxury of the Cardiff studio. I don't wish to infer that wonderful tapestries are hung from the walls, and that it is equipped with expensive Turkish carpets, but luxurious as compared with the London studio. But there is a reason for this, however, as during the daytime, owing to lack of room, the station director finds it necessary to convert the studio into his office, and it makes rather a nice office, too, with its heavily draped walls, a nice fireplace, and a fine piano. The bay windows of the "studio-office" look out upon the famous Cardiff Castle. It should be mentioned that this view is exclusive to the station-director,

as double shutters are fitted during broadcasting, the artistes thereby missing one of the finest views in the country. But a beautiful view of the modulating-room is obtained through a small side window.

The Modulating Room.

IN front of this window are three lights, one red, one green, and one uncoloured. Should the red one light, there is a breakdown in progress (somewhat unusual, I understand, in Cardiff). The uncoloured one signifies "proceed, all O.K." The green is now not used. Formerly various combinations of the three lamps were used, but now lighted letters which read "stand



nearer Mic"; "Piano nearer Mic," etc., have been placed over the modulating-room studio. The studio measures approximately 18 ft. square, as compared with 40 by 25 ft., which is the size of the London studio.

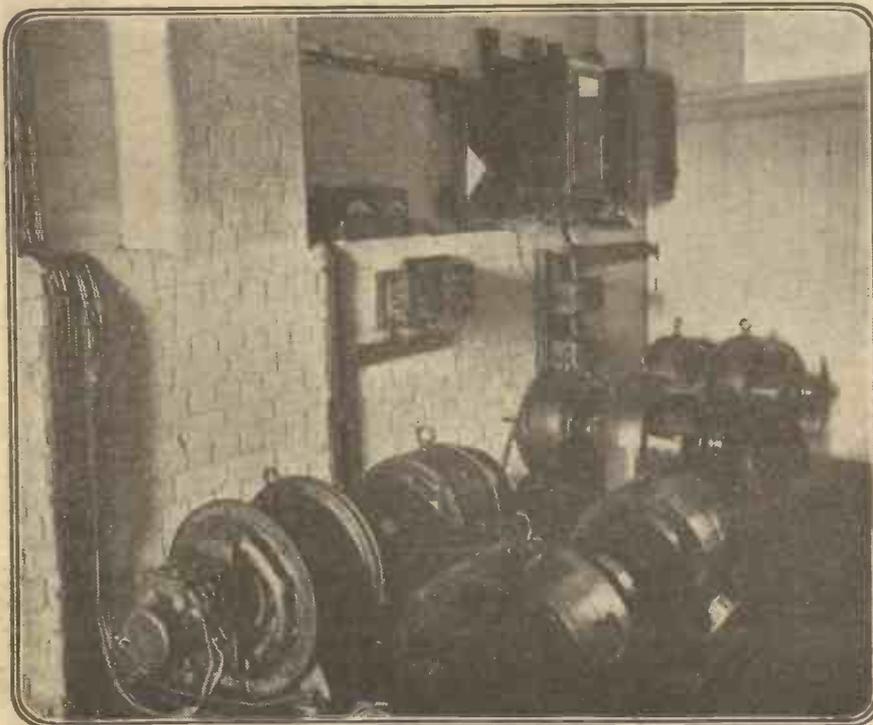
As I was having a last look round the studio the station director entered. Major A. Corbett-Smith was very pleased to give me details of the station and the rest of the staff, but he was particularly reticent about himself, and I have absolutely failed to find out anything of his past, present, or future; but I believe that he is responsible for one or two operas, among which shines "Elizabeth."

The modulating-room at Cardiff is, perhaps, a little smaller than "moderately sized," but its importance should not be underestimated. He who modulates has to be forever alert. He is the man of the red, white, and obsolete green lights. Should the artiste be somewhat near to the microphone, he presses a button or pulls down a switch, etc., and the little lighted letters above the modulating-room window in the studio read out a message which the artiste obeys. There are switches also for connecting the London station to the Cardiff transmitting station for retransmission of the London programme in Cardiff, while one of two telephones in the modulating room are always connected direct with London. The other is connected direct with the Cardiff Power Station.

While I was in the modulating-room, the afternoon programme commenced. This con-



The way the blanketing is seen from this



General view of the generator room at the power station in Eldon Road.



"Uncle Norman," "Auntie Betty," and "Uncle Leslie."



sisted of selections played by Falkman and his orchestra at the Capitol cinema some three-quarters of a mile away, and it came through well on a crystal set to which were attached several pairs of 'phones with leads taken to the various offices for waiting artistes, etc., to listen to.

The transmitting plant is situated about a mile from the broadcasting studio, and is at the power station in Eldon Road. A large double sausage aerial is suspended from a tall chimney, and, by means of insulated stays fastened to the ground, is kept taut.

There are two generators here, one for a spare in case of trouble with the other. These generate 500 volts at 300 cycles, and are driven by Corporation supply. In the same room as the generators the batteries for heating the filaments of the valves are stored, while the actual panels are in a further room.

Controlling the Transmissions.

IN the panel room there are transformers to step up the generated 500 volts to 10,000 volts, and this is applied direct to the plates. The first panel is the rectifier for rectifying the alternating current supplied by the generators. The second panel is known as the drive oscillator, but this is not coupled direct

to the aerial, which, however, is the case with the main oscillator (third panel). The fourth and last panel is known as the modulating control panel. A small power amplifier is also mounted below this last panel. The average voltage



arranged can be clearly photograph.



A group taken during the recent visit of Capt. Eckersley and Mr. Burrows to Cardiff.

applied to the filaments is fifteen, while the consumption is 11 amps. These figures are somewhat reduced in the case of the small power amplifier. One would imagine that the engineer in charge would have a not too difficult job, but this is not the case, and he always has to be on the alert watching the various meters, etc. Should the artistes go too near to the microphone a spark is liable to jump from the plate leads to the metal work of the panel, and he always has to be on the look out for this, and report over the telephone to the modulating-room, when "he who modulates" works his signalling lights. As regards the tuning, this is set, although the changeable weather sometimes makes it necessary to alter the

aerial coupling, but this never varies to any great degree.

Tracing Breakdowns.

HOWEVER, a change of wave-length entails some considerable amount of work, and as in the recent changes, each circuit has to be retuned separately.

The transmitter is of the Marconi 1½ kw. type, and aerial radiation is 9 amps.

A breakdown can usually be traced and remedied by glancing at the many dials on the various panels, but it is unusual for any interruption of this sort to take place between the cheery "Hello, Kiddiewinks" and "Good-night, Everybody, 5 W A, the Cardiff station of the British Broadcasting Co., now closing down."



A corner of the studio at Cardiff.



Another view of the studio at 5 W A, showing the microphone and tubular bells.

A SIMPLE VALVE-CRYSTAL RECEIVER.

PART IV.

This concluding article deals with the various circuits contained in the set, and explains the methods employed in the operation of the receiver.

FOR the box on which the panel is to be mounted, planed wood $\frac{3}{8}$ in. thick, for the sides, should be cut out to give the required internal dimensions of 12 in. by 8 in. and a depth of $4\frac{1}{2}$ in. The bottom consists of $\frac{1}{8}$ in. three-ply. The sides are screwed together, and corner-pieces fitted at the top right-hand corner, and the two lower corners to take the fixing screws. The bottom is then butted on, a strip of beading being used to hide the bottom junction as shown.

After assembly, the box should first be well rubbed down with fine sand or glass

switch on 2, and the second coil on anode B. If working on 2 L.O., signals may first be obtained on the crystal only. Then by turning on the valve filament the effect of high-frequency amplification will be shown by a considerable increase in signal strength. The main purpose of this circuit is, however, for picking up distant stations, outside the range of ordinary crystal reception, and in this case the valve should, of course, be lit before one commences to "search" on the tuning condenser for the station desired.

By changing the second coil from anode B

to anode A, the high-frequency circuit is altered from a tuned anode with reaction on the aerial to a simple tuned anode not coupled to the aerial. Generally speaking, this circuit should always be used, as it limits the possibility of energising the aerial and so radiating "interference." In both cases it must be remembered that it is necessary to tune on two circuits—i.e., both on the aerial and anode condensers.

The valve-crystal switch should be on "valve," the main switch on 1, with the aerial inductance coil plugged in and both valves inserted in their sockets (or the left-hand valve alone is sufficient). It must be remembered that whenever the valve-crystal switch is on "valve," the telephones must be inserted across the lower and not the upper set of 'phone terminals. For a single pair of 'phones the two lowest terminals are used. If two pairs are required, one pair should be inserted across the two left-hand terminals, with the other 'phones across the right-hand pair, as shown in Fig. 14, or two or more 'phones may be used in parallel across each pair of terminals. On turning the rheostat handle the left-hand valve is lit, and the signals rectified by

the crystal are now strengthened by the note amplifier. The circuit for this arrangement is illustrated in Fig. 12, and was traced out from the wiring diagram in the last article.

Distant Reception.

The set is left in exactly the same condition as for the previous circuit, except that a second coil is plugged in anode A and the main switch is turned to 2. Both valves are now lit up, and the rheostat should be opened out until both filaments are fully incandescent.

The set is now giving its maximum output, the circuit being as illustrated in

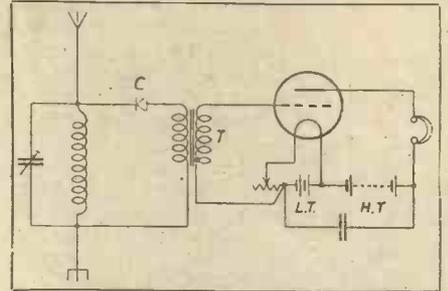


Fig. 12. Crystal and L.F. amplifier.

Fig. 4 of the first article. In this condition the set will give maximum signal strength on distant stations. For direct reaction on the aerial (when working on Eiffel Tower, or Radiola, or any other station outside the broadcasting wave-lengths) the second coil may be inserted in anode B instead of anode A. It must not be forgotten that whenever the H.F. valve is in operation it is necessary to tune-in on both aerial and anode condensers.

Coupling Adjustments.

If it is desired to cut out the high-frequency amplification the rheostat should be turned to reduce the current somewhat before changing over the main switch from 2 to 1, so as to guard against applying too high a voltage to the single filament, particularly if six-volts L.T. is being used.

The secondary coil should be in anode B, the H.F. valve removed, the single-pole switch placed on "valve," and the main switch on 2, with the lower 'phone terminals in use. The coupling between the coils should be adjusted for loudest signals free from interference.

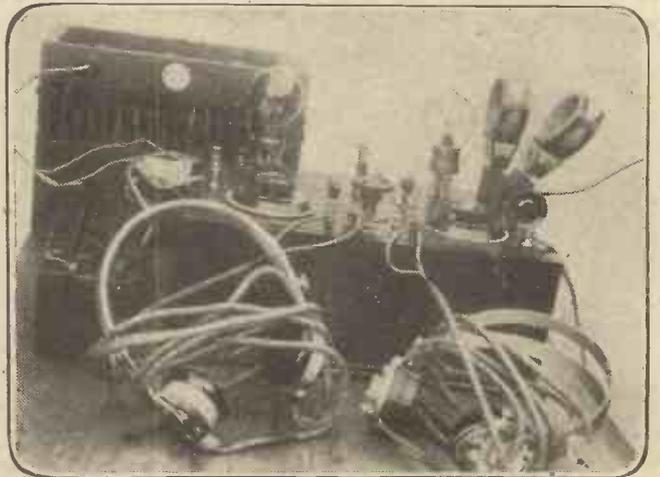


Fig. 14. The finished set connected up for use.

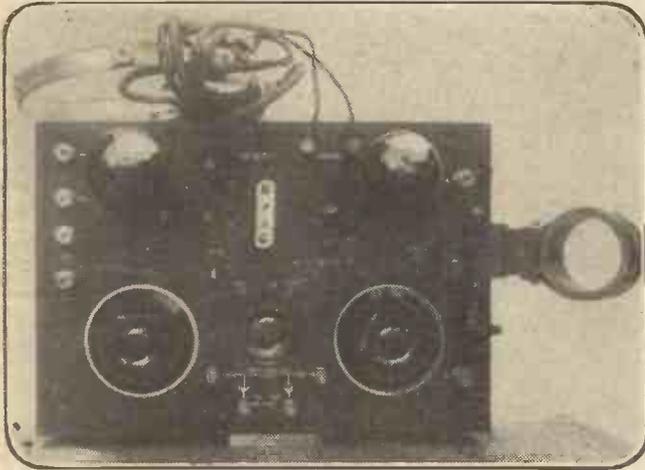


Fig. 13. A view of the completed panel, with 'phones in upper terminals.

paper, and a first coat of water-stain applied, followed by a coat of varnish. When dry, the panel is dropped in so as to rest upon the inside corner-pieces, and screwed down.

It now remains to run through the various circuits, and to say a few words on the general operation of the set.

The telephones are connected across the top telephone terminals, the valve-crystal switch turned to "crystal" and the main switch turned to 1 as shown in Fig. 13. In this position the crystal and 'phones are connected directly across the aerial inductance (Igranic coil No. 35), and signals will be brought in by turning the aerial tuning condenser. This circuit can be traced out from the wiring leads in the last article.

Different Combinations.

Plug in a No. 50 or No. 75 Igranic coil in anode B, and turn the main switch to position 2; re-tune on aerial condenser slightly, and adjust coupling between the two coils to maximum signal strength. Both these crystal circuits are shown diagrammatically in Fig. 3 of the first article.

Connect up accumulator and high-tension batteries, and insert the right-hand valve only. Leave telephones on top terminal, single-pole switch on "crystal," main

Illustration shows Mr. Keith Jopp and his Peto-Scott Units



Mr. Keith Jopp gets W H A Z so well that the Boston (U.S.A.) papers give an account of his results.

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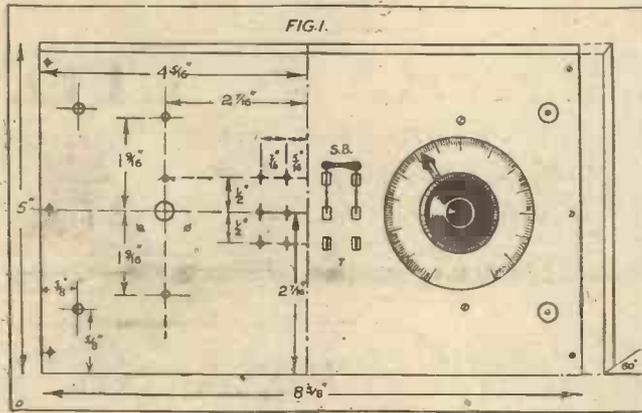


A Compact Tuner.—Connections from Movable Arms.

A COMPACT TUNER.

IN describing this tuning unit, which the writer constructed a short while ago, no claims to originality are put forward, as doubtless an instrument similar in many respects may already be in the hands of a

number of experimenters. Nevertheless a large number are doubtless in possession of various condensers and a two or three coil holder. The writer was one of these until recently, when it was decided to make a compact unit of the various components, which at the same time could be used to try out any new circuit. The accompanying photograph will show that the result was a compact instrument of pleasing appearance.



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Making the Switches.

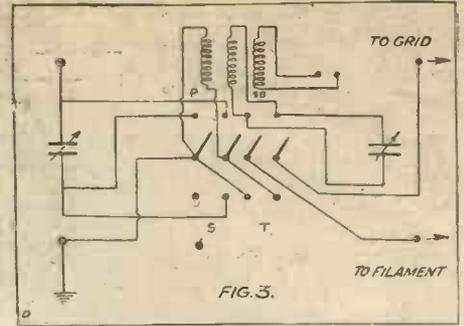
The two "Polar" condensers were selected from the stock in hand, because of their compactness and smooth action, and

wire driven in from each side, care being taken that they did not meet in the centre, so causing a short.

Four terminals are mounted at each corner, top and bottom left-hand being aerial and earth, and top and bottom right-hand being grid and filament respectively. The three coil holder is mounted on the top of the case, short lengths of flex being taken through holes drilled in the base. The left-hand coil is the A.T.I., the centre the secondary or closed circuit coil, and the right-hand side can be used either for reaction (outside the broadcast wave-lengths), or as a wave trap when using a loose-coupled circuit, in which case a variable condenser is connected across it by means of the two terminals at the right of it.

Efficient "Wave Trap."

When receiving on a single circuit it will be found that the centre or secondary coil acts as a very efficient wave trap. A glance at the wiring diagram (Fig. 3) will show that with the switch in the lower or "tune" position, this coil is shunted by the secondary condenser, and is disconnected everywhere else. By careful adjustment of this condenser



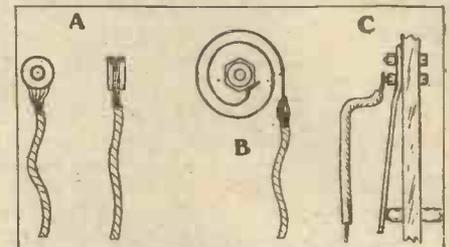
and with the primary closely coupled, the unwanted station can be completely cut out.

Fig. 1 gives the general layout of the ebonite panel, which was $\frac{3}{16}$ in. thick, sizes of holes being governed by the terminals and screws on hand. This panel lays back at an angle of 60° , which allows the condenser scales to be clearly seen at any position of the pointer. The sides and top (Fig. 2) were made of $\frac{1}{4}$ in. wood, and given a coat of dead black.

CONNECTIONS FROM MOVABLE ARMS.

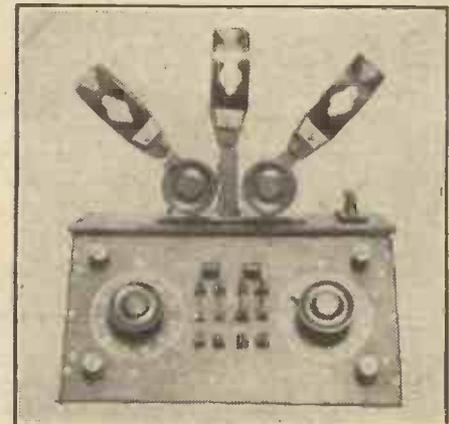
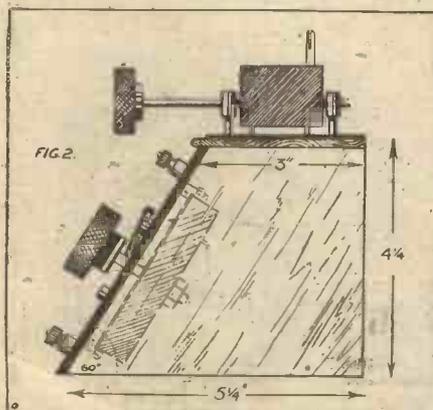
IN diagram A the end of a piece of flexible wire is frayed out and soldered between two brass washers, which are then clamped to the end of the spindle by means of two nuts.

In diagram B a strip of copper foil, about $\frac{1}{4}$ in. wide, is made into a spiral, and arranged as shown, one end being soldered to a nut



on the end of the spindle, and the other to a piece of flexible wire.

Diagram C shows what is probably the most simple method, in which a strip of thin spring brass is arranged to make a rubbing contact with the end of the spindle, a piece of ordinary copper wire being connected to any part of the strip or to one of the supporting bolts.



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D.P.D.T. 3/6.

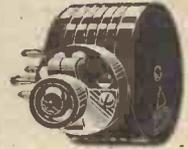


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By W. James

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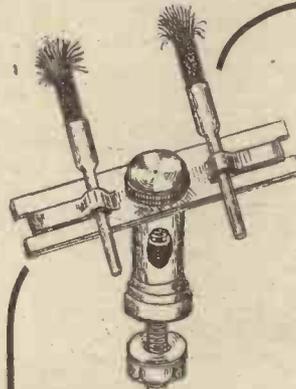
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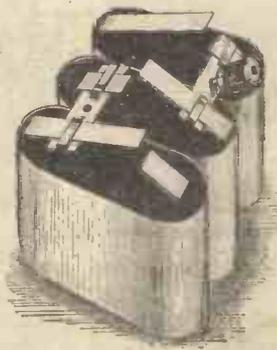
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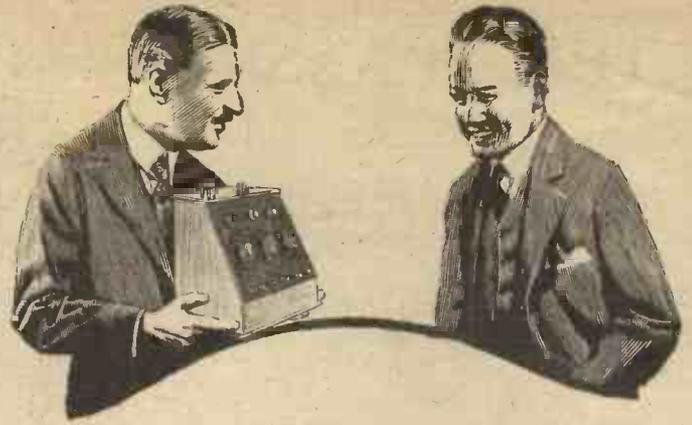
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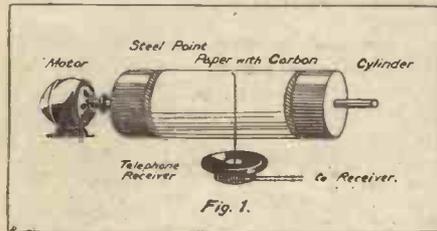
THE TRANSMISSION OF PHOTOGRAPHS BY WIRELESS.

By T. BROWN-THOMSON.

The problem of television has been occupying the attention of electrical engineers for some years, and various schemes have been put forward to make the transmission of photographs possible. Since the perfection of radio-telephony the question of television has come up with increased interest, and the difficulties and possibilities are fully discussed in this instructive article, the first part of which is published below.

BEFORE any progress at all can be made in the problem of television, which every sound wireless amateur believes to be among the possibilities of the next twenty or thirty years, the perfect transmission of photographs is an absolute necessity. The fact of being able to transmit through the ether, at any time, a perfect reproduction of any photograph naturally brings with it the query, "Can any scene from life, moving or still, be reproduced in the same manner at a distance?"

It was not until about 1900 that any real progress in the transmission of photographs was made, but even up to date the solution of this problem of the transmission of photographs, and other matter electrically over conductors for any great distance, has not yet been solved. It would seem, therefore, that it is nonsensical attempting this feat by means of the science of radio, when the solution as to land-line working, where the conditions seem to be so much easier, still evades us. It will be found, however,



that the problems which are apparent in land-line working disappear when we consider radio, although, as is to be expected, the latter method develops problems peculiar to itself. The problem in land working when attempting the transmission of matter such as photographs is the effect of inductance and capacity, two electrical factors which are present in all systems of conductors where current is flowing.

The Charbonelle System.

In radio, utilising as we do the ether for our conducting medium, the problems of lag in speed due to inductance and capacity are non-apparent. Distance with the modern valve transmitter is also no drawback. The problems which confront us, then, are contained in the instruments used for the transmission and reception of the photographs. The only instrument I wish to refer to connected with the transmission of photographs over the land line is one used for reception and invented by a French engineer named Charbonelle. A diagram of this will be seen in Fig. 1.

It is because of its very simplicity and its adaptability to radio in these days of multi-valve receivers, that I include it. The photograph which it is desired to transmit is

specially prepared by one of the methods which are set out later on. The receiver consists of two thin sheets of white paper between which is placed a sheet of carbon paper. These are fitted around a drum which can be revolved by a small motor. Bearing on the top sheet of paper is a steel needle, the other end of which is fastened to the diaphragm of a telephone receiver.

Crude but Ingenious.

The photograph which it is desired to transmit, giving a make and break electrical contact in the circuit in which is placed the telephone receiver, will cause the diaphragm of that receiver to vibrate. This in turn will cause the needle to press on the paper on the drum, which in turn, by pressing on the carbon paper will cause a black mark on the bottom sheet of paper. In this manner, if the drum and the photograph are moved in synchrony, a reproduction of the negative will be found made by the black marks on the bottom sheet of paper.

While the method is very crude, it will certainly give some kind of reproduction, probably something like the pictures one made in childhood days with a stencil, and it has at any rate the merit of being both ingenious and simple.

Three Important Points.

With the transmission of photographs by radio, there are three points of prime importance.

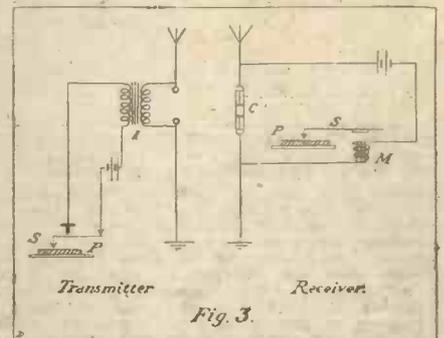
1.—The speed of transmission of the photograph. It will be readily recognised that this is a factor of the utmost importance to the successful commercial transmission of photographs, and is the main factor in television. 2.—The quality of the picture transmitted. This, in the end, is the supreme test of the success of any system.

3.—Synchronisation. This will be found, for the experimenter, the greatest problem of all. The inherent difficulties of synchronising two machines separated by any reasonable distance are many, and constitute in the transmission of photographs and television the greatest problem.

We will consider, before passing to the many problems and the methods evolved to overcome them, two of the early systems. This will serve to give the reader some idea of what is necessary in both the transmission and the reception of photographs by wireless.

The first system is one invented by an

Italian at Turin, and although not really connected with radio is, nevertheless, of interest because of the methods used. These methods run very close to modern practice in the transmission of photographs. As will be readily seen from a study of the system, as set out in Fig. 2, the transmission is really a visual transmission of photo-



graphs, and because of the use of the arc lamp and reflectors would necessarily be limited to a few hundred yards at the most.

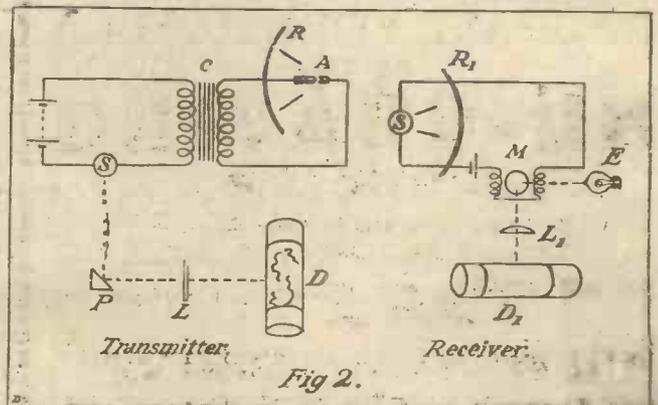
The transmitter consists of an induction coil, C, in whose primary circuit is placed, as a controller, a selenium cell. The secondary voltage produces an arc at the carbons A. The photograph to be transmitted is wrapped round the drum D, in which is placed an electric lamp.

The drum is given a small forward movement as well as a rotary one, and the light is focused through the film or photograph, through the lens L, on to the prism P. From the prism the light is reflected on to the selenium cell.

The Selenium Cell.

The variations of the light caused by the photograph and reflected through the prism will cause similar variations in the resistance

(Continued on page 824.)

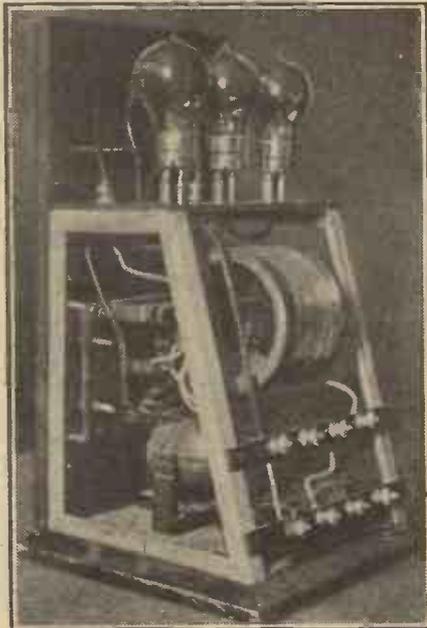


FROM PARIS TO BRIGHTON ON FIVE WATTS.

An interesting account of the successes achieved by a well-known amateur with a low power transmitter.

THE reduction of antenna capacity to a minimum has perhaps been one of the favourite pastimes of the radio experimenters lately; but the great difficulty has generally been a proportionate reduction in range of the transmitting set, which does not seem to be the exact result desired. While "baby" sets are still being constructed, both in the sending and reception phase of wireless, many amateurs have begun to look on these sorts of jobs as merely trick fads, of no real value to industry or science.

However, there still remain those optimists who never quite lose hope—they are generally to be found in the laboratories, fussing around on seemingly useless tasks; and one of these. Reginald Gouraud, the



A view of the wiring of the 5-watt set.

American radio constructor in Paris, has apparently proved that this "useless fussing" may come to some good end.

He chose for his research work one of the simplest of the transmitting circuits, and in turn "condensed" this to its smallest dimensions. Reducing also to a minimum the number of control and measuring dials, he set the whole apparatus up on a single ébonite panel about 18 in. high and 12 in. wide. Assembling the little toy set, turning on his generator, and commencing to operate, he developed from five to ten watts antenna capacity, and actually found that the best modulation was obtained at about 5 watts.

Unexpected Results.

Not long after his first trials, when he announced his call letters as 8 C A, he was the recipient of a large number of telephone calls from different parts of Paris and the suburbs. Most of the callers wanted to

say two things, the first being that he ought to get off the wave-length of the English concerts, and the second that they had never heard such perfect modulation from any set. As the days passed, Gouraud received letters from various departments in the provinces, congratulating him on the excellent modulation, until at last he saw his call letters reported as heard by three different people in England, in the general locality of Brighton.

The generator for this set is an Electro-labor dynamo, delivering 300 volts direct current, and this generator is equipped with a filter circuit. The three valves used are the usual French 5-watt transmission type, two modulating and one oscillating. Gouraud will not give out the details of his circuit—the circuit itself is absurdly simple, he insists—because of the coupling he has made between the modulating and the oscillating circuit, which, he claims, is the secret of the entire transmission.

For Short Distances.

He has only sent gramophone records, modulated continuous wave telegraphy, and various test speeches over the little set, but hopes to develop it commercially for short distance work in the near future. In his most successful tests, he used a prismatic antenna (four-wire), about 30 ft. long.

THE TRANSMISSION OF PHOTOGRAPHS BY WIRELESS.

(Continued from page 823.)

of the primary circuit of the coil in which the selenium cell is operating. This in turn will affect the secondary voltage, and in consequence the arc, which that voltage is causing. These variations are transmitted through the air by the parabolic reflector R.

The receiver consists of a similar reflector, R1. The received variations of the light are reflected on to a selenium cell, S, which is in circuit with a mirror galvanometer, M. The light from the lamp, E, is reflected by this mirror through the lens, L1, on to the printing paper, which is wound on a similar drum, D1, moving in synchrony with the drum D at the transmitter.

It will be obvious that the light varia-

tions will affect the selenium cell, and will cause variation in the galvanometer circuit, which in turn will cause the mirror to oscillate. The light reflected from the lamp on to the paper will thus be varied in synchrony with the variations of the light from the transmitting arc, and a reproduced image of the photograph will be obtained.

The second method, using the "spark" or damped wave system of transmission, was invented in 1908.

Knudsen's Method.

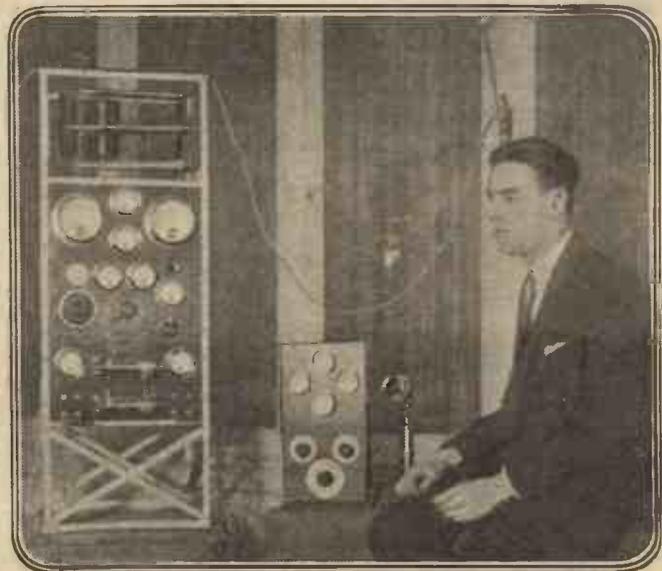
The plate to be transmitted was prepared in a special manner. The camera had a single line screen (screens will be treated later) and the plate had a very thick coating of gelatine. The effect of line screen is to break the picture up into parallel lines, and when the negative had been developed it was sprinkled over with fine iron dust. Owing to the transparent parts drying more quickly than the shaded or dark parts, the filings or dust adhered more to the darker portions. We have therefore a picture composed of iron dust with insulated portions.

The actual transmitter consists of an induction coil, I (Fig. 3), connected to an aerial system. In place of the transmitting key in the primary circuit is placed a moving table, P, on which is placed the prepared negative. Resting on the negative, and forming part of the electrical circuit, is a light spring, S. As the table is set in motion the spring is set into vibration and causes a make and break in the primary circuit of the coil, according to the density of the iron dust, which in turn is controlled by the density of the prepared negative.

Taking a Print.

At the receiving end a coherer is attached to a receiving aerial system, connected so as to control, by reason of the received waves, an electro-magnet, M. This electro-magnet controls a similar spring to that at the transmitter. This spring bears on a smoked glass plate which is placed on a table moving in synchrony with the table at the transmitting end. When the signals from the transmitter are received they cause the spring to vibrate on the smoked glass, which in turn scratches the plate. A print can be taken from the smoked glass.

(To be concluded.)



Right: 5-watt set; left: 20-watt set. The latter is considered quite small!

Artistes of the Aether

BY 'ARIEL'

Some of the artistes who have given you pleasure while "listening-in"

"IT is the woman's vote that counts," said one of the candidates in the recent election, and so indeed it proved to be. We think, too, that if a vote were to be taken for the best of all scientific pleasures, it is the woman's vote that would "plump solidly" for wireless.

This does not mean that the feminine sex has taken it to its heart and head for itself—far from it—but for its effect on the home and things domestic. Those members of the male sex who have developed wireless are now prone to make a bee-line for home, but are blind to all petty discomforts of domestic life. They return promptly to wrestle with the crystal or the detector valve, and have no minds for grumbling at an unpunctual, or even—though whisper it gently—an ill-cooked meal. They can have all the causes for grumbling at a faulty battery or a mishap to the aerial, and by the time they



Mr. Bert Kellaway.

have expended their natural irritation, things domestic run on oiled wheels again, while apart from that aspect, it forms a constant source of pleasure.

An Amusing Incident.

Books have all been read, the evening paper disposed of, rain precludes an "outing." What was there left in former times but a dull evening and possible rifts in the domestic peace? But now, there is the apparatus to rail against when things are not to our liking, and the pleasures of the programmes themselves. Oh, yes, indeed, wireless would have the woman's vote.

A prominent Bournemouth favourite is the singer Mr. Bert Kellaway. He has a tenor voice which apparently is especially adaptable for broadcasting purposes, and he is always assured of a welcome. Mr. Kellaway is well known throughout the Hants districts, and has appeared at many amateur operatic societies. He tells of one little incident that nearly turned a big scene into comedy. When playing in "Les



Miss Muriel Brunskill.

Cloches de Corneville," as Grenichieux, he was being badly treated in the haunted chamber, and the country audience were being badly thrilled, when a shrill voice came from the stalls: "Oh, mummy, mummy, can't you help daddy!" Mr. Kellaway's little son

had done his best to come to his father's rescue, but with nearly disastrous effects.

With the British National Opera Company now in full swing at Covent Garden, listeners-in will have the opportunity of hearing many of their favourite artistes again. One of the stars is Miss Muriel Brunskill, a brilliant young contralto. English in every sense of the word, for not only was she born in Kendal in Westmoreland, but all her training has been British, she sings with perfect diction and grasp of her own language. Her studies have been under Sir Henry Wood and Samuel Broughton, and for opera, Mme. Marchesi.

The Inimitable Four.

A pianist who has done some good work at the Bournemouth Station is Mr. Allan Franklin, and he has given several recitals, recently playing the solo in the Beethoven Concerto No. 1 with orchestral accompaniment, this being the first pianoforte concerto to be broadcast from 6 B M.

A hearty laugh cures many an ill, and the "entertainer" of the B.B.C.'s day is often an angel in disguise, and is sure to meet with a warm though necessarily silent welcome, and when this "entertainer" turns out to be Miss Helena Millais, then the headphones nod with pleasure, for "Our Liz." has already become a favourite personality at 2 L O.

Helena Millais started her career as "the youngest leading lady on the stage," and very quickly established herself as an actress of immense capabilities, in plays ranging from Shakespeare to the most modern of our comedies.

Miss Millais provides another example of the value of stage training to the radio artiste, for her voice is made to accommodate itself instantly to the special needs of the microphone, and her experience in both drama and comedy enables her to make the widest of appeals. One of her last appearances was at 2 L O when she formed a Christmas party with John Henry, Ronald Gourley, and Jaye Kaye, the four together making the best turn of the week.

Popular Elocutionist.

Another clever raconteuse and elocutionist is Mme. Lillian Ginnett, and she has appeared on many occasions before the microphone. As an elocutionist this artiste ranks as one of the highest, and all concert goers who have attended her many recitals at the Steinway and other classical concert halls will remember her skill, while

many singers of the day have reason to be thankful for her coaching at the Guildhall School of Music. In a recent "chat" Mme. Ginnett related some of her earlier experiences.

Her first appearance was made at the age of three in the circus of her father, Frederic Ginnett senior, who had often appeared before Queen Victoria. Between the ages of five and thirteen Miss Ginnett continued to play the parts of Cinderella and other nursery favourites, until at last she took seriously to music. Then at the Royal Academy of Music she studied the pianoforte, singing, and elocution, the last under the famous William Farren. For a time Mme. Ginnett became attached to musical comedy and acted with the George Edwardes companies in such favourites as "The Circus Girl," "The Country Girl," "The Shop Girl," and "San Toy," etc., till at the age of twenty-five, on her marriage, she left the stage.

The Fairy Godmother.

But her art was not to be lost, and she was prevailed upon to take up concert work, and for which she has made another reputation for herself. Her talent, too, has been transmitted to her little daughter Anne Bolt, the clever little child dancer and film actress. Already she has played important parts in some of the biggest films of the day, amongst them being "The Prodigal Son," "The Bohemian Girl," "Brown Sugar," and "The Wandering Jew." She will no doubt become one of our leading ladies on stage and screen. Mme. Ginnett, like most mothers, would fain hide her own talents, but the microphone has brought her the biggest audience in the world, and one that is always awaiting her.

In some cases the B.B.C. may be termed the fairy godmother of the modern school of musicians. Waving a wand, or perhaps a disused aerial, she places them before her microphone and bids them "do their best" and see what the world thinks. But in most cases the artistes are extremely well known in their own immediate counties.



Miss Helena Millais.



Mr. Allan Franklin.



Mme. Ginnett.

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Who ties a "Granny" knot? Why, those good folk who have not been Boy Scouts in their young days, or still have yet to discover the difference between a reef knot and a "Granny". The difference between these two knots is the same as soldering with or without Fluxite — one holds, the other doesn't! And, again, twisting wires of your set together is just like a "Granny" knot — liable to slip at

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CRYSTAL DETECTORS (enclosed in glass) 1/6
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FIXED CONDENSERS, all Capacities. 3d.

CONDENSER VANES, dozen 3d.
L.F. TRANSFORMER, Ratio 5-1, best quality, each 8/9
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SWITCHES ON EBONITE, S.P.S.T. quality, the best. 1/-
VALVE-HOLDERS, each. 6d.

Please send sufficient in stamps to cover postage.

JOHN BRAHAM

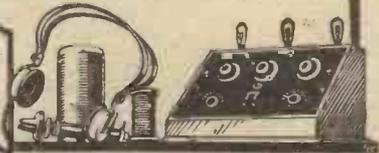
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SUITABLE FOR EITHER CRYSTAL OR VALVE SETS.
 Best possible workmanship. Mounted on engraved ebonite panels in polished mahogany cabinets. "MAX-AMP" Transformers used throughout.

1 VALVE, 32/6 (Amplifying 5 times). Postage and Packing 1/-
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 (Latter can also be obtained with switch to cut out last valve at slight extra charge of 5/- Will operate a Loud Speaker from any crystal set within 12 miles of any Broadcasting Station. Send for complete specification.

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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 report 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 to the Radio Society of Great Britain.

Radio Association of Great Britain.

The Fellowship (F.R.A.) and Associateship (A.Rad.A.) of the Radio Association are granted only to members of the association. The hon. secretary takes this opportunity of replying to many inquirers who are not members, and he would add that applications for both degrees must be made on forms supplied by him, which, when returned to him duly completed, are submitted to the Executive Committee and by them to the Board of Examiners. Hon. sec., S. Landman, M.A., Sentinel House, Southampton Row, W.C.2.

Hackney and District Radio Society.*

At a recent meeting, Mr J. F. Stanley, B.Sc., A.C.G.I., gave a talk on "Distortion in Valve Receivers." Mr. Stanley indicated various remedies for the various causes he had explained and afterwards kindly answered many questions. Hon. sec., A. G. Parry, 66, Ballance Road, Homerton, E.9.

The Hornsey and District Wireless Society.

Last month Mr. F. H. Haynes delivered a lecture on "Points in design when setting up Valve and Crystal Receivers." Hon. sec., Mr. H. Hyams, 188, Nelson Road, Hornsey, N.8.

Lotram Radio Society.

An interesting and enjoyable evening was spent on January 9th, 1924, when Mr. Webb ("Ariel") related his experiences in connection with the transatlantic experiments, followed by some amusing anecdotes of the trials of a wireless journalist. Hon. secs., H. J. V. Gatrell and J. R. Lovell, L.C.C. Tramways Offices, Victoria Embankment, W.C.2.

Honor Oak Park Radio Society.

An excellent lecture entitled "Radio Principles and Tuning," was given during December by Mr. H. Bevan-Swift. Under the sub-title, "Ether," the lecturer dealt shortly with the Fleming theory, jamming, and the underlying principles of transmitting. Hon. sec., G. J. Price, 22, Honor Oak Park.

Peckham Wireless and Experimental Association.

The Association, Central Library, Peckham, on Wednesday January 2nd, had the honour of a visit from Capt. Eekersley, of the B.B.C. Hon. sec., Geo. Sutton, 18, Melford Road, S.E.22.

Brockley and District Radio Association.

At a recent meeting we had the great pleasure of listening to a very excellent lecture by our esteemed hon. secretary, Mr. R. O. Watters. The subject of his discourse was "Wireless Reception and Transmission in the good old days." Hon. sec., R. O. Watters, Grove House, Brockley Grove, S.E.4.

Wimbledon Radio Society.*

A constructional evening was held on 4th January last, at headquarters. The society possess a full range of tools, and several members are constructing their receiving sets at headquarters. Hon. sec. (pro tem), C. G. Stokes, 6, Worple Avenue, Wimbledon, S.W.10.

Milwaukee Radio Amateurs' Club, Inc.

An American Radio Relay League traffic meeting and an annual dinner were the big

features in the recent activities of this society. At a well-attended Saturday afternoon traffic gathering under the chairmanship of C. N. Crape, 9VD, Local Operating Dept. Officer, U.S. Radio Inspector A. F. Parkhurst, 9RI; Chicago, spoke on "The Relation of the Work of the Department of Commerce to the Radio Amateur."

On the evening of the same day the annual dinner was held, at which Inspector Parkhurst entertained the gathering with a talk entitled "Reminiscences of an Old-time Operator." Business manager, L. S. Hillegas-Baird, 229, Ninth Street, Milwaukee, Wis.



The "Puratone" Aerial.

Catalogues Book Reviews Etc.



FLAT-DWELLERS who live within a radius of twenty miles or so of a broadcasting station need no longer despair if they are unable to erect an efficient outdoor aerial, as the new "Puratone" will give as much as 90 per cent. the efficiency of an average P.M.G. aerial, and is much more compact.

At a press demonstration of the "Puratone" in the showrooms of the Electrical

Supplies Co., Ltd., a four-valve G.R.C. receiver with a loud speaker was used in a comparative test between a good outdoor aerial which was available, and the "Puratone." At the time of the test both speech and musical items were being broadcast from the London stations, and the transmission, of course, came through with good volume on the loud speaker. Atmospheric were noticeable, but these were not very bad at the time in question. To prove that the set was tuned for maximum results we were asked to re-tune and obtain better results, if possible, and after a few moments everybody was satisfied that the tuning could not be bettered. The outdoor aerial was then disconnected and the down-lead taken clear of the set, and the "Puratone" connected up in its place. Results were certainly beyond expectations and any decrease in volume was not noticeable.

We have received from the Thorpe Valve Co. one of their new Thorpe K1 valves, which retails at the very reasonable price of 10s. It is British made and stamped B.B.C., and we are given to understand that every valve manufactured by this firm is given an independent test before leaving the factory. Average consumption is .42 amps, with 4 volts on the filament. On test the K1, which is stated to be particularly suitable for H.F., dual amplifying (reflex), and super-regenerative circuits, gave surprisingly good results; in fact, for the specific purposes mentioned, we consider the Thorpe the most useful valve we have yet examined. Although the K1 type can be used as a detector with good results, we understand that the Thorpe Valve Co. are issuing another type specifically for detecting and L.F. work. The K1 is very hard, and will stand voltages up to 200 on the plate quite comfortably. It is interesting to note, by the way, that the Thorpe Valve Co. is employing a new and original method of exhaustion which guarantees a very accurate degree of vacuum.

"Peto-Scott's Wireless Book," which may be obtained from any of their branches for 1s. 3d., contains over eighty circuit diagrams, and also gives much other interesting information, such as how to solder, how to obtain a licence, choosing tuning coils, frame aerials, etc., etc.

Catalogue No. 50A, received from A. H. Hunt, Ltd., contains much interesting information of their Hellesen dry batteries for wireless, both high and low tension. Many other accessories are shown, including a good range of measuring instruments.

Now that so much foreign ebonite has found its way to the market, amateurs will welcome the decision of the British Ebonite Co. to stamp all their panels, etc., with the trade mark "Becol" and the words "British Made."

For sixpence one may obtain from H.M. Stationery Office, Imperial House, Kingsway, a copy of the "Supplementary Agreement between the P.M.G. and the B.B.C., Ltd., providing for the modification of the Licence of the 18th January, 1923, published in Parliamentary Paper Command No. 1822 of 1923."

RADIOFORIAL

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

The broadcasting of Mr. Richard Hughes' play, "A Comedy of Danger," opens up a new field of experiment for the B.B.C. But after listening to the play I could not help wondering if the field for Radio Drama was not rather restricted, and not so fertile as one would at first believe.

Mr. Hughes' play was successful because it was founded on an idea which lent itself admirably to the limitations of a stage. The correct atmosphere could only be obtained by sitting in the dark; in fact, it was the only atmosphere in which one could really feel the dramatic potentialities of the theme Mr. Hughes had built his play on. Those three voices, supposedly the voices of a girl and two men trapped in a coal mine, issued from the loud speaker with terrifying reality, and the room being in darkness the effect was, to say the least of it, sepulchral in the extreme. But it "got over," and the first Radio Drama must be counted a great success. But how did it "get over" in houses where listeners did not turn out the lights, and so obtain the necessary atmosphere of being buried alive in a tomb?

And how many situations can ingenious authors devise which will enable listeners to partly create the necessary theatrical atmosphere—very necessary when a play is restricted to dialogue and "off-stage" effects?

The problem is a fascinating one, and its solution by no means easy. On the face of it, it looks as though the number of Radio Dramas capable of "getting over" with the full effect of Mr. Hughes' play will be rather limited; but the B.B.C., and those who labour for them, are nothing if not ingenious, and it will be interesting to see how far this Radio Drama business can be carried with full success.

Adaptations from some of Edgar Allan Poe's stories might prove suitable for Radio Dramas; notably, the tales entitled "The Tell-Tale Heart" and "The Fall of the House of Usher."

The last story is rich in "off stage" effects; the moaning of the wind, the lugubrious twanging of a guitar, the creaking of a coffin-lid; the clanging of the doors of the vault as the lady who was buried alive manages to force her way out, and lastly the excited shrieks of her brother and the bursting of the thunderstorm. Yes, that story is rich in Radio Grand Guignol situations; but the nerves of listeners-in must be considered!

Again, take that wonderful story by Morley Roberts, the story of "Billy Be Damned." With but few modifications that story would make a fine Radio play. It is mostly dialogue, and depends for its

effect on the weird and terrifying experiences as related by a mad castaway sailor, picked up by a sailing ship.

And, doubtless, readers of "P.W." can think of many good ideas for Radio plays. It would be interesting to see their efforts at Radio play-writing, so I will offer a Prize of £5 for the best Radio Drama idea sent to me, not later than February 25th. Address all MSS. to the Editor, POPULAR WIRELESS, The Fleetway House, London, E.C.4. I reserve the right to publish the plot of the play which wins the prize; the dramatic rights remain the author's.

THE EDITOR.

IMPORTANT NOTICE.

Readers are please requested to note that not more than three queries can be answered in one letter addressed to the Technical Queries Department. Owing to the extraordinarily heavy pressure on this department, readers are requested only to send in questions which they find they cannot possibly solve for themselves. On no account will more than three questions be answered in one letter, and telephone calls and personal calls at this office cannot be dealt with, owing to pressure of work on the technical staff.

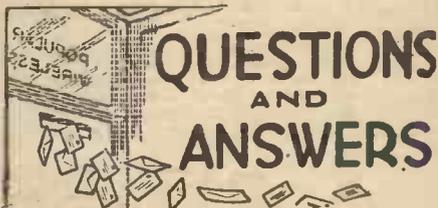
A stamped and addressed envelope must accompany all queries. A copy of the questions asked should be kept by the sender, as it is not possible to reproduce the original query when replying. Number your queries 1, 2 and 3, and answers will be given to each item.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would

be well advised to obtain permission of the patentees to use the patents before doing so.

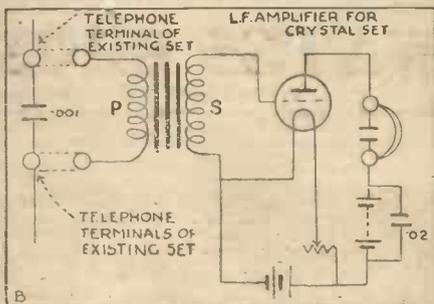
PATENT ADVICE FOR READERS.

The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.



P. S. S. (Chepstow).—I have two receivers, a two-valve with one stage of H.F., and a crystal set. I wish to make a one-valve low-frequency amplifier in a separate unit so that it may be added to the output terminals of either receiver at will. Only one set of batteries is to be used when the amplifier is added to the two-valve set. What circuit shall I use?

Herewith a suitable L.F. diagram which may be added to any existing receiver. When this amplifier is placed after another valve set, care should be taken



that the battery connections of both units agree—i.e. (in this case) L.T.— to earth and H.T.— to L.T.+, otherwise separate batteries will be necessary. Like battery terminals of both units should be joined, and the leads to the batteries taken from either set of terminals.

"AMATEUR" (Plymouth).—Is an Armstrong super-regenerative receiver selective? Will it cut out local "spark"?

The conventional one or two valve Armstrong "super" cannot be said to be very selective unless handled very carefully. However, the frame aerial, which is always used with such a receiver, renders reception very directional, and this tends to assist in regard to selectivity.

F. B. (Manchester).—Which would be better for running a '06 amp. dull emitter valve, a Leclanché or bichromate battery? What size would be required?

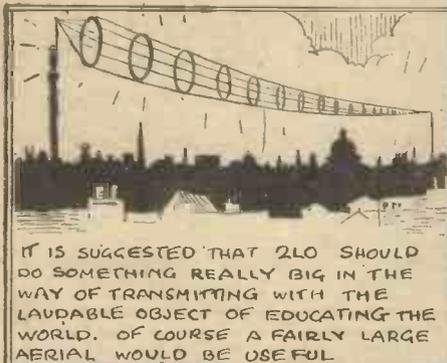
Two quart size Leclanché batteries, of the sack type, in series, would answer the purpose quite efficiently.

P. L. (Nottingham).—Does it make any difference if an aerial runs north and south? Is reception improved by erecting it in such a manner?

Although compass bearings may possibly influence reception to a slight extent, such would not be sufficient in the case of the average amateur aerial to seriously affect reception. The directional effect of the aerial in relation to a transmitting station is much more important. Reception is better when the lead-in end is pointing to a transmitting station.

(Continued on page 832.)

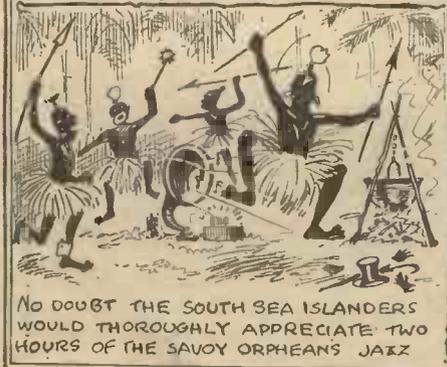
EXTENDING THE SCOPE OF THE B.B.C.



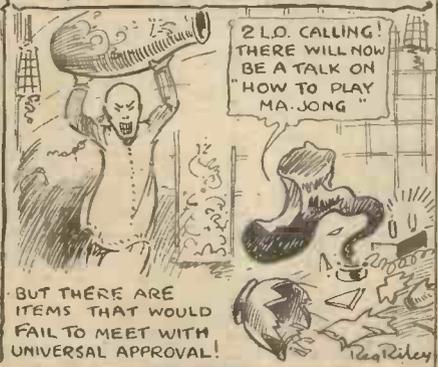
IT IS SUGGESTED THAT 2LO SHOULD DO SOMETHING REALLY BIG IN THE WAY OF TRANSMITTING WITH THE LAUDABLE OBJECT OF EDUCATING THE WORLD. OF COURSE A FAIRLY LARGE AERIAL WOULD BE USEFUL



AND THE B.B.C WOULD BE ABLE TO CONSIDERABLY EXTEND ITS SCOPE!



NO DOUBT THE SOUTH SEA ISLANDERS WOULD THOROUGHLY APPRECIATE TWO HOURS OF THE SAVOY ORPHEANS JAZZ



BUT THERE ARE ITEMS THAT WOULD FAIL TO MEET WITH UNIVERSAL APPROVAL!

WATES Specialities

Ensure Best Possible Reception.

THE "MICROSTAT" FILAMENT RESISTANCE.

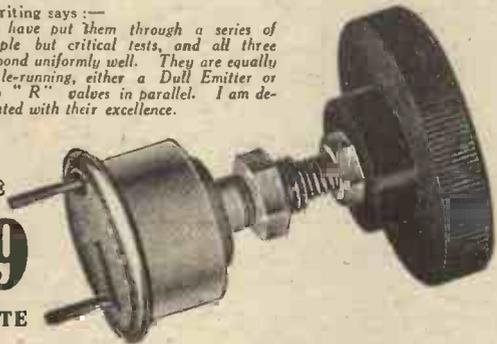
(Pat. applied for.)

Resistance is regulated by the compression of carbon powder—an entirely new method. There are no wires to break or get out of order, a "one-hole" fixing only is necessary, and the under panel space is negligible. Absolute "freedom from noises" is ensured. Many enthusiastic letters have been received from users.

One user writing says:—

"I have put them through a series of simple but critical tests, and all three respond uniformly well. They are equally stable-running, either a Dull Emitter or two "R" valves in parallel. I am delighted with their excellence.

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 - Filament Resistances, excellent smooth action; not the rubbish usually sold at this price each 1/9
 - Nickel or Brass Switches (small), for panel-mounting; S.P.D.T., each 1/3; D.P.D.T. each 2/-
 - L.F. Transformers, ratio 5/1, tested and guaranteed...each 10/6
 - Potentiometers, 250 or 450 ohms each 5/-
 - Crystal Detectors, upright, enclosed in glass each 1/7
 - Do. Do. horizontal, enclosed each 1/6, 2/-
 - Do. Do. Perikon, enclosed each 2/6, 3/-
 - Brass Rod, screwed, 2 B.A. 2½d., 4 B.A. 2d. per ft. length.
 - Brass Nuts, 2 B.A. 2½d., 4, 5, 6, 8 B.A. 2d. per dozen.
 - H.F. Transformers, 350 to 450 metres each 4/9
 - Variometers, complete with knob and dial each 2/9 and 3/8
- Everything else for the constructor, at the same rock bottom prices, and all **SOLD UNDER GUARANTEE.**

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CRYSTAL RECEIVER, in special antique design Cabinet. A Super Crystal Set at very little extra cost. Gives best possible results and is really ornamental as well. Has accommodation for 2 pairs of headphones. Write for specification. PRICE £4 0 0 complete, including B.B.C. Royalty, 1 pair 4,000 ohm 'phones, 100 ft. 7/22 copper aerial wire, leading-in tube and 2 insulators.

SINGLE VALVE REFLEX RECEIVER, Range 300 to 500 metres. Coils can be plugged in to increase range. Polished walnut case. Valve performs functions of H.F. and L.F. Amplifier, the crystal rectifying, therefore, equal in performance to 3-valve set. Write for specifications. Price, complete with all accessories, £13 13 6. No extras, all royalties paid. (If without accessories, only £9 3 3.)

2-VALVE CABINET MODEL RECEIVER, Range 300 to 3,000 metres. Range for telephony 500 miles. Polished walnut case. H.T. battery in base and valves enclosed. Ebony panel engraved. Write for specifications. Price, complete with all accessories, £24 2 6. All royalties paid. No extras.

Write for Catalogue and Components Booklet.

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- AMPLIFIERS, 3-valve, £4 10s.
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- BATTERIES, all sizes.
- BUZZERS, 2/6.
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- CABINETS, with ebonite, 10/-.
- CONDENSERS, 2/- to 27/6.
- CRYSTALS, 6d.
- DETECTORS, 1/9.
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- EARTH CLIPS, spikes and mats, from 6d.
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- MICROPHONES, 2/6 to 20/-.
- Fine selection 'PHONES of every kind, from 2/-.
- PLUGS and SOCKETS from 3d.
- POTENTIOMETERS, 3/6.
- RECEIVERS from 1-valve sets, 35/-.
- RECORDERS, magnificent Morse Inkers, £6 10s.
- RELAYS, 12/6. to 55/-.
- FIL. EHEO DIXON-STATS, 3/-. SWITCHES in great variety.
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- TERMINALS, 4 W.D., double, 2d.
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- TRANSMITTER and RECEIVER combined, Marconi, £5.
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- WAVEMETERS, broadcast, finest make, £3.
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LESLIE DIXON & CO., 9, Colonial Avenue, Minories, E.1.

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Variometer tuned, enclosed crystal. Fitted in polished oak desk-shaped Cabinet. Range 25 to 30 miles. Price 15/-, plus 1/- B.B.C. Fees, not including accessories.

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Write for Catalogue "B" and Supplement. Trade Terms on Request.

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Cut to any size required in high grade, easily worked material: $\frac{3}{8}$ in. thick, 1d. per sq. in.; $\frac{1}{2}$ in. thick, 1d. per sq. in. Mail Orders:—Add 6d. towards cost of packing and post. Panels drilled and/or engraved to your own paper pattern. It's cheaper than buying drills. Estimates free.

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Coil stands. Best quality. Brass pedestal. Ebonite bases. Two-way, 3/11; Three-way, 4/11. Satisfaction assured. Trade supplied.

THE GWENALLAN MANUFACTURING CO.,
 77, Galedon Road, East Ham, London, E.8.

A BETTER WAY

of charging Accumulators from alternating current is by using the **TUNGAR BATTERY CHARGER**. Simple, Safe, and Economical. No moving parts. Requires no attention. No Garage, Owner-Driver or Wireless Enthusiast should be without one. Will charge from 1 to 10, 6-12 volt batteries at a time. Descriptive Booklet free on application. Deliveries from stock.

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 Mazda House, 77, Upper Thames St., E.C. 4.

"AERIAL CRADLE"

P.P. 15,302

Fit this to your aerial and get 50 per cent better signals. Full instructions given. Price 1/6, postage 2d.)

HUMPHRIES, GRIFFIN & JONES,
 1, Gordon Road, Sneinton, Nottingham.
 Or to London Branch, 19, Archer St. Works, Piccadilly, W.1.

ALL BRITISH 1 VALVE AMPLIFIER

unassembled, comprising mahogany cabinet, drilled ebonite panel, L.F. transformer, terminals, rheostat, wiring diagram, everything complete, 22/6, post 1/-.

Complete parts for Crystal Variometer Receiver, including slope front cabinet, drilled ebonite panel, wiring plan, etc., everything complete, 12/6, post 1/-. Particulars and general list post free.

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PORTABLE AERIAL WHICH GIVES PERFECT RESULTS

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Super insulated aerial wire and sectional frame. Send P.O. to-day. Money refunded if not satisfied.

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 Carriage & packing 3s. extra.

COLBROOKS STORES, Pasture St., GRIMSBY

THE ROYAL AIR FORCE

requires well-educated youths between the ages of 18 and 21 for training as Wireless Operators; also skilled Operators. Age limits for skilled men, 18 to 35; Ex-N.O.'s up to 38 with rank according to trade ability. Rates of Pay: For men under training, 21/- per week; skilled men from 25/3 to 59/6 per week, on enlistment, and all found. Allowance for wife and children to men 26 and over. Write or call:—

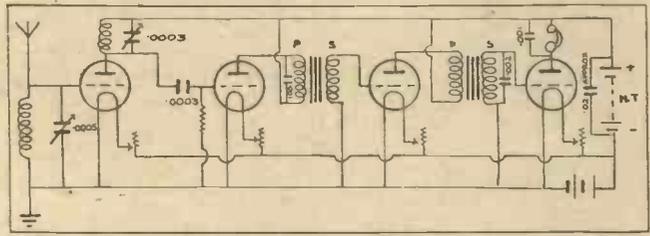
Inspector of Recruiting, R.A.F.
 4, Henrietta Street, Covent Garden, London, W.C.2.

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 830.)

B. E. C. (Westcliff).—What circuit do you advise for reception of all the B.B.C. stations on the 'phones? I do not desire to incorporate any form of reaction. No H.F. transformers are to be used. I want a straightforward circuit, not a dual or super, etc.

This four-valve circuit should get all the B.B.C. stations on the 'phones—London probably on the



loud speaker. We presume that you are able to erect a good outdoor aerial. No H.F. transformer is used, a suitable inductance being used in its place and acting as a tuned anode. The inductances may be of any suitable type, plug-in coils being preferable.

R. S. E. (Kendal).—Can iron filings be used instead of carbon filings to form a microphone? Such could be used but would not answer the purpose, as efficiently as carbon granules.

N. C. C. (Dilwyn).—I have in my possession five double-pole double-throw switches, and wish to build the "P.W." Combination Set. May these be used in place of the two jacks and plug? If so, will you give me a panel wiring diagram?

This circuit employs the five D.P.D.T. switches you possess, four for giving the various combinations, while the fifth is used for placing the aerial tuning condenser either in series or parallel. The switching for the four bottom D.P.D.T.'s is as follows: (Crystal—all up. Crystal and H.F. amplification—two left-hand ones up, two right-hand ones down. Dual—all

down. The best position for the centre switch should be found by experiment. The two loading coil terminals should of-course be shorted when no loading coil is in use.

D. D. (Hoddesden).—What does L 1,250 and L 1,500 mean?

The L signifies "duolateral coil," and the number the number of turns, fifteen hundred, etc., as the case may be.

J. B. (Coventry).—How much H.T. does a '06 dull emitter require in a one-valve circuit?

Thirty six to 60 volts, but individual valves, even of similar types, vary considerably in their characteristics.

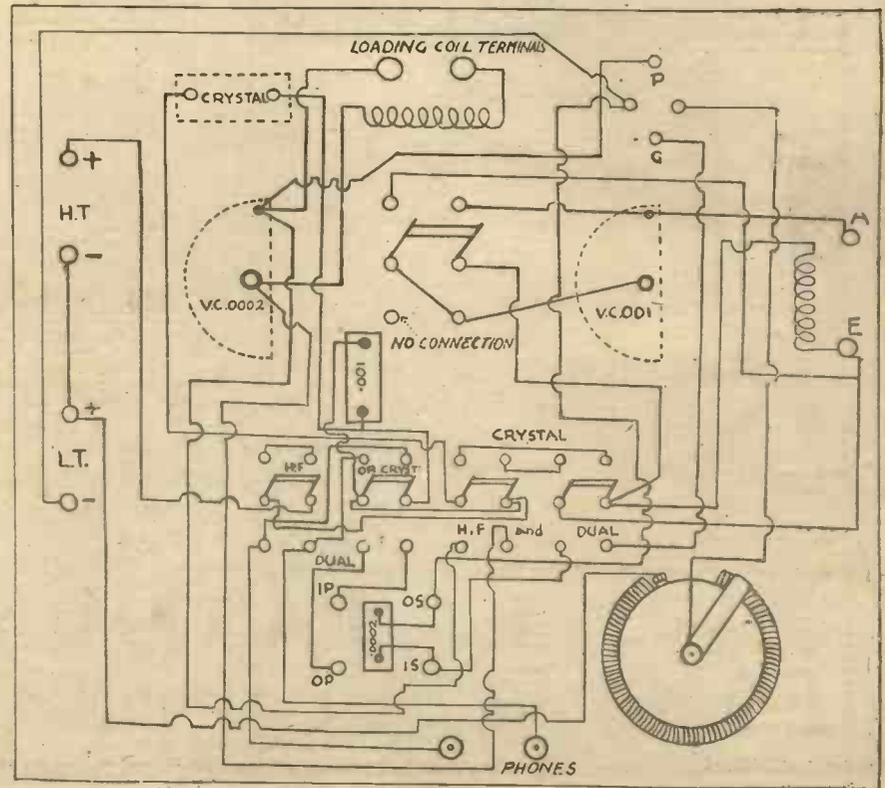
W. D. (London, S.W.).—How is it known, or what means are used to show, that the electric impulses received by an aerial wire are of an oscillating nature—that is, moving alternately in different directions of an aerial?

It can be readily proved by testing on close reception from a powerful signal station, when it will be seen that the ample received energy available cannot be measured with any direct current measuring instrument.

W. M. C. (Crieff).—I intend building a three-valve set to receive both of the Scottish stations, and perhaps some of the other B.B.C. stations, if possible. Reception is to be made on the 'phones, but if you think it possible for me to get Glasgow on the loud speaker, I shall obtain one.

This circuit employs 1 H.F., 1 Det., and 1 L.F.; perhaps the most commonly used three-valve circuit. The tuned anode method of coupling is used, and a coil placed in the plate circuit of the detector valve is coupled to the anode coil, thus obtaining intervalve reaction, which, if handled carefully, will not enervate your aerial. If you require the circuit to be particularly selective, a secondary closed circuit should be employed as shown, but probably, in your case, this will be found unnecessary when the aerial and earth should be connected, as shown in dotted lines, and the

(Continued on page 834.)



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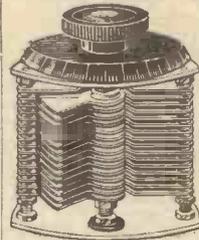
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No Post Orders at These Prices.

Terminals (comp. with Nuts).....	doz.	1/-
Triophone	doz.	1/3
Large W.O.	4 for 5d.	doz.
W.O. Pillar	4 for 5d.	
Small Pillar	1d. each.	doz.
Switch Arm, 12 Studs and Nuts, the lot		1/-
Small Variometers, 250/650, with knob and bush	3/-, 2/8, 2/4	
Larger Variometers, 250/650	4/9, 3/9,	2/11
Igranic Variometers, Ebonite, 350/650		15/-
2-Way Coil Holders, for Duolateral Coils, 5/6, 4/6		
3-Way Coil Holders, for Duolateral Coils	6/11,	5/11
Phillips R Type Valves		7/11
Stop Pins, with shoulder ... 2 a 1d.; doz.		5d.
Fixed Condensers, .001, 10d.; up to .005		1/3
Fixed Condensers, .006		1/6
Valve Pins, doz. 6d.	Sockets, doz.	5d.
2, 4, 5 B.A. Nuts	3 doz.	6d.
Basket Coils	set of 6	2/-
Spade Terminal Tags	doz.	4d.
Vario Couplers, with Knob, Wound D.C.C.		4/11
Glass Enclosed Whisker Detector		1/6
High-Class Whisker Detector (large), enclosed		2/6
Fine Perikon 2 Crystals, enclosed		3/-
Small Perikon 2 Crystals		2/6
Bell Wire, D.C.C., 1.C. 2 og.	10 yds.	6d.
Twin Flex	12 yds., 1/8; 4 yds.	7d.
Plug Coils, Ebonite		1/-
Extra Quality, ditto on base		1/3
Pillar Terminals, Nut and Washer, 2 B.A. large	2 for 6d.	
Switch Arms	8d., 9d., 10d.,	1/-
Filament Resistances	1/8, 1/10, 2/-,	4/6
Igranic Resistances		7/6
Igranic Vernier		4d.
4 Cat's-Whiskers, one gold		4d.
Single Basket Coil Holders		1/4
Variable Grid Leaks		1/5
Lissen Variable Grid Leaks, guaranteed		2/6
Pin Terminals, screw pattern	2 for	3d.
Spade Terminals, screw pattern	2 for	3d.
Shaw's Genuine Hertzite		9d.
Grid Leaks and Condensers, .0003, 3/-, 2/3, 2/-		2/3
Valve Sockets, with shoulder		2/3
Basket Coils, Duplex Waxless, set of 5 for 100,000-ohm Resistance		1/6
Variometers on Ebonite, ball rotor, wound D.C.C.	8/11, 7/11	6/11
D.C.C. Wound Tapped Coils	2/-, 1/9,	1/6
Double 'Phone Cords	pair	9d.
D.P.S.T. Switches, special		1/3
S.P.D.T., on Ebonite	1/8 to	2/3
D.P.D.T., on Ebonite	1/11 to	2/9
2 B.A. Rod, 12 in.	2 for	5d.
Basket Coil Holders, for 3 coils		5/6
Plug and Socket, brass	pair	1d.
Pocket Lamp Batteries (best)		6 for
Special Filament Resistance, very fine value		2/3
D.P.D.T., Nickel Switches for panel mounting		2/-
Fil. Res. Dials, 0-10, 7d.; with knob		9d.
Real Ebonite Slider Knob and Plunger		6d.
Set of Names (12), engraved black or white		6d.
Insulated Hooks	each	1d.
Copper Foil	per foot	4d.
Best Zincite and Bornite, 6d. each, pair		1/-
Ebonite Turned Valve-Holder and Nuts 1/3 & 1/-		1/3
Shellac	bottle	5d.
Tinned Copper, 16, 18, 20 gauge in stock.		2/6
Formo Fil. Resistances, best		33/-
Accumulator (Rotax), 6 v. 80 amps.		17/6
" " " 4 v. 40 amps.		19/6
" " " 4 v. 60 amps.		2/6
Rubber Lead-in Wire, 10 yards	1/3, 1/6,	2/6
Lissen. Anode V.R. of grid leak	each	2/6
Transformer. Lissen T.3.		15/6
Reacta- 20/-, Lissenstat, 7/2, Coils all sizes.		7/3
Edison Bell. Fixed from .0002 to .001		2/-
" " " Fixed from .002 to .006		2/-
" " " Grid Leak & Condenser, .0003		2/6

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VARIABLE CONDENSERS.



Without Dial.

*001	6/6
*00075	5/6
*0005	4/9
*0003	4/2
*0002	3/-
*0001	2/8

Fully Assembled with knob, pointer, bush, screws and connections, aluminium end plates.

BRITISH MAKE.

- Fully Assembled.
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- Narrow Spacers.
- Metal to Metal Bearings.

Ebonite Dial and Knob complete as sketch.

*001	7/6
*00075	6/9
*0005	5/9
*0003	5/2

Registered Post and Packing 6d. set. Foreign post 1/- set.

HEADPHONES.

4000 ohms "Sidpe" genuine	14/9
4000 " Brunet	15/11
4000 " N. & K.	12/9
4000 " Fellow's Lightweight	18/6
Premier B.B.C., 4,000 ohms, very fine value	16/11
Sterling, 4,000 ohms, latest model, B.B.C.	25/-
N. & K. Standard, latest model, 4000 ohms	14/9
Raymond, 4,000 ohms, high-class	12/11

ERICSSON "EV" TYPE PHONES
4,000 ohms. Thousands sold last season.
Lovely tone. 13/9 per pair. Post 1/- pair.

VALVES

MARCONI D.E.R.	21/-
EDISWAN A.R.D.E.	21/-
EDISWAN, COSSOR P.1	12/6
MULLARD ORA	12/6
MARCONI R.	12/6

L.F. Intervale Transformers.

5-1...Radio Instruments, Ltd. (1)	25/-
5-1 Igranic shrouded	(2) 21/-
5-1 Formo shrouded 18/- (3) Plain	15/-
5-1 Raymond	12/6

On Transformers (1) (2) and (3) goods to the value of 1d. in the 1/- given free to callers.

H. T. Batteries (very best only).
60 volt. Post 1/3 each. 8/9, 10/6, 12/6
36 volt. Post. 1/- each. 4/9, 5/-, 5/6, 5/9

CRYSTAL SETS, ALL KINDS

10/6, 12/6, 17/6, 21/-, 28/6

EDISON BELL, LISSEN, DUBILIER parts stocked

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LISSEN PARTS—

Transformers	6/6
Valve Anode Resistances	2/9
Transformer T.2	25/-
Valve Grid Leak	2/9
Reactance	20/-
Lissenstat	7/9
Coils from 25 upwards. All Parts Stocked.	

Headphones and L.F. Transformers.

Please see centre list.

Edison Bell Variometers, ebonite	15/-
" " Fixed Condensers, up to .001	1/9
" " Fixed Condensers, up to .006	2/6
" " Grid Leak and Condenser, .0003	3/-
" " Shaped Coil Plug, ebonite ...	1/3
Quarter-inch Ebonite Condenser Ends. Pair	1/9
American pattern dial and knob	1/8
Accumulators, high-glass goods, 4v. 40 amps.	20/-
Fixed Condensers, .0003 to .001	1/4
Fixed Condensers, .002 to .005	1/8
Fixed Condensers, .006	2/-
Ebonite Valve Holders, 8 nuts, each, 1/6; 3 for 4/-	
Ebonite Dials and Knob, turned ebonite, 2/-, 2/6	
D.P.D.T. Switches, small size, on ebonite base	3/3
S.P.D.T. Switches, small size, on ebonite base	2/9
Variable Grid Leak, pencil pattern	2/6
Two-way Coil Holders, 3 qualities; all good value. No rubbish.	5/6, 6/6, 7/6
Three-way ditto, as above	6/9, 7/6, 8/9
Twin Flex for Extension Leads, 12 yds.	2/3
Grid Leak and Condenser, .0002, .0003, .0005	2/9
Grid Leak, 2 megohms	1/4
Pin Terminals, screw pattern	6 for
Spade Terminals, screw pattern	6 for
Ebonite Coil Plugs	1/3
4 Cat's-whiskers (gold, silver, etc.)	6d.
Bell Wire, D.C.C., I.R.C.	10 yds. 1/-
100,000 ohm Resistance	2/-
Switch Arms, very good quality, complete with 12 studs	2/-
Valve Sockets, polished, with shoulder and nuts	doz. 1/6; 3 doz. 4/-
Shaw's Genuine Hertzite Crystal	1/6
Double 'Phone Cords, with screw terminals	1/6
Basket Coil Holders, for 3 coils, on stand	6/-
Basket Coil Holders, single, with coil plug	2/9
Filament Resistances (not cheap rubbish)	2/6, 2/8, 3/-

Very Special ditto (limited number)

Terminals, Telephone, W.O. Pillar, with nut; all good size; best possible quality	
doz.	1/9
Terminals, Large 2 B.A., with nut. ...	0 for
Variometers and knob, 250/650	4/6
Basket Coils, up to 3,500 metres. Set of 6	2/6
Crystal Detectors, all best quality, not junk. Enclosed, large whisker	3/3
Crystal Detectors, enclosed, smaller whisker	2/9
Crystal Detectors, enclosed, large, Perikon, 2 crystals	3/9
Crystal Detectors, enclosed, slightly smaller Perikon	3/3
Many Other Detectors, open type, 2/-, 2/6, 2/9, 3/-	
Variometer, on Ebonite Ball Rotor	10/-
Igranic Variometers, Inside Winding	15/-
Sets of 12 Name Tabs, black or white	1/-
2 B.A. Nuts	per gross 1/10
Insulating Sleeving, all colours, 6 yds.	2/9
Amplion Junior Loud-speaker	42/6
Baby Sterling ditto	55/-
Best Knobs, Bushed 2 B.A.	4 for 1/6
D.P.D.T. Switches for panel mount.	2/6

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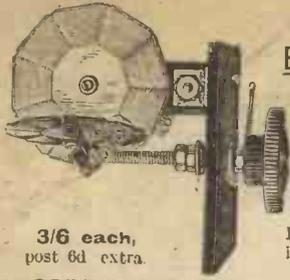
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EXPERIMENTER**

**IDEAL
BROADCAST
VARIO
TUNER**

For Panel Mounting, as illustrated.

3/6 each, post 6d extra.

ANODE REACTANCE UNIT 43, post 6d. extra.

Can be supplied wound for any wave-length. Trade enquiries solicited. London Wall 3305.

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PICKETT'S CABINETS—they're good value, from 1/6 each, highly polished. Cabinet (P.W.) Works, Albion Rd., Berley Heath, S.E. Write for lists.

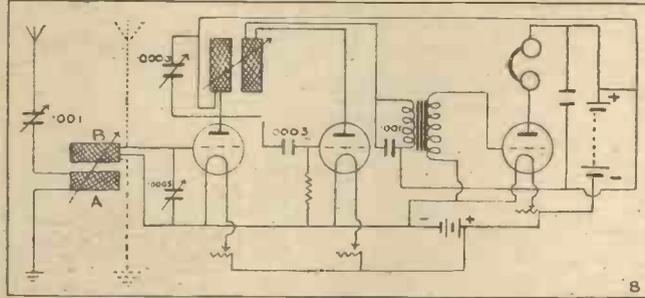
Fix your crystal in GOLD SEAL PLASTIC METAL.
It is positively the best contact possible, and results in **LOUDER AND CLEARER SIGNALS.**
Guaranteed to contain no mercury. Price 6d. per packet, sufficient for 3 to 4 crystal cups. Of all Wireless Stores.
Wholesale Enquiries (or sample pkt. 6d.) to **SAMUEL LEVY**, 53, Ben Jonson Road, Stepney, London, E.1.

ACCUMULATORS.
O.A.V., Fullers, etc. Guaranteed brand-new and perfect, but slightly soiled. We refund cash with carriage both ways if returned within 7 days.
4v. 40a. 17/- 6v. 40a. 25/-
4v. 60a. 21/9 6v. 60a. 32/6
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4v. 100a. 32/6 6v. 100a. 46/-
Polished teak cases for 6/60 and 4/100 only, fitted with fuses and switch, 6/6 each.
SPECIAL LINE.
First-class English make. 6v. 60-amp hours. 25/- ea.
MAUDE RUBBER CO., 58, PRAED ST., LONDON, W. 2.

**RADIOTORIAL
QUESTIONS & ANSWERS.**

(Continued from page 832.)

coil "A" omitted. If you use the closed circuit two two-way coil holders should be used, and these should be well separated from each other, otherwise they are liable to set up undesirable capacity effects. Should the coil "A" be omitted, as suggested above, "B" should be mounted separate from the other two coils, as if coupled to them your aerial will be energised. The fixed condenser across the H.T. should be of large capacity, .02 mfd. to 1 mfd., the latter size often being recommended as they may be obtained cheaply from many ex-government depots. An extra stage of L.F. will be required to work a loud speaker satisfactorily for Glasgow's transmission.



addition they have had a considerable amount of trouble in their transmitting room, owing to the instability of the flooring and consequent vibration from heavy traffic, resulting in transmitting valve troubles. Further, this station has to spare a considerable amount of power for relaying to Sheffield and appears to have robbed the general body of radioists instead of increasing the power to compensate.

Whilst on the subject of 2 Z Y, I can assure them that the programmes generally speaking are unacceptable except to high-brow cranks (there are exceptional transmissions, such as "Pagliacci" a little time ago). What is required by the average man is melody and not music on the same level as futurist paintings understood by perhaps one in a hundred. I would appeal to Mr. Dan Godfrey on behalf of a large wireless circle to give us melody and not musical problems. Give "high-brow" once or twice a week,

and cater for the crowd the remaining evenings.

Yours faithfully,
R. EASTMAN.



THE "P.W." SET.

The Editor, POPULAR WIRELESS.
Dear Sir,—I feel I must congratulate you on the success of the "P.W." set.

I constructed Unit No. 1, and have obtained excellent results. I can get 5 W A, 2 L O, 6 B M, 5 N O, 5 S C, 5 I T, and 2 B D. all quite easily, and not a bit of howl, and I am using two 5,000 variable condensers. The readings of the A.T.C. are 40, 50, 64, 70, 102, 120, and 140. The second variable condenser I don't need to move; it is set at 0, and there's no need to alter it. I simply turn condenser knob to the number for the required station, and in it rushes without any warning. Cardiff is about 48 wireless miles, and it comes in the faintest. Manchester is the only station I cannot get. 2 L O, 6 B M, and 5 S C are absolutely great; speech and music all that could be desired.

Dozens have heard it who have never heard wireless before, and all are anxious to have one like it.

I have now added Unit No. 2, and I get a great improvement in volume, but not quite up to loud-speaker strength, but loud enough so that anyone turning or twisting a newspaper does not worry or interfere with the one listening.

I am, indeed, very pleased with the result. Many congratulations.

Yours faithfully,
MISS EVA HAYDLEY.

Oaklands.
Builth Wells.

2 Z Y'S TRANSMISSION.

The Editor, POPULAR WIRELESS.
Dear Sir,

There is no doubt that 2 Z Y's power is very much less than at their old station. Mr. Atherton gives one explanation, but in

B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel I must write and heartily endorse the opinions expressed by E. M. O. re B.B.C. programmes, which, to put it mildly, are boring in the extreme. One has but to notice the tone of voice in which some of the highbrow items are announced to realise that the staff themselves do not appreciate this kind of entertainment, so what of the poor and weary listener-in? It's a case of stick it in the hopes of the next item being better, or switching off.

The fault of this partly lays with the "unseen audience" itself, for in nine cases out of ten they will not take the trouble to drop a card to the B.B.C. stating their candid opinion. What is obviously needed is a Listeners' Association, where concerted action would undoubtedly get programmes to suit public taste. Now, listeners, what about it?

I am, Sir,
Yours faithfully,
6 K I.

The "Six Bells" Hotel,
211, High Street, Acton, W.3.

TWO PERTINENT QUESTIONS.

The Editor, POPULAR WIRELESS.
Sir,—The Marconi-Osram D.E.R. valve has been reduced to 21s. This valve was on sale six months ago at £2, being reduced to 27s. 6d. on the advent of the Wecovalve. Presumably it is not being manufactured free of charge now. It would be interesting to know:

- (i) What percentage of profit was made by the manufacturer on the original price of £2?
- (ii) What competition will be necessary in order to bring the price of the new D.E. 3 valve down to something like a reasonable figure?

Yours faithfully, H. W. FULLER.
Room 527, County Hall,
Westminster Bridge, S.E. 1.
London County Council Radio Society.

(Continued on page 835.)

**"THE HAYWARD"
TWO-VALVE CABINET SET.**
The set with a reputation for quality and efficiency. Will receive all Broadcasting Stations, including Paris, etc. All Components Stocked. Write for Illustrated Price Lists.
L. HAYWARD & SON, Fleckney, LEICESTER.

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LIFETONE LOUD SPEAKER
We are discontinuing our Type "A" because of the great demand for Type "B" which we think is the best. We have greatly improved Type "B," which now incorporates Corrugated Adjustable Diaphragm; it is the best Loud Speaker money can buy. You can try for yourself. We send same on three days' approval against cash. We are not boasting, as a demonstration or a test at home will convince you as it has hundreds of others. £3 10 0. Resistance from 120 to 4,000 ohms, 22 in. high; base 5 in. wide; weighs 5 lbs.
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CORRESPONDENCE.

(Continued from page 834.)

LONG-DISTANCE RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—Perhaps it will be of interest to you and your other readers who receive "P O Z" on a crystal receiver that I, in Melbourne, can receive the German station on a one-valve non-reaction set. It was a surprise to me that I got him, as the coils that I was using were wire wound round my fingers and left on the table. I have a good aerial two hundred feet long and thirty feet high. I think this is fairly good for one valve.

Yours faithfully,

C. K. BEAUCHAMP.

35, Herbert Street,
St. Kilda, Melbourne.

THE WEEK'S BROADCASTING PROGRAMMES.

FORTHCOMING SIMULTANEOUS EVENTS.

- Sunday, January 27th.—Symphony Concert from Manchester, 3 p.m.
- Children's Concert, 5 p.m., from Manchester.
- Monday, January 28th.—Light Opera Evening. S.B. all stations except Cardiff. B.B.C. Literary Critic.
- Tuesday, January 29th.—Savoy Dance Bands.
- Wednesday, January 30th.—B.B.C. Dramatic Critic.
- Thursday, January 31st.—B.B.C. Music Critic. Pianoforte and Song Recital, by Maurice Cole and Rex Palmer. Savoy Dance Bands.
- Friday, February 1st.—B.B.C. Film Critic. Vocal Programme S.B. to Bournemouth, 10.15 p.m.
- Saturday, February 2nd.—The Valkyrie at 8 p.m. Major Tosswill, Rugby International Prospects. "La Bohème," Acts 1, 3 and 4.

LONDON (2 L O).

- Sunday, January 27th.—Preacher, Rev. E. Gordon Saville. Carmen Hill and Daisy Kennedy.
- Monday, January 28th.—Light Opera Night.
- Tuesday, January 29th.—2 L O Light Orchestra.
- Wednesday, January 30th.—Vocal and Orchestral Night.
- Thursday, January 31st.—See Simultaneous.
- Friday, February 1st.—Popular Orchestral Night.
- Saturday, February 2nd.—See Simultaneous.

BIRMINGHAM (5 I T).

- Sunday, January 27th.—Preacher, the Rev. Canon Long. Station Repertory Chorus.
- Monday, January 28th.—See Simultaneous.
- Tuesday, January 29th.—Miscellaneous Programme by the Birmingham Cymric Choir.
- Wednesday, January 30th.—Violin Recital by Frank Cantell. Station Repertory Company.
- Thursday, January 31st.—A Night with Operas.
- Friday, February 1st.—Special Request Night.
- Saturday, February 2nd.—Metropolitan Works' Band.

CARDIFF (5 W A).

- Sunday, January 27th.—Rev. T. Madoc Jeffreys and Station Symphony Orchestra.
- Monday, January 28th.—Oakdale Colliery Band.
- Tuesday, January 29th.—Programme relayed from London.
- Wednesday, January 30th.—Dance Night.
- Thursday, January 31st.—Orchestral and Vocal Programme.
- Friday, February 1st.—The Apollo Concert Party.
- Saturday, February 2nd.—Orchestral and Vocal Night.

MANCHESTER (2 Z Y).

- Sunday, January 27th.—11th Symphony Concert.
- Monday, January 28th.—See Simultaneous Programme.
- Tuesday, January 29th.—The Don Haydn String Quartette.
- Wednesday, January 30th.—St. John's Wesleyan Prize Choir.
- Thursday, January 31st.—See Simultaneous.
- Friday, February 1st.—Popular Orchestral Programme.
- Saturday, February 2nd.—Ivy Davies' Concert Party.

NEWCASTLE (5 N O).

- Sunday, January 27th.—The Rev. Robert Cleminson and Mlle. Marchant's Quintette.
- Monday, January 28th.—See Simultaneous.
- Tuesday, January 29th.—Popular Orchestral and Vocal Programme.
- Wednesday, January 30th.—The Wireless Orchestra.
- Thursday, January 31st.—See Simultaneous.
- Friday, February 1st.—Popular Orchestral Programme.
- Saturday, February 2nd.—Popular Night.

(Continued on page 836.)



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PROGRAMMES.
 Continued from page 835.)

Bournemouth Events (6 B M).
 Sunday, January 27th.—Rev. C. Bostock. St. Ambrose Church Choir.
 Monday, January 28th.—Programme relayed (mainly) from London.
 Tuesday, January 29th.—Programme relayed (mainly) from London.
 Wednesday, January 30th.—Scottish Night.
 Thursday January 31st.—Vocal and Instrumental Concert.
 Friday, February 1st.—Entire Programme from London.
 Saturday, February 2nd.—Entire Programme from London.

GLASGOW (5 S C).
 Sunday, January 27th.—The Rev. J. A. C. Murray.
 Monday, January 28th.—Programme from London.
 Tuesday, January 29th.—Popular Orchestral Night.
 Wednesday, January 30th.—Modern British Composers' Night.
 Thursday, 31st January.—Request Night.
 Friday, February 1st.—Story Recital Night, by Mr. Percival Steeds.
 Saturday, February 2nd.—A Triumph of Montrose.

ABERDEEN (2 B D).
 Sunday, January 27th.—The Rev. George Bartlett. Beethoven Symphony Concert.
 Monday, January 28th.—Programme from London.
 Tuesday January 29th.—Operatic Night.
 Wednesday, January 30th.—Dance Night.
 Thursday, January 31st.—Classical Night.
 Friday, February 1st.—Instrumental Night.
 Saturday, February 2nd.—Scottish Concert.

Technical Odds & Ends

H.F. Transformers.
 A very interesting high-frequency transformer has recently been patented in London (communicated from the Radio Instrument Co., U.S.A.), which employs an iron core, contrary to usual practice. It is stated by the inventors that in previous types of high-frequency transformers there are either considerable capacity effects or restricted coupling. The iron cores are in the form of square-section rods, formed of extremely thin laminated sheets of enamelled silicon steel. The windings are laid in grooves in wooden sleeves which slide tightly upon the iron core. Much greater efficiency is claimed for transformers of this type.

Coke "Crystals."
 One often hears wonderful accounts of the reception of signals on coke "crystals," and, although, perhaps some accounts may be exaggerated, there certainly seem to be some extraordinary properties about this familiar substance. For example, if a piece of coke be placed in contact with the crystal, and the cat's-whisker be received practically as before. The coke, in fact, makes numerous contacts with the crystal, instead of only one, as in the case of the cat's-whisker, and for this reason alone has an advantage. If the coke is mounted in a suitable holder, the cat's-whisker may be dispensed with.

If coke is impregnated with mercury, it is said to behave quite well as a "crystal" itself. This is a point which is worthy of experiment, and I should be glad if experimenters who make any trials would let me know what results they obtain.

NEW MUSIC PAPER.
 Every music lover—and who isn't in these days, when dancing is booming and popular melodies such a vogue?—should make a special point of securing a copy of "POPULAR MUSIC AND DANCING WEEKLY," the wonderful new paper now on sale, which offers readers six complete full length song and dance hits every week, in addition to fine articles contributed by well-known composers, artists, and others.
 In the first issue, now on sale, you will find ROMANY ROSE, the valse sensation of the world; JUST LIKE A THIEF; HE USED TO SING IN HIS SLEEP; CALLING, the popular fox trot; TOMAHAWK BLUES, and a specially simplified version of the popular GOLDEN DREAMBOAT Valse for young people and beginners.
 All these successes are published full music size (usually sold at from 2/- to 6d. each), and will be found in this week's record first number of "POPULAR MUSIC AND DANCING WEEKLY," now on sale at the price of 3d. only. This is the most astounding value ever offered by any paper, and intending purchasers should secure their copies without delay.

A Novel Grid Leak.
 There must be innumerable forms of variable grid leak, but I saw an interesting one the other day which made use of a principle which, so far as I know, is new. Owing to the very high resistance of the grid leak, the difficulty is to get a sufficient resistance into a comparatively small compass, and the materials used are such as do not permit of easy adjustment of the resistance. The leak referred to consisted essentially of a rubber band coated with graphite, which formed the resistance. In order to increase the resistance, the rubber band was stretched, and this had the effect of separating the graphite coating somewhat, so that its density upon the surface was reduced.

There are several ways in which the stretching of the rubber band can be operated by means of a rotary knob, so that the variable leak becomes practically as convenient as an ordinary rheostat.

Earth Oscillations.
 If electrical oscillations could be set up in the earth, they would have a natural frequency of about six per second. The wireless waves emitted would, therefore, have a wave-length of something like 31,000 miles. M. Boutillon, a noted French wireless engineer, and Chief Engineer of the French Government Telegraph Service, has proposed to transmit power by wireless, using earth oscillations in this way. He is said, indeed, to have made a number of experiments on the subject, but the results of his experiments are not yet published. If the method proved successful, it might be possible to employ huge power stations, erected at Niagara and some of the immense waterfalls in Africa, to develop electrical energy, which would be fed into the earth and tapped off at other points as required.

Home-made Insulators.
 The necks of glass bottles make excellent insulators for general purposes, such as supporting the lead-in, and so on. The section of bottle-neck may be mounted upon a suitable nail, by means of a cork inside, or by means of fibre washers. In order to remove the neck from the bottle, tie a piece of string round the neck at the place where it is desired to crack off. Soak the string with a little petrol, and light. When the flame has died down, plunge the bottle-neck into cold water, and, with a little skill, it will be found easily possible to secure a neat crack round the desired place, the neck coming away at once.

Effect of Light on Crystals.
 The effect of light on crystal detectors is very curious, though not more so than the characteristic detecting action of the crystal itself, which has never been satisfactorily explained. Most crystals will work better if strong light, such as sunlight focussed by means of a lens, be allowed to fall upon them. The light from a tungsten lamp may similarly be used. Galena behaves in this way, and so do most samples of pyrites. Carborundum and tellurium mixtures, on the other hand, do not seem to be affected by light. There is here a very interesting field for experiment by the enthusiastic amateur.

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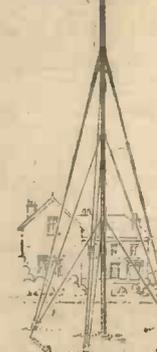
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