

A "NO-CONTROL" CRYSTAL SET FOR THE NOVICE.

Popular Wireless

and Wireless Review

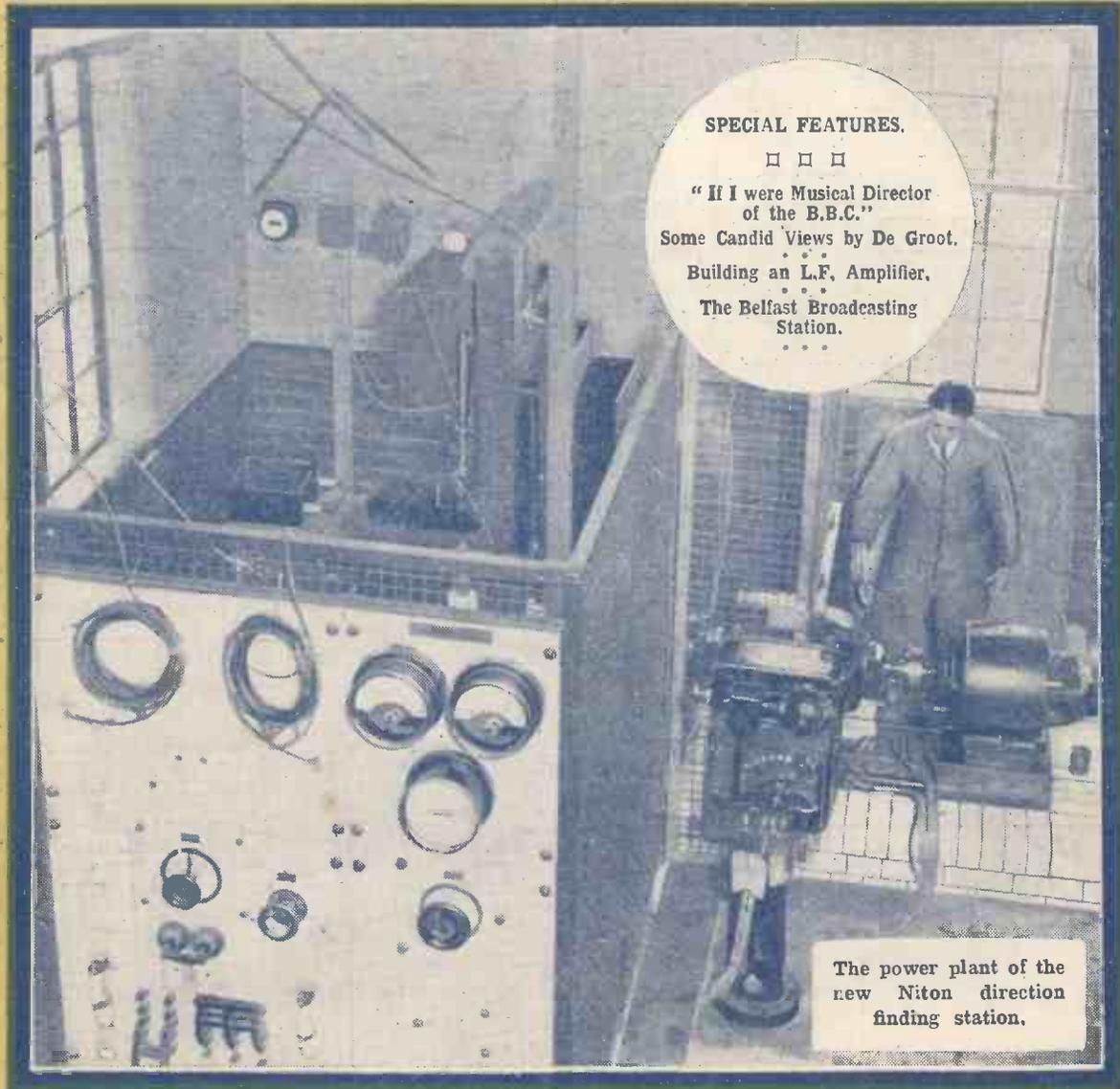
PRICE 3d.

EVERY FRIDAY.

No. 127. Vol. VI.

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

November 1st, 1924.



SPECIAL FEATURES.

□ □ □

"If I were Musical Director of the B.B.C."

Some Candid Views by De Groot.

Building an L.F. Amplifier.

The Belfast Broadcasting Station.

The power plant of the new Niton direction finding station.

OTHER FEATURES IN THIS ISSUE.

Making Anti-Capacity Basket Coils.

Crystal and Valve Rectification.

Technical Notes.

Radio Notes from New York.

Dull-Emitter Filaments.

A Chat on Waves.

Listening-in to the FIRPO-WILLS Fight

using

Exide

The Long-life
Battery.

BLOWS HEARD IN LONDON FROM AMERICA.

Extract from "The Daily Mail"
Sept. 13th, 1924.

HOW THE FIGHT WAS HEARD.

BLOWS AND MOVEMENTS OF THE MEN'S FEET.

Mr. Davies picked up the report of the fight on his set at his home, using 1 detector, 3 high-frequency and 2 low-frequency valves.

The reception—which was very clear—was all the more remarkable for the fact that Mr. Davies used a loud-speaker.

Describing this notably successful experiment to a *Daily Mail* reporter yesterday Mr. Davies said—

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THE LONG-LIFE BATTERY.

Obtainable from your usual dealer
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Look for the Sign.



450 Service Agents.

Send for Catalogue "W."

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THE Chloride ELECTRICAL STORAGE
COMPANY LIMITED.

BRISTOL:
22, Victoria Street.
MANCHESTER:
1, Bridge Street.

MADE IN THE LARGEST BATTERY WORKS IN THE BRITISH EMPIRE.

26, FORDINGTON ROAD,
HIGHGATE, N.6.

September 19th, 1924.

Messrs. THE CHLORIDE ELECTRICAL STORAGE CO., LTD.,
LONDON.

Dear Sirs,

You may be interested to know of the part your batteries played in my recent successes in receiving American broadcasting, which culminated in my being able to supply the *Daily Mail* with a complete report of the Firpo-Wills fight many hours before it would have been otherwise available.

As you know, I have been using Exide Batteries both for High and Low Tension for some considerable time, since, in fact, I first commenced my experiments in long distance reception. The circuit which I have at last evolved is capable of bringing in KDKA on the loud-speaker on occasions quite equal in volume to 2I.O. This may seem a little difficult to believe, but the fact does not rest upon my own testimony.

I can honestly say that these results would not be possible with any other make of storage battery I have ever tested and I am taking this opportunity of writing you as some measure of thanks for the great courtesy I have always received from your Mr. Kennan.

In a circuit as sensitive as the one I am using, both filament and plate voltages are extremely critical, the least deviation in steadiness throwing the whole set out of balance. Even as low as one hundred metres the set is quite easy to control providing the filament current is exact. I have not been able to get this exactitude on any accumulator other than your own.

Using six valves, two of them power valves, it is obvious that the ordinary H.T. battery will very soon give rise to internal cracklings which would make long distance reception impossible. Your H.T. accumulator renders me a perfectly steady plate current free from any noise at all. I will go so far as to say that the freedom from noises generally regarded as atmospherics which I enjoy nightly in my reception of American broadcasting is due entirely to your batteries and I am of opinion that much if not all of the static complained of in long distance work is due to faulty High Tension supply. With a really sensitive circuit it is not sufficient to have a set which is normally quiet, as the magnification is sufficient to make the least whisper sound like a cannonade. H.T. must be absolutely silent and lengthy experiments have led me to the conclusion that up to now you make the only battery that is of the least use for this work.

You may make use of this letter in whatever manner you wish.

I remain,

Yours truly,

(Signed) EDWARD C. DAVIES.

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AMAZING UNSOLICITED TESTIMONY

TUNGSTALITE BLUE LABEL (Regd. No. 447149)

A REMARKABLE IMPROVEMENT



1/6

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Messrs. Tungstalite, Ltd.,
47, Farringdon Road, E.C.1

Birchwood,
Burton Green, Nr. Kenilworth,
WARWICKSHIRE.
October 11th, 1924.

Dear Sirs, I thought it might interest you to know that I invested in one of your Blue Label Tungstalite Crystals purely out of speculation, and substituted it for a "Hertsite" in my Geophone One Valve Amplifier Set, which was already giving very good results.

The improvement was remarkable, in so much that it has enabled me to cut down the filament current from '6 to '41 amps—quite an appreciable saving in "juice."

Yours faithfully,
R. E. D. PHILLIPS.

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BEWARE OF FRAUDULENT IMITATIONS!

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Fallon's, in accordance with their usual custom, are giving the public the benefit of the improvements they have effected in their new model Square Law Condensers without increasing the price.



The New Fallon Square Law Condenser is absolutely the last word in perfect condenser construction.

Extremely handsome appearance, all parts being heavily plated; .068 spacing (the closest possible). In the new model the overall length of the .001 condenser is only 4 1/2" as against 5 1/2" in the old model, and by a new idea in spacing washers, rigidity of construction, never before achieved in any make of condenser, has been obtained.

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Plates	Price	Plates	Price
.001	8/-	.0002	4/6
.0005	6/-	Vernier 5	4/-
.0003	5/6	Vernier 3	3/6
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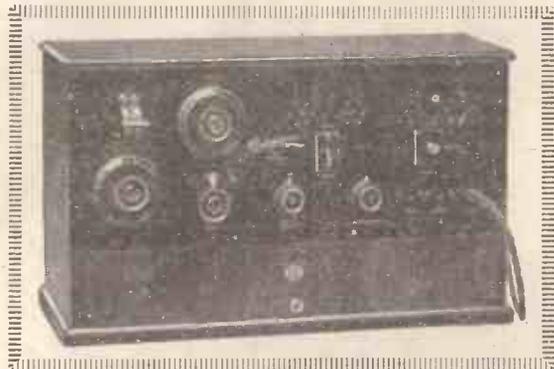
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"THE SET YOU CAN BE PROUD OF"
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Also made in two and three valve models at equally keen prices.

ASK YOUR WIRELESS DEALER FOR A FREE DEMONSTRATION.

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Yesterday

—the explorer braved hardships to chart the seas.

WUNCCELL DULL EMITTERS.

W.1. (For Detector and L.F. use).
 Operating at 1'8 volts ... 21/-
 W.2. (With red top) for H.F. use.
 Operating at 1'8 volts ... 21/-
 Types W.R.1 and W.R.2 as above but
 with resistance incorporated in base to
 operate off 2, 4 or 6-volt accumulator 23/6
The Wuncell is fully described in a comprehensive Folder which will be sent post free to any experimenter on receipt of a postcard. Don't invest in a Dull Emitter Valve until you have read about the Wuncell.

While the explorer of long ago had to set sail and face almost incredible hardships in his praiseworthy efforts to chart the globe, his successor sits by the fireside and logs Foreign Broadcasting Stations with almost absurd ease. From America to the borders of Russia and from Scandinavia to the shores of the Mediterranean the ether is available for his exploration. But the man who is enthusiastic over long-distance reception will see that he is not handicapped either by his Set or his Valves. His Set should employ at least one stage (and two for preference) of high-frequency amplification, and for his Valves

he should use those which have been specially developed for the work.

Undoubtedly the most popular high-frequency amplifier to-day is the Cossor P2—the Valve with the red top. Hundreds of thousands of these Valves are in use at this moment among all grades of wireless enthusiasts—from the expert to the novice—and everywhere it is giving the most complete satisfaction.

Its striking success is undoubtedly due to its design. As every wireless enthusiast knows, the working of a Valve depends upon the correct use being made of its electron



Cossor

Get Cossor Valves—they cost no more



To-day

—he charts the ether from the comfort of his fireside.

emission. You must have noticed that when your accumulator begins to fail and the filaments of your Valves grow dim that your Set falls off in sensitiveness and volume. A clear case that the emission from the filaments has decreased.

Obviously, therefore, the quantity of the electron emission is an important factor in Valve efficiency.

Now compare the Cossor P2 with an ordinary Valve. Instead of a hood-shaped Anode and Grid totally enclosing an arched filament and almost completely entrapping its electron stream, we see that at each end

of the tubular Anode the filament is exposed and that a large proportion of the electron stream is obviously leaking away.

Remember that for high-frequency use you cannot afford to risk efficiency—feeble oscillations from Stations thousands of miles away will strike your aerial and you'll be none the wiser if your Valves are not sensitive to them.

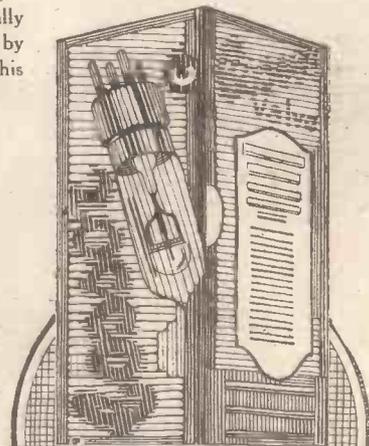
The remedy is in your hands—for high-frequency use select the Valve specially developed for the purpose and chosen by the vast majority of Valve users in this country—the wonderful Cossor P2.

COSSOR BRIGHT EMITTERS.

- P1 For Detector and Low-Frequency use 12/6
- P2 (with red top). For H.F. use only 12/6

From all Dealers.

Valves



but what a difference in results!

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Maximum Capacity Microfarad.	PRICE
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Ebonite boxes can be supplied at an extra charge of 7/6, 10/-, 12/6, according to capacity.

Calibration charts can be supplied at an extra charge of 10/6.

Extra for Vernier for all capacities except 0.0003 mfd. 2/6.

Deceptive Simplicity.

THE apparently simple things in life are frequently the most difficult to achieve.

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There is little apparent difference between the ordinary variable condenser of unknown make and the Vanicon, but when you examine a Vanicon closely several things will strike you.

The plates are accurately and evenly spaced, they are stiff and will not touch one another.

The spindle turns freely but does not work up and down causing unexpected variations in capacity, and a fixed pointer is provided just below the dial. The moving plates are joined to their terminal positively by means of a phosphor-bronze strip—not by uncertain “rubbing contact,” thus good electrical contact is assured *always*.

In fact, the Vanicon abounds in instances where our twelve years' experience enables us to offer you a product which has no equal on the market whatever the price.

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POPULAR WIRELESS

AND WIRELESS REVIEW.

November 1st, 1924] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d.

Technical Editor:
G. V. DOWDING, Grad.I.E.E.

Editor:
NORMAN EDWARDS, M.Inst.R.E., F.R.G.S.

Scientific Adviser
Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

Dundee's Director.

THE appointment of Mr. E. W. M. Heddle, M.C., M.A., B.Sc., to be station director at Dundee is a very popular one. He has distinguished himself in several spheres already, but what the Dundee kiddies like best about their new "Uncle" is the fact that during the war he was gassed, wounded, awarded the Military Cross, and mentioned in dispatches!

Sporting Offers.

IN a letter recently published in "P.W." a tribute was paid to the friendliness and co-operation which is to be found amongst radio amateurs. This is well borne out by the fact that since I announced that the last "P.W." Set Booklet had been given away, dozens of readers have written in offering to lend their own copies to disappointed applicants. Incidents like this show the right radio spirit, and on behalf of the new readers I should like to say "Thank you" once again for these sporting offers.

Melba Again?

HOW many listeners of to-day can remember Dame Nellie Melba singing at the first British wireless concert, which took place at Chelmsford in 1920? A few weeks ago she bade farewell to the Australian operatic stage, and is due to sail for London on November 25th. It looks like a great opportunity for the B.B.C., and it will be a thousand pities if we do not hear this wonderful singer again.

Continental News.

INDUSTRIOUS readers who keep an up-to-date list of Continental stations should note that the German station at Munster is now working upon 410 metres, and that the call sign IRO has been allotted to the Rome broadcasting station.

Poland Next.

POLAND is the latest Continental convert to broadcasting, and there is a possibility of a station being erected there before the winter is over. A French company is doing the necessary backing, and it is interesting to note that entertainment will be only a side line, the station's chief purpose being the distribution of market reports and commercial information.

A Crystal Expert.

CAPTAIN A. HINDERLICH, M.A., who recently gave a very informative talk upon crystals at a meeting of the Radio Society of Great Britain, has done a good deal of experimental crystal

work. Enthusiasts who are always buying new cat's-whiskers will be interested to know that he thinks good regulation of the contact-pressure is the essential point, but that the metal of which a cat's-whisker is made makes little difference to results.

A Novel Experience.

LONDON guests of Messrs H. J. Heinz & Co.—of "57 varieties" fame—had a novel experience at the Founders Day Banquet held recently at the Great Central Hotel, Marylebone. They listened-in by wireless to speeches made at the central gathering at Pittsburg, and presently upon the loud speaker they heard their own congratulatory telegram being read out at the American banquet, which was broadcast through K D K A and other stations to all the firm's guests.

Our Query Department.

SPECIAL ANNOUNCEMENT TO READERS.

In future a charge of Sixpence per Query will be made for answering all technical questions submitted to the Technical Staff of POPULAR WIRELESS. A group of three queries will be answered for One Shilling. Postal Orders must be enclosed with all queries and a stamped addressed envelope in addition. *This new arrangement comes into force at once.* Since the inception of POPULAR WIRELESS readers have had all their problems settled for them free of charge, but with the great increase in the circulation and the corresponding increase in the number of queries sent in the task of dealing with the latter has become gigantic. A large Technical Staff is now employed answering queries and it is with the object of relieving the pressure on them that we have decided to make the small charges mentioned. Readers of POPULAR WIRELESS know that the Editor and Staff of this journal have always had, and always will have, their best interests at heart.

The Bishop and "Mike."

MR. ARTHUR BURROWS tells a good story of a well-known bishop who startled listeners by concluding a religious address with the words, "We shall all meet in the kingdom of Heaven—I don't think." The explanation of this astonishing statement is quite a simple one. Forgetting that the microphone was still in circuit, the bishop turned at the conclusion of his address and said: "I don't think I spoke too long, did I?" and the first three words of this remark were broadcast!

Radio Whaling.

WHEN the s.s. "Sir James Ross" recently sailed from Cardiff for the Ross Sea she carried a Marconi direction-finder for the purpose of whaling

by wireless. The small boats from which the whales are attacked will be fitted with receivers, and they can then keep in touch with their parent ship through fog or darkness by means of radio.

Madrid's Popularity.

RADIO-IBERICA is still coming in strongly on 392 metres, and these Madrid transmissions are becoming decidedly popular in the South of England. I am told that the microphone used for these transmissions was made by the famous French firm of Gaumont.

Tuning-in Zurich.

I RECENTLY remarked upon the difficulty of tuning in to Zurich, but already several readers have been successful in logging this station.

One correspondent, who lives at Gloucester, has heard Rome as well (when Glasgow is off about 6.30 p.m.), but he states that whilst the Italian station is occasionally clear, the signal strength varies greatly.

Milan Testing.

ALTHOUGH the Rome station has only been in operation for a few weeks, Italy is taking to broadcasting with great enthusiasm. Another station is being erected at Milan and will be testing in a week or so, upon a wave-length of 650 metres.

An American 5 X X?

FROM New York I hear there is a possibility of a long-wave high-power station (similar to 5 X X) being erected near that city in the near future; and that The Radio World's Fair was a great success, one of the most interesting awards going to Mr. E. T. Flewelling, for the "originality and perfection" of his circuit.

For and Against.

"COMPLAINTS and Compliments" have been pouring in to this office ever since I asked readers to let the Editor know their opinions of the B.B.C. programmes. I have been helping to sort out some of the post cards and found it a most refreshing task, and I think readers will enjoy them as much as I have done when we publish a selection next week.

Post Cards Only.

IN case you missed the first announcement I will repeat the offer made in order to obtain our readers' opinions upon the subject of the B.B.C.'s entertainments. All that you have to do is to state

(Continued on page 490.)

NOTES AND NEWS.

(Continued from page 489.)

your candid opinion of the programmes upon a post card, marking it "Compliment" or "Complaint," as the case may be, and addressing it to the Editor at this office. We shall then publish a representative selection of both types, for the benefit of other readers, and to stimulate both criticism and appreciation.

2 D E.

ARRANGEMENTS for the new Dundee Relay Station are now well in hand.

The studio will be situated at 1, Lochee Road, and the transmitter at Calderum Works, St. Salvador Street, where a high chimney is available for the aerial.

The wave-length will be 331 metres, and the call-sign 2 D E.

A Great Achievement.

TO their long list of successes British wireless amateurs have now added the supreme triumph—trans-world communication.

Three English transmitters and three amateurs in the Antipodes have succeeded in bridging with small power a gap of *twelve thousand miles*, and in congratulating Mr. Simmonds, Mr. Cyril Goyder, Mr. Partridge, and their New Zealand confrères, I feel that I have every reader of "P.W." behind me.

The 95 Metres Call.

THE first New Zealand call-sign to be picked up in this country was heard by Mr. E. J. Simmonds, of Gerrard's Cross, whose call sign is G 2 O D. For half an hour he listened to the New Zealander Z 4 A G calling up an American amateur, so the next day he sent out test signals on 95 metres, which he subsequently learned had been received O.K. in New Zealand, by Mr. Bell, of Dunedin.

Two-Way Communication.

THE news of this feat did not come by cable but direct by wireless, for by this time Mr. Goyder was on the job, working the Mill Hill School set. To him belongs the record of establishing *two-way* communication, and for over half an hour he sent and received New Zealand messages, one of which gave the news of Mr. Simmonds' successful transmission the preceding day.

On a Two-Valve Set!

THE other successful British transmitter was Mr. Partridge, the well-known South London amateur whose call-sign, G 2 K S, is already famous as a record-breaker.

The most remarkable feature of the whole affair is that Mr. Goyder was receiving on a two-valve set—detector and L.F.—but more of Mr. Goyder anon!

Readers' Technical Queries.

THE announcement concerning the queries department which appears on page one of these Notes will doubtless come as a shock to readers. Much as the Editor regrets the adoption of a policy of charging for queries, he tells me it is the only solution to a serious problem. For months past now the technical queries department have been inundated with

queries. Over 200 letters a day—each letter containing three queries—600 questions a day and most of them severely technical—have kept every member of the staff working at top pressure. And with the queries steadily increasing the decision to charge 6d. per query had to be made. The Editor feels sure readers will understand the absolute necessity for this new rule which, he hopes, may be only of a temporary nature.

A Compliment.

NOW that compliments are flying I have persuaded the Editor to let me pass on to readers the contents of a telegram which has just been received by him from New York. It is a brief one, but the significance of the signature will not be missed by readers of "P.W.," I am sure.

Here is the telegram: "I have just seen the 68-page issue of POPULAR WIRELESS. My heartiest congratulations.—THOS. A. EDISON."

WHAT THEY SAY.

"Mention must be made of the splendidly interesting part in the life of war-blinded men which wireless plays. . . . A very large number of the men are now the possessors of wireless sets of their own, and find, we know, the most intense pleasure in the science. . . ."
—Ninth Annual Report of St. Dunstan's.

"Wireless is such a good friend to hapless lonely people, to the isolated farmer's wife who never gets to town but twice a year or so, to the men on the prairies, to the fishermen and sailors at sea, that the fair-minded person cannot consider its music as a foe to art."
—Mme. Marguerite D'Alvarez.

The isle is full of noises,
Sounds and sweet airs that give delight and hurt not,
Sometimes a thousand twanging instruments
Will hum about mine ears, and sometimes voices.
—Shakespeare.

"I am shocked at the price of wireless apparatus. I have been used to electrical apparatus all my life, and I cannot see where the £30, £40 and £50 comes in for valve sets, whose reasonably competitive price would appear to be about half this. . . ."
—Earl Russell.

THE WEEK'S QUERY.

I am sorry to say that in the dusk the other evening I connected my aerial to the earth terminal of my crystal set, and the earth wire to the aerial terminal. Will it hurt the set if I change them back again, or had I better leave it as it is?

Youthful Talent.

CONJURORS say that children make a far more critical and exacting audience than grown-ups, and I think that announcers with experience of the Children's Hour will agree that this applies to broadcasting also. Glasgow has hit upon the happy idea of making the children themselves do the entertaining, and I hear that some promising youthful talent has been unearthed in 5 S C's radio circle and will be broadcast shortly.

Artistes of the Aether.

IN last week's "Artistes of the Aether" the two photographs appearing in the first column were inadvertently reversed, and readers should note that the top photograph is of Miss Olive McKay, and the lower one of Miss Dorothy Franklin.

A Message from Denmark.

DID you hear the message to all "P.W." readers which was broadcast from Copenhagen on 750 metres? Ap-

parently my recent remarks regarding the Danish station were noticed by the announcer there, and thinking that as a result we might be tuned in, he very kindly broadcast a greeting to us all. Such a courteous and friendly spirit adds an additional charm to broadcasting, and I should be very glad to hear from any readers who intercepted this message.

More Problems to Solve.

CAPTAIN ECKERSLEY is due back in England from America before these words are in print, and there is an enormous pile of work awaiting him in connection with the new high-power station at Northampton.

The B.B.C. would like to establish a second London station as well, and as the technical problems connected with this possibility are also hung up pending the return of the chief engineer, he looks like having a busy time!

Wireless Wind-Motors.

THE success of the giant Zeppelin ZR 3 in crossing the Atlantic was largely due to the wireless installation, which kept her in touch with patrols and land stations and enabled the best course to be chosen. The power for transmitting was supplied by wind-motors swung out from the cabins and operated by the rush of air due to the forward motion of the airship.

Sheffield's Birthday.

THE next B.B.C. station to celebrate its birthday will be Sheffield, which was officially opened on November 16th, 1923.

It was the first of the relay stations, and the staff at 6 F L have reason to be proud of the fact that already about one-tenth of the houses in Sheffield are fitted with aeriels.

Coming Cup-Ties.

WHO is going to win the Cup? Not the F.A. trophy, but the first British Wireless cup, to be presented to the winner of the POPULAR WIRELESS Constructors' Competition, of which full particulars will be found on another page of this issue.

The White City Exhibition.

THE competition is in connection with the second London Radio Exhibition, which is going to be a huge success, judging by what I hear from Mr. Dale, who is one of the organisers. He says that entries are tumbling in, and that there will be wonderful wireless value for money on November 15th, when the White City opens its doors.

Getting America.

SO many readers have already "got America" that I am expecting soon to receive complaints of jamming by the transatlantic stations! Experience is showing that H.F. amplification and wonderful hook-ups are not half as important as straight circuits and skilful handling. And that is just where the delicate controls of the Unidyne are going to score this winter!

ARIEL.

"IF I WERE MUSICAL DIRECTOR OF THE B.B.C."

SOME CANDID OPINIONS

By DE GROOT
(In an Interview with "Ariel.")

Every listener is familiar with the music of Mr. De Groot, whose broadcast concerts from the Piccadilly Hotel are such a favourite feature of the Sunday Programmes. In this interview he explains his views on broadcast music to "Ariel" of "Popular Wireless."

WHEN I called on Mr. de Groot recently, at his flat off Portman Square, my mind was still full of the wonderful melodies I had heard him play that same evening at the Piccadilly Hotel. The chief feature of his programme had been selections from the opera "Samson and Delilah," and so vividly had he and his orchestra rendered the music that I had almost believed I was watching the development of the story on the stage at Covent Garden.

I found Mr. de Groot with his family, and when I told him that I came from POPULAR WIRELESS he asked me to sit down, and told me how interested he was in every branch of this new science.

"You know," he said, "I think it is the most wonderful invention of the past century. When I am playing at the Piccadilly I am playing to two audiences; the one before me, which shows its appreciation and gives me inspiration, and the other, scattered all over the country, and drawn from every class of the population."

"Does not the thought of this unseen audience distract your attention?" I asked with some curiosity.

"No," he replied, "for I know from the numerous letters that I receive that these people who hear me over the ether, although they cannot afford to come and see me, appreciate my work as much as, if not more than, the wealthier classes who can come to me any night they like."

What the Public Want.

"Then," I continued, "you consider that the broadcasting of music means a lot to the population of this country?"

"I am quite sure," he replied, "that the introduction of really good-class music into all the homes in the British Isles is the greatest work that has been accomplished by the entertaining world. It is this that has made broadcasting so important."

"But," I objected, "I am always being told that we English are the most unmusical nation in the world."

"Don't you believe it," replied Mr. de Groot. "In my experience England is the most appreciative and most widely musical country in Europe, but in America, I do not know much, I have never been there, although I have had many very tempting offers."

"I remember when I was in Vienna I was one of a large audience listening to a very good concert. I was thrilled with the performance, but not one of the audience showed any signs of appreciation, and that is why I say that England is appreciative."

"Well," I replied, "you, if anyone, I suppose, are qualified to gauge the taste of the English public. Do you think that the musical programmes at present broadcast are really what they want?"

Mr. de Groot considered for a moment. "In my opinion," he said, "the B.B.C. have been perfectly wonderful in the way in which they have supplied something which will appeal to everybody. But I am not sure that they have quite realised how much could be done with real classical music."

Some Suggestions.

"But surely classical music is appreciated only by the few?" I inquired.

"A question," he answered. "In drawing up my programmes I have found that high-class—not necessarily classical—music is really more in demand than any other kind. After all, jazz was invented to be

an audience which does not want to dance I play them rather as I would classical music. I give them expression and an interest of their own. I have never heard a tune, however dull, but I have been able to find in it some peculiar rhythm or expression which can give it interest and hold the attention of an audience. You have, of course, heard Jack Hilton's orchestra in the Piccadilly Hotel. He has shown appreciation of jazz music to classical style. I heard him quite recently play a popular jazz number to the style of Liszt and another to Wagner."

"If this is your point of view," I asked, "what would you do for broadcast music if you were one of the musical directors at the B.B.C.?"

"I should give programmes," he replied, "very similar to those I do now. I would emphasise semi-classical music, and prove to the satisfaction of everyone that really good music is neither boring nor depressing, and that some of our very best tunes are to be found even in classical music. I know that these programmes would be appreciated. Often when I am playing at the Piccadilly I remembered the letters I have received from my unseen audience, and I can picture to myself families in houses and cottages all through the country listening to the music I am providing."

Providing an Audience.

"May it not be true," I asked rather tentatively, "that the pleasure derived from your programmes is due not so much to the music you play as to your rendering of that music?"

"I am sure that is not the case," he modestly replied. "Nobody would listen to a violinist, however good, if he played what was uninteresting and not worth while. On the other hand, of course, personality does go a long way. When I am playing I strain every nerve to convey to the audience the sense I have of the music and the reason why I love it. And I do think that in this way I help them to realise the beauty of the music they are hearing, even those of them who cannot see me. But I am not sure that I could do this were it not that I have always before me an audience which I can watch and see how my emotion reacts on them."

"Then you agree with other artistes," I asked, "that playing to the microphone only is flat and uninspiring?"

"Yes," he said emphatically. "If I were musical director of the B.B.C. I would always provide for my artiste an audience in the studio. Their presence and appreciation gives one the enthusiasm that is wanted, and through them one can exert one's personality in such a way that the unseen audience can feel it."



Mr. de Groot.

danced to, and you must not forget that one sometimes wants to listen to real music. Now, to listen for a whole evening to dance music, especially the dance music of to-day, is really very exhausting, and when, in an evening, after a long day's work, one turns on a wireless set, one wants to be refreshed and soothed. And it is from this point of view that good music is so valuable and makes so wide an appeal."

"But you yourself have often played popular turns," I suggested.

"Of course," he replied. "I have a great admiration for this type of music, and many very good dance numbers have been written. But when I am playing them for

RADIO NOTES FROM NEW YORK.

(From a CORRESPONDENT.)

Valves Without Batteries.

A NEW wireless outfit in which any number of valves may be used without batteries has been tried out in Chicago. All energy is procured from the ordinary house lighting main of 110 volts. The experimental set was made with three valves, one for rectification and two for amplification of signals, and, despite the fact that no aerial was used, good volume and selectivity were obtained.

The outfit was provided with a plug attachment which fitted into an electric-light socket. The electric main was utilised as an aerial, and a ground attachment, coming from the primary tuning coil, was clamped to the house radiator. Two choke coils and two fixed condensers of .006 mfd. capacity were used to smooth out the commutator hum of the generators, and to cut the potential down to about 80 volts, suitable for the plate circuit. A 36-candle-power lamp was placed in series with this circuit to reduce the energy to a quarter ampere for the valve filaments.

There is only one objection, which is that only direct current can be used. However, for homes provided with alternating current, a synchronous rectifier unit is contained in the outfit to convert the electricity.

Measuring Waves with a Yardstick.

This sounds rather difficult, for wireless carrying waves are probably the most intangible things extant. But it has been done in a very unique way by an American experimenter who created a material manifestation of Hertzian waves.

Two diverging wires were connected to an oscillator, with an ion-filled tube shunted across the opposite ends. When oscillations were created—i.e. when the wireless transmitter was placed in operation—and the circuit was tuned, it was found that at a certain capacity the tube would light.

This marked the point where the wire system and oscillator were in resonance. An illustration of this condition can be made by comparing the wave motion set up by an oscillator with the curves in a line of rope when one end is fixed and the other moved up and down with a steady motion of the hand. When two parallel wires are connected to the oscillator and just the right tuning is obtained, the oscillations passing to and fro will superimpose one upon the other just as the curves in a piece of rope would if a regular motion were maintained, forming what is known as "standing waves."

Short Wave-lengths Only.

When the tuning is proper and the circuit is in resonance, it will be found that the illuminated tube will go on and off if the diverging wires are short-circuited at certain points. When the tube is off this indicates that a point of no voltage has been found, and the distance between the wires there is equal to half a wave-length. It is then a simple matter to estimate the length of the wave with a yardstick.

Of course, this system is only practicable for very short wave-lengths, probably not exceeding five or ten metres. It would take a man in seven-league boots several years to measure some of the low-frequency waves with this system.

Ornamental Wireless Gear.

If all the human ingenuity directed toward disguising practical, pleasant-looking electrical and wireless apparatus were diverted to scientific research and development, the age of perfect living would be with us. In the ordinary household one may find a telephone hidden under a doll-stand, the electric switch may look like anything from a golf ball to a steering-wheel, and a reading-lamp may be a dragon with flaming eyes.

And wireless has not escaped this disguise craze. I have seen sets that looked like "dime" banks, like wall safes, the combination wheel of which served as the tuning dial, and like dolls, chiffoniers, fountain-pens, and telephone receivers.

A Loud Speaker Lamp.

I stepped into a wireless store in Chicago recently and heard distinctly a concert from a local station, K Y W. Where it came from, however, was quite a mystery, until I traced the wire from the receiving set to an illuminated table lamp. This latest novelty is quite interesting, for although no laws of acoustics, wireless, or electricity are violated, the device works equally well as a loud speaker and lamp.

In the base of the lamp is located the receiver unit, which carries the sound up the lamp base, formed like a sound chamber. When it reaches the top it is deflected

downward by a semi-transparent parchment shade, and sends in all directions. In their usual places two little electric lamps are fixed with chain sockets under the shade.

Unique Receivers.

Often, in the immediate neighbourhood of a powerful sending station, the ordinary rules of receiver construction may be ignored, due to the tremendous amount of energy available.

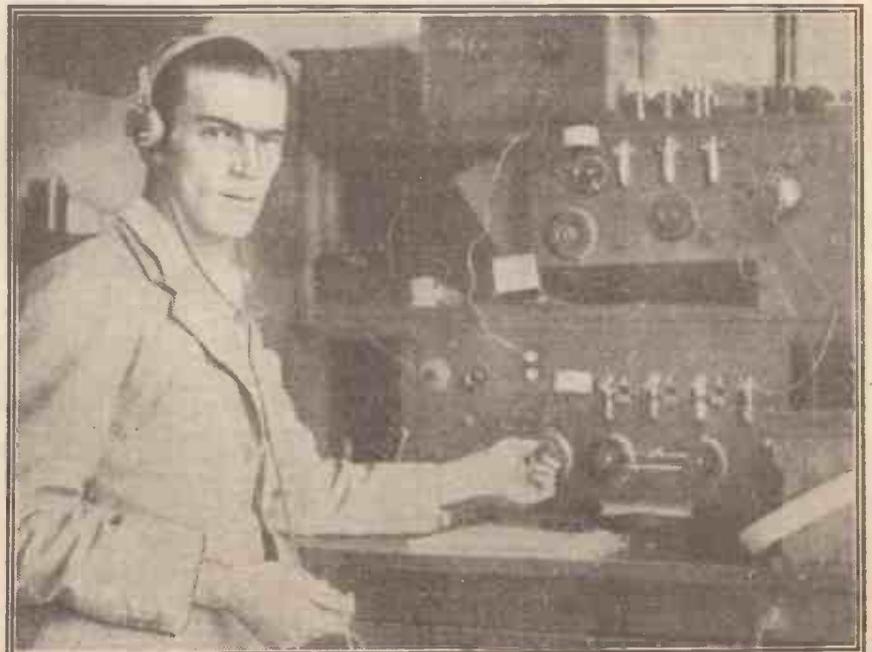
In the Drake Hotel, Chicago, where the powerful station W G N is located, a novel method of reception is used. A helix of insulated wire, about No. 12 size, is made in hat shape, so that it may be fitted upon the head. For the cover a piece of cardboard is placed over the "hat" upon which a crystal is mounted. A telephone comes down over each ear so that when the complete outfit is placed upon the head the appearance is that of a straw hat, minus rim, and with ear-muffs. It is not an uncommon sight to see these "wireless hats" upon a guest in the hotel corridors, and if one were not informed that the person was listening to a concert broadcast from an upper floor of the hotel, he would feel a bit confused.

"Some Hook Up."

These hats work very effectively in the hotel, for the helix, although without ground or aerial, collects sufficient energy to afford a very entertaining concert to the wearer.

In Washington, D.C., a different method is used for receiving nearby concerts. There a crystal is fitted into a telephone and connected directly to the magnet windings. That is all there is to it, and concerts can be heard quite clearly by connecting one binding post of the telephone with an umbrella or aerial wire. The aerial wire takes the place of the tuning element, for when one is so close to the source of energy, fine tuning is not necessary.

Naturally, such methods of reception are limited in their uses, and unless one lives "under the aerial" of a station, are merely curiosities.



Mr. Edward Davis with the set with which he received the broadcast details of the Wills-Firpo flight recently.

HOW TO MAKE AN AUDIO-FREQUENCY AMPLIFIER WITH A VARIABLE GRID-BATTERY.

By M. J. CHUGHTAI.

The amplifier described in the following article contains a grid battery of four cells with a switch to regulate the voltage. When connected to a crystal set it will work a loud speaker with unusual clarity and lack of distortion.

A PIECE of metallic wire falling over the bare terminals of a valve set has often been the cause of "blowing" the valves, which can be prevented by replacing the ordinary terminals by the sockets into which fit insulated plugs, so that there is no liability of the terminals being short-circuited when a piece of

valves. The most suitable resistance for the filament resistance is about 5 ohms, and the transformation ratio of the intervalve-transformer of a reliable make should be preferably 1:5. The pocket-lamp batteries often used for H.T. work provide excellent cells for the grid battery, and the best four should be selected, after testing with a voltmeter, as it is not always possible to change the cells frequently when they are once fixed in their proper position.

The lay-out of the panel is shown in Figure 4, from which the positions of the necessary holes can be marked on the ebonite sheet, which is 8 in. long, 4½ in. wide, and ¼ in. thick. The ordinary matt ebonite sheet being brittle to work, polished ebonite should be used for the purpose, which can be given a matt surface, after being drilled, by rubbing its surface with fine sandpaper.

The position of the valve-holders and the grid cells is shown in Figures 2 and 5.

Two wooden pieces M, ¾ in. thick, 3½ in. high, and 1½ in. wide, are fixed on the underside of the panel by long wooden screws, and behind these is screwed an ebonite sheet N, ¼ in. thick, 4 in. long, and 1½ in. wide, in the middle of which is fixed the valve-holder shown at V, Fig. 5.

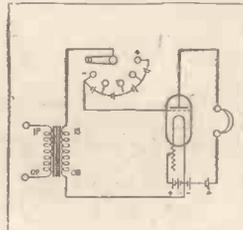


Fig. 3. Theoretical diagram of circuit.

The grid cells, four in number, are fixed on the inner side of the wooden pieces, two being clamped on each piece by a small ebonite piece E, which is hollowed near the ends to hold the cells firmly in position. Having fixed the grid battery and the valve-holder, the rheostat can next be fixed in its proper position R, Figure 8.

Varying the Grid Bias.

The variation of the grid potential is effected by the switch G, Figure 6, comprising an ordinary switch arm and six contact studs fixed in a semicircle. When the arm is on the first stud, the transformer is disconnected from the valve, while the connections are made when the switch arm is at the second stud, and on moving the arm to the third stud the valve grid receives a negative potential of 1.5 volts, which is increased as the arm is moved further on the remaining three studs.

The theoretical diagram of wiring is given in Figure 3, while Figure 5 gives the actual wiring of the panel. The difficulty of soldering the wires to the grid battery is got rid of by connecting the cells in series before they are fixed in their proper position. Care should also be taken in insulating the grid cells, and the suitable material for the purpose is waxed paper wrapped two or three times round each cell.

Neat Method of Wiring.

The wire used for connections is No. 21 S.W.G. tinned copper wire, which is carefully soldered by means of a small soldering iron, as a large one is apt to make the components too hot, with the consequent danger of injury to the panel and the components themselves. The connections with the transformer are made by soldering the wire on to small copper strips fixed under

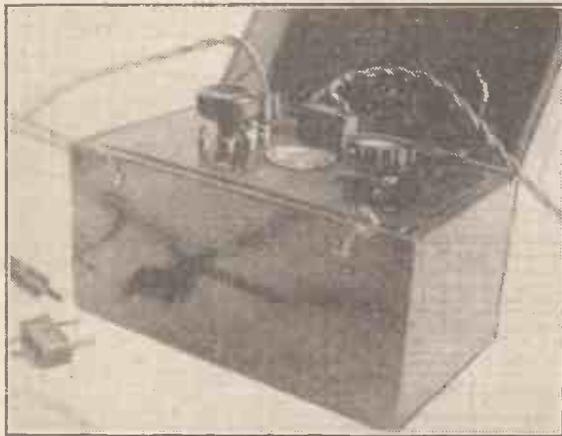


Fig. 1. The amplifier with two plugs in position.

wire happens to fall on them. The amplifier described below is fitted with ordinary valve sockets instead of the terminal screws, and the connections are made by putting in suitable plugs made from valve legs.

The amplifier, which contains a grid battery of four cells with a switch to regulate the potential, when connected to a crystal set works a loud speaker so that it is distinctly heard in a large room, and the application of the correct negative potential to the grid of the valve nearly doubles the volume of the sound emitted.

Details of Construction.

The components should be carefully selected, as a cheap transformer is liable to give distortion, while a rheostat of 25 ohms resistance is practically useless for the

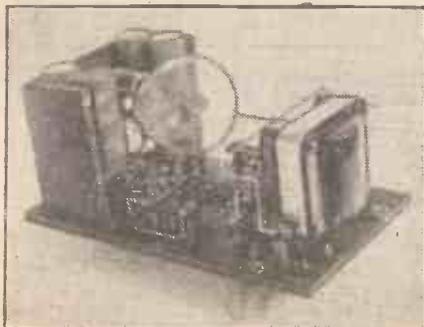


Fig. 2. Position of rheostat and grid batteries.

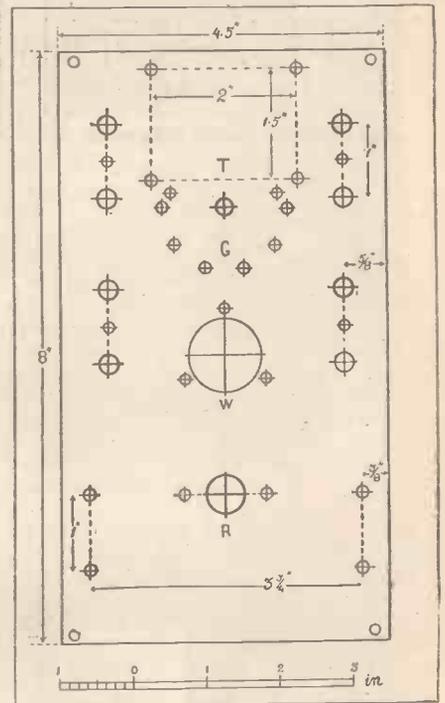


Fig. 4. The panel drilling measurements

the terminals; in fact, the wiring becomes much neater if copper strips are used with every terminal than without them. Figures 2, 3, and 5 show the wiring of the panel, with copper strips fixed to every terminal.

Figure 6 shows the place of the panel fittings, G being the switch to regulate the grid potential, and R the filament resistance for controlling the filament current; between these two is fixed the valve window W. The pair of sockets marked I.P. are the

(Continued on page 494.)

AN AUDIO-FREQUENCY AMPLIFIER.

(Continued from page 493.)

input terminals—i.e. those to be connected with the receiver—while those marked O.P. are the output terminals. The sockets for high-tension and low-tension batteries are marked H.T. and L.T. respectively.

The cabinet for the completed panel, whose dimensions are given in Figure 9,

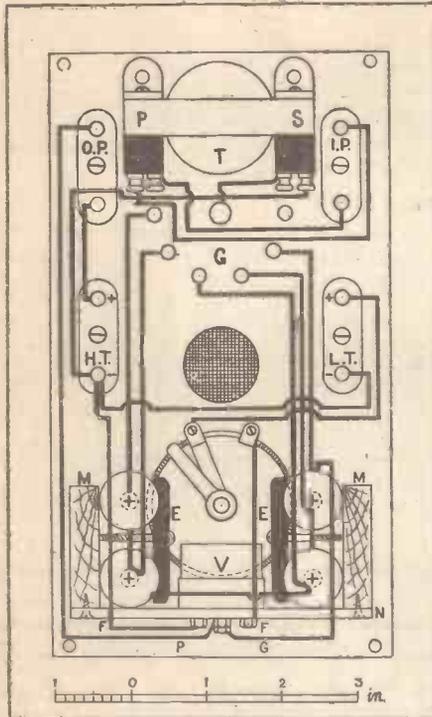


Fig. 5. The actual wiring of panel.

can be easily made from a piece of wood 5 in. wide, 4 feet long, and $\frac{1}{2}$ in. thick. Figure 1 shows the completed amplifier.

The Plug-in Sockets.

The method of fixing the valve sockets to serve as the terminals is clearly shown in Figure 7. The two sockets C are first fixed by nuts K to a thin ebonite strip G, which is $1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. wide, and $\frac{1}{8}$ in. thick. This ebonite piece is fixed with the panel D by means of a long screw N, with a

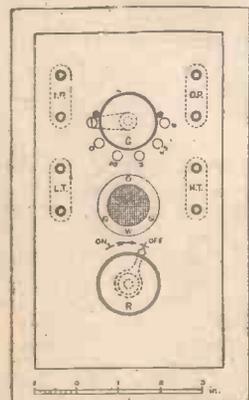


Fig. 6. Showing panel mountings.

piece of ebonite tube M between them to keep the sockets nearly flush with the panel. The hole drilled in the panel for the screw N should be less in diameter than the external diameter of the screw, which on screwing will thread the panel itself, thus avoiding the use of an extra nut.

The plug for

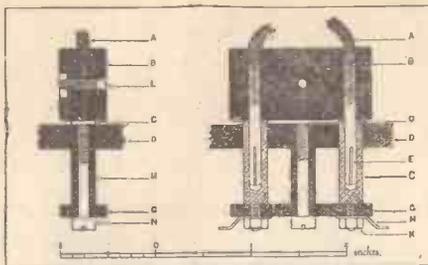


Fig. 7. The arrangements of plug and sockets.

the sockets can be very easily made by clamping together two pieces of ebonite B, Figure 7, $1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. wide, and $\frac{1}{8}$ in. thick, by a screw and a nut L, and then drilling two holes $\frac{3}{8}$ in. diameter and 1 in. apart along the surface of contact of the two pieces. The pieces are then unclamped, and the valve legs E, at the ends of which are soldered the ends of the flexible wires A, are inserted in the grooves. The two pieces are then clamped together by the screw L, which holds the two legs in position, thus forming a suitable plug to fit in the sockets.

The connections with the sockets are made by soldering the wires to the copper strips H, Figure 7. The sockets thus fitted have a much neater appearance than the terminal screws themselves. This arrangement also facilitates the connecting of the amplifier with the batteries and the receiver.

The necessary constructional details in this article are provided by the accompanying photographs and diagrams, which are all drawn to given scales, and it requires very little skill to construct the above amplifier by following them.

Distortionless Results.

The results may be extremely unsatisfactory if the batteries are not connected properly—i.e. if their positive and negative poles are connected to wrong terminals. It is possible to get good reception when the H.T. battery is properly connected while the L.T. battery is not, but the results are

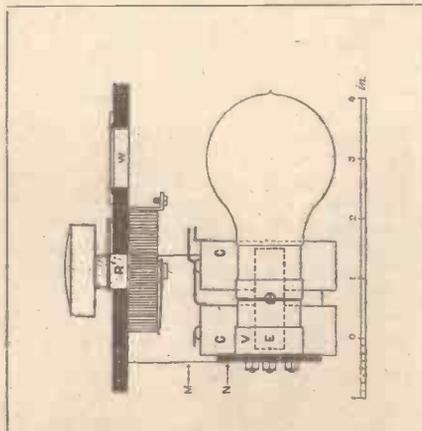


Fig. 8. Plan of valve and rheostat positions.

further improved if the L.T. and H.T. batteries are connected as indicated in Diagram 5.

The amplifier when connected with a crystal set works a loud speaker, loud enough to be heard clearly in a large room, and the music, both vocal and instrumental, is absolutely distortionless, being of the

same tone and quality as received on the crystal set itself. The value of the H.T. battery used is about 75 volts, which requires a negative potential of 3 volts for the grid of the valve running on a 4-volt accumulator, though the exact value of the grid bias may vary with the type of valve used.

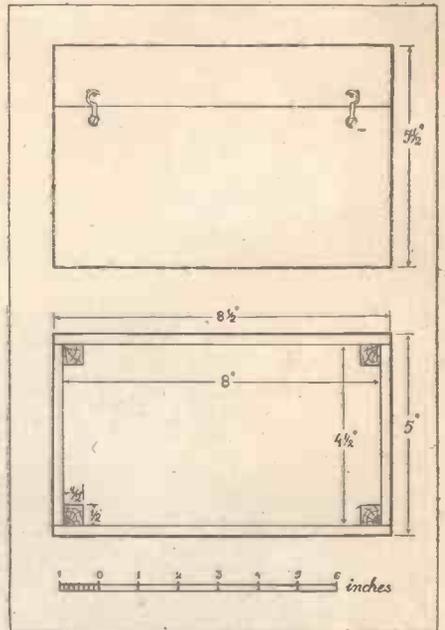
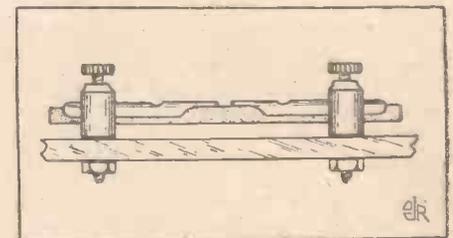


Fig. 9. The dimensions of the box.

A NOVEL ARRESTER.

TWO large W.O. telephone terminals, two heavy type brass pen nibs, and a short length of slate pencil are the only parts required to construct a very useful lightning arrester which can either be mounted on the panel of a receiver or fitted to a separate base and attached to the window frame. The idea is clearly shown in the sketch.



The terminals should be clamped to the ebonite about 2 inches apart, one being connected to the aerial and the other to the earth terminal in the usual way. The pen nibs are adjusted until there is a space of about $\frac{1}{8}$ in. between their points, the small clamping screws then being screwed down very firmly.

Although this device is not intended to supersede the A to E change-over switch, it will be found very useful in passing heavy electrical discharges which might otherwise damage the delicate 'phone windings.

THE BELFAST BROADCASTING STATION. DETAILS ABOUT 2 B E.

By T. P. ALLEN
(Our Correspondent in Belfast).

AT last the first Irish broadcasting station has opened, and seems already to be established firmly in the everyday life of Belfast and the surrounding country.

The offices and studio are situated at 31, Linenhall Street, a central and convenient site for artistes and others attend-

station buildings, where the transmitter is situated. The horizontal portion of the aerial had to be considerably shortened since erection, as, on test, the original arrangement gave a wave-length much in excess of the 435 metres needed.

The studio is about three-quarters of a mile from the transmitter, and is connected

across the North Channel, this portion being about 25 miles long, so technical difficulties were present in obtaining undistorted speech and music at this end. The B.B.C. engineers deserve the greatest credit for the way in which they have met these difficulties, and on the opening night the speech from London was vastly superior in quality to that from the local studio. Earl Haig's speech was the best S.B. that I have ever listened to, and everyone was commenting on its clearness.

Items That Broadcast Badly.

The trouble now with the land-line is not distorted speech, but interference. On some nights the news is almost unintelligible, due to the amount of what appears to be interference caused by induction from some neighbouring wires carrying high-speed Morse, such as that used in working Creed machines. But, given a quiet period on the line, the speech and music from London is excellent.

The modulation of the Belfast station has greatly improved during the first week, and the speech and music from our studio is now quite satisfactory.

One has one's doubts about the desirability of broadcasting choir music, such as we had on the first night. The majority of listeners with whom I have discussed the matter since are quite convinced that choir music does not broadcast well, and that the B.B.C. would be wise in limiting the amount of such music transmitted. In fact, I have not heard a single listener say that he liked the choir music on the opening night, and I am quite sure that it was not the fault of such an excellent choir.

A real treat is before listeners on October 16th, when Miss Erskine and Miss Warnock,
(Continued on page 496.)



The 6 kw. Transmitter at the Belfast Station.

ing the studio. The space now occupied by the offices and studio was originally one large flat, and this had to be divided off into the various rooms necessary for the staff. The studio itself is approached through a winding corridor, which divides the various offices, all of which are situated on the second floor and above the B.T.H. Company's Belfast premises. The corridors are liberally placarded with requests for silence, and a waiting-room is provided for artistes; those wishing to listen-in while waiting their turn may do so.

Initial Difficulties Overcome.

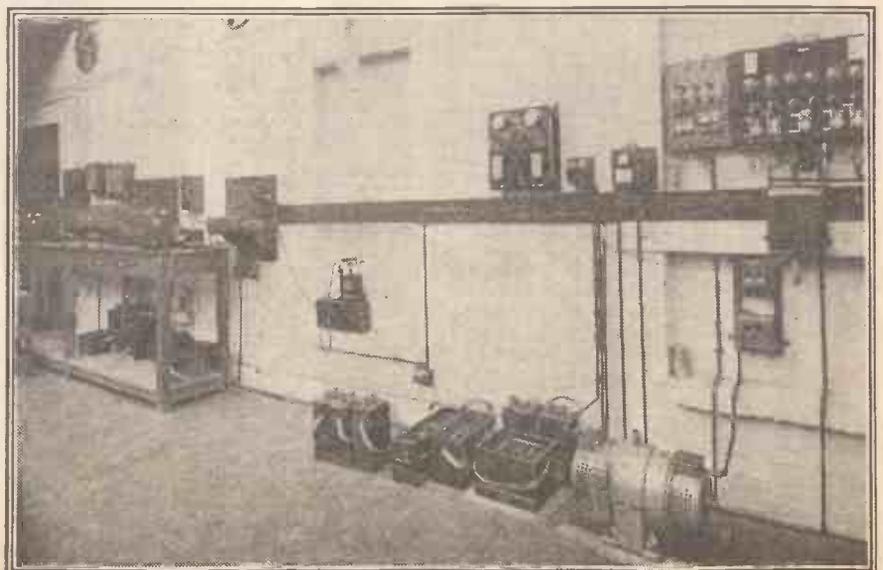
The studio is treated in the same way as those "across the Channel," and is draped and carpeted, and has a canopy of light fabric, all with the idea of reducing echo. As a matter of fact, the draping was not finished when the station commenced its present experimental transmissions.

The transmitting gear is erected at the Belfast Corporation's electric station at East Bridge Street, which is now acting as a sub-station for the new Harbour Power Station, and supplies the transmitter with the necessary electrical energy.

The aerial is of the sausage-type, and is suspended from the two tall smoke-stacks of the electric station, the sausage-type lead-in being taken to the rear of the

by a double land-line, a telephone being provided for communication between the engineers and the studio staff.

The land-line which brings us our S.B. from London is carried by submarine cable



The Control Room at the Belfast Station.

A CHAT ON WAVES.

By T. C. ECCLES.

A short article for the new amateur.

SEEING that certain waves, designated electrical or ether waves, play so important a part in wireless, a few words on them will, it is thought, not be amiss. It is necessary before wireless can be thoroughly understood, to obtain a sound knowledge of wave motion on which the science is founded.

All must have a conducting medium, and in the case of wireless this medium is known as ether, a substance which, it is thought, permeates all space. All waves, too, possess the property of propagating themselves radially from a certain point. If we throw a stone into a pool of water the resulting ripples or waves all have their origin at the spot where the water was displaced by the stone.

If a wave, during its travels, comes into contact with any body it will produce in that body a disturbance similar to the one which started the wave. There is a point concerning wave motion which the beginner in wireless will do well to understand. It is this: Although a wave travels from one part of a medium to another, the medium itself does not travel; except for a slight motion of its particles, it remains where it is.

Measurement of Waves.

The measurements of waves often proves disconcerting to the newcomer to the science. These measurements consist of the amplitude, the length, the velocity, and the frequency. We will take them in their turn.

By amplitude is meant the distance from the highest point to the normal level. Thus, a wave six inches above the normal surface of a medium would be six inches amplitude or height. The length of a wave is the distance from the crest of one wave to the crest of the next. If we notice the surface of a pond over which a wave is travelling, we shall see that only part of the wave is above the surface of the water; the other part is below.

A complete wave therefore consists of the part above and the part below the surface of a medium. Velocity or speed of radiation is the distance a wave will travel radially in one second. The number of completed waves which pass a given point in one second constitutes the wave's frequency.

Another definition of frequency can be made in terms of wave-length. For example: If we take two points of a pond 100 feet apart, the total number of waves included between these two points in a second will be the frequency, because all of them will have passed the first point in that time.

A simple table for the measurement of waves is as follows: Frequency equals velocity divided by wave-length; velocity equals frequency multiplied by wave-length; and wave-length equals velocity divided by frequency.

Pressure Waves.

Besides the waves which travel on the surface of a medium, there are those which travel in a medium. These are known as pressure waves, and have the following

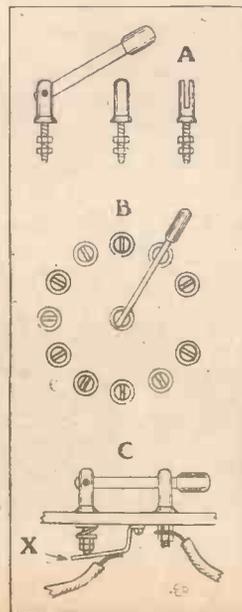
characteristics. They travel at a definite speed according to the conducting medium; and their speed remains the same, no matter what the size of the wave may be.

Electrical Waves.

Electrical waves, or ether waves, as they are sometimes called, are produced in the same way as pressure waves, since really they are pressure waves. The displacements of the ether are caused by the electrical charges in the aerial. The origin of the pressure used in this case is the condenser. During a complete cycle of operations the condenser is charged positively, then discharged, next charged negatively, and finally discharged again. If during each cycle the condenser is charged to the same extent, the resulting waves will be continuous waves, but if the charges gradually grow weaker and weaker, we shall get damped waves. Whilst the condenser is being charged, a current of electricity will flow in the aerial, and will cease to flow when the aerial becomes fully charged. As soon as it ceases to flow, the current will commence to go back in the opposite direction. It is, therefore, constantly flowing backwards and forwards, and becomes an oscillating current. These oscillations govern the frequency of the wave.

A NEAT MULTIPLE SWITCH.

MOST readers are acquainted with those useful little sets of switch parts now on the market. These are specially intended for panel mounting, and may



be obtained in complete sets for making up any desired type of switch. Thus an enthusiast may purchase one arm with pillar and two split pillars, as shown at A, to make a S.P.D.T. switch, one arm and one pillar to make a simple cut-out switch, and so on up to a complete D.P.D.T. switch.

Now if a dozen or so of the split pillars are purchased and fitted to the panel in radial formation as shown at B, one has a very neat and efficient multiple switch.

The pillar which carries the arm is swivelled to the panel by means of a spring washer and two lock-nuts in the manner indicated at C. A small strip of spring brass, X, is secured at one end to the under side of the panel, the other end being sprung hard against the end of the revolving pillar. The connecting wire from this is preferably soldered to the brass strip.

An Ideal Selector.

This makes an ideal selector switch for H.T. batteries made up from unit cells. When the ordinary multiple switch is used for this purpose the arm makes contact with one stud before leaving the other, and thus short circuits one of the cells every time an adjustment is made.

With the present arrangement this is completely obviated, it being possible to lift the arm clear of one contact before it is made to engage the next.

THE BELFAST BROADCASTING STATION.

(Continued from page 495.)

of Belfast, are to broadcast some humorous duologues in the Ulster dialect.

Many of these delightful pieces are written by Miss Warnock, and I understand that she has been asked to write one specially for broadcasting. The many Belfast people who have had the privilege of hearing these two ladies will welcome their first appearance before the microphone, and I am sure that distant listeners will thoroughly enjoy these dialect pieces.

Forthcoming Events.

Other forthcoming events are the recitals of Miss Edith Mathews, L.R.A.M., and the "appearance" of Miss Carrodus Taylor. Miss Mathews is a well-known teacher of voice production, while Miss Taylor's 'cello music will now be familiar to Belfast listeners, as she assists the station orchestra on their special Wednesday evening programmes.

Our announcers have excellent voices, especially Mr. Guthrie and Major Thompson. By the time these lines are in print we will be having our own Children's Corner, under the direction of Miss Eva Kerr. If the Children's Corner is as good as Uncle Mungo's we should indeed be satisfied.

The Interference Problem.

A great deal of controversy is going on in Belfast about the interference caused by the local station with the reception of the other stations of the B.B.C. This is a serious problem for the user of a multi-valve set, and every listener has not the technical knowledge necessary to make and use a super-sonic set, as recommended by Capt. Eckersley, and will have to do the best they can with wave traps.

But I'm afraid that, so far as the ordinary listener is concerned, he will have to be content to lose Glasgow and Newcastle at least. Each installation would really need individual treatment to cut down the amount of interference, and no general solution would be of much value.

Brandes

The Name to Know in Radio

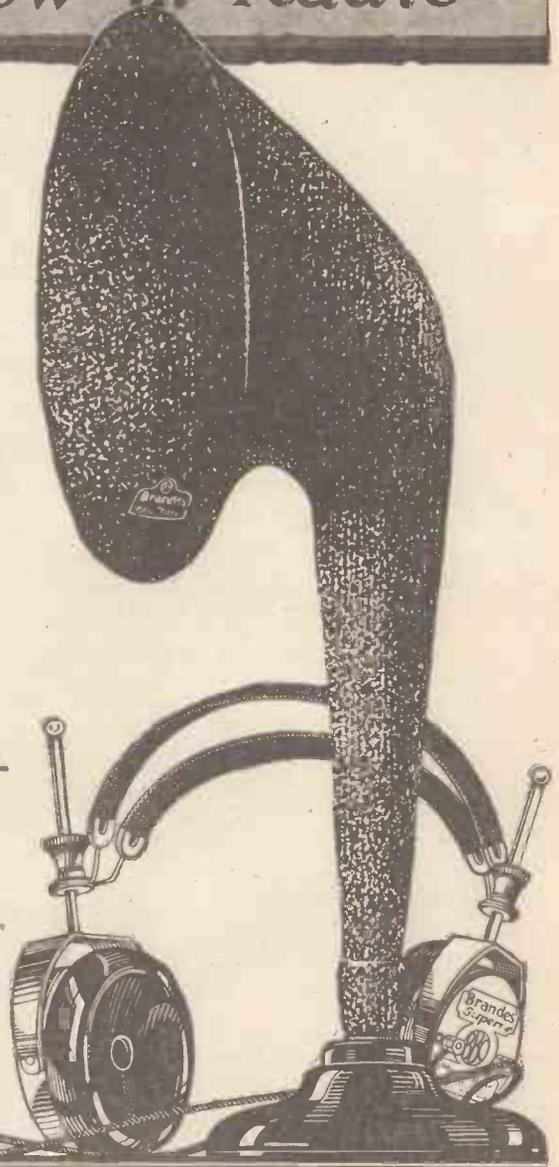
“Is it natural?”

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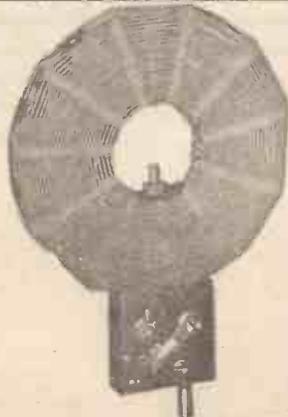
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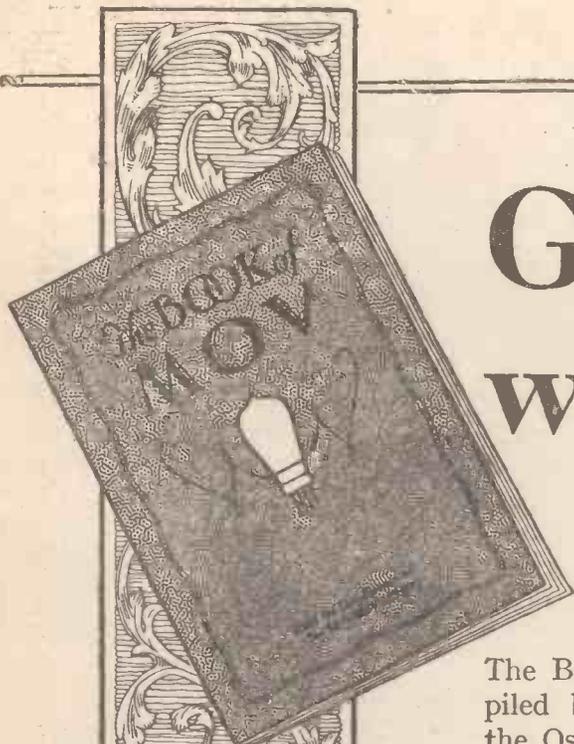
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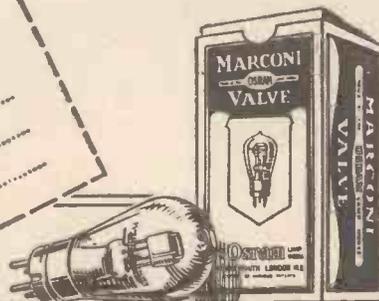
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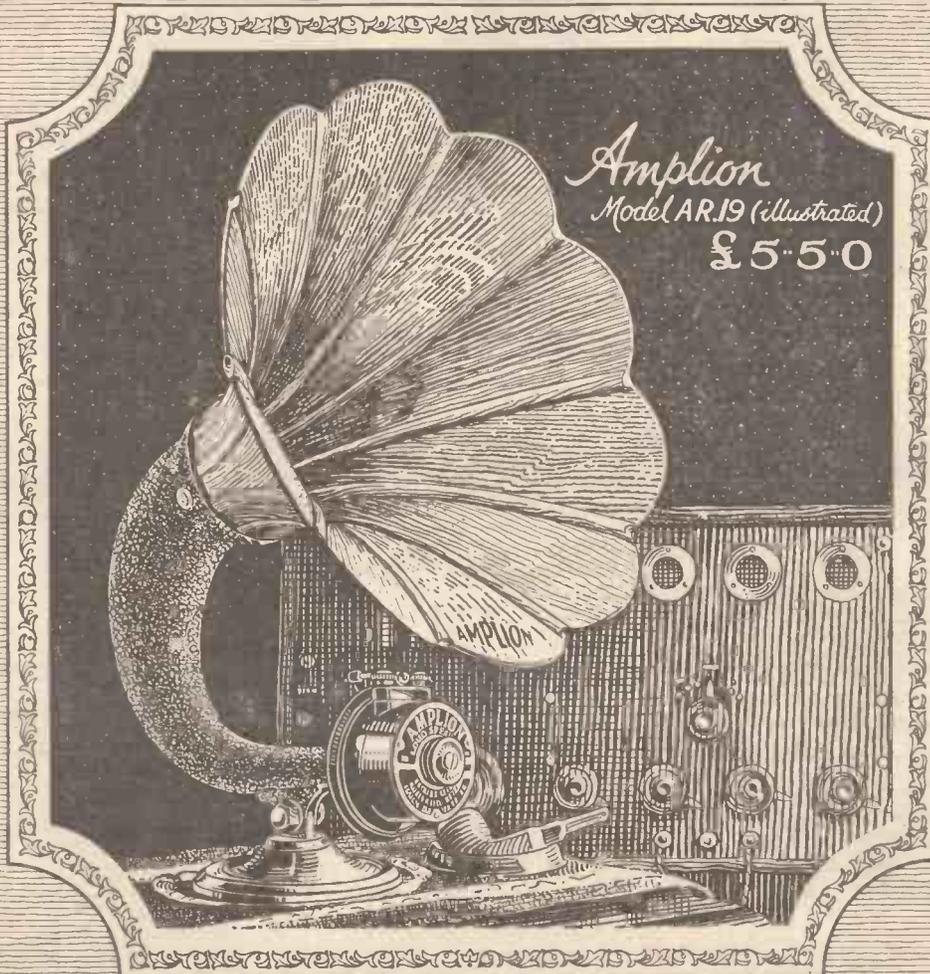
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A RADIO RETROSPECT.

By F. G. LIDSTONE.

"2 L O calling the British Isles," says the announcer, and the statement nowadays leaves us entirely unmoved. The thought that every word spoken in the studio at 2, Savoy Hill is heard simultaneously throughout Great Britain, and, in fact, all Europe as well, interests us a little, if we think about it, but it does not thrill us.

In the "Good Old Days."

Yet two years ago we should have sat with bated breath, wondering at the latest marvel which brought almost every town and village in the country within reach of a building by the side of "Father Thames."

Broadcasting we certainly had two years ago, but it was—well, just broadcasting. For a beginning, it was good, but the concerts to be heard *via* the ether then would not satisfy us now.

In those days, our old friend, Mr. A. R. Burrows, was "the voice at 2 L O," and it was the only voice 2 L O had for quite a time.

"This is 2 L O, Marconi House, London, calling. We are about to transmit a short concert of half an hour's duration. Stand by for three minutes, please."

An anxious pause, during which we scraped our cat's-whiskers, or adjusted our condensers, waiting for the concert to begin. And how we enjoyed it! How we hung on every note! What matter if the lady singer's voice did "blast" the microphone when she reached her top notes? Why worry if the piano did sound like a dulcimer? The microphone had a delicate lisp, too, in those days. It used to make Mr. Burrows say, "Thith ith 2 L O Marconi Houth, London, calling." Did we mind that? Not a bit. We knew that things were just beginning, so to speak, and the engineers would soon put things right. And they did. After much "2 L O tethting. Thunday, Monday, Tuethday, Wednethday, Thurthday, Friday, Thaturday," and so on, intermingled with readings from motoring journals and the daily papers, we began to notice an improvement. The programme organisers began to get ambitious, too. One Saturday night we had our first orchestral concert from 2 L O, and a wonderful success it was.

Fresh voices "appeared" at the microphone; some came to stop, others went after a day or two's trial. Perfect an-

nouncers, it was found, were not common. We soon began to recognise some of those that stayed, however, the soft sympathetic voice of Captain Lewis, the rich musical tones of Mr. Rex Palmer, and the bubbling-over-with-humour announcements of Mr. L. Stanton Jefferies.

We don't envy the new announcer when he is confronted with his first programme. Captain Lewis didn't like the job a bit at first.

Mr. Burrows was called away suddenly to go to the North of England, and Captain Lewis undertook to announce the Sunday

howls, and chirps. It was then that he, in the words of the advertisement, "gave out the following statement," a statement which will live down through the ages: "If the pitch of the note alters when you turn your tuning handle *it is you*, and please, oh, *please don't do it!*"

Criticism Displaces Wonder.

Oscillation has decreased a good deal since those days, but we have by no means heard the last of it. P.P.E. made sure that all should know what oscillation sounded like, and gave us a very true imitation.

His talks are always illustrated with imitations. Recently he made a noise like an atmospheric, and if he were asked to make a noise like a grid leak or an L.F. transformer, we've no doubt he'd have a good try!

The press was enthusiastic about broadcasting, and gave unlimited space to articles on the subject, sometimes by very questionable "experts"! One writer cheerfully told his readers that you could always tell when 2 L O was transmitting because of the large blue sparks that could be seen on the aerial! The technical terms of wireless rather confused the printers, too. We saw advertisements for radio

sets, "without VALUE," and advertisements for "TURNING coils." A little informative "ad." mentioned that the concerts "which were carried on the air waves" could be received on a — receiver. But we didn't worry much about mistakes of that nature, then.

The concerts, of course, began to improve every week, and now we might say that they have become almost as perfect as possible. One or two matters might be criticised.

It has been said that many of the "talks" broadcast are so much waste, as the announcement that so-and-so would now give a talk on "Animal Life in Jugomoinbanzi" is the signal for a general "switch off." We might deplore the number of "quartettes" that render "Drink to me only," and "Off to the woods away" during the Sunday programmes, or the disinterested way in which some of the announcements are made. After a whole year of listening to their music, the Savoy bands are beginning to pall, and many deplore the fact that 2 L O hasn't a dance band of its own, instead of "lifting" music from elsewhere.

We no longer wonder at wireless. We listen to it, and criticise.



A "Sportsmen All" dinner party at 2 L O. Mr. Rex Palmer can be seen on the extreme left (sitting), and Mr. C. A. Lewis standing at the back.

evening programme. His constant announcements to a mysterious "C.Q." aroused the curiosity of many listeners who were not familiar with the jargon that originated in the spark and coherer days. The atmosphere of the old 2 L O studio, which was originally a cinematograph theatre on the top floor of Marconi House, was noted for its "thickness" and it wasn't long before "Caractacus" had a splitting headache. He confessed afterwards that he would have handed the job over to anyone "for a bag of monkeynuts"!

A Gift to Posterity.

We had the "canaries" in those days, much worse than now, and 2 L O used to give out the names of the districts where oscillation was preventing reception. But affairs grew worse—the howlers increased their activities just in order to hear the name of their district announced from the studio—and all in the days when reaction was strictly forbidden!

Oscillation did one good thing—it roused Captain Eckersley and he made that memorable speech condemning those who made the night hideous with their shrieks,

Technical Notes



Conducted by J. H. T. ROBERTS, D.Sc., F.Inst.P.

Filament Sag.

A WRITER in the "Irish Radio News" gives directions for removing the filament from contact with the grid, should a valve have become a victim to this particular misfortune. The method is as follows. Take a two-volt cell and connect one terminal to one filament-pin and the other terminal to the other filament-pin and to the grid-pin. Then hold the valve in such a way that the filament may fall away from the grid under the action of gravity, and give the glass a number of careful taps on the underside with a piece of wood.

If the filament suddenly becomes somewhat duller, this is stated to be evidence that it has come away from the grid. One or two further taps should be sufficient to bring it to a safe position. Two volts only—presumably for a 4 or 6 volt filament—should be used.

Matt-Surfacing Ebonite.

In the same journal is a method of removing the glossy surface from ebonite panels. A glossy surface promotes the condensation of moisture and gives rise to electrical surface leakage. Wireless panels should be of dull or "matt" surface. They may be made so by rubbing, in two directions at right angles, with fine emery-paper, finishing with a cloth with a few drops of sewing-machine oil soaked into it.

Wired Wireless in France.

The Union des Syndicats de l'Électricité of Paris and the Société Française des Electriciens are carrying out tests with a view to the adoption of the systems of wired wireless, which has been developed principally in the United States. This system is sometimes known as "guided radio," and is thought by many experts to be the radio system of the future. By its use, wireless may be broadcast in a limited sense, being guided along power-lines and other conductors.

A New Valve.

A patent recently granted to A. P. Portway (218,784) describes a construction for a wireless receiving valve which is ingenious, and, if capable of successful commercial manufacture, ought to meet a demand. The valve contains two filaments, so that when one is burnt out the other may be used; this idea is not new, but it is the method of construction which deserves mention.

One of the filaments is connected, together with the grid and anode, to the contact pins in a cap at one end of the glass bulb, in the usual way. The other filament is similarly connected to contact pins in a second cap which is attached at the oppo-

site end of the glass bulb, and the same grid and anode are connected to their respective pins in the second cap.

Thus the grid and anode are common to both ends, so to speak, but each end operates a different filament. An ebonite cap is provided to cover up the projecting pins in the upper end of the valve—that is, the end which is not in use—so as to prevent accidental contacts.

Most Popular Circuit.

An investigation was conducted lately in America to find out the order of popularity of the different receiving circuits used for commercial sets. Three separate questionnaires were conducted from different parts of the country—one by a wireless magazine,

another by a battery manufacturer, and the third by an advertising agency. It was found that about half the total sets sold were on the tuned-anode system. Regenerative sets comprised about 33 per cent of the total, whilst multi-valve sets, such as super-heterodyne, were placed at 14 per cent.

Resistance-Coupled Amplification.

The relative merits of resistance-coupled and transformer-coupled audio-frequency amplification are discussed by the "Scientific American." According to that journal, resistance-coupling is slowly gaining favour in the U.S.A., in spite of the fact, urged by its opponents, that its amplification is relatively low.

Resistance-coupled amplification, on the other hand, makes for the reduction of loud-speaker distortion, and, as regards its amplifying power, it is computed that three resistance-coupled stages are equivalent to two transformer-coupled. It would be interesting to know the relative favour in which these two methods of amplification are held by British experimenters.

Atomic Energy.

A good deal of popular misapprehension seems to exist largely owing to the matter having been the subject of much newspaper publicity, upon the possibility of extracting larg

(Continued on page 542.)



W N Y C, the Municipal Broadcasting Station, New York City. Several amateurs have reported good reception from W N Y C.

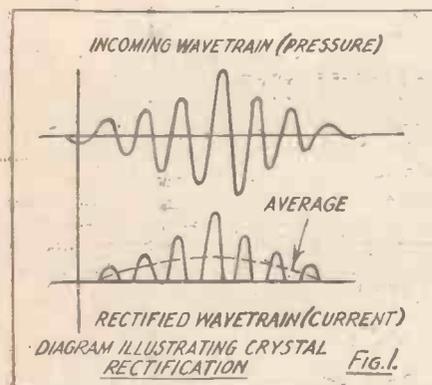
CRYSTAL AND VALVE RECTIFICATION.

By Lieutenant-Commander H. W. SHOVE, D.S.O., R.N.

This is an article for the student of wireless, showing the similarity between two different types of rectifiers.

WHEN a "new chum" first decides to take up wireless, he usually begins, if he is fortunate enough to live anywhere near a broadcasting station, with the purchase or construction of a crystal set. If he understands anything of the theory of the apparatus it generally amounts to this:

"The waves in the ether (often, by the way, confounded with the air) set up oscilla-



tions in the aerial, which try to force a current through the crystal alternately in opposite directions. But the crystal will only pass current in one direction, and therefore only those impulses which are in this direction will cause current to flow. The result is that, instead of very rapid alternations to which the telephones could not respond, we get pulsations all in one direction, whose varying amplitude gives an average effect of a frequency to which the telephones can respond."

Crystal Rectification.

This, or something very like it, appears in nearly all elementary text books, and diagrams of crystal rectification such as

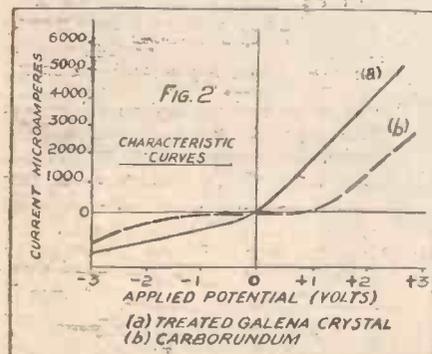


Fig. 1 generally accompany the statement. As a matter of fact, the statement is a half-truth which, useful as it may be in giving some sort of idea of "how it works" to the

complete novice, is apt to be misleading, and more particularly tends to make him think that when he tackles the valve he is up against some wholly different kind of action from that of the crystal he has hitherto used. Now, I would not for a moment contend that the action (even the rectifying action alone) of a valve is as easy to understand as that of a crystal.

But there is far more similarity between them than the above crude statement, taken literally, would lead one to suppose. By thinking in terms of *variable resistances* instead of the less accurate idea of "one-way conductivity," we shall be able to appreciate this.

Not Unidirectional.

First, as to the rectification effect of a crystal. It is not true to say that a crystal will only pass current in one direction. The real fact on which this popular idea is based is that the resistance of certain substances



Mr. J. C. Stobart, B.B.C. Director of Education.

(of which rectifying crystals are the most important) varies when different electrical pressures (potentials) are trying to overcome that resistance. And, further, that there is a "critical" potential at which a more or less sudden change of resistance takes place. We may plot the relation of the currents passing to the applied electrical pressure causing them to pass as a curve (Fig. 2).

Here the point marked zero on the scale of pressure (voltage) corresponds to the "potential" of the earth, and pressures higher than this are called positive voltages, while those lower are considered negative. In the first case a current tends to flow from the body considered to earth, in the second vice-versa. We see that, for the crystal considered, an increase of pressure above the zero point causes a greater flow of current in that direction than the flow in the opposite direction due to an equal decrease of pressure.

The "Critical" Point.

This is because the bend in the curve shown is exactly at zero volts—i.e. zero volts is the "critical" pressure for the crystal considered. So that this is the

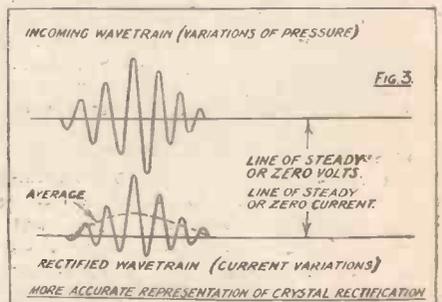
point at which this particular crystal should be worked. This is the case with most of the crystals used in W.T. But there is no physical necessity about it. Carborundum, for instance, has the bend in its curve at about 1½ volts positive, as shown in Fig. 2b.

Thus we use a battery with this crystal, which keeps a steady pressure of the required amount on the crystal when no signals are coming in. There will then, of course, be a steady current through the 'phones. This steady current will not cause any sound, as the diaphragms will only move, and so (by beating the air) enable one to hear signals when the attractive force of the magnet varies with variations of current. It is not current but changes of current that cause audible signals.

The arrival of signals will cause changes of current greater in one direction than in the other, and, consequently, audible sounds, just as in the previous case when the steady current was zero. The actual variations of H.F. current above and below the normal, whether that normal be zero or no, will not be as in Fig. 1, but as in Fig. 3.

The Three Electrode Valve.

An examination of the curves in Fig. 2 will make this clear, and also that the sensitivity—i.e. the difference between the



values of the fluctuations in the positive and negative directions respectively, and consequent value of the average "audio-frequency" current pulsations, depends on the sharpness of the bend in the curve. This may vary at different points in the same crystal, the curve when the cat's-whisker is resting on some points being practically straight (insensitive spot), and at others very decidedly bent (sensitive points).

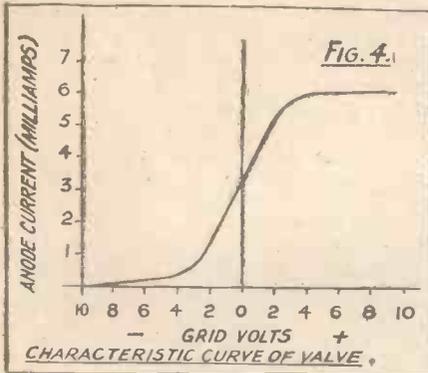
Passing now to the three-electrode valve. There are, as is generally known, two methods of rectification with this device. To take first that rarely used in this country, but popular in America, and which makes use of a principle very similar to that of the crystal. Without going into the theory of electron flow, etc., we may start by stating this fact: That the resistance of the valve to the passage of a current between the

(Continued on page 504.)

CRYSTAL AND VALVE RECTIFICATION.

(Continued from page 503.)

filament and the anode varies with the potential applied to the grid. And again—without going into the theory—we may take as a fact that there is a bend (as a matter of fact there are two,) as shown in Fig. 4, in the characteristic of this action corresponding to that in the case of the crystal.



The steady anode current (which is always necessary with a valve) is supplied by the anode, or as it is commonly known, the H.T. battery.

Potentiometer Control.

The function of the L.T. battery is simply to make the filament glow, without which the valve will not work, so that it has not to be considered here. But now, instead of applying our variations of potential direct to the circuit in which the 'phones are situated, we apply them by means of another (the grid) circuit. The result, if we are working at a bend, is exactly the same as that in a crystal, except that the variations are magnified, due to the fact that a three-electrode valve always amplifies applied potentials. But this need not be considered now, and is not really necessarily the case.

It is only a matter of detail design, though of course the effect is of great value. We adjust the initial grid potential to the correct value to work on the bend, just as we did with the carborundum crystal, using as a rule a potentiometer across the filament battery (but any other effective method could be employed). The result is again as in Fig. 3, except that, as stated above, the fluctuations will be amplified—i.e. a stronger current will flow corresponding to a given potential variation.

Leak Rectification.

The greater number of British-made valves are more efficient when used to operate on a rather more complicated system, the leaky grid condenser system. But, bearing in mind that we are still using the same property of varying resistance in the anode circuit by means of varying grid voltage, it becomes fairly easy of comprehension. In this case we make use, not of a bend in the characteristic curve, but of a straight portion between the bends.

With the valve whose curve is shown in the figure, and which is fairly typical of British valves, we can therefore dispense with "grid bias," since the ordinate of zero volts cuts the curve well in the middle of this straight portion.

Action of the Grid Leak.

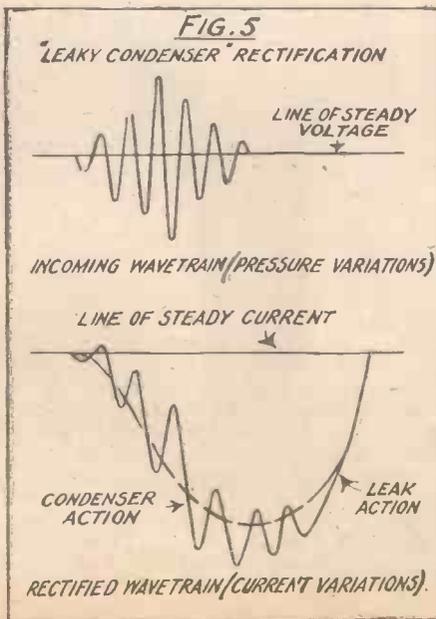
In this method of rectification we introduce another new factor, the time factor. We institute a race, which may be roughly described as between the applied potential and the leak action, which is tending to destroy this potential. What happens may be thought of somewhat as follows:

The incoming oscillations try to make the grid alternately positive and negative, this action being conveyed freely through the condenser.

Still without burdening our minds with "electrons," we may say that it is a property of the valve that negative charges, though they can be applied to the grid through a condenser, can only be discharged through a continuous path leading back to the filament. Such a path is provided by the leak, but its resistance is so high that the charge induced by one wave has not time to get away before the next one comes along. This action only affects the negative charges, so that the result is that each succeeding positive impulse has to start its work of reducing the filament anode resistance from a point lower down the characteristic curve—i.e. with a higher initial value of that resistance, than its predecessor.

Similarity of Three Methods.

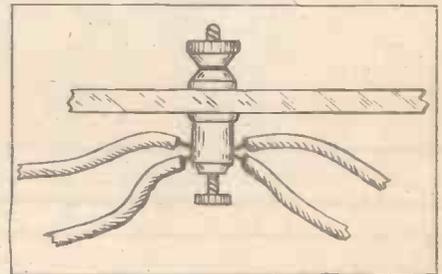
As a consequence the resistance is increasing throughout the train of waves, and the filament anode current is therefore undergoing an average decrease which will cause an audible effect in the 'phones. When the wave-train ceases the leak action has time to make itself felt, and (if the leak is of proper proportions to the capacity of the grid and condenser) by the time the next train starts the accumulated charges have been got rid of, and the apparatus is ready to start the same series of operations over again. This is shown graphically in Fig. 5.



All this seems a long way from our original crystal system, but a careful consideration will, I think, suggest to the heretofore uninitiated reader what I have been trying to convey, viz., that all three systems can be considered to consist, so far as the practical results in the outside circuit are concerned, in the variation of the resistance of a circuit due to variations of potential (pressure) applied to the same or to another interacting circuit. In the first two cases we are relying on a sudden change in the resistance at a critical value of the potential. In the third case we are piling up our differences by causing them to take place faster than the apparatus can neutralise them.

A TERMINAL TIP.

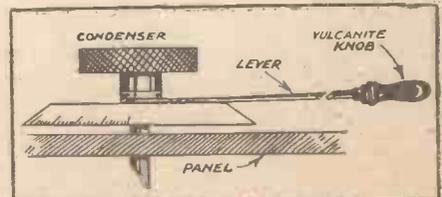
WHERE a number of connecting wires have to be joined to one terminal it is usual to provide a small buss-bar, to which the ends of the wires are soldered. Alternatively the buss-bar may be fitted with one or two small terminals, but for simplicity and neatness the idea outlined in



the accompanying sketch is to be recommended. A medium-size telephone terminal is fitted to the panel in an inverted position, and the hexagon nuts are replaced with two milled nuts taken from an ordinary terminal. Thus all soldering troubles are eliminated, the ends of the connecting wires being clamped in the lower terminal in the usual way.

AN ANTI-CAPACITY HANDLE

IT is not often realised that an old motorcycle control lever makes a very efficient anti-capacity handle. It will fit quite easily under the knob of any



variable condenser (see Fig.), and such levers are usually fitted with ebonite or vulcanite handles.

Mainly About Broadcasting

by
The Editor

A FEW days ago amateurs were thrilled to hear that Mr. J. Simmonds, of Gerrard's Cross, had picked up a New Zealand amateur giving the call sign Z 4 A C, calling up U 5 M I and U 6 A R B. Mr. Simmonds' call sign is G 2 O D, and he reports that the signal strength of Z 2 A C was very good, with a low musical note. Subsequent reports stated that the signals from Mr. Simmonds' transmitter were strongly received in New Zealand.

Another amateur, Mr. Cyril Goyder, of Mill Hill School, whose previous experiments have also been dealt with in POPULAR WIRELESS in connection with transatlantic work, heard the New Zealand amateur Z 4 A A calling. Two-way transworld wireless communication was immediately established, and Mr. Goyder took down the following message:

"Z 4 A A calling. Pass following to Radio Society of Great Britain. Greetings from New Zealand."

Also this message:

"Z 4 A A calling. Pass following to G 2 O D your signals strong last night."

Mr. Goyder received these messages, gave his address, and then confirmed the transmissions by cable. A cable reply was received as well by Mr. Goyder, reading:

"Congratulations on first transworld message.—Dell, Waiheno, Dunedin, New Zealand."

A Wonderful Achievement.

There is no doubt that these messages are quite *bona fide*, and in consequence the honour goes to British amateurs for being the first to succeed in realising an ambition which has long been talked of, but which very few people thought would be realised in such a startling short space of time.

It is a really wonderful achievement, and one to be proud of, and every amateur in this country must feel a thrill of satisfaction and pride that the first transworld "chat" has been accomplished by British amateurs.

Mr. Simmonds, of Gerrard's Cross, is well-known to me by reputation, although I have never met him personally. Some years ago now I first heard of him through a friend of mine who lived at Gerrard's Cross, and who, although knowing nothing about wireless, was often invited to Mr. Simmonds' house to listen-in. This friend of mine quickly imbibed Mr. Simmonds' enthusiasm. Before very long he had taken up wireless as a hobby, and, with Mr. Simmonds to prompt him, quickly became a most efficient experimenter.

Mr. Goyder is still a schoolboy at Mill Hill School, but my readers will remember that not many months ago he exchanged messages across the Atlantic and established two-way communication for the first time in the history of amateur work.

Mr. Goyder was personally congratulated by the Prince of Wales when His Royal Highness visited Mill Hill School a little while back.

Mr. Goyder and Mr. Simmonds are going to continue their efforts and will, it is

anticipated, again establish transworld communication.

Quite possibly, by the time these words are read, they will have transmitted the following message to New Zealand:

"To the Radio Society of New Zealand congratulations on achievement and greetings from the Radio Society of Great Britain."

The work of these two amateurs gives one "furiously to think," as the French would say. Working on short wave-lengths and with practically insignificant power, two British amateurs, one of them a school-boy, have startled the world by their experiments. Some people have poo-hooped the importance of this work, and have fallen back on the suggestion that freak messages are nothing new. That suggestion is by no means a satisfactory explanation. There is a technique in amateur wireless work which few people realise, who have not devoted hours and hours to their work and to the perfection of their apparatus and to the art of extracting the maximum efficiency from limited materials.

THE WHITE CITY WIRELESS EXHIBITION, and THE "P.W." CONSTRUCTORS' COMPETITION.

On another page readers will find the rules governing the big competition for constructors, organized by "Popular Wireless," to be held at The White City Exhibition, commencing November 15th.

Every reader of "P.W." is invited to participate in this competition. No Entrance Fee required.

Despite restrictions, regulations and other drawbacks, these two amateurs have proved more than once that there is a great future for low power and low wave wireless work, and the sceptics who laugh at the idea of there being established in the near future a world-wide broadcasting service, must be feeling rather foolish when they read of the achievements of Mr. Simmonds and Mr. Goyder.

To them POPULAR WIRELESS extends its most hearty congratulations, and the sincere hopes that they will carry on their good work and maintain the world's record for amateur wireless work.

A Great Pioneer.

On November 6th one of the world's greatest pioneers celebrates his eightieth birthday. His name is Edouard Branly, and he will always be associated with the coherer, despite the fact that his researches into other branches of physics have been of enormous benefit to the world.

It is good news to hear that the Radio Club de France is arranging a great banquet in honour of Branly's eightieth birthday, and that members of the French Cabinet will be present, together with many famous

scientists. For many years now Professor Branly has been attached to the Catholic Institute, which might be united to the Catholic University of Paris.

I quote from "The Times" as follows:

"His personal sacrifices for his faith have undoubtedly precluded him from receiving many substantial benefits at the disposal of the Government. It was discovered a few years ago that his professional income was less than twenty francs per day, and a fund of several hundred thousand francs was promptly raised by public subscription through one of the newspapers. With characteristic self-denial Professor Branly utilised the money for the reconstruction of his laboratory. He was once offered a munificently paid post as consulting engineer by Signor Marconi, but politely declined the offer, with the explanation that he is a scientist and not a consulting expert."

A Change of Fortune.

Some months ago readers may remember that "Ariel," when on a visit to Paris, interviewed this famous pioneer of wireless and remarked in his article on the exceedingly adverse conditions under which Professor Branly worked and how, in the course of a conversation, the famous Frenchman sadly, if philosophically, regretted his inability to reconstruct his laboratory on modern lines. But apparently fortune has changed for the better, and it is pleasant to learn that this great pioneer is to be fêted on his eightieth birthday by his scientific colleagues and by the French nation.

Broadcast Education.

In last week's POPULAR WIRELESS I referred briefly to "education" by wireless and suggested that too much of it, emanating from the aerials of the B.B.C.'s stations, might be regarded with some irritation by many listeners-in.

I have just received an Educational Broadcasting Syllabus for October/December which might interest readers. It includes a series of talks designed for London and the home counties: "Music," by Mr. Geoffrey Shaw; "British Birds," by Mr. E. Kay Robinson; "Poetry," by Mr. S. C. Stobart (who is the B.B.C. Director of Education), and "Men Who Have Made History," by Professor A. J. Ireland. "French Lessons" by l'Institute Français are included.

This syllabus is not for simultaneous broadcast, as the B.B.C. stations outside the London area are devoting their own afternoon transmissions for schools. I understand that for the evening programmes an adult education scheme is being developed. Whatever the merits or demerits of this scheme, I am given to understand that the B.B.C. have been careful not to encroach unduly upon the time usually devoted to entertainment, music, news, etc.

Constructional Notes

Conducted by Dr. J. H. T. ROBERTS, F.Inst.P.

Soldering Flux.

FOR soldering large work, "killed spirits," or "acid flux," as it is sometimes called, is readier than rosin, and, provided care is taken to wash off the remainder of the flux when the work is finished, there can be no objection to its use. But it is different when small work is in question, particularly fine-wire electrical connections, which often cannot be got at afterwards to wash them. Here the use of acid flux is undesirable for several reasons. In the first place, corrosion is apt to take place in the joint afterwards, so that a bad or broken connection may result. In the second place, whilst the soldering is taking place, the flux sputters and falls as fine drops upon surrounding objects, often with the result that surface leaks are produced upon panels or insulators. Moreover, the acid tends to "creep" in course of time, producing similar effects to those due to sputtering. An excellent non-corrosive flux may be made by dissolving a small quantity of rosin in methylated spirit. It will be found that the rosin will dissolve much more readily if it is broken up into powder. This flux should be kept in a corked bottle, and may be applied to small work by means of a hatpin or other sharp object. The least possible amount of flux should always be used.

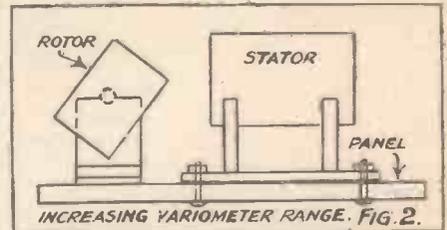
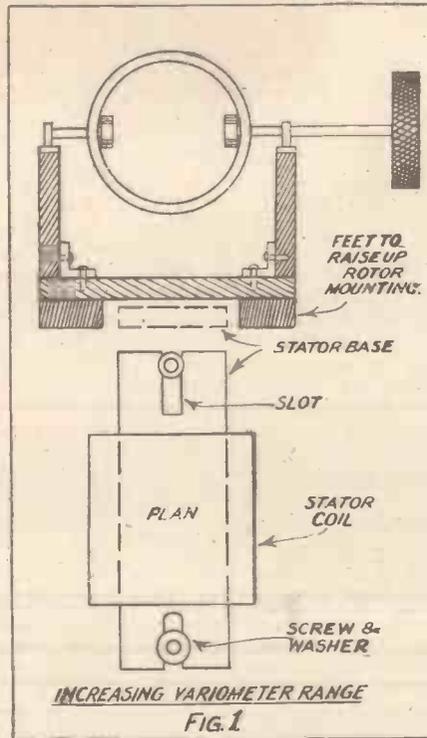
Combined Battery Switch.

Every wise experimenter includes a switch for cutting the filament battery out of circuit when the set is not in use. The H.T. battery, however, is generally dis-

this must be fixed, owing to the passing of the control-shaft through the panel. The stator is mounted upon a platform or base as shown in a similar manner to the rotor, but this base is provided with two longitudinal slots, enabling it to be shifted along. It is finally secured in the desired position by means of two screws with broad washers. The support of the rotor is mounted upon two feet, to leave a space for the baseboard of the stator to pass beneath.

Gramophone as Loud Speaker.

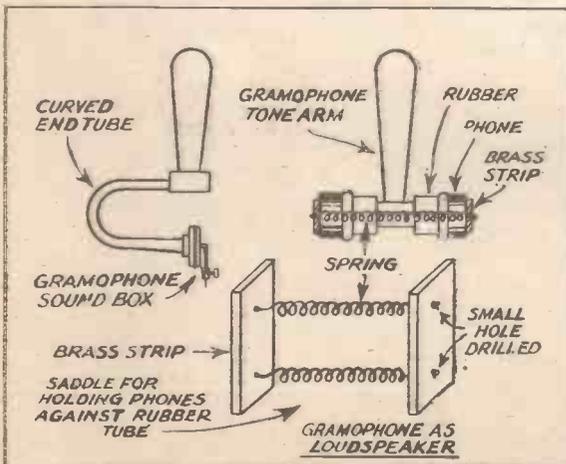
There are many gramophones which are fitted with a curved tube at the end of the tone-arm, the type of neck being sometimes referred to as "swan neck." These tone-arms are readily adapted for



use with the headphones by the arrangement illustrated herewith.

Remove the curved end-tube, leaving the short piece of right-angle tube exposed. Fit two short pieces of stout rubber tube upon this, or, if that be not convenient, two stout rubber discs, against which the 'phones will press. (If pieces of rubber tube are used, they should project beyond the end of the metal tube about $\frac{1}{8}$ or $\frac{1}{4}$ in.) A saddle should then be made for securing the 'phones in position. This may consist of two short pieces of brass strip, fairly stiff, connected together by spiral springs.

The proper length for the springs can only be found by trial, but they should be short enough to hold the 'phones firmly and securely against the rubber pieces. The brass strips may be about 3 in. long and 1 in. broad, and the springs secured through them by means of a small hole. This can easily be drilled in each end of each strip, and the end of the spiral spring wire is then inserted and bent over.



connected by removing the wander-plugs. It is a very good plan to have a switch in the H.T. circuit as well, however. The switch shown herewith serves both purposes at one movement.

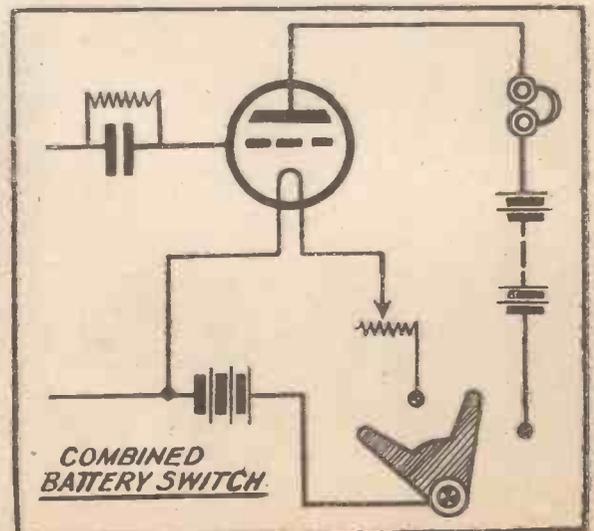
The device will be practically self-explanatory from the figure. A four-point two-blade rotary switch is arranged, the

filament return from the L.T. battery being connected to point 2 and the negative end of the H.T. to point 4, points 1 and 3 being blanks. The two blades are spaced for alternate points, and when in the left-hand position both batteries are out of circuit, whilst when in the right-hand position the usual connections between L.T. and H.T. batteries and one end of the filament are made.

Increasing Variometer Range.

An arrangement by which very loose coupling and fine tuning between the stator and rotor of the variometer may be obtained is shown in the accompanying diagram. The rotor,

instead of being mounted within the stator, is mounted independently, and the stator is fixed to an adjustable base so that it can be shifted nearer to or further from the rotor. The mounting for the rotor will be clear from the figure;





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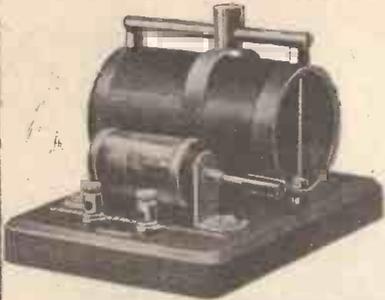


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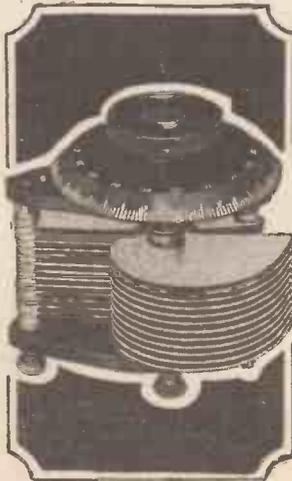
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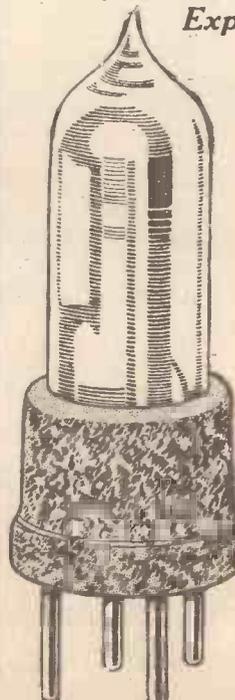
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WIRELESS FOR THE BEGINNER.

A NEW SERIES FOR AMATEURS.

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

Here is the second of a new series specially written for the amateur who has taken up wireless as a hobby this winter.

PART II.—WAVES AND WIRELESS WAVES.

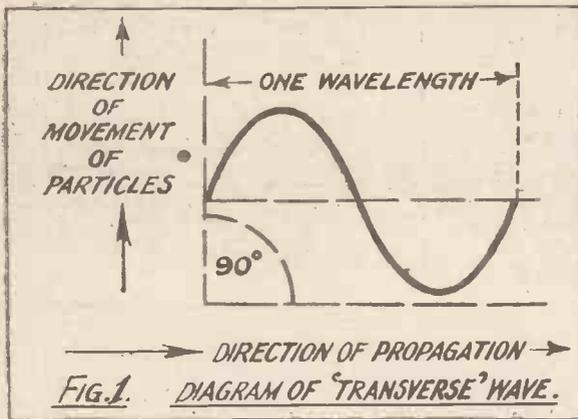
IT was stated in the previous article that the electrical "records" of speech and music are carried from the broadcasting station to the receiver by means of waves, and it is these so-called "wireless waves" we are now going to study. The chief difficulties to the non-technical "listener-in" seems to be that there is no very obvious connection between waves and the various

gives rise to another wave, and so on, the energy which caused the original disturbance being passed from one particle to another of the material in which the disturbance is created.

In other words, the parent disturbance propagates itself—like bacteria—very rapidly and prolifically, each new member of the family

(or squeezed together and separated) and these alternating effects take place in the same direction as the movements of the air particles.

Both these types of waves are utilised in wireless, but the "wireless" waves proper are of the "transverse" kind. To achieve a working notion of a transverse wave you have only to tie a rope to the top of a pole, and holding the free end give your arm a steady "up and down" motion. Transverse waves will then appear to travel up the rope.



tones and timbres of an orchestra, and that anyhow the alleged waves cannot be seen or felt.

What is a Wave?

I well remember that after one of my lectures someone asked me how there could be waves in space unless space had a surface. I think the inquirer had no notion of waves apart from those he had seen at the seaside. However, I appreciate fully the difficulty people may have in conceiving waves which, like those made by Senatore Marconi at Poldhu not long ago, can carry the human voice from this country to Australia in the twinkling of an eye. This difficulty arises from an incomplete idea of what a wave really is—I mean in a scientific sense.

A wave is not a thing; it is not material. An air wave is not air, nor is a water wave made of water. A wave is an effect produced in some elastic medium, which effect is propagated through the medium. A wave is a disturbance of the substance of some material, the said disturbance being reproduced and re-reproduced farther and farther from the cause or centre of the disturbance, until the disturbing force is used up. Contrary to what is implied by common parlance, waves do not travel.

A proper statement of the matter is rather that the energy of the first wave travels outwards and makes another wave some distance farther on, which in turn

towards the beach. In reality each wave which is observed to surge up the pole is created at that spot, and at that spot it dies, but some of its energy—or water-disturbing property—is passed on and in turn produces another wave. This process continues till no more energy is left.

There are two kinds of waves.

Waves are not primarily classified according to the medium—air or water or aether—in which they may be made, but according to the relation between their direction of apparent movement and the direction in which the particles of the medium vibrate. The two kinds of waves, according to this classification, are:

1. Transverse waves, and
2. Longitudinal waves.

Transverse waves appear to move in a direction at right-angles to the direction of the vibration. (See Fig. 1.) Here the particles move up and down, while the waves appear to travel (or properly speaking, are propagated) along.

The Two Figures.

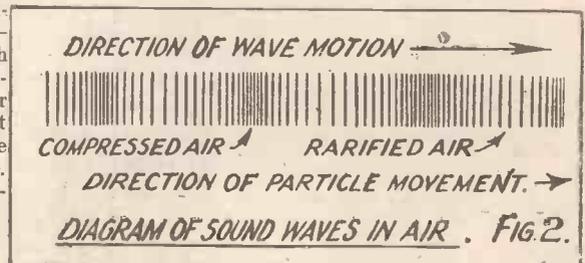
Longitudinal waves move in the same direction as the vibration. (See Fig. 2.) Here is a diagrammatical representation of a sound wave in air. The particles of air are alternately compressed and rarefied

Wave Length.

When I was at school we used to call this diversion "snakes." Kindly take mental hold on two facts about these "snakes."

1. The faster you move your arm up and down the more waves appear, and (2) If you reduce the number of waves they become longer. From these common observations of the playground emerges a great physical truth—i.e. the greater the frequency with which waves appear—(that is to say, the greater the number per second) the smaller they are, and vice versa. In other words, the more rapid the vibration the shorter the wave, and vice versa.

How then are waves measured? Most commonly by their length. You have heard the word "wave-length," London so many metres, Cardiff so many metres. The metre (39.37 inches) is used instead of the yard simply because electrical engineers prefer the metric system. Waves could be measured in rods, poles or perches or inches just as well, though not so easily. The length of a wave is the distance between



where it begins and ends, just like the length of a stick or anything else. For example, the length of the wave in Fig. 1 is exactly as indicated, and thus you will understand that when you are receiving 2 L O, the distance between the crest of a wave cutting across your aerial and that of the nearest wave on either side is 365 metres, or about 396 yards. The particular kind of transverse waves used for wireless are vibrations or disturbances in a strange, little-known medium called the "aether."

HOW TO MAKE A "NO-CONTROL" CRYSTAL SET.

By OSWALD J. RANKIN.

WITH the advent of the new high-power station, 5 X X, and with the aid of a good "ever-set" crystal detector, the dream of the self-operating receiver is at last a reality as far as crystal sets are concerned. It is well known that if the actual wave-length of an aerial and internal capacity in the wiring of a receiver is

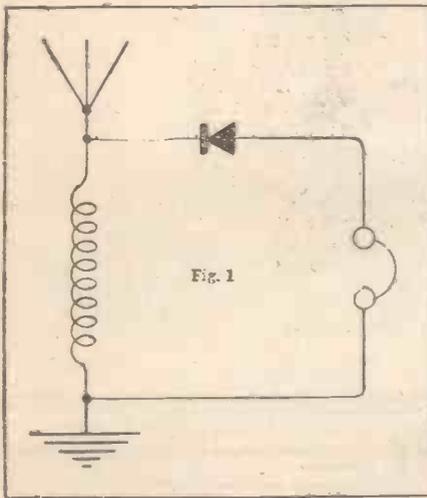


Fig. 1

accurately determined, the tuning coils can be wound so that the tuning of the whole system will respond to the exact frequency of the waves from the station from which it is desired to receive, without further refinements such as variable inductances or tuning condensers, but up to the present time the cost of the instruments required for making the necessary measurements has been altogether out of proportion with the saving effected in dispensing with tuning devices.

Tuning Not Necessary.

But if we take the simplest possible crystal circuit and design this to receive the transmissions from the new high-power station, 5 X X, then the "instrument" required for calibrating the coil may consist of a mere brass clip as described below.

During a series of experiments with various types of crystal receivers, 90 miles from Chelmsford, the writer found that no advantage was gained in providing elaborate tuning arrangements. For instance, when using a very selective tapped coil with 10 single turn tappings to the "fine" tuning switch, the signal strength remained constant at all variations of the latter. Similarly, ten to fifteen turns on a slide inductance made no material difference in the tuning, and assuming this to be due to the very high power of the transmitter at Chelmsford it was realised that in this case very accurate tuning was not such an important factor as many would imagine.

The position of the slider on a slide inductance was carefully marked, the slider and bar were then removed and the dead end portion of the winding was stripped off the coil. The coil was then connected up as a fixed inductance as shown in the diagram, Fig. 1, and the results left nothing to be desired—except a fancy for a "fixed" crystal detector which would complete the elimination of controls. As this arrangement was highly successful the design of the receiver to be described was immediately proceeded with.

Winding The Coil.

The construction of such an instrument is simplicity itself. Obtain a 12 in. by 3 in. cardboard tube, and wind this full with No. 24 enamelled copper wire, keeping the turns very close together. With the point of a small penknife scrape off the insulation for a distance of about $3\frac{1}{2}$ in., as indicated by the thick black line in Fig. 2, and then make a temporary slider, S, from two narrow strips of spring brass, each about 4 in. long, and a small block of wood.

Connect the slider to the aerial lead-in, and also to one side of the detector, join the other side of the detector to one 'phone tag, and the other 'phone tag to earth, to which is also connected the lower end of the coil winding. Carefully adjust the slider until signals are loudest, cut the coil winding at the point where the slider makes contact, and strip off the portion of winding not required. Allow this portion to become un-

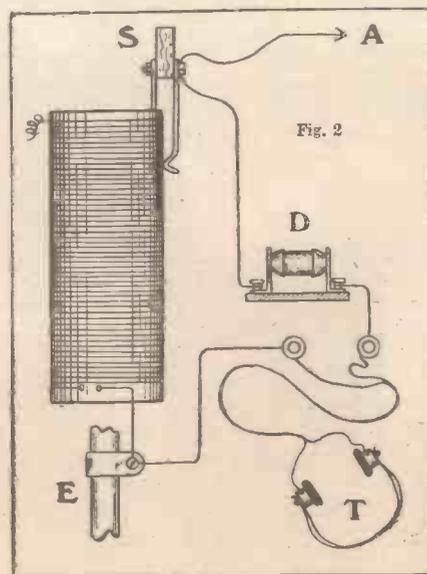


Fig. 2

coiled, and pierce two small holes in the former for the purpose of anchoring the other end of the winding, which is firmly held down after being cut.

The coil is now permanently tuned to

5 X X in conjunction with the existing aerial, and it is now only necessary to mount all the components in a cabinet, as shown in Fig. 3. The ends of the cabinet should be about 4 in. by 5 in. by $\frac{1}{2}$ in. in thickness, these being clamped to the ends of the coil by means of a length of screwed brass rod and two nuts. The length of the base, top, and sides will, of course, depend on the coil

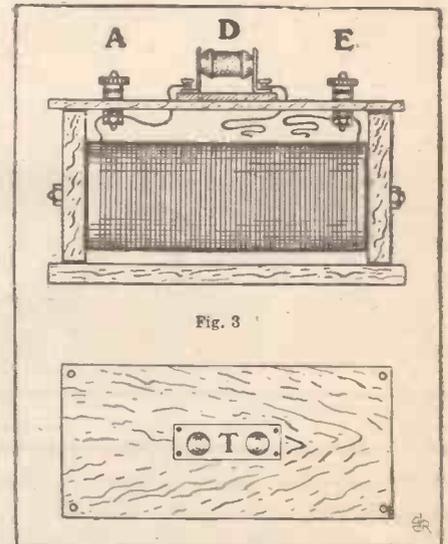


Fig. 3

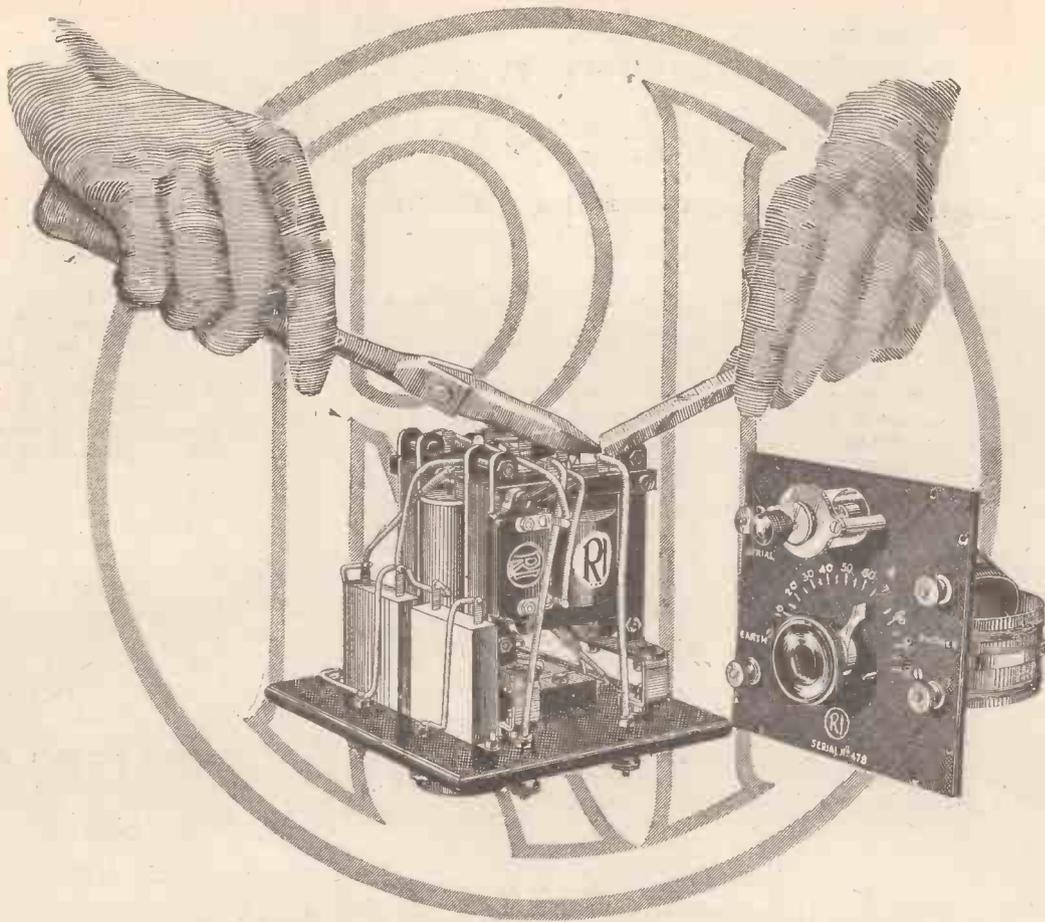
after the unwanted portion of the former has been cut away.

Very Simple Wiring.

On the top of the cabinet is mounted the aerial and earth terminals (which are preferably bushed with ebonite) and the "ever-set" crystal detector, D, these being connected up as shown—i.e. aerial terminal to one end of coil and one side of detector, and earth terminal to the other end of coil. Two insulated leads, each about 7 in. long, are joined to the other side of the detector and to the earth terminal, these being finally connected to the telephone terminals, which are mounted on a small strip of ebonite attached to the front side of the cabinet. (See lower illustration, Fig. 3). These leads should be fairly stiff, and when fitting the front of the cabinet care should be taken to see that they do not touch the coil winding.

When purchasing the "ever-set" detector an actual test should be insisted upon, and it should at all times be handled with the greatest care. If desired, this may be mounted inside the cabinet.

Realising that there are thousands of people desirous of building wireless sets whose knowledge of even the principles of radio theory is negligible, we have under preparation a series of constructional articles primarily intended for the absolute beginner. This series, which will commence very shortly, will in no way interfere with our usual features.—Editor.



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I may say that within four days I burnt out five transformers of other makes. This will give you some idea of the test that your instruments are undergoing.

I shall be fitting two into my wireless set at a later date.

Yours faithfully,

(Sgd.) Harry V. McCalla,
Engineer Palace, Gateshead.

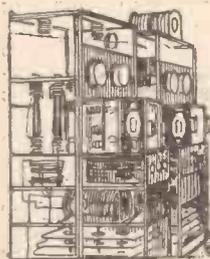
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Artistes of the Aether

By "Ariel"



Some of the artistes who have given you pleasure when listening-in.

EACH week the demand for improvement increases, and there is no doubt that the majority of the B.B.C. stations are steadfastly doing their best to overcome that great difficulty of satisfying everybody. It is endeavouring also to recognise all tastes, all religions—at last—and all desires. It would ease its own path if it allowed a different programme to be relayed from 2 L O and from Chelmsford, at the same time, one a "high-brow," the other a popular programme; but perhaps this, too, will come to pass.



Mr. T. Morrison.

The company has been fortunate in some of its permanent artistes, amongst them Mr. Cyril Estcourt.

He is one of the best-known at all the stations, his rendering of the famous "Retreat from Mons" being memorable. By special request he repeated Masfield's "Reynard the Fox" at 2 L O on the 29th ult. Mr. Estcourt has been associated with the B.B.C. for some eighteen months, and has done much for the cause of poetry and drama through this new medium.

Well-known Dramatic Orator.

From his school-days upward, and during which he then won numerous prizes for his recitals, Mr. Estcourt has been prominently before the public, and has given poetry and song recitals in all parts of the world. He is perhaps best known through the dramatic recitals which he gave towards the end of the war upon the "Old Contemptibles," "Mariners of England," and more recently the "Flying Services."

Concerted Music.

Though it is hard to convince the B.B.C. of its shortcomings, this type of music does not broadcast well, notwithstanding the many excellent bodies that have been engaged. Amongst the recent ones are the London Welsh Male Choir on the vocal side, and on the instrumental side, the Old 3rd Cheshire Military Band, the Stonehouse Silver Band, the City of Birmingham Police Band, and the 2 L O Military Band. All consist of known and tried artistes, but for real microphonic



Miss Norah L. Allison.

success give me a smaller number of players every time.

A Famous Singer.

Amongst the many famous singers that have appeared recently mention must be made of Mr. William Heseltine, for he has had wide experience in all branches of the vocalist's art, and has broadcast on many occasions in important productions. He hails from Lancashire, and commenced singing at the age of ten in the chapel choir. Wisely he was prevented from straining his voice till he reached the age of nineteen, when he took up the study of music seriously. Subsequently he won the gold medal for an open competition held at Olympia in London.

Newcastle.

A clever station director here, for he recognises the claims of the older generation. To the young, fox trots and nigger song may be the soul of music, but to his parents



Mr. W. Heseltine.

the old melodies of the half-forgotten operas recall the best of life. A recent programme at Newcastle had a charming singer in Miss Norah Allison.

The possessor of a soprano voice of excellent range, she has been heard at other B.B.C. stations.

Although on this occasion she sang from the operas, "Tales of Hoffmann" and "The Song of Fortunio," Miss Allison is a famous Bach singer, and has been the winner of the Soprano Class at the North of England Musical Tournament for successive years since 1921, and held the Morison Trophy for the years 1922-23. She is greatly in demand for oratorio work, and has performed that difficult work Bach's Mass in B minor, twice in Newcastle. In opera, too, she is known, and has taken principal parts in "Merrie England," "The Sorcerer," etc.

Bournemouth.

This station is conspicuous for its excellent programmes, and to pick any one out of the week for mention is difficult. "Comic Opera Night" produced Audran's "La Cigale," an excellent cast working with the wireless orchestra under Captain Featherstone. A Night with Modern Composers had the support of Miss Doris Vane, John Collinson, Herbert Heyner, and included some fine excerpts from the best-known works of Gerrard Williams, Dame Ethel Smyth, Maurice Besley, and

including the Beni Mora Suite of Gustav Holst.

A favourite singer is Miss Edythe Kinch. She has broadcast on several occasions. As a well-known critic wrote of one of her concert performances, "She has learnt that a song has two elements—words as well as music; her enunciation is admirable."

This possibly accounts for her success "over the aether," every word is clear and distinct. From early childhood she has sung and has received an excellent all-round training.



Miss Edythe Kinch.

Manchester.

Manchester's programmes need but little comment. They are invariably well balanced, free from monotony, and have the assistance of the best-known artistes.

The musical direction is safe in the hands of Mr. T. H. Morrison. As a violinist he has played in public since the early age of 7½. Studying under his father for ten years, he then became a pupil of Auguste Wilhelmj, and at the age of 18 entered the Queen's Hall Orchestra, becoming its leader at the age of 21.

Subsequently he became leader of the Covent Garden Orchestra, and remained there nine years. He has played in all parts of the world, including China, Japan, and all over the European continent. Upon his work at 2 Z Y there is little need to dilate. Veritably it "speaks" for itself through his instruments. Special nights marked the appearance again of Mr. Edward Isaacs, the well-known pianist, and Mr. Stephen Williams.

The Relay Stations.

These continue to retain a high standard. At Liverpool an excellent night was spent with Schubert, the station orchestra being under the direction of Mr. Joseph Lewis, the artistes including Clinton Shepherd, Doris Gambell, and Walter Wright.

Hull, Leeds and Edinburgh have also had admirably framed schemes, while no doubt Stoke and Dundee will also be well to the fore.



Mr. Cyril Estcourt.

A NOVEL VALVE HOLDER.

FROM A CORRESPONDENT.

At the present time the almost universal method of mounting valves of the four-pin type is by means of four valve sockets mounted on an ebonite panel, or by means of a holder of moulded composition containing the four brass sockets encased therein.



Fig. 1.

Now this method of mounting has several disadvantages. Firstly, the capacity between each socket and its associated nuts and connections is considerable, and leads to a loss of signal strength when the valve acts as an H.F. amplifier. Secondly, as the tops of the sockets are invariably exposed, it is possible, by accident, to allow the pins of the valve to make contact with the wrong sockets, and, should the H.T. battery be connected to the receiver, the valve will be ruined.

Moreover, everyone who mounts his valves in the above manner must have noticed the stiffness of the action of insertion and withdrawal of the valves, and when delicate and expensive dull emitters are used, unless extreme care is taken, this jarring may lead to a broken filament.

It was with the view of overcoming these disadvantages that the holder described herein was designed. The completed holder is shown in Fig. 1, while Fig. 2 shows in detail the component parts.

Detailing the Construction.

A base plate of $\frac{3}{8}$ in. ebonite is cut to the dimensions of Fig. 3A, and holes drilled and tapped 4 B.A., as shown. Four lengths of thin springy brass or copper, $\frac{3}{8}$ in. wide and $1\frac{1}{2}$ in. long, have a 4 B.A. clearance hole drilled in them at their centres, after which they are bent to the form of Fig. 3B.

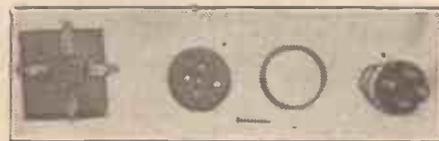
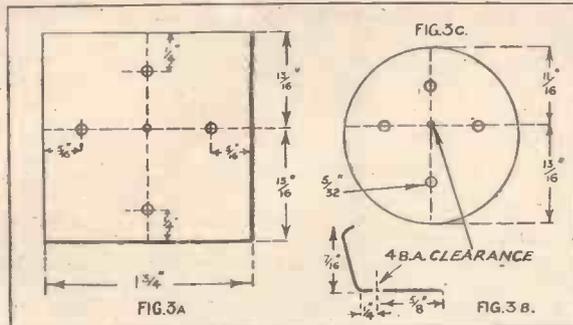


Fig. 2.

The four contacts are then screwed to the base plate by 4 B.A. cheese-head bolts, $\frac{3}{8}$ in. long, screwing into the holes already tapped in the base.

Next, a support for the top plate is cut from $1\frac{1}{2}$ in. diameter ebonite tube, $\frac{3}{4}$ in. in length, and notches filed on one end to clear



the brass contacts. The top plate is a circle of diameter $1\frac{1}{2}$ in. cut from $\frac{1}{8}$ in. thick ebonite, and four $\frac{5}{32}$ in. holes are drilled in it as indicated in Fig. 3C.

A valve template may be used to mark out the positions for drilling these holes. At the centre, a 4 B.A. clearance hole is drilled and countersunk to take a 4 B.A. bolt (countersunk head) $\frac{3}{4}$ in. in length.

The holder is now assembled by placing the supporting ring on the base and placing the top plate on it so that the four holes come over the corresponding contacts

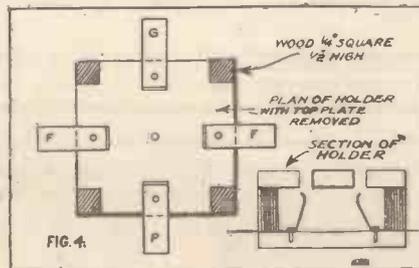


FIG. 4.

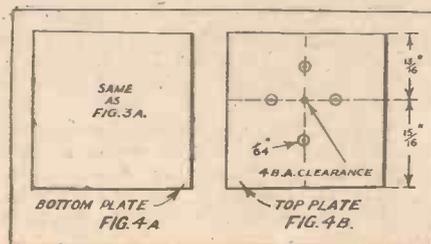
beneath. The 4 B.A. bolt is then passed through the centre hole and screwed into the hole tapped in the base plate, thus holding the component parts tightly together.

Minimum Capacity.

As the pins of the valve do not make contact until they have passed through the holes in the top plate, it is impossible to damage the valve. Moreover, the action of insertion and withdrawal is extremely easy and smooth, and requires very little force.

Above all, owing to the disposition of the springs, the capacity between each contact is small, and the inter-electrode capacity of the valve, when connected up, is much less than with the old system.

If desired, holes may be drilled in one's



panel, and the base and supporting ring mounted underneath, the panel now forming the top plate. This method of mounting is extremely convenient and neat, and enhances considerably the appearance of one's receiver.

Provided the base-plate and contacts are constructed as described above, it is not necessary to make the supporting piece and top plate circular in form, and an alternative design is shown in Fig. 4.

Experimenters who are constructing the new "P.W." Unidyne receivers, can easily design for themselves holders on these lines to take the five-pin type of valve.

SOME USEFUL HINTS.

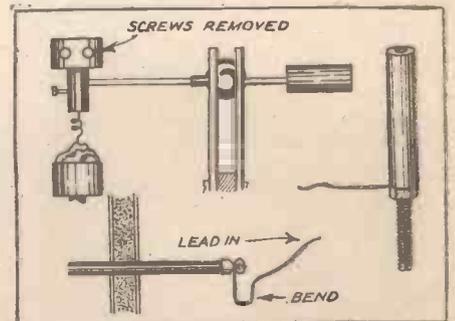
MANY amateurs possessing an open type crystal detector have no doubt noticed that after some time, the crystal loses its sensitivity, owing to dust.

If a crystal cup be soldered on to the other end of the cat's-whisker holder, by reversing the cat's-whisker the cup will fit over the crystal and protect it when not in use. Also, the detector may then be used for such crystals as zincite and hornite, or any combination.

A common fault with all leads-in is that the rain runs down the wire and wets the insulating lead-in tube, shorting the current to earth. By simply bending the wire into the form of a U close up to the tube, the water will drip off the lowest part of the U and not reach the tube.

It is always advisable to shield the tube from rain by means of a sheet of lead. The importance of this is easily seen on a rainy night by wiping the lead-in and noticing the difference of power.

A useful and cheap wander plug may be made by screwing a flexible lead to an ordinary valve leg and splitting the pin. In this way, since each plug has itself got a socket, several may be plugged one into



the other. Should it be impossible to split the pin, the same effect is obtained by flattening the thread slightly until it fits tightly.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per photo.

DULL EMITTER FILAMENTS.

SOME OBSERVATIONS FOR THE AMATEUR.

By J. H. T. ROBERTS, D.Sc., F.Inst.P.
(Staff Consultant, "Popular Wireless.")

The story of dull emitters, with much interesting information concerning "low consumption" valves, is clearly set forth in this article by a well-known physicist and contributor to "Popular Wireless."

VALVES provided with dull-emitter, or "low consumption," filaments are now so familiar that it is difficult to believe that they only began to be produced on any sort of commercial scale about the middle of the year 1921.

No doubt every reader is aware that the so-called dull-emitter filament is one which yields about the same thermionic emission at a dull-red heat as is given by an ordinary pure metal filament at a white heat. A misapprehension frequently exists as to the relative emissivities of dull-emitter and bright-emitter filaments. It is sometimes stated that the dull-emitter filament gives thousands of times the emission of a bright-emitter filament. The statement in this form is rather misleading. It does not mean that if a dull-emitter filament were to be operated at the same temperature as a bright-emitter filament it would give thousands of times more emission; what it means is that if a bright emitter were operated at the normal working temperature of a dull-emitter filament, it would give very considerably less.

In other words, the comparison is to be made at the working temperature of a dull-emitter filament, and not at the working temperature of a bright emitter.

The evolution of the dull-emitter filament is an important step—probably the most important practical step up to the present time—towards the realisation of the ideal "cold valve," that is, the valve which shall be operated purely upon the energy in the anode circuit and without the necessity for the employment of energy for the liberation of the electron stream.

Light Without Heat.

So accustomed have we become to the waste of a large quantity of energy in the form of heat from an incandescent substance—whether that substance be raised to incandescence for the purpose of giving light, as in the case of an incandescent mantle, or an electric-lamp filament, or for the purpose of giving a supply of electrons, as in the case of a wireless valve filament—that it is often thought that to attempt to obtain a supply of electrons, without at the same time dissipating a large amount of heat energy, is like trying to obtain perpetual motion—a sort of scientific heresy.

This view, however, is without foundation. It is true that the readiest and most convenient method of causing a substance to yield light or electrons is to raise the substance to a high temperature. But there is no inherent association—or perhaps one had better say no necessary association—between the two effects, and in fact there are known cases of the production of cold light and cold electronic emission.

The glow-worm, for example, emits a cold light, that is, light without heat, and a

similar effect is characteristic of phosphorescent and fluorescent substances. Similarly, electrons are emitted from certain substances (zinc, for example) when subjected to the incidence of radiation of short wave-length.

Wasted Energy.

I do not mean that in these cases there may not be a minute amount of heat generated during the process in question; I mean that these are instances in which light or electronic emission, as the case may be, is produced otherwise than by the employment of ordinary high-temperature conditions.

There is thus nothing scientifically un-sound in the search for the cold or comparatively cold electronic emitter, and the various scientists and research organisations responsible for the development of the present-day dull-emitter filament have rendered a great and valuable service to wireless science.

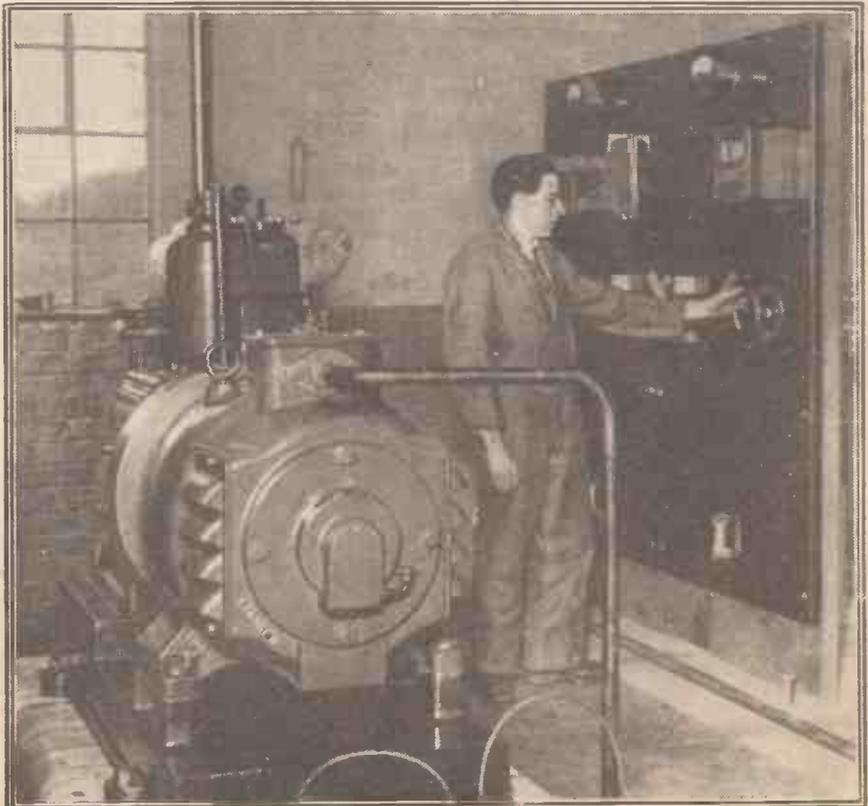
How greatly the efficiency (in the engineering sense) of a wireless receiving set is lowered by the necessity of heating the filament will be evident from a very simple calculation. To take an average

case, suppose a valve filament consumes 0.5 amp. at 6 volts, that is, 3 watts, and suppose that the current output of the H.T. battery is 1 m.a. at 50 volts, that is, $\frac{1}{10}$ watt. Then the power which is actually employed in the oscillatory circuits is something less than 2 per cent of the total battery power employed in the set, most of the remainder being lost as heat. If the electron emission could be secured without heating the filament, the power efficiency of the system would evidently be enormously improved.

The Origin of D.E.'s.

The idea of employing a filament coated with a substance of exceptional thermionic emissivity probably dates from the experiments of Wehnelt, who found that if a strip of platinum were coated with certain metallic oxides and then heated to dull redness in a vacuum, it yielded a copious supply of electrons: such a coated strip was known as a "Wehnelt cathode." The coatings made in this way, however, were very variable in their properties, and also appeared to attack the metal of the strip in some way and caused it to decay. Further—

(Continued on page 516.)

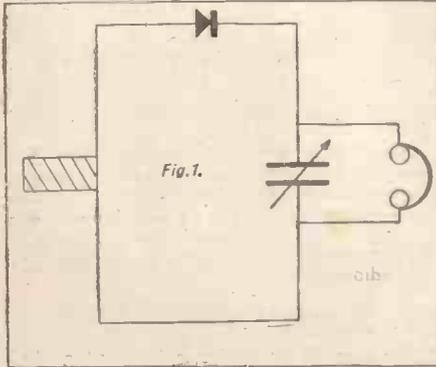


Switchboard and power plant at 2 B E, the Belfast Broadcasting Station.

HOW TO MAKE OCTAGONAL COILS.

FROM A CORRESPONDENT.

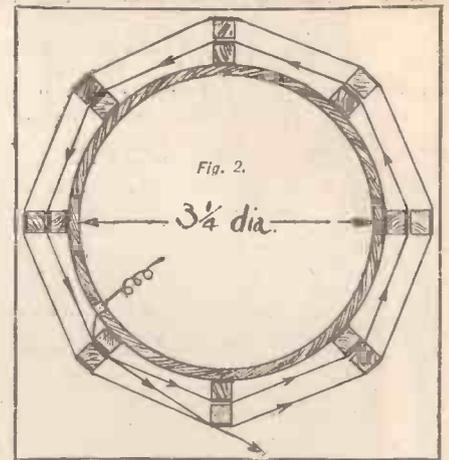
MULTI-LAYER coils are known to be much more efficient than the ordinary layer-wound type. These can be easily made at home at little cost. Octagonal coils are equally suitable for a regen-



erative or straight circuit inductance. For use as wave-meter inductances these coils are particularly suitable, and if used for this purpose should be calibrated with a standard wave-meter and a graph made to show the different wave-lengths; the circuit of one is shown in Fig. 1.

The most convenient sized coil can be wound on a paraffin-waxed cardboard tube of $3\frac{1}{4}$ in. diameter by $1\frac{1}{4}$ in. in length. Using No. 24 D.S.C. wire, wind the first layer the full length of the tube. The second layer is separated from the first by a gap of $\frac{1}{4}$ in., made by eight blocks of cardboard $\frac{1}{4}$ in. square and $1\frac{1}{4}$ in. long, spaced evenly around the tube.

In winding the second layer, cross the wire back to where the first layer was started and continue the operation; eight blocks, third winding, and so on, until eight turns have been wound. For a wave-length



up to 480 metres the coil will require between 60 and 75 turns of wire.

Coils for higher wave-lengths will, of course, require more turns. A coil is shown in Fig. 2. There are many ways of mounting these coils, the best perhaps being in the "bookcase form," as described in a recent issue of POPULAR WIRELESS, wood centres being substituted (similar to cork bungs) for the pin and socket method.

DULL EMITTER FILAMENTS.

(Continued from page 515.)

more, the coating was found to evolve gases which lowered the vacuum, although this has since been overcome by the introduction of such substances as sodium and potassium, which have the effect of "cleaning up" traces of residual gas.

It should be mentioned that the coated filament has been greatly developed by the Western Electric Co., and a very complete and interesting account of their work on the subject, by H. D. Arnold, will be found in the "Physical Review," vol. 26, p. 76.

A great deal of research work has been carried out during the past 20 years on the thermionic emission from metal wires, and it has long been known that impurities in the material of the filament have a considerable influence on the emissive properties.

Even gases absorbed in the metal of the filaments have an important effect, but as the gases are comparatively quickly expelled when the filament is heated, their effect cannot be relied upon, and it is found preferable in practice to expel the gases from the filament and other electrodes of the valve as completely as possible, and to rely for enhanced emissivity upon solid impurities deliberately introduced into the material of the filament.

The term "dull emitter" filament is commonly employed to designate the type of filament in which, as mentioned above, solid impurities are introduced during manufacture, the impurity being usually thoria, and the filament being described as a thoriated filament. The coated filament, however, may in general be operated at a somewhat lower temperature than the thoriated filament, so that the title of "dull emitter" belongs a fortiori to the former.

The reader may wonder how it came to be discovered that a small percentage of thorium oxide introduced into tungsten, had the effect of increasing the thermionic emission from a filament of the metal.

The discovery came about in a more or less accidental way. Tungsten filaments were employed for electric lamps long before their application to wireless valves and certain impurities found their way into the metal during the process of manufacture, probably from the Batierea crucibles employed. When attempts were made to purify the filaments and expel the impurities, the resulting filaments were more brittle, and eventually it was discovered that the deliberate introduction of a small percentage of impurity, particularly of thoria, had the effect of greatly increasing the mechanical strength of the filament. In 1911, for example, W. D. Coolidge (pat. 18167) claimed the use of thoria and other refractory oxides mixed with tungsten before sintering.

THE "POPULAR WIRELESS" CONSTRUCTIONAL COMPETITION.

1. Competition to be for home-made complete receiving sets either crystal, valve, or valve and crystal. Entries to be limited to one set per competitor.

2. Two classes will govern the entries, viz.: junior class for competitors under 15 years of age, and senior class for competitors over 15 years of age. A declaration as to age may be required at the discretion of the judges.

3. Sets entered to be the unaided work of the competitor, who must not be in any way connected with the wireless industry.

4. Entries must be sent to Radio Exhibitions and Wireless Conventions, White City, Uxbridge Road, Shepherd's Bush, London, not before November 10th, and not later than 12 noon, November 14th.

5. Each entry must be labelled "For competition," with the name of the sender and description of apparatus enclosed.

Non-compliance with above regulations or late arrivals of entries may cause disqualification.

All entries must be carriage prepaid and securely packed, and will be returned carriage forward as soon as reasonably possible after the close of the exhibition.

6. The judges may, if unanimously agreed, alter, modify, or add to these rules and conditions, and in all cases the judges' decision shall be final and conclusive.

The judges and organisers will not be responsible for any loss or damage to the articles entered for competition, but every reasonable precaution and care will be taken to prevent such loss and damage.

7. Awards will be announced on Saturday, November 22nd, at the exhibition, and published in "Popular Wireless," November 29th.

This thoriated lamp filaments were available before 1914, but in that year Dr. Langmuir, the well-known physicist of the General Electric Co. of America, took out two patents dealing with special methods of heat treatment for such thoriated tungsten filaments which, he had discovered, resulted in a great increase in the electronic emissivity.

So the short history of the case is that the thoriated filament was first developed for its mechanical properties, and it was subsequently discovered to possess (or rather to be capable, by suitable treatment, of being endowed with) valuable properties.

The heat treatment indicated by Langmuir consisted briefly in raising the temperature of the filament to about 2,600° C. for a period of two minutes, and then lowering it to 2,000° for a few minutes; the emission from such a filament at a temperature of about 1,000° C. was then found to be equal to that from a similar filament of pure tungsten at a temperature of about 1,700°.

This heat treatment has the effect, according to Langmuir, of evaporating or driving off all gases and solid impurities from the surface of the filament at the higher temperature, whilst at the second temperature the thoria diffuses to some extent from the interior of the filament, and forms a very thin filament upon the surface. The greatly increased thermionic emission is considered to be due to this very thin surface layer of thoria.

"Dry Cell" Valves.

The exact *modus operandi* of a thoriated filament is still imperfectly understood, but it is thought that at the normal temperature the surface film is being driven off, but is at the same time being replaced by the diffusion of thoria from the body of the filament.

Under ordinary conditions, and after the filament has attained the "steady state," these two effects more or less balance. If, however, the normal temperature of the filament should be considerably exceeded, the surface film is driven off much more rapidly than it can be replaced by diffusion, and the filament for the time being loses its characteristic properties.

These can, however, be restored by carrying the filament through the heat treatment indicated above, although this is a process requiring some degree of skill in the technique, as well as a good deal of caution, and as prevention is much better than cure in this particular case, the best advice for the owner of dull-emitter valves is always to take great care not to overrun the filament.

Dull-emitter valves at present usually cost considerably more than bright-emitter valves, and they also, generally speaking, require more care in handling and operating, owing to the slender and fragile nature of the filament. But, these disadvantages are much more than counterbalanced by great economy in battery power, and many of the dull emitters now available are quite rightly described as "dry cell" valves.

It is evident that a valve consuming 0.06 or 0.1 amp. at a voltage of from 1 to 3 volts may easily be operated for many weeks on a small dry battery. The dull-emitter valve is now a thoroughly practical proposition, and goes a long way towards the solution of what is often called the filament battery "problem."

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IT is quite possible for a signal, practically inaudible on headphones with even one high frequency and detector valves, to become positively deafening when passed through two stages of low frequency amplification, but the reproduction will be far more distorted than if the detector signal strength had been twice as loud, when only somewhat less than half the amount of low frequency amplification would be required to yield the same amount of audibility.

It is axiomatic that the louder the signal strength at the detector valve, the less low frequency amplification required for any given volume of audibility, and correspondingly more natural and tuneful reproduction will result.

YOU CANNOT USE TOO MUCH HIGH FREQUENCY AMPLIFICATION NOR TOO LITTLE LOW FREQUENCY AMPLIFICATION FOR PERFECT REPRODUCTION

BUT the use of more than one stage of high frequency amplification has, hitherto, proved to be commercially impracticable, because of the extreme difficulty in tuning and the need for considerable skill and patience to obtain results which, even at best, would be erratic and unreliable.

Designers and manufacturers have therefore been compelled to rely on the employment of excessive reaction and low frequency amplification to make up for the weakness of the received signal, with consequent comparative distortion. The Curtis "Constant-Tuned" High Frequency Amplifier is the only automatic high frequency amplifier on this or any other market which, when connected in circuit, guarantees the maximum efficiency of two stages of radio amplification on any wave-lengths between 300 and 3,000 metres, and requires no additional controls, nor more effort, skill or patience in tuning, than is required for the operation of the usual orthodox single stage tuned anode circuit.

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WITH its automatic simplicity combined with increased receptivity, selectivity and power, is predestined to make two stages of high frequency amplification a *sine qua non* of every Wireless Receiver for the Experimenter and Home Constructor, or the purchaser who prefers to buy a professionally constructed instrument. For the greater convenience of the constructor, and so as to conform with existing panel design, the Curtis Constant-Tuned High Frequency Amplifier is designed for use and must be connected up in exactly the same way in which an ordinary High Frequency Transformer is used.

The Curtis High Frequency Amplifier may be instantly substituted for any High Frequency Transformer in any existing circuit or instrument where such is used, but the corresponding condenser of such transformer must be turned to zero or any one wire disconnected therefrom.

The Curtis Constant-Tuned High Frequency Amplifier guarantees such a reserve of receptivity as to permit the efficient use of a suitably designed wavetrap.

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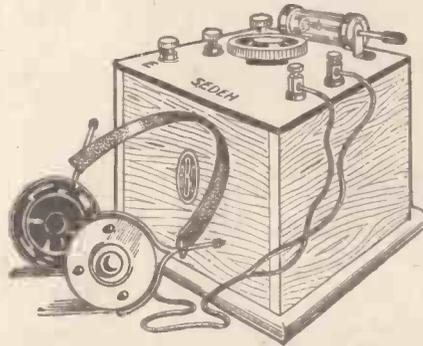
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Richardson's
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(Patent No. 216675)

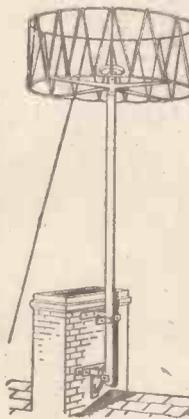
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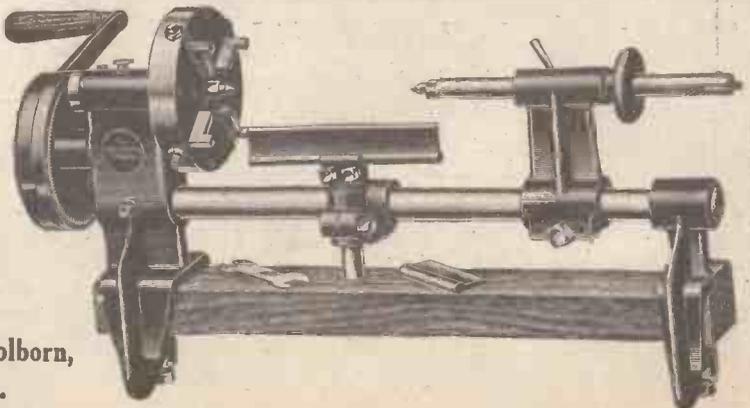


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HOW TO SECURE SELECTIVITY WITH EASE OF CONTROL.

A SET TO BRING IN DISTANT STATIONS.

By F. W. PLEWS.

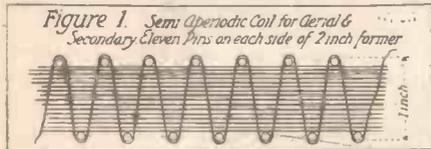
This selective receiver is the outcome of experiments made by a well-known contributor to "Popular Wireless."

DURING the past few months I have been experimenting with a single valve "tuned regeneration set," in which I have incorporated two or three novelties. "One control" is often asked

22 stout pins screwed on the circumference of the metal former, eleven on each side; these pins were staggered as shown on Fig. 1.

Double cotton-covered wire 22 gauge was used for winding the secondary portion of this combination, and before starting to wind, a piece of thin card was placed around the former between the rows of pins to form a base for the layers of wire. The edges where the cardboard overlapped were glued, allowed to set, and then coated with varnish. When the varnish was dry I proceeded to wind the coil. Anchor the wire around one of the pins, leaving about 12 inches of loose end, then sixteen turns of wire are wound in a clockwise direction; these turns just occupy the space between the two rows of pins.

pin and lay these ten turns over the previous winding, anchoring the end on the pin opposite to the one at the start. Any blank space at each side may be filled with a turn or two of string about same thickness as the wire.

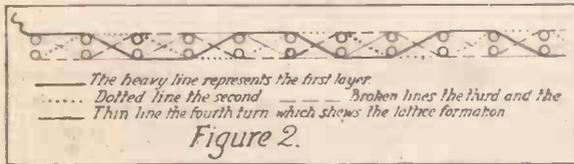


for by those people who require a good set, to bring in distance and which involves no trouble. "Simplicity of design with effect" is what appears to be demanded. The set I am about to describe is much simpler to make than it appears to be at first sight. It combines great "selectivity with ease of control," and, above all, coupled with those two factors, I may say extraordinary signal strength, with low cost of production.

The aerial coil is "semi-aperiodic," or in other words I might say the aerial system

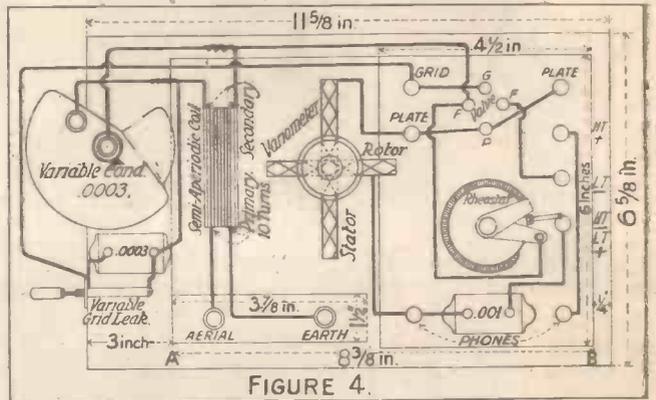
Fig. 1 clearly shows the manner in which this is done.

Now cross over to the starting peg and proceed to lay the zig-zag around the coil (see Fig. 1). This system produces a coil air-spaced between layers. Another layer once more to the starting peg of sixteen turns is now made, then anchor the wire on the starting pin, but do not cut it off yet. The aerial coil consists of ten turns of 18 gauge D.C.C. wire. Anchor the wire at the starting



or circuit is untuned. There are many ways of making a coil of this type. The one shown on the photo was made on a former two inches in diameter and having

now made, then anchor the wire on the starting pin, but do not cut it off yet. The aerial coil consists of ten turns of 18 gauge D.C.C. wire. Anchor the wire at the starting

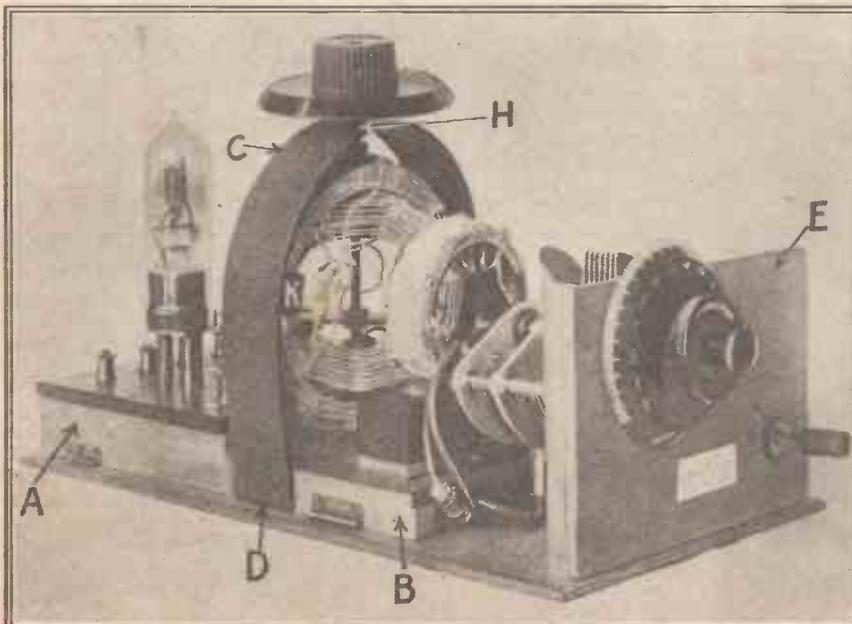


Proceed once more to wind the 22 gauge wire. Sixteen more turns in the same direction, then a course of zig-zag turns, then the final sixteen turns are laid. Always go back to the starting pin when commencing a fresh layer, and anchor the end on the peg opposite to the start. We have now sixty-six turns of 22 gauge wire on the secondary coil and ten turns of 18 gauge for the aerial coil sandwiched between the two bottom and two top layers of the secondary, with sufficient loose ends to take to their proper terminals later on.

We may now stitch the coil to support it, then unscrew each peg and it will be found a very easy matter to slide it off the former. The cardboard support assists in this procedure and also forms the permanent base for the coil. The underside of this base may also be varnished, and the coil may then be wrapped with empire tape to protect it from damp or other injury. Before wrapping it with tape, the projecting loops at the side may be turned over each side alternately; this also helps to support the wiring and prevents the layers from slipping out of the side of coil. This forms a closely coupled aerial and secondary coil.

The Variometer.

The variometer was wound on a former measuring two inches in diameter and $\frac{3}{4}$ of an inch wide, measuring from the outside of the double row of pins which are placed opposite each other, as shown in Fig. 2. Commence in the same way by placing a narrow piece of thin card on the base of the former; this is not to be a permanent base, so need not be varnished. Anchor the start of wire in the usual way and take the wire behind two pins, alternating from side to side as shown in diagram Fig. 2; follow this procedure until eight yards of wire



(Continued on page 522.)

HOW TO SECURE SELECTIVITY WITH EASE OF CONTROL.

(Continued from page 521.)

have been wound, and without breaking the wire anchor it temporarily and wind five or six turns of string in the same manner, then continue to wire the stator portion of the variometer in series with the rotor, allowing at least four inches of loose

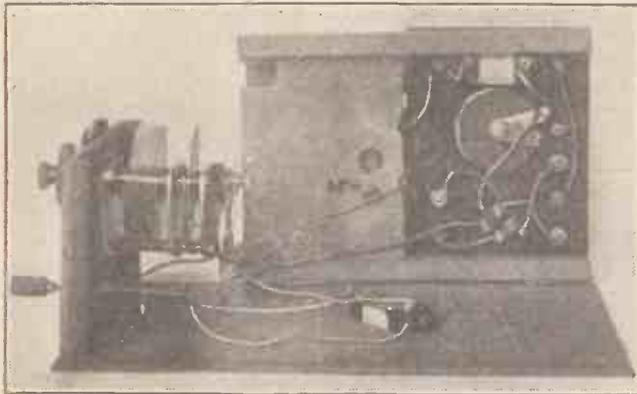


Fig. 5. Showing the wiring of the valve panel.

wire before continuing to wind another eight yards of wire.

At the end of this eight yards leave at least one foot of wire for joining up to the plate of valve. The pins are now very carefully taken out and the angles formed on each side of the coil are carefully tied up with strong thread; the coil may now be slipped off the former and the layers of string between the rotor and stator removed. It will be now seen that the inner portion of coil will move freely within the larger or stator coil.

A piece of fibre is cut to suitable dimensions and placed across the lower portion of the rotor coil (see Figs. 3 and 7), a hole having previously been drilled in the centre through which the 4 B.A. tapped rod is screwed and fixed firmly, with two nuts. This rod is placed through the top and bottom portions of rotor and stator, both of which have been bushed with cork, not only for insulation, but also to act as a friction washer when working the spindle of variometer. Figs. 3 and 7 will explain

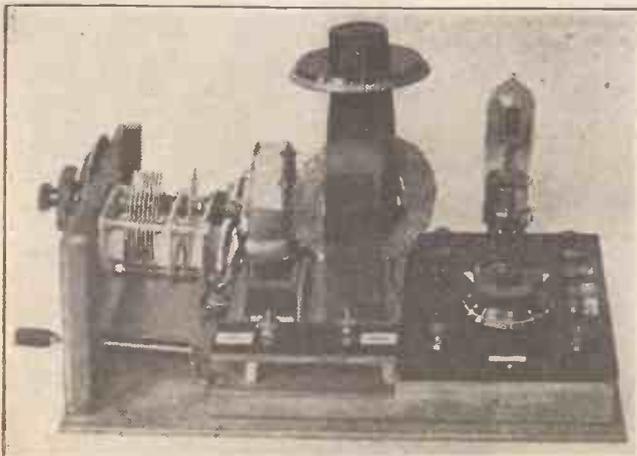


Fig. 6. Another view of the complete receiver.

better than any description how this part of the work must be done.

Fibre washers were also placed between each coil, as seen in photo and diagram. The condenser for tuning the secondary coil may be either a .0003 or .0005 variable and equipped with a vernier adjustment, which is very necessary owing to the fine tuning of this set. The valve panel is made of ebonite and measures 6 in. by 4½ in., and is wired up as shown on Figs. 4 and 5. The entire base of this set measures 6½ in. by 11½ in., and is made of fretwood walnut slightly beveled on the edges.

A raised platform measuring 8½ in. by 5½ in. is placed at A B shown on diagram 4 and Fig. 3, and hinged as seen in photo. The curved support C, Fig. 3, is made from fibre and measures 1½ in. wide and about 15 in. long, screwed on the side at D, Fig. 3, and bent at right angles at the end, and screwed on the raised platform beneath the earth terminal. The aerial and earth terminals are also fixed on a raised ebonite platform which

measures 3½ in. by 1½ in. (see photos).

On the front at E, Fig. 3, will be seen a support measuring 5½ in. by 4 in. This is stayed at the back with two upright supports (see Fig. 6), and screwed on the base in an upright position, and is used as a panel for the variable condenser and variable grid leak. The condenser, the aperiodic coil, and the variometer have each one common centre or axis, hence the necessity for raising the aperiodic coil on a wooden support, upon which it is fastened with empire tape and pivoted at one end. This is necessary to get the proper adjustment between this coil and the variometer to prevent howling or whistling.

The Set in Operation.

The hole where the spindle of condenser comes through the front of panel is insulated with an ebonite bush, also the grid leak. The spindle of the variometer is taken through a hole in the fibre support at H, Fig. 3, and the dial and knob firmly clamped in position. A brass bush is screwed on the raised platform for the other end of spindle, and fixed with two nuts on the underside in such a manner, whilst preventing the spindle from slipping out of the bush it will still allow it to turn easily (see Fig. 5 at M, and Fig. 7).

The grid condenser must not be placed where shown on photo 5, but can be placed immediately beneath the grid leak (see diagram 4 for position). The connections may now be made according to instructions given in the wiring diagram, Fig. 4.

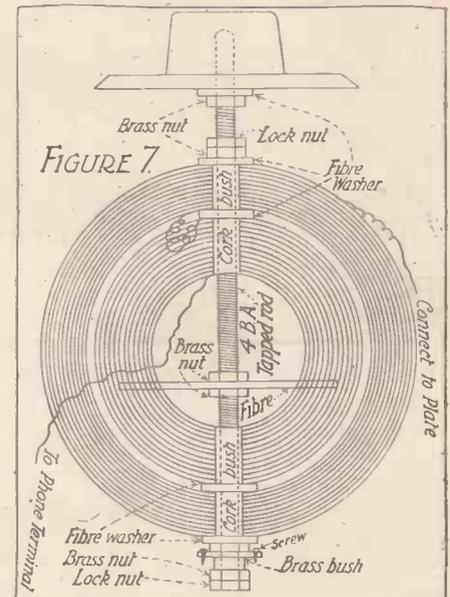
Instructions for Using the Set.

Fix your aerial and earth leads to their respective terminals, and the battery leads also. With the variometer at its maximum position and the filament of the valve aglow, start with the condenser at zero, and gradually turn the dial until signals are heard very strong, then slightly adjust variometer.

Using a Frame Aerial.

I am using a dull emitter valve and dry batteries. A suitable rheostat is fixed on the valve panel for regulating the current. The two plate terminals are simply used for relay purposes; the one nearest the variometer can be dispensed with and the lead from the variometer stator made direct to the plate terminal on valve socket.

A frame aerial two feet square and wired with eight turns of 20 gauge D.C.C. wire may also be used with great success. I also receive signals with no other exterior connection but a 24-foot length of "electron wire" suspended across a room and one end fixed on either the aerial or earth terminal. Connection made to gas or

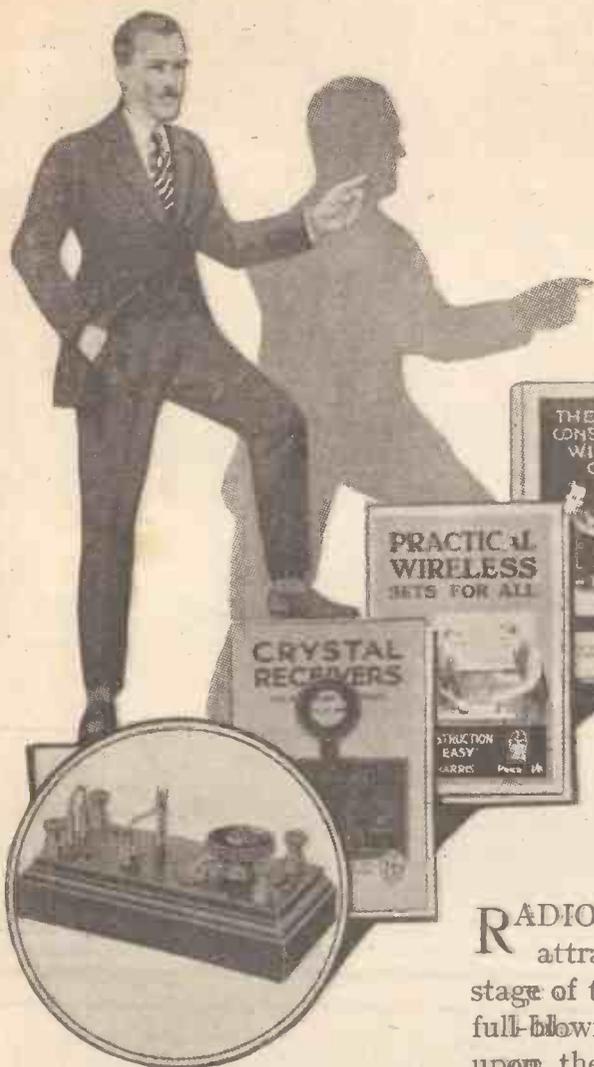


water pipes may also be used, either singly or the gas connection made to aerial terminal and the water pipe to earth terminal. Near a broadcasting station I have heard signals without any aerial or earth wire connection. This semi-aperiodic coil system appears to be a very accommodating piece of apparatus.

Distant Reception Possible.

One may visit any friend's aerial and be certain to receive signals on practically the same setting every time, no matter what the length of aerial. It is a very satisfactory set for portable use, for which I have also used it. Before closing, I would like to call attention to the four pieces of rubber placed one on each side of variometer and fixed to the fibre strip at K, Fig. 3, these prevent the stator of variometer from turning round when tuning.

The variometer, as will be seen, is wound on the principle of a latticed space coil, and is a very efficient piece of apparatus. The set is capable of bridging great distances. Queries about this set will be welcomed and answered. My previous sets have made me many friends through the agency of P.W., and I feel convinced this will be no exception.



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- RESISTANCES (VARIABLE).—Woodhall, 100,000 ohms, mounted on Ebonite, 2/9; Allen, 50,000 to 100,000, 2/-; Lissen, 50,000 to 100,000, 2/6; Watmel, 50,000 to 100,000, 3/6.
- RUBBER—"PHONE EAR CAPS.—"Sorbo," per pair, 1/6.
- SCALES.—Half circle, 0-180°, 2d.; complete circle, 360°, black or white, 4½d.
- STAPLES (Insulated).—Per doz., 3d.
- STAPLES (Tin).—Per doz., 1d.
- SLIDERS AND PLUNGERS, 3d.; G.W. type, very efficient, 9d.
- SHELLAC.—Per bot., 5d., 7d. and 10d.
- SWITCHES.—S.P.D.T. Miniature panel mounting, 1/-; D.P.D.T. Miniature for mounting, 1/6.
- SWITCHES (EARTH AND AERIAL).—Mounted on Ebonite, S.P.D.T., 1/3 and 1/9; D.P.D.T., 3/3. (Above fitted with Terminals.)
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- TERMINALS.—Small fancy, 1d.; small W.O., 1d.; large W.O., 1½d.; Telephone, 1½d.; Nickelled, 2d. (All above complete with nut and washer.) Red and black Terminals, per pair, 1/-; Screw Spade Terminals, each, 1d.; screw pins, each, 1d.; "Clix" Terminals, complete, 4d.
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- TRANSFERS.—"Easie-fix" Aerial, Earth 'Phones, per set, 2d.; large sheet of Words and Scales, 9d.
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- VALVES.—Thorpe K.4 for Unidyne circuit, 17/6; Cossor, B.T.H., Marconi R., Marconi R.5V., Mullard-Ora, Ediswan, Myers, all at 12/6.
- DULL EMITTER VALVES.—Marconi D.E.R., 21/-; Ediswan A.R.D.E., 21/-.
- VALVES, DULL EMITTER, .06.—Marconi D.E.3, 25/-; B.T.H. B.5, 25/-; Ediswan A.R., 25/-; B.T.H. 6 Volt Power Valve B.4, 35/-; Mullard and F.A.I., 35/-.
- VOLT METERS, 0 to 15 Volts, 5/-; double reading, 0-10, 0-100 volts, 12/-.
- VALVE HOLDERS.—With 8 nuts and washers, 8d.; 5 Leg Valve Holders for K.4 Valves, 1/3; Valve Holders for Flush Panel Mounting, 8d. set.

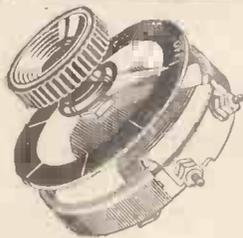
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Prov. Pat. 12452.

Winding cannot be damaged by ordinary use.
 Size, 1½ ins. diameter, 1 in. high.

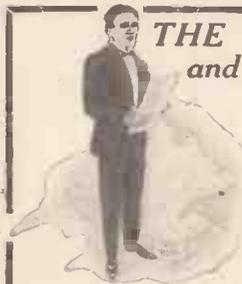
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THE BEDFORD ELECTRICAL & RADIO Co., Ltd.,

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One hole fixing.
 Handsome nickel dial.
 Phosphor Bronze contact arm.

2/6
 6 ohms
 15 ohms
 30 ohms

Say **PEERLESS JUNIOR** when you want a better Rheostat



THE GREATEST SENSATION and SUCCESS of the SEASON

THE WORLD'S CHAMPION
 The marvel A.B. Headphone which has dealt the knockout blow to all others and overshadowed them all. Fully guaranteed.

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Uniform with No. 40, but incorporates the Radiax Universal principle, and enables, by means of a switch, perfect results to be obtained on the lower wave band or on the new 1,600 metre High Power Station. Price £2/10/-



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Resistance
2000 or 4000
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Sent you immediately on receipt of
20/- deposit and your agreement to pay 10/- per month for 8 months if satisfied.

This Speaker is manufactured by Fullers United Electric Works and its reputation is second to none.

The cash price being £4/15/0 we only charge 5% extra for easy payments. The Speaker is guaranteed for one year.

We also supply Igranic Components, Accumulators, H.T. Batteries, Condensers, etc., charging only 5% interest for Easy Payments.

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EVENING TRIPS TO AMERICA!

YOU can get there every night with the P.P.V.2, the world's loudest and most sensitive long distance circuit. Simple enough for a child to assemble. Panel cost need not exceed 30/-. Thousands have already logged from 1 to 5 American stations nightly. P.P.V.2 works loud speaker, and carries 20 pairs of headphones.

RADIO-PLAN No. 1 contains—

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PRICE 10/6
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HOW TO MAKE ANTI-CAPACITY BASKET COILS.

From a CORRESPONDENT.

The coils described in the following article can be easily made at home at low cost.

FROM the point of view of ease of construction and general efficiency in use the basket type of tuning coil is perhaps the most generally used amongst the amateur wireless enthusiasts who prefer to make as much of their own apparatus as possible. It has, however, several drawbacks, not the least of which is its mechanical weakness. The necessary

far superior both mechanically and electrically.

The former used is of the usual "spider" type, with the exception of the hub, which was fretted out from 1/2-in. wood to the shape shown (see Fig. 1). Eleven spokes consisting of 1/2-in. round wood were made a tight "push fit" into holes at the top of each projection on the central hub.

Winding the Coils.

No. 22 S.W.G. D.C.C. copper wire should be wound over and under two spokes until the desired number of turns has been put on. The tying up of the turns of wire is now undertaken in the following manner:

Two long needles are both threaded on one piece of strong cotton thread. One is then passed up through the winding along the line of spoke, and the other similarly passed up through the winding along a line with the adjacent spoke. The thread is then pulled taut and tied off neatly in a reef knot at the outside edge of the coil, as is clearly shown in Fig. 2.

Each point at which the inner winding of the coil crosses the outer winding is treated in the same manner. The coil should then be complete, and may be mounted on any of the standard types of basket coil holders.

One continuous length of thread may be used for each side of the coil, but this method calls for a little more patience and skill. The manner in which to insert the needle is also shown in Fig. 2.

circuit, with the usual 0.0005 microfarad variable condenser in parallel.

Number of Turns.	Standard Wire Gauge.
20	22 D.C.C.
35	
50	
70	
90	
100	32 D.C.C.
125	
150	
200	
250	

For the sake of compactness the wire may be wound over and under three or four spokes, in which case it would facilitate winding to use more than eleven. Indeed, any odd number of spokes within reason may be used.

USEFUL HINTS.

BRASS screws are usually used to fasten the panel when the set is finished; and if the fittings happen to be plated, these screws show up very badly. It is not necessary to have these plated. A very good substitute will be found by dabbing a little flux for soldering on the head of the screws, then hold them in a gas flame or similar heat, and when the flux is well heated rub a little solder across the head, and wipe off quickly with a piece of rag, so that there is not enough solder to fill up the cut. If warmed again quite a bright, shiny finish will be the result.

Marking Panels.

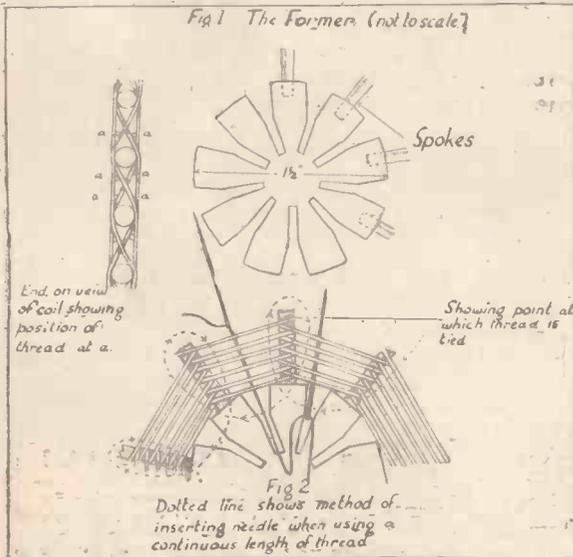
Always mark the panel out on the reverse side, and never use a pencil. When two or three holes have been drilled, screw the panel down to a piece of flat wood, and drill right through to the wood; this will ensure clean holes. It is a good plan to lay out all the parts on a sheet of paper the size of the panel, and when all is ready prick small holes through the paper, reverse, and lay it on the panel, and mark through with a centre punch. It is well to just stick the corners of the paper to prevent slipping.

Switch-arms and the like will have a better bearing and act more rigidly if an extra panel bush is placed on the spindle on the underside of the panel, as well as on the top.

Safeguarding Valves.

Amateurs frequently try out several units to arrive at the final circuit that will be used in the set. Although this is a good plan, it should be remembered that when so doing the units used should be placed together as close as it is possible as they will be when they are finally assembled in the cabinet. It is very often the case that units work quite up to the mark when all over the table, but when assembled in a cabinet the results are disappointing. The reason is the inter-capacity effects of all the units when close together.

Always use distinctive coloured flex to take the battery and accumulator current to the set. Many a valve has been burnt out quite accidentally. Use red and black flex, and if possible red and black spade terminals, and different patterns for the high and low currents



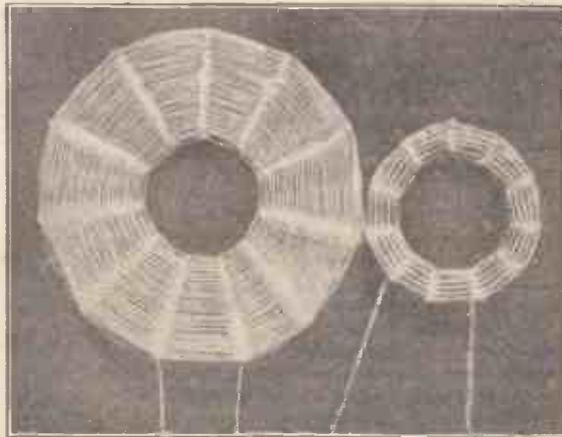
paraffin wax or shellac varnish with which it is held together produces considerable losses due to capacity effects.

It may be argued that these faults are avoided when the coil is wound upon a former consisting of fibre, mica, or shellacked cardboard, etc., but here, also, there are dielectric losses due to the presence of the material from which the former is made.

Considerable interest was aroused by the appearance on the market of the so-called "waxless coils," in which all the afore-mentioned faults have been abolished.

An Efficient Method.

The writer therefore set about to devise a method whereby such coils could be constructed at home with the minimum of trouble, and after a considerable amount of experimenting the following method was devised as being the most efficient and simple, whereby the home constructor can build such coils with only slightly more trouble than is spent upon basket coils of the usual type, the result being a coil which is



Showing the anti-capacity coils in their completed form.

Two of such coils are shown in the photograph, and the following table gives sufficient data for the construction of a set of such coils to tune from approximately 150 to 2,000 metres, when used in the aerial

Sept 8 1924
 DEVONSHIRE CLUB.
 ST. JAMES'S, S.W.1.
 To the British Thomson-Houston Co. Ltd.
 Sir, It may perhaps interest you to know that during my recent experiments in reception of the B.B.C. stations upon the Jungfrau & other points in the Alps I tested many makes of valves. The one which gave the best all-round results was the B.T.H. B4—one of which I consider equal to two of any other. I strongly advise every amateur to use the B.T.H. B4.

What Mr William Le Queux thinks of the



B.T.H. B4 Valve

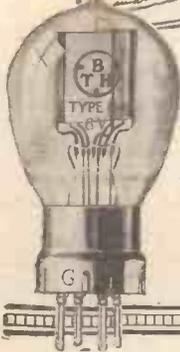
6 VOLTS—0.25 AMPS.

MR. WILLIAM LE QUEUX the famous novelist and wireless experimenter, as the result of his Jungfrau experiments, has proved the superiority of the B.T.H. B4 Valve—the supreme valve for use as a low frequency power amplifier.

Price 35/-

Obtainable from all Electricians and Radio Dealers

The British Thomson-Houston Co Ltd
 Works Coventry Offices Crown House, Al wych, London, W.C.2
 Branches at: Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Middlesbrough, Newcastle, Swansea, Sheffield



It may perhaps interest you to know that during my recent experiments in reception of the B.B.C. stations upon the Jungfrau and other points in the Alps I tested many makes of valves. The one which gave by far the best all-round results were the B.T.H. B4—one of which I consider equal to two of any other. I strongly advise every amateur to use the B.T.H. B4.

(Signed) WILLIAM LE QUEUX.



2234A

A.J.S.

TWO, THREE and FOUR VALVE WIRELESS RECEIVERS

REVISED PRICES:	
PANELS ONLY.	COMPLETE SETS.
Two Valve ..£12 0 0	Two Valve ..£17 10 0
Three Valve ..£15 17 6	Three Valve...£22 5 0
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This very handsome Pedestal Cabinet fitted with New Model A. J. S. Four-Valve Receiver, H. and L. Tension Batteries, and A. J. S. Loud Speaker, the horn of which matches the wood, is supplied complete with all accessories ready for use in

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YOU don't know what pleasure there is in a Crystal Set, until you have used the GIL-RAY wireless crystal. The GIL-RAY is super-sensitive, and each piece is tested and guaranteed. See for yourself what a difference it makes! Supplied in neat tin boxes with Sterling Silver whisker, and full instructions for perfect results. Price 1/6 of dealers everywhere. If unobtainable, please forward 1/6 and name and address of dealer. Sole Distributors for U.K. and Ireland

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 Agent: F. K. HADDEN, 5, Osbourne Road, Newcastle-on-Tyne.

The Crystal of the Age!





The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

WE recently deplored the fact that to our knowledge there was no L.F. transformer on the market designed for single hole panel mounting. Subsequently, however, we received a sample from Messrs. Anderton, Britton & Co., Ltd., of Queen's House, Queen Street, London, E.C.4, of a transformer that fulfils the above requirements. It is stated to consist of British material throughout, and is retailed at 25/- net. Its ratio is 3-1, the primary consisting of 11,000 turns and the secondary 33,000 turns, 2½ miles of wire in all being used. As will be seen from the photograph of this transformer which appears on this page, it is of the hedgehog type totally enclosed in a metal casing.

In appearance it is quite a well-finished, solid-looking instrument, and on test very good results were obtained. The ratio is such that the transformer can be used in almost any stage, including power and "reflex" circuits. The distortion noticeable in a careful test was almost negligible throughout the whole range of audio frequencies; we did not draw up a curve, but we should imagine that, had we done so,

it would have been gratifyingly flat and even. No doubt the one-hole mounting will ensure the success of this transformer, more especially as it appears to function in just the



Showing the transformer mentioned above in various stages of assembly.

way a first-class L.F. transformer should; it is certainly a component that the constructor has been patiently waiting for.

At the popular price of 5/-, the E. C. Coil Former, which is now being placed upon the market, will meet a long-felt

want. Fitted with a stout wooden handle, and with provision for four rows of pins, it enables amateurs to easily wind their own coils. The centre diameter of the specimen sent to us measures 1½ in. It is manufactured by Hughes and Co., 19/21, Fore Street Avenue, London, E.C. 2.

While the words "All-British" must invariably appeal to all patriotic constructors, there are times when it is necessary to go farther afield if the amateur desires to take full advantage of the progress of wireless science. For instance, circuits that originate in other countries cannot be ignored, any more than certain pieces of apparatus which are manufactured abroad—if similar apparatus with equal efficiency is not available in the home markets. A case in point concerns "Push-pull" power amplification, a branch of radio work which we consider is rather neglected. We have arrived at this conclusion only after the most careful of tests carried out with a pair of transformers designed for this purpose, and which have been submitted to us for test by Messrs. Gaston E. Marbaix, of 27-28, Anning St., London, E.C.2, who are agents for the high-class components manufactured by the King Manufacturing Corporation.

The above agents also handle the products of the Rauland Manufacturing Corporation, who are the makers of the "All American" transformers mentioned above. Push-pull amplification is undoubtedly deserving of serious consideration, as it provides a means of signal magnification which enables great

(Continued on page 530.)

M.H.

SPECIALITIES

The Finest Results can only be secured from your set by using the best and nothing but the best British Components. Insist on having "M.H." products.

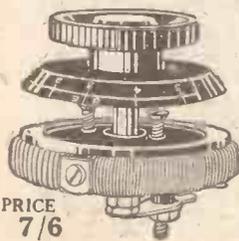
FILAMENT RESISTANCES.

Combined Dull and Bright Emitter Type.

The advantages in this type of resistance are at once apparent.

It is the most convenient and economical method of controlling filament current as the space occupied on the panel is reduced to a minimum while any valve can be used at an emergency. This rheostat is built up on the same principles

as the bright emitter type, but it has a double reading on the dial, and to safeguard your operation with either type of valve, the bright emitter resistance comes into operation first and is added to the dull when the latter comes into operation.

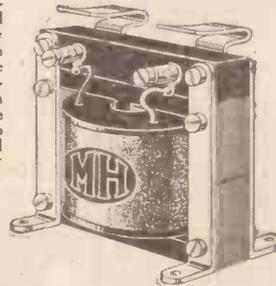


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L.F. TRANSFORMERS

—are most efficient

A high grade and efficient Transformer of pleasing design for all inter-valve purposes, possessing the best possible electrical characteristics. A fixed condenser is nearly always used with an inter-valve transformer; provision is made in this model by the clips at the top to take our standard flat type condenser of suitable value.



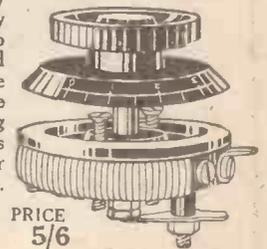
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FILAMENT RESISTANCES

play a most important part in purity and perfection of reception.

The "M.H." Bright Emitter Type are smooth in action, resistance coils are of Eureka wire, the acknowledged best, cleanly engraved dial, finely controlled by milled edged knob and constructed throughout on the principle that the best and nothing but the best is good enough for satisfactory service.

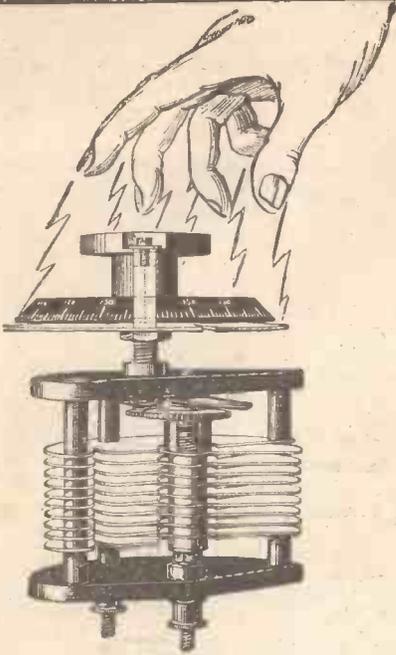


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The Naylor "Fulstop" Condenser enables tuning to be carried out with a wider range of accuracy than has hitherto been obtained. In addition to being a square law condenser, which avoids the overcrowding of stations at any particular point, the dial of the "Fulstop" Condenser is graduated over the complete circumference and geared at two to one in relation to the moving plates, thereby giving twice the rotary movement of any other condenser and enabling stations to be picked out with the greatest of ease. Further still, the abolition of all hand capacity effects is guaranteed unconditionally by the makers.

A leading Wireless magazine says:—
 "We can strongly recommend this type of geared condenser for careful tuning and for use in situations where hand capacity effects are troublesome." October, 1924.

Protected throughout the World.

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J. H. NAYLOR, LTD., Condenser Works, WIGAN.

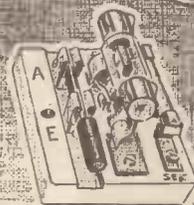
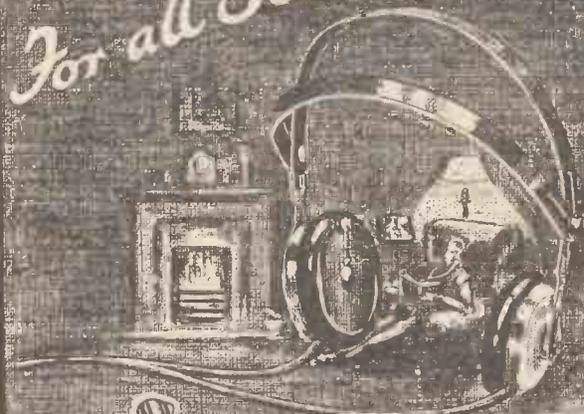
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 VARIABLE
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Combined Earthing Switch & Aerial Protector.



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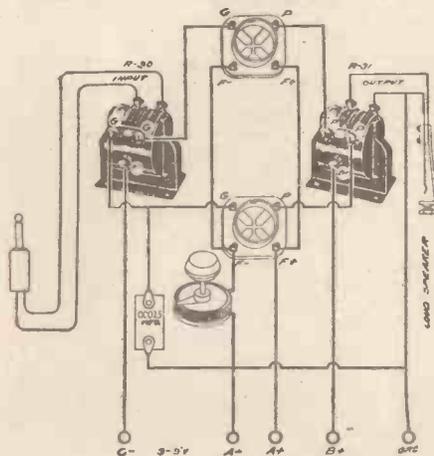
SIEMENS BROTHERS & CO LIMITED,
 WOOLWICH, LONDON, S.E.18.

APPARATUS TESTED

(Continued from page 528.)

volume to be obtained without impairing purity of tone.

Push-pull amplification is, in effect, the placing of two valves in parallel, and the circuit is so arranged that the input E.M.F. is applied to the grids of the two valves exactly 180 degrees out of phase, so that one valve is in operation during one half of the



A "Push-pull" amplifying circuit using the special transformers mentioned below.

cycle, while the other valve functions during the other half. It is claimed that this action neutralises the distortion and harmonics usually produced when only one valve is used.

A typical circuit is shown on this page,

and, as will be seen, two slightly different transformers are required, the one being known as the "Input" and the other as the "Output." It is impossible to enter into a full explanation of the system on this page, but all amateurs interested are advised to communicate with Messrs. Marbaix, who will be pleased to forward them descriptive literature and full details and prices of these interesting components.

The Shakespeare Engineering Co., of 15A, Shakespeare Road, N.10, have sent us a range of switches comprising simple and multi-contact switches for all wireless purposes from simple two-way single poles to series parallel and multi-stud selection switches. Throughout, the workmanship and finish shown is excellent, and contacts are made smoothly and positively. The most outstanding feature in connection with these switches, however, is that they are so designed that the contacts are dustproof, a very strong point in their advantage indeed.

THE WONDERS OF SALVAGE. By David Masters. Published by John Lane, The Bodley Head. Price 8/6 net (illustrated).

In this fascinating volume the author recounts a story of particular interest to wireless amateurs—how radio saved the lives of some men imprisoned in a half-sunken submarine; how, although a rescue ship wirelessed for assistance in order to save the men from a living tomb, no other ship was in range; how, after agonising suspense, the ship's call was picked up by an American schoolboy quite by accident when he was experimenting with a home-

made set, and how he relayed the call on to the destroyer and so was instrumental in saving many lives.

Mr. Masters has told this one particular story very well, but there are others in his book of equal and often greater fascination. "The Wonders of Salvage" is a book to read with deep absorption, and few works of fiction can rival these true stories of "adventures on the deep." The book is handsomely illustrated with photographs.



One of the transformers for use in the above circuit.

The text is distinctly of historical value, but the author of "The Romance of Salvage" knows how to impart colour and romance to his subject, and in this, his latest volume, the reader will inevitably come under the spell of his graphic pen.

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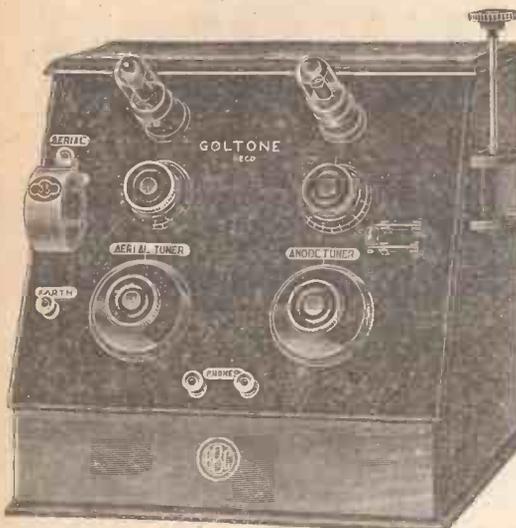
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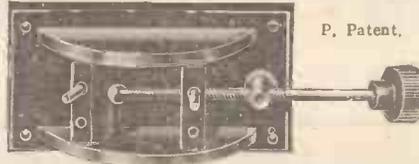


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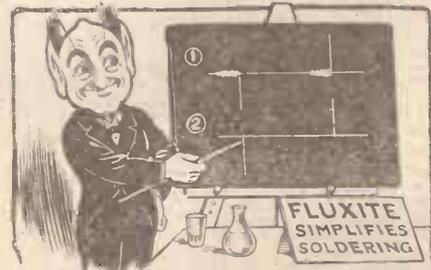
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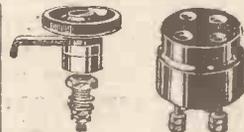
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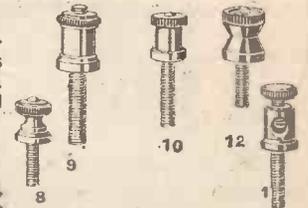
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- Plug and Socket .. pr. 1d.
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RADIOFORIAL

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REVIEW, The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Technical queries are answered by post at a charge of 6d. a query or 1s. for three. All queries must be addressed to the Technical Query Dept., **POPULAR WIRELESS, The Fleetway House, Farringdon Street, E.C. 4,** and must be accompanied by a stamped and addressed envelope. Copies of the queries sent should be kept, as the original query cannot be reproduced in the answer. Cash should be sent in the form of postal orders.

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.

Questions and Answers

handle as might be thought, and a complete set can be constructed in a couple of evenings or so.

J. MCE. (Glasgow).—Is there any possible way that two receivers can be used by two parties with the same aerial? The aerial is 75 ft. long; one receiver is at one end and the other at the opposite end. I want to preclude the necessity of erecting another aerial, as it is an extremely difficult job in the location, there being a slate peaked roof on a group of houses. How can it be eliminated?

You cannot operate two receivers with any certain degree of success on one aerial. It can be done in some small measure if a coupling coil is used on the lead-in, but tuning in on either one of them will de-tune the other. We are afraid that the only method of getting around it is to erect two aerials, one for each receiver, to be sure of good reception when both desire to use their sets at the same time. Erecting a single wire under the first wire, using the same poles, will be satisfactory unless one of the sets happens to be a violent re-radiator, which will cause mutual interference every time both of you want to listen to the same station.

P. T. (Gt. Yarmouth).—I am making a 5-valve set (2 H.F. transformer coupled, detector and 2 L.F.). Is it necessary to exercise as much caution in placing H.F. transformers as with L.F. ones? I have never seen anything mentioned with respect to this.

The magnetic fields produced by H.F. transformers are not nearly so strong as those produced by L.F. transformers, therefore the spacing need not be as great with the former. However, they should be separated by at least two inches to prevent any possible trouble.

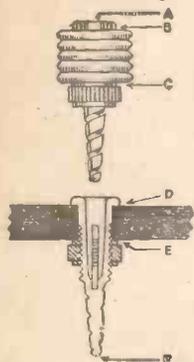
H. A. D. (Chadwell Heath).—I get excellent results upon my one-valve set from stations above 350 metres, but I have trouble in reaching lower wave-lengths. I am told this is due to the condenser used. How can the wave-length range be reduced to receive the shorter-wave stations?

The position in which the condenser is connected to the coil makes the greatest difference to the wave-length which the set will cover.

If connected "in parallel" (that is across the aerial coil) the wave-length is increased. If connected "in series" the wave-length is reduced, and you will find that the more condenser is in series the less will be the reduction in wave-length. Therefore a small condenser in series will reduce wave-length to a greater extent than a large condenser.

(Continued on page 538.)

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·0002 mfd. 8/6 Dual Conden-

·0003 mfd. 10/- ser for 2 stages

·0005 mfd. 10/6 of H.F. - 15/6

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(Type "B")

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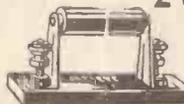
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RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 536.)

It will be seen that the use of a series-parallel switch (for putting the condenser in either position) will enable a wide range of wave-lengths to be covered with the same aerial coil.

It is not clear from your question whether you are using a condenser permanently connected in parallel, or whether your aerial coil is too large. It must be remembered that wave-length range depends not only on the amount of inductance, but also upon the variable condenser used.

Assuming that the inductance is correct, let us consider the condenser. Many believe that if they use a 43-plate condenser they will get a much better range than with an 11-plate condenser or a 23-plate. This might be true, but as a rule it cannot be followed because of the greater variation in types of condensers on the market. The range that can be covered in the broadening field with the condenser does not depend wholly upon the number of plates in it, but upon the ratio existing between its minimum capacity and its maximum capacity; in other words, were a 7-plate condenser to have a larger ratio from zero setting to maximum setting than a 43-plate condenser, you would be able to tune over a larger wavelength range.

One of the things to look for when purchasing a condenser is to see that you are guaranteed a very low capacity at the zero setting of the condenser, and you will then be able to get a very much greater range with your set than if you were to use a condenser without consideration of this point.

C. O. D. (York).—I have a two-valve set, H.F. and det., which has received America several times, and I wish to add an L.F. valve so that it can be switched in at will while I am listening in to distant transmissions.

The arrangement shown on page 113 of our issue of September 13th gives the circuit, but if you wish to switch on the L.T. for low wave reception we advise a separate L.T. and H.T. battery for the L.P. unit, otherwise the switching on of the third valve will upset the other two and reception will be lost for some time, and you will have to tune in again.

B. S. L. T. (Newcastle-on-Tyne).—Are dual receivers always non-selective? On my "P.W." set I get very good signals as far as clearness and strength goes, but I am always troubled with jamming. This is bad enough when listening to 5 N O on the loud speaker, but it is much worse when Newcastle is closed down and I am trying for distant stations on the 'phones. Can anything be done to reduce this disturbance and to make the set more selective, or do all reflex receivers give similar trouble?

All dual circuits are inclined to be non-selective, but tuning can generally be sharpened by one of the following methods:

1. **Reaction.** In the case of the "P.W." set, reaction may be obtained by coupling the anode coil to the aerial coil. This is easily done by taking the respective leads out to a two-coil holder, in which the coils are mounted. Like all reaction coils, the anode coil must be mounted the right way round or it will oppose instead of assist the weak currents in the aerial.

Alternatively, a separate coil may be inserted in series with the anode coil, and coupled to the aerial coil; but this will make it necessary to correspondingly reduce the number of turns on the anode coil. The exact sizes vary under different conditions, and should be altered until desired results are obtained. Generally a 35 and 40 or else 50 and 25 are satisfactory coils to use for this purpose.

2. **Loose-coupling.** Instead of connecting the grid and filament direct to the aerial coil, a "secondary" coil can be used, and placed between the grid and filament leads. This consists of a 50 or a 75 turn coil, with either .001 or .0005 variable condenser across it.

The valve connection with the aerial is not a direct one, but the secondary is coupled to the aerial coil,

(Continued on page 539.)

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Valves .06 amp. - - - - -	18/8
Valve Holders, - - - - -	10d.
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FORGE & CO., EASTHAM FERRY, CHESHIRE.

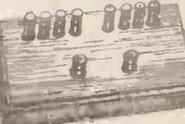
THE "P.W. UNIDYNE"

Build a "P.W." Unidyne Receiving Set with components which will not let you down
Phillip's 4 Electrode Dull Emitter Valves, 25/- Each.
16:14 volts, 15 amp. Post free
Phillip's 4 Electrode Bright Emitter Valves, 12/6 Each.
3:5 volts 3 amp. Post free

ALL VALVES ARE TESTED BEFORE DESPATCH.

Complete Set of Tested Parts for 1 Valve "Unidyne" including Cabinet and Drilled and Engraved Panel. Post free **£3 : 0 : 0**
Ditto for 2 Valve "Unidyne" **£4 : 17 : 6**
Valves Extra, according to choice.
Prompt Delivery. Note Change of Address:
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2/3 THE "EXTRACON" VARIABLE MICA CONDENSER .001
HUNDREDS NOW IN USE
JOHN WALKER & CO.,
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The **"MUNRO"** HEADPHONE Distribution Board

A simple method of listening-in in any part of the house without removing your set. Made of Polished Walnut Hardwood. Brass Terminals for four pairs Headphones.
PRICE 3/6, POST FREE.
N.P. Terminals 1/- extra. Extension Flex, 4d. yd.
MUNRO & CO., Pembroke House,
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Phone: Royal 1481.

ENTIRELY DELIVERY **3 DAYS**
NEW PROCESS DELIVERY **3 DAYS**



Equal to, if not better, than a new valve.
Money refunded if not satisfied.
TRADE TERMS ON APPLICATION.

WIRELESS VALVES REPAIRED BY LUMINAX

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ENTIRELY POST **6/6 FREE**
NEW PROCESS POST **6/6 FREE**



Power and special purpose valves.
AGENCIES AVAILABLE
PRICES UPON APPLICATION.

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 538.)

which has no other connection besides the tuning condenser and aerial and earth leads. A two-coil holder can be used to hold the coils, and varying the degree of coupling between the two coils will often entirely eliminate unwanted signals.

Results with loose-couplings vary greatly, and whilst the selectivity gained often results in rather weaker signals, it sometimes happens that signals are quite noticeably stronger than before. If the rearrangement of the set can be carried out without much difficulty, loose-coupling is well worth trying on all straightforward circuits.

It should be remembered that where the interference is constantly coming from a powerful local station (such as a B.B.C. station situated within 10 miles or so), the ordinary methods of interference elimination will not be successful, and a "wave trap" with rejector circuit or similar device must be employed.

R. W. K. (Dublin).—In the booklet "Five Special Crystal Sets," what is the meaning of the figures in columns four to twelve, Table of General Data?

The figures under the various diameters shown indicate the maximum wave-length of coil in metres used with a 100 ft. aerial.

May a variometer—loaded if necessary—be used in place of the tapped inductance coils shown in the diagrams, without deterioration of efficiency?

The variometer is very efficient for tuning over the range for which it is constructed, and can be loaded with fair efficiency up to about double its natural range. But if loaded in excess of this it becomes very inefficient, and a broadcast variometer which has been loaded up to, say, 1,600 metres for Chelmsford, will be found to be very unsatisfactory for tuning.

"REGULAR READER" (Preston).—With reference to Mr. Sholl's article in "P.W.," No. 124 (October 11th), describing the construction of a two-valve Unidyne Set. What is the capacity of the "J.B." Microdenser which is given in the list of components?

The most convenient condenser to use is one having a maximum capacity of .0005 mfd.

W. B. (co. Down, Ireland).—Has the construction of a valve magnifying unit for a crystal receiver been described in a back number of "P.W."?

An article, entitled "A Useful and Easily-made L.F. Amplifier," appeared in "P.W." No. 81.

I wish to construct a selective crystal set capable of receiving Paris, Chelmsford, and other long-wave stations, as well as broadcasting. Has such a set been described recently in "P.W."?

A suitable set for your purpose is described in "A Selective All-Wave-length Crystal Receiver," which appeared in "P.W." No. 119 (September 6th, 1924). Back numbers of "P.W." may be obtained from The Amalgamated Press (1922) Ltd. (Back Number Dept.), Farringdon Street, E.C.4, price 4d. each, post free.

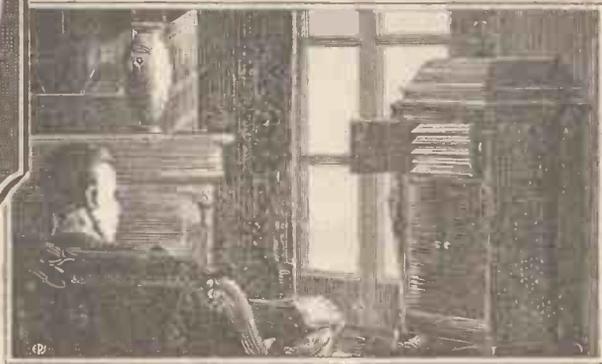
W. C. S. (Iford), E. S. S. (Derby), A. G. M. (Tooting), D. L. (Weymouth), T. W. (Blackpool), R. W. T. (London, N.10), H. F. (Liverpool), A. E. K. (Anerley), J. H. (Hull), L. W. G. R. (Bexley Heath), S. C. H. (Felixstowe), E. D. (Leeds), N. McG. (Stirling), E. W. B. (Tottenham), G. C. P. (Leicester), "Sovereign" (Stockport), T. K. (Newton Chester), W. D. (Humberstone), W. T. (New Cross), V. C. (Manchester), N. E. M. (Brondebury Park), and F. J. P. (Tottenham).

In sending your queries unaccompanied by a stamped addressed envelope you disregard the rules of the Query Department. As the questions are not of sufficient general interest to answer through these columns (or else have already been dealt with) replies can only be sent through the post. For this purpose a stamped and addressed envelope should be enclosed.

Foreign readers—whose postage stamps cannot be used for prepayment of letters to be posted in this country—can send "Reply Coupons," which are obtainable at their local post-offices, and can be exchanged here for British stamps. The queries should be repeated, and should in all cases be numbered. Replies to each question will then be given under the appropriate numeral.



Louden



Have you noticed it?

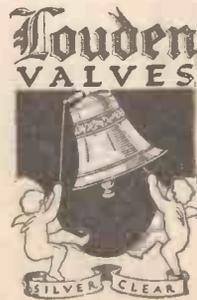
If you listen intently to your gramophone you will become aware of the light scratching of the needle. But although you hardly notice it unless you listen specially it is there all the while.

Once you could hear gramophone music against a background of complete silence you would never be content to return to the obligato of scratches and hisses which you now cheerfully endure.

It is the same with Wireless Reception; you hardly notice the continuous breathing sound going on in your loud speaker but—unless your set is fitted with Louden Valves—it is there, and it is preventing you from getting the best possible results from your set.

The Louden Valve has been designed specially with the object of eliminating all those "mush" or breathing sounds so prevalent with valves of the ordinary type. If you would care to know how this is achieved your dealer will supply you with a folder giving full information.

But we feel that you are concerned with *results* rather than with *reasons*, so our advice is that you should not consider your present reception perfect, but fit Silver Clear Louden Valves and see how much better it can be.



The plain Louden for detecting and Low Frequency Amplification.

The Blue Louden for H.F. Amplification. Filament Volts 7-8.5. Filament Amps 0.4. Anode Volts 40-60.

FELLOWS WIRELESS

Manufactured throughout in Great Britain. All Loudens are Silver Clear and free from "mush." The current consumption is very low and the life long.

Louden Valves - Silver Clear



—the same portable and non-spillable Accumulator that the miner uses!



Even when the Oldham Portable is held upside down the acid cannot spill. The ideal battery for all Dull Emitter Valves.

EVERYONE knows that the Miner's Electric Lamp must be able to withstand hard knocks and deliver a regular supply of light month in and month out. The Oldham Lamp has achieved a great reputation by reason of its special Activation Process—a unique method of accumulator plate-making which ensures a longer life and greater reliability.

The same long life Battery which is used in Oldham Miner's Lamps is now available for use with Dull Emitter Valves.

Hold it upside down—shake it even—and the acid cannot spill. Think how convenient a pocket-size accumulator will be. Made from strong seamless celluloid with generous terminals it is workmanlike and attractive in appearance. Just the accumulator for Wuncells, 1-volt Oras,

Wecos—and two of them in series will run a Dull Emitter of the '06 type for weeks at one charge.

See it at your Dealer's to-day and you will appreciate the wisdom of paying a shilling or two more to obtain an accumulator which will easily outlast two ordinary accumulators.

Two volts in series 12/-
ampere hours continuous

Oldham & Son, Denton, Manchester.
LONDON - Gt. Chapel Street, Oxford Street, W.1.
NEWCASTLE - - - - - 1, St. Mary's Place.

Special Activation Process OLDHAM ACCUMULATORS

Gilbert Ad. 1671

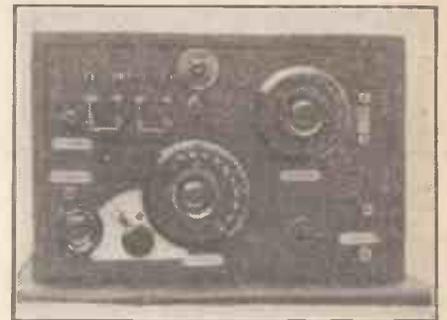
Correspondence

THE "P.W." ULTRA CRYSTAL SET.

The Editor, POPULAR WIRELESS.
Dear Sir,—I am writing to tell you how pleased I am with the Ultra Crystal Set, described in "P.W.," No. 114, which I have constructed. I must say, however, on first trial I was frankly disappointed, as Birmingham, 30 miles away, only came in faint. This was strange as I use a full-size aerial, 32 ft. high and 75 ft. long, and adhered strictly to the specified number of turns on the coils. I soon remedied this defect by taking three more tappings of ten turns. This had the desired effect, and now I am delighted to say I receive 5 I T with a fine roar, with Chelmsford, 150 miles away, equally as strong. I also receive the Nottingham relay station, 25 miles away, very distinctly. I can also get Manchester, London, and Glasgow, the first two plain enough to hear what is being said. On Thursday, Friday, and Saturday last, between 8 and 10 p.m., I received a foreign station on about 1,000 or 1,050 metres, speech being guttural. The programmes consisted chiefly of piano and violin solos, followed by a dance band with vocal accompaniment. I also find I can receive most distinctly without the earth connected up. Altogether, I consider the Ultra Set far above the ordinary for a crystal set, and congratulate "P.W." on inventing such a fine circuit.
Yours respectfully,
W. TAYLOR.
110, Regent Street,
Church Gresley,
Burton-on-Trent.

AN H.F. AND DETECTOR UNIDYNE.

The Editor, POPULAR WIRELESS.
Dear Sir,—I enclose herewith a photograph of one of the Unidyne receivers (H.F. Det.) which I have constructed, and trust it is suitable for reproduction in your journal.
I have had excellent results on this set, having received Leeds (relay), Hull (relay), Manchester



Newcastle, Glasgow, Aberdeen, Bournemouth, Chelmsford, "Le Petit Parisien," Breslau, and Frankfurt-am-Maine.

Yours truly,
C. J. INGHAM.

Rosedene, Victoria Terrace,
Tadcaster, Yorks.

THE "P.W." REFLEX CIRCUIT.

The Editor, POPULAR WIRELESS.
Dear Sir,—I am writing to let you know the results I have obtained on the one-valve "P.W." Dual Circuit. I have been successful in obtaining the well-known American Broadcasting station W G Y. I heard it two nights running, so the idea of re-radiation is abolished. The results were very good, and every word could be heard distinctly, but there was a little fading at times. My aerial is a fairly good one, being 30 ft. high and 60 ft. long, and not being screened by houses or trees. I have also heard all the B.B.C. stations, and five Continental ones, being Ecole Supérieure, Radio-Paris, Brussels, Hamburg, and Holland.

Wishing POPULAR WIRELESS every success,
Yours faithfully,

27, Weston Park,
Crouch End, N.8. H. HINDE.

K D K A RESULTS.

The Editor, POPULAR WIRELESS.
Dear Sir,—I am writing to let you know of the success I have had with the K D K A one-valve set, which appeared in "P.W.," No. 97, on page 214. K D K A comes in wonderfully clear, and on October 5th the whole concert was received right from the first item up to the relaying of the "Arlington" Time-signals at 3 a.m., G.M.T. And on Sunday, October 12th, Capt. Eckersley's voice was easily recognised.

Yours truly,

12, Lord Street,
Letchford, Warrington. H. T.

(Continued on page 541.)

CORRESPONDENCE.

(Continued from page 540.)

RECEPTION OF SOVIET STATIONS.

The Editor, POPULAR WIRELESS.
 Sir,—Re "Reception of Soviet stations," of which you ask for any available information; perhaps from the following lines you may get sufficient data to enable some of your readers to get on the track of these concerts, or at least one of them.

First of all, my set is just a common single slide crystal set, home-made; my aerial a single wire, about 55 ft. high, 45 ft. long, and about 40 ft. high at the lead-in end. We have no ship's wireless, and this is for my own amusement.

While lying near the port of Viborg, in Finland, on September 27th, at 7 p.m. (Greenwich time), I put my "phones on and out of curiosity moved the slider back and forward a few times, when I was surprised to hear a voice speaking. After careful tuning and wangling the cat's-whisker I got it fairly plain, hearing a good deal of talking and several songs; as near as I can judge the wave-length would be about 450-480 metres, judging from where my slider is at present for the Hull station. This concert lasted until about 8.25 (G.T.), when I distinctly heard the Russian National anthem played by an orchestra, then a few words, and it closed down. The following evening there were several tunes which I recognised from the "Tales of Hoffmann," the Barcarole coming through very plainly. The next day I went on board a German ship which had wireless, and saw the operator. He had been trying to pick up some music, but the size of his coils restricted him to certain wave-lengths (a Telefunken set). From the information I gave him he tried that night, and thought the wave-length about 460. He said it was a Russian station, but one or two of the songs had been in German. Yet at the end there had been a lot of Russian folk music and dance music. The nearest place in Russia where there was likely to be a concert station was Petrograd, 65 miles away. I made inquiries, and found there were no concert stations in Finland.

I heard these concerts for four successive nights, after that reception was faint.

Trusting these lines may contain some items of interest.

Sincerely yours,
 East Boldon, J. J. STOREY.

THE "P.W." UNIDYNE.

The Editor, POPULAR WIRELESS.
 Dear Sir,—I have constructed a one-valve Unidyne receiver, using the circuit given in "P.W." No. 112—i.e. without any transformer, and have received nearly all the B.B.C. main stations and a French and a German station quite clearly.

These results in themselves would be excellent for any one-valve "straight" circuit, but I cannot but feel that they are outweighed by the fact that with a Unidyne receiver we have at last a valve set capable of reproducing a studio concert without extraneous noises—a claim which few H.T. receivers can make. That a wireless set for receiving broadcast should function firstly as a musical instrument and not as a device for producing the maximum amount of noise is a point which seems to have been forgotten by the majority of designers. The Unidyne principle does away with all background and splutter; in fact, reception is that of a crystal set, only, of course, much louder.

There is one point which may be useful to readers who decide to make this set and that is that the size of the reaction coil may prove somewhat critical. To obtain maximum results one should experiment with coils of various sizes, and if this is done I am sure that there will be few disappointments.

Yours faithfully,
 O. G. SUTTON.

The Schoolhouse, Cwncarn, Crosskeys, Mon.

THE B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.
 Dear Sir,—Your comments on Mr. Holloway's letter in a recent number call the attention of your readers to the B.B.C. programmes.

I consider Mr. Holloway's points on this question are very fair and accurate, and am in agreement with his criticism.

I do not concur with your observations on his letter when you say, "if the majority of listeners were dissatisfied with the programmes they would quickly be altered."

Letters of complaint and criticism have been sent to the B.B.C. for months past, but no improvement in the desired direction has resulted.

I have not joined in the chorus of disapproval because I think it would be useless. Remember, the B.B.C. are a monopoly, and whoever heard of a monopoly "quickly" altering their policy to please anyone?

One is too disappointed and weary of the programmes after waiting over eighteen months for something better, to commence writing to the B.B.C. and maintain it until they give their listeners a programme worthy of the wonderful possibilities of wireless.

Yours faithfully,
 J. B. TITCHENER.

G1, Brailsford Road, Brixton, S.W.2.

[NOTE.—Readers will observe that our correspondent has NOT written to the B.B.C. himself, and that he still retains the erroneous belief that the B.B.C. is a "monopoly."—Ed.]

Brown



Factory Series.
 No. 6.



Illustration shows aluminium cases for the H2 type Loud Speaker being machined.

Expert knowledge and Superb machinery

THE high reputation enjoyed by all Brown Wireless products—not only in this Country but throughout Europe and the Colonies—was not built up in a day. It is the result of an increasing effort to produce apparatus of nearly electrical and mechanical perfection as possible.

Take for example the Brown Loud Speaker. Few can realise the immense number of processes necessary before the Instrument reaches its final tests. Even when the Loud Speaker arrives at the Testing Department it is by no means certain that its tonal purity and volume will reach the high standard of efficiency which has been so deliberately set.

No Loud Speaker is ever released for issue until S. G. Brown, Ltd., are satisfied that it will uphold their reputation as

builders of the finest Loud Speakers on the market.

Naturally, to produce such instruments requires sensitive and accurate machinery and workers possessing experience above the ordinary. Although there is such a tremendous demand for Brown Loud Speakers because the wireless public has realised that its exclusive tuned reed principle must give more faithful reproduction, yet the policy of S. G. Brown, Ltd., is such that every instrument receives individual care from commencement to finish.

It is worth remembering that the very first Loud Speaker for Wireless use was manufactured by S. G. Brown, Ltd.—even the words Loud Speaker were evolved by them—obviously such greater experience must have its effect upon ultimate results.

From all Dealers or can be demonstrated at the following Showrooms:

- 19, Mortimer St., W.1.
- 15, Moorfields, Liverpool.
- 67, High Street, Southampton.

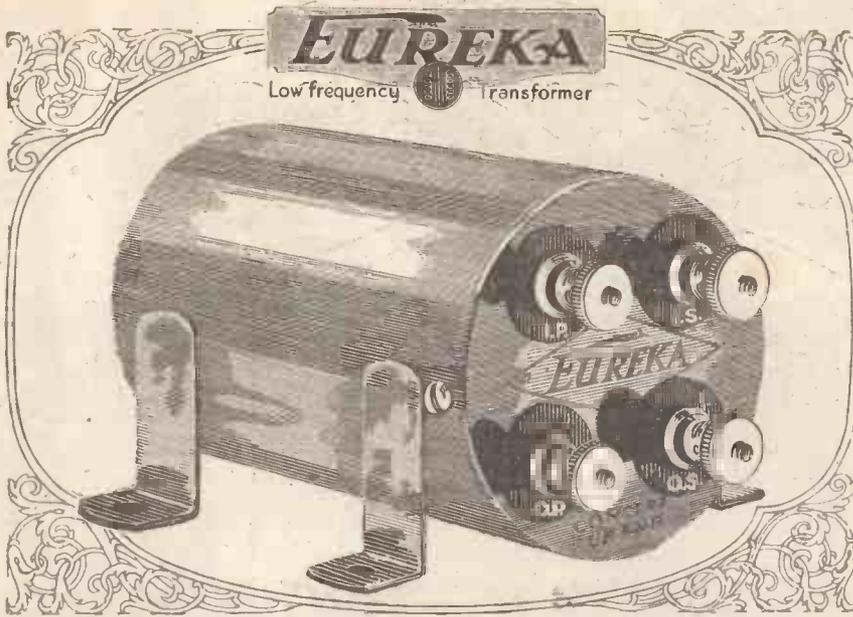
Prices:

Type H.1	Type H.2	Type Q
120 ohms £5 5 0	120 ohms £2 5 0	£15 15 0
2000 ohms £5 8 0	2000 ohms £2 8 0	in all
4000 ohms £5 10 0	4000 ohms £2 10 0	resistances.

S. G. BROWN, LTD.—Victoria Road, N. Acton, London, W.3.

TECHNICAL NOTES.

(Continued from page 502.)



—built for the man who
wants something better.

FOR the man who wants the finest Transformer money can buy, there can be only one choice—the EUREKA. Its scientific design and robust construction is the culmination of a decision to produce a truly distortionless and powerful Transformer irrespective of prime cost.

Its particular design is responsible for a core of generous dimensions, coils that contain as much as 2 1/2 miles of fine copper wire and a steel case fashioned to prevent interaction.

Every detail of its construction is under the supervision of skilled instrument makers—and even the raw material before being put into use is subjected to the most careful scrutiny.

The insulation between windings and between windings and case has been tested up to a breakdown strain of 2000 volts—more than four times the safety limit allowed to ordinary Transformers. And owing to the exclusive process of hermetically sealing the interior this high insulation efficiency can be retained indefinitely.

The man who appreciates that the L.F. Transformer is the one factor that can make or mar Loud Speaker reception will eventually select a EUREKA—none other can satisfy his critical demands.

Sold by all Dealers and manufactured only by
PORTABLE UTILITIES CO. LTD.,
7 & 8, Fisher Street, LONDON, W.C.1
Scottish Agents: FULLER, BLACKIE &
RUSSELL, Ltd., 30, Gordon Street, Glasgow.

Made in two types
Concert Grand .. 30/-
Eureka No. 2 .. 22/6
(For second stage.)



Gilbert Ad. 1665

amounts of energy by bringing about unusual changes in the constitution of atoms, the process, whatever it may be, being popularly referred to as "tapping the energy of the atom." It is true that some of the atoms of a radio-active substance, in undergoing a certain degree of spontaneous disruption, yield a relatively large amount of energy; that is to say, an amount of energy large compared with that which the atoms would yield when entering into an ordinary chemical combination. It has been calculated, for example, that if all the atoms in one ounce of radium could be exploded, the energy liberated would be equal to that produced by the detonation of about 30 tons of dynamite. But it is probable that these radio-active atoms are exceptional.

A Special Class of Atoms.

It may be that the elements uranium and thorium (the two original radio-active elements) represent the survivals in the earth of types of elements that were common in the distant ages when the atoms now composing the earth were in course of formation. It is possible to regard these atoms as having not yet completed the cycle of changes which the ordinary atoms have long since passed through, and that the radio-active atoms are still in the "excited" state, where the nuclear units have not arranged themselves in positions of ultimate equilibrium, but still have a surplus of energy which can only be released in the form of the characteristic radiation of active matter. On such a view the presence of a store of energy ready for release is not a property of all atoms, but only of a special class of atoms.

These remarks apply, of course, to energy released by the spontaneous or radio-active disruptions of atoms of matter. Energy may, however, be released during the process of the building up of lighter atoms into heavier ones. For example, if four hydrogen atoms unite together to form a helium atom, the mass of the helium atom is less than the sum of the masses of the four hydrogen atoms, and with the disappearance of a certain proportion of the original mass, energy is produced. To break down a helium atom into hydrogen atoms, with the production of mass, however, energy must be supplied from without.

On the general question of the tapping of energy from the atom, otherwise than by the ordinary processes of combustion and chemical reactions generally, whilst, of course, it is necessary always to preserve an open mind, it should be said that in the present state of science there appears to be no evidence that this is in any way on the verge of accomplishment.

(Continued on page 543.)

PHONE REPAIR SERVICE

ALL MAKES and Ex-Army Phones rewound 4,000 ohms, 4/6 per pair; 8,000 ohms, 1/- extra. Postage, 6d. Remagnetizing, 1/- per pair. Transformers rewound, any ratio, from 5/-.
The H.R.P., 46, St. Mary's Road, Leyton, E.10.

ACCUMULATORS.

C.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	25/6
4v-60a	21/9	6v-60a	32/6
4v-80a	27/6	6v-80a	40/6
4v-100a	32/6	6v-100a	47/6

Special Line—
Best English Make, 6-v. 60-amp. hour, 22/9 each.
MAUDE RUBBER CO., 58, PRAED ST., LONDON, W.2.

TECHNICAL NOTES.

(Continued from page 542.)

Short-Wave Transmission.

In a recent number of "Radio Broadcast," Prof. J. H. Morecroft, the well-known wireless authority, discusses the uses of short-wave in wireless transmission, and gives some significant prophecies as to its importance in the future of wireless.

The high-frequency range, from 3,000 kilocycles upwards, was regarded as useless only a few years ago. It was admitted to be interesting for laboratory experiments, such as those of Hertz, but considered to be of no practical value for long-distance communication.

Opinion on this point is rapidly changing round, however, and the feasibility not only of waves of 3,000 kilocycles, but of even shorter waves being employed for long-distance transmission is being more and more demonstrated. Pittsburg to London, and Schenectady to California and England, both short-wave channels, seem to have attained a remarkable degree of reliability compared with what was originally expected.

Power Radiation.

With a good antenna, continues Prof. Morecroft, as much as 10 kilowatts can be radiated at 3,000 kilocycles without any trouble, and possibly much more than this will be achieved when we know more of high-frequency engineering. Up to the present there appears to be no advantage from the point of view of "fading" with the short waves. With waves as short as 36 metres, a Paris amateur has communicated with Algiers, and Marconi and others have used still shorter waves for very long distances.

An Interesting Experiment.

The very high speed of wireless waves was brought out in rather an interesting manner in an impromptu experiment carried out by a wireless amateur in St. Thomas, Ontario, Canada. Station W T A M, in Cleveland, was broadcasting a concert when the amateur in Ontario called up W T A M on the long-distance trunk line, and, having got through, placed the transmitter of the land-line against his loud speaker, on which he was reproducing the Cleveland broadcast concert.

The operators in the studio in Cleveland heard the concert by land-line from Ontario apparently coincident with the concert as proceeding in the studio. The music had travelled by wireless to Ontario and then back by land-line, but the lag was so slight as to be inappreciable.

Wireless Devining.

At a recent World Power Conference in London a well-known Austrian engineer, O. Taussig, suggested the employment of wireless waves, transmitted from aeroplanes, for locating underground water and mineral deposits. Some experiments have, in fact, been made in Austria, short waves being sent continuously from a transmitter on a Zeppelin type of airship, and it is said that, according to the intensity and manner of

(Continued on page 544.)



—ensure success by using Radion for your next Panel.

QUITE a number of Wireless enthusiasts decide to make up a good set and purchase only the very best components—determined that the Receiver should be the last word in efficiency and results. And yet—they make one little mistake. They exercise no discrimination in the choice of their Panel.

Not everything masquerading as ebonite is worth using for a panel in a wireless Receiver. On the contrary independent experts have proved that Radio demands the very highest efficiency in insulation it is possible to obtain.

An inferior panel—while not completely preventing a Receiver from functioning—will cause a serious loss in signal strength.

The remedy is to use a material which is fully guaranteed to have passed the most stringent tests—which never varies in quality—which is readily identifiable—and which can be obtained all over the country.

Such material is Radion.

Radion is manufactured in two colours—but one quality only. A beautiful glossy black and Mahoganite—a colour which

faithfully reproduces the sheen of old mahogany.

Its polished surface need not be removed—a real boon to the home constructor who naturally dislikes tedious sandpapering. By its use the appearance of the Receiver is considerably enhanced while no dust can gather on the panel to its detriment.

Radion is sold by all dealers and can be obtained in 21 different sizes packed individually in stout envelopes. Each panel is squarely cut with its edges accurately ground and the name Radion is stamped in the corner.

Radion Sizes and Prices:

Size	Black	Mahoganite	Size	Black	Mahoganite	Size	Black	Mahoganite
6" x 7"	3/6	4/3	7" x 14"	8/-	10/3	8" x 26"	17/6	21/3
6" x 10 1/2"	5/3	6/6	7" x 18"	10/6	12/9	9" x 14"	10/6	12/9
6" x 14"	7/-	8/6	7" x 21"	12/3	15/-	10" x 12"	10/-	12/-
6" x 21"	10/6	12/9	7" x 24"	14/-	17/3	12" x 14"	13/3	16/-
7" x 9"	5/3	6/6	7" x 26"	15/-	18/6	12" x 21"	19/9	24/3
7" x 10"	5/9	7/3	7" x 30"	17/9	21/6	14" x 18"	19/9	24/3
7" x 12"	7/-	8/6	7" x 48"	28/-	34/6	20" x 24"	39/6	48/-

Special Note: All 3/4 in. thick—quite sufficient owing to Radion's tremendous strength. Dials and Knobs to Match.

RADION FOR PANELS

American Hard Rubber Co. (Britain), Ltd.
13a, Fore Street, London, E.C.2

From all Dealers. Gilbert Ad. 1672

To WIRELESS TRADERS, DEALERS, ELECTRICIANS, and others.
THE AUCTION ROOMS,
 13, HIGH HOLBORN, W.C.1.
HENRY BUTCHER & Co.
 will SELL by AUCTION, on the PREMISES, on THURSDAY, November 6th, 1924, at 10.30 a.m., large quantities of ex-Government Surplus WIRELESS and ELECTRICAL ACCESSORIES and STORES, comprising:
 50,000 gross BRASS TERMINALS and SCREWS.
 200 prs. HEADPHONES, 500 HEADBANDS, 2,000 SINGLE EAR PHONES.
 2,000 SINGLE MICROPHONES, 1,000 2-m.f. CONDENSERS.
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TECHNICAL NOTES.
 (Continued from page 543.)

the reflection of the waves from the earth, estimates can be made of the probable presence of water and minerals.

Improved Loud Speaker.

An amateur writing in one of the French wireless journals describes a very simple loud speaker which he made at practically no cost, and which he states worked well. A long funnel was first made by rolling a sheet of stout brown paper in a well-known manner; the narrow end was allowed to become completely closed up. About two or three inches from the closed end two holes were cut in the paper, at opposite ends of a diameter of the section, the holes being about 1 in. in diameter.

A piece of bamboo was taken, 6 in. in length, and about 1 in. in diameter, the core cleaned out so as to make a tube, and a V-notch cut at the centre. This bamboo tube was then passed through the two holes in the brown paper until the V-notch was centrally within the trumpet and facing towards the open end of the same. The headphones were then placed against the two ends of the bamboo tube, the sound entering the tube and escaping through the V-notch into the interior of the brown-paper trumpet.

Loud-Speaker Announcers.

Some of the Paris subways have recently tried experiments with loud speakers to announce the names of the stations and, if the trials are successful, it is contemplated to extend the method to the entire subway system.

Crystal Cups.

When mounting a crystal in a cup of the type in which the top or cap is screwed down to hold the crystal in place, you will sometimes find, especially if you are using a small fragment of crystal, that the latter cannot be fixed tightly even when the cap is screwed home. To get over this difficulty, take a piece of tinfoil and crumple it up in a small pad, place this in the cup first, to raise the crystal up a little, and then screw down the cap. Add more foil if necessary.

If the hole in the cap is too large, roll some foil into a little stem and bend this round into a ring, and lay on the top of the crystal. Or a brass washer having a smaller hole than that in the crystal cap may be introduced upon the top of the crystal.

Philips "R" & "D.2" Valves..... 7/6 each
 Philips Dull Emitter Valves..... 17/6 ..
 Dutch "R" Valves..... 5/- ..
 Postage free. Loud Speakers, Headphones, etc., etc.
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	R. Type.	Dull Emitters.
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Ask for MULLARD H.F. Red Ring Valves for H.F. AMPLIFICATION AND DETECTION, 12/6 each.

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(These Green Ring Valves give wonderful results in reflex or dual circuits).

Mullard H. F. and L. F. Valves only require a 4-volt Battery.

Leaflet M. 8 can be obtained from your dealer, and avoid accidents to your valves by asking for the Mullard Safety-Disc, free on request.

Send us his name and address if you cannot get what you want, and we will supply him.

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THE MASTER VALVE

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THE RIGHT WAY TO JUDGE Low Frequency Amplification

PURITY FIRST—VOLUME AFTERWARDS. All too readily moderate tone quality has been accepted as good, but sooner or later the right means of obtaining pure low frequency amplification will be used universally, instead of by those who are sufficiently discriminating, as at present.

The right way to obtain pure low frequency amplification is to use a coupling at each stage which has been designed to meet the technical requirements of the position. For instance, the importance of the first stage transformer cannot be over-estimated, for any distortion here is magnified many times with each succeeding stage. But the expensive transformer which is ideal for the first stage need not be used throughout unless superlative amplification is desired, for it is not so necessary to have such high impedance in the second and third stage transformers as in the one used for the first stage. Where power amplification is used, however, the first stage transformer should be employed.

Apart from the usual transformer coupling, another interesting coupling to use is the LISSEN L.F. CHOKE COUPLING. To the keen enthusiast the comparisons possible are very instructive. One can, for instance, see how many stages of LISSEN CHOKES can be used in cascade.

Each requirement of low frequency amplification is met by the following parts. In the design of these couplings, **PURITY OF TONE QUALITY HAS BEEN THE FIRST CONSIDERATION—PLEASING VOLUME THERE IS, TOO, BUT AFTERWARDS. IN BUYING A LISSEN TRANSFORMER OF ANY TYPE, YOU CAN BE SURE YOU ARE GETTING PURITY AND POWER—and the best transformer value.**

LISSEN L.F. CHOKE COUPLING

The new LISSEN L.F. CHOKE is becoming very popular—for quality of tone it ranks with the best Resistance Capacity Coupling, without the disadvantage of using the large H.T. voltage necessary with the latter. Its price makes it very economical also.

HOW TO USE THE LISSEN L.F. CHOKE

The construction of an L.F. amplifier using LISSEN L.F. CHOKES instead of transformers is quite simple. The connections are as follows:—

One terminal of the LISSEN CHOKE is connected to the plate of the preceding valve, the other terminal to the H.T. Battery. A fixed condenser of .01 capacity is connected between the plate of the preceding valve and the grid of the L.F. valve, and a grid leak (preferably the LISSEN Variable Grid Leak) is connected between the grid of the L.F. Valve and the L.T. negative. Grid cells should be introduced between the grid leak and L.T. negative if they are found necessary. Each succeeding stage is connected in the same manner.

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IMMEDIATELY BEHIND THE DETECTOR VALVE

Use the LISSEN T₁. If you contemplate buying an expensive transformer, be sure you can get none better than this. **35/-**

FOR REFLEX CIRCUITS

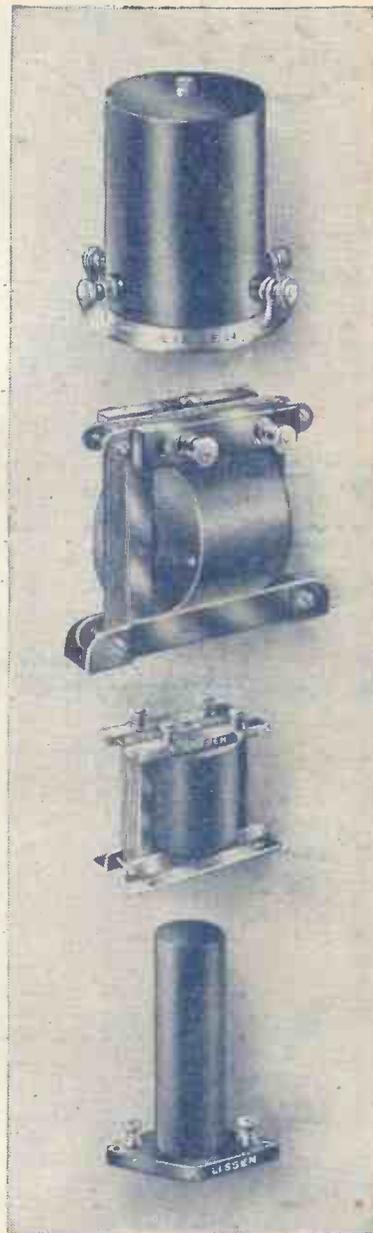
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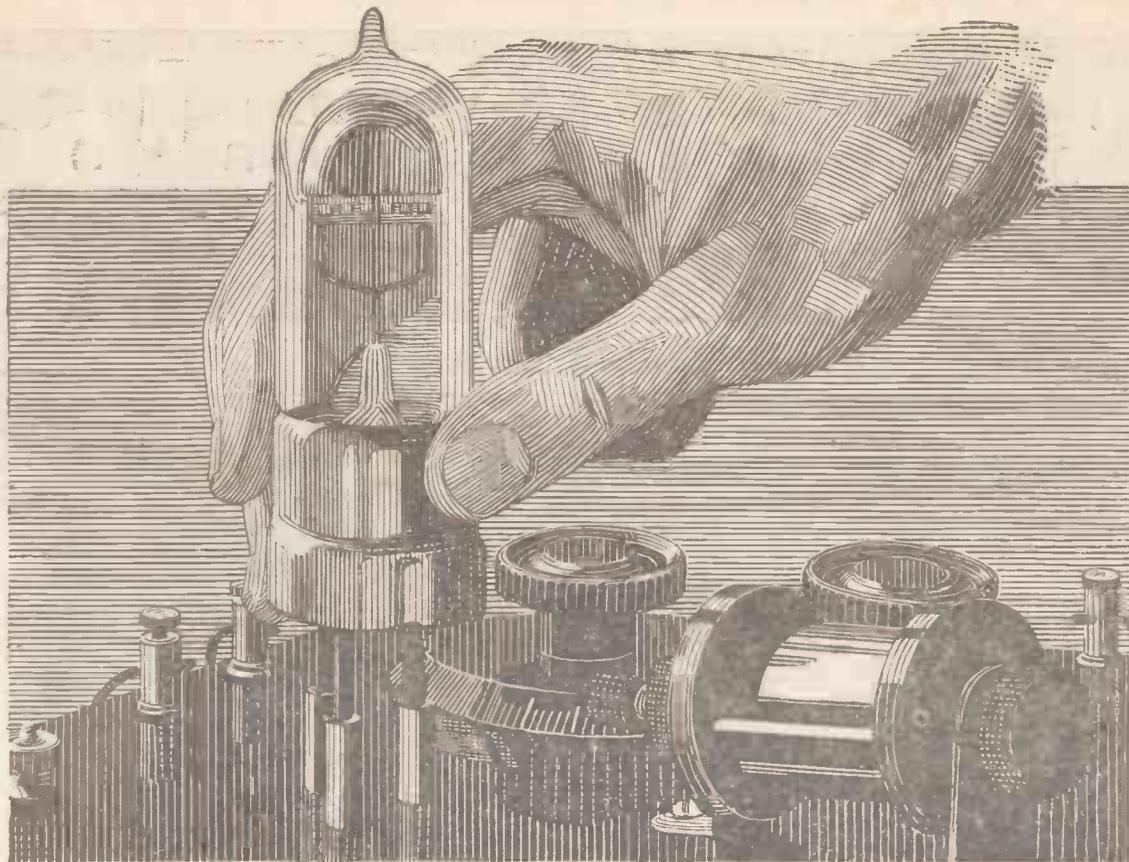
Operating the receiver at a modern Marconi direction finding station.

FEATURES IN THIS ISSUE.

A Dual Amplifier for Crystal Sets.
 How to Make a One-Valve Set.
 Listening-in for New Zealand.

Some "Dead-Spot" Experiments.
 Overhauling Your Apparatus.
 Short-Wave Reception.

Etc. etc., etc.



A sovereign remedy for a lifeless receiver

NUMBERS of wireless enthusiasts have never experienced the finer delight of logging distant Broadcasting Stations. They still think that it requires some kind of "professional skill." They have not yet realised that the fault probably lies in their Valves and the lack of a little patience in learning the capabilities of the Receiver and how to tune it.

Both of these points are capable of easy remedy. If your Set is lifeless—that is to say, if it will not respond

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to long-distance signals, it is quite likely that you are using the wrong kind of Valves.

While, obviously, loss of efficiency in a Valve may not seriously affect the reception from near-by stations, yet when you are dealing with the extremely faint oscillations generated by a Station hundreds of miles away you cannot afford to take chances.

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P.1. For Detector and Low-Frequency use **12/6** | P.2. (with red top) For H.F. use only **12/6**

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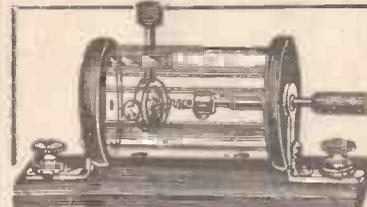
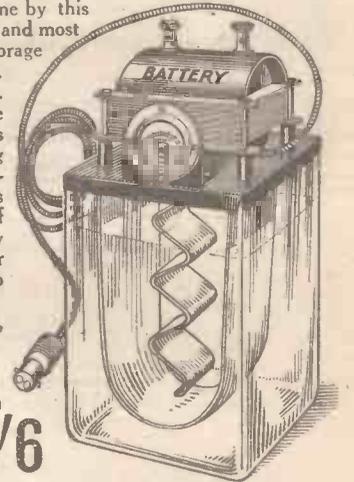
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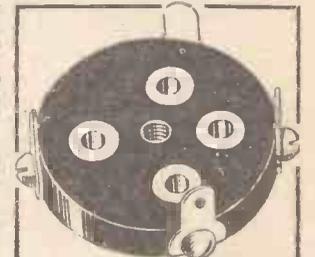
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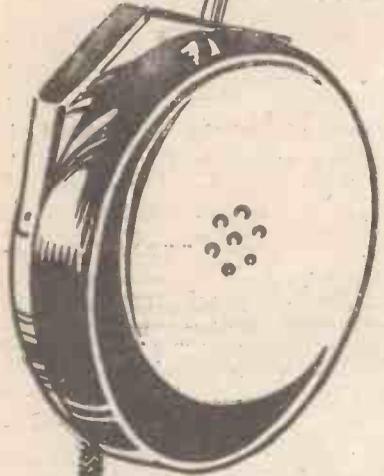
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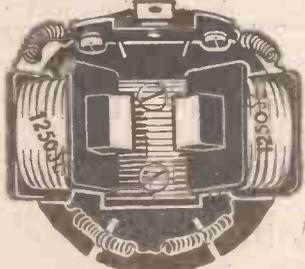
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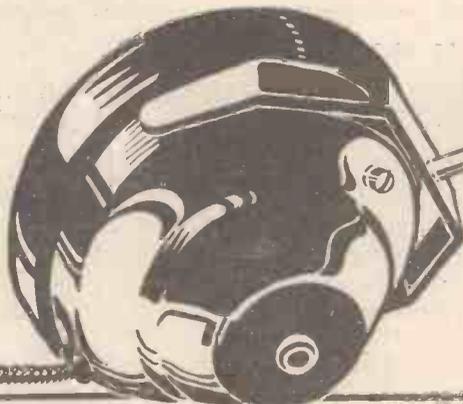


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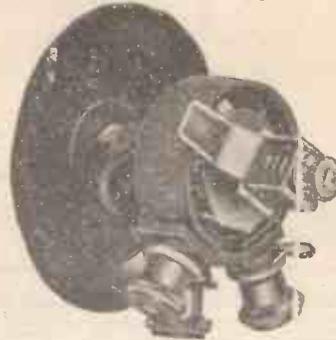
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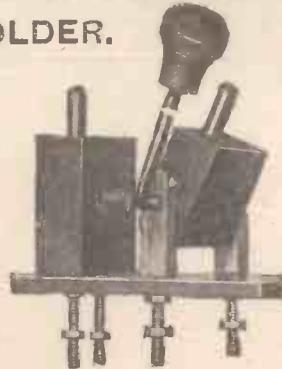
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POPULAR WIRELESS

AND WIRELESS REVIEW.

November 8th, 1924] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d

Technical Editor :
G. V. DOWDING, Grad. I.E.E.

Editor :
NORMAN EDWARDS, M.Inst. R.E., F.R.G.S.

Scientific Adviser :
Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

Important Announcement !

WILL readers please note that, commencing with our issue for week ending the 22nd inst., POPULAR WIRELESS will be on sale every week on Thursdays instead of Fridays ?

The Relay Stations.

HAVE you noticed how well the relay stations have been coming in lately ? On a single-valve Unidyne I picked up three of them the other evening, and Hull was as strong as any of the main stations, except 2 L O and Bourne-mouth, whilst Liverpool had nearly as much "punch" as Birmingham or Manchester.

Any Complaints ?

HULL evidently transmits very strongly in a northerly direction also, as a week or two ago the Edinburgh engineer was on the phone to 6 K H complaining of jamming from there. But, so far as I know, nobody has ever complained of 2 E H being too loud—it is generally quite the other way !

The Warning Note.

THE new five-seconds warning, which is now broadcast to all stations preceding the time-signal, will prove a rather useful innovation. The tuning note has always been very popular as a means for calibrating condensers and marking wave-length, and the new warning signal—which is similar to the tuning note—lasts just long enough to serve a similar purpose.

More Zoo Transmissions.

THE next Zoo transmission has been arranged for Sunday, November 16th. Sunday has been selected so that the B.B.C.'s audience—juvenile and adult—will be as large as possible for an afternoon performance.

Radio Exams.

A WIRELESS University, open to everyone who owns a receiver, is one of the interesting possibilities of educational broadcasting.

A promising beginning has already been made, and the first wireless examination for schools is to be held before Christmas. Prizes to the value of £10 will be given by the B.B.C.

On the Dust-Heap.

WHY do Corporation Dust Destructors seem to have a special fascination for the B.B.C. as sites for transmitting stations ? Both Leeds and Liverpool have recently had to shift their quarters

on account of interference with military wireless, and in both cities a new home was found at the Dust Destructor !

Transmitting Prospects.

CAPTAIN IAN FRASER, C.B.E., who is chairman of the transmitting and relay section of the R.S.G.B., has had a busy time during the past few months in connection with the British preparations for the International Radio Tests.

In view of the recent wonderful New Zealand successes, he expects that International Radio Week (which commences

OUR QUERY DEPARTMENT.

In future a charge of Sixpence per Query will be made for answering all technical questions submitted to the Technical Staff of POPULAR WIRELESS. A group of three queries will be answered for One Shilling. Postal Orders must be enclosed with all queries and a stamped addressed envelope in addition.

THIS NEW ARRANGEMENT IS NOW IN FORCE.

Since the inception of POPULAR WIRELESS readers have had all their problems settled for them free of charge, but with the great increase in the circulation and the corresponding increase in the number of queries sent in the task of dealing with the latter has become gigantic.

A large Technical Staff is now employed answering queries, and it is with the object of relieving the pressure on them that we have decided to make the small charges mentioned.

Readers of POPULAR WIRELESS know that the Editor and Staff of this journal have always had, and always will have, their best interests at heart.

on Nov. 23rd.) will be a triumph for long-distance radio.

Studio Atmosphere.

SHOULD there be clapping in the B.B.C. studios at the end of the items ?

It has been suggested as a means of gingering-up the atmosphere like that of a concert-hall, but there is another side to the question. One world-famous musician—who does not want his name mentioned—told me that the greatest advantage of broadcast music is the fact that the final dies away into silence, as the composer intended, and is not spoilt by premature clapping, which always ruins the end of a public recital.

The Mystery Service.

THE mysterious "clergyman" who broadcast part of a service late on Sunday nights did not prove very difficult to trace, and, as I have already announced, Cardiff station was the original "church" from which the services came. Complications arose, however, when people who were interested kept watch and tuned in to long-distance services as well.

From the States.

DURING their church services the American stations are free from jamming, and they have been coming over exceptionally well lately.

Mr. E. C. Davies, of Highgate—who overheard the Wills-Firpo fight via K D K A—tells me that he has traced two of the "mystery services" to W H A Z and W G Y.

The Ferranti Advt.

SEVERAL readers have pointed out that in the "Ferranti" advertisement which appeared in "P.W.," No. 126, the words "high-frequency" appear to be incorrect. This is so, and the week-end tests should have referred to a "low-frequency" amplifier.

S. O. S.

EIFFEL TOWER gave listeners a shock recently, when a concert was interrupted by an S.O.S. from the steamer "St. Martin." There were shouts and the cry, "Help ! We are sinking," followed by agonised yells, and a despairing "We are lost," and then—silence.

But it was not a real S. O. S. at all. Only a wireless drama that was being rehearsed, and which somehow was accidentally broadcast with F L's programme !

The B.B.C.'s Birthday.

NEXT WEEK is a week of anniversaries. In addition to Armistice Day, the first station of the B.B.C. celebrates its birthday then, and the occasion is to be marked by a ball at the Savoy Hotel. Preceding this there will be a programme broadcast by the B.B.C. staff to their friends, the listening public.

Twenty Stations Working.

IT is only two years ago since 2 L O was officially opened, followed four days later by the Manchester Station. Birmingham followed the day after, and on December 24th, 1922, Newcastle "took the air." These were the only four stations at the close of 1922, but before Christmas this year there will be twenty stations in operation.

NOTES AND NEWS.

(Continued from page 549.)

Wireless Prosecutions.

THE Editor has received a copy of a letter which has been sent to the Postmaster General with reference to his warning that proceedings will be instituted against persons who have not taken out a licence for their broadcast receivers. The writer of the letter is Mr. R. M. Ford, of East Lodge, Park Row, Albert Gate, S.W. He begins: "Dear Postmaster General," and ends "Yours disobediently"! Here is an extract from his letter:

"I see by the newspapers that you now really are going to prosecute people who have not obtained licences for their broadcast receiving sets. Will you very kindly let me be the first one you prosecute?"

"Not that I am anxious to be a martyr or enjoy being fined, or that I don't want to pay, but merely because I would like the public to know that I, for one, do not like criminal methods employed in civil matters, because I wish to continue to believe that an Englishman's home is his castle."

"I am interested in certain businesses showing great benefit to the public, but when I, rightly or wrongly, consider a man owes me ten shillings, I certainly cannot enter his premises to frighten him into paying me, nor can I use the unduly terrible means of taking criminal proceedings against him, with the ultimate issue of the loss of his liberty, to recover the amount. And I don't see why any other individual or party in commerce should have this overwhelming advantage. Please understand that when I accept value I have no objection to paying for it, but when I have got to take something whether I like it or not, payment becomes an entirely different matter. In one of your recent communications for publication you referred to the non-payment of licences as "unsporting," presumably because you think everybody wants to listen to the B.B.C. programme."

"But what if I don't want 2 L.O., and would far rather be without 5 X X? Possibly you are unaware of the exasperation caused, just at the moment when one has got Mars or Kamschatka nicely tuned in, by a voice, however charming, intruding with 'One minute please,' or 'Copyright by Reuter, The Press Association and The Central News.'"

"Again, am I bound to allow my feelings to be harrowed by long accounts of men fighting serpents in trees through floods (which receive no subsequent corroboration) when I would much prefer to be trying to pick up 'Radiola' in Paris or a concert in Pittsburgh? Why this restriction upon and prevention of endeavour? Will you take ten shillings from me to keep these things away from my receiving set?"

Congratulations.

ALTHOUGH we often grumble at the B.B.C., I think we are all really proud of their record, and there is not a listener who does not wish them "Many Happy Returns." It is true that their weather reports are always dismal, but where should we be without Big Ben, and the "Six Pips" from Greenwich?

New Zealand's Plans.

NEW ZEALAND is now planning a broadcasting service, and it is expected that a good deal of British apparatus will be exported to the Dominion during the coming months.

Mr. Ernest Griffin—late of Griffin Wireless Supplies—tells me he is shortly proceeding to New Zealand to introduce British wireless lines there, and manufacturers and others desiring agencies should communicate with him at 161, Croydon Road, Anerley, S.E.20.

South African Stations.

DURBAN Station is due to open this month, and I hear that a full-power standard broadcasting set will be employed there. The Cape Town Station (W.A.M.G.) now works upon the same wave-length as Manchester, and in the apparatus employed, studio arrangements, and microphone, it is a replica of 2 L.O.

The R.S.G.B.

THERE is to be an informal meeting of the Radio Society of Great Britain on Wednesday next at 6 p.m., at the Institution of Electrical Engineers, Savoy Place, W.C. 2.

A particularly interesting demonstration will be given by Mr. R. C. Chinker, M.I.E.E., with a dynamical model of an oscillating valve circuit.

"Osculation."

A CORRESPONDENT with a sense of humour has sent me a photograph and cutting from the "Belfast News Letter" showing the Belfast transmitting gear "with the assistant engineer at the main osculator."

In the accompanying letter he asks: "Would not this account for some of the 'sizzling and crackling' noises which were attributed to atmospherics?"

The "P.W." Cup.

ARE you entering your set for the "P.W." Cups?

Every reader is entitled to compete, providing his set is home-made and that he



A photo of one of the two silver prize cups for the "P.W." Constructor's Competition, details of which appear in this issue.

is not connected in any way with the wireless industry. Full particulars were given in last week's "P.W.," to which intending competitors are referred for details.

For Young Constructors.

TO give our younger readers a chance against older competitors, there will be a special junior class for those who are under fifteen years of age.

The awards will be announced at the White City Radio Exhibition on Saturday, November 22nd, and published in "P.W." the following week.

How to Send Sets.

ALL sets must be carefully packed and sent to Radio-Exhibitions and Wireless Conventions, White City, Uxbridge Road, Shepherd's Bush, London. They must be plainly marked "For Competition," and must arrive not before November 10th, and not later than noon, November 14th.

Austria and Radio.

AUSTRIA has just been revising its radio regulations, and as a result the wireless amateur there will be encouraged to develop his hobby. An Austrian Club of Transmitting Amateurs is being formed, and British transmitters, with a knowledge of German or Esperanto, who would like to exchange signals should communicate with the Internacia Radio-Asocio, 17, Chatsworth Road, London, E. 5.

5 S C's New Studio.

TODAY the new studio of the Glasgow Station is being opened at 21, Blythswood Square. The ceremony will be performed by the Hon. the Lord Provost of Glasgow, and Sir Landon Ronald is conducting a special musical programme, which will include Mendelssohn's Scottish Symphony.

New Feature from 2 L.O.

SUNDAY'S London programme is on rather novel lines, and listeners are invited to let the B.B.C. know their opinions of the innovation. Instead of the usual concert, a party of twenty vocalists has been selected from the Oriana Madrigal Society, and it is hoped that selections from their repertoire will include old English madrigals and modern part songs.

Broadcasting on Armistice Day.

AT the time of writing it is still uncertain whether the B.B.C. will be allowed to broadcast the Cenotaph Service on Armistice Day.

As there is only one way in which the ceremony can be shared by the whole country, and as the B.B.C. are willing to do their part, I think that there ought to be no question about the matter.

Some Impressive Items.

WHETHER the Cenotaph service is broadcast or not, the special Armistice Day programme to be broadcast from London on November 11th will include some very impressive items. Sir Edward Elgar's "For the Fallen" will be rendered about 8 p.m., and during the evening we shall hear Sullivan's "In Memoriam," and works by George Butterworth, the promising young English composer who was killed in the War.

A Question of Connections.

L.T.-COMMANDER SHOVE draws our attention to the fact that in "P.W.," No. 126, the theoretical connections for L.F. choke coupling (page 41, Fig. 3a) were shown incorrectly. The lead from the Choke to H.T. + should go direct, and the plate of the last valve is connected only to 'phones and thence to H.T. +

What We Cannot Do.

FOLLOWING the publication of photographs showing "P.W.'s" workshop, it is sometimes assumed that the Technical Staff is regularly engaged in testing sets for readers.

This is quite impossible in view of our circulation, and parcels containing readers' sets forwarded for this purpose must inevitably be returned unopened.

ARIEL.

CAPTAIN ECKERSLEY'S VISIT TO AMERICA.

PROSPECTS FOR TRANSATLANTIC BROADCASTING.

By "ARIEL."

Captain Eckersley, who has just returned from his tour, tells "Ariel," in an interview, some of his observations made in America.

BRONZED and busy would be the best description of Captain Eckersley, when I called upon him at his offices at 2, Savoy Hill, to ask the result of his recent visit to America.

He certainly looks extremely well after his trip, but I had a difficulty in spotting this at first for he was almost hidden behind shoals of papers, which were stacked in baskets and piled in trays, covering his desk and overflowing on to the carpet.

What they Live For.

It appeared that they were plans for the new B.B.C. station (or stations) which had accumulated during his absence.

"Yes, we have arranged to link up Britain with America by wireless," he said, in answer to my first query; "but for a time the tests will be purely experimental. We want to find out how far it is possible to ensure regular reception in both directions before we promise any American programmes here, or before New York listens in to London.

"Are they anxious over there to listen to London?" I said.

"Anxious—why, long-distance reception is all they live for," he replied.

"The difference between their attitude towards radio and our own is amazing, for whereas we are chiefly concerned with quality of reproduction, their desire is distance.

"Of course, there are plenty of exceptions," he went on, "but, generally speaking, New York tunes in for Chicago programmes, whilst Chicago is looking for St. Louis, or San Francisco. There are 550 broadcasting stations in America and their idea of a really good receiver is one which will tune the whole lot out, and let them listen in to the Children's Hour in Chile, or to a weak 'Hello' from Honolulu!"

Unity of Control.

"Do you think that the Americans are ahead of us in wireless?" I inquired. "One hears a good deal of America being the home of broadcasting, and it is often supposed that the rest of the world still lags behind them in the technique of wireless. But does British broadcasting compare favourably with theirs?"

"It is not easy to compare, because our standards are different, but I certainly do not think English broadcasting is inferior to American," Captain Eckersley replied.

"We have unity of control here, and the listeners interests can be far more effectively ensured in this way than by happy-go-lucky arrangements between dozens of diverse authorities. Unity is strength, you know, and the B.B.C. is not only united technically, but from every practical and artistic point of view it has all the advantages of co-operation.

put the whole thing in a nutshell when he said to me, 'I don't wanna hear music on my radio—I wanna get miles!'"

"What did you think of W G Y when you visited the station?" I asked.

"It's a very fine station, as one might expect from its record," he replied, "but unfortunately they collared me for a speech before the microphone, so I did not have much time to look round."

The Man who Heard.

"I heard about that speech," I said; "for one British listener who was tuned in for transatlantic reception wrote to me and asked my advice about it. He said you told your audience that if ever they came to London, and looked you up at 2, Savoy Hill, you would be pleased to show them over 2 L O, and as he was one of your audience (though in England) he asked me if I thought you'd show him round the London station when he comes up to town?"

"I didn't think of that," laughed Captain Eckersley; "but I am afraid he has earned the right to see over 2 L O if he actually heard my invitation."

"So altogether it was an enjoyable and successful trip?" I asked, preparing to leave the Chief Engineer to his work.

"Yes, and I had one absolutely unforgettable experience. We were three days out in the "Homeric," when I began to notice an extraordinary exhilaration in the air. I thought this must be due to my feeling better as wireless worries were left behind. So just to test the truth of this idea I went up to

the ship's wireless cabin and asked to listen in, to see if wireless would drive the feeling away again. The operator—who seemed to have heard of me somewhere—gave me a pair of 'phones, and with him I listened in to the "Jane Mary" (New York to Yokohama) talking to the "Mary Jane" (Bombay to Boston), and scores of other marine conversations.

"But all the while my mysterious feeling of elation grew—and suddenly I realised why. I was in the Wireless Paradise—mid-Atlantic. No dry land to spoil reception. All the aerials for hundreds of miles were high ones, totally unscreened. All the earth connections were perfect—not merely moist, but with three miles of wet water underneath the earth plates. And I had been listening in for over an hour, and hadn't heard one howl—not one oscillation on the ocean."



The transmitting and receiving station at the Soesterberg Aerodrome.

The American Way.

"Topics, times, wave-lengths—they can all be arranged best by one central authority, and listeners in this country are far better off than in any of the places I visited."

"One thing to remember," he continued, "is that their problems are not the same ones that we have to face. The area of America is hundreds of times greater than that of the British Isles, and there are all sorts of diversities in the American audience which are due to mere distance.

"No doubt this partly explains their attitude towards long-range reception; but whatever the cause, the effect is that they look at wireless in a quite different from our own. From their point of view the artistic and entertaining side of broadcasting is unimportant compared with its value as a scientific hobby. One man in Pittsburg

LISTENING-IN FOR NEW ZEALAND.

By K. D. ROGERS.

SEATED in a long narrow room on the top floor of the new science buildings of Mill Hill School, Mr. C. W. Goyder, recently a student at that school, spends hours and hours, night after night, in silence that can be "felt," searching the ether for signals that may come from the most distant parts of the earth. On his left is a wooden framework containing the transmitting valve, and rectifying valve, smoothing the H.T. supply, and all the other impedimenta of a typical amateur's transmitting station, while at his hand is a small key, coupled by a magnetic key to the transmitter.

The Romantic Side.

In front is a low panel, about 10 in. long and 5 in. high, containing the receiving valve, coupled to a note magnifier of ordinary pattern.

The time is 5.40 to 5.45 a.m., but not a sound is heard save the faint ticking of the clock as it goes relentlessly on towards dawn, only a brief hour distant. Anxiously the listening amateur varies the reaction control, tuning condenser, and aerial coupling of his receiver, waiting for the call from the other side of the world that shall announce the crowning achievement of amateur research in long distance low power transmission.

At last, at 6 a.m., the long-awaited-for signals come in answer to his own call which, at intervals, he has sent out into space from the small key at his side. "G 2 S Z, G 2 S Z, G 2 S Z de Z 4 A A, Z 4 A A. Your signals received quite well. Can you hear me?"

The third New Zealand amateur transmitter to be heard in this country has picked up his call and has answered. From that time on, for a full half-hour, two-way communication is carried on, and then, as dawn heralds its approach, signals fade. All is over.

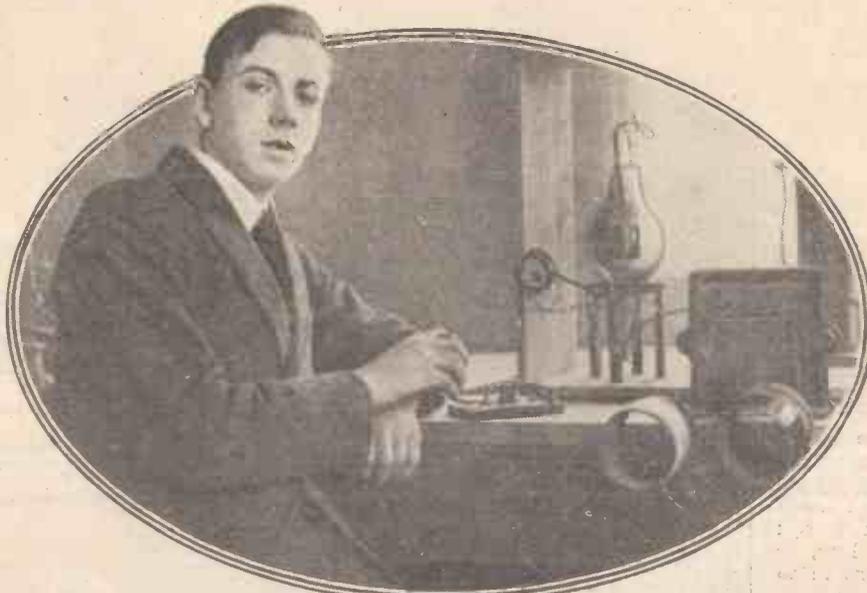
The above is a glimpse into the romantic side (for there is a romantic side) of the efforts and long vigils that have taken place night after night on a lonely hill-top nine miles north-west of London. A few miles away Mr. Partridge and one or two other amateurs have been similarly occupied, all bent upon reaching the climax of low wave power wireless communication; between the two opposite ends of the earth.

But of what value is all this, it may be asked. At first sight it is difficult to see where the value of such experiments come in, for it is true that though low power coupled with

low wave-length (those used being 250 watts on about 96 metres) can bridge ends of the earth, this communication at the present time is to a certain extent freak reception.

A Great System.

I do not mean by this phrase to belittle the efforts of Messrs. Goyder, Partridge and



Mr. Cyril Goyder at his transmitter.

others for a moment, for it is by such experiments that wireless has become an accomplished fact, and there must be a beginning to all things. The first signals from Poldhu to the other side of the Atlantic, successfully received by Senatore Marconi (really only a very few years ago), were themselves of no value. They were useless from a commercial point of view, and, if any signals ever were, "freakish": that is, totally dependent on atmospheric and similar conditions. But they heralded a great system which has grown and grown until to-day nobody stops to think of the wonder of this harnessing of the ether, for we have our Carnarvons and Leafields daily in operation with places thousands of miles away.

And in this achievement of the larger stations readers must not forget that a very great deal is due to amateur enterprise, and results obtained by amateurs. For though amateur transmission over long ranges cannot be said to be regular, it is becoming far more so than it was a few years ago, even than a year ago, and readers will remember

that to get a message on 100 metres across the Atlantic on 200 watts was quite an achievement last year, whereas now it is a common occurrence among those amateurs who are smiled upon by the P.M.G.

The Day of Short Waves.

It is unfortunate that amateurs should be restricted, as they are in many ways, and especially in long range work, but it must be said that the authorities have been remarkably helpful in the case of 2 S Z, for a six months' licence for 250 watts has been approved and granted, and that station can now carry out such tests to its heart's content.

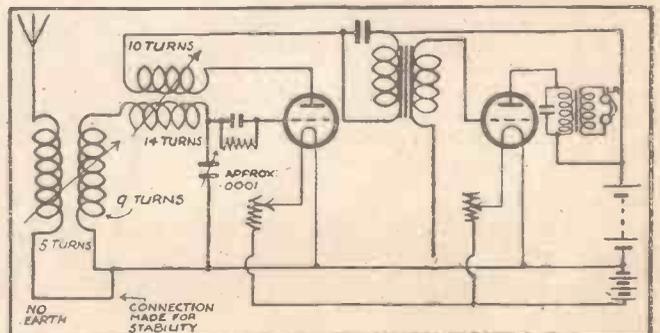
It is undoubtedly the day of short waves, for, contrary to the theories and beliefs expressed a few years ago, these waves "carry" better than their longer brothers for a given aerial power, and remarkable

results are being achieved on the other side of the Atlantic on 10 and 20 metres. Of course it is not possible for all of us to participate directly in these tests, or the ether would be unbearable, but all amateurs can experiment on the reception side of the matter, especially on metres below 120, for there is usually plenty to be heard between 70 and 100 metres and even lower, without depending upon extreme DX reception.

But readers who feel disposed to sit up at night searching the ether for low wave transmissions should get away from the well-known circuits, for if we all keep to the conventional and well-trodden paths we shall get no farther.

Plenty of useful details on short wave reception have been given in POPULAR WIRELESS from time to time, and all the circuits given have proved their worth for this class of reception, but as a further point of interest and in order to place any new enthusiasts on the right track, I propose to describe the construction of the set used by Mr. Goyder in next week's "P.W."

But as I must repeat, don't keep to the beaten track; branch out, never mind



The correct circuit of Mr. Goyder's receiver.

upon what wild theory; and if you have any novel ideas try them out. You may meet with 99 failures, but the 100th may bring something worth having.

HOW TO MAKE A ONE-VALVE SET WITH REACTION.

By J. LAURENCE PRITCHARD.

Although the set described in the following article employs a V.24 valve, prospective constructors will have no difficulty in noting the small alterations necessary if an ordinary four-pin holder for a valve is required.

THE single-valve set illustrated in Fig. 1 is easy to construct, and with careful manipulation of the controls has a very good range for a single-valve set. An uncommon feature of the receiving set is the fitting of a glass panel to the back of the set so that the interior may be inspected at a glance. The glass back is quickly removed if it should be desired to obtain access to the interior.

Two Aerial Condensers Used.

Another useful addition to the set is a fixed condenser wired in the aerial side of

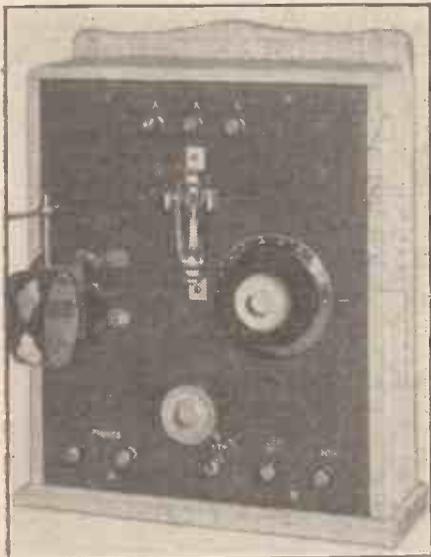
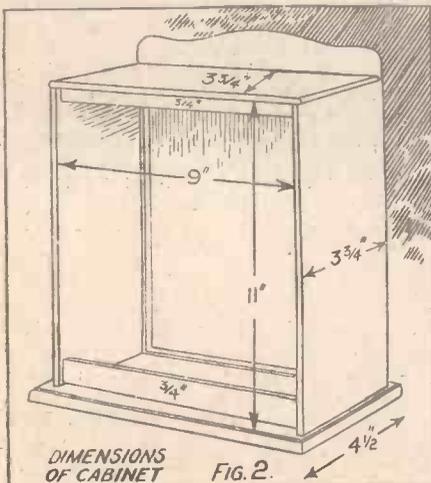


Fig. 1. The complete receiver, using V.24 valve.

the tuning circuit. It is connected between the ordinary aerial terminal and the additional aerial terminals. It thus forms a series condenser in the aerial circuit, its object being to reduce the wave-length range of the set. Capacity in parallel with



an aerial tuning inductance has the effect of increasing the wave-length range of the circuit.

It is often found that a signal is at its maximum when the moving plates of the condenser are entirely out of the fixed plates. It is under this condition that the fixed condenser is utilised. The aerial wire is removed from the right or normal aerial terminal, as shown on the circuit diagram, and secured to the extra aerial terminal to the left, which brings the series condenser into the circuit. The wave-length is thus reduced, and the effects of the new setting to the variable condenser noted.

The panel is fitted to the front of an oblong cabinet, of which dimensions are given in Fig. 2. Before the case is assembled, grooves are ploughed in the back edges, $\frac{1}{8}$ in. wide and $\frac{1}{2}$ in. deep, in which the removable glass back is dropped. A wooden piece, to which the top edge of the glass is secured, is cut and moulded as shown in the illustrations. It is fixed to the glass in the following way. A groove is cut in the centre of the flat edge of the wooden top piece, the width of the groove being the same as the thickness of the glass. The depth should be at least $\frac{1}{2}$ in.

Mounting the Components.

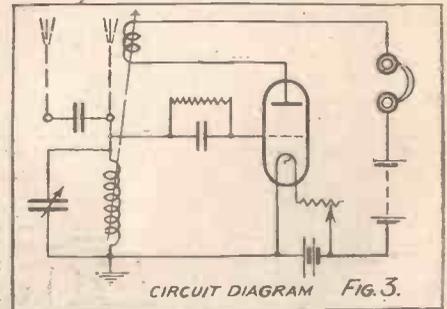
A quantity of Chatterton's compound or Prout's glue is melted, and run into the groove. It is essential that the glass should fit entirely into its grooves, as if it is too stiff the wooden top may be pulled off.

It is a good plan to secure a piece of string to the inside of one of the sides, a few inches up from the base. A groove is cut in the base at this end, through which the string projects. When it is desired to raise the glass back, the string is pulled vertically until the glass is raised sufficiently to be held in the hand.

The panel of $\frac{1}{4}$ in. ebonite measures 11 in. by 9 in. The two aerial terminals and the earth terminal are screwed $1\frac{1}{2}$ in. apart, and at a distance of 1 in. from the top edge of the panel. Below the centre terminal clips for a V.24 valve are fixed. Special clips are made for this valve, but they can easily be made up if desired. The V.24 valve is chosen on account of its low self capacity.

The filament of the valve connects to the end contacts, while the grid and anode connect to the side contacts. The anode

contact is painted green to distinguish it from the grid. The filament resistance is placed in the centre of the panel, and $2\frac{1}{2}$ in. up from the bottom edge. The variable con-



denser, which has a capacity of .0005 mfd., is fixed $2\frac{1}{2}$ in. from the right side, and $5\frac{1}{2}$ in. from the bottom of the panel. In a corresponding position to the left of the panel, a two-coil holder, having one fixed and one movable coil plug, is attached.

The grid leak and condenser are screwed to the back of the panel towards the top. The grid leak is connected across the grid condenser so that a bought combined grid leak and condenser will be suitable. The grid leak has a value of two megohms, and the condenser a capacity of .0003 mfd. The fixed aerial condenser is of .0003 mfd. capacity.

Three battery terminals and two telephone terminals are placed in line 1 in. from the bottom edge of the panel. Wiring

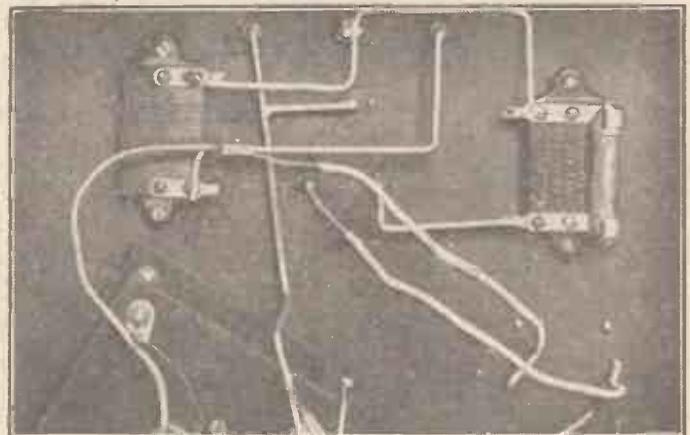


Fig. 4. Back of the panel—wiring of series aerial condenser to terminals.

is carried out to the diagram given in Fig. 3. With the exception of the connections to the coil-holder, which are made with flexible insulated wires, the anti-capacity method of wiring employing bare tinned wire is used. A close-up view of the wiring of the series aerial condenser is given in Fig. 4. After the wiring is completed, any fluxite or other soldering paste is carefully removed from the panel.

(Continued on page 554.)

A ONE-VALVE SET WITH REACTION.

(Continued from page 553.)

The completed wiring of the set, seen through the glass back, is illustrated in Fig. 5. Before the panel is attached to the case, it is advisable to make certain that all the connections are properly made, and that nothing stands in the way of obtaining immediate results.

Testing the Variable Condenser.

A common trouble occurs in the variable condenser by the accidental touching of the fixed and moving plates. In some condensers, connection to the moving plate is made under a screw or nut connected with

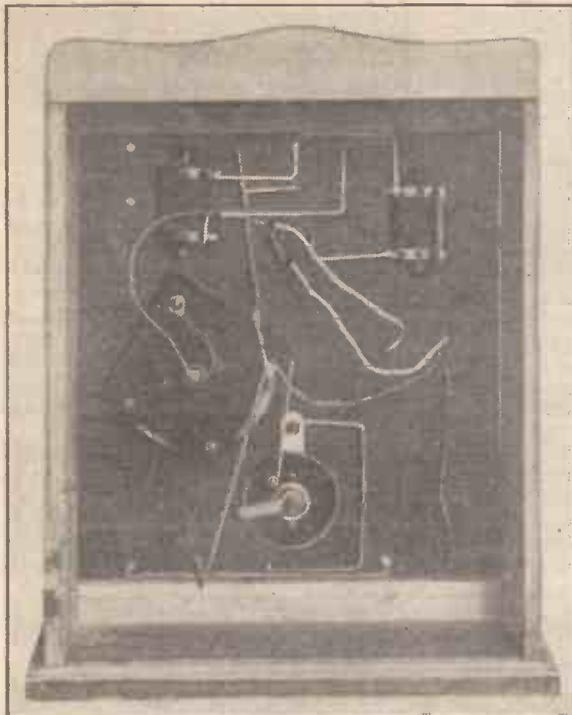


Fig. 5. The completed wiring of the set as seen through the glass back.

the adjustment of the moving plates. In condensers of this type it is important to see that the adjustment is not dis-

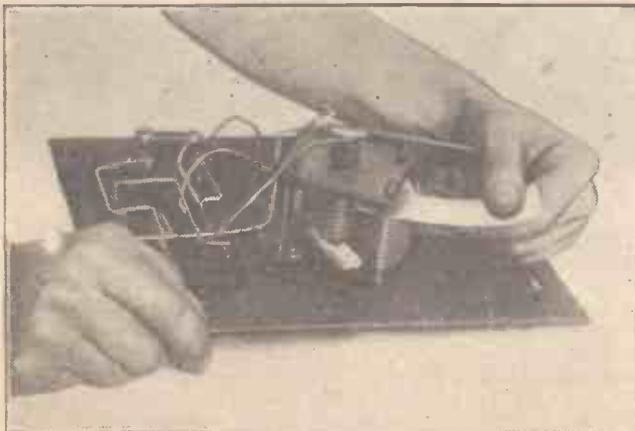


Fig. 6. Testing the variable condenser by passing a piece of paper between the plates.

turbed, as if it is, trouble with the plates touching is very likely to occur. Occasionally also, the end plate of the set of moving plates is bent slightly during the process of constructing the set, and if not noticed, may lead to considerable trouble in obtaining results.

A test that is very easily made for this trouble is illustrated in Fig. 6. Before the panel is assembled to the case, a strip of thin cardboard is slipped through between each fixed and moving plate. If it meets undue resistance in any place, or moves the set of moving plates backwards or for-

wards, the condenser should be inspected closely for trouble. A bent condenser plate can usually be put right by bending it back in the opposite direction slightly. This test is useful also in removing any dust or dirt from between the plates.

The Coils to Use.

When the batteries, coils, and the other components are fixed, the set is ready for testing. Care should be taken in fitting the valve into its clips. The correct method is illustrated in Fig. 7. The top contact of the valve is fitted into its clip and pushed upwards until the bottom contact fits into the lower clip. The grid and anode contacts are not put into position until after the filament contacts are fitted. The grid contact is held between the two side clips, and the valve is given a slight turn to the right to bring the grid and anode contacts against their respective clips.

For the aerial tuning inductance an Igranico Coil No. 35 or 50 will be suitable, while a No. 50 or No. 75 coil of the same make will be required for the reaction.

To tune the set, the reaction coil should be coupled until a rushing sound develops in the telephones. At the same time the tuning condenser is rotated until a signal is heard. If the reaction effect is not felt, but closer coupling of the reaction coil results in weaker signals, the leads to the coil should be reversed.

It must be remembered that a valve set of this nature employing reaction, can cause considerable interference with other listeners if not handled properly, so that the

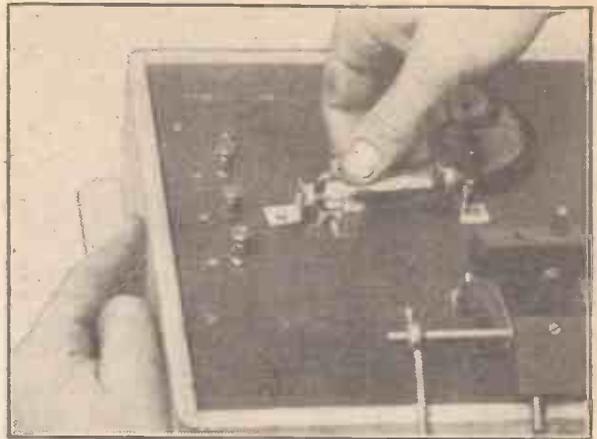
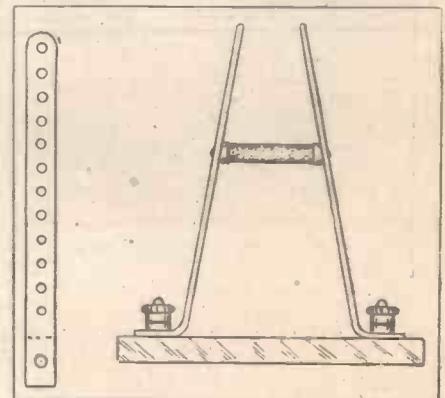


Fig. 7. The correct way to insert a V. 24 valve.

constructor should make himself acquainted with the subject of "oscillation" in order to "preserve the wireless peace."

A UNIVERSAL RESISTANCE HOLDER.

A VERY simple holder, designed to accommodate grid or anode resistances of varying sizes, may be built up from two strips of spring brass, two terminals, and a small piece of matted ebonite. The spring brass strips may be about $3\frac{1}{2}$ in. long by $\frac{3}{8}$ in. wide, each being drilled, as shown on



the left, and bent at the dotted line, so that when clamped to the ebonite base by means of the two terminals the distance between them is diminished towards the top, as shown in the illustration representing a view of the completed instrument.

Thus almost any size of commercial resistance can be used without altering the position of the clips. The distance between the two terminals should be about $2\frac{1}{2}$ in.

NEW STATIONS FOR SPAIN.

The Radio-Iberica Co. of Spain has recently inaugurated a radio broadcasting station in Seville, and concerts and news will be broadcast from 7 to 9 p.m. daily.

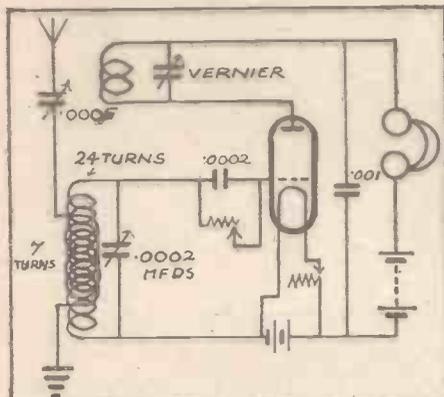
At the end of this month a Western Electric Co. broadcasting station of 100 watts will be inaugurated in Barcelona.

SHORT-WAVE RECEPTION FOR THE AMATEUR.

By G. V. DOWDING, Grad.I.E.E.
(Technical Editor, "Popular Wireless.")

There is every indication that short-wave reception of American Stations will prove very popular with amateurs this winter, and in the following article Mr. Dowding offers several suggestions to experimenters and constructors contemplating a short-wave programme for the next few months.

ALREADY reports are coming to hand from amateurs who are able to receive our old friends, K D K A and W G Y on quite straightforward and simple apparatus. The weather—damp, chill, overcast days, and cold, black, misty nights—although not welcome to the devotees of the open air are greatly appreciated by the disciples of the vast open spaces of the ether: they



A one-valve circuit with a tightly coupled aerial and closed circuit with which short wave American stations have been clearly received in this country. A 100 turn reaction coil may be necessary.

recognise ideal conditions for real "D X" work.

So we must carefully stow away our portable sets and banish visions—seldom fulfilled—of the transient delights of summer wireless and turn our attention to the more serious but no less enjoyable occupation of searching "the American ether."

Direct Reception.

The B.B.C.'s experiments in relaying American stations will prove interesting, and should be highly commended as being first-class cementing material for purposes of strengthening Anglo-American bonds of co-operation; but listening to K D K A as passed on by 2 L O cannot be compared to direct reception of that station on the "home aerial" over thousands of miles of intervening space. Direct reception, with all due respect to the engineers of the B.B.C., is also much clearer, because it does not necessarily include feats of amplification of signals and magnification of statics—the latter generally being more efficiently accomplished than the former.

This reminds me of a remark I heard in the train some months ago. Said a passenger to his friend: "My word, it was rough on the Atlantic last night! You could hear the waves roaring and the winds howling!" No need to add that he had been listening to a relayed version of K D K A's programme!

Apart from the absorbing interest—the

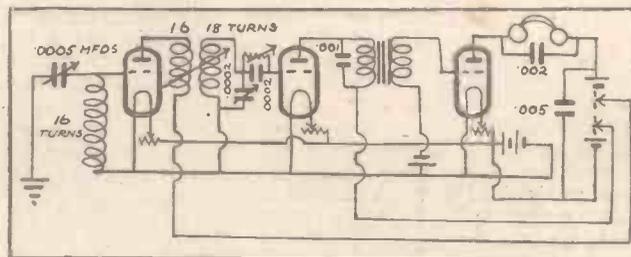
romance one might almost say—of listening to sounds originating in a distant continent, such D X (long distance) work is of great value. To it, or similar striving for distant reception, we owe to some extent the present highly efficient valve circuits in general use. Even the amateur who enthusiastically breaks radio records for no other reason than that of personal enjoyment may unknowingly contribute to the progress of wireless science, as some of those little "tips" passed on by one listener to another subsequently become adopted as standard practice.

Future Experiments.

What circuits will be used this winter? Where will super-heterodyne, super-regenerative, Flewelling, "reflex" circuits be placed? In my opinion "straight" circuits will prove the most popular, just as they did last year. I also anticipate great things from the Unidyne. It has proved an excellent circuit for long range work. Almost daily we receive letters from possessors of single valve Unidynes, reporting reception of all B.B.C. stations and several Continental stations—and this in the middle of so-called "summer," too. Surely then, I am not being too optimistic when I predict reception of American stations during the winter will not be too difficult on a single-valve Unidyne.

We had intended to carry our own experiments in receiving American broadcasting stations on through the summer months, but pressure in other directions prevented us from doing so.

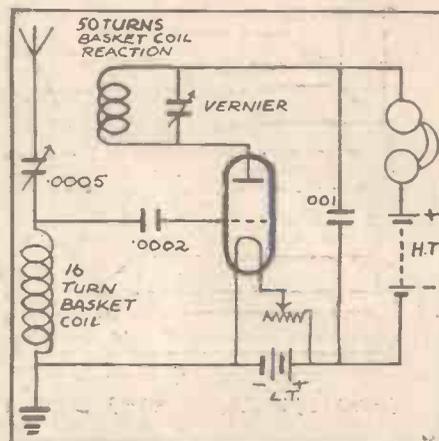
It is by no means difficult to receive K D K A and W G Y on an amateur aerial using an amateur constructed receiver. It will perhaps be remembered that Mr.



The three-valve circuit with which Mr. Rogers heard K D K A last winter without using an aerial. The last valve was ultimately cut out.

Rogers last season was able to bring K D K A in using three valves WITHOUT ANY AERIAL AT ALL. As a matter of interest we are reproducing the diagram of the circuit he employed. We are also reprinting two of the circuits with which K D K A could be clearly received on 100 metres.

During the last season regular readers will recollect that we advocated the use of a minimum number of valves for the reception of clear signals from the U.S. stations, and may wonder where the "P.W." 24-valve set will figure in our future activities in this direction. The construction of this gigantic receiver may even be the cause of us being accused of "stunting."



A simple single tuning circuit short-wave receiver which has been proved suitable for K D K A reception.

This, however, would be doing us an injustice, for while we intend to demonstrate the possibility of regular American reception on single and 2-valve circuits of straightforward design, we have certain interesting schemes arranged in which we hope the 24-valve set will figure.

We have also constructed a special Unidyne receiver for the reception of the short wave-length U.S. stations, and when this has been thoroughly tested out, full constructional details will be published for the benefit of those of our readers who would like to listen to K D K A with a minimum of interference.

I do not want to promise too much in case some of our plans miscarry, but any way, I think I can safely

predict an interesting season from the technical point of view. Similarly I have been given to understand that we can expect interesting developments in the "home ether." Therefore, taking everything into consideration, the coming winter should amply compensate wireless amateurs, at least, for the bleak, wintry summer they have endured.

VARIOUS CRYSTAL FORMS.

AN INTERESTING ARTICLE ON CRYSTALLINE STRUCTURES.

By J. F. CORRIGAN, M.Sc., A.I.C.

CRYSTALLOGRAPHERS have divided up crystals into many different classes, each according to the peculiar form in which they occur. There is no need to go into the subject very deeply in this article. The article is merely written in order to give crystal enthusiasts an additional insight into the many different varieties of their rectifying minerals. We shall therefore confine ourselves to the description of a

of crystal forms should consult a text book of mineralogy or crystallography for a minute and accurate description of all the different forms in which the members of the mineral kingdom disport themselves. As the actual structure of the rectifying crystals forms the basis of at least one of the theories of crystal rectification, it is desirable that experimenters on the subject should know something of the

science of crystal forms, and a little knowledge of crystallography may prove to be of great use to workers in this sphere of research. The whole subject is deserving of the attention of radio experimenters and of amateurs generally.

Might Prove Puzzling.

One word in conclusion. It may be puzzling to the amateur after reading the above short description of the shapes of some of the ordinary rectifying crystals to observe that his own favourite piece

of zincite, bornite, or whatever it may be, has no particular definite shape at all. It must, however, be observed that radio "crystals" are often not single crystals at all. They are often merely pieces of crystals which have been previously broken up by the importer or dealer. Again, many radio crystals are in reality masses of very small crystals which have become fused together during their formation in the earth. Examined under a powerful lens, such minerals will be found to be entirely composed of hundreds of tiny crystals, and more especially in the case of the "treated" galena crystals is the confirmation of the truth of this fact easily possible.

A SERIES TELEPHONE DISTRIBUTOR.

By W. A. R.

THE 'phone distributor is one of those additions to a radio receiving set which after being used for a week or two you begin to wonder how you got on without it.

The materials required are:

- 10 'phone terminals.
- 1 switch-arm.
- 5 studs.
- 6 small brass screws.

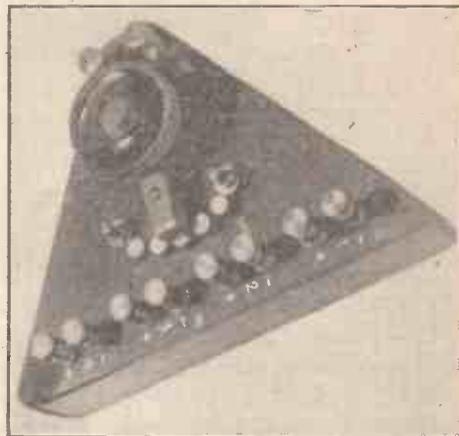
1 piece $\frac{1}{2}$ in. ebonite, 7 in. by 5 in.

A few odd pieces of wood and a little glue.

I am no cabinet maker, but found that by cutting a piece of $\frac{3}{4}$ in. or $\frac{1}{2}$ in. wood into a triangle, each side being 6 in. long, and then cutting off about $1\frac{1}{4}$ in. of one of the points, I had the base.

Mounting the Studs.

The sides were made of a strip of $\frac{1}{4}$ in. oak, $1\frac{1}{4}$ in. wide; the front, $6\frac{1}{2}$ in. long, being glued and tacked on first. Then the sides were fitted, $5\frac{1}{4}$ in. long, and with the aid of rough glasspaper wrapped round a flat piece of wood, one end of each cut so that



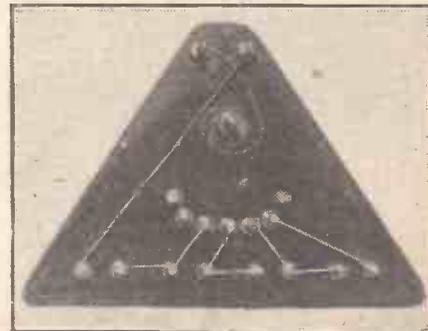
Showing the neat appearance of the completed instrument.

it fitted the front piece, and lastly the small back piece was shaped and fitted, and put on one side for the glue to set.

Next, I roughly cut out the top from a piece of $\frac{1}{8}$ in. ebonite, and with small brass screws fixed it to the box, and then glasspapered the whole thing to shape, rounding the corners and taking the ebonite down flush to the sides. Now take the top off again, and fix studs, switch arm, and terminals, as shown by the photographs, the studs being $\frac{1}{8}$ in. apart, and the terminals $\frac{1}{2}$ in., the distance between each pair being $\frac{3}{4}$ in.

Cuts off H.T.

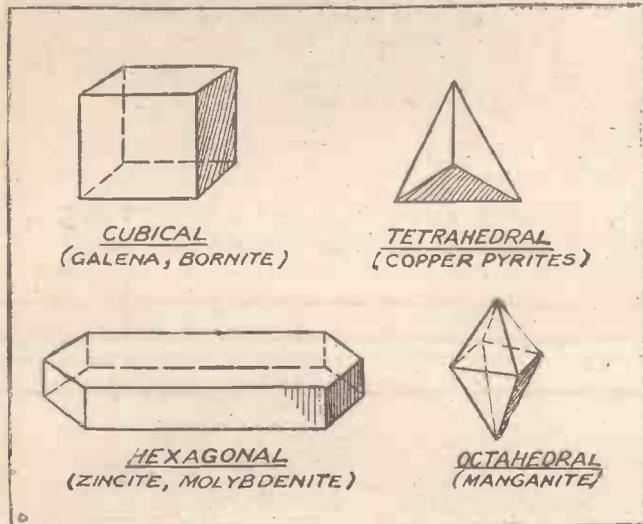
The box may be stained and polished to taste, and then have a piece of cloth (velvet-



The wiring can be clearly followed from this photograph.

een for preference) glued on to the bottom, and trimmed off with a pair of scissors.

The back pair of terminals are of course the input, the one leading to the switch-arm being +. The wiring should be done neatly with $\frac{1}{16}$ bare copper. The "off" stud cuts off the + H.T., and thus saves pulling out + H.T. plug when the set is not in use.



few of the forms in which rectifying minerals are found to be crystallised.

Many radio-sensitive minerals are found naturally in the simplest shape which a crystal can take. This is, of course, the cube—a body possessing six equal sides all of which are at right angles to one another. Among radio minerals which crystallise in this form may be mentioned ordinary galena, bornite, and iron pyrites.

A Useful Subject.

Another fairly simple form of crystal structure is the regular tetrahedron, a figure which is bounded by four triangular planes. Copper pyrites is a well-known example of this type of crystal structure.

Zincite generally occurs in the form of a hexagonal shaped crystal. Such a crystal is built up upon a hexagonal or six-sided base, as will be apparent from the diagram.

Well crystallised specimens of many rectifying minerals possess a rhombohedral shape—that is, they exhibit forms, the sides of which are equal, but whose angles are not right angles. A cube, when distorted out of shape becomes rhombohedral in form. Graphite possesses a rhombohedral structure, and so does carborundum, hematite, and many other varieties of crystallised minerals.

Many of the minerals which have been mentioned exist in more than one form, as well as in several varieties of the same form. The reader who is interested in the subject

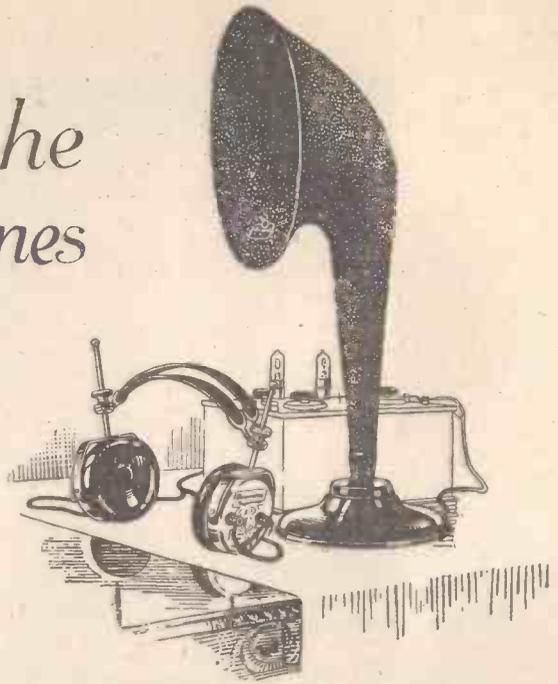
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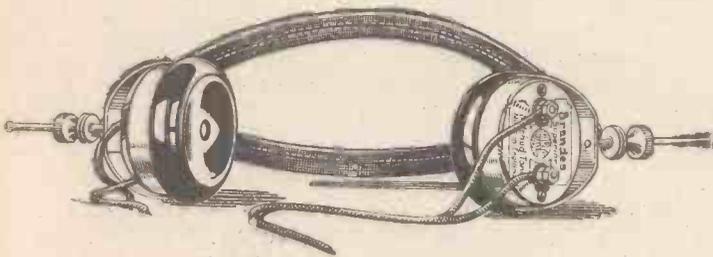
BABY sits intently watching Young Bill tuning up the receiver. He finds it mighty hard not to take up a roving commission among the shining accessories. He wonders devoutly to himself why Brother Bill should find it necessary to become involved in a mass of tangled wire and mutter whole-heartedly to himself. But he knows just what it will mean to him. In a little while the *Table-Talker* will speak easily and naturally of the many phantasies of his youthful imagination. Fascinated by the burnished discs and metal of the "Matched Tone" Headphones, he will be able to place them on his tender head with their gentle comfort, and listen to the sweet bell-like notes. Ask your dealer for Brandes.

self why Brother Bill should find it necessary to become involved in a mass of tangled wire and mutter whole-heartedly to himself. But he knows just what it will mean to him. In a little while the *Table-Talker* will speak easily and naturally of the many phantasies of his youthful imagination. Fascinated by the burnished discs and metal of the "Matched Tone" Headphones, he will be able to place them on his tender head with their gentle comfort, and listen to the sweet bell-like notes. Ask your dealer for Brandes.



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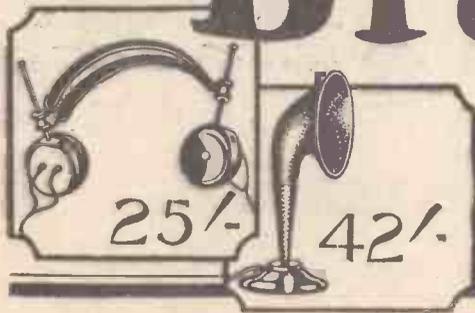
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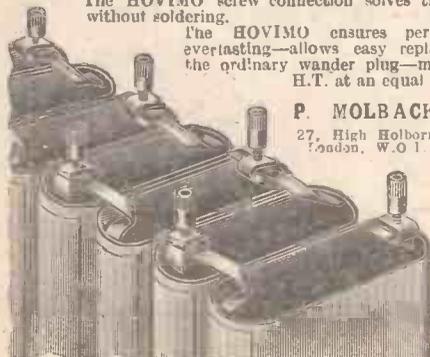
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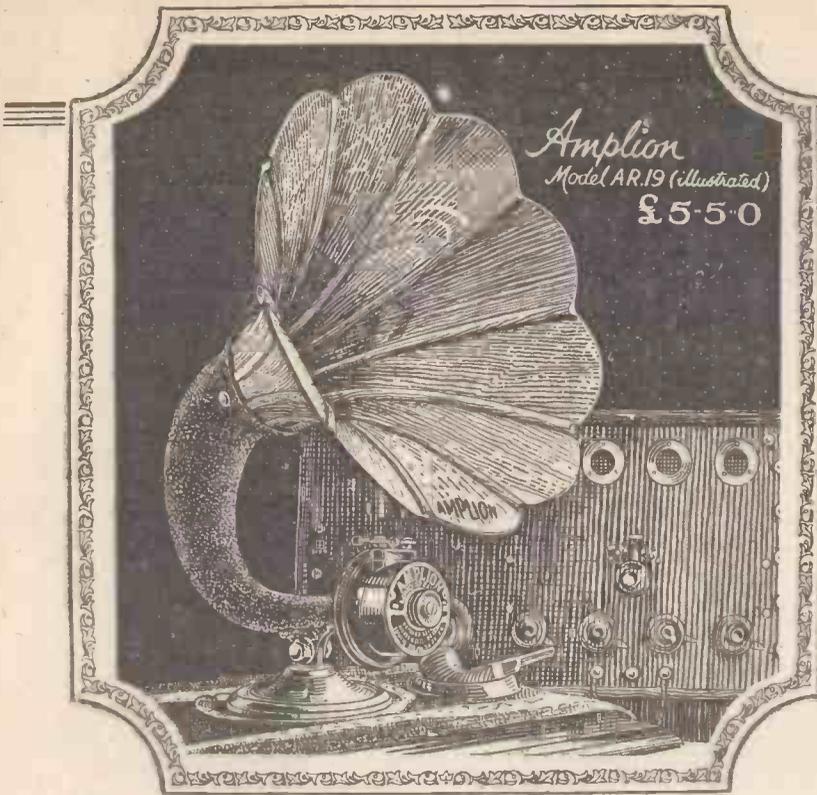
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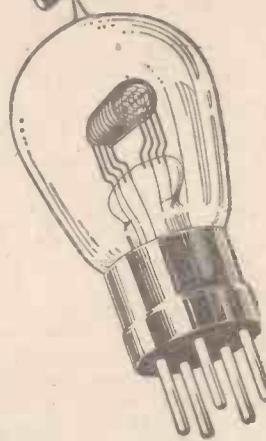
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WIRELESS ON TOUR.

SOME "DEAD SPOT" EXPERIMENTS AND THE TRIUMPH OF 5 X X.

By B. S. T. WALLACE.

Our contributor has recently concluded a holiday tour with a portable set and the story of his adventures and experiments makes interesting reading.

DESPITE almost incredibly rapid progress there are yet many localities where broadcasting is little known and only dimly comprehended. In such places as the out-of-the-way villages of Cornwall and mountain hamlets of Wales



Wireless loud-speakers for "addressing" a large open-air crowd.

and Scotland it is the exception rather than the rule to find a wireless aerial. The reason is not far to seek. The population is sparse, distances from the transmitting stations considerable, and technical knowledge and opportunity very limited. It is in such localities as these that the enthusiastic experimenter can experience and also give a great deal of pleasure by taking a portable receiver when on holiday, not to mention the likelihood of acquiring new and valuable information.

In Wales and Cornwall.

The writer, even in pre-broadcasting days, has always made it a practice when spending a holiday to take a receiver of some sort with him. True, in the old times there was nothing more than Morse S O S calls, time signals, and weather reports to entertain one, but they were sufficiently exciting and interesting in their day. The performance of various types of aerial and earth in the different localities continually added to one's knowledge.

As the point is of great importance it may be mentioned, before going further, that any particular type of aerial, providing the height and capacity to adjacent objects is approximately identical in each instance, performs practically the same wherever it is placed and that any variation of signal strength above or below the estimated normal signal of a particular station, when not obviously due to screening by large hills and masses of metal—such as gasometers—in the immediate vicinity or direct line of two stations, is entirely due to the good or

bad conductivity of the earth in the region of the receiving station.

Should it happen that the region is of bad conductivity; such as a position with shallow, well-drained soil on an insulating rock subsoil and with no connection by such means as a stream, or gas and water mains to a position of good conductivity, there is no means of making an efficient earth, and it amounts to a more or less dead spot.

All cases of alleged "dead spot" investigated by the writer, where they have not been due to any instrumental fault, have been traced to the bad conductivity of the surrounding earth. The only time these places give any satisfactory performance is during heavy rain, when a conducting path is made from a bad patch to a good earth—which may be miles away.

To ascertain the efficiency and effectiveness of present-day holiday wireless possibilities a tour embracing north-west Wales and south-west Cornwall was arranged. These are two of the most difficult positions for broadcast reception, the latter being about the worst place in the British Isles.

Some very remarkable experiences were recorded, but the outstanding feature of the tour was the ease and certainty with which the Chelmsford long-wave station, 5 X X,

popular for holiday work, it is proposed to give details of method and apparatus used and reasons for employing particular arrangements.

The Set Used.

Previous expeditions having shown that

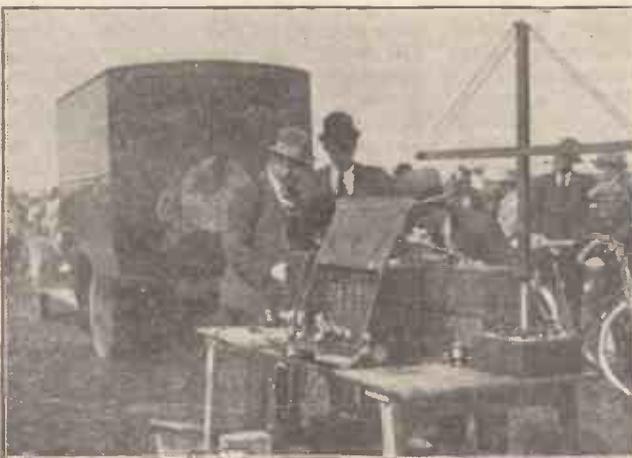


A "touring" broadcasting car and some of the apparatus

some localities are inclined to be somewhat "dead" or difficult, it was decided to have a good reserve of amplification, and in order to minimise space and weight a receiver using two valves acting as both H.F. and L.F. amplifiers, with crystal as rectifier, was built up and tested for nearly twelve months.

Special attention was paid to the H.F. side, and Marconi copper sheath tuning was used, as this is decidedly more efficient than coil and condenser.

Tuning was arranged from 300 to 3,000 metres. Testing during the building of the set was done mainly on 600-metre shipping traffic, as to anyone with long experience at wireless and Morse the relative strength of the various coast stations, such as North Foreland, Niton, Land's End, Cullercoats, etc., in different localities will give a better indication of the efficiency



An outdoor mobile set with frame aerial.

could be received anywhere and everywhere under most adverse conditions. As portable receivers will no doubt become increasingly

of a particular aerial-earth system than anything else.

(Continued on page 562.)

WIRELESS ON TOUR.

(Continued from page 561.)

The ideal holiday set must, of course, have a small frame or no aerial at all. To attempt this and expect to receive broadcasting over 300 miles at a strength sufficient for light loud-speaker work and everything, including batteries, to go in a box 8 in. square, was out of the question. So the same aerial-earth arrangements were used as the writer has adopted successfully for the past fifteen years.

The greatest difficulty is usually with the earth connection. With a little experience one can usually tell by the aerial tuning adjustments whether the earth is functioning satisfactorily.

If the locality will "earth" well, then a metal spike one foot into the ground will be quite suitable. If this is not satisfactory then the only near approach to anything efficient is to lay or bury a wire *directly underneath the whole length of the aerial.*

This latter point is of the utmost importance, and has been verified time and time again. If in a place of bad conductivity an earth wire is laid at right angles to the aerial, signal strength will be reduced 75 per cent or more.

An Improvised Aerial.

The aerial and its method of erection will sound like rank heresy. Enamelled copper wire of 28 to 24 S.W.G. is laid out on the ground, and a stone or other suitable weight fixed at the end. This is thrown up into the most suitable tree available, and readily catches up somewhere, enabling the wire to be pulled steady. The only circumstances under which loss of signal strength is experienced with this type of aerial is when the whole trunk of the tree is made thoroughly wet with driving rain. In practice this is quite an exceptional occurrence. No difficulty was experienced in working this aerial both in Wales and Cornwall throughout September, during heavy and continuous storms of rain. The wire used is sufficiently cheap to be discarded after use.

Operations were commenced at a farm at the head of the Nantle valley, which extends from the foot of Snowdon to the sea. Except to the west, the position was entirely surrounded by hills of 2,000 feet and upwards.

My good hostess had informed me that a gentleman had left some copper wire behind in case it might be of use to someone else. On arrival I found this to consist of 2 ft. of bare copper wire sticking out of the ground. Inquiring if any broadcasting had been heard, the lady as good as said it would be a surprise if anything of that nature were ever heard down there, and that the gentleman who left the copper wire behind seemed rather puzzled over something or other, and expressed a regret that he had not brought his big set down. So things did not look promising.

However, with 80 ft. of wire at a height of only 25 ft. at one end and a chance earth on the piece of wire coming out of the ground, it was an agreeable surprise to find the coast stations of Fishguard, Liverpool, Cullercoats, and Land's End all coming in at good strength, and everything was most satisfactory with aerial and earth. What the earth wire was connected to I do not know, but the surrounding ground was marshy, and like a sponge full of water, with river and sea a mile or so away; a position likely to give a good earth without any trouble.

On tuning for the Sunday afternoon programmes the first two stations struck were Manchester (90 miles) and Glasgow (225 miles), the latter being nearly as good as the nearer station, the good reception being due to 100 miles of the distance being over water. Bournemouth, 225 miles, was readable, though the intervening country is entirely over land. The most astonishing surprise came after dark, when Bournemouth swelled up to greater strength than any of the other stations, and consistently maintained this behaviour every night.

5 X X's Quality.

In the evening 5 X X was sought, and as anticipated from tests made in London on Radio-Paris, he gave good light loud-speaker signals with a strength far greater than any of the short-wave transmissions, and of remarkably good quality.

It seems evident that the slight flatness of articulation and tone due to the use of the long wave is not nearly so detrimental to good broadcast as is the effect of using a long land-line for simultaneous broadcasting from London to the more distant stations.

A peculiar experience occurred one evening. Seven of the natives, four of whom could not speak or understand a word of



Broadcasting a concert to a crowd of 2,000 people.

English, were sitting round the table listening enthralled to the Balalaika orchestra via 5 X X, by means of a single Brown "A" earpiece placed beneath an inverted china bowl in the centre of the table.

Crystal Reception.

The room was in darkness, and outside, some miles away, flashes of lightning lit up the countryside. There was the usual plop in the receiver every time a flash was seen. Presently a peculiar crackling noise was heard near the set, and on close examination tiny sparks were seen jumping from the 'phone and H.T. leads on to a lead sheet damp-course fitted on the window-ledge on which the set was standing. On switching off the valves this sparking ceased, but commenced again when the valves were lit. The transmission continued perfectly. Presumably the valves amplified the atmospheric to such an extent as to give them sufficient voltage to spark to earth. No damage was done, and any possible risk to the 'phones was taken for the sake of experience. The storm was too far away to do any direct damage, and the aerial was too ridiculous to cause any fear, as it was a nearly invisible 36 wire literally smothered with leaves and branches all round it. A crystal set was tested here on 5 X X. It was audible, but, of course, weak. With a good horizontal aerial

elevated from 60 ft. to 75 ft. it would have been good enough for two pairs of 'phones.

A move was now made to an old haunt in the West Country not far from Falmouth, and 300 ft. above sea-level. More attention was paid to the aerial so far as height was concerned, it being drawn across a field between two trees at a height of 40 ft. The subsoil is slate-rock 1 ft. below the surface, and the old difficulty of inefficient earth was again experienced.

So a determined effort was made to get some improvement. Wires were led in all directions to iron railings, and any metal suitable was buried and connected up. Improvement was noticed with every extension of the earth system, but a really good earth was not obtained.

Short Wave Signals.

On the usual 600 metre test some stations were good but others that should have been audible, were missing. This was proved by making a test two miles away with a water earth, bringing in numerous stations inaudible in the former position. Tuning to short-wave broadcast the "local" relay station at Plymouth, 55 miles away, came in best at all times, the only other passable runners-up being Bournemouth, 175 miles, and Cardiff, 150 miles, both of which were poor.

Turning to the new hope, 5 X X, 325 miles, it was gratifying to hear it come in with great strength and purity, but unfortunately frequently marred by atmospheric, which are more prevalent in this part of the country than elsewhere. Reception of 5 X X on crystal in this position was quite good. Radio, Paris, was a good second-best to 5 X X.

Components Used.

It is only under adverse conditions that one is able to realise the great value and high efficiency of the high-power long-wave broadcast station. For portable work under any circumstances it is certainly the best station to rely on. The only disadvantage at present is its late hour of starting, but this will no doubt be remedied in due course.

Another point that one cannot help realising is that there are still large numbers of people in isolated localities, and consequently in greater need of broadcast, who are still debarred from the benefits of the new social convenience because valve apparatus is not yet sufficiently cheap, simple, and foolproof for use in localities where technical assistance is unattainable.

Although every endeavour was made to minimise weight and space in the receiver, this was appreciable when compared with a camera, for instance. It is interesting to note that the bulk of the weight was in the filament battery. Three Siemens 1½ volt Q-size cells were carried, and they weighed more than the remainder of the apparatus and H.T. battery together. The latter was composed of 8 very small 4½ volt uni's measuring 1½ in. by 1½ in. by ½ in., and giving just over 30 volts.

Mullard .06 valves were used, and normally they require 3 volts, obtained by 2 dry cells, but with 3 or 4 hours' run per day the voltage soon commences to drop, making it necessary to bring the third cell into operation. These valves have had plenty of rough treatment, have been burning some hundreds of hours, and still perform wonderfully well for dull emitters.

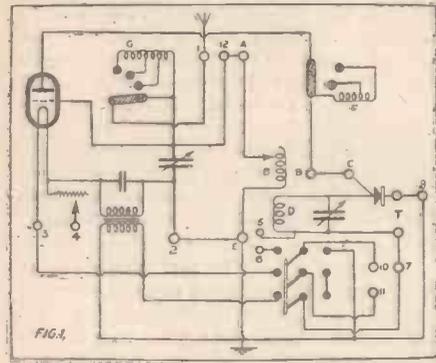
A USEFUL DUAL AMPLIFIER FOR A CRYSTAL SET.

By B. H. J. KYNASTON.

The one-valve amplifier described in this article has given very good results when used in conjunction with a crystal set of ordinary design and should prove of interest to the constructor experimenter.

THE single-valve amplifying panels, which are usually used as an addition to the crystal receiver, are not always very efficient, since they are almost invariably a high-frequency unit or an ordinary note magnifier.

The instrument to be described in this article, although it has only one valve, will be found to give exceedingly good results,



since its single valve is made to amplify the incoming oscillations before the crystal rectifies them, and also to amplify the rectified signals.

The Long Wave Coils.

It will be understood from this that the great advantage of this instrument is that it provides two stages of magnification instead of one. Apart from this, however, the panel is a great improvement on the ordinary single-valve amplifiers, inasmuch as it provides for long and short wave reception on both spark and C.W.

The amplifier referred to has been designed for use with any two-circuit crystal set, and a simplified diagram of the combined circuits are shown in Fig. 1. The two-circuit crystal receiver can be seen in the diagram, and as will be noticed from the diagram requires no alterations, the extra panel being simply connected to its existing terminals.

It will, however, be noticed that it is necessary to take a connection to one side of the crystal, and this can usually be accomplished without taking down the set, but if desired a permanent connection can be made to a terminal.

It will be found necessary to use a cabinet at least eight inches square to take the various components without undue cramping. An ebonite top to the cabinet should, of course, be used and the various parts mounted on this. Fig. 2 shows the method of arranging the panel and wiring up.

The coils G and F, which are provided for long-wave reception, consist of a coil of three hundred turns and a coil of two hundred turns respectively. Each coil should be wound on an ebonite former of about two inches in diameter. As will be

seen from Fig. 1, these coils are connected in the aerial and plate circuit respectively.

The aerial circuit coil is connected to the four-stud switch, so that there is one hundred turns between each stud, and the anode circuit coil is connected to the other switch, as shown. These two coils should be arranged in the cabinet so that there is a slight amount of coupling between the two coils and then fixed firmly in this position.

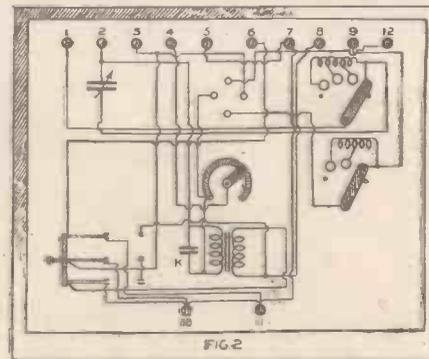
The position referred to is the one which just gives sufficient reaction for C.W. reception and insufficient reaction to spoil long-wave telephony. The actual position will easily be found by experiment.

How the Switches Operate.

It will be noticed that the crystal circuit shown in the Diagram 1 uses a slider for aerial tuning, and a variable condenser for tuning the secondary circuit. Another variable condenser of .0005 mfd. has been added to the amplifier in order to give fine tuning to the aerial circuit; however, if the crystal receiver to be used possesses an aerial tuning condenser the one in the amplifier can be omitted.

A three-pole two-way switch is used in order to obtain a rapid change over from crystal to valve and crystal; in both Figs. 1 and 2 this switch is shown in the position for valve reception.

When the switch is moved into the other position the telephones are disconnected from the valve high-tension circuit and are connected to the crystal terminals of the receiver. The third pole of the change-over switch breaks the transformer primary



circuit, which is used for obtaining low-frequency amplification. When on the valve side this transformer serves to feed the low-frequency currents of the crystal circuits into the grid circuit of the valve.

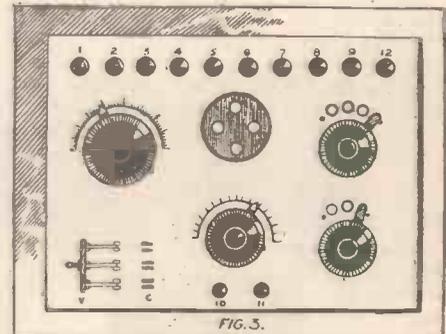
A small fixed condenser must be used across the secondary of this transformer in order to form a low resistance path for the radio-frequency oscillations, this condenser, which is shown as K in the diagrams, should have a capacity of about .0001; the actual value is, however, not important.

Fig. 3 shows what the finished amplifier

should look like. The terminals, which are numbered in all three diagrams, should be connected as follows:

If the Amplifier Oscillates.

1 is connected to the aerial, and 2 to earth; 3 is positive L.T. and 4 negative; 5 and 6 are positive and negative H.T. respectively. The terminals 7 and 8 are connected to the telephone terminals of the



crystal receiver, while the terminal 9 is connected to the one side of the crystal, as shown in Fig. 1. The telephones should be connected to 10 and 11, and the remaining terminal, 12, is connected to the aerial terminal of the crystal receiver.

The coils B and D in Fig. 1, being aerial and plate circuit coils respectively, must have as loose a coupling as possible when receiving, and care should be taken that the coil D is connected so that no reaction can be obtained.

Oscillation.

If it is found that the set oscillates strongly and is therefore liable to cause interference, the connections to terminals 9 and 5 must be reversed. This will, of course, stop reaction, but will make no difference to amplification provided a very loose coupling is used as the necessary magnification is obtained by tuning the anode circuit, the coils B and D acting as an H.F. transformer.

The wave-lengths which this instrument will cover will depend upon the crystal receiver and the size of the coils in the amplifier. The dimensions given above are such as will cover the British and Continental telephony stations.

ÉCOLE SUPÉRIEURE CHANGES WAVE-LENGTH AGAIN.

THE broadcasting station of the École Supérieure des P.T.T. of Paris has changed its wave-length again to 458 metres. The "Petit Parisien" has also changed its wave-length, which will now be 346 metres.

MIDLAND WIRELESS NOTES.

FROM OUR OWN CORRESPONDENT.

AMATEUR circles in the Midlands have lost a well-known and valuable experimenter in Mr. Gerald Baynton, of 2 K O, at 48, Russell Road, Moseley, Birmingham, as the result of a motor accident at King's Heath, Birmingham, in which both he and his brother were killed and two other persons injured. 2 K O was the call-sign of Mr. C. S. Baynton's station, an article concerning which appeared in POPULAR WIRELESS last year, and which by reason of its Sunday evening transmissions was famous throughout the Midlands. Mr. Gerald Baynton's voice was often to be heard, his breeziness and good cheer was always distinguishable, and he will be greatly missed. During the war he served in the Air Force, being captured by the Germans, and was a prisoner of war for a considerable period. He was a brother of Mr. Henry Baynton, the well-known Shakespearean actor.

Educational Value of Wireless.

"In every generation there are some few score really born teachers able to inspire. If we can get the voices of those born teachers into every school, every home, then wireless will have done a real service for education."

This was a remark made to a POPULAR WIRELESS representative at Birmingham by Mr. J. C. Stobart, the Board of Education official attached to the British Broadcasting Company for directing the work of educational wireless on the occasion of a visit to arrange the scheme for the Birmingham area.

At the conference with the local advisory committee for wireless education, which took place at the station, there were present, besides the station staff, the Principal of the Birmingham University, Mr. C. Grant Robertson, Professor Granville Bantock, the eminent composer, Dr. Adrian Boulton, and the directors of education for Coventry, Leicester, and Derbyshire.

As an outcome of the conference it was arranged that there would be at 3.30 on Thursday afternoons a local transmission for schools from the Birmingham station. This, Mr. Stobart pointed out, would consist of correlated talks on English literature and music. The English talks would be accompanied as far as possible by recitals of fine verse, and the whole course would be drawn up by a local educational authority, probably someone from the University.

Growing in Popularity.

One difficulty which existed in this matter of educational wireless, Mr. Stobart remarked, was that the Broadcasting Company could only use the land-lines for simultaneous broadcasts after 5 p.m., so that school talks on a national basis could not be given, and they had to be arranged locally. They had already proved to their own complete satisfaction that wireless could be made to serve the purpose of education, and during the experiments which had been going on in London for the past five or six months they had found that

children could learn by wireless lectures, for admirable little essays dealing with the talks had been submitted.

"We are not waiting," he observed, "for the schools to be equipped with wireless apparatus. We are not even pressing the local education authorities to equip the schools. We feel sure that if we can put over something really good from the studio

Our New Publishing Date!

"P.W." On Sale THURSDAYS

No. 130 of "Popular Wireless," dated week ending November 22nd, will be on sale Thursday, November 20th. Commencing with that issue, "Popular Wireless" will in future be on sale every Thursday instead of Friday, as is at present the case.

Bear this new arrangement well in mind, and do not forget to ask for your "P.W." on Thursday, instead of Friday, commencing with No. 130.

the schools will find some means of receiving it. That has been our experience in London.

"There," he went on, "this application of wireless to education began in the science room. A science master or the handicraft master directed the building of a set by the class and the school became interested in what was a scientific novelty. Then the head-teacher tried to use it to serve education.

"The educationalists here to-day agreed that if the lectures were of a first-rate quality, and could be satisfactorily received, they might prove a very great boon, especially to the remote country schools."

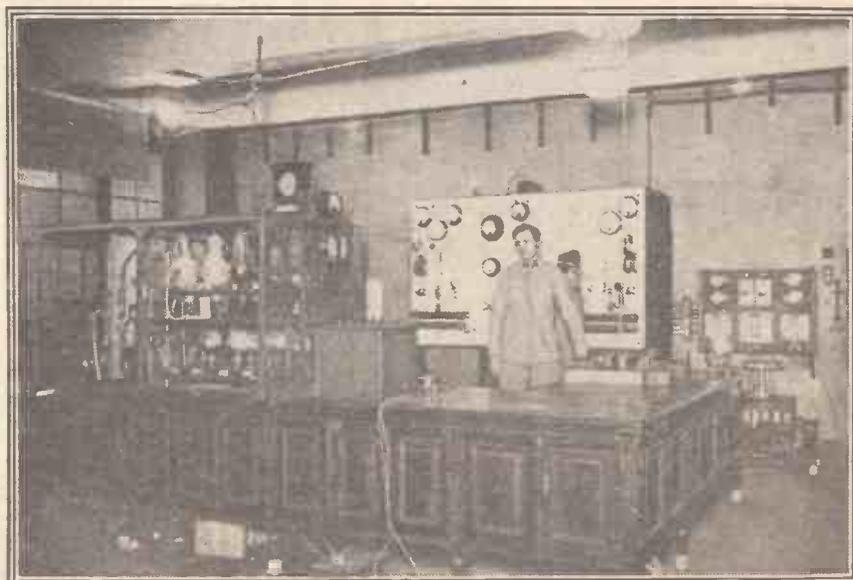
Making Haste Slowly.

In answer to the "P.W." man, Mr. Stobart said it had been generally accepted that for a school 20 to 30 miles distant from the broadcasting station, the necessary loud-speaker equipment could be obtained to equip a country school. In this application of wireless they only aimed at reaching the children between the ages of 12 and 15. "I am not convinced," he added, "that younger children than that can get very much good out of wireless lectures.

"But all our lectures have been purely experimental, and we have tried out several methods. We tried having classes in the studio and having questions and answers. But that was not a great success, for technical reasons. There was a difference between the strength and quality of the voice of the teacher and the voices of the scholars. My voice could be heard, but not the voices of the boys. But we shall try to get in touch with any school that intends to listen, and we shall send them a syllabus, and then if they like to send us some of their best compositions, we shall judge and commend them.

"Of course, we realise that we shall have to overcome a good deal of conservatism. There are always the two extremes in these things—the conservative type who refuses to try a new thing because it is new, and the other extreme which espouses everything because it is new. We much prefer to build slowly."

Mr. Stobart described in detail the scheme for systematising the educative talks contained in the general broadcast programmes. Natural history, famous pictures, history, French, economics, public health, foreign affairs, science, he said, had all been arranged for, and without any diminution of the entertainment side of broadcasting. The principle of these talks would be to create a desire for knowledge rather than to impart instruction.



Part of the broadcasting transmitter at the Eiffel Tower Station, Paris.

Mainly About Broadcasting

by
The Editor

DURING the last few days I have had an opportunity of meeting several well-known artistes in the musical and theatrical world, and in conversation with them about broadcasting in general I have been struck very forcibly by the criticisms made concerning the B.B.C.'s activities.

I asked one very well-known actor what he thought of the B.B.C.'s radio plays. He told me that he considered, on the whole, that the idea of broadcasting plays was an excellent one, but that in his opinion the policy of giving three plays in one evening was absolutely wrong. He supported these opinions by the argument that to listen-in to three plays in one evening by wireless meant that listeners-in must follow the dialogue from beginning to end if they wished to understand what was going on. And the fact that to appreciate radio plays means considerable concentration was sufficient, in his opinion, to condemn the idea that three plays in one evening proved popular with the majority of listeners-in.

Furthermore, he very severely criticised the elocution of the ladies taking part in these plays. "It seems to me," he said, "that an artiste wishing to qualify for a part in a radio play should undergo, first of all, an intensive training in the art of speaking by wireless. Every time I have listened-in to a radio play I have noticed that the female characters gabble their words far too quickly, and with far too little consideration for clear enunciation.

Broadcasting the Clavichord.

"Frankly," he said, "I cannot imagine any listener-in enjoying three radio plays right off the reel. With only words to hold one's attention, no action, scenery, or atmosphere, it seems to me impossible that anybody can be expected to listen-in to three plays one after the other."

There seems to me to be a good deal of common sense in this opinion, and my actor friend suggested that one play of a duration not exceeding twenty minutes would be ample for inclusion in one evening's programme.

It so happened that I was also able to obtain the opinion of a well-known musician whose name must likewise be anonymous. His chief grouse against broadcast music was the fact that the B.B.C. did not make sufficient use of string quartettes, but relied too much on orchestras.

"By wireless," he said, "one has the unique opportunity of appreciating the delicacies and beauties of string quartet music. When listening to a big band by wireless (even on the very best of loud speakers), I find it difficult to thoroughly appreciate the music, because it seems to me that with so many instruments being broadcast at once, there is, inevitably, a good deal of blurring which, although it may not be apparent to the unpractised ear, certainly detracts considerably from the full appreciation of the items being played.

"I have often wondered," he said, "why the B.B.C. have not tried broadcasting

music played on the clavichord. This little instrument I am sure would appeal tremendously to listeners-in, and it would stand a much better chance of 'getting-over' than the piano.

"The other evening I happened to listen-in and heard a quartet singing from "Rigoletto," and here again I came to the conclusion that two or more voices never broadcast well. But nevertheless, I am not unduly prejudiced against wireless, as are so many people who will not give broad-

THE "POPULAR WIRELESS" CONSTRUCTIONAL COMPETITION.

1. Competition to be for home-made complete receiving sets either crystal, valve, or valve and crystal. Entries to be limited to one set per competitor.

2. Two classes will govern the entries, viz.: junior class for competitors under 15 years of age, and senior class for competitors over 15 years of age. A declaration as to age may be required at the discretion of the judges.

3. Sets entered to be the unaided work of the competitor, who must not be in any way connected with the wireless industry.

4. Entries must be sent to Radio Exhibitions and Wireless Conventions, White City, Uxbridge Road, Shepherd's Bush, London, not before November 10th, and not later than 12 noon, November 14th.

5. Each entry must be labelled "For competition," with the name of the sender and description of apparatus enclosed.

Non-compliance with above regulations or late arrivals of entries may cause disqualification.

All entries must be carriage prepaid and securely packed, and will be returned carriage forward as soon as reasonably possible after the close of the exhibition.

6. The judges may, if unanimously agreed, alter, modify, or add to these rules and conditions, and in all cases the judges' decision shall be final and conclusive.

The judges and organisers will not be responsible for any loss or damage to the articles entered for competition, but every reasonable precaution and care will be taken to prevent such loss and damage.

casting a fair chance. In some ways I consider a good loud speaker to be far in advance of any gramophone, but in other directions the gramophone has it hopelessly beaten. The other evening, I happened to listen-in to Ronald Gourlay singing songs at the piano, and here again the piano, in my opinion, was far too near the microphone. It absolutely swamped the singer's voice, and the resonant effects were very bad indeed. I should think the piano should have been pushed considerably farther away from the microphone, or else

the pianist should have been warned not to play so loudly, and to be very abstemious in his use of the loud pedal."

I asked him whether he considered broadcast recitals by well-known musicians deleterious to the prosperity, etc., of concert halls and those agents and business men who make their living by financing and arranging for recitals by well-known musicians.

"Frankly," he replied, "I do not think it does us the slightest harm; in fact I am inclined to the belief that in many respects it is good for the concert halls. When a man like Pachmann or Rachmaninoff, or any other great artiste, gives a recital, a great number of people go to hear them and see them play in preference to putting on the 'phones and listening to them by wireless. The reason for this is that musicians of this type depend a good deal on their personalities.

More Tolerance.

"You have only to go to the Queen's Hall Promenade concerts to see how the people flock round the piano when a well-known pianist begins to play. People like to watch as well as to hear, and I am quite sure, however much broadcasting expands and progresses, it will never seriously interfere with the receipts at the box office of the concert halls."

These opinions, I might say, were given to me on the strict understanding that no name should be mentioned, but the gentlemen who gave them had in the past acquired the reputation of being far from friendly towards broadcasting; but it would seem that they have now both acquired wireless sets and a more tolerant view of the activities of the B.B.C.

They have summed up the pros and cons of this new art, and, naturally enough, they find it wanting in many respects; but they also frankly admit that in other respects as well it has many commendable points.

This brings me to the fact that there still exists a good deal of unreasonable prejudice against the activities of the British Broadcasting Company, and that there are many famous men and women in the concert world and on the stage to whom the word "broadcasting" is like a red rag to a bull.

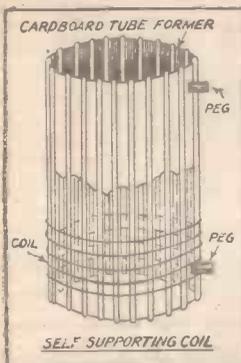
In one or two cases, to my own personal knowledge, well-known people have absolutely refused to listen-in or to attempt to form an opinion on broadcasting. Prejudice is a funny thing, especially when it is combined with an "artistic temperament," and yet, when this prejudice has sobered down, as it certainly has in the two cases I have mentioned above, you will find that those who have been most inimical to broadcasting have the power of giving a very sound, fair and impartial opinion. Others again will give opinions that gush over and which are really not opinions at all, and others will still continue, out of sheer perversity, to condemn the whole business right and left.

Constructional Notes

Conducted by Dr. J. H. T. ROBERTS, F.Inst.P.

Self-Supporting Coil.

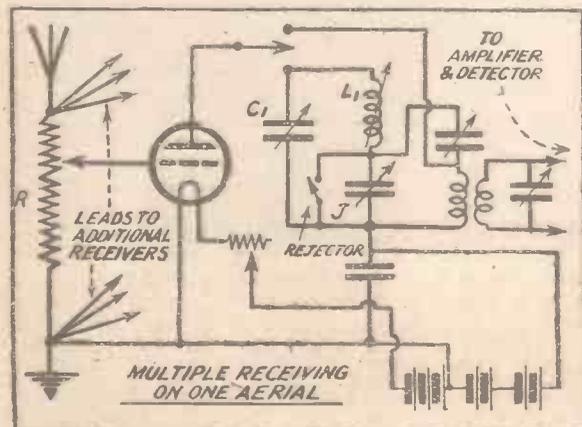
THE method shown herewith is stated to be easily carried out and to give satisfactory results if a little care is exercised. A cardboard-tube former should be used, and this should first be wound lengthwise, inside and out, with string, spaced close together. Two short metal pegs should then be inserted into the side of the tube at the ends, as indicated in diagram. The wire is wound round the first peg two or three times, and then laid carefully round the tube in the ordinary way for winding the coil, being again given two or three turns round the other peg when the coil is finished. The whole is given a



coating of insulating varnish, of low capacity-effect, and when it is nearly dry, the string is carefully cut at various points and all the pieces of string drawn out from under the wire, except four lengths, which are left equally spaced round the circumference. Now take out the pegs and slide the coil, together with the four remaining pieces of string, off the tube. The coil is given a thorough further coating with the cement, and is left standing on end until dry. The two holes at the ends, where the wire was wound round the two pegs, serve for mounting the coil. The coil is said to be perfectly self-supporting if properly made and varnished, and it may be used, for example, as the stator of a variometer or variocoupler, using 20 S.W.G. wire.

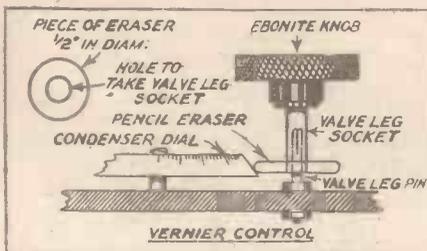
Vernier Control.

Here is a diagram of the one-knob vernier control for several dials, sent me



by a reader, Mr. A. K. Marais, of East House, Portmanomack, N.B. He says:

"Procure as many valve-pins, with collars, as there are dials to be operated, one valve-socket, an ebonite knob into which the valve-socket may be tightly inserted, and a piece of fairly thin, flat



rubber sheet, such as a circular eraser. From this latter cut out a circular piece about half an inch in diameter, and through the centre of this piece a hole just large enough to enable it to be fitted tightly upon the valve-socket.

Secure a valve-pin through the panel about an eighth of an inch from the edge of each dial, and fix the valve-socket into the ebonite knob mentioned above (a little secotine will help), fastening the rubber disc upon the lower part of the same, again with secotine. The little rubber wheel with knob, etc., is thus a loose component, and can be pushed on to the projecting valve-pin adjacent to any dial which is to be vernier-operated. Hand-capacity effects are negligible, owing to the length of the socket."

This little arrangement is quite novel, so far as I know, and has the merit of being very easily made.

Multiple Receiving on One Aerial.

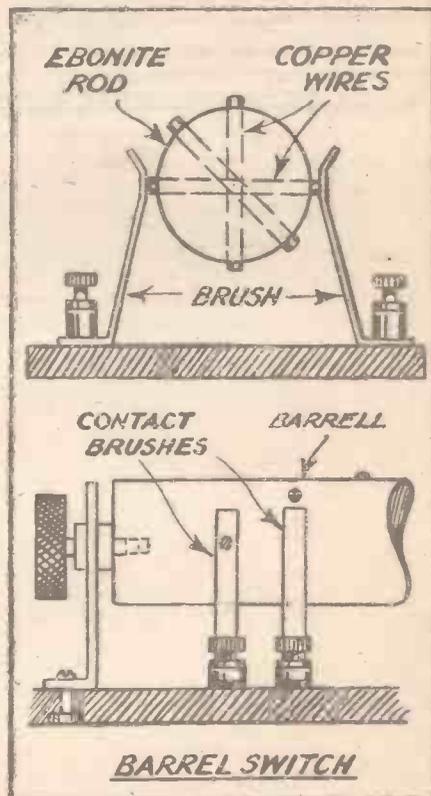
A system for multiple reception on one aerial has been developed by Dr. Hoyt Taylor, research physicist of the U.S.

Navy, and is now being commercially produced under the trade name "Unitenna." Published descriptions of the commercial circuit are incomplete, but the figure herewith is from Dr. Taylor's patent specification (U.S. pat. 1,489,287, April 8th, 1924). The essential idea appears to be the use of a special tuned low-inductance unit, termed the retractor (J). As described in the patent, the retractor is preceded in the circuit by an aerial rendered aperiodic by means of a valve

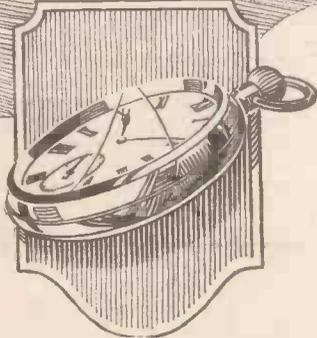
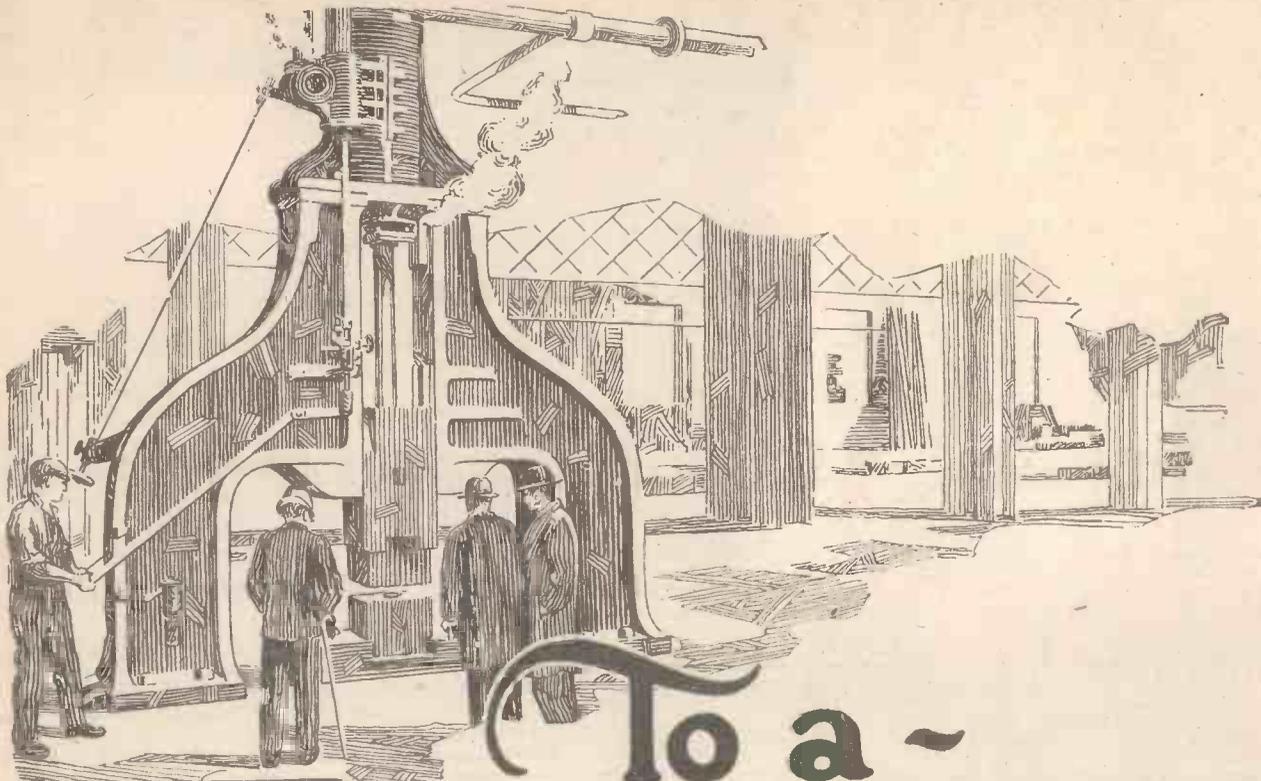
amplifier, and by a preliminary selector circuit comprising the inductance L1 and the condenser C1. According to the patent, the rejector unit "comprises a very low inductance element having a very low resistance, usually being one or more turns of very heavy copper strip or wire, and a large capacity condenser constructed to have a small resistance." An account of this circuit was published in the radio section of the "New York Telegram and Evening Mail" on July 12th.

Barrel Switch.

Rotary switches have the great advantage that they take up little space behind the panel and, furthermore, a single switch may be made to do duty for several separate switches by providing it with a sufficient number of contacts. Most barrel switches are difficult to construct, but the one herewith is quite straightforward. The principal part is a stout rod of ebonite or fibre, provided with an ebonite or fibre knob and mounted in the usual way between brass or copper strips, bent at right-angles. Springy-copper brushes are arranged in pairs at the two sides of the barrel, and contact is made between the two elements of a pair by means of a piece of stout copper wire which is inserted through a hole drilled through the axis of the ebonite barrel. The copper wire should be projecting about an eighth of an inch at each end, the projecting portion being then



hammered over to make a rivet and good contact. It will be evident that after a turn of 180° of the barrel the pair first in contact will be again in contact. The several pieces of copper wire passed through the barrel must, therefore, be included within a range of 180°; say, at angles of 30° to one another. A dial may also be added, so marked as to indicate which of the contacts is being engaged.



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WIRELESS FOR THE BEGINNER.

A NEW SERIES FOR AMATEURS.

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

PART III. HOW BROADCAST WAVES ARE MADE.

THE waves used in wireless telegraphy and broadcasting are waves in the ether. Ether is the name given to a mysterious "something" which most physical scientists consider must exist throughout the universe, even in the spaces between worlds and solar systems where there is no atmosphere; even in the interior of substances, filling up the tiny spaces between atoms.

A number of scientific experiments have proved to the satisfaction of men competent

Here are two simple rules about the speed, length, and frequency of wireless waves.

(1) *Speed* divided by *Length* equals *Frequency*.

(2) *Speed* divided by *Frequency* equals *Length*.

Example: A broadcasting station works on a wave-length of 1,000 metres. The frequency of its waves is therefore,
 $300,000,000 \text{ (metres per sec.)} = 300,000 \text{ (frequency)}$

1,000 (metres)

Hence this particular station sends out 300,000 waves every second.

Electrons.

It is a very convenient method to imagine the ether to be the keyboard of a piano of which the first key on the left gives the lowest note, and the note becomes higher as one progresses towards the right-hand side. The low notes are akin to the long waves and the high notes to the short

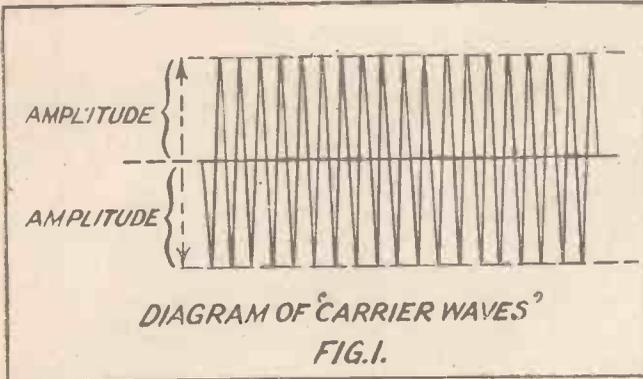
freely within the substances of metals and other conductors of electricity. If an electric battery or dynamo is connected to both ends of a wire the electrons are forced to move along the length of the wire and this procession is the wonder-working power which lights lamps, drives trams, and rings bells.

These electrons are too tiny to be seen through a microscope, and are about 1-1800th the size of the smallest atom. When electrons move through a wire in one direction, that is called a "direct" current. This is the kind of current which batteries and dynamos give. But when the electrons move first in one direction and then in the other, as it were to and fro, that is called an alternating current; but if the alternations are very rapid, of the order of many thousands a second, the current is called "high frequency oscillating current."

It is high-frequency oscillating currents which are used for wireless. The chief difference between the alternating current supplied by the mains for your electric lamps and the current used by the B.B.C. for broadcasting is the frequency; in the first instance the frequency is about 60 per second and in the case of the B.B.C. the frequency is round about a million per second, putting the wave-lengths roughly at 300 metres.

Oscillation.

When electrons move to and fro in a wire they cause a peculiar effect in space (that is, *in the ether*) at a distance from



to reason soundly from their observations that light is sent across space in the form of waves. The fact that light can pass through spaces devoid of matter proves that the waves must occur in some medium which is not material or which is matter in a state unfamiliar to us, a state in which it cannot be perceived by our senses. This something has been named ether. The chief argument in proof of the existence of the ether is that as light means waves, and light can travel through a vacuum, then there must be something left, even in a vacuum—because there cannot be waves in nothingness. If there is a disturbance (or wave-motion) there must be something disturbed.

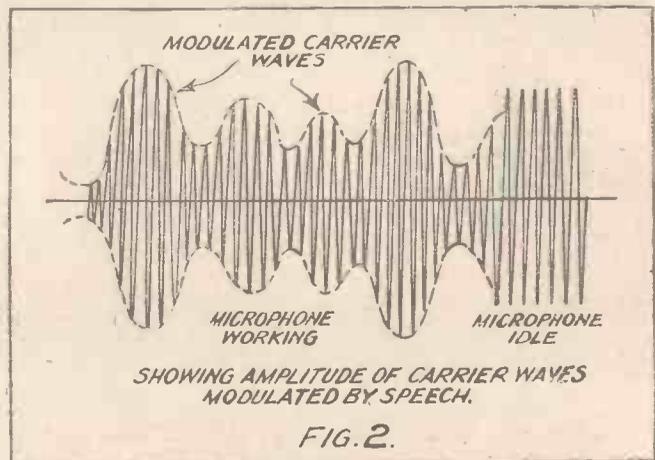
Wave-Length.

As explained in an earlier article, the faster the vibration or rate of disturbance the shorter the waves produced. The rate of vibration is called the *wave frequency*, and the distance from the beginning of a wave to the end, measuring horizontally, is termed the *wave length*. All ether waves, of whatever length, are reproduced (or if you like, *travel*) at one speed, namely, three hundred million (300,000,000) metres per second, or about 186,200 miles per second. This means that a millionth of a second after the ether is disturbed by the wireless station the effect has travelled no less than 300 metres outwards; or that a wireless signal from England can be detected in Australia about one-fifteenth of a second after it is made here

waves. In the instance of a double bass 'cello, the frequency of the lowest note is so low that one can almost see the separate vibrations of the string, but the frequency of the highest note of a violin is so high that the vibrations of the string are not so easily apparent. In fact there are some sound waves so small (i.e. such high frequencies) that the human ear cannot detect them.

Coming back to our parallel, the "high notes" of the ether are the short waves. Light waves are so exceedingly short that their length is expressed in billionths of an inch. Heat waves (radiant heat, such as from the sun) are a little lower down the scale, that is, they are longer than light waves. Wireless waves come very low in the scale, none in common use being shorter than 100 metres.

Now, how is the ether disturbed in order to make these wireless waves? There is only one known way, and that is by means of an electric current flowing rapidly to and fro. An electric current is a procession of tiny bodies, called *electrons*, which exist



the wire; this effect can be detected by a wireless receiver. The more frequently the electrons—or the current—change direction and swing to and fro, the farther off is this peculiar effect noticeable. In brief, when the current oscillates extremely rapidly, it causes ripples or waves in the ether which

(Continued on page 570.)

OVERHAULING YOUR APPARATUS.

By GERALD WHITLEY.

NO wireless set will continue to work satisfactorily unless it is occasionally overhauled. Few listeners trouble much about this point in reception, and it is probable that for some months your apparatus has been lying exposed to our capricious climate without any attention. Damp and dust will have had their effect, and efficiency has, perhaps, been impaired.

Far and away the most important thing to consider is the aerial-earth system. Even the best set made will give only a poor performance if the aerial and earth are not both of first-rate quality. All aerial wire should, of course, be stranded, and the strands should be insulated.

Aerial and Earth Hints.

After the wire, the next important point is the insulators. They are almost certain to be covered with grime (which acts as a conducting path), and may be cracked. The remedies are obvious. Whilst attending to this part of the aerial equipment, consider well whether it would not be on the safe side to add extra insulators, for these are cheap devices the use of which should never be stinted. Masts have been known to split and spreaders to crack; see that yours are beyond reproach. Halyards may need renewing and pulley-blocks should run quite freely.

Earth connections play an important part in the reception of good signals, and should be given at least as much attention as the aerial. Soldered joints should be carefully inspected for corrosion; this is especially important in the case of buried plates.

The wire from the set to earth should be thick; at least as thick as the aerial wire and of low resistance. Always look out for a better earth than the one you are using at present. It is surprising what you will find after a short search.

Almost every receiver has a tuner (there are some freak sets that do not), and this should next be given attention. Coils left lying about in the damp will have absorbed moisture and should be dried carefully in a current of warm air; they should not, however, be roasted.

Replacing the Crystal.

Dust that has accumulated between the turns of a coil may often be removed by the aid of a cycle pump. Contact studs should be rubbed gently with emery cloth. Dust between the vanes of a variable condenser can be removed by a pipe cleaner or a cycle pump.

In the case of crystal sets care should be taken to see that the cup is quite clean, and that the cat's-whisker has a sharp end and a clean point. If the crystal has become covered with grime through being exposed it should be thrown away and a new piece bought. Crystals are very cheap and there is no need to be "stingy" about them. Some people expect crystals to last for years, but unless very carefully protected from the atmosphere they will lose their sensitivity in a few months, of course.

Valve legs and holders soon become coated with a film of oxide, which means that there are high-resistance contacts in

the circuit. They should be carefully cleaned with emery cloth. The insides of sockets can be cleaned with a small roll of emery cloth wound round a matchstick,

afterwards carefully removing the dust which is caused.

Terminals also should receive similar attention. The contact arms of filament rheostats should not be too loose, otherwise you may unwittingly allow too much current to pass and burn out a valve.

A careful and intelligent overhaul carried out periodically will add a great deal of pleasure—in the way of purer and louder reception—to subsequent listening-in. Get on with it now!



Control and transmitting room, with the staff at work, at 2 Z Y.

WIRELESS FOR THE BEGINNER.

(Continued from page 569.)

we may imagine, much in the same way as water waves reproduce each other, and speed outwards like ripples from a stone dropped in a pond. The speed at which this effect travels is, as I have said, 186,200 miles per second. This throwing-off of ether waves by an oscillating electric current is called *radiation*.

Explaining Modulation.

The methods by which oscillating currents are produced cannot be described in these articles. The reader must be content for the present to understand that in the most modern wireless stations—and in all B.B.C. stations—it is done by means of valves. The wire in which the current is caused to oscillate is the aerial, which is caused to radiate a pure ether wave of the type shown in Fig. 1. Examining this diagram, it is seen that the distance from the crests of the wave to the horizontal line—the normal level—are equal. This distance represents the electrical strength of the wave—a feature which owners of receiving sets will readily understand. This pure wave is called the "carrier" wave, and can be

heard as a whistle in a valve receiver, as no doubt readers will have noticed.

When someone speaks or plays into the microphone the strength—or "amplitude" as it is called—of the carrier wave is altered; increased or decreased according to the characteristics of the sound waves made by the voice or instruments. (See Fig. 2.) This process of modifying the amplitude of the carrier wave by means of sound waves is termed modulation.

The whole process may be visualised as the moulding of a flat piece of clay (or the carrier wave) into a pattern (the song or speech). Or you may imagine the carrier wave as a steadily-flowing river upon whose surface ripples may be made. A reed growing in the river-bed does not respond to the steady current of the river, but when the surface of the water is ruffled by the wind the reed will quiver or vibrate in sympathy with the surface ripples. That steady current is the carrier wave, the ripples are the modulation waves of the speech or music. The reed is your receiver.

(Another article for the beginner will appear in next week's "Popular Wireless.")

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per photo.



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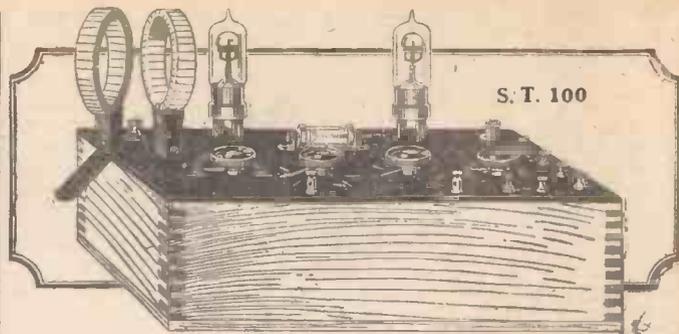
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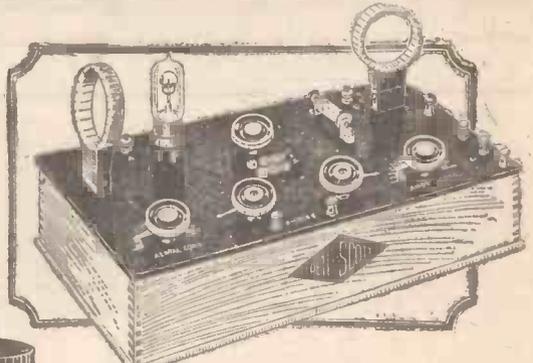
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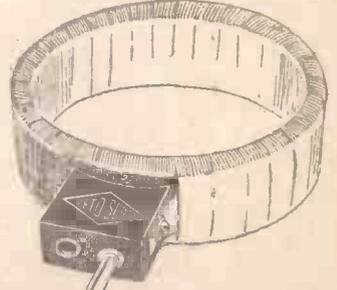
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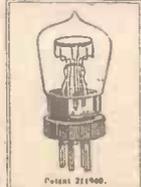
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HOW TO MAKE AN IMPROVED COIL WINDER.

FROM A CORRESPONDENT.

THE coil-winder to be described in this article was designed by the writer to obviate the numerous little troubles usually experienced with such devices, such as the slipping and untrue alignment of the former, uneven spacing, and uncoiling of the

board shaped similar to a 60 degrees set-square, as shown at B, the long edges of these then being covered with thick sheet rubber strips or very coarse emery cloth. An ordinary brass bush is then attached to the exact centre of each disc, on the opposite

of the winder, the bobbin will be self-aligning. The finger and thumb of the left hand should, of course, exert a little pressure on the wire as it leaves the bobbin.

The device will be found indispensable when constructing cylindrical coils, and

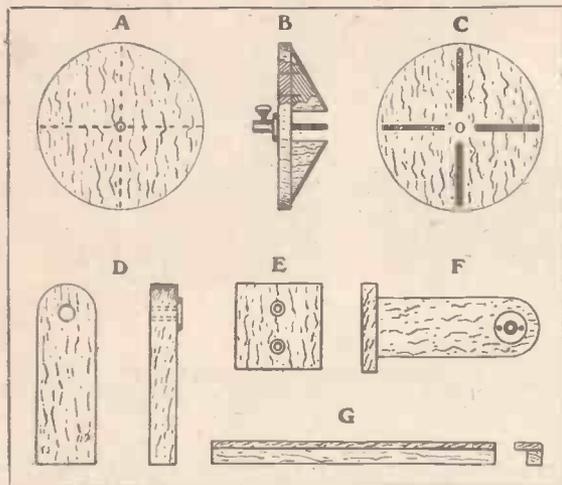


Fig. 1.

winding, etc., and so it was decided to construct a thoroughly reliable machine which would be in no way complicated in construction or use. Since the dimensions of the parts are of little importance, this matter is left to the reader's own choice.

It should be observed, however, that all parts should be in proportion with the size of the disc-chucks, these depending on the size of coils it is proposed to wind. If the disc-chucks are cut about 5 in. in diameter they will accommodate coil formers ranging from about 1 in. to 4½ in. in diameter, so that if this measurement is decided upon almost any useful size of coil can be wound without necessitating the construction of other chucks.

Making a Chuck.

The arrangement of the chucks is shown in Fig. 1, the special feature of these being that they are self-centring to any size

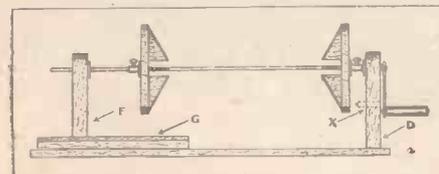


Fig. 2.

former within the prescribed limits. Two discs of five- or six-ply wood are accurately cut out, drilled through the centre, and marked off into four equal parts as indicated at A, and to one side of each disc, over the markings, is attached four pieces of thin

sides, and in the manner shown, these being first drilled, tapped, and fitted with small thumb-screws. Diagram C shows the face of one of the chucks with the "jaws" attached.

Obtain a fairly thick strip of wood, cut out two identical pieces, as shown at D, and fit a brass bush to each in the position shown. Now cut off ½ in. from the lower end of one piece and screw a square piece of ½ in. board, E, to this end, as shown at F, taking care to see that the screw heads are well countersunk.

Rub this small base very smooth with a piece of glasspaper, and then make two runners or guides, as shown at G, so that when these are screwed down to the baseboard, the bearing pillar, F, will slide accurately between them.

Counting Turns Automatically.

Next prepare a suitable baseboard and assemble the parts as shown in Fig. 2, using a 15 in. or 18 in. length of steel rod for the spindle, which is fitted with a simple handle at one end. When working the machine it is usually best to keep the right-hand chuck permanently set in the position shown in Fig. 2, and make the necessary adjustments by means of the left-hand chuck. This method prevents "side play" of the spindle, as does also the alternative method of sliding the bearing pillar, F, up flush with the bush fitted to the left-hand chuck. To attach or detach a coil former it is only necessary to slide the movable bearing pillar and the left-hand chuck off the end of the spindle.

If a small nail is driven through the edge of the right-hand chuck and made to engage the end of a strip of spring brass, X, secured to the stationary pillar, D, this will be found a very effective means of counting the turns wound on the former, providing of course the operator is not deaf.

Self-Aligning Bobbin.

Fig. 3 represents a plan or top view of the winder in use, where a simple holder for the wire bobbin is shown, this consisting of a length of metal rod which is arranged to slide through the top portions of two upright supports secured to the baseboard. If this rod is accurately parallel with the spindle

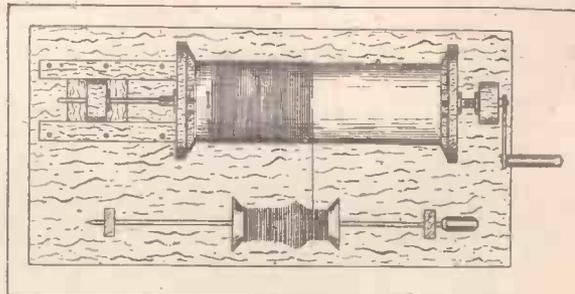


Fig. 3.

especially coils to be wound with enamelled wire for slide inductances, for the whole winding may be completed in a few minutes, while the shellac varnish on the former is in the desired "tacky" or semi-dried condition.

WIRELESS IN TURKEY.

By W. G. CAMPBELL.

EVER since the war the position of the wireless amateur in Turkey has been most unfortunate, and he has greatly envied the comparative freedom enjoyed by experimenters in England. During the armistice the Allied forces of occupation refused to permit anyone even to "listen-in," and since then the position has been quite as bad, because the Turks issued no definite regulations regarding the use of wireless, and when they discovered the unfortunate amateur carrying on experiments they promptly arrested him and confiscated his apparatus!

There are, however, a good many amateurs in Constantinople who have experimented during the armistice and since with indoor and frame aerials, but they dare not use an outside aerial; hence, their operations are somewhat restricted. But even with an indoor aerial a good deal can be done. For example, the time signals from Paris and Nauen came in quite strong, although these stations are nearly 1,500 miles away, and sometimes, with three or four valves, the music from Paris and Königswusterhausen could be picked up when atmospheric or the high-power stations of Sofia, Moscow, Tiflis, etc., did not interfere.

Technical Notes

Conducted by J. H. T. ROBERTS, D.Sc., F.Inst.P.

A Tiny Aerial.

POSSIBLY the smallest loop aerial in the world to give practical signals is that used by Mr. A. Obermiller, a well-known radio engineer of New York, and an account of which appears in the "Radio Umschau" (Frankfort). It consists of two square loops, the outer one being of 2-in. side, and the inner one a shade smaller, the inner one rotating about a common diagonal. Although small in size, it contains an astonishing amount of wire, and, used on a set with three stages of H.F., is stated to bring in stations up to, 1,000 miles quite easily.

Drying-Out Coils.

In making your own H.F. coils it is a good plan to avoid the use of shellac or celluloid binding varnish if you possibly can, as it tends to add to the capacity of the coils and make them tune broadly, as well as to increase losses due to moisture absorption. If, however, coils are kept in a reasonably warm room, and particularly not near open windows, they should not gather much moisture. Should the coils be suspected of being damp, care must be exercised in warming them to drive off the moisture. It is much better to apply an extremely gentle heat for a long time than a considerable heat to try to hurry the process. An ordinary metallic filament lamp (not a carbon lamp) may be placed near to the coils for a time, or even within the cabinet, if this is fairly large.

Radium Valve.

The idea of using radium or some other radio-active substance in place of the filament of a valve as a source of electrons has very often been discussed, and I notice that a patent has been granted in France for a wireless valve operated in this way. The patent specification does not state the amount of radium which is required or exactly how the emission is to be controlled.

Making Out a Panel.

The most experienced constructor is apt to make mistakes in laying out the instruments for the panel, or, apart from mistakes, he frequently changes his mind as the lay-out proceeds. If the marking out is done direct on to the panel, something has to suffer. It is much better to take a sheet of paper, the same size as the panel, and do all the marking out, as well as alterations, on this paper until the whole of the instruments are arranged for.

Then place the paper against the panel, and secure it by gumming the corners or edges, or gum it at isolated spots here and there. By means of a centre-punch or a stout pin the positions for all the drillings can then

be made with perfect confidence, and the resulting panel is much more likely to be neatly done.

Adjustable Aerial.

If you should wish to adjust the length of your aerial for best reception of different wave-lengths, in particular for receiving short-waves, you can easily do so by arranging it in the following way, quoted from the "Wireless Age." Use an aerial wire about three times as long as the shortest length you will require when operating. For example, if you wish to vary the operating length of the aerial between 100 ft. and 50 ft., use a length of wire at least 150 ft. An insulator is introduced into the wire at a distance of about 100 ft. from the lead-in end, and the opposite end of the wire passes over a pulley at the top of the mast or other support, and then carries a weight, or preferably is wound upon a reel which can be locked so as to prevent unwinding.

The lead-in is also brought to a reel, or equivalent device for taking up any slack, this being, of course, mounted upon an insulating block. If a length of 100 ft. is required, the mast end of the wire is drawn down until the insulator comes close to the head of the mast (it is assumed that the mast is at least 100 ft. from the lead-in.) If a shorter length is required, the lead-in is drawn down, and the mast end paid out, the insulator travelling towards the lead-in end. The operating length of the aerial will be the length from the lead-in to the insulator carried by the aerial wire.

Short-Wave Treatment.

The close relationship between wireless waves and X-rays is brought out by the experiments of MM. Gosset, Gutmann, Lakhovsky, and Magrou, reported in the "Radio Revue" (Paris). It has been found possible to inoculate certain plants in such a way

as to produce in them conditions corresponding to those of cancer in animals.

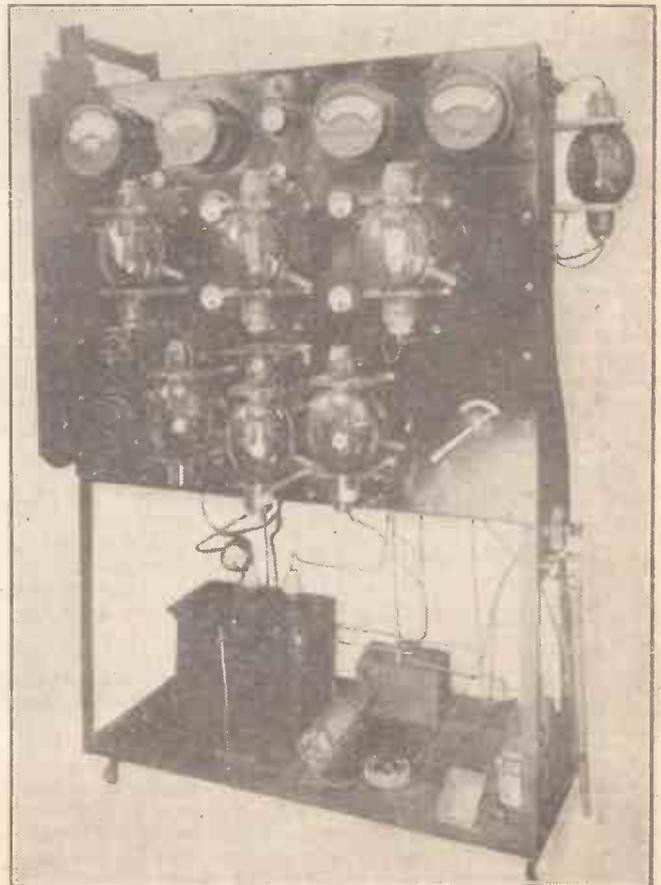
These conditions when produced are made the basis of a study of the curative influence of short electro-magnetic waves, the waves being produced by an apparatus known as the radio-cellulo oscillateur Lakhovsky; the waves usually employed have a frequency of 150 millions per second, or a wave-length of 2 metres. It has been found that the application of the rays has produced curative effects which were not brought about by surgical means. Readers requiring fuller information will find the same in the Revue de Path. comparée, March, 1924; Revue de Path. végét. et d'Entomol. agric.; Ann. de l'Institut Pasteur; and Conference École Sup. des P.T.T., June, 1924.

Making Discoveries.

In wireless, probably much more than in any other science, progress has been largely due to the enthusiasm of a multitude of amateurs and experimenters who, unhampered by any great knowledge of theoretical principles, have adopted the simple motto, "Try it." In "Radio Digest" (Chicago) is a paragraph headed "Fooling with Radio," from which the following may, perhaps, be quoted:

"Radio widows (this is American for the wife whose husband neglects her for the wireless set) may not all agree, but, of course, the real answer for this strange conduct is the urge for experiment. To members of their families who are waiting to go to the movies, or to be taken out in the car, they are simply 'fooling with radio.'

(Continued on page 603.)



The modulating and oscillating panel at La Presse, the Montreal broadcasting station. The huge 2,000 watt valves were made in England.

HOW TO MAKE A STANDARD TWO-VALVE SET.

VALVE DETECTOR—REACTION FROM ANODE CIRCUIT TO AERIAL TUNING COIL—ONE L.F. VALVE—AN EASY SET TO MAKE.

By J. LAURENCE PRITCHARD.

Simplicity of construction and efficiency of operation are the keynotes of this useful receiver described by the Technical Editor of Harmsworth's Wireless Encyclopedia.

A NEAT and efficient two-valve receiver is illustrated in Fig. 1. It will be found a useful piece of apparatus for reception of broadcast concerts at exceptionally good headphone strength up to a

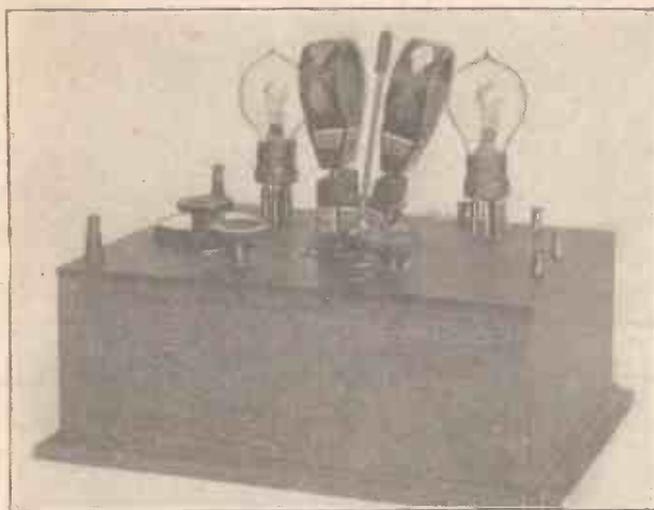


Fig. 1. The two-valve set complete.

range of forty miles or more. There is nothing difficult in its construction and with the straightforward circuit employed, immediate reception should be possible on completing the set. The circuit incorporates a valve detector with reaction from the anode circuit to the aerial tuning coil. A single stage of L.F. amplification brings the volume up for good reception in more outlying districts.

Making the Case.

For simplicity of construction, all the components are arranged on the front or the back of the panel. Of the actual panel lay-out two filament resistances are secured towards the front edge of the panel. The two valve holders are correspondingly placed at the back of the panel. A two-coil holder, having one fixed and one movable holder is attached in the centre of the panel. To the left of this component a variable condenser of .001 mfd. capacity is situated. In a similar position and on the underside of the panel is screwed an L.F. transformer. Aerial and earth terminals occupy the back and front left-hand corner of the panel, respectively, while two terminals are required in the middle of the right-hand side of the panel for attachment of the telephones. The three-battery terminals are placed at the back edge of the panel behind the L.F. amplifying valve.

Before the panel is cut, the case is con-

structed. This is simply made from $\frac{3}{4}$ in. finished deal or other wood as desired. The ends of the case are mitred together, the sides being 12 in. long and the case 9 in. wide. All four pieces have a common depth of 4 $\frac{1}{2}$ in. They stand upon a moulded base measuring 13 in. by 10 in. having a thickness of $\frac{3}{8}$ in. If it is not desired to mitre the edges they may be lap-jointed. If this is adopted, the combined thickness of the front and back of the case must be deducted from the two pieces forming the sides of the case. It is advisable after finishing the case, to turn it upside down and tap away any sawdust or shavings which may have collected inside.

The Lay-out.

The panel is cut from $\frac{1}{4}$ in. ebonite to the outside measurements of the case, which should be 12 in. long and 9 in. wide. Holes are drilled and countersunk round the edges, and the panel is then screwed in position so that the rough edges overlap the sides of the case on all four edges. The case is placed

The following is a list of materials and approximate cost of the chief parts for the two-valve set.

- 1-in. ebonite, 12 in. by 9 in.
- Variable condenser, .001 mfd., 8/6.
- L.F. transformer, 20/-.
- Two filament resistances, 1/9 each.
- Grid leak and condenser, 3/6.
- Two fixed condensers, 2/- each.
- Two valves, 12/6 to 30/-, according to type.
- Two coils, Standard Lissen or Igranite, 5/6 each.
- Coil holder.
- Batteries. Cost according to type.
- Valve sockets, terminals, wire, etc.
- Wood for case.
- Telephones. Cost, according to make, say, 25/-.

on its side and the rough ebonite edges are filed and scraped flush with the sides of the case. If a steel scraper is not available for this, a sharp piece of glass with a flat side will answer very well. The panel and case should be marked, so that the panel after removal can be put back the same way. The case is put aside after it has been stained or polished as desired, until the panel is ready to be finally fixed to it.

The filament resistances are placed 4 in.

apart, equi-distant from either edge of the panel and 2 in. from the front edge. The valve holders are made up from valve sockets, each set being placed the same distance from the sides of the panel, 1 $\frac{1}{2}$ in. from the back edge and 6 in. apart. The two coil holder is placed at the crossing of two lines joining the diagonally opposite corners of the panel. The variable condenser, which has a capacity of .001 mfd., is situated equi-distant between the back and front and 2 in. from the left-hand side of the panel.

The Wiring Connections.

All terminals are screwed $\frac{3}{4}$ in. away from the edge of the panel. A feature of the aerial and earth terminals is that they are mounted on tapering ebonite bases to give them a better appearance. Two pieces of $\frac{1}{8}$ in. diameter ebonite rod are cut to a length of $\frac{3}{4}$ in. and centrally drilled with a drill to suit the diameter of the terminal shank. Terminals of the square box pattern are selected, having stems of about 1 $\frac{1}{4}$ in. in length. The two terminals before assembling to the panel are illustrated in Fig. 2.

Three fixed condensers are required. The grid condenser of .0003 mfd. capacity has clips for a grid leak of 2 megohms resistance and is connected across the grid condenser. The grid condenser is placed towards the centre of the panel. Above it, and between the two valves, a .001 mfd. fixed condenser is fixed and wired across the primary of the transformer. A third fixed condenser of .001 mfd. capacity is wired across the telephone terminals.

The circuit diagram is given in Fig. 3. Tinned wire is used and by keeping all the bends at right angles and wires parallel, or at right angles to each other, a very pleasing appearance is obtained. This is borne out by the illustration of the under-side of the wiring shown in Fig. 4. It will be seen that the four wires connected to the plugs and sockets of the two-coil holder are insulated flexible wires. This is necessary in the case of the moving coil to prevent the wire from breaking after the coil has been moved backwards and forwards several times.

In making the connections with the

(Continued on page 576.)

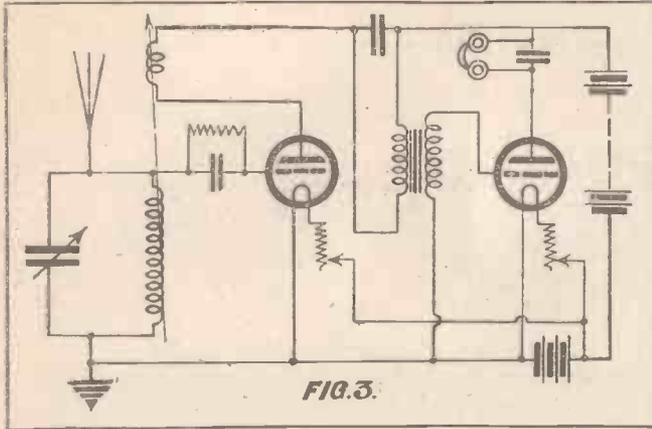


Fig. 2. Assembly of Aerial and Earth terminals.

HOW TO MAKE A STANDARD TWO-VALVE SET.

(Continued from page 575.)

flexible wires it is necessary to take care that each individual strand is embraced by the clamping screws and washer. Failure to observe this may result in one or more loose



strands shorting across to the other contact. A good plan is to solder the bearings of the wires or to twist them round so that there is little fear of loose strands coming away. Another important point to observe, which may save considerable time in making these connections properly, is to twist the wire round the screw in the same direction that the screw is tightened up.

Where soldering is employed, a soldering paste of a non-corrosive nature such as Fluxite must be used. Although killed spirits of salts or other acid flux may make a good joint at the time it is almost certainly bound to corrode in a short time.

Operating the Receiver.

Before fixing the panel to the case the under side of the panel must be thoroughly cleaned from any traces of solder which may have dropped from the iron or other material, such as short cuttings of wire, which have a habit of finding resting places in quiet corners where they can short between two circuits. A good method of cleaning the

panel is illustrated in Fig. 5. A piece of clean rag is wrapped round a sharp pointed stick, which is poked into the places where foreign material is likely to collect.

The removal of any trace of soldering paste is important. Apart from any electrical loss which may be occa-

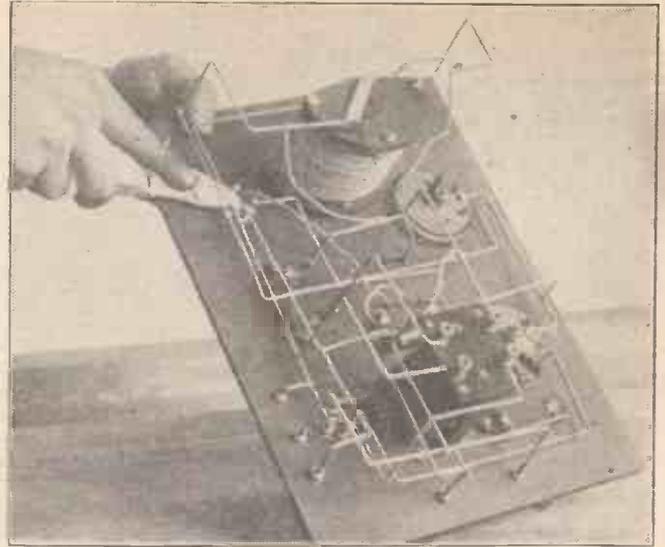


Fig. 5. A view of the lay-out and wiring at the back of the panel.

sioned by the presence of the paste, its sticky surface picks up dust which may cause considerable trouble to efficient reception.

After the construction has satisfied himself that the panel is quite clean it may be finally screwed to the case, taking care to keep the marks previously made together so that the edges of the panel will come exactly flush with the case. For general broadcasting a No. 35 or No. 50 Igranite coil will be suitable in the aerial circuit and a No. 50 or No. 75 in the movable coil holder for reaction.

To operate the set the terminals are joined to their proper connections and the valves fixed in position. On tapping the valves, especially the detector valve, a ringing sound may be heard which indicates that the valve

be, the other controls should be adjusted until the signal is brought to its full strength. The completed receiver in operation is shown in Fig. 6, where final adjustment is being made to the coupling of the reaction coil.

Once the tuning and controls are mastered the set will be found very easy to operate, but it will be some time before the novice will get the full efficiency from this—or, indeed, any—valve receiver. In capable hands a valve detector followed by an L.F.



Fig. 6. The completed set in use.

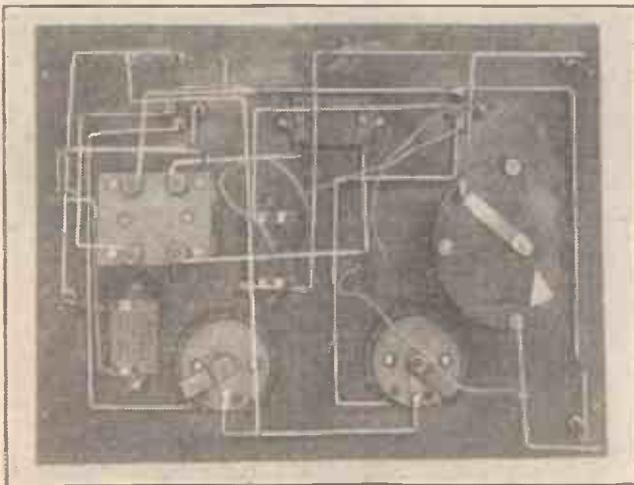


Fig. 4. View of the wiring of the panel.

is functioning correctly so far as its electronic emission is concerned.

On tapping the aerial terminal with a damped finger a distinct click should be heard which is not observed when the same thing is done to the earth terminal. To tune in the set to a desired signal the variable condenser is rotated slowly. Having picked up the signal, no matter how weak or faulty it may

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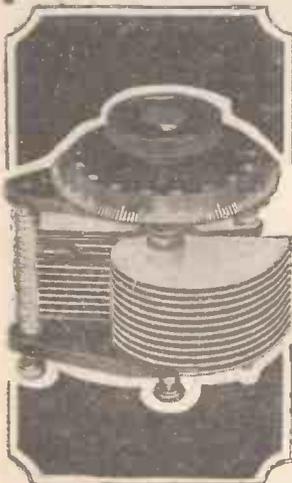
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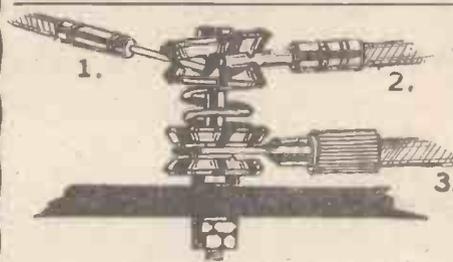
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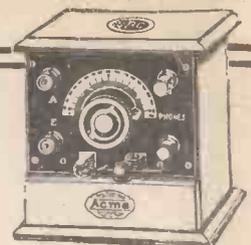
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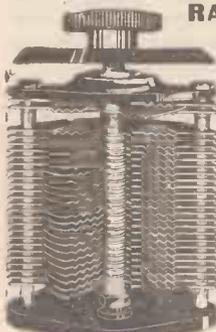
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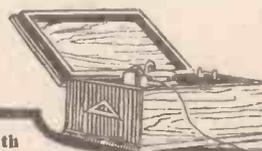
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GEARY AND THE FIELD DAY.

By HIGHAM BURLAC.

GEARY is President of the Upper Clapham Radio Round Table. It is a rôle in which he delights chiefly because it keeps him always in the lime-light—or rather, the X-rays, for that is more topical and more apt, because when Geary takes the chair he becomes transparent, and you see what a pompous little gossoon he really is. I am the Benevolent Friend.

Geary, of course, shines as a great Social Figure, and is to be seen at his best on occasions when the Knights of the Round Table close up and make room in the ranks for the Enids and Elainees, etc. Then he expands like a lotus, wears hideous garments—like an undertaker—and does the lah-di-dah. When I see him shove on his pince-nez, rub his hands as though washing, and say, "Now, ladies," I feel that for two volts I could choke him.

This will explain why Geary is always so keen on the Table's annual outing. This year we went to Dogbones Wood.

The Knights met outside the Three Bells, bringing their belles (if any) with them. There was Geary in a clean shave and a white waistcoat, carrying some of the wireless set we were to take. There were Mrs. Geary, Miss ditto and young Bill ditto, the latter very doggy in a three-electrode collar. There was Dr. Cardinal Nooman, our expert locator of faults. Rumour said he used to try his stethoscope on wobbly valves and test his accumulators with a clinical thermometer.

Selecting the Site.

Then we had "Cox and Box" tightly clutched in each other's arms as usual; they wandered in a dazed way into the club room one evening and we let them stop to please Mrs. Geary, who had called for her husband.

There was our old friend, Dean Doolum. He added "tone" to the Table, but little else. He will never grasp the ter-ruth about radio this side of Mars, being Providence's Own Select Ass, but good for the valve trade.

Having been decanted upon the grassy sward of Dogbones Wood, we stood around waiting for Geary to take command, which he did when he saw that I had not unloaded the dog-cart. "Now, Higham," he said briskly, "but with the gear, sharp and navy fashion. Mind that crate, now. Put the receivers down there. That's right. Now I vote we have a bite before business. What do you say, ladies?"

"Where's your bit, Geary?" I asked.

He produced from his waistcoat pocket a screw of paper and held it out to me. "I don't smoke shag," I said coldly.

"Take it, Higham, and treat it gently; it's valuable."

"What is it," I asked, "a couple of aspirins or a bismuth lozenge?"

"It's my super-crystal. It cost me half-a-crown and I've only used it for two years. Its a bit of signalite—very rare."

"All right, Geary. Hand it over. I suppose you know galena when you see it. Is that all you've brought?"

"Man alive! That's my ewe lamb, the flower of the flock. But I've brought a beautiful earth-spike, too. It's in the dog-cart. Roof for it and come to lunch. Er—is that something to drink in that crate?"

"Yes," I replied, "for Cox and Box and Burlac and Nooman and Doolum. I've lemonade for Geary and his harem."

After lunch and the inevitable insect-hunting, Geary began a strange stunt



The amplifier room, with control engineer in charge, at the silversum broadcasting station.

which he called "Selecting the Site." This consisted mostly of frowning round the landscape, stamping on the ground and saying, "Ha! I suspected as much," or "Hum! I doubt it; I doubt it." At last he pretended to be satisfied and, turning to me, said, "Here we are, Higham! Ideal spot to go to 'earth.' Lug the things over while I spike in." I turned away, catching half a glimpse of Geary with the spike brandished high. He would have done for one of these amateur photographers—you know—"Esquimo spearing fish," or "The Javelin Lunger."

A Good Earth.

I had not gone six steps before a few squeaks from the lady-folk and a yell on a lower note caused me to turn. Geary had disappeared, all except his head and his hands, the latter clutching the turf.

"My colonial aunt," I remarked, surveying him, "it's a good place to go to earth, as you said, Geary. But we're out for radio, not a treasure hunt. Why have you planted yourself there, like a blithering tulip? Do you think you'll grow up into an F.R.S., or what? Just like you, trying to sneak off after lunch and leave me the work. But don't let me detain you;

give my regards to the boys down under, but you might hand up the earth-spike first."

This was hot stuff, but did not take long to say and it did me a world of good. Then I hoisted Geary out and found he had selected a disused well to go to earth in. As I said, a little more care on the part of some Dogbones (unknown) and Geary would have stopped annoying me. Well, Geary had another bottle and became a hero, much petted by Miss Georgianna Skoofer, 41, spinster. Then he seized the spike and started hunting for another site, "It's no good, Geary," I remarked blandly. "You can't expect two wells in one field; better have another jab at the old spot."

"Shut up, Burlac!" he snapped. "Anybody would think you wanted me to fall in."

For a flat with the top attic vacant Geary makes remarkable guesses at truth sometimes. But all I answered was, "This, this to the man who strained his wrist-watch in rescuing you is—well, you're King Lear's daughter plus Brutus for ingratitude."

Bang went the spike to the hilt, and down we sat to connect up.

Why this was Written.

I connected while Geary directed the operations in his usual sarcastic manner. The results were ga-ga in the extreme. Weak? As weak as six days and a wet Sunday! All over the set we went, the honour of my Unidyne at stake. As a matter of fact it was not so much at stake as at spike. Yes, the earth-spike again. I pulled it up, and in jabbing it in again found the earth round about very loose. So I dug a little and found that with unerring aim Geary had

selected a grass-grown rubbish tip and had embedded the spike—deeply in a derelict *vinegar bottle*.

"Upon my soul, Aloysius—for I can call you by no other name at a moment of deep emotion such as this," I said. "If you aren't the gnat's eyebrows. First you go and insulate the earth-spike with hair, and then you insulate it with glass. Shall I fetch you a gallon of oil now, or a chunk of ebonite? Or would you like to connect the 'earth' to the aerial and make the R.B.C. loop the loop?"

Geary, for the first time in his life was at a loss.

"Higham, old man! Don't let it get about. You do misrepresent and exaggerate things so. I'm trying for the Gold Medal this year, and if this gets out I'm done."

"Aloysius," I replied severely, "tell me—was it you who swiped my pet galena? Yes, that very bit you brought to-day. Man, I know every nook and corner of that crystal."

"Absolutely not," returned Geary defiantly.

"Righto," I said. "Then no gold Medal. I'll publish this true story."

And I have.

ARE WIRELESS WAVES ETERNAL?

By G. H. DALY.

What happens to wireless waves? Do they die out as one would think, like sea waves, or do they go on for ever?

ACCORDING to the latest theory wireless waves have no destination or end, and, once created, go travelling on through space for all time. In fact, once you speak into the microphone at 2 LO or any other station, the sound of your voice or lit of your music will still be flying merrily on its way past distant stars and invisible planets long after you are dead and gone.

It sounds rather fantastic—yet certain scientists are quite convinced that this is really what does happen to wireless waves, and certain known facts seem to prove that they are right.

The London broadcasting station, for instance, cannot be heard in the usual way on a crystal receiver situated, say, in the north of Scotland, nor is a one-valve set of much use. This, however, does not mean that the wireless waves from London do not reach the north of Scotland, for if a suitable multi-valve receiver is used, Uncle Rex's voice will be heard a hundred times louder than it actually is in the broadcasting studio in London. So there is no dearth of wireless waves in that locality.

Through Unimpeding Space.

The same thing happens if a wireless receiver is erected on the other side of the world. "London station calling" would still be heard provided a sufficiently sensitive receiver were employed. In short, whether you hear the London station or any other wireless transmitter, in Ealing or in Timbuctoo, depends entirely upon the sensitivity of the said receiver. And wherever you go on earth the wireless waves, from all wireless stations transmitting at the time, are flowing past you and even through you, for wireless waves, it should be added, have a constant speed of 186,000 miles per second. And the mere fact that wireless waves ten thousand miles away from the station which has transmitted them have exactly the same speed as the waves which are just leaving the aerial of the same station bears out this theory.

This theory admits, however, that the earth and the atmosphere damp wireless waves, and thus weaken them considerably; but, once clear of the earth and earthly atmosphere, the waves travel on unimpeded. For the ether of space, through which the waves travel once clear of the earth, offers in itself no resistance to the passage of the waves, as ether is a non-material substance. Should the waves strike another world, more damping will take place before they again pass on their way, but the waves will never be completely killed, as it were, for impressions once made on the ether are eternal, says this theory.

Practical Limitations Only.

Certain peculiarities in wireless transmission also bear out this theory, for, while

some of the high-power European wireless stations employ 250 electrical horse-power to transmit across the Atlantic, wireless amateurs frequently transmit over the same distance on less than half an electric horse-power. This shows that weak wireless waves from a small transmitter are capable of spanning the same distance as waves from a high-power station.

A Million Year Journey.

The most conclusive proof of all, however, is based upon the relationship between wireless and light waves. Both are waves in the mysterious ether, and what is common to one is common to the other; they have the same speed and obey the same laws.

Now, in the telescope at the Mount Wilson observatory, it is sometimes possible to see a star, the light waves from which take one million years to reach the earth. Thus we can actually see light waves which

have been travelling for a million years with our own eyes.

In the same way light waves are arriving on the earth which have been travelling for millions of years, only our telescopes are not sufficiently powerful to detect them; and, as science has proved that light and wireless waves are twin brothers, it follows that wireless waves also travel for millions of years, which is well on the way to being eternal.

Through the Ages.

According to this theory, if there are inhabitants on the planets in the vicinity of Alpha Centauri, the nearest fixed star, and these inhabitants are equipped with super-sensitive wireless receivers, they will be just tuning in to the first concert broadcasted from England, for wireless waves, even travelling at their colossal speed of 186,000 miles per second, will take four years to reach Alpha Centauri.

As for the inhabitants of Venus and Mars, our earthly concerts only take a few minutes to cover the distance separating these planets from the earth. The sound of the King's voice at the opening of the British Empire Exhibition at Wembley is already beyond the confines of the solar system, and the speeches and music on that occasion—the greatest and most awe-inspiring accomplishment of British broadcasting—will still be travelling on their way long after the Empire is no more and our earth is a dead world.

A VARIABLE H.F. CHOKE COIL.

ALTHOUGH the H.F. choke coil is not used so frequently as the L.F. choke, it is nevertheless a very useful component in the hands of the serious experimenter. Its function is, as its name implies, to choke out or eliminate an H.F. current from a circuit by setting up an H.F. impedance, and in certain types of reflex receivers it often becomes an essential part of the apparatus.

It is, of course, a distinct advantage if the choke is made variable, and it is here proposed to detail the construction of such a device.

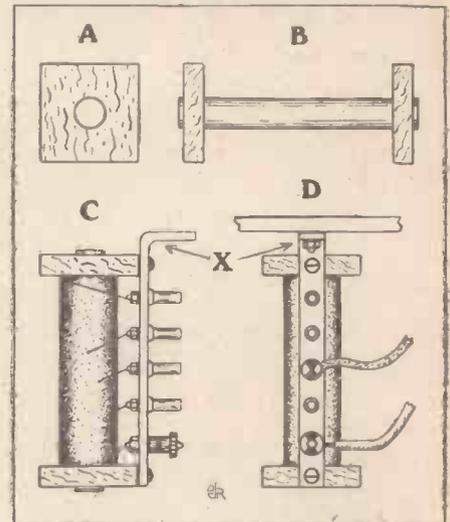
Novel Form of Tappings.

Cut out two pieces of dry board, A, each about $1\frac{1}{2}$ in. square by $\frac{1}{2}$ in. in thickness, drill a $\frac{1}{2}$ -in. hole through the centre of each piece, and then force them over the ends of a 5-in. length of $\frac{1}{2}$ in. ebonite tubing in the manner indicated at B.

Obtain some No. 40 or nearest D.C.C. wire, anchor the end from the bobbin to one of the wooden supports by means of a drawing-pin, and commence the winding. Wind on 500 turns, placing a thin sheet of waxed paper round each layer, and take off tappings at the 200th, 300th, 400th, and 500th turns. The last tapping, of course, constitutes the end of the winding. Next, cover the whole winding with imitation leather or adhesive tape, cut out a strip of $\frac{1}{8}$ in. sheet ebonite 6 in. long by $\frac{3}{8}$ in. wide, and drill this to take four ordinary valve

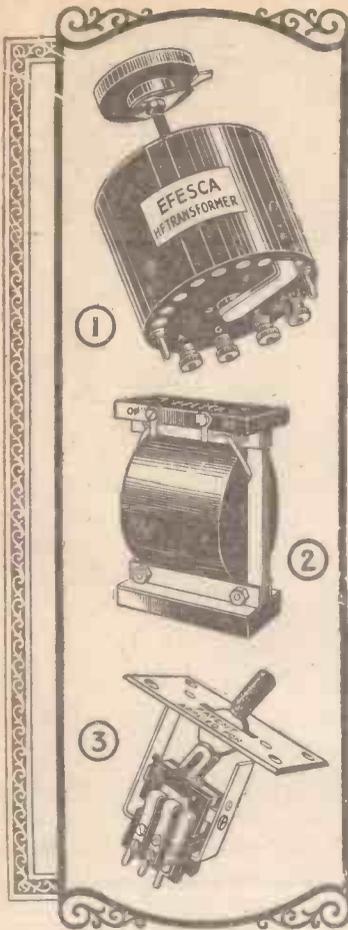
sockets, a terminal and two wood screws, as shown in Diagram C.

Screw the strip firmly in the position shown, hold the protruding end in boiling water for a few minutes, and then bend it over at right angles so as to form a lug, X,



for the purpose of attaching the instrument to the panel of the receiver.

Now solder the tappings to their respective sockets, commencing with the beginning of the winding which is soldered to the terminal, first tapping (200 turns) to the first socket, and so on, and the instrument is then ready for immediate use. The terminal is permanently connected up to the desired circuit lead, an ordinary wander plug and flexible lead being all that is required to form the variable connection.



The Components Illustrated are

1. EFESCA HIGH FREQUENCY TRANSFORMER. Can be employed immediately preceding a reactance coupling to form two High Frequency stages or any number of separate transformers may be used in combination. Can also be used as a Tuned Anode Transformer by shunting the primary with a '0003 mfd. variable condenser in any number of stages. Wavelength range, 150-2600 metres. Complete as illustration, wound on Ebonite former, 21/-. Ditto embodying Grid Leak and ('0003) condenser for use as Transformer connected to Detector Valve, 25/-.
2. EFESCA SPEECH AMPLIFYING TRANSFORMER, TYPE "C." This Transformer is designed to give the amplification of a power Transformer without the loss in purity of reproduction generally experienced with power amplification. The coil is wound in a special manner to neutralise resonant effect, while the laminations of the core are extra carefully insulated from each other to localise eddy currents and thus prevent distortion. Ratio 2-1 one hole fixing, 25/-.
3. EFESCA ANTI-CAPACITY SWITCH (Pat. applied for). A double pole, double throw switch specially designed to minimise the capacity which exists in most change-over switches. The contact brushes are of phosphor bronze and present only their edges to each other with a comparatively wide air gap—thus practically eliminating all capacity effects. Specially suitable for High Frequency and aerial circuits and for all intervalve change-over combinations. Price 8/- each.

Learn more of Efesca parts by sending for Catalogue 522 which contains the full range. It's Free!

For those not interested in the constructional side there is a wide range of complete Efescaphone Sets, from the simple crystal set to the multi-valve receiver for loud speaker and long-range work.

You can build a better set with



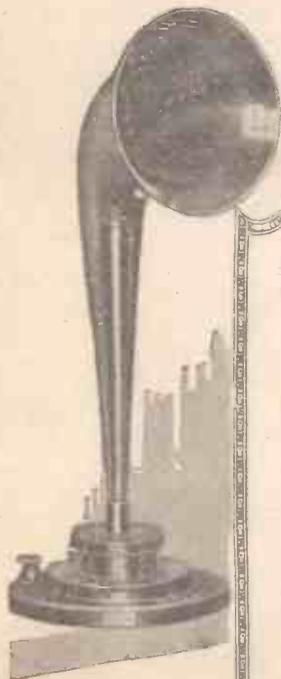
One-Hole Fixing Wireless Components.

THERE is hardly a wireless enthusiast who is entirely satisfied with his set. He wants still better results—and they can be had by building with Efesca parts. Each is designed to give the maximum efficiency. A combination of Efesca components, therefore, leaves nothing to be desired.

Each part is the outcome of much careful study—a real scientific instrument of unique design and first-class workmanship. They are stocked by wireless dealers, ironmongers, and electricians.

Wholesale only.

FALK, STADELMANN & Co., Ltd.,
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and at Glasgow, Manchester and Birmingham.



Ask to see the TrueMusic JUNIOR Loud Speaker.

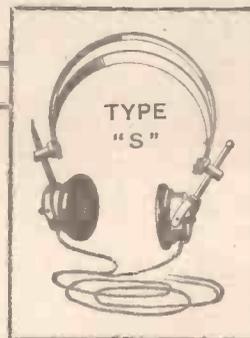
Before you decide on the Loud Speaker for your Set, see, and listen to a TrueMusic Junior. Its clear, pure tone is a revelation.

Reproduction of Broadcasting is so faithful, because the metal in the Horn is not stretched or twisted. It is made in one piece of electrolytically deposited copper.

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REPRODUCTION THAT SURPASSES BELIEF

The extreme sensitivity and complete absence of distortion of the New Improved M.E.L. Phone, coupled with the greater volume and clarity of reproduction which they afford, simply surpasses all belief of those who have not tried them.

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SOME NEW WIRELESS BOOKS. WINTER READING FOR THE AMATEUR.

By THE EDITOR.

WITHIN the last few weeks several books of considerable interest, not only to the amateur and experimenter, but to the general listener-in, have been published.

The following is a list of books I have received which, considering they are published at very reasonable prices, should make a strong appeal:

"Valves and Valve Transmitters." By W. James. Published by the Wireless Press. Price 9s. net; "Radio for the Millions Who Listen." By "Experimenter" of the "Manchester Evening News." Published by Hodder & Stoughton. Price 2s. 6d. net; "Captain Eckersley Explains." By Captain Eckersley. Published by the Wireless Press. Price 2s. net; "Uncle Jack Frost's Wireless Yarns on Good Reception, and How to Get It." By Captain C. C. J. Frost, M.I.R.E. Published by the Wireless Press. Price 2s. net; "The Story of Broadcasting." By Arthur Burrows. Published by Cassell & Co., Ltd. Price 3s. 6d. net; "Still Calling." By John Henry. Published by Nisbet. Price 2s. 6d. net.

"Valves and Valve Transmitters," by W. James, is a book which will make its primary appeal to the wireless amateur possessing a transmitting licence. Mr. James deals with his subject in a very thorough manner. He commences with a chapter on "Electrical Principles," which deals briefly and lucidly with resistance in connection with direct currents, high-frequency currents, resistance in series and parallel, etc. This chapter also covers direct current in low-frequency circuits and high-frequency circuits, and gives a clean exposition on Ohm's law, cells in series and parallel, currents and voltages in simple circuits, etc.

Chapter 2 contains some very useful information on condensers of all types, electro-magnets, and all types of inductance coils. Chapters 3 and 4 deal respectively with alternating current circuits and the supply of power, the latter giving a very thorough resumé of the various ways and means of obtaining suitable power for amateur transmitters.

A chapter on rectifiers, including the Noden valve, accumulators, mercury arc rectifiers, etc., leads to a chapter on valve rectifiers, which should prove of especial interest to every amateur transmitter.

Chapter 7 deals with microphones and amplifiers, with some very clear information concerning the Marconi-Sykes transmitters, and advice on the mounting of a microphone. Chapter 8 is another very interesting chapter on the three-electro valve as an oscillator; but probably the chapter which will prove of most interest to the general reader is chapter 9, which deals with modulated waves and wireless telephony.

This very thorough work is indicative of considerable experience and knowledge on the part of the author, and, although the

introduction of a certain amount of mathematics and formula presupposes that the reader is anxious to go very deeply into the subject, it might at first give the impression to the average amateur that this is a book for the advanced student. Yet there is a considerable amount of information which can be thoroughly appreciated and understood by the average amateur desirous of one day trying his luck with the Post Office for an amateur transmitting licence.

"Radio for the Millions Who Listen," by "Experimenter," of the "Manchester Evening News," is written in the first person, and contains a good deal of the personal experiments of the writer, which will give the average amateur a pleasant feeling of being in the confidence of his author.

This book is by no means a text-book. It tells the story of wireless in a simple straightforward fashion, which should appeal to the amateur not desirous of delving too deeply into this subject.

"Captain Eckersley Explains" is a little handbook which will be sure to gain a very wide public. It contains four chapters. The first, on "Broadcasting in Britain, With Some Remarks on the Technical Aspects of the Present Scheme," is written in Captain Eckersley's own inimitable style, and is probably the best outline of its kind yet published. One wonders how Captain Eckersley can impart so much information in so short a space. Chapters 2, 3, and 4 on "Signal Strength, Interference, and Quality or Faithfulness of Reproduction," are packed with information for the general listener-in.

Here is Captain Eckersley's idea for choosing a site for a broadcasting station.

"In choosing the site for a broadcast station, one usually bribes someone to take one to the top of the highest building in the town, and one there scans the horizon for a nice tall chimney. Having found the chimney one goes and interviews the owner—usually to be turned out neck and crop—but eventually, after a good deal of trouble, it is usually possible to find a chimney and accommodation beneath it, and one then sets to work to install the apparatus and to 'wangle' things to overcome a source of unpleasant and unforeseeable electrical difficulties."

Captain Eckersley has this characteristic conclusion to his excellent little book. Referring to his book he says: "Like the high-low programme, it probably will earn the scorn of the high and the indifference of the low. It has been solely inspired by a desire to help. We answer in a day in my office alone 150 letters on the average. If, as I hope, all my correspondents will buy this book and find enlightenment, I shall earn the undying gratitude of my staff; if, on the other hand, it has merely mystified readers who will promptly seek further en-

lightenment by post, it will at least give further employment to the deserving."

But Captain Eckersley is a pessimist. The merest novice reading his book cannot fail to get a thoroughly good and elementary grasp of the mysteries of wireless broadcasting, and, if, after reading "Captain Eckersley Explains," he has the temerity to write in to 2, Savoy Hill, the only thing I can suggest is that Captain Eckersley should write another book entitled "Captain Eckersley Further Explains."

"Uncle Jack Frost's Wireless Yarns on Good Reception and How to Get It" needs very little introduction to readers of POPULAR WIRELESS who have listened to Captain Frost's excellent semi-technical talks from 2 L O.

There are twelve chapters in this little book, dealing with wave-length, amplitude, screening, amperes, volts, ohms, aerials, crystal sets, valve sets, accumulators, diseases of the same, etc., etc., etc. In fact, Uncle Jack Frost is one of those beneficent uncles who seem to take a keen delight in giving of their very best for the sheer pleasure of giving it. This book does not contain explanations on any technical aspect of wireless which an average amateur would not understand; in fact, I gave it to a friend of mine the other day, who some people delight in referring to as "a congenital idiot," and on questioning him after he had read the book I found he had clearly understood it. No better compliment can I pay Uncle Jack Frost.

"The Story of Broadcasting," by Mr. Arthur Burrows, is not a technical book, for which no doubt many people will say "Heaven be thanked!"

Those who read Captain Lewis' book, and who were interested in the romantic story of broadcasting, cannot afford to miss Uncle Arthur's book.

Space will not permit me to review this book to the extent I should like, but here are one or two extracts which will give the reader an idea of the charming style in which Mr. Burrows writes.

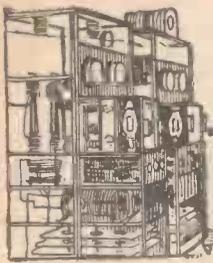
"Do I not treasure, even to this day, a baby chest protector, daintily stitched, and sent to me in mid-winter when my throat was troublesome?"

And here is another quotation:

"An artiste in the wireless studio, who asked what the announcer was doing to the microphone, was informed by a friend 'he is getting the ether ready.' A critic of 2 L O's programmes once sent a letter to Mr. Burrows offering "to slit the throats of the entire Savoy Band for the sum of fourpence"—which, on the face of it, is a remarkably low estimate for the assassination of so many brilliant musicians.

Mr. Burrows' book is one which every listener-in and every amateur should buy. It gives a fine survey of the history of wireless, and the feature giving sketches of the personalities of the directors, engineers, etc., which make up the B.B.C. personnel, will make interesting reading for all who are interested in the activities of the British Broadcasting Co.

Last, but by no means least, John Henry's effusion, "STILL CALLING." John dedicates this book to Blossom, who, it appears, incited him to the crime of becoming an author, because she thought he might make some money out of it, and I hope he will. John Henry says Blossom is responsible, but I think when listeners have read this book they will send a letter of thanks to Blossom for making John come up to scratch and writing such a thoroughly entertaining volume, which reveals him as a humorous author of no mean ability.



Artistes of the Aether

By "Ariel"



Some of the artistes who have given you pleasure when listening-in.

ISTRUMENTAL music has occupied the most prominent place in most of the recent programmes, and if the British Broadcasting Company could only be made to realise that it is music that is really



Miss Alice Vaughan.

wanted, whether high or low-brow, instead of the over numerous "talks," a far better result would be obtained when it comes to the question of renewing licences.

Many of the best-known concert artistes have broadcast from the various stations recently, amongst them Miss Irene Scharrer, the pianist, who played at Manchester and Birmingham. At the former station, as the date coincided with the anniversary of the death of Chopin, a special programme was devoted to his works, and included the Funeral March. A Chopin group was also played at Birmingham. At the former station appropriate notes were delivered by Mr. Moses Baritz.

At Glasgow and Aberdeen appeared again Miss Adelina Leon, the violoncellist, and at Manchester, Miss Marjorie Hayward, the famous violinist and chamber music player.

Programmes at 6 B M.

Miss Hayward is a true Londoner, being born at Greenwich, and entered the Royal Academy of Music, where she is now a professor, at the age of eleven. Studying first under Emil Sauret, she subsequently went to Prague. She is well known at all the big concert halls in London, especially at the Queen's Hall Promenade and Sunday series.

There is never any lack of good programmes at Bournemouth, and variety is the keynote of its success. One of the best series has been the Night with other Nations, and that held with Spain and Portugal proved thoroughly interesting and thoroughly enjoyable. The Wireless Orchestra, under the masterly conducting of Captain Featherstone, found excellent material



Mr. D. E. Ormerod.

in works of Diaz, Turina, and De Fall, amongst others, and two good soloists were found in John Collinson and Dorothy Robson, both favourite broadcasting artistes.

A new idea was exploited at 5 W A in "Plays for Children, Young and Old," by S. Lyle Cummins, and it is safe to say that probably the "Old" ones enjoyed the modern settings of "Bluebeard" and "St. George and the Dragon" right well. A capital cast was engaged, also, amongst them being Miss Mabel Tait, a well-known elocutionist and winner of numerous degrees. Cardiff and Birmingham.

Miss Tait has made a speciality of character studies, and has a wide classical and modern repertoire. She has broadcast on several occasions both from London and Cardiff.

Cardiff has a capital orchestra and, conducted by Mr. Warwick Braithwaite, some excellent results are obtained. For their British Musical Renaissance series the works of Edward Mitchell were performed, the composer himself being at the piano.

Another station this for well-balanced programmes. Drama plays a strong part, and with Mr. William Macready at hand it matters little whether comedy or tragedy is wanted. The old play, "Box and Cox," received splendid enactment recently, while another success was the repetition of "Elizabeth," the opera written and composed by A. Corbett Smith, now the Artistic Director at 2 L O. This was the first opera ever broadcast at all, and on this occasion fresh interest was lent by its being first performed as a play, followed by its operatic version. Mr. Macready was again heard in these, as some proof of his versatility.

A Popular Composer.

A favourite artiste at this station is the well-known contralto, Alice Vaughan. Winner of many scholarships, she has also trained under Sir Henry Wood, and has sung for the Birmingham Festival Choral Society, as well as in London, where, at Steinway Hall, she introduced many of Mr. Frederick Nicholls' songs to the metropolis. Miss Vaughan has broadcast on many occasions, and she is giving a special recital on November 9th at 5 I T, giving first performance to three of Mr. Nicholls' new songs and four by R. Kenneth Vaughan.

At 5 I T another recent concert deserves mention, when following the pianoforte solos of Miss Irene Scharrer, came some lighter music, thoroughly enjoyable. These included the famous "Songe d'Amour après le Bal" of Czibulka, and the Tone

Poem of Albert Ketelbey, "In a Monastery Garden," followed later by the same composer's clever potpourri, "A Musical Jig-Saw." A new song has just been published, entitled "Will You Forgive," and to this hangs a story. Novel readers who have read Andrew Soutar's novel, "This Frail Woman," will remember the lyric that plays so important a part in the story. The author, a keen admirer of Mr. Ketelbey's music, sought him out and asked if he would set it to music. Mr. Ketelbey undertook to do so, wrote it, and had the felicity of seeing it published within a week, and on its way to becoming a rival to "The Rosary." Like all Mr. Ketelbey's work, it has a haunting lilt to it which explains its success.

Manchester.

Humour is not forgotten at 2 Z Y, and mention must be made of that "High-Speed Drama," "Speech Day," written by H. Toplis in five acts, five scenes, and for five persons. The cast included for the various scenes, Betty Elsmore, Victor Smythe, D. E. Ormerod, H. B. Brenan, and R. T. Fleming—oh, and just one more, Tom Wilson.

Manchester.

Miss Elsmore is a favourite member of the 2 Z Y Dramatic Company, and was originally a member of the late George Edwardes' companies.

Mr. D. E. Ormerod is another well-remembered member. He joined the 2 Z Y Dramatic Company in its very early days, and was one of the best broadcast voices. He is also a member of the Rochdale Dramatic Society, and played the part of the K.C. in "The Butterfly on the Wheel" when broadcast, and the part of Harold Hazlewood in "The Witness for the Defence," both difficult parts, and in addition he is assistant producer of the plays.

Belfast.

There is considerable character about the Belfast programmes, a great feature lying in the fact that all tastes are being obviously studied, and the programmes kept free from prejudice or faction.



Uncle Bret of 2 L O.



Miss Betty Elsmore.



Miss Mabel Tait.



APPARATUS TESTED

The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

WE have received for test one of the new loud speakers manufactured by A. J. Stevens Ltd. Modelled on familiar lines, the loud speaker has an attractive finish and on test accounted for itself very well. As regards sensitivity, it has perhaps a little less than some other

so that the consonants of the announcer's voice are very well reproduced and do not tend to run together as is the case with so many loud speakers.

Readers who desire comfortable drawing room loud speaker results will not go far wrong if they try an A.J.S., though, as we said before, it will not stand pushing and therefore cannot be expected to fill a large hall.

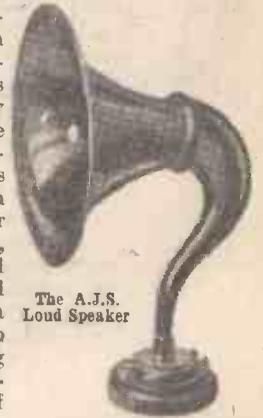


A sure safeguard against damage by lightning. Ericsson device which sells for 9/6. An interesting

loud speakers, but the tone—as long as it is not pushed—is very good. A very great volume is not possible, as if overloaded the loud speaker becomes a little harsh. As a matter of fact, a large condenser is advisable across its terminals whenever it is used, but the makers are to be congratulated upon the production of a loud speaker that (as regards the horn) has negligible resonance,

A component which, as the makers' claim, does fulfil a long-felt want, is a coil holder designed specifically for panel mounting, a sample of which has been sent us for test by the Goswell Engineering Co., of 12a, Pentonville Road, London, N.1. This coil holder also permits positive connections beneath the panel by means of the four fixing screws and obviates the hitherto essential, but very annoying, flexible leads. At 3/- for the two-way type and 5/- for the three-way type, drilling template included, they should sell like "hot cakes."

A variable condenser of more than usual interest has just been sent to us by Messrs. Naylor, Ltd., of Wigan. It is known as the "Fulstop," and retails at 11/3; at least, that is the price of those of 0003 mfd. value. The "Fulstop" is provided with a 2-1 geared adjustment which permits a very smooth and accurate control, and the vanes are specially shaped to give square law readings. Ebonite discs are provided with every condenser and these discs, which are lettered A.T.—H.F. and S.E.C., fit into a recess of the knob to hide the fixing screw and to indicate the purpose of the instrument in the circuit in which it is used. A special metal disc is also included which acts as both a position indicator and a "capacity shield." Altogether, we were rather impressed by the "Fulstop," which strikes us as being a really scientifically modelled instrument with a finish worthy of its makers.



The A.J.S. Loud Speaker

From Neutron Ltd., of Sicilian House, Southampton Row, W.C.1, we have received a sample of "Neutron." This crystal, which sells at 1/6 per box, complete with cat's-whisker, proved on test to be very

(Continued on page 588.)



MICROMETER FILAMENT DIMMER,

- 0-5 ohms 3/6
- 0-10 ohms 3/9
- 0-20 ohms 4/-
- 0-30 ohms 4/3

PATENTS APPLIED FOR

- CENTRE-FIXING
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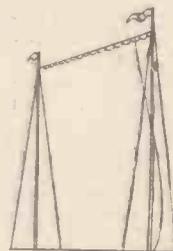
It's the Cartridge that counts

ALSO MADE AS A GRID LEAK WHICH IS CONSTANT 2-5 MEG., 3/6; 5-10 MEG., 4/-.

ASK YOUR DEALER. IF UNABLE TO SUPPLY, WRITE TO MAKERS ENCLOSING 3d. FOR POSTAGE EXTRA.

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60 to 100% improvement for your set! —



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'SILLERY'S MAGNETIC AERIAL ATTACHMENT'

Over 250,000 sold within the last month!

NOT AN EXPERIMENT!

TO THE TRADE. Some territories are still open—write for attractive terms.

If unable to obtain from your regular dealer write to EMPIRE RADIO CO., HAMPTON ST., BIRMINGHAM. (Sole Distributors for U.K. and Ireland.)

Can be obtained of A. W. Gamage, Ltd., Wireless Dept., Holborn, London



"GOLTONE" (Regd.) LOW FREQUENCY TRANSFORMER
 Unsurpassed for silence, efficiency and reliability. Provides remarkable amplification with freedom from noise and distortion. Equally suitable with every type of valve. No make of Transformer gives better results. Price 17/6

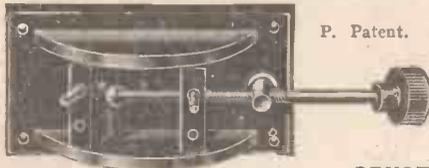
We can also supply at same price ratio 10 to 1 Transformers recommended with "Unidyne" High Tensionless Circuit.

H. A. D., Fairhouse Road, Derby.— I have already fitted one of your transformers into one of the "P.W." Sets and find it amplifies splendidly on the dual.

"GOLTONE" Micrometer Regulating COIL HOLDER

High grade finish. Enables the finest possible tuning and adds considerably to the efficiency and selectivity of the Receiving Set.

Two Coil Type, as illustrated... 9/-
 Three Coil Type 12/6



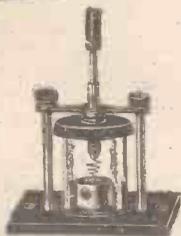
P. Patent.

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 Stocks also held at Glasgow Depot—
95, PITT STREET.



CRYSTAL DETECTORS

Improved Type Dust-proof Detector, Fitted with Glass Shield. Mounted on Ebonite Base. Price 1/9
 Parts only for Panel Mounting 1/6
 Vertical and Horizontal Types supplied at same price.



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THE "GOLTONE" CRYSTAL RECEIVING SET (BRITISH MADE.)

Wave Length 150 to 650 Metres.

Most remarkable value ever offered. Equal in results to Sets sold at many times the price.

The Set includes improved type Dust-proof Detector, Polished Ebonite Top and Base, Archimedean selective Tuning. Complete with "Sonyte" Crystal. All metal parts are heavily nickelled.

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An extremely effective instrument for eliminating signal interference up to 600 Metres Wave Length. Can be easily attached to any Set without alteration to the actual wiring. Price 12/6

VARIABLE CONDENSER, .0005 mfd. for use with above Wave Trap 6/-

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Enables one Wireless Set to be used in 4 or 6 rooms at one time; either loud speakers or ear 'phones.



Can be screwed to Cabinet, Wall, or simply laid on table.

THE ONLY PROPER METHOD INVENTED.

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PRICE for 4 rooms 3/9; postage and packing 3d. extra.
 6 " 5/6; " " 3d. "

J. E. HANSON (Actual Maker), 1, Kingsley Road, HOUNSLOW, MIDDLESEX.

Manufacturers of a kinds of Wireless Accessories.

4/11 STANDARD DUTCH VALVE

Post free

Trade enquiries invited.

Complete satisfaction guaranteed with this astonishingly low-priced valve. 4 or 6 volts. Current consumption. 1/2 amp. 4-pin fitting. Can be used as Amplifier or Detector. Type L.V.S. 4/11 post free.

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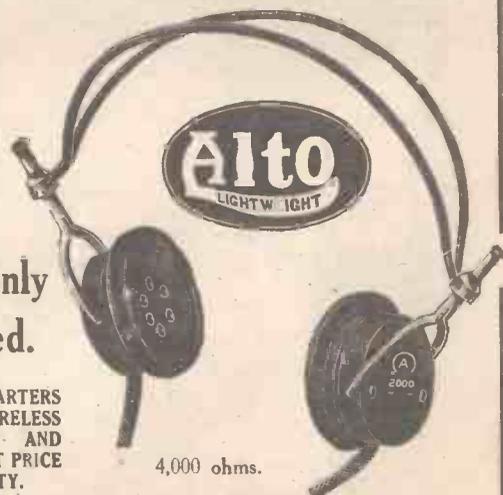
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The HEADQUARTERS OF ALL WIRELESS ACCESSORIES, AND AT THE RIGHT PRICE & QUALITY.

Write for our Illustrated Catalogue, comprising a comprehensive list of all Wireless Accessories.

The Wholesale Fittings Co., Ltd.,

23, 25 & 27, COMMERCIAL ST., LONDON, E.1.

'Phone: London Wall 1191.

Telegrams: Calottes, Norton, London.

South London Depot: 65, Newington Butts, London, S.E.11

'Phone: Hop 773.

MANCHESTER: 78-80 High St. BRISTOL: 14, North St., Stokes Croft.

APPARATUS TESTED
(Continued from page 586.)

sensitive, a very light contact only being required. In a crystal set very loud pure signals were obtained. In a reflex receiver, the crystal did not appear to be as stable as some, and this was only to be expected in view of its almost super-sensitive nature. For the crystal set user pure and simple it can be fully recommended, and the list of instructions provided with every specimen sold should enable optimum results to be obtained.

It is one thing to gain a reputation for one particular product, but having done so such is apt to overshadow other lines; with this commercial epigram we draw our readers attention to a series of components sent us by the Edison Swan Electric Co., Ltd. The name Edison stands in wireless circles for first class valves, but we do not think it is too generally realised that this same name covers a whole range



An Edison L.F. Transformer.

of first-class wireless components and complete wireless receiving sets.

For instance, we have before us as we write an L.F. transformer, a pair of telephone receivers, a potentiometer and a filament resistance all manufactured by the above well-known firm and sent us for test. We



Ediswan Telephone Receivers

tested the L.F. transformer first for two reasons, one because it would take longest; two, because it is one of the most interesting of all wireless components to test. Twenty minutes work can be summed up in a very few words.

The Ediswan L.F. transformer, first of all, was proved to be electrically sound in respect of winding coupling and winding insulation, and gave no indication of a breakdown when an unfair potential was applied. The curves prepared for our own information and our favourite heterodyne test showed that no distortion existed over the middle frequencies and very little in the extremes. At 18/- it represents good sound value.

The telephone receivers (4,000 ohms) were connected up during the above tests and were found to be both sensitive and of good

tone. They are comfortable to wear, and are both handsome in appearance and clean and sound in construction. At 24/- they should command a ready sale among all classes of wireless enthusiasts who appreciate carefully designed and manufactured all-British wireless accessories.

The Ediswan potentiometer and filament resistance are almost deserving of special mention inasmuch as they are fitted with projecting terminal connections which greatly facilitate wiring up. These terminals are so spaced that there can be no danger of fouling of leads, and in fact require examination before their advantages can be fully realised. Smooth, positive contacts, which should ensure noiseless adjustments, are also features that require commendation. The potentiometer, 300 ohms, at 6/6, and the wire filament resistance, 4.5 ohms, at 4/- are both examples of Ediswan value and fully uphold this well-known firm's reputation.



Ediswan potentiometer. note the extended terminal connections.

A catalogue of extreme interest to the wireless trade has just been issued by the well-known wholesalers, Messrs. A. J. Dew & Co., of 33 and 34 Rathbone Place, W.1. It is claimed that it is the most comprehensive publication of this nature issued. We have had a copy sent us and advise all trader readers to do likewise.

(Continued on page 500.)



The Introduction of the



LOUD SPEAKER

marks a definite step forward to the perfection of wireless listening-in. Not only do

You hear the Musician himself

but when vocal music is broadcasted, the consonants "l," "s," and "r," are reproduced with absolute clarity. You who already have Loud Speakers—note how these letters sound on your instrument, and then arrange to hear a C.A.V. The result will be a pleasant surprise! Don't spoil a good set with an inferior Loud Speaker—have one that will do justice to the excellent programmes now being broadcasted.



J.H.W.

Write for illustrated folder of C. A. V. Wireless Productions.

- 120 ohms £4-15-0
- 2,000 ohms £5-0-0
- 4,000 ohms £5-10-0

C.A. Vandervell & Co. Ltd.
ACTON VALE, LONDON, W.3.

- C. A. V. Junior £2-15-0
- C.A.V. Tom Tit £1-10-0



Headphones



B.T.H. Headphones are supreme in all respects—in sensitiveness, tone, permanence, and comfort. Although fitting closely to the ears and thus excluding extraneous sounds, very little pressure is exerted and they can be worn for hours without discomfort.

Price per pair (4000 ohms) - £1 5s. 0d.

A PROOF OF SUPERIORITY

Ask your dealer to tune out his demonstration set until you can only just hear. Then substitute B.T.H. Headphones and you will be amazed at the clearness with which you can hear every word and note of music.

We also make Crystal Sets, Valve-Crystal Sets, Valve Sets, Loud Speakers, Amplifiers, Valves (including B5-0.06 amps) and Tungar Battery Chargers.

Obtainable from all Electricians & Wireless Dealers

The British Thomson-Houston Co Ltd
 Offices: Crown House, Aldwych, London, W.C.2

Branches at: Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Middlesborough, Manchester, Newcastle, Swansea, Sheffield

2218



Magic Music from the Skies
 - the GIL-RAY brings it
 out in all its Purity of Tone

YOU don't know what pleasure there is in a Crystal Set, until you have used the GIL-RAY wireless crystal. The GIL-RAY is super-sensitive, and each piece is tested and guaranteed. See for yourself what a difference it makes! Supplied in neat tin boxes with Sterling Silver whisker, and full instructions for perfect results. Price 1/6 of dealers everywhere. If unobtainable, please forward 1/6 and name and address of dealer. Sole Distributors for U.K. and Ireland

V. ZEITLIN & SONS,

144, Theobald's Road, London, W.C.1.

Trade enquiries welcome Phone: Museum 3795 and 6841
 Solely produced by the GIL-RAY RADIO CO. Sicilian House,
 Southampton Row, London, W.C.1.

*The
 Crystal
 of the
 Age!*



When fitting an Earthing Switch
 fit the **ARGUS** LIGHTNING
 PROTECTOR

ALL users of Wireless know well the importance of installing some substantial device to prevent natural electrical disturbances from destroying their wireless installations.

The "Argus" is the most efficient earthing switch, and enables listeners-in to use their sets in perfect safety, even during a thunderstorm.

Price 2/9 complete with
 Post 3d. instructions.

Obtainable from all Wireless Dealers, or direct from—
ANDERSON'S Wireless Sales Agency,
 9-13, Oxford Street, W.1.

Telephone: Gerrard 1749. Telegrams: Anwisalg: Westcent: London.



A MOST EFFICIENT DEVICE

to which the ordinary headphones are clipped by a simple pressure on the spring clips.

THE

"Gramaphix"
 Loud Speaker 10/6

Horns to mount on Gramaphix:

- Straight Horn (Bell 10") .. 6/-
- Swan necked Horn (Bell 11") .. 15/-
- Small curved Horn (Bell 8 1/2") .. 7/6 (Postage 9d. extra.)



PRICE 10/6
 (Postage 6d. extra.)

The Gramaphix requires (according to distance from the Broadcasting Station) at least one stage of low-frequency amplification to give satisfactory volume.

RICHD. MELHUISH, LTD. Est. 1828.
 Electrical Engineers and Wireless Experts,
 50, 51 & 84, FETTER LANE, LONDON, E.C.4.

APPARATUS TESTED

(Continued from page 588.)

"Where to Seek For Scientific Facts," by Alex B. Eason, M.A. (Cantab), A.M.I.C.E., A.M.I.E.E. (1s. net, S. Rentell & Co., Ltd.), is a very excellent little work, and should prove very useful on the wireless amateur's bookshelf. It is an index, as it were, to scientific books, periodicals, scientific society proceedings, etc., and fulfils its object very creditably.

From the various drawings of the "Six Sixty" dull-emitter we have seen, we had gained the impression that it was rather a clumsy-looking production, and we were agreeably surprised when Messrs. The Electron Co., Ltd., sent us a sample for test. The "Six Sixty" is a very neat little valve, and presents a distinctly well-finished appearance. It is stated that it operates on 1.8 to 2 volts, consuming .25 amp. The sample submitted, according to our ammeter, requires the full 2 volts but only .22 amp., a variation from the specification, but in the right direction. It is claimed that the "Six Sixty" is superior for both H.F. and L.F. amplification to any other dull-emitter, and in our opinion, founded on a careful series of tests, we do not consider that this is an extravagant claim. Our tests, however, have amounted but to a few hours in duration, and this, of course, is not a sufficient length of time to study a new dull-emitter in all its interesting aspects.

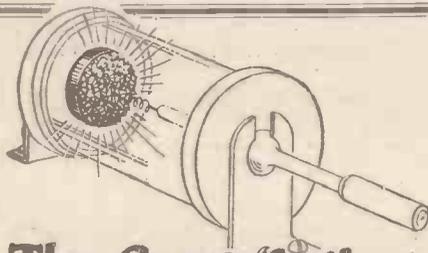
There are six most important requirements to be considered in respect of dull-emitter valves, quite apart from the question of low current consumption, and these are: (1) General efficiency in operation in respect of distortionless detection and amplification, and including a good magnification factor; (2) Freedom from microphonic noises (most dull emitters fail in this respect); (3) Mechanical strength (another dull-emitter "weakness"); (4) Filament life (most types score over bright emitters; for the latter 1,000 hours is a good "life," for the former 20,000 hours has been proved possible); (5) Stability of emission; (6) Uniformity of production.

The "Six Sixty" is good value so far as is in our power to judge, and at 20s. should command a very ready sale. As it enables multi-valve sets to be operated with a comparatively small single-cell accumulator, it should go a long way to popularise "D.X." and loud-speaker work, while for all-round usage it should appeal, as the makers claim, as a "great economiser."

The Fallon Condenser Manufacturing Co., Ltd., of Tottenham, have sent us samples of their new 'Phone Tip Jacks, which retail at the low price of 9d. per pair. These little devices are designed particularly for use as 'phone connections and to replace the usual 'phone terminals on a panel. In operation they can be likened to ordinary jacks, the pins on the ends of the telephone cords taking the place of plugs. To connect the 'phones up with the set, all that has to be done is to push the cord pins into neat little nickelled sockets. They are accessories that should find considerable favour as having undoubted merits.

From Messrs. J. E. Hanson, of 1, Kingsley Road, Hounslow, Middlesex, we have received a specimen "Alloid" 'Phone Distributor which sells at the modest figure of 3/9. Unlike most accessories designed for a similar purpose, the "Alloid" has one outstanding advantage—i.e. that of compactness. Carrying eight brightly-nickelled terminals to accommodate four pairs of 'phones in series, it is of such neat dimensions that it can be mounted on the panel without giving an appearance of bulkiness. There is only one little criticism we should like to make, and that is that, owing to the excellence of workmanship, it is impossible to spot any trace of connections between the terminals that are so ingeniously hidden that we had to resort to electrical tests to trace them; therefore we trust Messrs. Hanson will send out full instructions as to how the "Alloid" should be used, as owing to the symmetrical "staggering" adopted, the non-technical user might connect up the wrong pairs.

Something of interest to crystal users has been brought to our notice by Messrs. "Holtite," of Victoria House, Widnes, who have sent us samples of the "Holtite" Super-Cat'swhisker. They are retailed at 6d, each in airtight glass tubes; almost an innovation in the crystal contact line, although it has long been realised that crystals themselves should be provided with such protection. The "Holtite" is novel, inasmuch as it consists of a closely-wound spiral of thin strip brass which thus forms a small flexible metal tube with walls 1/350th of an inch in thickness. We have tested it and can endorse the claim that it provides a stable and sensitive contact



The Crystal that brings the Station twenty miles nearer

When W. Bennison, F.C.S., and T. Hadley, B.Sc., after long study of the characteristics of minerals in wireless practice, evolved this new crystal, they opened up a new field to crystal users. Neutron has in many cases been found to produce volume of sound equal to a valve without reaction. It brings your local station "twenty miles nearer" in volume, and many long-distance records are to the credit of Neutron.

Concert Tested and Guaranteed.

NEUTRON

TRADE MARK

The World's Greatest Radio Crystal.

Neutron, Ltd., Sicilian House, Southampton Row, London, W.C.1. 'Phone—Museum 2677.
Sole Distributors: V. Zetlin & Sons, 144, Theobald's Rd., London, W.C.1. 'Phones—Museum 3795 & 6841

What Correspondents say:

Manchester (38 miles away), received on Neutron as clear and strong as a 2-valve set:—"A. E.," Bakerswell.

Neutron is the best and loudest crystal I have ever known:—"H. R.," Liverpool.

Stocked by the best Radio Dealers. Packed in airtight tin with silver cat's-whisker. Insist on Neutron in the Black and Yellow Tin—or send 1/6 and Dealer's name, and this wonderful Crystal will be mailed by return.

1/6

See Stand D2, British Wireless Exhibition, White City, Nov. 15 to 29.

Blame your Transformer—if it isn't a Woodhall



If your Loud Speaker says "Burragurrumph!" don't blame the announcer or the loud-speaker—if the soprano shrieks, don't blame the singer or wireless. Think first of your Transformer.

Cheap Transformers may amplify, but they will not reproduce. "One-to-Five" implies nothing except a doubtful "step-up."

In the "Woodhall No. 1" you have, with only a 1-2.8 ratio, a wonderfully faithful "tone," that is due to correct propor-

tioning of impedance, uniform amplification, plenty of wire, heavy core and a unique method of winding.

That method is the use of SILK, simultaneously wound with the wire—a method used in no other Transformer. It is costly, but remarkably efficient.

The "Woodhall No. 1" is sold by **23/6** all Wireless Dealers, who can obtain supplies through their usual Factors. Sole Distributors:

PRESSLAND ELECTRIC SUPPLIES, LTD., HAMPTON-ON-THAMES.

The Woodhall-Wireless Manfg. Co., Ltd.

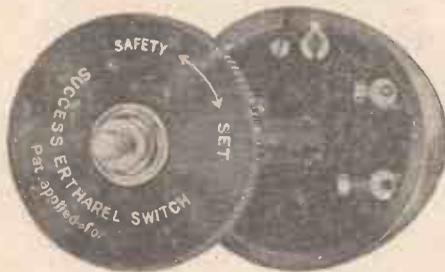


PROTECT your LIFE and PROPERTY from DAMAGE by LIGHTNING

It is a fool's paradise where the aerial is earthed *inside* the house. We need not emphasise the invitation to danger. By means of the **SUCCESS ERTHAREL LEAD-IN SWITCH** the aerial is earthed **OUTSIDE** the house. This *will* protect your set from damage.

The switch is connected either to aerial or earth by turning the knob fixed *inside* the house. **THE SUCCESS ERTHAREL** is weatherproof—the Switching arrangements are protected by a metal cap.

PRICE
6/6
EACH

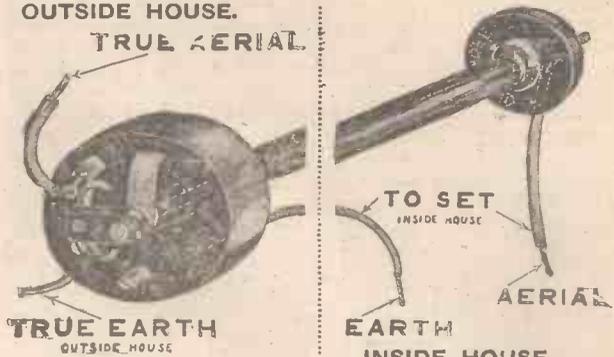


COMPONENTS

Obtainable from all Dealers.

OUTSIDE HOUSE.

TRUE AERIAL



TRUE EARTH
OUTSIDE HOUSE

TO SET
INSIDE HOUSE

EARTH
INSIDE HOUSE.

PROTECTS your SET from LIGHTNING

—for power and for volume

The very high voltage passing through the primary of a transformer behind a power valve will break down the insulation of the primary; a common fault of ill-designed transformers

The successful employment of Power Valves renders the choice of L.F. transformers a very serious consideration which is simply overcome by fitting the **SUPER-SUCCESS (All-Black) Transformer.**

PRICE 21/-

Advertisement of Beard & Fitch Ltd., London, E.C.1.

Barchya Ad.

FIRST ANNOUNCEMENT.

About the time when this notice appears, the Wonderful

DAWN ABSOLUTELY PERMANENT DETECTOR

will be ready for the market.

IT CANNOT BE ADJUSTED. IT CANNOT LOSE ADJUSTMENT.

THE DAWN DETECTOR is worked on an entirely new principle, and with new materials.

THE DAWN DETECTOR has no cat-whisker, and does not employ the old method of jamming two crystals together.

THE DAWN DETECTOR is as loud as the finest crystal detector in existence, and remains so.

We are confident that you will be entirely satisfied with THE DAWN DETECTOR; but if you are not, your money will be refunded by the next post, without question.

JUST CONNECT THE TWO TERMINALS AS INSTRUCTED: THAT'S ALL.

Price 5/- post free.

Orders, which will be executed strictly in the order in which they are received, should be sent to the Sole Manufacturers—

THE DAWN COMPANY. ELMLEY, AMERSHAM, BUCKS.

HEADPHONES

T.M.C. with GUARANTEE

19/6 pair

Telefunken Lightweight

18/6 pair

Special Job Telefunken 8/9
ALL 4,000 ohms - -



COMBINED VOLT AND AMPMETER



6/-
EACH



H.T. BATTERY CASES take pocket batteries up to 63 volts—6/3

EVERYTHING POST FREE

All the above are Special Prices for Quick Sale

RIBBON AERIAL

100 ft.
2/3



KENNETT'S STORES

ESTAB. 1861.

11, LIVERPOOL ROAD, LONDON, N.1



A Natural Galena Crystal of special selectivity

PRICE 1/6

In glass topped box.

Each piece is selected, tested and guaranteed; also contains a good quality non-corrosive spearpoint catwhisker.



L.M. MICHAEL LTD

IN CONJUNCTION WITH **B. HESKETH LTD**

179, STRAND, LONDON, W.C.2.

Barclays 285

HULLO EVERYBODY!!

ALL VALVES ON POST SENT AT PURCHASER'S RISK.

VALVES

- THORPE K4 .. 17/6
- 5 PIN
- PHILLIPS 4 ELEC-TRODE .. 12/6
- (Both for UNIDYNE)

Bright Emitter 12/6 each.

- B.T.H. R. Type
- Ediswan A.R. "
- Marconi-Osram R or R 5 V "
- Mullard-Ora P.1 "
- Cossar P.2 "
- Cossar P.2 "
- Myers-Universal Mullard H.F. (Red Ring)
- Mullard L.F. (Green Ring)

Dull Emitter

- 21/- each Type
- B.T.H. B.3
- Ediswan A.R.D.E.
- Marconi-Osram D.E.R.

- 25/- each Type
- B.T.H. B.5
- Ediswan A.R.O.G
- Marconi-Osram D.E.3
- Mullard D.F.Ora

- DULL Emitter POWER VALVES
- For use with A.R.D.E. and D.E.R. Valves.
- Marconi-Osram, Type D.E.6, 2-2.5 volt, 25 amps, 25/-

- DULL Emitter POWER VALVES
- For use with '06 Valves.
- B.T.H. Type B.6 35/-
- Marconi-Osram D.E.4 30/-
- Mullard D.F.A.2 30/-

- DULL Emitter POWER VALVES
- For use with Bright Emitters.
- B.T.H. B.4 35/-
- Marconi-Osram D.E.5 35/-
- Mullard D.F.A.1 35/-

- '06 French Metal 17/6
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- Phillips '04 Type 17/6

HEADPHONES

We can recommend these as being excellent Headphones, with a great reputation for telephone designs behind them. British Thomson-Houston, Sterling, Brown's Featherweight, Geophone, 4000 ohms resistance, each £1 5 0

British Ericsson, 4000 ohms resistance, each £1 6 6

G.E.C., 4000 ohms resistance, each £1 0 0

B.T.H., 4000 ohms resistance, each £1 5 0

Brandes Matched Tone, 4000 ohms resistance, each £1 5 0

Brown Type A, 4000 ohms resistance, each £3 2 0

Sterling, 4000 ohms resistance, each £1 5 0

Geophone, 4000 ohms resistance, each £1 5 0

POST FREE OFFER

DELIVERY Every endeavour is made to despatch goods EARLY but sometimes delays occur which are beyond our control and in which cases customers may rest assured that their orders will be executed in the very shortest period. They will therefore realise that it is not possible to have orders cancelled through above causes. All orders over 20/- post free U.K. only.

POST PAGE No. 1. Not Applicable to Foreign Orders.

FILAMENT RHEOSTATS

Wire Wound Type. Rotary Action.

The "different" filament resistance with stationary contact arm, extremely silent in operation, the plain type is recommended for amplifying valves. For the rectifier use the Vernier adjustment.

- IGRANIC ohms each
- Plain Type .4 & 7 4/6
- With Vernier Adjustment .4 7/-
- Plain Type .30 7/-
- The Raymond 6 1/6
- The Ormond 2/-
- The T.C.B. Type, B 13 4/-
- The T.C.B. Type, D 30 4/-
- The Burndep, Dual, 222 5 & 30 7/6
- Microstat .. 2/9
- Lissenstat, Minor 3/6
- Lissenstat .. 7/6
- Lissenstat, Universal .. 10/6
- Lissen Auxiliary Resistance .. 1/3

- SHIPTON'S
- 30 ohms .. 3/-
- 60 ohms .. 3/-
- 600 ohms Potentiometer .. 4/6
- Highly recommended.

- T.C.B.
- 6, 13, 30 ohms .. 4/-
- 300 ohms Potentiometer .. 5/-
- Highly recommended



Made by Powquip
"BUCKS" for 12/6 Redex



"R.I." NEW MODEL IN SEALED BOX. Don't Buy Otherwise. Post 25/- Free

- EBONITE
- 2 for 1/2
- 2 for 1/4
- 2 for 1/6
- 3 Qualities.

L.F. TRANSFORMERS

Eureka Concert Grand

This is a really high grade transformer for Inter-valve use. We can thoroughly recommend its use where first class results are required. It increases power and the purity of signals. Made in two sizes but only one quality.

"Concert Grand" Model .. £1 10/-

No. 2 (Second Stage) .. £1 2/6

R.I. 5-1 Ratio .. 25/-

Igranic, 5-1 Ratio 21/-

The Ferranti, 4-1 Ratio .. 17/6

The Silvertown, 5-1 Ratio 21/-

The G.R.C. 5-1 Ratio 15/-

The G.R.C. 10-1 Ratio .. 20/-

Marconi Ideal Power .. 35/-

Burndep L.F. 5-1 Ratio .. 25/-

Lissen T.1 L.F. .. 30/-

" T.2 L.F. .. 25/-

" T.3 L.F. .. 16/6

Success, 5-1 Ratio 15/-

Ditto, Super .. 21/-

Ormond .. 14 11

LOUD SPEAKERS

- BABY MODELS
- Sterling, 4000 ohms .. £2 15/-
- Sterling Dinkie 1 10/-
- Brown's 2000 ohms .. 2 8/-
- Amplion Junior .. 1 7/6
- Dragon Flv. .. 25/-

PARTS FOR 2-VALVE "UNIDYNE" RECEIVING SETS.

- The 4-Electrode Valve Thorpe K4 each 17/6
- 6 Terminals for 10d. 2 Microstat Filament Resistances each 2/9
- 1 Variable Grid Leak 2/6
- 1 Single-Pole Double-Throw Switch 1/9 or 2/-
- 1 '0005 Variable Condenser, with Vernier 7/6
- 1 Cam Vernier 2-way Coil Holder .. 9/-
- Panel, 5 1/2 in. by 1 1/2 in. by 1 in., drilled to hold 2 5-Pin Valve Holders .. for 2/-
- 2 5-Pin Valve Holders each 1/6
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- 1 Fixed Condenser, '0002 .. 1/2, 2/2, 3/-
- 1 Shrouded L.F. Transformer G.R.C. 10-1 .. 20/-
- 8 yds. No. 18 Gauge Tinned Copper Wire 1/2
- Necessary Screws, Nuts, and Washers, Free if above lot purchased.
- Post Extra.

EBONITE COIL HOLDERS

- Polar 2-way, with Vernier .. 11/-
- Polar 3-way, with Vernier .. 17/-
- Polar-Junior, 2-way Cam Vernier 6/-
- Polar-Junior, 3-way Cam Vernier 9/6
- Polar Universal 2-way .. 10/6
- Goswell 2-way coil holder .. 5/6
- Goswell 2-way Vernier Coil Holder 9/-
- Goswell 3-way Coil Holder .. 7/6
- Goswell 2-way Panel Mounting .. 3/-
- Franco Cam Vernier 2-way .. 12/6
- (glazed)
- Franco 3-way .. 17/6
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BASKET COIL HOLDERS

- No. 1 .. 2 for 2/-
- No. 2 .. 2 for 2/6
- (both with plug)
- Coil Stand 2-way for Basket Coils 5/6
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'BABY' COIL STANDS

- 2-way on base .. 3/-
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- (brass fittings)
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- 2-way Cam Vernier high class .. 5/9
- Several high-grade patterns.
- 2-way .. at 5/-, 5/6
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- H.F. Plug-In Transformers. Post 2d. each.
- No. 1. 150-450 .. 3/6
- No. 2. 250-700 .. 3/11
- No. 3. 450-1200 4/3
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BRUNET (genuine)

- 4000 ohm Double 16/6
- 4000 ohm Single 8/11
- 2000 ohm Single 7/6
- Post Free.



ONE HOLE FIXING 1/3 By Post 1/6

ORMOND

Ormond Condensers No. 2 and Square Law. Complete with Aluminium End Plates, Knob and Dial. Superior finish, close precision (.073 in.), spacing for panel mounting.

No. 2	Square	Law
Each	Each	Each
.001 mid .. 8/-	10/6	
.00075 .. 7/-		
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.0003 .. 5/6	9/-	
.0002 .. 4/6	8/6	
.0001 .. 4/-		
Vernier .. 4/-		
.0005 with Vernier .. 7/6	11/-	

"Polar" Condensers (Variable). "Ordinary and Precision" Types. For Panel Mounting only.

A new form of Variable Condenser, constructed with a di-electric of air and high-grade mica, reducing losses to a minimum. Tested for insulation on 1000 volts potential. Adaptable to any type of Panel.

- Ord. Each.
- .001 mid .. 10/6
- .0005 .. 10/6
- .0003 .. 10/6
- .00025 .. 10/6

'Sterling' Square Law Variable Condensers

A new type of superior quality, distinctive design of moving plates, with Vernier Adjustment. The auxiliary knob controls the Vernier.

- Each
- .001 mid .. £1 10/6
- .0005 .. £1 5/6
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LISSEN PARTS

- Variable Grid Leak .. 2/6
- Anode Resistance .. 2/6
- Lissen Minor .. 3/6
- Lissenstat .. 7/6
- Do. Universal .. 10/6
- 2-way Switch .. 2/9
- Series Parallel .. 3/9
- Choke Coil .. 10/-
- 5 point Switch .. 4/-
- Cons: 25, 4/10; 30, 35, 40, 4/10; 50, 5/-; 60, 5/4; 75, 5/4; 100, 6/9. All Coils stocked.

DUBILIER PARTS

- .001, .002, .003, .004, .005, .006, Fixed, 3/-
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- Type 577, .01 .. 7/6
- Grid Leaks .. each 2/6
- Anode Resistance 50,000, 70,000, 80,000, 100,000, on stand complete .. 5/6
- Minicap Switch .. 8/-

VARIOMETERS

(Inside Winding)



RAYMOND

8/11 Post 3d. each.

FALLON, IGRANIC, or EDISON-BELL

Post Free 10/-

UNDER PANEL VALVE HOLDERS

"CLIMAX"

Price 1/6

Callers see your own page

FORMO 12/6

Post Free.

IGRANIC COILS

- Cons: 25, 5/-; 35, 5/-; 50, 5/2; 75, 5/6; 100, 7/-; 150, 7/10; 200, 8/8; 250, 9/-; 300, 9/6; 400, 10/3; 500, 10/6

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Phone: GERRARD 4637

TWO PAGES MORE OVERLEAF

ALL OUR CONDENSERS HAVE BEEN TESTED AND RECOMMENDED BY LEADING JOURNALS UNSOLICITED } **BRITISH MADE** } **ALL LEADING CIRCUITS**
 } **SPECIALLY ADAPTED FOR** }

ALL ORDERS STRICTLY IN ROTATION. NOT RESPONSIBLE FOR MANUFACTURERS' DELAY. RIGHT RESERVED TO RETURN CASH.

RAYMOND'S VARIABLE CONDENSERS

ALL OUR CONDENSERS HAVE BEEN TESTED AND RECOMMENDED BY LEADING JOURNALS—UNSOLICITED.

- Exclusive Design.
- Stout Vanes.
- Extra Insulation, Very Compact.
- Narrowest Spaces (Pressed Aluminium).
- Centre Rod cannot bend.
- Terminal Connections, Capacity Guaranteed.
- Perfect Efficiency.
- Handsome Design.
- Takes up very little space in panel.
- Nickelled Fittings.
- Beautifully Made.
- New one-hole fixing method.
- Wonderful for Portables.



'DE LUXE' MODEL

AS SHOWN, WITH DIAL, KNOB AND BUSH.

- 001 - 7/3
- 0005 - 5/11
- 0003 - 5/4
- 0002 - 4/11

POST 6d. SET.

John Blair, Esq., Rexall Pharmacy says:—
 Your Condensers are a REVELATION to me as a Dealer. Sept., 1924.

C. Walton, Esq., Andover tested your Condensers on Mexger and got "INFINITY"

UNSURPASSED FOR FINE TUNING.

Costs a trifle more, a few pence only, and is just what you want. Nice dial and knob included

JACKSON BROS. "J.B." VARIABLE CONDENSERS. SQUARE LAW

•001	9/6	•00025	6/9
•00075	9/-	•0002	5/6
•0005	8/-	•0001	5/3
•0003	6/9	Vernier	4/6

ORDINARY MODELS

Standard		Super		Microdenser	
•001	8/6	9/6	11/6		
•00075	8/-	9/-	11/-		
•0005	7/-	8/-	10/-		
•0003	5/8	6/9	8/9		
•00025	5/9	6/9	8/9		
•0002	5/-	5/6	8/-		
•0001	4/9	5/3	7/9		
Vernier	4/-	4/6			

Post 3d. set.

HAWK COILS HONEYCOMB

25. 2/4	150. 4/6
35. 2/6	200. 5/4
50. 3/-	250. 5/6
75. 3/4	300. 6/0
100. 3/10	400. 6/6

POST 2d. COIL.

"MURRAY" (Prov. Pat.)

VALVE HOLDERS 1/3

High finish. Absolutely Safe. Low Capacity.

CRYSTALS

- most with whisker
- NEUTRON .. 1/6
- GECOSITE .. 1/3
- PERMANITE (Gamage's) 1/-
- BLUE TUNG-STALITE .. 1/6
- URALIUM .. 1/6
- LAST BUT NOT LEAST, OUR OLD FRIEND SHAW'S GENUINE HERTZITE .. 1/- still going strong.

HT BATTERIES

- B.B.C. 60 v. 10/6
- B.B.C. 36 v. 6/6
- B.B.C. 9 v. 3/6

West End Stockists of
 POLAR: JACKSON BROS.; R.I.; BURN-DEPT; GOSWELL ENG. CO.; SILVERTOWN; IGRANIC; LISSEN; RADIO PRESS ENVELOPES; DUBILIER; EDISON BELL.

Parts For 2-Valve Selective Receiver

- 1 Lissens T2 L.F. Transformer.
- 1 2-way Coil Holder (Goswell).
- 1 •0003 Var. Condenser.
- 1 Coil Plug Raymond Shaped No. 4.
- 1 Watmel Var. Grid Leak.
- 2 Fixed Condensers .0001 and .0003.
- 2 Fixed Condensers .002 and .004.
- 2 Rotary Switch Arms complete.
- 8 Valve Sockets.
- 2 Filament Rheostats.
- 1 Marconi Valve.
- 1 Edison Valve.
- 24 W.O. Pillar large Terminals.

£4 10 0 Post Free

POST PRICES
 VARIOMETER 250/600 2/6
 Ditto with fixing clips 3/-
 EBONITE 4 11, 5/11
 ALL KINDS STOCKED at
 2/11 3/6 3/9 4/- 4/6

Leave the selection to me and you won't be disappointed

SUNDRIES

- POST FREE.
- Ebonite Valve Holders 1/5 and 1/-
 - Lead-in Wire 4 M.M. 10 yds. 2/8
 - Lead-in Wire 10 yds. 1/6
 - Twin Flex 12 yds. 1/11
 - 100 ft. Aerial Wire with four 7/22 Insulators 3/6
 - Nugraving Titles or Seals 8d.
 - "R.I." Choke Coil 10/-
 - Nickel Panel Switches, D.P.D.T. 1/5
 - Ditto, S.F.D.T. 1/2
 - Insulating Sleeving 3 yds. 1/4
 - Tinned copper sq., 18 gauge, 15 ft. 1/-
 - Spearpoint Whisker, gold 4d.
 - Screw Spade Terminals 10z. 1/-
 - Pin Screw Terminals doz. 10d.
 - Spade Tags doz. 5d.
 - Empire Tape, lin., 12 yds. 9d.
 - Insulating Sleeving, 6 yd. 2/-
 - Ebonite Knobs, 1 1/2 in. 2 B.A. 6d.
 - Moulded Knobs, 1 1/2 in. 2 for 8d.
 - Ditto 1 in. 2 B.A. 2 for 8d.
 - Ebonite ex-handles, 6 in. 9d.
 - D.C.C., 1 R.C. Bell Wire 10 yds. 1/-
 - Double 'Phone Cords, 72 in. 1/11
 - Porcelain S.P.D.T. Switch 1/11
 - Ditto, D.P.D.T. Switch 2/6
 - Neutron Crystal 1/6
 - Blue Tungstalite 1/6
 - Gecosite (G.E.C.) 1/3
 - Gold Whisker 4d.
 - Set of 5 (one gold) 6d.
 - Variometer (250/650) 3/3 and 2/8
 - Ditto Ebonite 4/11
 - Ditto Ball Rotor 8/11
 - Burndept Detector 5/6
 - "Soldo" and Soldering Iron 2/6
 - Screw Wander Plugs pair 6d.
 - Seven Twist Drills 1/11
 - Taps 0, 2, 4, 6 B.A. set 2/-
 - Sorbo Ear Pads, pair 1/9
 - Tumbler Switches (Ebonite) 1/9
 - Valve Sockets, Plain and washer) doz. 1/-
 - Sets of Spanners 2/-
 - Single Coil Holder mounted on ebonite base and fitted with terminals 1/4
 - Ditto, Swivel movement 1/8
 - Valve Holder (flanged) 1/3
 - Dutch Detecting valves 1/11
 - Hard Dutch Valves 6/11
 - French "R" Valves 7/11
 - 'Phone Bobbins 1,000 ohms, per pair 3/-

CALLERS SEE ELSEWHERE

TWIN CONDENSER

9/-



POST FREE.

Composed of two equal units of •00025 or •0003 mid., operated by one Knob and Dial, thereby enabling you to tune two circuits by one turn of the dial. Complete as shown, with Knob and Dial.

ALSO TWIN •0005 SQUARE LAW 2 EQUAL PARTS OF •0005 EACH VERY FINE INSTRUMENT, EBONITE ENDS KNOB & DIAL

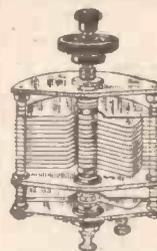
Price 21/- FOR NEUTRODYNE

MYERS VALVES UNIVERSAL DULL EMITTER 12/6 21/-

NEW MODEL

WITH VERNIER

- 001 - 9/3
 - 0005 - 7/3
 - 0003 - 6/9
- WITH EBONITE DIAL and Two Knobs. Post 6d. Set.



WITHOUT VERNIER

- 001 - 6/6
- 0005 - 5/3
- 0003 - 4/11
- 0002 - 4/6
- Vernier, •0005 3/9

With knob and dial Post 6d. Set.

SQUARE LAW

- 0005 .. 7/9
 - 0003 .. 6/6
- With Vernier.
 •0005 .. 10/6
 •0003 .. 9/6
- Post 6d. Knob & Dial included.

BASKET COILS. Post 3d. Set.

- DUPLEX WAXLESS (5) 200/2,000 metres 1/8
- D.C.C. CHELMSFORD WAXLESS SET OF 5 1/- 3/9
- 25, 35, 50, 75, 100
- WAXED (8) 200/3,600 1/8
- Ditto (7) 150/3,600 1/10
- WAXLESS (2) ST 100 1/-
- Ditto (2) UNIDYNE 1/-
- (For Broadcasting only)
- D.C.C. COIL FOR CHELMSFORD complete with adapter 2/3
- (to use with 650 variometer)

RIGHT OPPOSITE DALY'S GALLERY DOOR

K. RAYMOND

27, LISLE STREET, LEICESTER SQUARE, W.C.2

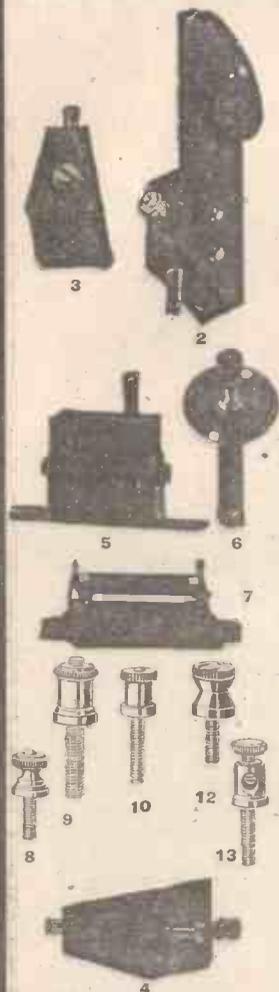
No responsibility accepted on post orders unless cheques and postal orders are crossed and made payable to the firm. Moneys sent must be registered

HOURS OF BUSINESS:
 DAILY . 9 to 7.45
 SUNDAY . 10 to 1

Phone: GERRARD 4637

POST PAGES CONTINUED

SEE OVERLEAF EXTRA POSTAGE ON FOREIGN ORDERS. SEE OVERLEAF



- No. 2. Extra quality . . . 2 for 3/-
- No. 3. Edison Bell, shaped 1/3
- No. 4. "Raymond" . . . 1/-
- No. 5. Plug and brass clips 10d.
- No. 6. ALLEN GRID LEAK 1/9
- No. 7. Edison Bell '0003 and leak . . . 2/9
- No. 8. Terminals, doz. . . 1/-
- No. 9. Large Pillar, doz. . . 1/3
- No. 10. Medium Pillar, doz. . . 1/1
- No. 12. W.O. Pattern, doz. . . 1/3
- No. 13. 'Phone 4 B.A., doz. . . 1/1
- No. 13a. 'Phone 2 B.A., doz. . . 1/6
- No. 14. Voltmeter . . . 4/6
- No. 15. Grid Leak 1/-, 1/3, 2/6
- No. 16. Rheostat and Dial . . . 2/3
- No. 20. Murray Valve Holder 1/3
- No. 21. Rheostat (one hole fixing) . . . 1/6
- No. 22. Set of Spanners . . . 1/9
- No. 25. S.P.D.T. china base 1/9
- No. 25a. D.P.D.T. china base 2/3
- No. 26. "Baby" Coil stand (coils extra) 3/- and 4/9
- No. 27. Dr. Nesper Phones . . . 13/6
- No. 28. Square Law Condensers (Please see lists)
- No. 29. Shaped coil plug . . . 1/-
- No. 30. On and off switch . . . 1/6
- No. 31. Igranic Rheostat . . . 4/6
- No. 32. McMichael H.F. (List)
- No. 33. Energo or Raymond (List)
- No. 35. Tumbler Switch . . . 1/6
- No. 36. Real Ebonite Dial . . . 1/-
- No. 37. Fixed Condensers . . . 1/- (cheap quality all capacities)
- No. 40. FORMODENSER with vernier (List)
- No. 41. BABY AMPLION (Dragon Fly) . . . 25/-
- No. 42. Cam Vernier coil stand 6/11, 7/8, 9/-, 11/- (list)
- No. 43. Basket 2-way coil stand . . . 5/6 also at . . . 5/11
- No. 44. Bretwood Valve Holder 1/9
- No. 45. Brass Switch Arm . . . 1/-
- No. 46. Valve Holder (cut from solid rod) 1/3
- No. 47. Powquip "Bucks" L.F. (for Reflex) . . . 12/6
- No. 48. Formo L.F. (open) . . . 12/6
- No. 49. Formo L.F. shrouded 18/-
- No. 50. Basket Coil Holder. Extra quality, 2 for 2/6
- No. 51. Crystal Detector 1/3, 1/6, 1/9 Nickel . . . 1/9, 2/-
- No. 53. Coil plug, 2 for . . . 1/3
- No. 54. Variometer Ball Rotor 5/11
- No. 55. ONE HOLE fixing . . . 1/6
- No. 56. Accumulator (see list)



NOTE!
OUR WONDERFUL MICRO-METER ADJUSTMENT GLASS-ENCLOSED DETECTOR. WHY PAY MORE?
POST 6d. each. **1/9**

WATES MICROSTAT
FOR D.E. or it. **2/9**
Post Free. VALVES

TELEFUNKEN 4,000 ohms HEADPHONES
As light as a Feather **17/11**

FRENCH THOMSON HOUSTON JUST TRY THEM
4,000 ohms Per pair **15/11**

FAMOUS N and K MODEL HEADPHONES
Genuine 4,000 ohms. Beware of Rubbish.
Post 6d. pair. Price **12/11**

Genuine **DR. NESPER HEADPHONES**
Adjustable diaphragm, detachable receivers, double leather-covered head-springs, long flexible cords, nickel-plated parts. Very comfortably fitting to the head. LOOK FOR THE TRADE MARK
4,000 ohms **13/3**
Post 6d. pair.

ACCUMULATORS MADE BY WELL-KNOWN FIRM FOR ME.

2 v. 40 amps. 9/6.	By post 10/6
4 v. 40 amps. 16/6.	" 17/6
4 v. 60 amps. 17/11	" 20/6
4 v. 80 amps. 23/6.	" 24/6
6 v. 60 amps. 27/6.	" 29/-
6 v. 80 amps. 33/-.	" 34/6
6 v. 105 amps. 38/6.	" 40/6

POST FREE PRICES.

EBONITE

6 x 6	3/16 in.	1/2 in.	2/-
7 x 5	1/8	2/-	2/6
8 x 6	2/-	3/3	3/6
9 x 6	2/2	3/3	3/6
10 x 8	3/-	4/2	4/2
12 x 6	3/3	4/2	4/2
12 x 9	4/3	5/6	5/6
12 x 12	5/6	7/6	7/6
14 x 10	5/6	7/6	7/6

Cut to Size, 3/16 in. at square inch.

D.C.C.

16 D.C.C.	1/2 lb.	2/-
16 "	1 lb.	3/6
18 "	1/2 lb.	2/3
13 "	1 lb.	3/9
20 "	1/2 lb.	1/3
22 "	1 lb.	1/4
24 "	1/2 lb.	1/8
26 "	1 lb.	1/8
28 "	1 lb.	1/10

CALLERS SEE CALLERS' PAGE

FIBRE STRIP FOR COILS
3 feet lengths 1 inch wide
12 feet 1/-
Post free.

POST PRICE TINNED COPPER
Hanks of 12 feet.
16 or 18" square **10d.**

McMICHAEL'S H.F. TRANSFORMERS

150-300	10/- EACH
300-600	10/- EACH
1,100-2,000	10/- EACH

(Manufacturer's advance.)
100,000 ohms Fixed . . . 2/8
2 meg. Leak . . . 2/8
Both with clips.

WATMEL
Var. Grid Leak . . . 2/6
Anode Resistance . . . 3/6

EDISON BELL

'0001 to '0005 Fixed	1/3
'002 to '008	2/-
001	1/3
0003 with Grid Leak	2/6
Variometer	10/-
Twin Detector	5/-

POST 2d. each.

BRETWOOD (New Model)
Var. Grid Leak . . . 3/-
Anode Resistance . . . 3/-
POST 2d. EACH.

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

Phone: GERRARD 4637.

K. RAYMOND
27, LISLE STREET,
LEICESTER SQUARE, W.C.2

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HOURS OF BUSINESS:
DAILY . . . 9 to 7.45
SUNDAY . . . 10 to 1

THIS PAGE IS FOR CALLERS ONLY

ALL POST ORDERS FROM THE OTHER THREE PAGES

Prices subject to alteration without notice. Every endeavour made to keep large stocks; but am not responsible for manufacturers' non-deliveries.

NO POST ORDERS FROM THIS PAGE.

**OPEN
WEEKDAYS
9 to 7.45
SUNDAYS
10 to 1**

SUNDRIES.

- Legless Valve Holder
- Solid Ebonite 10d.
- Phone Cords (6 feet) 1/3
- Nugraving 7 1/2d.
- Similar Sets (Titles or Scales) 3d.
- Good Knobs 1 1/4d.
- Small Knobs, 2014 B.A. 2d.
- Studs, Nuts and Washers doz. 4 1/2d.
- Switch Arms 8d., to 1/-
- Copper Foil 1/2 ft. 2 1/2d.
- 18g. Sq. Tin Copper 15 ft. 5d.
- 16g. Sq. Tin Copper 12 feet 5d.
- Round Tin Copper, various Sizes.
- Insulated Staples 5 a 1d.
- Insulated Hooks 4 for 3d.
- Rubber Lead in, 30 feet 1/3
- 7/22 Copper Aerial, 100 ft. 1/10 1/2
- Extra Heavy Aerial 100 ft. 2/- & 2/3
- Good Valve Holders 8d.
- H.T.C. in Stock 1/6, 1/9
- H.F. Transformers, 300/600 2/9
- Empire Tape, 1/2 in., 2 yds. 1d.
- Ditto, 1/2 in., 2 yds. 1 1/2d.
- 6 in. Ebonite Anticap Handles 8d.
- Skinderviken Buttons (Aluminium) 4/6
- Connecticut Switches 1/4
- 1,000 ohm Bobbins 1/3
- 2,000 ohm Bobbins 1/2
- Sorbo Rubber Ear Caps pr. 1/4
- Adhesive Tape Roll 2 1/2d.
- Allen var. Gd. Lk. 1/3
- Allen Anode Res. 1/3
- Scales, 0-190, 2d., 3d., 4d.
- Dial and Knob (Ed. Bell) 1/3
- Dial (Ebonite) 10d.
- Brunet Headphones 14/6
- Twin Flex 4 yds. 6d.
- D.C.C. Bell Wire, 10 yds. 5d. (Indiarubber covered)
- Slewing yd. 4d.
- Wander Plugs pr. 3d.
- Coloured Plugs each 1 1/2d. (All screw pattern)
- Electron Aerial 1/3 1/2
- Polished Boxes, 8 by 6 3/6
- Strong Valve Template 4d.
- Egg-Insulators 1d.
- Real ditto 1d.
- Thick Rubber Lead-in per yd. 2d., 3d.
- Ribbon Aerial 100 ft. 1/10
- Panels Drilled
- Radio Press Envelopes.
- Raymond Fixed Condensers '001, '001 to '0005, 10d.
- '002, '003, '004 1/-
- '006 1/3; '01 1/9; '02 1/9
- Polar Micrometer Condenser 5/6
- 2 Meg. Grid Leak 1/-
- Rubber Lead-in 10d. doz. yds.
- Valve Windows 6d., 7d., 9d.
- R.I. Choke Coil 10/-
- Lissen Ditto 10/-
- Bretwood Valve Holder 1/9

SWITCHES ON

- Porcelain D.P.D.T. 1/7 1/2
- Porcelain S.P.D.T. 1/3
- Ebonite D.P.D.T. 1/8
- Ebonite S.P.D.T. 1/3
- Min. Panel D.P.D.T. 1/-
- Min. Panel S.P.D.T. 10 1/2d.
- Tungstallite 1/-
- Microstat 2/6
- Tumbler Switches (Ebonite) 1/4
- Fibre Strip (for Coils) 3 feet 2 1/2d.
- D.C.C. Wire, per 1/2 lb.—
- 13 g. 9d. 20 g. 9d.
- 22 g. 10d. 24 g. 1/-
- 26 g. 1/1 28 g. 1/3
- 30 g. 1/6 Etc., etc.
- Solder per stick 2d.
- 2 Color Flex yard 2 1/2d.
- Shellac 5d.
- Battery Box 4/6 (with clips for 36 v.)
- Nickel Pillar Terminals 2d.
- Nickel Contact Studs 2 for 1 1/2d.
- Nickel Switch Arm 1/- (one-hole fixing)
- Loading Coil and plug 3d.
- Condenser Brushes 6d.

BRASS PARTS.

- W.O. or Pillar Terminals 1d.
- Small Pillar 4 for 3 1/2d.
- Phone 4 B.A. 1d.
- Phone 2 B.A., 2 for 2 1/2d.
- Valve Sockets 4 for 3d.
- (Above with Nut Washer)
- Valve Pins and Nuts, 2 a 1d.
- Stop Pins and Nuts 2 a 1d.
- Plug and Socket pr. 1d.
- Spring Washers 4 a 1d.
- Spade Screws 1d.
- Pin Screws 2 for 1 1/2d.
- Spade Tags 6 a 1d.
- Spring Pillar Terminals 2 1/2d.
- Nuts, 2, 4, 5, 6 B.A. doz. 2d.
- Washers (Brass) 12 a 1d.

DETECTORS, &c.

- Enclosed Brass, Large 1/3
- Ditto, Nickel or Brass, Large 1/6
- Small Brass 9 1/2d.
- Ebonite, Enclosed 1/-
- Burndept 5/-
- Easi-Fix Cups 1d. & 1 1/2d.
- Gold Spearpoint 3d.
- Neutron Crystal 1/6
- Hertzite (Shaw's) 8d. & 1/-
- Midite 6d.

VALVES.

- Dutch Detector 4/9
- Dutch "E" 5/-
- Phillips "E" 7/6
- French "Metal" 6/11

TOOLS.

- Set of Spanners 1/4
- Taps, 0, 2, 4, 6 B.A. set 2/-
- Small Soldering Irons 8 1/2d.
- 7-Twist Drills 1/4

SHAW'S HERTZITE.

BEATS ALL OTHER "ITES." 1/-

Impossible to Advertise All the Goods Stocked.

MYERS VALVES.

UNIVERSAL D.E. 12/6 21/-

EXIDE. D.T. 9 Type. 2 Voits. (Glass). (For '06) 5/-

EBONITE PARTS.

- Good Coil Plugs from 4 1/2d.
- Edison Bell Shaped 1/-
- Raymond ditto 10 1/2d.
- Basket Adapters 8 1/2d. Also at 1/- & 1/3
- 2-way Coil Stands 2/6
- With Extens. Handle 2/11 Also at 3/6, 4/-, 4/6
- 3-way 4/3, 4/6, 5/-
- Goswell Cam Vernier 9/-
- Franco 12/6
- Polar 11/-
- Etc., etc.
- Coil Plug on Stand 1/-
- Ditto, Swivel Movement 1/3
- Coil Plug and Clips 6 1/2d.

H.T. BATTERIES.

- Best Made 30 v. 4/6
- Best Made 60 v. 7/6
- Best Made 66 v. 9/-
- B.E.C. 9 volts 3/-
- B.E.C. 60 volts 9/6
- B.E.C. 36 volts 5/8
- B.E.C. 16 volts 2/6

EBONITE STOCK SIZES

- 8x8 1/4
- 7x5 1/4
- 8x8 1/10
- 9x6 2/-
- 10x8 3/-
- 12x6 3/-
- 12x9 4/3
- 12x12 5/6
- 14x10 5/6
- Cut to size WESTOCK 1/-
- 1 1/2 sq. inch. in. EBONITE.

CRYSTAL DETECTOR.

Glass enclosed. Micrometer adjustment. 1/9

MURRAY VALVE HOLDER (Patent) 1/3

Blue and Red TUNGSTALITE MIDITE, GECOSITE, NEUTRON Stocked.

"POPULAR WIRELESS."

FREE TO CALLERS. (Limited number, of course.)

BRASS FORMER

(DOUBLE) 23 spokes 2/11 each side. Make your own coils.

BEST SWITCH ARM.

12 Studs THE LOT 12 Nuts. 12 Washers. 1/-

FAMOUS N and K MODEL HEADPHONES

Genuine 4,000 ohms. BEWARE OF RUBBISH. Price 12/11

"METAL" (FRENCH) '06 VALVES, 15/11

DR. NESPER (SEE TRADE MARK) 4,000 OHM 'PHONES 12/6 (NOT DR. "ANYTHING!")

VARIOMETERS.

- Impregnated Board, Wound D.C.C. and Clips, 200/600 metres 2/6
- Very Good Value, Wound D.C.C. and Knob 1/6
- Ebonite D.S. Wound, with Ball Rotor and Knob, 200/700 metres 5/11
- Ebonite, 200/600 3/11
- Raymond Inside Winding 8/11

RHEOSTATS.

- Small 5 ohms "C" 1/3
- One Hole Fixing 1/3
- Ormond 1/9
- Ebonite Former 1/6
- Ditto and Dial 1/10
- Igranic, T.C.B., and all known makes.

16g D.C.C. USUALLY IN STOCK

FIBRE STRIP (For Coils) 3 ft. long, 1 in. wide. 2 1/2d. per length.

BREAST DRILLS

0 to 1 chuck Cut Bevel and Gear 4/9

BOXES

- 7 x 5 9 x 6 12 x 9
- 8 x 6 10 x 8 12 x 12

BASKET COILS

- DUPLIX WAXLESS (5) 1.8
- 1,200/2,000 metres
- WAXLESS SET OF 5 3.9
- 25, 35, 50, 75, 100
- D.C.C. CHELMSFORD 1/- 1/3
- ENAMELLED Do. 1/- 1/2
- WAXED (6) 200/3,600 1/8
- Ditto (7) 150/3,600 1/10
- WAXLESS (2) ST 100 1/-
- Ditto (2) UNIDYNE 1/-
- (For Broadcasting only)
- D.C.C. COIL FOR CHELMSFORD complete with adapter (to use with 650 variometer) 2/3

BATTERIES 4'5

5d. 7 1/2d. EVER-READY ETC.

MANSBRIDGE TYPE FIXED CONDENSERS

With 2 Fixing Lugs. '25 Special Price 3/6 2 Microfarad 3/11

"ORMOND" L.F. A WONDERFUL TRANSFORMER

13/11

"FERRANTI" L.F. BETTER THAN THE BEST

17/6

PHILLIPS 4 ELECTRODE VALVE 12/6

DUTCH '06 VALVES 12/6

COIL Plugs on base with terminals Swivel movement

1/- 1/3

GAMACES PERMANITE 1/-

Experimenter's Sets of 4 Cat's Whiskers 2d.

OUR WONDERFUL H.T. BATTERIES

30 v. 4/6 60 v. 7/6

BROWNIE "IMPROVED" WIRELESS SET 7/6

RAYMOND CRYSTAL SETS

7/11 9/11 12/11

NO POST ORDERS FROM THIS PAGE.

RIGHT OPPOSITE
DALY'S
GALLERY DOOR
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RADIOTORIAL

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All contributions to be addressed to The Editor, POPULAR WIRELESS and WIRELESS REVIEW, The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

Technical queries are answered by post at a charge of 6d. a query or 1s. for three. All queries must be addressed to the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, E.C.4, and must be accompanied by a stamped and addressed envelope. Copies of the queries sent should

be kept, as the original query cannot be reproduced in the answer. Cash should be sent in the form of postal orders.

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.

Questions and Answers

F. A. F. (Torquay).—I am in a difficulty with the wiring of my two-valve Undyne amplifier, as described in No. 109, Vol. V, of POPULAR WIRELESS.

I get very good results with the one-valve detector, but when I switch in the L.F. amplifier it gives no amplification whatever.

I think I have gone wrong in wiring up the transformers, as I cannot understand the theoretical diagram. So would you kindly forward me a "flattened out" diagram (like the one-valve detector diagram was), so that I can follow the I P's, O P's and I S's and O S's to their respective points, also the '001 fixed condenser.

The wiring diagram appeared in "P.W." No. 124, Oct. 11th issue. In answer to an enquiry by "Two-Valve" (Altrincham).

P. T. S. (Haileybury).—Can a tapped coil be used to increase the wave-length of a frame aerial in the same way as for an ordinary outdoor aerial? If so, should it be in series or connected across the "aerial" and "earth" terminals?

It is possible to "load" a frame aerial by means of a coil joined in series, but it is not usual to do so. The directional effect of the frame aerial (which is one of its greatest advantages) is reduced by the use of a loading coil, and it is generally quite easy to wind a larger number of turns on the frame and so make its natural wave-length near to the desired wave-length.

If it is necessary to use a small loading coil, it should be connected in series with the frame aerial in order to increase the inductance.

"HOME CONSTRUCTOR" (Winnipeg) asks how many metal plates are necessary in order to make up fixed condensers of various capacities, using waxed paper as a dielectric.

It is often difficult for an experimenting wireless amateur to calculate the capacity of any condenser he possesses, but the accompanying table should enable the amateur to build up fixed condensers having any capacity over as wide a range as is likely to be necessary.

The table gives values for fixed-capacity condensers in which the dielectric is waxed paper. The first two columns in the table give the dimensions of the

(Continued on page 598.)

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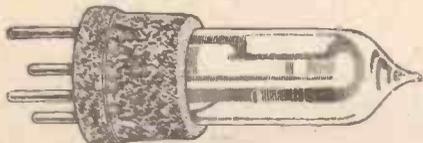
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RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 596.)



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will be only approximately that stated at the head of the column, for a particular capacity is not always given by an exact number of plates, the nearest whole number being given in each case.

P. D. (Crown Hill, S. Devon).—What resistance loud-speaker was used with the two-valve Unidyne, described in "P.W.," May 31st and June 7th, and what was the ratio of the transformer used in the same receiver?

The resistance of the loud speaker was 2,000 ohms. The original experimental set (upon which these tests were conducted) embodied an L.F. transformer of 10 to 1 ratio, but the circuit was subsequently

Table I.—Fixed Condensers. (Waxed Paper Dielectric) Number of Metal Plates.

Length in Inches.	Breadth in Inches.	.001 Mfd.	.0025 Mfd.	.005 Mfd.	.0075 Mfd.	.01 Mfd.	.025 Mfd.	.05 Mfd.	.075 Mfd.	0.1 Mfd.	0.25 Mfd.	0.5 Mfd.
2	1	7	15	29	43	57	140	279	419	—	—	—
	1½	5	10	20	29	33	94	187	279	—	—	—
2½	1	5	12	23	34	46	112	223	335	—	—	—
	1½	4	8	16	23	31	75	150	224	298	—	—
3	2	3	7	12	18	23	57	112	168	223	—	—
	2½	3	6	10	14	19	46	90	134	179	—	—
3½	1½	3	7	13	20	26	63	125	187	249	—	—
	2	3	6	10	15	20	48	94	140	187	—	—
4	2½	2	5	8	12	16	38	75	112	149	372	—
	3	2	4	7	10	13	32	63	94	125	310	—
4½	2½	—	4	7	9	12	29	57	85	112	279	558
	3	—	3	6	8	10	24	47	71	94	233	466
5	3½	—	3	5	7	9	21	41	61	81	200	400
	4	—	3	4	6	8	18	36	53	71	174	348
5½	3	—	—	5	7	8	20	38	57	75	186	372
	3½	—	—	4	6	7	17	33	49	65	160	320
6	4	—	—	4	5	7	15	29	43	57	140	280
	5	—	—	3	4	5	12	23	34	44	112	224

ordinary exercise-book paper would reduce the numbers of plates required by 60 per cent. or 20 per cent. respectively. The thickness of any particular kind of paper, however, is a very uncertain quantity, and the experimenter should, if possible, measure the thickness of the paper which he intends to use. The figures given in the table can then be multiplied by the ratio of that thickness (in inches) to .005. For example, if the paper being used was .003 in. thick, the values given would have to be multiplied by 2.

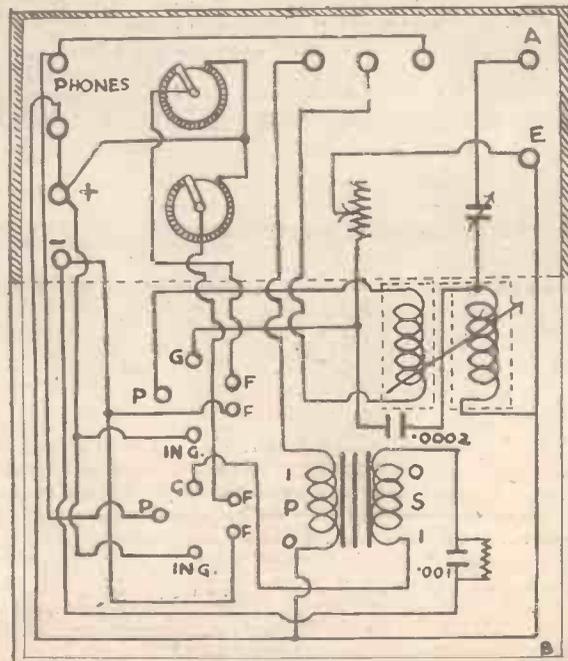
It will be seen that whilst the construction of fairly small condensers could be carried out without much difficulty, the higher capacities could be undertaken only by experienced workmen, and such components would be better purchased.

It should be noted that where the number of plates required is only two or three, the resulting capacity

simplified as shown in "P.W.," No.112. A pictorial diagram showing the altered connections appears in "P.W.," No. 122, and this is the circuit generally referred to as the "One-Valve Unidyne."

When a two-valve Unidyne is used for detector and L.F., the L.F. transformers should not be of the 10 to 1 type used in the original set, but should be an ordinary intervalve L.F. transformer having a ratio of 4 or 5 to 1.

"TWO-VALVE UNIDYNE" (Preston), and others.—As I am quite a novice at wiring up I find great difficulty in following the connections for the detector and L.F. Unidyne circuit. The diagrams and photographs in



"P.W.," Nos. 105 and 106 show the connections for 4-pin valves, with an extra terminal for the extra grid, but I have purchased the set of parts advertised in "P.W." and I wish to use 5-pin valves. Can you publish a diagram showing the wiring from point to point?

The accompanying sketch, which is partly pictorial, shows how the different components should be connected. The upper portion of the diagram (with shaded edges) represents the back of the panel, and needs no explanation except that the grid leak is shown symbolically below the centre stud of the switch, with the variable condenser on its right.

Below the dotted line are the two valve positions, with the sockets marked as seen when looking down at the baseboard. The transformer connections are marked, but on both sides the leads should be tried in the reverse position, until the best results are obtained. The leak across the .001 should be varied carefully, as explained in POPULAR WIRELESS, No. 117, and for close coupling between the coils it is essential to use the types recommended, and not any plug-in coil that happens to be on hand.

(Continued on page 599.)

QUESTIONS & ANSWERS.

(Continued from page 598.)

H. S. (Barnsley).—During my temporary absence on holiday in April my landlord erected a mast at the bottom of my garden without having mentioned the fact or asking permission. My neighbour residing next door and living under a different landlord to me, asked if he might fix an aerial to my pole to run to his skylight. This permission was granted by me, but on commencing to fix up same the landlord of the property where I live came out and raised objections, and said he would not allow it, so the matter was allowed to rest pending inquiry.

Will you inform me of the exact position? I am of opinion that my landlord exceeded his rights both in erecting a post in the garden which I rent from him with the house, and also in objecting to allow a neighbour to connect to my mast. Kindly inform me if I can cause him to remove his mast or claim a nominal rent for same. Should he lose his case, can he cause me to quit the house I occupy as his tenant?

Your landlord had no right to erect the mast on the ground leased to you, and you are entitled to demand rent for it or ask him to remove it.

Strictly speaking, your landlord is within his rights in objecting to allow your neighbour to fix his aerial to your pole, but he would experience difficulty if he attempted to do more than protest.

If your landlord lost his case it would not affect your tenancy. Provided you pay your rent regularly you are protected by the provision of the Rent Act, and you cannot be evicted unless an order to that effect is made by the court, and the dispute as to the mast affords no ground for applying to the court for an order for possession of the premises.

W. McC (Berwick-on-Tweed).—Will you tell me how many hours a 6-volt 40-ampere-hour accumulator is supposed to last, and how many hours a 4-volt 30-ampere-hour accumulator will last after charging?

This depends entirely upon the current taken out of the accumulator. It can be estimated by the following method:

First, it is necessary to know the actual capacity of the accumulator (which you have omitted to state). A "40-ampere hour accumulator" does not give the information, because, although this accumulator would give 40 hours service, there is no indication of what kind of service.

An accumulator which is only used intermittently for short periods—such as for motor-car ignition work—recovers itself in the intervals between use, and will give long service of an intermittent nature.

But if the same accumulator were to be discharged steadily, such as is done when lighting the valves of a wireless set, it would only give about half the current which it was capable of supplying in small quantities at irregular intervals.

This important difference between the nature of the services required from an accumulator must always be borne in mind when purchasing this component.

For wireless work we require to know the actual capacity. If the accumulator is marked "40-ampere hours (actual)," it will give one ampere for 40 hours when used for wireless work. If, however, the accumulator is marked "40-ampere hours (ignition)," it will give only about half—i.e. 20 hours, at one ampere, when used to light wireless valves.

The "actual" capacity may always be reckoned as half the "ignition" capacity.

Having settled how many actual ampere hours the accumulator is capable of giving, it is a very easy matter to find how long it will last before requiring recharging.

Divide the number of amperes taken by the valve (or valves) into the actual ampere hours which the accumulator will give, and the result is the required number of hours.

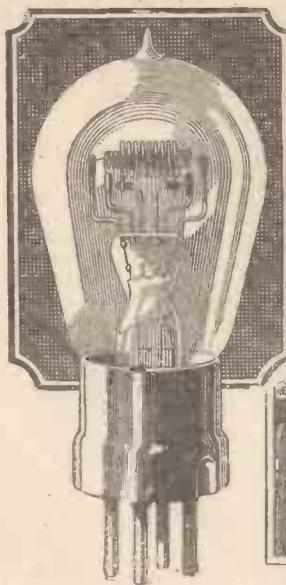
For instance, if five valves are used, and their total current consumption is two amperes, a 20 actual ampere-hour accumulator would last for 10 hours.

The same accumulator when used on a one-valve set taking, say, three-quarters of an ampere, would therefore last for just over 26 hours.

In case this is not perfectly clear, we will take one more case in detail. Suppose an accumulator marked 60-ampere hours (ignition) is used for a three-valve set. How many hours will it last?

The first thing to find is the current consumption of each valve. This is generally marked on the box in which the valve is packed, but in any case can always be obtained from the makers or dealer. Suppose, in this instance, one valve takes 6 and two take 7 amperes each. The total consumption of the three valves is thus two amperes.

The accumulator is rated at 60-ampere hours "ignition," so it will only give 30 hours actual discharge. Therefore, when two amperes are taken from it for the three valves, it will need recharging every 15 hours.



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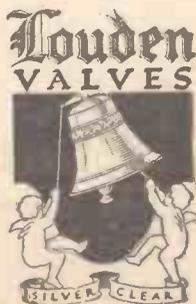
The current consumption of the Louden valve is exceptionally low (0.4 ampere) whereas that of the ordinary bright filament valve is almost double this figure.

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If this were the only advantage which the Louden Valve possessed over others it would alone be sufficient to recommend it, but when you consider that in addition it gives a reproduction startling in its silver clarity, that it gives the same volume as valves costing considerably more, and that the life of the filament is greatly prolonged by the absence of "bombardment," you will agree that in fairness to your purse you should fit your set with Louden Valves at the earliest possible date.

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MORE UNIDYNE RESULTS.

The Editor, POPULAR WIRELESS.
Dear Sir,—I have constructed the Detector and L.F. Unidyne-Set as described in the back numbers of POPULAR WIRELESS, from which I am getting some excellent results.

Using my water-pipe as earth and a twin aerial 42 ft. long and at a height of 30 ft., I receive 5 IT, 5 S C, 2 Z Y, and 6 B M with good 'phone strength on one valve, while when using the two valves speech can be heard perfectly 16 ft. from the loud speaker (the speaker used is an Amplon Baby). On one occasion I received Newcastle (5 N O) speech being sufficiently loud enough to be heard 6 ft. from the loud speaker. The only trouble I had was, however, fading, but by making a slight adjustment to the grid leak its original strength was attained.

Using good component parts, a Unidyne I find will stand a test of equality against any H.T. two-valve super set, both in range and volume, while when considering purity a set using H.T. shows itself partially inferior. Wishing POPULAR WIRELESS continued success.

I am,
Yours faithfully,
E. F. PERRY.

140, Franklin Road,
Gillingham, Kent.

SOME FURTHER "D X" RESULTS.

The Editor, POPULAR WIRELESS.
Dear Sir,—Being a reader of POPULAR WIRELESS, it may interest you to hear of the results which I am getting.

On two valves all British stations come in well on the 'phones. W G Y and W B Z were received twice in the last week, and on both occasions two other American stations were heard on slightly higher wave-lengths. On Tuesday, October 21st. at 2.30 a.m., seven American stations were received on two valves —W G Y, W B Z, W J Z, W A A F, K D K A, and two others whose call signs were not heard.

With third valve switched on, W G Y and W B Z could be followed at 12 ft. from the 'phones. Most of these stations were transmitting dance music. W B Z was relaying from an hotel in Boston.

On most nights, using two valves, the following Continental stations can be received: Four Paris stations, Amsterdam, Berlin, Breslau, Eberswalde, Brussels, Frankfurt, Haeren, The Hague, Hamburg, Hiltversum, Konigsberg, Lausanne on 780 metres, Leipzig, Lyons, on 1,500 metres, Madrid, Munich, Rome, on 422 metres, Stuttgart, Vienna, on 600 metres, Zurich and a very faint station on 375 metres.

We are 40 ft. above sea level, and I am using an aerial 40 ft. one end and 65 ft. the other.

Wishing POPULAR WIRELESS every success.
Yours truly,
J. C. DARCOMBE.

The Glebe House,
Hill Croome,
Upton-on-Severn.

CRYSTAL RECEPTION.

The Editor, POPULAR WIRELESS.
Dear Sir,—Seeing an inquiry in your paper, October 24th, from H. B. T. (Llandebie, Carmarthen) for a set to receive Swansea, seventeen miles distant, your

reply suggests little use for a crystal, so if this bit of information may be of any use will you kindly let him have it through the medium of your paper.

A few months ago I constructed (to instructions given in your valuable paper) the "P.W." Ultra, using only 84 ft. of aerial and lead-in, together with long earth lead to buried earth plate; aerial only 25 ft. at highest point and eighteen miles from Newcastle. The volume of sound obtained is splendid and clear. To-night, while listening to Belfast's official opening, speech could be clearly understood with 'phones 6 in. from head and with 'phones on the table about 1 ft. to 18 in. away. The tune of band music was easily recognised. Hoping this may be of help to any other readers.

I am,
Yours sincerely,
W. HOLDSTOCK.

13, Byron Terrace,
New Sealham.

CONCERNING REFLEX RECEIVERS.

The Editor, POPULAR WIRELESS.
Dear Sir,—I am very pleased to see the articles (and circuits) on reflex sets which have appeared lately in your interesting paper, as I am quite convinced that the finest poor man's set at the present time is the one-valve and crystal reflex. I also feel sure that it will not be long before really good two- and three-valve circuits employing dual amplification on all valves will be found.

For "the encouragement of the others" I give a list of stations logged in one hour after constructing a one-valve and crystal reflex:

All main broadcasting stations; Leeds, Liverpool, and Stoke-on-Trent (testing). Relay stations, Chelmsford, Radiola (1,780 metres), Paris (340' metres), and Brussels.

I used the "P.W." circuit, but with transformer coupling, as this will allow a valve detector being added without trouble, and the following components were found to give excellent results: Myers' valve, Edison Bell L.F. transformer, Edison Bell fixed condensers, Ormond variable, aerial -0005, anode -0003, Burndeput crystal detector, Permanite and silver spear point whisker. A vernier on aerial condenser would help.

Great selectivity is obtained by mounting aerial coil so that it can be coupled to H.F. transformer. When reaction is used in this way the tuning becomes critical and retuning necessary as reaction is altered.

With the above parts the set is very stable and howling practically eliminated.

Yours faithfully,
F. B.

16, Marbury Road, Chester.

CORRESPONDENCE BETWEEN THE INTERNACIA RADIO-ASOCIO AND THE POSTMASTER-GENERAL.

The following copy of correspondence between the Internacia Radio-Asocio and the P.M.G. has been sent to "P.W." for publication in these columns.

Internacia Radio-Asocio,
October 9th, 1924.

The Postmaster General,
Department of Wireless Telegraphy,
G.P.O., E.C.

Dear Sir,—I have been instructed by the Council of this Association to communicate with you on the subject of amateur radio communication between this country and abroad.

My Council feel that the new restrictions which have been introduced will undoubtedly prevent the natural development of international relations between wireless amateurs of different countries. At such a time as this, when almost every day countries are giving more freedom to amateurs for receiving and transmitting, and when the valuable work done by amateurs in the past and at present has enabled communication to be set up under what have hitherto been considered impossible conditions, it appears to us to be a serious retrograde step to place restrictions on free intercourse between amateurs of this and other lands.

Surely the barrier of language is at present a sufficient deterrent against indiscriminate and unnecessary transmissions abroad! A number of amateurs in this country and other countries have been preparing to commence tests in Esperanto, by means of which they hope to obtain better results than previously on account of the greatly extended field Esperanto opens out to them, but the new restrictions will, I am afraid, be a very severe handicap.

We trust that this matter will be reconsidered by you and that you will see your way to abolish a restriction which will hinder the valuable work of the radio amateur.

Believe me to be, Sir,
Yours faithfully,
(Signed) H. A. EPTON,
Hon. Sec. Internacia Radio-Asocio.

General Post Office, London, E.C. 1.
17th October, 1924.

The Hon. Secretary,
Internacia Radio-Asocio.

Sir,—With reference to your letter of the 9th October concerning wireless licences, I am directed by the Postmaster-General to say that the restriction which you mention is not new. When the conditions respecting experimental wireless licences were settled after the war, experiments were limited, as a general rule, to those carried out in co-operation with not

(Continued on page 601.)

MIKRO Ltd.,

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SKINDERVIKEN BUTTON

and

LOUD SPEAKER CRYSTAL SYSTEM

are now in a position to supply parts to all experimenters who wish to make their own sets.

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CITY CORRESPONDENCE COLLEGE,

Dept. 452, 89, New Oxford Street, LONDON, W.C.1.

CORRESPONDENCE.

(Continued from page 600.)

more than five specified experimenters in this county. Early in 1922, the limit of number was abandoned but the scope of experimental communication was not extended to other countries.

It has been the recognised practice for licencees to apply for special permission where they wished to carry out experiments with places abroad. Many such permits have been given, and the Postmaster General is still prepared to give permission at once in approved cases.

I am to add that he is now in communication with the Radio Society of Great Britain on the general question of the conditions under which wireless sending licences are issued.

I am, Sir,

Your obedient servant,
(Signed) J. F. BROWN.

-AMERICA ON A "P.W." UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Noting that Mr. Ralston received W G Y on a 1-valve Unidyne, I am writing to say that I picked up this station a day before him on my single-valve Unidyne. I heard most of the speech and all the music from 3.15 a.m. to 4 a.m., when he closed down, on the morning of the 11th October, I also received a station at about the same time the Saturday before, but it was very faint, and I could not get the call sign.

Yours faithfully,
G. ANDREWS.

44, Grosvenor Place,
Newcastle-on-Tyne.

THE ONE-VALVE L.S. CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am writing to let you know the results I have had on the one-valve loud-speaker set described in your issue of August 9th. I have had all B.B.C. stations on it (excepting Cardiff). Glasgow comes in with almost as much strength as Manchester. The relay station at two miles is sufficiently loud to work a small loud speaker.

Of the Continental stations, I have only received Brussels and Madrid. Another station also came through very well on about 450 metres, but I did not know which station it was. (This was at 9.30 p.m., October 14th.) I am using a "Ferranti" transformer in place of the "Powqip" described. It is the best one-valve set I have tried. (Of course, I have not tried the Unidyne!) Wishing your journal every success.

Yours faithfully,
A. ORMANDY.

3, Sedley Street, Anfield, Liverpool.

RESULTS ON THE UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Just a few lines to let you know of the results I received with your Unidyne circuit. I am situated in Bangor, twelve miles from Belfast, locally known as a blind spot for crystal sets. On two valves Belfast comes in at fairly loud speaker strength, Glasgow loud on the phones, also Bournemouth, London, Birmingham, Cardiff, Manchester, Aberdeen, Newcastle, Nottingham relay, Stoke-on-Trent testing on Monday night. I received Boston (Mass.) twice, although this can't be "did" every night. I also receive a German station, but I don't know where it is. On Sunday and Monday nights, between eleven and twelve, I received a Frenchman, or a German, I am not sure which he was putting on some gramophone records, and when they were finished he said "Allo, allo," and he gave his call sign, but I could not catch it. Could you tell me who this is?

Wishing "P.W." every success.

I am, dear sir, yours, etc.,

CHARLES BURROWS.

10, Madrid St., Belfast.

P.S.—This is not bad considering where I am situated. It is my eighth valve set and the best of the lot of them.—C.B.

[We are unable to identify the station mentioned, and should be glad if any readers who can throw light upon the matter will communicate with us.—E.D.]

W J Z ON A ONE-VALVE UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Since sending you the account of my results with the simplified one-valve Unidyne, I have had W J Z. I started at 3 a.m. on Saturday 11th, and by 3.15 I had got him tuned in. There was a good bit of fading but I kept him until he closed down at 4 a.m. The music came through very well, but at times the speech was unreadable. Atmospherics were hardly noticeable, unlike the Saturday before, when I picked up another station, but it was very faint and X's were too bad to enable anything to be read.

Yours faithfully,
G. ANDREWS.

44, Grosvenor Place,
Newcastle-on-Tyne.

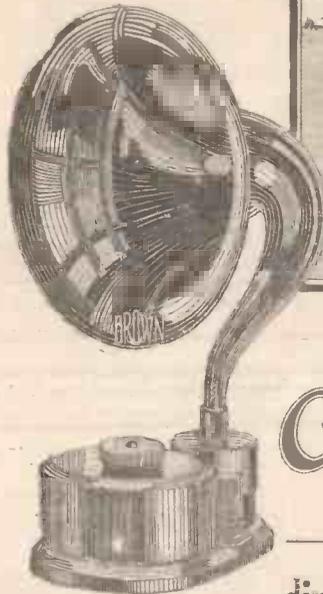
A "P.W." ONE-VALVE REFLEX.

The Editor, POPULAR WIRELESS.

Dear Sirs,—I feel it is only my duty to let you know the results obtained with the "One-Valve Reflex," by Mr. M. C. Pickard in POPULAR WIRELESS

(Continued on page 602.)

This Map shows the effective working areas of the Crystavox—the only Loud Speaker in the world capable of operating direct from a Crystal Receiver. If you live within any of the circles—and if your Crystal Set will respond to the simple test described below—you can use a Crystavox Loud Speaker.



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If you would know more about its capabilities ask your dealer for a free copy of a new Crystavox Folder, or if his supply is exhausted, we will send you one direct.

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'Grams.: Aermonic, Sheffield.



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2/3

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Perfect insulation.
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W. J. L. MILNE,
2, Stafford St., Old Bond St., W.1.

CORRESPONDENCE.

(Continued from page 601.)

of September 27th, 1924. I have received all B.B.C. stations, Brussels, School of Poste, Petit Parisien, Vox Haus, Madrid, two German stations, and to my surprise, on Tuesday morning (October 14th, 1924), at 2 a.m. picked up W.Z.B. (Mass.) K D K A (Pittsburg), W G V (Shenectady), and all distinctly readable; in fact, I listened to the whole programme from W.Z.B. from 2.30 to 5.30, and wrote down every item, and never lost him once. I have sent the programme to W.Z.B. for confirmation.

Yours faithfully,
W. WOOLVETT.

96, Clinton Road,
Mile End, E. 3.

RE "NOVEL CIRCUIT."

The Editor, POPULAR WIRELESS.
Dear Sir,—Having got fed-up with loud-speaker work for a while, I decided to try the one-valve circuit published in your paper a few months ago, which originated from Mr. Chitos, of Ealing.

It certainly is very extraordinary for its simplicity, for within an hour of fixing it up, on a wooden panel, I got Manchester, Glasgow, Bournemouth, Newcastle, and, of course, London, who comes roaring in. The provincial stations come in at fair 'phone strength, without any interference from each other. Besides the above stations, I have recently tuned in Aberdeen, Birmingham, Vox Haus, a continental station announcing in French and English, and Radio-Iberica, Madrid. This last was fair, although very careful tuning was needed, and knowing something of the language, I was able to follow the speech fairly well.

I am using an Ediswan A.R.D.E. valve, and 50 volts on plate. My aerial is badly screened, and is only about 25 feet high. Capacity is very troublesome with this set, but is overcome with careful tuning.

I shall be glad to know if Mr. Chitos has made any improvements in the circuit since its publication, as it is extremely interesting, and I am sure further possibilities are in store for it.

Yours faithfully,
A. C. BATES.

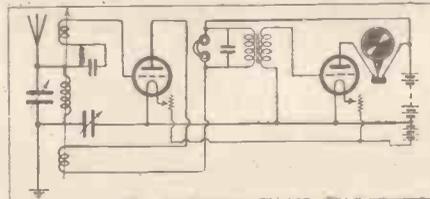
83, Salmon Lane,
Stepney, E. 14.

THAT SIMPLE SUPER CIRCUIT.

The Editor, POPULAR WIRELESS.
Dear Sir,—I was very interested in the single-valve super circuit described by Philip Masou in POPULAR WIRELESS a short time ago.

I have constructed a two-valve set, using this circuit for detector, followed by a stage of low-frequency amplification.

Below I reproduce the circuit as I am using it.



I can tune in all the B.B.C. stations with this circuit, while 5 X X, 2 L O, 5 W A, 6 B M, and 5 N O come in at appreciative loud-speaker strength; and between 1 a.m. and 4 a.m. on Sunday, 12th inst. I was able to receive the American Broadcasting stations, K D K A (326 metres) and W G V with clear, audible strength, although conditions were unfavourable. In all cases I was using dull emitter valves.

The circuit is particularly silent in action and almost free from violent oscillation; it is not a difficult-matter to tune in most of the B.B.C. stations without a single scream.

I think perhaps this last sentence might catch the eye of the person who, a few days ago, sent me by post, a press-cutting, suggesting I have been upsetting the whole neighbourhood with violent oscillations. If my correspondent cares to send me his name and address, I will give him some useful information.

I should be pleased to give any of your readers further information regarding this circuit should they correspond with me.

Yours faithfully,
L. R. EVERARD.

"Fernley,"
70, Waterhouse Street, Chelmsford.

[Just before going to press we received a letter from Mr. Philip Mason in which he gives some further constructional details concerning his interesting circuit. We will endeavour to publish this letter in next week's issue.—Ed.]

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PANELITE.
Will withstand 5,000 volts. Black finish. Will not fracture. 6 x 6 x 3/16, 1/-; 7 x 5, 1/1; 8 x 5, 1/2; 9 x 5, 1/4; 9 x 6, 1/6; 10 x 9, 2/2; 12 x 10, 2/9; 14 x 12, 4/6 post paid. Other sizes and thickness pro rata.
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4V-40	15/6	5/6	6V-40	24/-	8/6
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-.06 VALVES FOR 12/6-

Fil. volts 1.6, anode 30-100. This valve has stood the test. We have received **BEEFAT OPBEES** and **LETTERS OF TESTIMONY**. Owing to our success in marketing this valve, imitative offers are now being made. Our customers past and prospective are reminded of our service—we **CONCERT TEST** all valves before despatch, and send them on

24 HOURS' APPROVAL P.W. UNIDYNE VALVES
Phillips' (Dutch) 4 Electrode DULL Emitter Valves, 1.8 volts 1.6 amp. each 25/-
Phillips' 4 Electrode Bright Emitter Valves; each 12/6
Concert tested. 24 hours' approval.
5:1 L.F. TRANSFORMER 9/3
Finely built, electrically and mechanically, on 3 days' approval. All goods well packed and post free.
AMBLOY PRODUCTS (Dept. F.25),
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J. P. GOWLAND, Wireless Manufacturer, Dept. P. 18, Ellison Place, Newcastle-on-Tyne. A few agencies still open

TECHNICAL NOTES.

(Continued from page 574.)

but in reality they are conducting the practical experiments from which so many of the improvements of the last five years have resulted. They are striving to make the set work better, to make it simpler, to eliminate difficulties, to increase its range, and, above all, to improve the quality of the tone. It is this never-ending quest for perfection which is bringing radio to new stages of efficiency and usefulness."

New Wireless Words.

It is pretty evident to anybody that there must have been a large number of new words coined during the past three or four years as a result of the popularising of wireless. Such words as electron, proton, inductance, potentiometer, and so on, of course, existed long before broadcasting. But triode, autodyne, magnetron, heterodyne, not forgetting unidyne, and hosts of other words seem to have sprung up with wireless, and become known to the layman since the advent of broadcasting. It has been estimated that upwards of five thousand new words have come into being directly as a result of the development of wireless.

Simplifying Wiring.

When you are building a set, and following your circuit diagram carefully in finishing the wiring up, you will find it a great help as you make each connection, or pair of connections, to mark out the wire on the circuit diagram with blue pencil. In this way it is easy to see at a glance just which wires you have finished and which remain to be done. This hint seems almost too obvious to mention, but it is surprising how much trouble it may save you and how many experimenters there are who appear to prefer the longer way.

Panels from Scrap.

Many types of storage battery, more particularly certain kinds which were in vogue a few years ago, are fitted into hard rubber cases, and occasionally discarded cases of this kind may become across amongst electricians' scrap. They make excellent small panels, and should not be thrown away. All that is necessary is to cut the box down the angles by means of a hacksaw, thus separating the four sides and the bottom. If the pieces are warped they can be flattened by immersing in boiling water for a few minutes and then laying on a flat surface with a flat piece of wood covering them and a heavy weight upon the top of the wood. When cold they will be found to be quite sufficiently plane for the purpose. The two surfaces of each piece should be cleaned up with fine emery paper, afterwards smoothing with an oiled cloth. Usually these sheets are thinner than the conventional ebonite panel, so that washers may have to be added to the instruments which are to be mounted upon them. If the sheets are not required for small panels, they cut up into useful ebonite bushes, which may be used for mounting instruments upon a wood panel.

A Remarkable Valve.

In the "Science Monitor" (Boston, September 26th) is an account of a new wireless valve invented by a Mr. Schicker-

(Continued on page 604.)



TO THE TRADE.

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Concert Grand
30/-

Eureka No. 2 (for
Second L.F. Stage)
22/6

Penny wise and pound foolish

IS thirty shillings a lot of money for a Transformer? The tens of thousands of enthusiastic Eureka users do not think so, but we know that there are still a large number of home constructors who—before building their Sets—carefully go through their list of components and see where they can save money. And it is right that they should do, no doubt; but are they wise in stinting money on their L.F. Transformer—the one component on their Receiver that can make or mar its quality of reproduction.

After all, most multi-valve Receivers are operated in rooms of moderate size—sufficient amplification for which is readily obtained by the use of one Eureka Concert Grand. The difference in cost between a Eureka and a cheap and inferior Transformer cannot possibly exceed 15/- For fifteen shillings, therefore, would you prejudice the hours of work you have spent on your Set or the money you have invested in it?

Again, supposing you choose a cheaper Transformer, and find that you are not getting sufficient volume, your only alternative would be to add another stage of low frequency amplification—meaning another Transformer and another valve.

No! Think it over again and you'll want a Eureka—Britain's Transformer de-luxe. Guaranteed indefinitely against breakdown and recognised by experts as producing the purest tone—a Transformer you'll be proud to instal in your Set.

Portable Utilities Co., Ltd., Eureka House, Fisher St., London, W.C.1

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Steel Masts, 20 ft., 10/-; 30 ft., 14/-. Wave-meters, 50/-; Recorders, £6/5/-; Transmitting Sets, 15/6; Amplifiers, £2; Valve Cabinets, 10/-; Control Panels, 10/-.



6/6 Ediswan Valves, R.A.P. "C" Type (as illustrated). The finest all-round English Valve. Osram "CR" with 4 legs, 8/6. Alternators, 200 watts, 70/-; 500 watts, £2/10.

Accumulators from 4/6. Hydrometers, 2/-; Milli-ammeters, 5 m/a, 30/-; 50 m/a, 35/-. Wire, all types, tons stocked. Amplifiers, 3-valve, £3; 5-valve, £6; 6-valve, £7; 7-valve, £8. Buzzers, 1/6; 3/6. Valve Boxes and Coil Boxes, 1/6; Cabinets, 10/-. Condensers up to 24 mfd., all types, .001, 6d. Dynamos, 6v. and 12-v., 6-amp., 60/-; H/T 1,000-v. Hand, £8. M.G. 12 to 1,200-v., £22. Earth Clips, 6d. Mats, 15/-; Spikes, 1/3. Ebonite Panels, 3/6 lb. Meters, fine selection, all sizes from millivolts to 2,000-v., low prices. R.A.F. Insulators, 11d. Loud Speaker Units, 7/6. Microphones, 1/-; Phones, 2/- to 32/6. Plugs, 3d. Potentiometers, 3/6. Receivers: Crystal, 5/-; 17/6; 19/6; 37/6; 2-valve, £2; 3-valve, £3/15; 5-valve, £5/5; Switches, Dewars to 200-amps. Special: 2-valve C.W. Transmitters, £3/10. Ammeter Panel for do., 17/6. 1-Valve Trench Transmitters, £5. Spark Sets, 100/600 metres, 15/6. Large 52B 100 watts do., 35/-. Telephony Sets, No. 24, £5. Tuners, R.A.F. 3/- to 40/-. Valves, all types: Dull Emit., 17/6; Marconi Rounds, 3/6. Variometers, 3/-; Sq. Panel Wire, 2d. per 24-inch rod. Wire, Rubber Flex, 1d. per yard. Thunderstorm Arrestors, 3/-. Prompt delivery by mail all over the world. Send 4d. stamps for Illustrated Catalogue of Radio Bargains.

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Phone: Avenue 4166. Telegrams: Electradix, Ald., N.P.I. Barclays 171 London.

TECHNICAL NOTES.

(Continued from page 603.)

ling, of Newark, N.J., which is claimed to be completely independent of low-tension and high-tension batteries and to be capable of operating from the house-lighting system, either direct or alternating current.

The essential feature of the valve appears to be what may be described as a tiny valve within the main valve, the small internal one acting as a rectifier for smoothing out the hum of the alternating current or the ripple of the direct current. Connections for the valve are stated to be somewhat similar to those in the Unidyne four-electrode valve circuit.

The valve requires some slight further development, after which it is hoped that it will be on the market at a price of about £2. The inventor, Mr. Schickerling, already holds ninety-two United States patents.

New Insulating Material.

Although glass is a valuable insulator, it has certain electrical disadvantages when used in connection with wireless work, and, of course, it is impossible for the user to work it or manipulate it in the same way as ebonite or the other commonly used insulating materials.

Research work has, however, been steadily going on with a view to the production of a low-loss type of glass, suitable for the making of mouldings to replace those at present made in ebonite, bakelite, and other compositions. The commercial name for this new glass is "Pyrex," and it is now used for making valve-sockets and various other wireless components. According to tests at the U.S. Bureau of Standards, Pyrex, when tested at radio frequencies, has lower losses than any other material yet tried, with the exception of quartz.

Furthermore, it is very strong and heat-resisting and does not absorb moisture. It is not injured in any way by the heat of a soldering iron and is almost entirely free from surface-condensation of moisture. It would appear from this that Pyrex is likely to become an important material for the making of wireless parts. Pyrex aerial insulators are already fairly well known, and other components in this material may soon be expected.

Mail order firm wishes to purchase wireless novelties, final patent or in preliminary stages.

MASON, 8, AMITY ST., READING

Repairing Panels.

A writer in "Radio Digest" gives a method for repairing scratched or marred panels, or for filling up holes which may have been drilled in the wrong places. He says "Procure a small tube of liquid glue and a small packet of dry lamp-black (not in oil).

Mix a small quantity with the glue to the consistency of soft putty. Force this into the hole to be filled and leave it for twelve hours, then make smooth with 000 sand-paper, rubbing in one direction or the same way the panel has been rubbed. With a fair amount of skill the job will defy detection, as the colour will be identical."

Electrolytic Rectifier.

The following hint, also from "Radio Digest," may be useful to those experimenters who employ an electrolytic rectifier for charging their batteries. It has reference to the preparation and maintenance of the rectifier solution.

"Use a gallon jar for a stock solution and put in some ordinary borax, fill the jar up with water, stirring all the time, and add more borax until you have a saturated solution.

"After the solution has settled down, pour off the clear part into the rectifier jar. Bright points will appear and disappear on the aluminium rod, and it will turn white; whilst the lead rod becomes dark brown or chocolate colour. The solution will gradually become hot, and even boil. When the solution reaches a milk colour, pour it off and refill from the stock solution and let the milky solution settle. Pour the clear solution back into the stock solution and use it for the next charge. Throw away the milky sediment."

The writer of the above states that he uses an electrolytic rectifier of his own construction for rectifying 2 amperes at about 75 or 80 volts.

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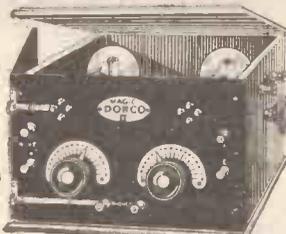
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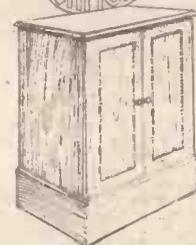
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1 6 v. Accumulator . . . 1 5 9
1 coil Aerial Wire . . . 2 6
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THANKS!

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AN IMPROVEMENT ON THE SQUARE LAW CONDENSER?—

A SQUARE law condenser is a condenser which for a given movement along its scale always gives the same alteration of wavelength with a given inductance. That is to say, if one movement of the pointer or dial of a square law condenser through, say, 10 degrees gives an alteration in wavelength of, say, 100 metres, every other movement along the scale will give a *pro rata* alteration.

Although for laboratory work a square law condenser is necessary, for ordinary tuning work it has its disadvantages. For instance, it would be impossible satisfactorily to use a .001 square law condenser in a short wave receiver for broadcasting, as such a receiver would be most difficult to tune—it would be far too critical. On the higher wavelengths the .001 square law condenser could be used without difficulty, because tuning on the higher wavelengths is much less critical than on the lower band, and much easier.

If a square law condenser is used for short wave work it should not exceed .0002 capacity. It would be found critical enough even with this capacity. But .0002 capacity is not nearly high enough for an ordinary receiver, as it does not provide sufficient capacity for working on the higher wavelengths.

It can be said, therefore, that a .0002 square law condenser cannot be used at all on the higher wavelength range, and that a .0005 or .001 square law condenser cannot properly be used on short wave work—certainly not .001.

If, therefore, a condenser can be obtained which has almost the accurate characteristics of a square law condenser but is easier to tune with, provides a negligible minimum capacity at one extreme of the scale while at the other end it

provides a high maximum capacity, a condenser has been found which for ordinary tuning work (outside a laboratory) is a great improvement on any square law condenser.

— There is now such a condenser available. On short wavelengths its characteristics make tuning much nicer and easier than even a .0002 square law condenser—it has a more open-scale. The effect of this is to make tuning, especially long distance tuning, much easier on short wave work than any square law condenser possibly can be, and incomparably better than a square law condenser of higher than .0002 capacity. This condenser also possesses the advantage that despite its negligible minimum capacity it also possesses a high maximum capacity, which is always necessary for tuning on the higher wavelengths. With this condenser a receiver is equipped for much nicer tuning, better long distance tuning, much more flexible tuning than is possible with any square law condenser. Its pointer makes two revolutions—when small changes of capacity are required, you work on the first revolution, and on the second revolution when more critical changes of capacity are necessary—**WITH ONE KNOB CONTROL.**

This condenser is the new **LISSEN MARK 2 MICA VARIABLE CONDENSER**—and it is worth its price of 17s. 6d.

Negligible min. capacity.

Maximum rated at .001 (actually much higher). Lissen One-hole Fixing, of course.

With this condenser and Lissenagon coils, a receiver is fitted with the best tuning combination it is possible to have. Ask for them if you are out for ease and distance.

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American miners listening-in to W G K in a coal mine.

FEATURES IN THIS ISSUE.

How to Make a One-Valve Reflex Set.

A Wireless Distance Chart.

Rachmaninoff on Broadcasting.

A Power Stage Two-Valve Set.

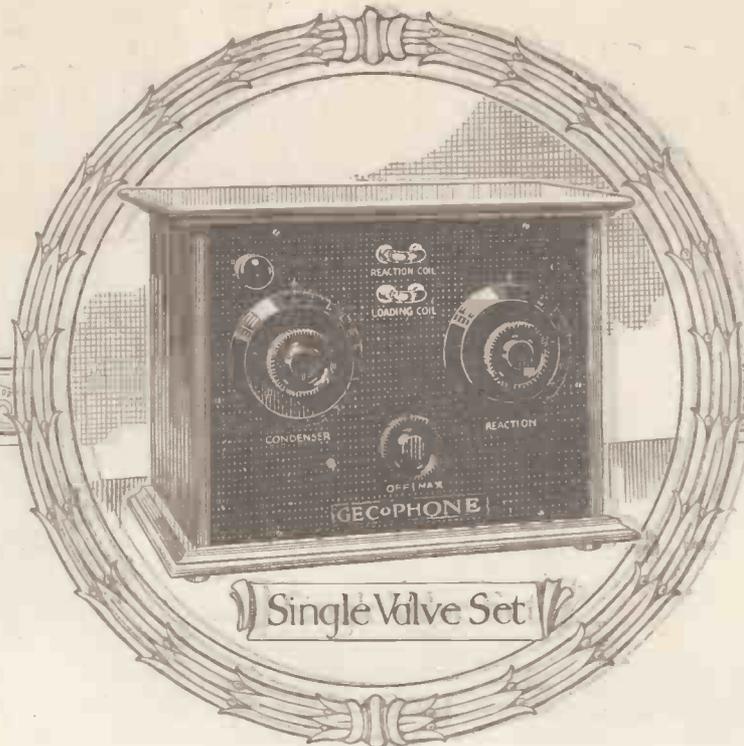
Mounting Basket Coils.

A Loose Coupled Crystal Set.

What You Need for "D X" Work.

Notes on Screening.

Etc. etc., etc.



Single Valve Set

For Service & Satisfaction

GECOPHONE

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NEW MODELS

The model illustrated above is the GECOPHONE Single Valve Set which meets the demand for an efficient popular-priced instrument. It is supplied either with D.E.R. Valve for use with an accumulator or with D.E.3 Valve for use with dry battery. In the latter form it is particularly useful to those living in the country or who do not wish to be bothered with the trouble of accumulator charging. It covers the British Broadcasting wave-length band whilst loading coils can be added for Chelmsford or higher wave-lengths. Its range for broadcasting is rated at 80-100 miles. Operation is simplicity itself. Connections are made simply by pushing plugs into sockets.

Cat. No. B.C. 3000, Set only with D.E.R. Valve	£5 18 0
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Fallon's, in accordance with their usual custom, are giving the public the benefit of the improvements they have effected in their new model Square Law Condensers without increasing the price.



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Extremely handsome appearance, all parts being heavily plated; .068 spacing (the closest possible). In the new model the overall length of the .001 condenser is only 4 1/2" as against 5 1/2" in the old model, and by a new idea in spacing washers, rigidity of construction, never before achieved in any make of condenser, has been obtained.

Features Include:

ONE HOLE FIXING, TAG CONNECTIONS, HEAVY ALUMINIUM TOP AND BOTTOM PLATES. Metal to metal adjustable bearings, stout, well-cut aluminium vanes. Complete as illustration.

Plates	Price	Plates	Price
.001	9/6	.0002	6/-
.0005	8/6	Vernier	
.0003	7/-	3 or 5	
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For long-distance work use a Cossor P2 (the valve with the red top) in the high-frequency socket, and a Cossor P1 as a Detector. These two valves have been definitely worked out as a combination where the greatest efficiency is required.

Any experimenter knows that high-frequency amplification must be treated quite differently to rectification or low-frequency amplification—therefore the Cossor P2 possess very different characteristics to the P1. But both of them use the same master principle of

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When dealing with the minute oscillations generated by a Broadcasting Station hundreds of miles away you cannot afford to take risks with inefficient valves—and the ordinary valve with a straight filament and tubular anode is inefficient when compared with a Cossor.

You know, of course, that the effective working of a valve depends on the electron stream given off by its heated filament. To prove this, turn the rheostat knob and lower the filament temperature of any valve—immediately the output of electrons is diminished and signal strength falls off.

In the Cossor Valve the filament is arched and follows closely the contour of the hood-shaped Grid and Anode, therefore few—if any—electrons can escape.

But in any ordinary Valve a large proportion of the electron stream leaks away at each end of the Anode and causes a serious falling off in efficiency.

If you are keen on getting good results from Continental Broadcasting, therefore, be sure to use Cossor Valves. *They cost no more—but what a difference in results!!*

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P1. For Detector and L.F. use	12/6
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WUNCELL DULL EMITTERS.	
Model A. (With resistance in base for use with 2-, 4-, or 6-volt accumulator.)	
WR1. For Detector and L.F. use	23/6
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W1. For Detector and L.F. use	21/-
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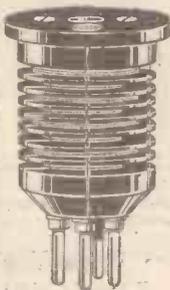
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The Complete Set		55/-

Can be supplied in matched pairs at NO extra charge if requested at time of ordering.



L.F. TRANSFORMER

A high-grade and efficient Transformer of pleasing design for all intervalve purposes, possessing the best possible electrical characteristics. A fixed condenser is nearly always used with an intervalve transformer; provision is made in this model by the clips at the top to take our standard flat type condenser of suitable value.

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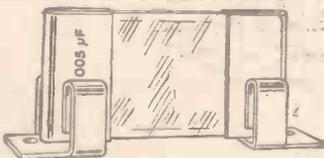


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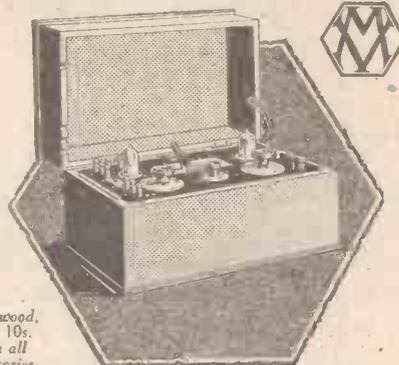
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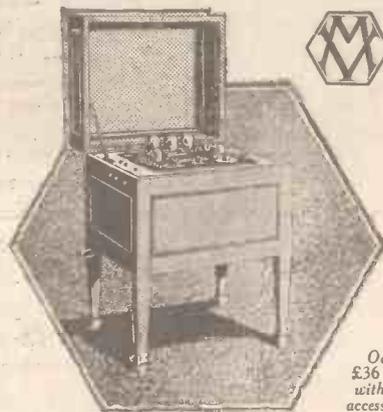
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DESIGNED for reception from both British and Continental Broadcasting Stations on wavelengths from 300 to 3,000 metres. Reaction on to the anode or aerial circuit is changed at will by the movement of one lever—a feature exclusive to "Cosmos" Sets. Illustration shows the receiver in simple hardwood case.

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EMBODYING both the two-valve receiver unit and the three-valve note amplifier unit; this Set comprises one stage of H.F. Detector and four stages of L.F. amplification. It is a very convenient set for armchair listeners, as the height of the table is just right to enable adjustment of controls to be made while sitting in a chair, and it is capable of receiving at L.S. strength both British and Continental Broadcasting.

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AND WIRELESS REVIEW.

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Scientific Adviser
Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

Guests of the B.B.C.

SIX hundred wounded soldiers will be the guests of the B.B.C. on November 23rd at the Palladium, where a matinee will be held in connection with the Adair Wounded Fund.

Most of the microphone celebrities will be there, and readers wishing to attend the matinee should write at once to Mr. Basil F. Leakey, Somerset House, New Barnet, for particulars of tickets available.

All the "Stars."

THE entertainment will be absolutely one of the best, and the attractions will include Isobel Elsom, "Blossom," John Henry, Phyllis Dare, and other famous stars of the stage and microphone.

The boxes are reserved for parties from the different London War Hospitals, and the host in each box will be a B.B.C. celebrity. Captain Eckersley tells me he will be in Box F (St. Dunstan's), and amongst those in charge of other boxes will be Mr. Arthur Burrows, Mr. Rex Palmer, and Captain Lewis.

Some Condenser!

A MICA condenser weighing three tons was referred to by Mr. P. R. Coursey in a recent lecture to the R.S.G.B., upon the subject of "High Tension Condensers."

Talking of the difficulty of wireless measurements, the lecturer gave interesting details of that most awkward radio problem, the measurement of condenser losses.

Experimenters who have ambitions in the transmitting line would certainly find these R.S.G.B. lectures of great value and interest.

5XX in India.

AN Indian radio record has been set up by Mr. W. H. Smith, who claims to have received 5XX in Bombay. Mr. Smith succeeded in tuning in speech that was perfectly audible on a 3-valve set, and Chelmsford's 9.30 p.m. time signal enabled him to check his watch direct by Greenwich time at a distance of 4,500 miles.

The Wireless Exhibition.

TOMORROW (November 15th) the Radio Exhibition at the White City opens its doors, and Londoners will have an opportunity of comparing the wares of "outside" firms with those manufactured by members of the National Association of Radio Manufacturers (N.A.R.M.).

Only the latter were displayed at the Albert Hall show, but the White City Exhibition is not restricted by radio politics,

and the entries will therefore be specially interesting from the point of view of cost.

The Jamming Problem.

SUFFERERS from spark jamming will be interested in a problem which is now being tackled by the Marconi Co.'s engineers. A large number of ships are being fitted for broadcast reception, and the problem is how to cut out the ship's own wireless signals? They are sent on full power within a few yards of the special broadcast-receiving aerial, but experiments in "balancing-out" the jamming have been very successful, and it is thought that a solution to the problem is in sight.



Professor Branly, inventor of the coherer, who reached his 80th birthday on November 6th.

G5NN.

ONE of the most successful amateur stations participating in the New Zealand triumph was G5NN, of South London. The owner, Mr. J. H. D. Ridley, tells me that not only has he heard the New Zealanders every morning since the first success, but his own signals have been received strongly in the Antipodes. He transmits on a wave-length of 97 metres, using a 6-wire cage aerial, 56 ft. high, and a 6-wire counterpoise which is 12 ft. above the ground.

The Discarded Aerial.

IF you imagine Mr. Ridley straining his ears to catch the New Zealand whispers, you will be surprised to know that signals often came through "phones on

the table" strength. And it is no use attributing his success to his magnificent aerial, for as a matter of fact he always disconnects it to receive upon these short waves, because he finds that atmospherics are less troublesome that way!

Hard to Beat.

BUT what I think is the most interesting point of all is the receiving circuit at G5NN. This is not a multi-valve or improved supersonic, but a straight two-valve set, detector, and L.F.

As a triumph of practice over previously accepted theory it would be hard to beat—short waves, low power, no H.F. amplification, and no aerial!

Another Mystery Station.

THE short wave-length band is slowly filling up, and in addition to Nauen (POZ) on 95 metres, a mysterious French station is now transmitting telephony on 105 metres.

The Americans are getting lower and lower, and they now have KDKA on 68 metres, and WGY (Schenectady) who works down on only 15 metres!

Progress in Germany.

AT a time when the British Post Office has issued at least one million broadcasting licences it is interesting to note the statement—made at the first German broadcasting Congress in Berlin—that there are now about a quarter of a million licences issued in Germany.

Lifeboat Wireless.

SINCE the tragedy of the "Trevessa," much attention has been paid to lifeboat wireless. Small sets to run off accumulators have been designed to keep surviving boats in touch with one another, and it is probable that in time such installations will be compulsory, at any rate upon all passenger vessels.

Who Pays?

IF you take your set to an electrician to test, and he accidentally burns out three valves, who pays for the new valves?

In a recent case at Nelson County Court the defendant said he was prepared to make the set efficient, but the judge was asked to award £4 10s. damages against him.

Holding that the set had been taken away without giving the defendant a chance to

(Continued on page 610.)

NOTES AND NEWS.

(Continued from page 609.)

complete the work, the judge gave a verdict in favour of the defendant.

Both At Once?

IS it possible to hear the same piece of music at the same time from two different stations?

A Cincinnati amateur claims that he not only heard WLW and WSAI playing the same song, but one station gave the music alone, whilst the other broadcast music and words.

If so, it must have been one of the most remarkable coincidences ever recorded.



Mr. Ford, the man who won't pay his license fee.

New French Station.

SENATOR PAUL DUPUY,

whose newspaper, "Le Petit Parisien," has a circulation almost as large as that of a great English journal, and whose broadcasting programmes, sent out from his offices on a wave-length of 340 metres each evening, are listened to with pleasure in England and in France, has just opened another broadcasting station in France. The station will be used principally for helping agriculturists by broadcasting weather forecasts.

A Mountain Aerial.

IT is erected on a high mountain, being at the Pyrenean Observatory at the top of the Pic du Midi, and Senator Dupuy's inaugural address was the first message transmitted.

Reports that the new station was heard in Central France on a crystal set indicate it will be very successful.

Investigating Fading.

IN his inaugural address M. Dupuy said that the station, the highest in the world, would permit the investigation of many wireless phenomena, such as fading and the effect of rarefied atmosphere on the propagation of sound.

A temporary aerial was used, the 98 ft.-long masts for the permanent aerial not yet having been hauled up the mountain-top, which is 9,350 ft. above sea-level.

The Wireless Exhibition.

ALL the latest news of the White City Radio Exhibition points to its being a huge success. I have just seen a list of the firms entering, and I can assure visitors that they will have plenty of first-class bargain components and sets to choose from—the difficulty will be not to find what you want, but to resist buying what you know you really can't afford.

The Editor's Book.

I HEAR that the Editor's book, "Broadcasting for Everyone," is to be published on November 21st by Messrs. Herbert Jenkins, of 3, York Street, St. James, S.W. Mr. G. V. Dowding, Technical Editor of "P.W.," has written the

introduction. The book runs to over 250 pages, and is illustrated with diagrams. There is a special chapter on the "Unidyne," and another chapter contributed by myself. "Broadcasting for Everyone" will, I believe, be published at the moderate price of 3s. 6d., and from what I have seen of it I am sure it is a book which will greatly appeal to the new amateur. Copies can be ordered from your local bookstall or direct from the publishers.

For Those Who Grumble.

LONDONERS who grumble at jamming from Chelmsford, and who fear trouble if the B.B.C. erect a second 2 L O, should remember the case of Paris, which has no fewer than four broadcasting stations. Eiffel Tower is always engaged upon a schedule of high-power work, and School of Posts, Petit Parisien, and "Radiola" are all situated in or

WHAT THEY SAY.

The days when we would rather hear howls on the wireless than harmony without it are for most people long gone by. Broadcastng is no longer a mechanical amusement. It is becoming an art.—"Daily News."

I confess to being one of the many who switch off my valves when the broadcast play is afoot; not because of any theory, but because, as hitherto given, it bores me stiff.—Eilson Young, writing in the "Sunday Chronicle."

One is inclined to suspect that those who ask for the broadcasting of Parliament have never heard it at its prosiest.—"The Manchester Guardian."

Official patience is getting exhausted. The day is not far distant when wireless pirates will be prosecuted.—"The Evening News."

"The next General Election may be won at the master microphone."—Mr. J. C. W. Reith (Managing Director of the B.B.C.), writing in "The Nation and the Athenaeum."

"I think I have now settled the problem of direct wireless communication between any two points on the globe without intermediary stations, and I obtained not only complete isolation in the transmission of messages which will allow of absolute privacy, but also a great acceleration which will enable us to reduce the cost of messages to one-twentieth of the present rates."—Mr. Marconi, interviewed by "The Daily Telegraph."

THE WEEK'S QUERY.

"I have heard all the B.B.C. stations, including Paris and Radiola; but why can't I get Chelmsford?"

around the city. The worst of it is that the rest of France is sadly in need of broadcasting stations.

"Dud" Valves.

IF you buy a French R-valve or dull-emitter be careful it is not a fake.

One of the big French valve manufacturers announces that a large consignment of spurious valves without a trademark have put in an appearance, and a good many would-be customers have been deceived by the resemblance.

The Amateur's Progress.

WHILST everyone is handing out bouquets to the B.B.C., and complimenting them upon their progress in the last two years, nobody seems to have remembered the still more wonderful progress made by the listener-in. In 1922 all

that he knew about, for instance, a variable condenser, was the fact that some of the plates moved round and some didn't. Now he won't look at one unless it is a one-hole fixing, square law, fitted with a vernier, hand-capacity screen, and has a guaranteed low-residual capacity.

Time Was—

IT was the listener's intelligent demand that revolutionised radio receiving apparatus. Time was when filament resistances measured 5 inches across, weighed about 1/4 lb., and had a coil of wire inside that resembled a spring mattress. They used to charge 5s. 6d. for one of these phenomena, but to get a really decent resistance one had to pay 12s. 6d.—which, incidentally, was the price of a Dubilier condenser. I remember one advertisement which offered a really good crystal set for £9 15s.—it is only fair to add that it was "complete with crystal"!

A French "Ace."

AN interesting record has been set up by M. Deloy, the French amateur radio ace. From his station in Nice he exchanged messages with a Buenos Aires amateur, 8,750 miles away, who reported excellent reception. So M. Deloy then called up New Zealand, and within an hour or so he was picked up there, and answered. The distance in this case was 12,500 miles, and signals were perfectly clear.

Our Scientific Adviser.

SIR OLIVER LODGE will succeed Sir William Bragg as scientific lecturer when the B.B.C. commence the evening educational lectures for adults, which are planned to begin in January. I wonder if this is just a happy chance, or whether Mr. Stobart, the Director of Education, is to be congratulated upon an almost uncanny instinct in his choice of lecturers?

A B.B.C. Promotion.

AN interesting little ceremony took place at the Plymouth station the other day, when the staff gathered to say good-bye to Mr. J. K. A. Nicholson. He has just been promoted to be engineer-in-charge of the Newcastle station, and his colleagues at 5 P Y gave him hearty good wishes, an engraved cigarette case, and a rousing send-off.

A Miners' Band.

FOLLOWING London's recent broadcast from an aeroplane, Leeds is going into the bowels of the earth for entertainment. It has been arranged to broadcast selections by the Colliery Prize Band from the Whitwood Collieries, and listeners will have the novel experience of hearing music which is being played 1,500 feet below the surface of the earth.

An X's Theory.

ARE atmospherics caused by shooting stars? This interesting query is raised by Dr. Fee, editor of the "Scientific American," who says that although there is no proof in either direction, the possibility should be investigated. He suggests that radio amateurs with a knowledge of astronomy should combine to test out the idea.

LISTENING TO NEW ZEALAND.

MR. GOYDER'S RECEIVER.

SOME CONSTRUCTIONAL DETAILS.

By K. D. ROGERS.
(Assistant Technical Editor.)

This exclusive article will enable readers to build a set similar to the one used by Mr. Goyder, of Mill Hill, when receiving signals from New Zealand amateurs.

WHILE discussing the question of long-range, short-wave, reception last week I mentioned the fact I would deal with the receiver used by Mr. C. W. Goyder at Mill Hill School. As a matter of fact, the exact measurements will have to be altered slightly owing to the fact that

about 10 ohms was found to be enough.

In order to make the set more practicable for the average reader I have revised the panel lay-out slightly, though not altering any of the "critical" components; but the reader will do well to experiment with the spacing of the coils, etc., as well as with the circuit and coils employed.

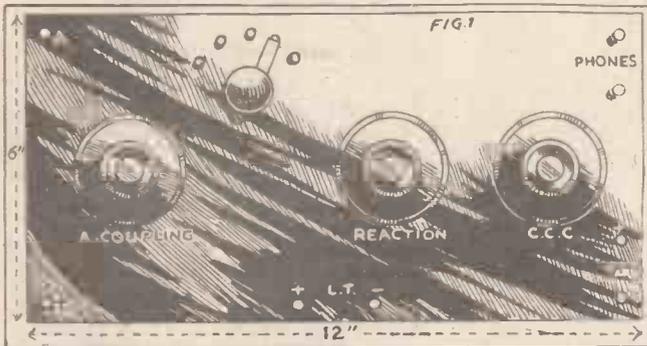
constructed being wound in and out of the nails or wooden pegs in basket fashion, but with one turn above the other, and not outside as is the case in ordinary spider or basket coils. The result is a coil of basket shape but of solenoid description.

Mounting the Coils.

Before removing the coils from the pegs (if nails are used point upwards the coils can be slid off the former) the coils should be tied loosely with string or thread at three or four points, in order to keep them from unwinding. Tape or shellac must not be used as a binder, or the aim of the coils, low capacity, will be lost.

The aerial coil is wound first, and is wound on a diameter of 2½ in. with five turns. Then comes the reaction coil of the same diameter, but of ten turns. After this the nails are altered to give a 3 in. diameter for the grid coils. These have nine

The approximate dimensions of the receiver will be seen from Fig. 1, which shows the front of the panel. The dial on the left controls the aerial coupling, while that on the right is the secondary tuning condenser (five plates), the aerial being aperiodic, or, rather,

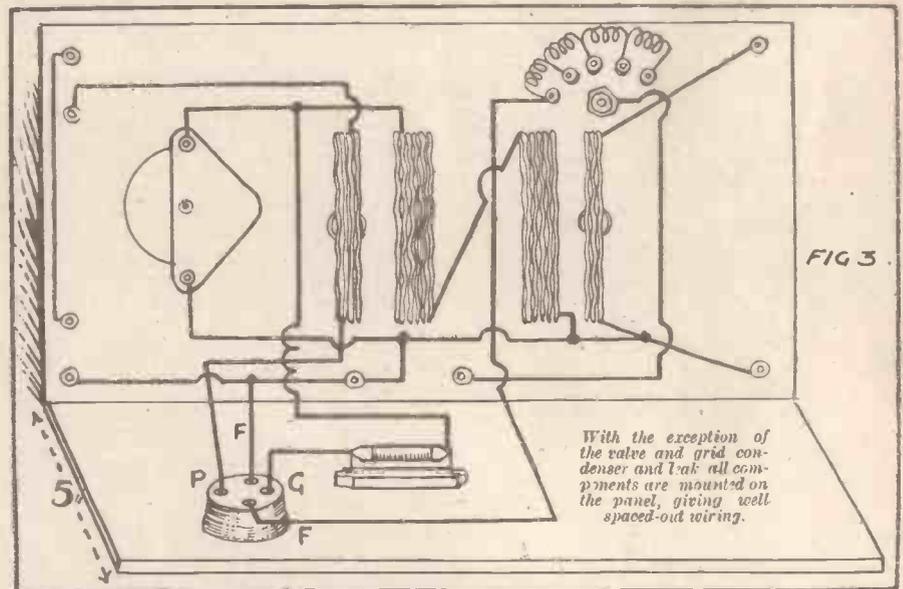


the actual receiver used by Mr. Goyder was an experimental one, inasmuch as neither H.T. nor L.T. terminals were arranged on the detector panel, and this panel was separate from the L.F. unit.

Another point worth mentioning is that low-resistance phones were used so as to decrease body effects; these need not be adhered to, and the receiver described herein is for use with H.R. phones. The filament resistance shown on the diagrams is similar to that used at Mill Hill School, but is by no means an essential point of the receiver, as any rheostat will do provided it is silent in working.

The Panel Lay-out.

That is the great advantage obtained by using a tapped resistance as shown, for with the valve used (a Mullard detector) the filament regulation need not be so very critical, and five tappings in a resistance of



With the exception of the valve and grid condenser and bak all components are mounted on the panel, giving well spaced-out wiring.

The back of the detector panel. The top connection to the variable condenser should be taken to the centre spindle instead of as shown.

untuned. The remaining dial gives the reaction coupling, the filament resistance being above or to the right of the aerial control. As will be seen, the receiver is built on the American system.

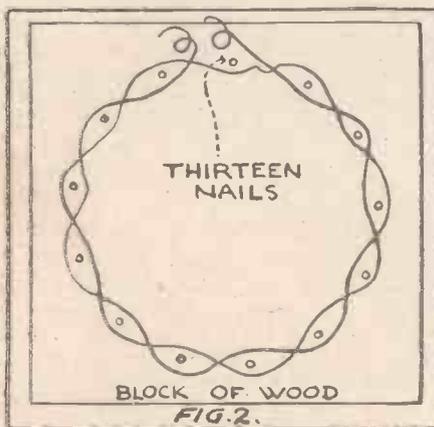
Low Capacity Inductances.

The coils are very simply made and are self-supporting, being mounted on the panel or baseboard by string, thus keeping the capacity down more than would be the case if coil holders were used. Fig. 2 shows the former upon which the coils are wound, the 22 gauge wire (D.C.C.) of which they are

and fourteen turns respectively, and as they are connected together can be wound on the former as a coil of twenty-three turns with a long length of wire (about 3 in.) left unwound after the ninth turn. The coils are bound separately—i.e. the nine turns are bound and then the fourteen before either is removed from the former.

The aerial coil (five turns) is fixed by cotton or thread to an ebonite or wooden spindle projecting through the panel from a control knob and dial.

(Continued on page 612.)



LISTENING TO NEW ZEALAND

(Continued from page 611.)

This can be a fairly loose fit, and can be stayed at the inner end by passing through a small block of wood. This rod is about 4 in. above the baseboard, and is passed behind the coil (to the left looking from the front of the panel) so that the coil may be coupled variably with the nine-turn grid coil, which is placed a convenient distance away so that fairly tight coupling is possible.

The nine-turn coil is fixed either to the panel or baseboard (preferably the former) by string or similar means that will not affect its capacity. The fourteen-turn coil, attached to the nine-turn coil, is placed parallel to the nine-turn coil and about 3 in. away, the turns being in the same direction in both coils. To this latter coil (fourteen turns) is coupled the reaction coil (ten turns) in the same way as the aerial is coupled to the nine-turn coil. The five-plate condenser is connected across the whole of the nine and fourteen turns as seen in the diagram. The rest of the wiring can be

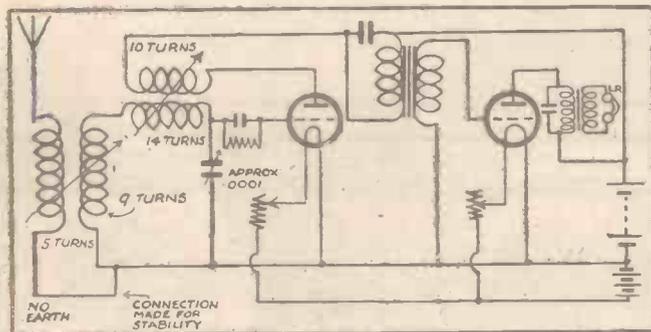


Fig. 4. Theoretical diagram of the complete receiver.

seen from Figs. 3 and 4. The note magnifier is of the usual pattern, so that it is not intended to dwell upon that part of the receiver.

Handling the Receiver.

As regards the filament resistance, a Microstat or other good make is suitable; or if a tapped one is used five studs and a switch arm connected to about 12 ft. of 26 Eureka wire wound in a helix round a pencil and tapped at even distances will be O.K. The H.T. voltage used in the recent tests was 60 volts and L.T. was 6 volts, two Mullard valves (red and green rings) being used in the detector and L.F. panels respectively, as these valves were found to be wonderfully silent. The valve in the detector was mounted on a platform of ebonite raised from the wooden baseboard, and no anti-capacity device was used. In the amplifier, the valve was on the panel itself, though this point is not at all important, and can be left to the discretion and desire of the reader.

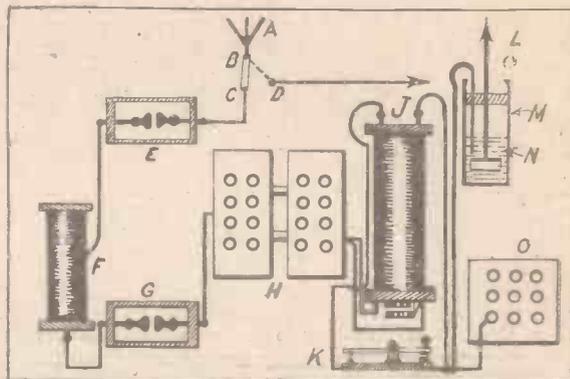
Tuning in will be found fairly easy, though the various coils should be reversed to give best results, and the reaction coil increased if necessary to make the set oscillate. This may even be tuned if desired by a .0001 condenser.

An ordinary grid leak and condenser of about 2 megohms and .0002 mfd. were used

by Mr. Goyder, but it is just as well to fit a variable grid leak of even working if this can be found. If even operation cannot be guaranteed the set will be noisy.

Setting the condenser at zero, move the reaction and aerial simultaneously until the set oscillates, then vary the condenser and reaction, keeping the set in oscillation until signals are heard. Then a variation of the aerial should bring them up, and final condenser and reaction adjustments will give maximum results.

It will be noticed that no earth is shown on the diagram of the circuit, and this was left out by Mr. Goyder as being unnecessary. As a matter of fact, an earth made absolutely no difference, the balancing capacity to the aerial being found in the L.T. battery and connections. The connection from earth side of aerial to L.T. negative was added to make the set more stable, but the receiver should be tried out without it at first.



The emergency transmitter set up by the crew of the "Teddy."

Those who intend to listen-in for America and New Zealand (call signs of the latter being preceded by Z, e.g., Z 4 A. A., etc.) on the set should remember the differences in time between those countries and our own, and it is useless to try for the former much before 11 p.m. G.M.T. and the latter at any hours except 5.30 p.m. and 5.30 a.m. (preferably the latter).

The set as designed by Mr. Goyder covers 70 to 150 metres, but a loading coil can be inserted between the fourteen-turn coil and the grid condenser and the tuning condenser if it is desired to load the set up to 250 or higher wave-lengths.

Above all things, patience and skilful tuning are needed, given right conditions, if results on this ultra D X work are to be obtained; but those readers who take it up will find it very fascinating, and I shall be glad to hear from them as to results obtained. Finally, as I said last week, don't keep to conventional circuits such as the above, but try out your own ideas. This article is not intended to give the one and only receiver capable of picking up New Zealand, but just a brief outline of the class of set suited for such work and one type of circuit that has been tried and found satisfactory.

A RADIO EXPLOIT IN THE ARCTIC.

THE following radio story is related of the Danish vessel, the "Teddy," which, belonging to the Danish Greenland Company, was sailing in Greenland,

and got trapped by ice in the polar seas. It shows how much can be done by a little skill and enterprise.

Of radio materials only a receiver was found on board the "Teddy"—no transmitter and no trained telegraphist. When the vessel was in need in the polar seas, and it was found especially expedient to get

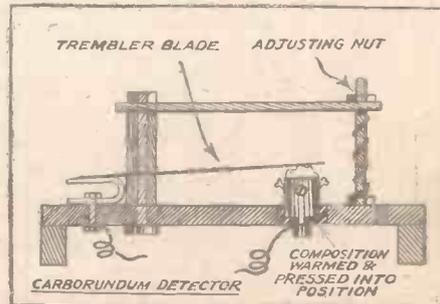
into touch with the outside world, Th. Rostgaard, the vessel's engineer, succeeded in constructing a transmitter with the materials at hand. While the captain and mate set themselves to learn the Morse code by means of a buzzer, the engineer, Rostgaard, coupled a little electro-motor to a petrol motor, which thus produced the necessary power for the transmission.

Aerial and earth connection already existed, and a large spark coil and a loading coil for 600 metres, together with some transmitting valves, were on board; a Leyden jar was made of some large glasses, and with the combination of these various items they succeeded in making both a spark coil set and an oscillating valve.

As the signals were received, among others, by the Norwegian steamer, "Konrad Halmbo," it must be said to be a real radio exploit which has been performed under despairing conditions.

EASILY-MADE CARBORUNDUM DETECTOR.

FROM an old Ford coil carefully take off the top (trembler, base, etc.). Then, in the hole where the magnet projected, fix an ordinary crystal cup, by filling up the space around the cup with the



black composition found inside the coil, slightly warming first. By screwing two battens to the underside of the base, the whole detector is then complete. A glance at the diagram will explain:

HOW TO MAKE A LOOSE COUPLED CRYSTAL SET.

By J. LAURENCE PRITCHARD.

(Technical Editor, "Harmsworth's Wireless Encyclopedia.")

The set described in the following article has the advantage of enabling high wave-lengths to be reached, at the same time retaining the desirable features of neatness, compactness, and general efficiency on lower wave-lengths.

A DIFFICULTY found in the construction of a loose coupler crystal set having a wave-length range up to 2,600 metres is to be found in the making of the

overlapping, moulded base, the front side, to which the controls are fixed, being left loose. In outside dimensions the case measures 9½ in. long, 5 in. wide, and 7 in. deep, and is made of ¾ in. deal or other wood. The base is not included in these dimensions. It is cut from ½ in. finished deal and measures 10½ in. long and 6 in. wide.

In order to make the assembly of the parts as simple as possible, a loose base is screwed at right angles to the bottom of the loose front. It is cut to form an easy sliding fit inside the case. No other work is required on the case itself, and it may be papered and stained or polished as the constructor desires.

While on the woodwork part of the construction, the wooden formers on which the coils are wound may be made.

These consist of two oblong frameworks made in ¾ in. ebonite or wood, one being arranged to slide inside the other. The outer and fixed former measures externally 7 in. by 5 in. The width of both formers is 2 in. The size of the smaller former should allow a gap of ⅛ in. between each corresponding side of the fixed former, when the movable former is placed inside it.

If the formers are made of wood, care should be taken in gluing and pinning, as, owing to the thinness of the material used, the formers are very weak before they are wound. A strip of wood of the same thickness is glued and pinned across the centre of the back of the fixed former. This strip supports the back ends of two brass rods attached at their front ends to the front of the set.

Fixing the Formers.

The smaller former is designed to slide along these rods to provide the variable coupling. This former has two strips of ⅛ in. wood, 1 in. wide, across each side of the centre of the former.

The ends of the back strip are let into the shorter sides of the former so that they come flush with its edges. A hole of ⅜ in. diameter is drilled in the centre of the other strip to form the means of attachment of the control rod for varying the coupling between the coils. Two more holes of the same diameter are drilled 2¼ in. on each side of the centre hole. These holes are continued through the other strip and also through the strip on the fixed former. It is very important that the holes should be dead in line with each other so that the rods supporting the movable coil are parallel.

Winding the Coils.

The arrangement of the formers is shown in illustrations of the set in more advanced stages of construction. The two supporting rods are 5½ in. lengths of ⅜ in. brass rod screwed 2 B.A. at each end. Before the formers are wound, three holes corresponding to those in the front strip of the sliding former are drilled centrally in the front of the case, allowing a ¼ in. for supporting brackets to the fixed former. A third rod



Fig. 1. Showing the compact appearance of the completed instrument.

apparatus reasonably small and compact. A loose coupler for these wave-lengths built on two cylindrical inductances, where one inductance slides inside the other, would be an extremely cumbersome apparatus.

Adaptable to any Circuit.

The loose coupler crystal set illustrated in Fig. 1 has the advantage of enabling high wave-lengths to be reached, and at the same time retaining the desirable feature of compactness. Although it is essentially a complete crystal set, the terminals are arranged so that the apparatus may be used as a loose coupler capable of being used in any circuit desired.

The case is a simply made box having an

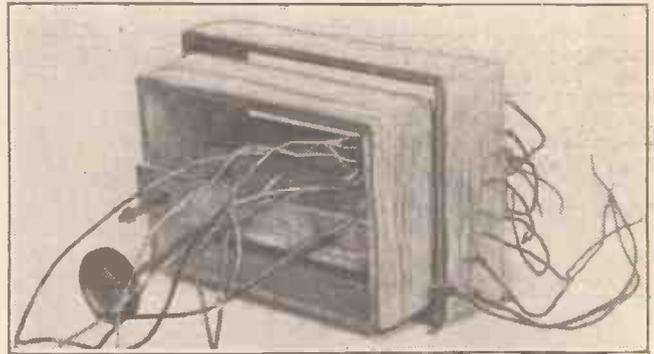


Fig. 3. The construction of the coils is made clear by this photograph.

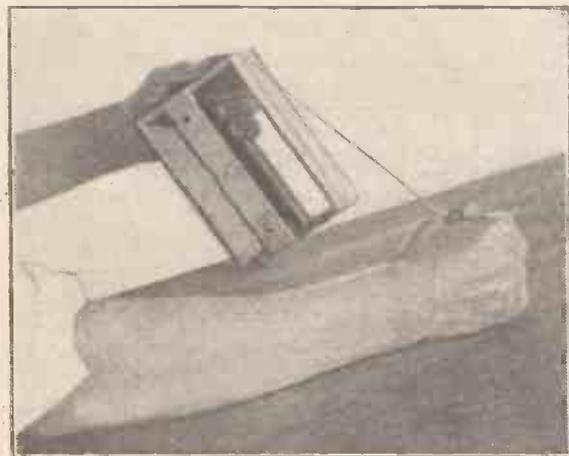


Fig. 2. Illustrating the method of winding the coils.

of ⅜ in. diameter brass rod 4 in. long and screwed 2 B.A. for a short distance at each end, is attached at one end to the centre of the sliding former. The other end of the rod projects through the centre hole drilled in the front of the case.

It is advisable to fit the formers into position to make certain that the movable former slides easily before the winding is started.

The method of winding the coils is known as bank or pile winding, in which one or more layers are wound on the top of the bottom layer of wire. It is not possible to complete one layer and run the second layer from end to end of the top of the first. The method adopted in a double layer coil, which is required in the set under construction, is to wind two turns of wire on the former and to run the third turn in the

(Continued on page 614.)

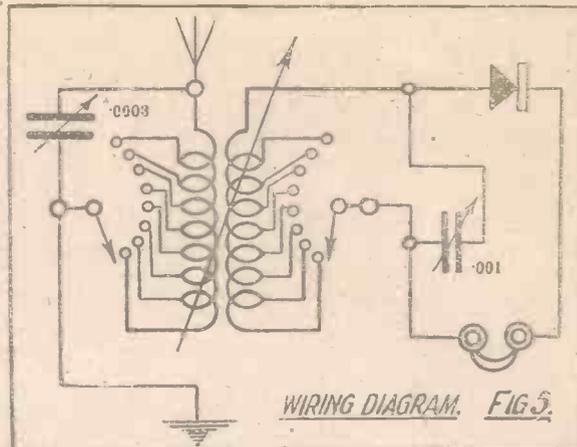
A LOOSE COUPLED CRYSTAL SET.

(Continued from page 613.)

groove made by the first two turns. The fourth is wound on the former again to form another groove for the fifth turn.

taps are made by twisting a small loop when the wire comes to one of the $\frac{1}{8}$ in. marks. The way the coils are wound is illustrated in Fig. 2, where the reel of wire is supported on a rod held in a vice while the turns are tightly and evenly laid. For both coils, No. 28 g. S.C.C. copper wire is used. In the fixed inductance the tapings are made on the outside of the coil.

The tapping points for the movable inductance are made in a similar manner, at spacings of $\frac{1}{8}$ in. along a line $2\frac{1}{2}$ in. long extending from side to side of the former. The tapings are taken on the right side of the former when viewed from the front. Small



back of the contact studs and the switch spindle are clear of the wood. The fixing of one of the switches, showing the hole for the second switch, complete in the foreground, is illustrated in Fig. 4.

The Wiring Connections.

The crystal detector, mounted on an ebonite base, is secured to the top of the front of the case, while two telephone terminals, also mounted on ebonite, occupy a similar position at the bottom of the front. Large clearance holes are drilled so that the connections may be made to the detector and the telephone terminals. The coils are mounted by means of brass brackets raising the fixed coil $\frac{1}{4}$ in. from the base.

The circuit diagram is given in Fig. 5, and in Fig. 6 a plan view of the receiver without the case is illustrated. The connec-

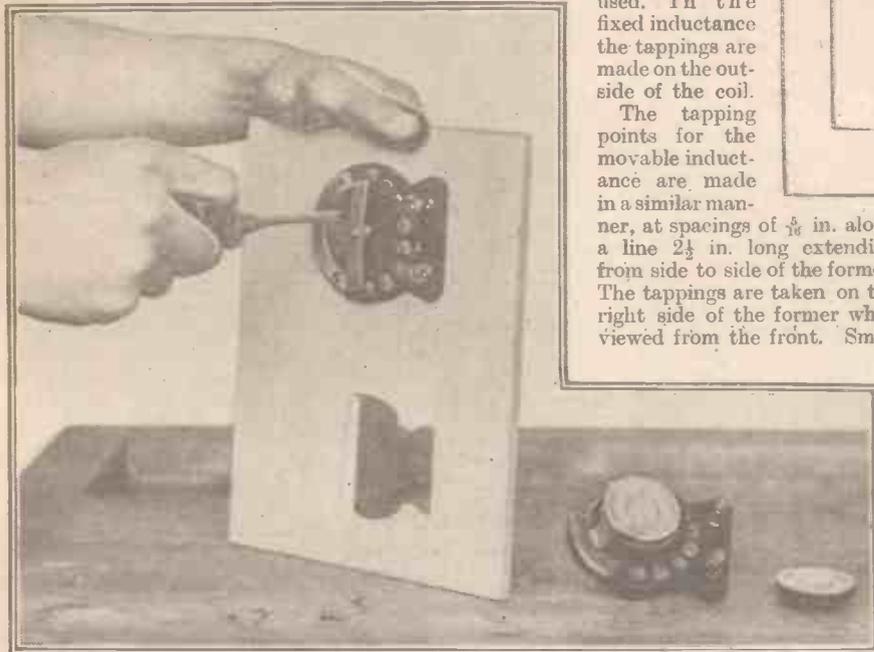


Fig. 4. Showing how the switches are fitted.

This process is continued throughout the entire width of each former. Eight tapings are required in each inductance, spaced at equal distances apart. A good method of obtaining the correct tapping distances is to mark a line, 4 in. long, across the right side of the fixed coil former. The line is divided into distances of $\frac{1}{8}$ in., which gives 7 intermediate tapping points. The eighth contact stud of each switch connects to the end of each coil. The

holes are drilled along the line and the tapings pushed through to the interior of the former. The insulation is removed from the tapings where flexible insulated leads about 12 in. long are soldered to them. The coils at

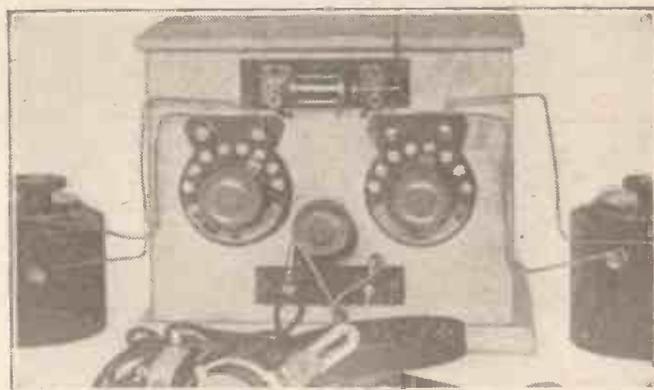


Fig. 7. The complete set showing how the variable condensers can be attached if required for fine tuning or increasing wave-length range.

this stage of construction are shown in Fig. 3.

The two 8-stud switches are mounted on ebonite shields, having two terminals at their top ends. A double-ended switch arm is employed, making contact with a brass back plate. To preserve the high degree of insulation obtainable with ebonite the front of the case is cut away so that the

connections to the moving coil are made to the left-hand switch, which gives the least amount of movement to the flexible leads. The leads to the fixed coil are quite short, as both the switch and the tapping points of the fixed coil are to the right of the set. A control knob is screwed to the rod operating the movable coil.

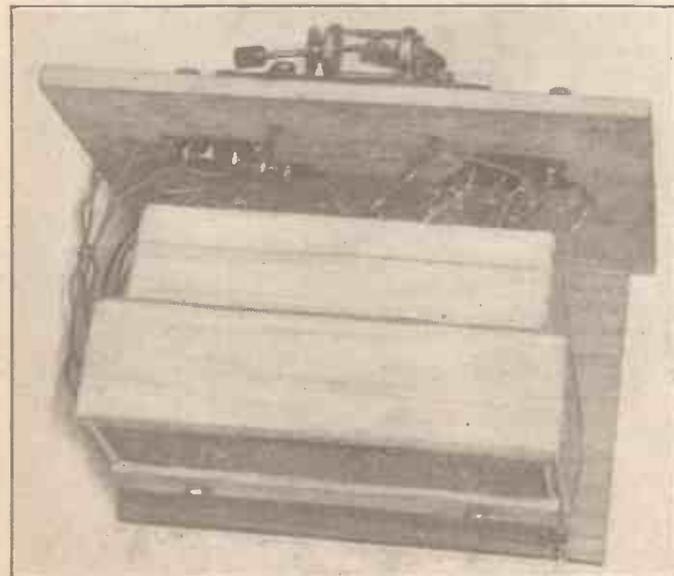


Fig. 6. A "plan view" of the set without its case.

LIST OF MATERIALS FOR THE LOOSE COUPLER CRYSTAL SET.		
2 Variable condensers from .0003 to .001 mfd., say		2 s. d.
Parts for two 8-stud switches, say		1 0 0
6 oz. No. 28 g. S.C.C. wire		2 6
Crystal detector		1 4
Telephones		4 0
15 in. brass rod $\frac{1}{8}$ in. dia.		1 0 0
Wood for case and formers, say		0 8
Terminals, connecting wire and screws, etc., say		2 0
		1 0

Technical Notes



Conducted by J. H. T. ROBERTS, D.Sc., F.Inst.P.

Sensitising Galena.

ONLY a comparatively small percentage of natural galena is found to be sufficiently sensitive for the purposes of wireless detection; in fact, it has been stated that not more than 7 lb. out of 100 lb. can be used for wireless crystals.

A method is given in "Radio" (Sydney, N.S.W.) for sensitising crystals which are not up to standard.

The galena is broken up into small pieces with a hammer, and is then placed in a small porcelain crucible such as those used for analytical purposes in chemical laboratories. These crucibles can usually be obtained for about a shilling or two.

When the crucible is about half filled with the powdered crystals, a layer of powdered sulphur or flowers of sulphur is sprinkled on the top to a depth of about one-sixteenth

of an inch. The porcelain lid of the crucible is then sealed on by means of plastic clay, so as to make the whole as airtight as possible and prevent oxidation of the sulphur.

The crucible should now be heated to about 1,100 or 1,200 deg. C., and this is the most difficult part of the operation. The best way to obtain this temperature is to enclose the crucible (which should be a small one) in coke and to direct a large Bunsen flame upon it or preferably, if you have the necessary facilities, a large blow-flame.

The crucible should be kept as hot as you can possibly make it for about half an hour, and should then be left to cool down slowly. It will generally be found necessary to break the crucible in order to remove the contents. If the fusing operation has been properly

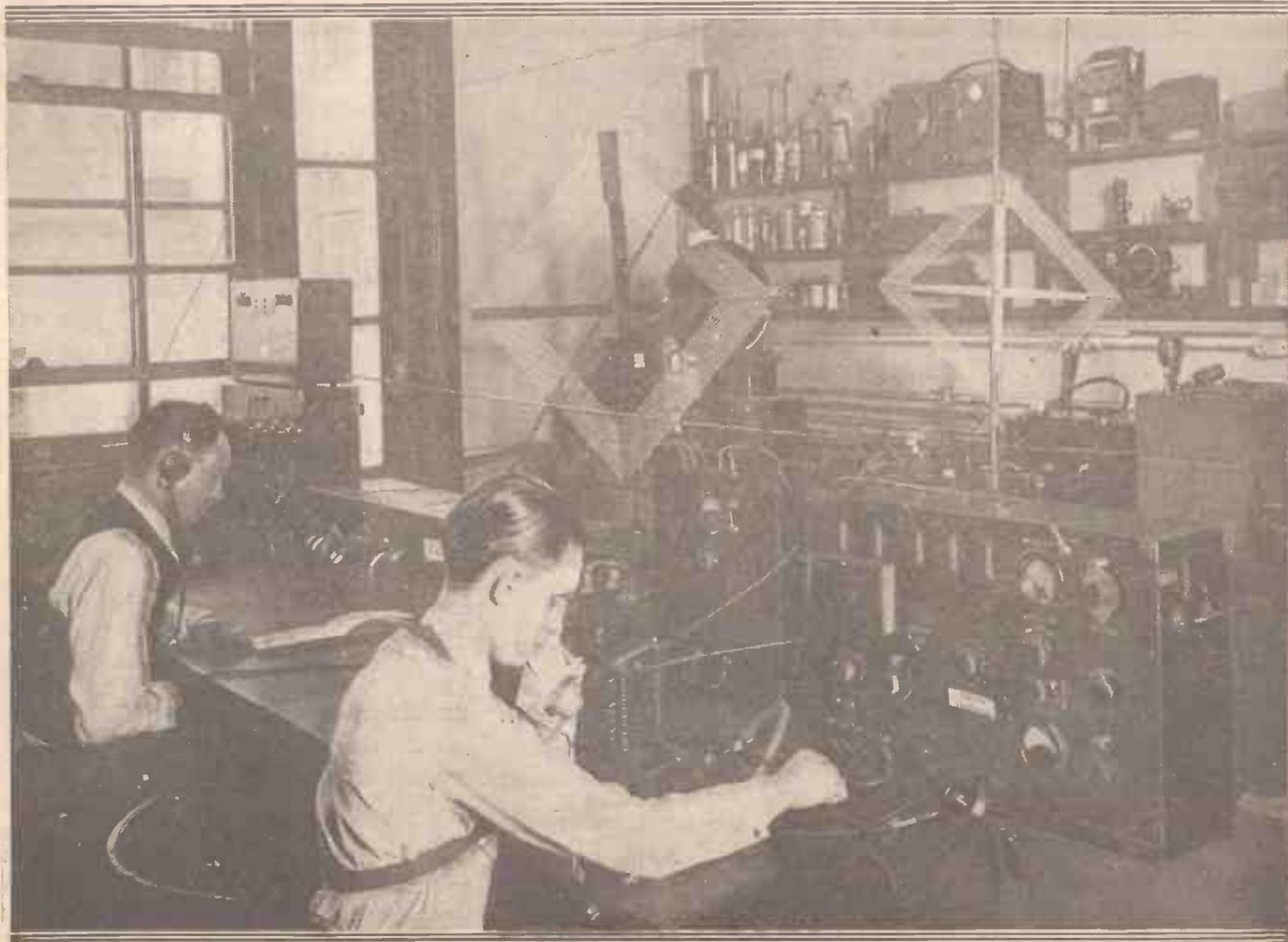
carried out the crystal mass, when again broken up with a hammer, will yield a large percentage of specimens sensitive for wireless purposes.

Ebonite Substitutes.

Good ebonite, which is a form of hard-vulcanised rubber, is a very good insulator, as everyone knows; but, owing to its comparatively high cost, various imitation ebonites are frequently offered for sale which, in reality, consist of pitch and resinous compositions and which, in many cases, contain little or no pure rubber. The insulating properties of this low-grade or imitation ebonite are comparatively poor. There are, however, certain insulating materials which, although they are sometimes described as ebonite substitutes, are not, and do not pretend to be, imitations or forms of ebonite at all.

They are classed under the general name of "phenolic compounds," a well-known representative of this class being the material known as "bakelite," which is very largely employed for wireless panels and components in America. The preparation of bakelite and suchlike substances is, of course, a specialised chemical process, but, briefly, the important ingredients used are formaldehyde and phenol.

Formaldehyde is a gas which, when in a 40 per cent. solution in water, makes the commercial article "formalin"; it has a hardening and preserving action on many
(Continued on page 669.)



The U.S.A. Station, W W Y, Underground Communication Laboratory of U.S. Bureau of Mines at Pittsburg

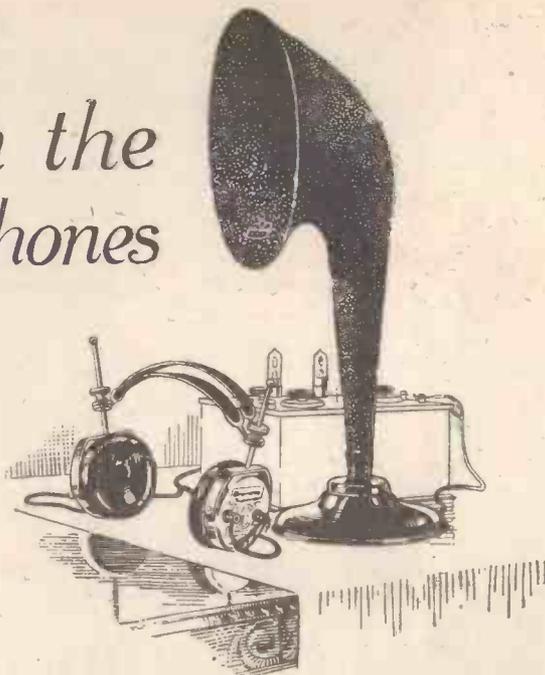
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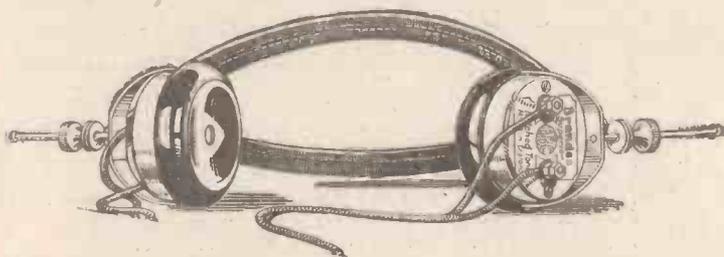


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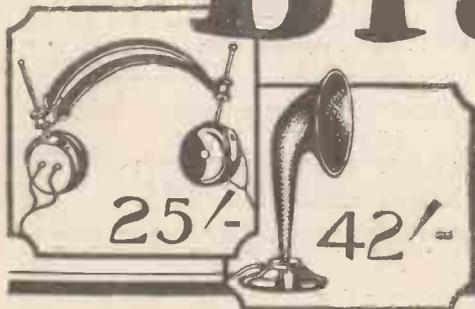
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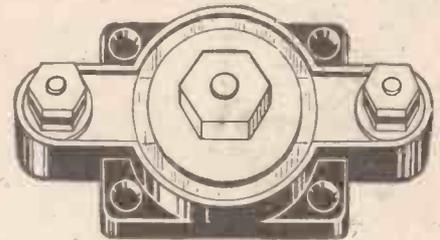
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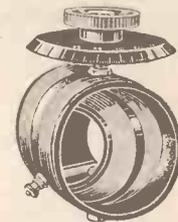


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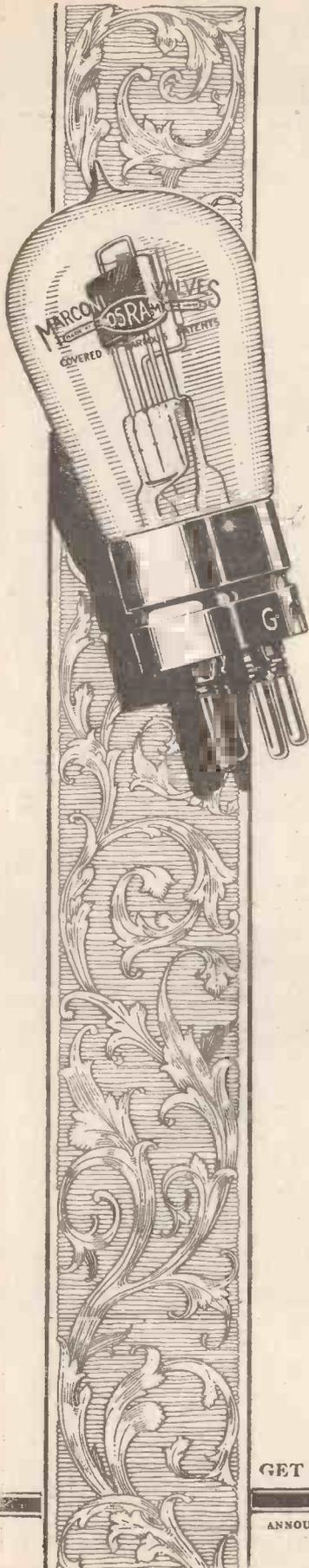
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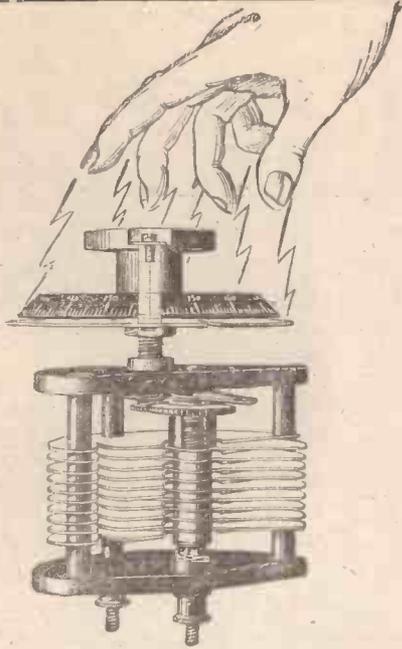
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HOW WIRELESS HELPS DOCTORS. RADIO PROGRESS AND MEDICINE.

By Dr. ALFRED GRADENWITZ (Our Correspondent in Berlin).

This interesting article contains information which will prove something of a surprise to many amateurs who may wonder what connection there is between wireless and the work of the medical practitioner.

THE actual significance of Galvani's celebrated frog muscle test, the very starting point of the investigations of electric currents, seems so far to have been misunderstood. This, at least, is the thesis upheld in a recent lecture by Dr. Leo Jacobsohn, of Berlin, himself one of the pioneers in the application of electricity to medicinal science and physical research, according to whom that test, 100 years before Heinrich Hertz, was the first instance

found to be set up, affording as it were a symptom of vitality. Working muscles, throbbing hearts, retina cells struck by beams of light—all of these give rise to what are known as "action" currents.

There was formerly only one possibility of ascertaining the presence of those small currents, viz., connecting the organ in question to a highly sensitive galvanometer and watching its deflections. The methods of wireless, however, now enable these currents of organic activity—by the use of three cathode tubes—to be amplified to loud telephone signals.

Tests such as these give one a strange feeling of watching at close quarters the primeval forces of Nature, in a similar manner the experimenter listening with the same methods of amplification to the cracking noise of iron molecules on the approach of a magnet, or perceiving the impact of helium atoms on the disintegration of radium may fancy himself penetrating the innermost structure of matter.

depth to which the condenser penetrates into the water, thus enabling experimental conditions to be widely controlled.

Another interesting measuring process based on the methods of wireless has been devised by Dr. Dowling, Professor at Dublin University, and enables the growth of a plant to be watched from one minute to another by the influence exerted on the current through an amplifier tube. Dowling's "Ultra-Micrometer" even allows the gravi-



Fig. 1.

of a transmission of electric energy through space, the spark of an electric machine serving as transmitter and an earthed frog-leg as receiver.

In fact, the frog muscle properly prepared would, without any visible connection, palpitate each time a spark was emitted. On closely examining the case, Galvani is thus seen already to have worked with elevated antennæ and ground earthing, and to have with his primitive experimental outfit ascertained the more important laws controlling the propagation of electric forces.

"Action" Currents.

Nay, Jacobsohn even claims for Galvani the distinction of being father to the broadcasting idea by arranging a considerable number of frog muscle receivers around an electric machine, and thus setting up palpitations simultaneously in all of them. The same test was eventually, 130 years after Galvani, repeated on a large scale by a French engineer causing the palpitating frog leg to record on sooted paper over a distance of 300 kilometres the wireless signals from the Eiffel Tower station.

This, however, is only one instance of the intimate connection between wireless and the progress of medical science and physics. Some other remarkable cases have been explored by Jacobsohn, and will be briefly discussed in the following.

Whenever a living organism performs any function of its own, electric currents are

Broadcasting Heart Beats.

The same cathode tube which by the application of high voltages is able itself to emit X-rays, at the same time affords a means of actually gauging their intensity. The arrangement consists in dosing Röntgen radiation by an amplification of the feeble ionisation current in a gauging compartment and thus actuating a milli-ammeter.

The X-rays from the anti-cathode of a Röntgen bulb are made to pass through a filter, thus entering a water-filled gauging compartment. A condenser penetrating into the water has its plates connected up to the grid and across a resistance to the cathode of a three-electrode tube.

The interval between the condenser plates is ionised more or less intensely by the impact of X-rays, the ratio being read from a milli-ammeter. The distance between the filter and the gauging compartment can be varied, as can the

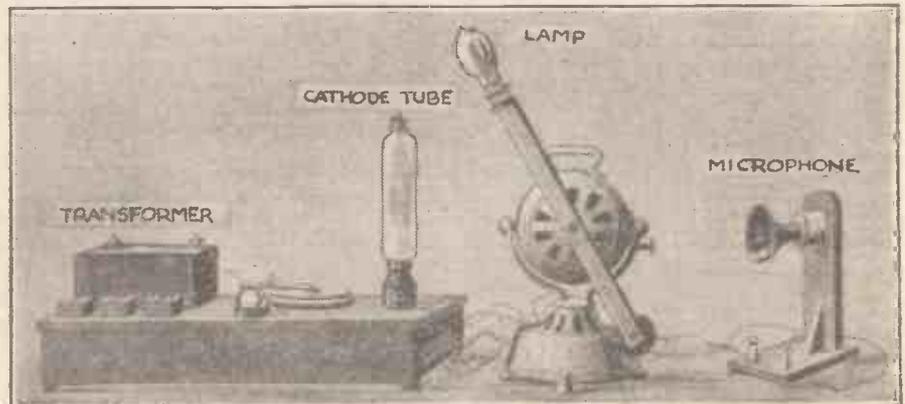
tational attraction of a lead mass weighing 20 kilogrammes to be ascertained.

A microphone having its currents sent through a convenient transformer to an amplifier enables any acoustic phenomena in an animal organism, e.g., the breathing of the lungs, the beating of the heart, to be made audible to long distance. Dr. Jacobsohn has designed an outfit, by means of which a human heart can be demonstrated to listeners from one end to the other of a large hall.

This method has been found most useful.
(Continued on page 622.)



Fig. 2.



Figs. 1 and 2 show in the central pictures the positions of the mouth in pronouncing "o" and "e" respectively, the surrounding circles of lights being the actual flame pictures of the corresponding vowels. Above is seen Dr. Jacobsohn's apparatus for converting sound into flame fluctuations.

HINTS ON MAKING LOW-FREQUENCY TRANSFORMERS.

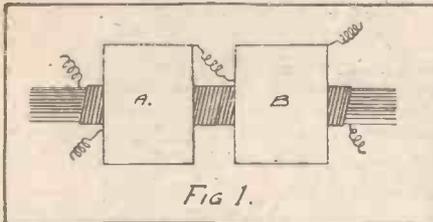
FROM A CORRESPONDENT.

Although a tedious process, the construction of an L.F. transformer is not impossible for the amateur, as this brief article clearly shows:

THE materials required are as follows:

- One "Ford" spark coil, complete.
- One piece of ebonite, 3 in. by 2 in. by $\frac{1}{4}$ in.
- Two strips of brass, $3\frac{1}{4}$ in. by $\frac{1}{2}$ in. by $\frac{1}{16}$ in.
- Four terminals.
- One piece of 2 B.A. screwed rod, 3 in. long.
- Two nuts to suit.
- One wooden bobbin, $\frac{5}{8}$ in. diameter, with $\frac{1}{8}$ in. clear hole through centre and about $1\frac{1}{2}$ in. long.

The first consideration is the dissecting of the spark coil, which is encased in a



small wooden box filled with black wax, or some similar substance.

This part of the programme over, it will be seen that the secondary coil is wound in two parts, as in Fig. 1, and this diagram also shows the position of the primary winding and core wires. The adaptability of the secondary coils for the making of a transformer is very evident.

Requires Careful Handling.

The wire is unwound from the outside of the first coil, A, and from the inside of the second coil, B, enough to allow A to slip inside B with a fairly tight fit, thus converting the two coils into a primary and secondary unit, as in Fig. 2.

Care should be taken at this stage to test the coils for continuity of windings,

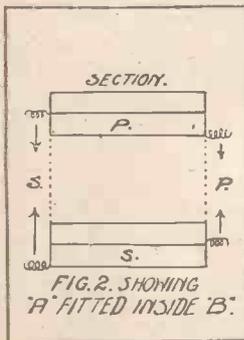


FIG. 2. SHOWING
"A" FITTED INSIDE "B".

should, of course, be marked.

The core wires and bobbin should now be fixed inside coil A, and the wires bent round the coils in the conventional "hedgehog" manner, as in Fig. 3. This diagram shows the transformer assembled.

The brass strips should be bent as shown and fixed to the transformer by means of

the screwed rod passing through the bobbin, and clamped by a nut at each end. As will be seen from the diagram, the strips form a mounting for the small piece of ebonite bearing the four necessary terminals, and also for mounting the transformer.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per photo.

The four wire ends should now be connected to the terminals, and the transformer is complete.

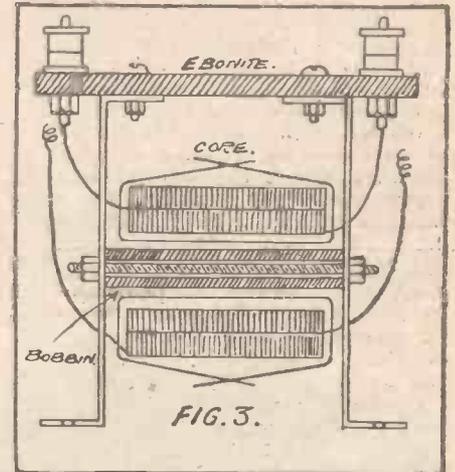


FIG. 3.

HOW WIRELESS HELPS DOCTORS.

(Continued from page 621.)

in watching a patient's heart during narcosis, the services of the assistant feeling the pulse being dispensed with by causing the heart to shout out into space at the rate of 150-200 sounds per second. The reinforced heart-beats are readily sent on over the telephone line, so that the practitioner may at a distance check his patient's heart, the same method being obviously applicable also to a wireless transmission of heart sounds.

Dr. Jacobsohn further draws attention to the fact that, whenever the physician for therapeutical purposes uses high-frequency currents, the methods of wireless are resorted to. In fact, the familiar high-frequency apparatus for treating nervous and muscular pain is practically identical with the antiquated spark transmitter. The medical apparatus thus only requires the addition of an antenna and earthing to constitute an ordinary wireless transmitting set.

Wireless in Hospitals.

Diathermic outfits, so much in use at present for an intense heating of a patient's body, are nothing else but quenched-spark transmitters on a 300-metre wave, the patient inserted in the secondary circuit being traversed by current intensities of a few amperes.

Wireless telephony, of course, is more directly related to medicine than wireless telegraphy. In fact, the very human voice is here brought into connection with high-frequency currents, and the tiny vocal cords of the singer are with their imma-

terial energy made to control the many hundreds of H.P. given out by large wireless transmitting stations.

Another possibility of making wireless telephony subservient to the physician's ends is providing wireless entertainment in hospitals. In fact, no better assistance of a medical treatment could be imagined than acting on the patient's mind, driving away any gloomy thoughts, and inducing pleasant ideas in their place.

Treating Ear Troubles.

The methods of wireless telegraphy and telephony not only afford a possibility of accurately analysing human speech and hearing, but opens up new vistas for the treatment of ear troubles, particularly hardness of hearing. An acoustic interference method enables the range of hearing of a patient to be accurately gauged, thus affording a means of early diagnosis of ear trouble.

In fact, the various sound intervals are never injured to the same extent, and whereas, e.g., patients having their middle ear affected will perceive high sounds better than lower ones, the opposite is the case with nervous ear trouble.

Dr. Jacobsohn has availed himself of the possibility of making sound waves visible—according to wireless methods—by an action on electrical discharges in a vacuum tube, in order to devise an attachment transforming acoustic into visual impressions and, as it were, constituting a counterpart to Dr. Fournier d'Albe's *Optophone*.

This, as represented in Fig. 3, comprises a glimmer lamp, a small cathode tube, an ordinary bell transformer, and a microphone, and enables the human voice to be dissolved into its individual vibrations. As the glimmer lamp modulated by microphone currents is set rotating, a special number and arrangement of luminous bands is seen for each vowel, each consonant, each sound.

Mainly About Broadcasting

by
The Editor

GLANCING through the "Daily News" the other day, I happened to notice a reference to wireless examinations. This reference was made by a gentleman who regularly contributes a column of wit and humour to the newspaper in question, and he signs himself "C. J. A." C. J. A. is certainly a satirist. He has heard that Wireless History Examinations are to be shortly held (I cannot confirm the news), and he wants to know exactly what is meant and offers a few "hints" for would-be candidates. Here are a few of them which I hope C. J. A. will not mind my reproducing:

Question 1.—Arrange in phonological order N. and K.; Brunette; Brown's Featherweight; Sterling.

Question 2.—Give dates B.B.C. of the following:

First wireless breakdown.

First reception of atmospheric waves from America.

Question 3.—When and where is the first mention of wireless? Expected answer: The loud speaker made out of Adam's spare-part.

Question 4.—Write biographical notes upon: Uncle Arthur, John, Henry, Philemon.

Question 5.—Who said and on what occasion:

- (a) 2 L O calling;
- (b) One minute, please;
- (c) And the night shall be filled with music?

Question 6.—What advantage has a crystal set over a trinket set? Illustrate your answer.

Wireless humour is so rare that it is refreshing to read "C. J. A.'s" hints. I hope he will garnish his column in the "Daily News" with further contributions of a like nature. He can rely on me to quote him.

Broadcast Services.

Should church services be broadcast? This interesting question was the subject of a report recently put before the Glasgow Presbytery of the Church of Scotland. The report was the result of a motion submitted at a recent meeting unfavourably commenting on the broadcasting of services during the ordinary hours of worship, it being suggested that this practice tends to keep people away from church.

One letter was read to the meeting expressing the belief that thousands of people would keenly miss the broadcast services if they were discontinued; and other letters were read from bedridden people all expressing great love for the B.B.C.'s broadcast services, and hoping that they would not be discontinued. The considered verdict of the committee of the Glasgow Presbytery is in the nature of a very great compliment to the B.B.C., and will, doubtless, be approved of by the majority of listeners-in. The committee declared its complete satisfaction with the religious policy of the B.B.C., and recommended that

the Presbytery should take no action in the matter.

One speaker, in reference to broadcasting, said the Church should be profoundly grateful for this great instrument of evangelisation. There seems to be no doubt that the Sunday services broadcast from the B.B.C. stations are enormously appreciated by thousands of listeners, and they will learn with pleasure that no steps are to be taken to effect the cessation of broadcast religious services.

Radio Critics.

Another sign of the times is the recognition of "wireless critics" by the Critics Circle—a body consisting of professional

moved an amendment, that members of the Circle broadcasting dramatic and musical criticism should have the support of the Circle.

So Radio critics are now officially recognised by their newspaper confrères of the Critics Circle, and I hope they will not earn the epithet hurled at Press critics (in a jocular way, of course) by Sir James Barrie who, when recently entertained at dinner by the Critics, commenced his speech by casting a withering glance round the company and exclaiming "scum!"

Sir Oliver Lodge's "Talks."

Readers will be interested in the announcement made by the B.B.C. that our



The Lord Bishop of Liverpool broadcasting the first Sunday service from 6 LV.

dramatic and musical critics. The Circle held a general meeting the other day to consider whether broadcasting dramatic and musical criticism ought to be regarded as a form of journalism, and whether it ought to be given Press facilities.

Mr. Reith (managing director of the B.B.C.) attended the meeting in order to give the views of his company. Mr. Reith said he was very anxious not in any way to conflict with the interests of the Press, and he pointed out that there was nothing prejudicial to journalists in anything it was proposed to do.

Mr Haddon, the B.B.C.'s dramatic critic, then submitted the motion: "It is the opinion of this meeting that a broadcasting critic, dramatic or musical, is eligible for election as a member of the Critics Circle."

But, after a long discussion, Mr. Baughan, the dramatic critic of the "Daily News,"

Scientific Adviser, Sir Oliver Lodge, will, commencing in January, 1925, give the Scientific Talks for Adults in place of Sir William Bragg.

The addresses by Sir William Bragg have been very much appreciated by thousands of listeners, and I am sure that Sir Oliver Lodge's "talks" will meet with keen appreciation by not only listeners interested technically in science, but by laymen as well. Both Sir William Bragg and Sir Oliver Lodge have the useful knack of explaining difficult subjects clearly and lucidly. No doubt many listeners remember Sir Oliver's address on "The Birth of a Star," which he delivered from 2 L O some months ago, and will remember the popular interest he succeeded in infusing in a rather technical address. And those who heard him will not gainsay his admirable "microphone voice."

WHAT YOU NEED FOR "D.X." WORK. A TIMELY ARTICLE FOR AMATEURS.

By A. J. BOYINGTON.

THE winter months bring renewed opportunities for indulging in that fascinating game of tuning-in W G Y or K D K A or W D A P, but apart from these there is quite a number of European stations whose programmes offer a pleasant diversion.

If the amateur fortunately possesses a smattering of French, German, Spanish, or Italian he is comfortably catered for at almost any hour; if he doesn't—the language of music is universal, and some very fine musical programmes are broadcast from the Continent. Then it must be admitted that there is something infinitely pleasing in the achievement of logging distant stations, and the sense of pleasure increases in direct ratio to the distance covered.

Unfortunately, one cannot predict for a certainty how many of these stations can be received on one's set. There are so many variable factors in wireless that half the enthusiasm the science arouses in its devotees lies in the very fact of its elusiveness and uncertainty—one never knows how much one's set is capable of under varying circumstances of time, weather, etc.

Ranges of Reception.

Within certain limits, however, it is possible to prescribe the capacity of one's set fairly accurately, assuming that the aerial is of the standard G.P.O. type, moderately high (40 feet or so), well insulated, and efficient lead-in and earthing arrangements are provided. The two latter factors have a great significance in reception efficiency—greater than is apparent—and no pains should be spared to see that they are the best possible in the circumstances.

(1) *Crystal Set.* A well-designed crystal receiver, capable of sharp tuning and equipped with a good crystal, will give excellent telephonic signals at 10 miles, fairly loud signals at 20 miles, and readable—though faint—signals at 30 to 40 miles from the station. A crystal set, however, is capable of novel surprises under favourable conditions. I have heard stations over 120 miles away at comfortable strength on one of the simplest and—from a technical point of view—worst designed crystal sets which I have ever met. On the other hand, a "de luxe" receiver of professional and expensive make has yielded very poor results when all external conditions have appeared favourable.

The term "favourable conditions" implies a good deal more than good aerial and earth arrangements; it takes into account, also, freedom from screening and from "dead spots." We cannot describe a circle with a radius of, say, 20 miles around the position on the map of a broadcasting station, and say that all the enclosed area is within crystal range, or that sets situated on the circumference will all receive at a uniform strength. Too many extraneous factors enter into the calculation to be able to predict strength and range with any degree of certainty, but only under freakish or very favourable conditions is it possible

for a crystal set to give comfortably clear reception of more than one broadcasting station of the usual transmission strength, although at times two or three have been received.

Danger of Critical Settings.

(2) *Single-Valve Set with Reaction.* A receiver of this type should give very clear telephony at a comfortable strength from two broadcasting stations, and, with very careful adjustment of the tuning values and of filament and plate potentials, it may be possible to hear all the B.B.C. stations at a more or less readable strength. These receivers call for very critical setting of the reaction to obtain such range, however, and in the hands of an inexperienced amateur are



The aerial building at the Soesterberg aerodrome wireless station.

capable of causing a great deal of distortion for himself and interference with neighbouring receivers.

The Use of H.F. Stages.

The critical setting referred to above is just on the brink of oscillation, and a slight movement of the aerial, or change in the transmitting wave-length, or altering of the tuning values, may cause the set to oscillate furiously. The addition of a single note-magnifier is often to be recommended. Although it has no appreciable effect on the range—except to render audible signals which were perhaps being received so weakly as to be inaudible to the human ear—it builds up the strength of speech sufficiently to make the use of dangerously excessive reaction needless, and to work a small loud speaker from one station at least.

(3) *One H.F. and One Detecting-Valve Set.*

If a set of this type is employed and reasonable reaction used on the aerial or upon the anode of the H.F. valve, all the B.B.C. stations can be received most evenings. The more distant stations, of course, will not come in very strongly, but the addition of a note-magnifier will remedy this, and bring two or three stations within the capacity of a small loud speaker. Incidentally, a three-valve set as above is probably the best average all-round receiver possible, taking into consideration range, strength, and economy of upkeep.

(4) *Two H.F. and One Detecting-Valve Set.* A receiver combining two well-designed H.F. stages with one of detection offers all that the average amateur desires in point of range combined with ease of operation. It should give him all the British broadcasting and most of the Continental stations at a comfortable headphone strength, without the need of pushing reaction so far as to cause distortion. With an indoor aerial or a small frame aerial most of the B.B.C. stations are within range—the local one may even be obtained without an aerial at all, occasionally—and as a portable receiver using dull-emitter valves and dry batteries it is peerless. Care is necessary to prevent oscillation in the H.F. stages, but the use of a potentiometer or other stabilising device generally overcomes any tendency in this respect. Note-magnification may also be tried here with advantage, all the B.B.C. stations then coming through at loud-speaker strength, and some of the Continental too, according to their distance.

The "Zero-beat" Method.

In searching for distant stations very fine tuning is essential. A built-in vernier or micrometer control is necessary for both aerial and anode condensers, while critical filament control sometimes proves the deciding factor between success and failure. Many amateurs make use of the "zero-beat" method when tuning-in—that is, they tighten the reaction coupling until the set just oscillates, and then vary the condensers until they hear the high-pitched note of the beat signal set up by their own oscillation heterodyning the carrier wave of the broadcasting station. By further adjustment of the condensers this squeal may be toned down to zero point, after which the note will rise again as the condensers are again varied. On the neutral point—that is, at zero—the best results will be obtained, and loosening the reactance coupling will bring in the telephony properly.

The advantages of using this method, it will be apparent, must lie with the amateur himself, since during the whole process of tuning his receiver is in a state of oscillation and causing interference to others who are trying to tune in on the same wave-length. To be recommended, then, it should only be used on sets which can be made to oscillate within themselves without energising the aerial. A little practice with his own set should familiarise the amateur with the adjustments necessary to reach the brink of oscillation without overstepping the margin, and by careful tuning he should then be able to pick up the other stations without oscillating. The best way, of course, is to use a properly calibrated wavemeter—an instrument which may appear an unnecessary expense at first, but which will prove invaluable to the man with a taste for experimental work.

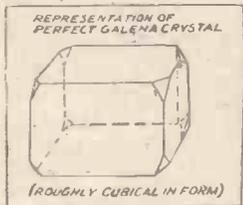
SOME REMARKS ON GALENA CRYSTALS.

By J. F. CORRIGAN, M.Sc., A.I.C.

Thousands of amateurs in this country alone have pieces of galena in their crystal cups, and in this article our contributor offers some good advice on the use of galena and much interesting information concerning it:

THE use of the mineral galena for the purpose of crystal rectification has now become so widespread that there are bound to be many amateur wireless enthusiasts who have often asked themselves questions concerning the nature, properties, and mode of origin of the mineral of which their favourite rectifying crystals are composed.

Galena, of course, has very many other, and perhaps more important, uses besides those of a purely radio nature. For one thing, the mineral constitutes almost the sole supply from which commercial lead is obtained. Galena is used in enormous quantities for the extraction of this metal, and for this reason alone naturally occurring deposits of galena have been worked in widely differing regions of the world.



Quite a Simple Substance.

Quite a lot of the galena which is obtained commercially contains an appreciable trace of silver, and on this account this "argentiferous galena," as it is called, is very carefully treated in order to extract the silver, which exists in the mineral to the extent of about 10 ounces per ton, before it is finally worked up for its lead content.

There are very few countries in the world whose natural deposits of ores do not contain at least some small amount of galena. Galena for commercial purposes comes from Sweden, Germany, America, Hungary, Switzerland, and the mineral is mined to some considerable extent in various parts of Derbyshire, and also in Cumberland.

The lead mines in the Isle of Man at Laxey are very well known to tourists in that region, and from these mines crystals of the mineral have been sometimes obtained which have measured over a foot in length from end to end.

Although the majority of the naturally-occurring varieties of galena possess radio-sensitive properties, most of the material which is at present on the market for the purposes of crystal rectification comes from the South of France and from Spain. A little of it also emanates from the Mexican region of America.

Chemically speaking, of course, galena is a simple enough substance. As almost every radio amateur knows, the mineral is really a sulphide of lead. In its purest form it contains approximately 86.6 per cent of lead and 13.4 of sulphur, which composition, of course, corresponds with the chemical formula PbS .

We have seen, however, that the mineral very often contains a little silver, and in

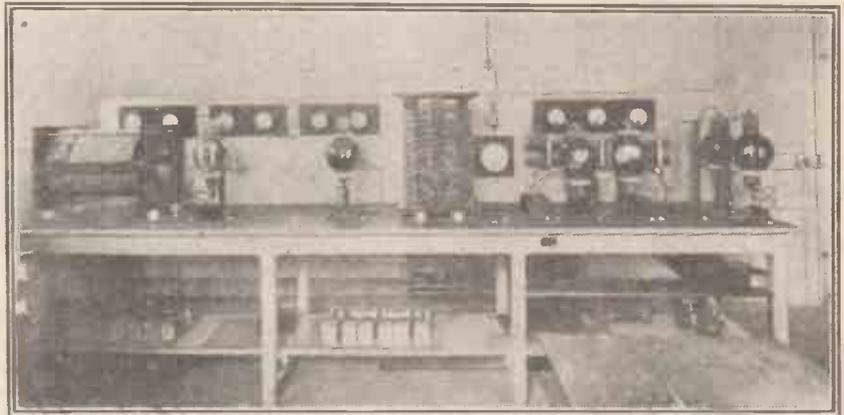
these cases the silver exists in the material also in the form of a sulphide. In addition to its sulphur content, most specimens of naturally occurring galena also contain traces of other elements, such as antimony, arsenic, copper, gold, and selenium, although in not sufficient quantities to make the extraction of them a profitable undertaking.

Natural galena is usually found in veins and quarries in clay or limestone districts. When it is first mined the mineral is nearly always associated with considerable amounts of impurities, such as quartz, limestone, calcite, fluorspar, all of which have to be very carefully separated from the ore before it is rendered fit for radio use.

case, tend to break up in a number of smaller crystals, each of which is a perfect replica of the original one. Amateur wireless enthusiasts who make use of considerable quantities of the material can learn a lot from the study of crystal cleavage. For instance, if a piece of sensitive galena which is too big to fit comfortably in the crystal cup is subjected to a heavy, smashing blow, it will break up almost into a powder.

How to Break Galena.

On the other hand, if the blade of a knife is laid lightly on the surface of the crystal parallel to its "grain," and then lightly tapped with a small hammer or



The transmitting gear at Radio-Paris, near Clichy, Paris.

These masses of galena which occur naturally possess sometimes a very coarse granular structure, and often a lump of the material may be found which is entirely composed of large crystals of a shape similar to the one depicted in the illustration, fused together by natural agencies.

How it is Classified.

Other samples of the mineral may again be found to have a very fine granular structure, and if these are examined under the microscope they will be found to consist of an almost infinite number of tiny crystals, each corresponding roughly in form to that which is shown in the illustration.

Crystallographers include galena in their "cubic" system of classification. That is to say, the mineral always tends to crystallise in the form of a cube, and in the sketch quoted above you have a representation of what a perfect crystal of galena looks like. This sketch is by no means a purely imaginary one, for large crystals of galena are often to be had which are almost perfect cubes.

Galena has a cubical cleavage. This means that if a crystal of the mineral is struck in the right manner, it will, in every

mallet, the crystal will break up very nicely into two smaller crystals, and there will be a minimum of wastage of the material.

Most of the commercial "cat's-whisker" crystals which are at present on the market are composed of natural or synthetic galena. By synthetic galena, of course, is meant that variety of the material which has been produced by artificial means.

If, for instance, you take a soluble salt of lead, such as lead nitrate or lead acetate, both of which can be very cheaply procured, and, after dissolving it in water, pass a stream of sulphuretted hydrogen gas through the liquid, you will obtain a black precipitate of lead sulphide—galena. But this form of galena will not rectify, because it is, as the chemists say, "amorphous," or non-crystalline in nature. One of the fundamental conditions which have, it would seem, to be fulfilled in radio rectification by means of galena is that the material must possess a crystalline structure.

However, if this amorphous form of galena is carefully collected, washed and dried, and then heated to a high temperature in a vacuum, or in the absence of

(Continued on page 626.)

SOME REMARKS ON GALENA CRYSTALS.

(Continued from page 625.)

oxygen or air, it will melt and sublime on the walls of its container in the form of brilliantly lustrous crystals which act as perfect rectifiers. From this you will be able to see how the synthetic varieties of galena are produced.

Again, instead of melting up and subsequently subliming pure galena, it is possible to make a mixture of lead sulphide and sulphides of other metals such as silver sulphide, and to submit these to the same process, and the result will be that the finished crystals will contain definite amounts of two or more materials. Quite a number of experiments have been carried out in this direction with a view to increasing the efficiency of the crystal rectification, and as the experiments are fairly easily conducted, the interested amateur may care to perform one or two of them on similar lines for himself.

Obtaining Greater Sensitivity.

It is a debatable point whether the naturally occurring or the artificially produced specimens of galena possess the greatest all-round efficiency for crystal rectification. The one great advantage of the synthetic varieties of the material is, of course, that they are not liable to vary in composition, and therefore that a constant standard of rectification can be more easily obtained. On the other hand, the opinion is held in some authoritative quarters that the synthetic galena is more liable to become insensitive than the naturally occurring forms of the mineral.

Again, artificially prepared galena is generally more sensitive to the destructive effects of heat than is the naturally occurring variety, whilst the latter is more economical to deal with in large amounts owing to its cleaner breaking properties.

The amateur who has a little time on his hands can very easily devise an almost infinite variety of experiments on the preparation of artificial galenas. For instance, it has been found that although pure silver sulphide is not a good rectifier, the introduction of certain percentages of this material into the composition of galena in the manner described above, results in an additional degree of sensitivity.

Scope for Experiment.

The incorporation of something like 40 per cent of silver sulphide with synthetic or natural galena will increase the sensitivity of the mineral to such an extent that it will be very difficult to obtain a stable contact owing to the "jogging" effect of the loud signals. A very small amount of tin sulphide in the galena (about 5 per cent.) increases its sensitivity; but if this amount is further increased the sensitivity of the resulting product becomes progressively less, until eventually it almost ceases to function as a rectifier.

The addition of the sulphides of arsenic, antimony, copper, mercury, etc., and of the elements selenium and tellurium to pure galena has not been studied to any great extent, and, as I have previously remarked, quite an interesting field of research awaits the amateur in this direction.

The nature of the metal out of which the cat's-whisker contact of a galena crystal is made does not really influence the efficiency of the resulting rectification, so long as the metal is a non-corrodible one. For this reason, cat's-whisker contacts for use with galena crystals should preferably be composed of one of the "noble metals," such as platinum or gold, although many of the rustless and non-corrodible alloys do almost equally well.

A Novel Cat's-whisker.

A small lead wire, however, can be employed with very good results in the case of a galena crystal, and to all intents and purposes the efficiency of the rectification does not seem to be very greatly influenced by any degree of oxidation which it may undergo whilst in use. The possible explanation of this is an interesting one, but it is one which cannot be entered into within the limits of a single article.



Russian valves being made at one of the Soviet factories near Nijni-Novgorod.

As is well known, the more sensitive a galena crystal is, the more necessary does it become to employ a contact which is actuated by some form of micro-adjustment. To get the utmost efficiency out of a crystal set employing galena rectification, a detector which is provided with a micro adjustment should always be used, for with the ordinary types of detectors strong signals will send the cat's-whisker contact right off the mark.

Not Recommended.

A galena-graphite combination is highly sensitive, and it can be easily made from a piece of the mineral and a small length of lead pencil of the "soft" variety. The combination of galena with tellurium, or silicon, also gives good rectification, as also does a galena-galena combination.

In conclusion, a note on the inner meaning of the term "Galena" may be of interest. Galena really comes from the Greek word *Galene*, meaning *tranquillity*. To the ancient Greeks this mineral was supposed to possess soothing medicinal properties, and when taken in specially prepared forms galena was credited with the property of being able to impart to the individual a remarkably peaceful and tranquil frame of mind.

The modern radio amateur, however, is not recommended to test the veracity of this ancient and interesting supposition. Galena is a lead compound, and if taken into the system in too large amounts, the degree of tranquillity imparted to the experimenter might probably be very much more than desired.

COMPLAINTS AND COMPLIMENTS.

OUR READERS' VIEWS.

AS we cannot change our B.B.C. musical doctor, who thinks we need frequent doses of his "best" educational mixture of chamber music, etc., at least we ought to be able to rely on our allowance of sweets not being curtailed by delaying second news and reducing the delightful hour of the wonderful Savoy Bands because some arid item has not finally dried up.

Most of our 'phones and valves have long enough rests, and should not lose more exercise.

G. E. Holloway.
71, Sydenham Road North, Croydon.

There seems little consideration for those workers who, like myself, cannot listen in till 9.30 p.m. Why should they not sometimes have an unbroken hour with the orchestra or band? At that time one does not always want weather, news talks, and "funny men," but a little decent music. After 9.30 the only unbroken programme offered is at the Savoy Hotel.

B. G.

Elstree.

Re Sportsmen All! item. Idea good, but badly performed. Oh, that voice formerly of Cardiff! Too much of a jumble, speaking much too fast. Choruses very weak. Why not have a real "to do" with Arthur Roberts as chairman—cigars and champagne, songs and stories assisted by old pals?

A. BARRATT.

Westward Ho! Hoddesdon, Herts.

I wish to compliment them highly on the Symphony Concert from 2 L O recently, and especially the Brahms violin concerto by Catterall. Although the mass of people prefer light music, such concerts as these are the whole joy of wireless to the real music lover. We received it direct on a Unidyne H.F. and detector quite clearly.

A. G. BANKS.

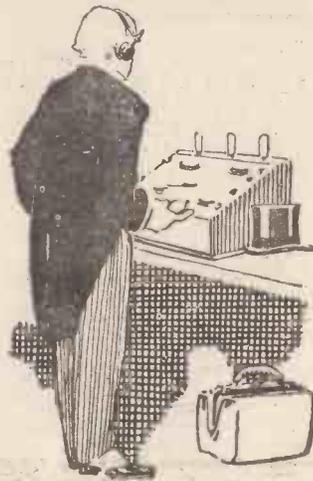
1, Weld Road, Southport.

How about the following two compliments for the B.B.C., which I feel are rightly deserved?

First, regarding the church services. Being unable to attend church, owing to ill-health, I can assure you that the services broadcast once a month from 5 N O (our local station) are received very thankfully. I am sure that I not only speak for myself, but for many other invalids also.

Secondly, I should like to put in a word of praise regarding the very excellent plays broadcast weekly from 5 N O as well as those S.B. from 2 L O.

K. STOREY.



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Maximum plate voltage...120 volts
Plate resistance 9,000 ohms.

*Type B 7 ... 37/6 each

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Filament current.....0.06 amp.
Maximum plate voltage...120 volts
Plate resistance 9,000 ohms.

*For use with Dry Cells



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HOW TO BUILD A TWO-VALVE RECEIVER WITH POWER STAGE.

By W. S. SHOLL, A.M.I.E.E.

This two-valve set will come in useful for loud-speaker work where it is required to obtain maximum power from a "straight" circuit with reaction.

THE receiver about to be described is a little unusual in that the detector valve is followed by a power stage. The idea was to obtain the maximum amount of power from a "straight"

the writer, in common with the average worker uses a separate tuning system, which, being of universal application, does duty on almost any circuit.

The results of the instrument are equal to the average three-valve (0-1-2), set at reasonable range; the signal strength on the loud-speaker is ample for the largest room and quite satisfactory in a small garden. The re-

still greater magnification is required.

Where this is done, the advantage of placing the extra unit next to the detector valve will be seen where the last stage is to be a power stage equipped with extra high tension and grid biasing terminals.

Generally speaking, the writer is not at all impressed with the average dull emitter valve. His experience is that while the input is small, so is the output, which, falling short of the majority of bright emitters, leaves a great deal to be desired.

An Efficient Power Valve.

It was therefore a pleasure to find in the B.T.-H. 4 a really good power valve which, calling for a mere 25 ampere on the filament and a modest 100 volts on the plate, yielded a measure of amplification considerably in excess of the extravagant bright emitter power valve.

These latter valves are not to be recommended to the average worker by reason of the large filament current required—

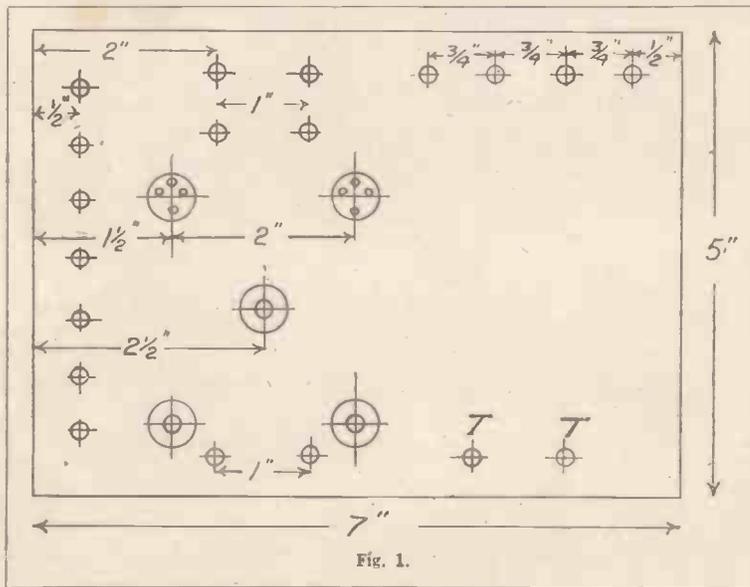


Fig. 1.

circuit, with reaction, and to obtain the greatest output in the smallest space by employing a power valve at option in the low-frequency amplifier.

By selecting suitable components and working to fairly close limits, it was possible to build the entire set on a 7 in. by 5 in. panel originally intended for a detector unit only.

The tuning gear is naturally separate, as

receiver has been provided with separate output and input terminals leading from the detector valve to the low-frequency amplifier, which enables the detector valve to be used separately if desired, or another and independent low-frequency unit to be introduced at this stage if



Fig. 2. Showing the lay-out of the valve panel

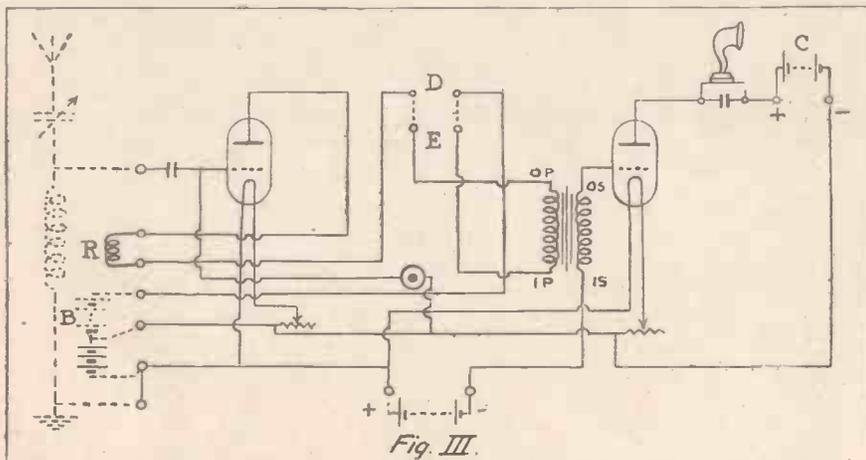


Fig. III.

viz. 1.5 amperes, and the high plate voltage which, running into some three or four hundred volts, means far more expense than the result justifies.

The dimensions and lay-out of the panel are shown in Fig. 1, and may be followed throughout, except in the case of the two holes, T.T. These are for holding down the transformer, and will naturally vary according to the instrument used. In the present case the MacMichael "M.H." transformer has been used with remarkably good results, the tone and magnification being such as to place it in the front rank of transformers.

The diagram should be compared with the photo, Fig. 2.

All terminal holes are No. 32—i.e. 4 B.A. tapping size, and all terminals are screwed home and fitted with back nuts and washers.

(Continued on page 630.)

A TWO-VALVE RECEIVER WITH POWER STAGE.

(Continued from page 629.)

The "Watmel" grid leak screws are 6 B.A. and the low-frequency transformer screws have 4 B.A. clearance holes. For a small panel of this nature $\frac{3}{8}$ in. in thickness is ample, the ebonite will, of course, be squared up and matted in the usual manner.

Fig. 3 gives the circuit diagram, the grid terminals being shown at A, the detector H.T. at B and the extra H.T. at C. It is not really necessary to provide a separate H.T. negative terminal for the power stage where a dull emitter is used calling for only a moderate voltage. In the present case, however, it was more convenient to use a small separate battery for



Fig. 5. The complete receiver ready for use.

the detector which required a rather low voltage, and to use a battery of 100 volts for the power stage.

Where an abnormal voltage is necessary, it is, of course, rather more economical to place the H.T. batteries in series rather than employ two separate batteries. In such case the extra H.T. terminal will be positive only to which a wander lead runs to the necessary tapping of the large battery. Fig. 4 shows the wiring carried out in 18 S.W.G. tinned copper wire bare throughout, except in the case of the lead from grid leak, which is arranged to go to either the L.T. positive or negative, and is therefore encased in sleeving to avoid any risk of short-circuiting.

Inserting Grid Bias.

The wire is pulled out taut in the vice and cut to lengths of about two feet, all terminal shanks are well tinned and the various bends tried up in position before soldering. Everything being complete it will be first necessary to test the reaction coils to see that they are the right way round and also to find whether the grid leak functions better in the L.T. positive or negative. In the present instance, it is found to give maximum signals on the positive pole.

In testing out in this way the detector terminals D—i.e. the output from the

detector are used only. Having got satisfactory results, the small wire links are put between the output and input terminals which places the transformer and second valve in circuit.

Having tuned in and obtained satisfactory signal strength, we may now remove the short-circuiting link and insert the grid battery. For this partially run down flash lamp cells may be used, preferably the long torch pattern cells which allow of one volt steps, enabling close regulation of the grid volts to be made at will.

Three handy round units may be obtained from a torch battery, and from six to nine of these will be required; six to nine volts will be about right on the grid. Some amateurs rather shy of grid biasing on account of the alleged "complication" involved. This, however, is far from the case, and it is strongly urged that grid cells be used, as the quality of the reception on the loud speaker is not only much enhanced, but, in fact, the latter instrument is hardly useable, in the best sense of the word, without grid cells.

Also, it is well worth trying every possible connection of the transformer windings. As a rule, the writer prefers the following order as giving generally the

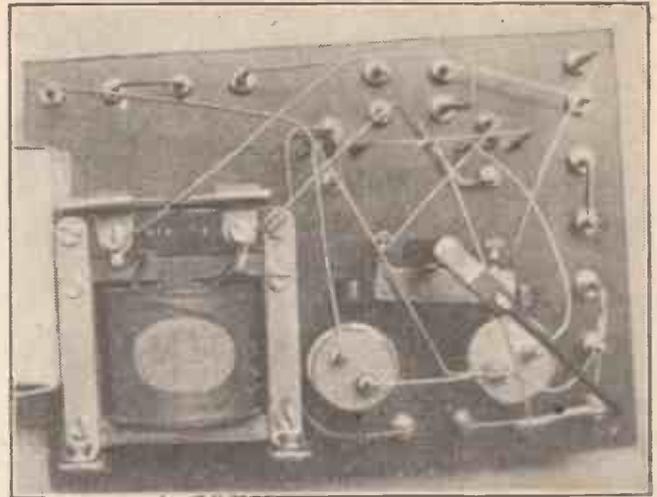


Fig. 4. Clearly showing the wiring beneath the panel.

best results—viz. anode to O.P.—I.P. to H.T. positive, O.S. to grid, inside secondary to grid bias terminal and negative of grid battery.

If the transformer used it will be noticed that the terminals are marked accordingly after having been tested out by the makers, a rather unusual but commendable idea. A removable condenser will also be noticed placed across the primary windings, the capacity being .001 mfd. This feature is of advantage in some cases, but was not found necessary in the present instance.

Increases Signal Purity.

A condenser, however, across the windings of a high resistance loud speaker is of the greatest value in getting the "raw edge" away from reception, particularly when signals are distinctly strong; a value of .004 mfd. will be found about right.

The finished instrument stands in a cabinet 3 in. deep, which is just capable of accommodating the whole of the components, although originally intended for housing a detector unit only. The neat appearance of the *tout ensemble* may be gathered from the photograph, Fig. 5.

NOTES ON SCREENING.

By A. J. B.

A REPORT recently made to the Institution of Electrical Engineers by Mr. R. H. Barfield contained the results of the first scientific investigation into the effects of screening by metal buildings, etc., upon wireless signals. Hitherto the exact nature of such screening effects has never been the subject of inquiry with any degree of accuracy and completeness, and some rather startling facts were brought to light. As all amateurs are aware, such screening effects do occur, and in the absence of any definite knowledge on the subject we have been prone to talk rather loosely about the impossibility of receiving radio signals inside metal buildings or in close proximity to them.

Mr. Barfield's experiments were conducted by means of frame aerials, attached to receiving sets of great sensitiveness, and placed inside continuous metal tanks, inside open-ended cylinders of wire or metal, inside cages of wire netting, and in other situations where screening was to be expected.

The results obtained in this manner indicate that the most important feature of an effectual screen is the presence of metallic circuits inside it. For example, a cage of wire netting was found to be an effectual screen only if the wire is electrically connected at all joints. In fact, a mere series of wires arranged in closed loops is effectual. But wires that do not make closed circuits, or wire netting that is

not electrically connected to form a similar closure, are not effective.

Perhaps the most striking instance reported by the investigator is that of a frame aerial which was entirely enclosed in a soldered metal envelope of tinned iron, as though it were inside the inner tube of a pneumatic tyre. The two terminals of the coil came out through small insulated holes in the case. The cover produced a practically perfect shield so long as the metal of it was continuous. This fact has been recognised by manufacturers for some time now, as instanced in the shrouded transformers and other wireless instruments where an enclosing metal case is used to reduce the effects of stray capacities and couplings.

What was not known was the propensity of the high-frequency waves to penetrate through the smallest possible chink of this "armour-plating," as was demonstrated by Mr. Barfield cutting a small transverse slit in the metal shield, when fairly strong signals were immediately heard. Even when the slit was as narrow as it was possible to make it without producing actual metallic contact, a substantial amount of radio energy continued to penetrate it.

After all we have read and heard on this subject it is hard to reconcile these results with the supposedly great screening effects ascribed to the steel frames of high buildings. It is evident that the exact effects of such metal structures on the radio waves deserve more careful and accurate study than they have yet received.

A model of a typical steel-framed building of the "skyscraper" type, for instance, showing the exact strength of signals obtainable on each floor and on each part of the floor, might be of the greatest service to wireless science as well as to the problem of how to provide for the reception of broadcasting in such a building.

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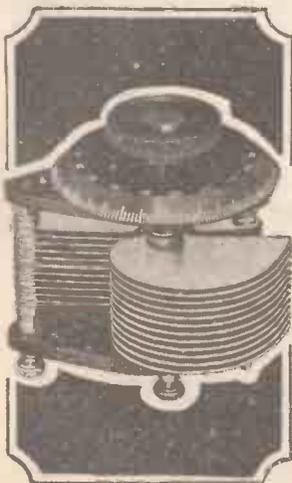
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SOME PRACTICAL SOLDERING JOBS

ESSENTIAL KNOWLEDGE FOR THE CONSTRUCTOR.

By OSWALD J. RANKIN.

To build a set properly a knowledge of soldering is necessary and in this article the amateur will find some really invaluable advice on the practical aspects of soldering work.

SOLDERING is not a gift; a man cannot be a born solderer, neither can he be born with a soldering iron in his mouth in place of the proverbial silver spoon. He must learn by actual experience how to do a practical soldering job. Now that the greater majority of wireless enthusiasts make up their own receivers, it becomes a case of every man being his

iron on very special occasions. Most of my soldering jobs are accomplished by means of this handy little lamp:

Diagram B shows the common petrol or paraffin blow-lamp, where the air is pumped in under pressure and fed to the flame via a small jet. This is useful for large work and for heating irons. Diagram C shows a simple spirit burner which is also very useful for heating irons, small parts, "tinning," etc., and diagram D shows the ordinary Bunsen burner, which may be used in the same way.

A little knowledge of common heating properties will be useful. With either of the lamps described a proportionately large red flame will surround a small blue flame. It is at the extreme point of this inner blue flame where the heat is most intense. This point is indicated by the arrows.

In the first place, it is quite useless to attempt a soldering job in any other but the right way. To solder properly the work must be scrupulously clean: this is perhaps the most important part of it. Clean the work with a file or scraper and some emery cloth, then smear a little flux over the part to be soldered (I would recommend "Fluxite" as a good all-round flux), and heat the iron by placing it in a suitable flame.

Important Question of Heat.

If the work is large it should be heated to a temperature nearly equal to that of the iron (melting point of the solder). For instance, it would be useless to expect solder to run and adhere satisfactorily on a large piece of cold metal, say one inch in square section, but if this was previously heated the solder would readily adhere. In ordinary small work, where wires, strips, etc., are to be soldered, the heat of the iron itself is usually sufficient to raise the required temperature.

In fact the soldering iron is intended mainly for this purpose, the melting of the solder coming next in importance. This is a fact which should not be overlooked. It should be remembered that molten solder is in a highly expanded state, and when this comes into contact with a piece of cold metal of normal temperature, the solder, in suddenly cooling, contracts or "shrinks" so rapidly that it does not adhere properly; but if it was applied to a piece of heated metal it would then adhere because both the solder and the metal would contract simultaneously. Success is only made possible by heating the parts to be soldered. Dropping hot solder on cold metal parts can only result in failure.

It is very bad practice to heat the iron in a coal fire, but should this be unavoidable, then a wire brush or a file cleaner should be kept handy and the iron quickly wiped with this immediately on coming out of

the fire. Never allow the iron to become red-hot, or the "tinning" will be burnt off.

Pick up a little solder on the point of the iron (to do this, rest the point of the iron on the stick of solder until the solder melts, then lift it away again), rub the iron slowly to and fro on the part to be soldered, and then apply one end of the stick of solder to the point of the iron, over the work, and repeat the slow, rubbing movement. To make a neat job apply the solder sparingly. Re-heat the iron whenever necessary.

If the solder does not adhere to any part of the work, then that part must be thoroughly cleaned again by scraping it with a sharp knife. Do not use the emery cloth this time, or the dust will adhere to the paste and make matters worse. Then apply a little more solder, and proceed as before.

Soldering Without an Iron.

Many little jobs may be carried out without using the iron. Clean the work thoroughly, smear a little paste, and hold it in the flame of a suitable burner with a pair of small tongs or old pliers. When the work is hot enough to melt the solder, take it out of the flame, apply a little more paste, and rub the stick of solder lightly over the parts to be joined. With a little practice the solder can be applied when the work is over the flame.

To "tin" a flat piece of work apply a little solder, take a clean piece of rag smeared with some paste, and rub or "stroke" it over the melted solder quickly, and in one direction only. If it is desired to "sweat" two pieces of work together, first "tin" each piece in the above manner, apply paste freely, lay the two pieces in position, and hold them firmly until the

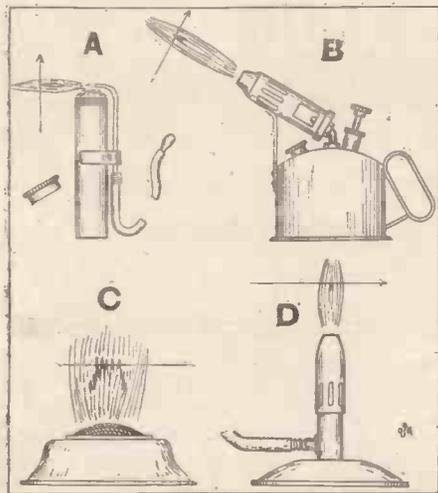


Fig. 1.

own tinker, and it is thought that a little advice, hot from the workshop, will be appreciated by those readers who are not yet sufficiently advanced to successfully tackle a soldering job, and also by those who are more or less advanced but are inwardly feeling ashamed of themselves for allowing such a simple matter to get the upper hand.

Different Heating Methods.

A good blow-lamp is almost an essential adjunct to a soldering outfit. Some of the most usual types are shown in Fig. 1, where A represents a "plumber's lamp," the air being "blown," in the real sense, by the operator himself, via the rubber tubing which is joined to the lower end of the small brass blow-pipe.

This little device is undoubtedly one of the most useful gadgets in any wireless workshop, and, considering its very moderate cost, no wireless mechanic should be without one. The tubular container is filled with hemp or cotton wool, and the fuel used is methylated spirit.

By carefully adjusting the blow-pipe it is possible to obtain a narrow needle-point flame, from two to three inches in length, this being a great advantage when engaged on very delicate work or on those awkward "fiddling" jobs where it is impossible to use the iron. Personally, I only use an

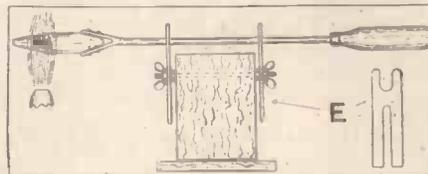


Fig. 2.

solder melts again. Then remove them from the flame, press them tightly together, and hold them thus until the solder sets.

Re-tinning the Iron.

It is considered very bad practice to burn the "tinning" off the point of the iron. This always happens when the iron is allowed to become red-hot, generally through neglect. But, unfortunately, accidents cannot always be avoided, especially amongst beginners, and should this happen no work should be attempted until the iron

(Continued on page 634.)

SOME PRACTICAL SOLDERING JOBS.

(Continued from page 633.)

is properly tinned again. To do this take some odd pieces of clean waste solder (or cut a few small shavings off the stick), and place them on a piece of medium glass-paper, previously smeared with a little paste.

Concerning the Iron.

Make the iron very hot (nearly red-hot this time), and while hot clean the point quickly with a file. Then rub it briskly on the prepared glass-paper, and the small pieces of solder will melt and adhere to it.

With regard to the iron itself, one sometimes expresses surprise at its somewhat clumsy appearance, but, if we give the

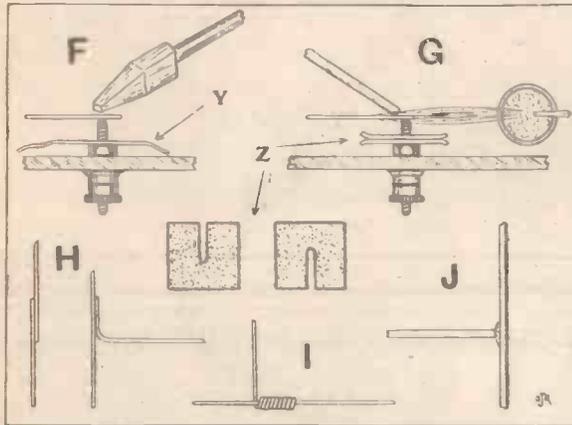


Fig. 3.

matter a little thought, it is not difficult to appreciate the fact that the larger and more clumsy the iron the greater is its capacity for storing heat, just as a large accumulator has a greater storage capacity than a smaller one.

One should never discard a large iron for the sake of its appearance, for it is much better to go straight through with a job with one heating than it is with several heatings, as would be the case if a small iron was used. There are, of course, instances where a small iron is essential, but if the large iron is tapered to a good point, then most jobs can be done with this.

A Useful Rest.

A suitable rest for the iron may be easily made up in the manner outlined in Fig. 2. A wooden pillar is drilled through near the top and fitted with a threaded metal rod which is clamped tightly by means of two small nuts. Two metal clips are then cut out, as shown at E, the narrow slots being made to slip over the protruding ends of the rod and the wide slots to take the shank of the iron.

Two small fly-nuts complete the device, these being tightened up when the iron is adjusted to the best position over the flame. The height of the wooden pillar and length of the metal strips will depend on the particular type of lamp it is proposed to use. Where expense is a minor consideration there is no doubt that the electric soldering iron is ideal for all purposes.

Diagram F (Fig. 3) shows the correct way to solder a connecting wire to a terminal shank. A small brown paper shield, Y, is pushed over the shank to prevent the flux from running over the panel. This is easily removed after the joint has been made.

It is usually best to file the end of the shank quite flat before "tinning" it. If tinned copper wire is used (which is always preferable), this will not usually require tinning, so that after well tinning the terminal shank it only becomes necessary to apply a little more flux and hold the hot iron on the wire until the solder melts. The iron is then taken away while the wire is held down firmly until the solder sets.

Soldering Connecting Wires.

Diagram G shows how the same operation is effected by using the small blow-lamp shown in Diagram A in place of the iron. Two small pieces of thin sheet asbestos, Z, are slipped over the terminal shank, these being placed on in opposite directions to form a complete shield which, unlike the paper shield, can be used any number of times. The main purpose of this is to prevent an accidental "wide" flame from burning the panel, but it also acts as an absorber for any excess of flux in the same manner as the brown paper. After well tinning the end of the terminal shank the wire is held down on same with a piece of metal rod (or the soldering iron may be used) while the point of the flame is again applied. The lamp is removed a few seconds after the wire is well embedded in the molten solder.

Diagram H shows a simple straight joint for connecting wires, and also a simple right-angle joint. A better method of making the latter is indicated at I, where the end of one wire is tightly bound round the other, the joint then being soldered in the flame of the small blow-lamp or with the iron. The tinning on the wires should never be relied upon to constitute the necessary amount of solder; it should be regarded as prepared groundwork for the little extra solder which will always be required.

When using the now popular square busbar for under-panel connections, joints can be made with comparative ease by sweating the flat surfaces together, using a good clean flame or the iron.

Diagram J shows a simple right-angle joint, the end of the horizontal wire being filed off perfectly flat, well tinned, and then soldered as shown. This makes a very neat joint, and one which is entirely satisfactory providing the general rule is applied in making it—i.e. that the end of the horizontal piece and that part of the vertical piece to which it is to be joined each receive an equal amount of heat, so that the whole joint will contract evenly when cooling.

Soldering Flexible Wires.

The soldering of flexible wires is no easy matter, even to the experienced mechanic. The usual trouble is caused by the thin hair-like wires becoming red hot, when oxidation immediately takes place and rather

spoils one's chances. The right way to tackle the job is to keep the wires well twisted together and apply the heat very slowly. Diagram K (Fig. 4) shows the method of making a small loop in the end of a piece of flex.

The wires are first halved, as shown at 1, and then given a twist as at 2. The loop is then made as shown at 3, and the insulated

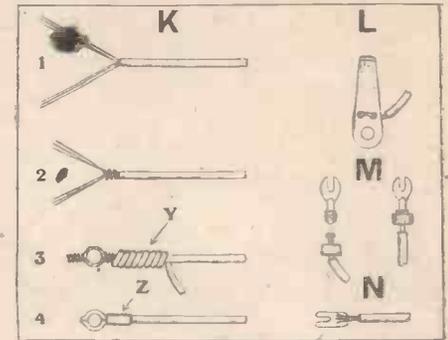


Fig. 4.

covering is bound round with a short length of asbestos cord, Y, before the soldering is commenced. Apply the heat sparingly and see that the solder runs well. Then trim up the joint, remove the asbestos, and bind on a small piece of adhesive tape, Z, as shown at 4. Diagram L shows an easy method of soldering a flexible lead to a movable contact arm, it being only necessary to fill up the two small holes with solder.

The Three Rules.

A much better job can be made by using a spade terminal, with bush, as indicated in Diagram M, where the bared end of the flex is passed through the bush and turned over at the end and soldered, the bush then being screwed on tightly so that the small point on the threaded spade shank bites well into the solder. A very simple form of spade terminal which is particularly suitable for connecting flexible leads to coil plugs is shown in Diagram N. This consists of a piece of thin sheet copper or brass to which the flexible wires are soldered direct.

Many other similar ideas will occur to the amateur in the course of his "apprenticeship," the term of which can only be shortened by using one's brains as well as one's hands, and strictly observing the essential points set out in this article. The whole business of soldering can be summed up in the following order: (1) Cleanliness, (2) equalisation of heat, and (3) common practice. Competency always follows the practical application of correct theories.

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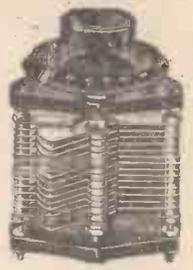
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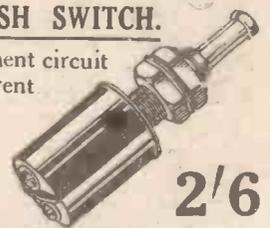
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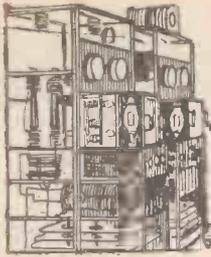
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By "Ariel"



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MMUSICAL anniversaries crowd thick and fast as the far-famed leaves of Vallambrosa, and it is only natural perhaps that the musical directors of the British Broadcasting Company should fall back on entire programmes devoted to the musical events. We have had, accordingly, Dvorak nights, Chopin and Liszt programmes, and of course the inevitable naval programmes to mark the anniversary of Trafalgar.



Miss Adelina Delines.

2 L O may be said to have "drawn first blood," as it were, by commencing the night before with A. Corbett Smith's "Under the White Ensign." This, with the assistance of the 2 L O orchestra under Dan Godfrey, the vocalists George Baker, John Huntingdon, and Sydney Coltham, with the Mayfair Singers as reserves, made very good innings, though there was no need, as far as I can see, to relay it to all stations.

Varied Schemes.

The provinces had far more varied schemes for the real Trafalgar Day, when Birmingham, Manchester, Aberdeen, and Glasgow, as well as Belfast, provided admirably balanced commemoration concerts.

Manchester started the first of a new series, "Fights for the Flag," and gave examples from 1500 upwards.

Glasgow and Aberdeen had excellent programmes and celebrated Nelson Day with renderings of Sir Charles Villiers Stanford's work "The Revenge." At Belfast also a special programme was framed, with Mr. Tom Case amongst the vocalists. As Mr. Tom Sherlock was singing on the same day at Newcastle, it is easy to see that we made a mistake in recently rolling these two fine singers into one and the same person, and tender all apologies due to both parties.



Mr. R. T. Fleming.

For the rest we had much music S.B. There was De Groot and his orchestra, excellent in tune if not always in pace, the official opening of Stoke-on-Trent, of course; the dinner of the National Farmer's Union, though why it is difficult to say, and a not over strong operetta "Highwayman Love."

As a matter of fact, I think we are suffering from too much "S.B. to all stations."

At least two nights are being enforced from 2 L O, when, by using Chelmsford, with an alternative programme, or the nightly relaying of a different provincial station, all parties would be satisfied.

Truly in theory I know I can "tune in" to these stations, but not only suitable valve strength is necessary, but suitable environment. I know one listener-in, possessed of a five-valve set and the longest aerial in the district, yet he cannot hear a note except from 2 L O, the only reason being a lead roof right over the house. A relayed station is the only hope, and doubtless there are others who would appreciate the continued "trip round the provinces."

Humour in the Ascendant.

Luckily we have had some excellent humorous turns. One of the chief stars has been the "Vicar of Mirth," Mr. Vivian Foster. It takes clever handling of the public to obtain appreciation of humour under the guise of the clergy, for the British public are not prone to mix levity and religion, so it says much for Mr. Foster that he has received such widespread commendation from the actual clergy as well as the laity.



Mr. Vivian Foster.

Mr. Foster has made his catch phrase, "Yes, I think so," as famous as the negative one of Harry Tate. He is not only a general favourite with listeners-in, but one might say, one of the oldest, for he was the first music-hall comedian to broadcast from Marconi House.

The Afternoon Concerts.

The 4 to 5 concerts are becoming more interesting, though there are far too many "talks," and that is apparently an incurable disease. Many well-known artistes, however, are contributing to the musical side of the "hour."

At 2 L O recently a well-known classical soprano in Mme. Adelina Delines was heard. The possessor of a voice of fine timbre and wide tonal range, her recitals at Wigmore Hall, one notably again of the same week, drew large and appreciative audiences. Her singing in many languages enables her to make her singing before the microphone admirable for its clarity.

At Aberdeen also appeared Mr. Tom Sherlock, and at Glasgow, the British National Opera star, Miss Eda Bennie.

Another popular singer is Miss Anne Thursfield, heard recently round the stations. She, too, is widely known on the

classical concert halls, her recitals being given at Wigmore Hall, Aeolian Hall, and Queen's Hall amongst others.

Dramatic Fare.

A thin end of the dramatic wedge was made by relaying Act I. of Eden-Philpott's rural play "The Farmer's Wife." Henceforth listeners-in may be like the proverbial "three blind mice," though let us hope no such disastrous end will be theirs if natural curiosity leads them to the Royal Court Theatre to see as well as hear the rest of the play.



Mr. Tom Wilson.

Birmingham may be said to have gone in for strong fare in "The Christian." A difficult play to perform on the actual stage, so "much more therefore," as Euclid would say, "to put it over the aether."

But Mr. William Macready, the dramatic director, is dauntless; and his company, headed by Miss Edna Godfrey Turner, achieved another triumph.

At Manchester.

From this play to Sutro's comedy "Mollentrave on Woman," is as wide a step as is possible to conceive. It is produced under the direction of Victor Smythe and D. E. Ormerod, both of whom take active parts. One of the best was the enactment of Sir Joseph, who has "to be senile and boil his milk," by Mr. Tom Wilson. This clever member of the 2 Z Y Dramatic Company has had a wide experience, and will be particularly remembered for his performance in "The Butterfly on the Wheel," one of the earliest plays broadcast.

Another popular member of the company is Mr. R. T. Fleming, and as Everard Swenboys, as well as James Dodd in the earlier work, "What a Man Wants," achieved his usual success.



Miss Anne Thursfield.

6 B.M.

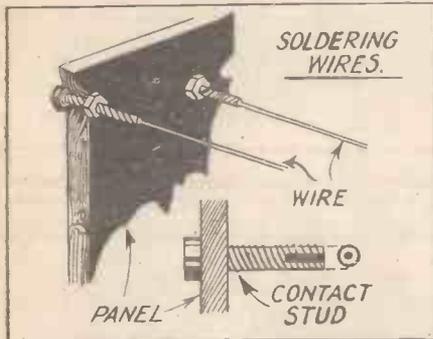
A good opening to the month was made at Bourne-mouth, as usual, with a Sullivan and Coleridge-Taylor programme. The artistes announced being Sydney Coltham, Dorothy Bennett, and a promising young contralto, Miss Jessie Record.

Constructional Notes

Conducted by Dr. J. H. T. Roberts, F.Inst.P.

Soldering Wires.

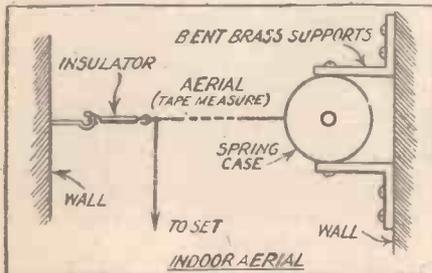
WHEN soldering wires to screws or connectors which project through the panel, there is often some difficulty in manipulation and a danger, if the heat is continued too long, of damaging the panel. A good plan is to drill a small hole, about $\frac{1}{8}$ in. deep and of sufficient bore to take the wire easily, into the end of each screw, as indicated in the figure. A speck of flux is introduced into the hole, and then a tiny speck of solder is dropped in after it and the screw heated in the spirit-flame until the solder runs. The wire is then soldered in the usual way.



If it is preferred to keep heat away from the panel altogether, a short length, say two inches, of straight wire may be soldered to each screw or contact before assembly, making the screw, in effect, about two inches long. After assembly in the panel, the buswire is then soldered in the ordinary way to the end of this extension piece, the heated joint being now two inches from the panel.

Indoor Aerial.

In cases where a short aerial is required for indoor use and where it is preferred to put it out of sight when not in use, the aerial illustrated herewith is useful. It consists simply of a steel tape-measure,

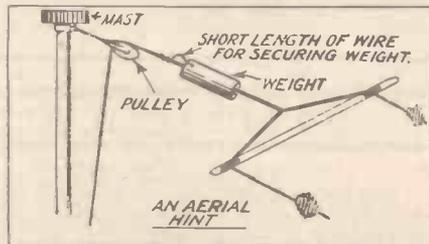


which winds up into a circular case by means of a spring. The case is mounted upon the wall at a convenient position, and an insulator with hook is attached to the end of the tape. A hook in the wall at another convenient place completes the device.

All you have to do when you wish to use the set is to draw out the aerial tape, hook up on the other wall, and attach lead-in to set. When not required, disconnect from the set, and allow the tape to wind into the case again, out of the way.

An Aerial Hint.

Although not a particularly common experience, it sometimes happens that the rope supporting the aerial breaks near the bridle, and not only the aerial, but the rope as well comes to the ground. It is then necessary to mount to the top of the mast, or adopt some ingenious method of getting the rope back into position again. If, however, a weight be attached to the rope, short of the place where it is most likely to break, this weight has the effect of



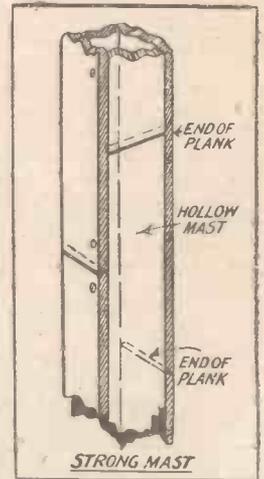
drawing down the part of the rope which was attached to the aerial, so that you then have the two parts upon the ground, as well as a length of rope over the pulley, and all you have to do is to make the necessary repair and haul up again. The weight may consist of a short piece of lead pipe threaded upon the rope, or bent round it and hammered into a lump.

Films as Templates.

The successful drilling of a panel is largely a matter of having the positions for the drillings properly located, and for this it is essential to use a template. Old photographic films are very useful for the purpose, especially those which are under-exposed or not exposed at all; if a film is very dark, the gelatine coating may be removed in hot water. Place a piece of the film over the instrument which is to be mounted (for example, the variable condenser), and prick through the film with a pin at the centres of the screw holes. There is no need to make holes in the template of the same size as those to be drilled; in fact, in my opinion, it is better not to do so, as you have to guess the centre twice instead of once. To mark off the panel, simply prick again with a pin through the pinholes in the film which you are using as template. The film has the advantages that it is flexible, transparent, and easily pierced. There is no need to attempt to make permanent templates from the film; new templates can be made specially as occasion arises.

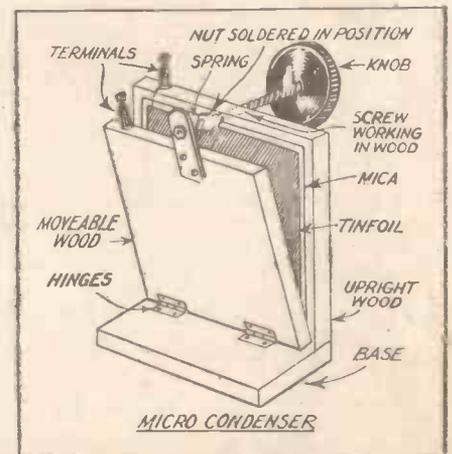
Strong Mast.

A metal mast is not always possible, sometimes owing to cost. A very strong wood mast, however, may be made (according to the "Wireless Age") by taking a number of strips of common spruce, 3 in. wide by $\frac{1}{2}$ in. thick. The pieces are boxed together to form a hollow square mast, but the joints of each pair are lapped a couple of feet from any other joint, so that no two joints on any side come opposite to one another. This is the secret of the strength. It is stated that a mast on this principle, 3 in. square in cross-section, and 40 ft. long, could be lifted by one man, and although it bent a good deal when horizontal, did not crack in any way. It successfully withstood several gales, in two of them the wind reaching a velocity of over seventy miles an hour. It was braced by three wires from the middle and three from the top.



Micro-Condenser.

An easily made variable micro-condenser is shown herewith. Three pieces of wood are required for the frame, one for the base, one for the stationary upright, and the third for the movable plate. The latter is secured by two hinges. The facing surfaces of the upright and moving wood pieces are pasted with tinfoil, the foil on the stationary piece being covered over with a thin sheet of mica, to prevent contact with the other plate when close together. Two terminals are mounted, one on the top edge of the



stationary piece and the other similarly on the movable piece, these being connected respectively with the two sheets of tinfoil, which are the "plates" of the condenser. The distance between the plates is regulated by means of a screw operated by a knob, as shown. Other methods of adjusting the distance may, however, be adopted as may be convenient.

SOME VIEWS ON BROADCASTING. THE MICROPHONE OR THE GRAMOPHONE ?

By S. RACHMANINOFF.

(In an interview with "Ariel.")

C sharp minor is the clue to the author of the opinions expressed in the following article. The famous Prelude of Rachmaninoff is familiar to hundreds of thousands, and readers will be interested in this well-known composer's views on broadcasting.—The Editor.

IT was with some difficulty that I obtained an interview with M. Rachmaninoff, for he has no great love for interviewers. But I managed to secure a meeting with him at the Piccadilly Hotel, where he stayed during his recent visit to London.

Rachmaninoff, as every listener-in knows, is the composer of the famous Prelude in C sharp minor. But his claim to fame by no means rests on this popular piece. He is undoubtedly one of the greatest living Russian composers, and is a pianist of no mean merit. Many of his works have been performed by the Broadcasting Company, and it was with considerable interest that I approached him for his views on broadcast music and to ascertain what sort of a policy he would adopt if by chance he was to become a musical director of the B.B.C.

Although Rachmaninoff has lived for some years in America, he has retained all his continental *savoir faire*, and his English bears no trace of the country he has made his home.

Rather a Shock!

As a preliminary question I asked him whether he preferred to live in America rather than in England, and he replied that he certainly did. "All the same," he added, "I very much like London. You English are so hospitable and so appreciative of my work. I always feel very confident when I have to play in London, for I know that my audience is sympathetic."

Leading up to the subject of wireless, I asked M. Rachmaninoff whether he intended to broadcast. To my surprise he emphatically repudiated the idea. "No," he said, "nothing would induce me to broadcast." Wondering what experience could have made him make up his mind so strongly on the point, I asked him whether he had ever listened-in. "Oh, yes," he said, "but I did not like it."

"Perhaps," I suggested, "you listened-in on a bad set."

"There was nothing wrong with the set," replied M. Rachmaninoff. "Some two years ago, when I was in America, I listened-in on a very expensive valve set which a well-known firm wanted to sell me, but I am afraid I did not care for it very much."

"What did you hear when you listened-in on this set?" I inquired with some curiosity, for I felt convinced that, when he first experienced listening-in, something must have been very seriously wrong with either the set or the items broadcast to have given him such an unfavourable opinion of broadcasting.

"I heard pianoforte and I heard orchestra," he replied; "but, quite frankly, it seemed to me to be spoilt by a harsh noise, which is very difficult to describe."

"But," he added, "I have heard a violin

solo by wireless and that was certainly much better."

"Probably," I said, "you listened-in when broadcasting was almost in its infancy and the subtleties of the microphone had not been fully discovered."

"Perhaps you are right," replied M. Rachmaninoff; but I could see that his first experience had proved rather a shock!

Best of All Kinds.

"I suppose, then," I added, "it will be quite impossible for any Broadcasting Company, either in America or elsewhere, to obtain your services as a musical director?"

M. Rachmaninoff smiled. "You can be quite sure of that," he replied.

"But just imagine for a moment," I insisted, "that you were the musical



Sergei Rachmaninoff.

director of such a company; what kind of music would you broadcast?" He replied without a moment's hesitation: "I should not specialise in any kind of music; I should broadcast the best music of every kind. Classical music, dance music, rag-time—all would have a part of my programme. That, I believe, would be the only way to satisfy everybody; otherwise, what pleased the many would probably offend the few, and what pleased the few would probably offend the many. But," he added quite emphatically, "I should always refuse to broadcast rubbish however many people might ask for it."

Remembering how many musical people had been converted to broadcasting by listening-in on the "P.W." Portable Set, and thinking that this receiver might

possess some advantages over the set M. Rachmaninoff used so far back as two years ago, I suggested that he might like me to bring it round, so that he might have a chance of recasting his opinion on broadcast music. The idea seemed to appeal to him but, unfortunately, he was due to leave England very shortly after our interview, and he regretted that it was absolutely impossible for him to give me another appointment during his present visit.

Before leaving I asked M. Rachmaninoff if he had any explanation for the reason why, although many famous musicians had broadcast and had expressed favourable opinions of this new art, so many other musicians left their arrangements entirely in the hands of their managers and had never had an opportunity of broadcasting, and so judging for themselves the advantages to be so obviously gained. I suggested that their attitude was due primarily to the policy of their managers.

The Artistes' Manager.

"I expect you are right," replied M. Rachmaninoff; "most artistes will always leave their business arrangements to their managers. If my manager seriously advised me to broadcast, I most certainly should broadcast, for I realise he knows more about the business side of my art than I do. Artistes seldom have much to do with business arrangements, and supposing, for instance, that I had a strong personal prejudice against broadcasting—that would not prevent me from broadcasting if my business manager thought it advisable. Of course, some artistes say to record for the gramophone is more profitable than taking occasional engagements to broadcast."

I suggested that one day, and very shortly at that, artistes would find the Broadcasting Company more profitable than the Gramophone. To this M. Rachmaninoff answered with a non-committal gesture.

As I prepared to say good-bye to this famous musician, it suddenly occurred to me to ask him a question which thousands of listeners all over the country have probably had in their minds since first they heard his famous Prelude in C sharp minor.

As probably many of my readers know rumour has it that Rachmaninoff composed this piece after having read a story which Edgar Allan Poe called "The Fall of the House of Usher." In this story a beautiful girl falls into a cataleptic trance and is mistaken for dead. She is buried in a family vault. But, horrible to relate, she awakens, only to find herself buried alive!

And Rachmaninoff's Prelude has gained the reputation of being a musical picture of the terrible experiences of this unfortunate maiden. It is not very difficult to imagine

(Continued on page 672)

HOW TO MAKE A ONE-VALVE REFLEX SET. CLEAR INSTRUCTIONS FOR THE NEW CONSTRUCTOR.

By F. W. PLEWS.

The efficient one-valve dual amplification receiver described by our contributor in this issue is not difficult to build, and the cost is low: It should prove a popular set with the new constructor.

IN the issue of "P.W." dated March 8th, there appears an article on page 39 entitled "Music on Tap." The simplicity of the set described there induced a great number of "P.W." readers to make it. Dozens of very interesting letters have reached me from all parts of Great Britain expressing the great pleasure the set has given the writers. Some of the readers of "P.W." had made the set in the usual box

5 SC, Glasgow. The capabilities of a simple crystal set are very limited; when distant signals are required H.F. amplification is needed; yet some of my correspondents tell me they have received Manchester from Southampton during the interval when Bournemouth was not broadcasting; and yet another from Brighouse, Yorkshire, receives Bournemouth.

The wiring plan and circuit of the new set is shown in Fig. 1.

This is not drawn to scale. The materials required are, variometer; C1 and C2 are mica fixed condensers, .001 mfd. in value, a variable condenser .0003 or .0005, a crystal detector, two basket coils measuring 2 inches diameter at the base of spokes wound with 50 turns of 20 gauge D.C.C. wire; these are seen in Fig. 4, and are used in place of the ordinary plug-in transformer. Telephones will also be required, 4,000 ohms, a D.E. valve, H.T. 60 volts dry battery, an L.T. 3 volts dry battery

was drilled for the grid pin on the valve socket, and the remainder of holes for the valve were carefully measured off and drilled in their respective positions; the plate socket is the lower one.

Owing to rheostats and condensers and detectors not being made to standard sizes, I will leave it to each individual to place the holes for fixing according to the sizes of his own components. A look at Fig. 3 will give him an idea where to place these components. The rheostat is the knob on the left of panel, and the condenser is the one on the right; the detector being placed above the condenser knob or scale.

Variometer Improvements.

Having fixed these components, proceed to wire them according to diagram, Fig. 1. No verbal description of this part of the process is necessary with such a diagram at our disposal. I need only say that the connections to the various coils must be left until the last. The variometer was described in my previous article. Briefly, it is made on a former consisting of 9 slots to size already given. Those who have not already got this piece of apparatus I would advise to wire it with 18 gauge D.C.C. wire, and about 35 to 38 turns will be required on each coil.

I have made a slight alteration here, because many of my correspondents found the amount of wire originally given was too

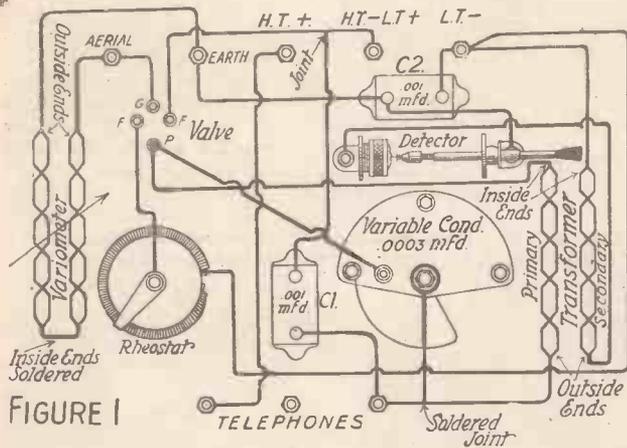


FIGURE 1

form, embodying the principles described in my original article of the above date. Some would like to go a stage further, they said, so I decided to make a dual amplification set, making use of the original components.

No L.F. Transformer.

To effect a further saving, I cut out the low-frequency transformer, deciding to make the converted set without this expensive piece of apparatus, and the results

or a 2½ volts will do, four valve sockets, eight terminals, a rheostat, some 18 gauge wire for connecting up, a detector, a panel measuring about 7¼ inches by 6½ inches, cardboard or fibre to make four coil formers which measure 4¾ inches diameter, a bottle of shellac varnish, and some small brass screws and wood to make the box, dimensions of which are given in Fig. 3; the depth of the box is made to suit the depth of the variable condenser.

Let us start with the drilling of the panel. To save expense again I made my panel from a piece of very stout cardboard, which has the appearance of fibre. In a straight line, ⅝ inch from the top, I drilled five holes for terminals; these were spaced 1⅜ inches apart (see Fig. 3). The same distance from the bottom three holes were drilled for the 'phone terminals. At a point 2¼ inches from the left side and 1⅞ from the top, a hole

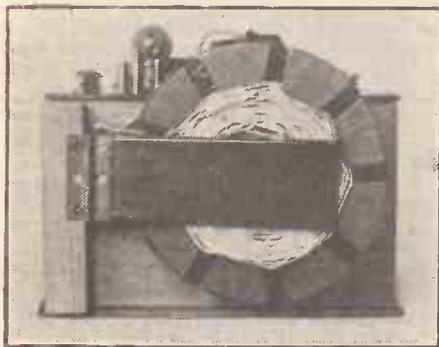


Fig. 2. Showing the method of fixing the variometer coils.

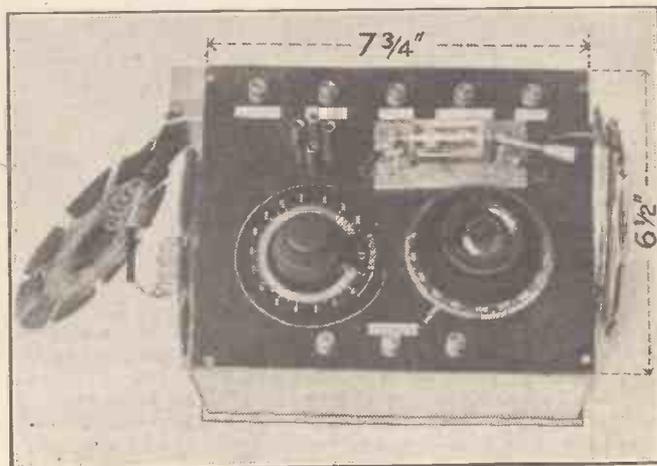
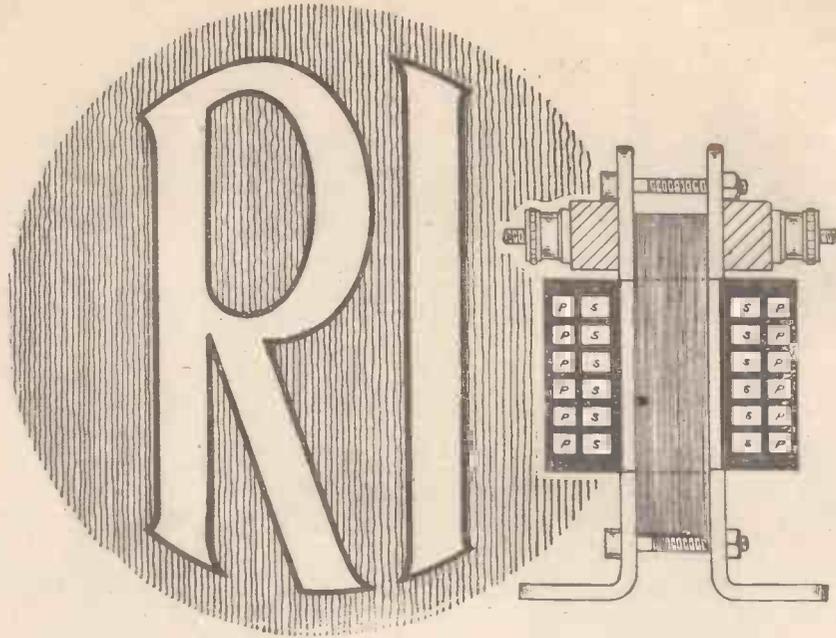


Fig. 3. In this photo the lay-out of the panel is clearly seen.

long when using a P.M.G. aerial. My own aerial is much shorter than the P.M.G. one, hence the difference in the length of wire given. I have since found that 18 gauge is much better than the gauge originally given. The centre leads from the variometer

(Continued on page 645).

have thoroughly justified my decision. I was agreeably surprised to be able to receive loud-speaker signals a good four miles from



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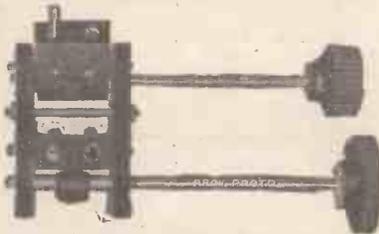
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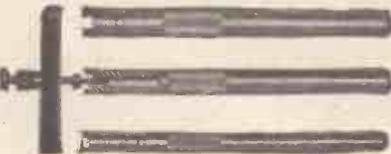


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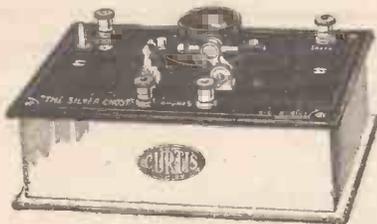
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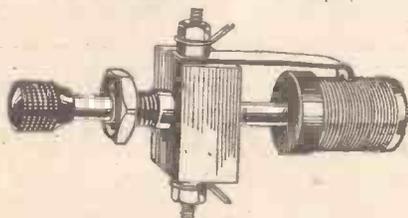
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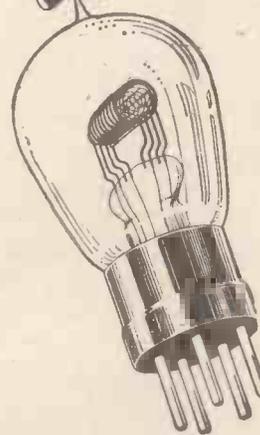
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HOW TO MAKE A ONE-VALVE REFLEX SET.

(Continued from page 640.)

coils are joined together in series, and the stator coil is fastened to the side of box, and the rotor is fixed on a piece of thin wood and hinged as seen in Fig. 2.

This hinge is fastened on a piece of wood about one inch square section, which is fixed to the side of the box (see Fig. 2 and Fig. 5).



Fig. 4. A view of the set from the transformer end.

This is to allow the rotor and stator to lie parallel with each other when in close contact.

The formers are cut with nine slots in a similar manner for the other two coils, used for the transformer on the H.F. side (see Fig. 4), the centre of which is 2 inches in diameter. Fifty turns of 22 gauge wire are wound on each coil, anchoring the wire in the centre of coil through two holes, leaving a loose length of fully 12 inches; proceed to wind in a clockwise direction under two and over two spokes, until there are 50 turns on each coil. These two coils are then placed in contact and fixed on the side of box as shown.

Surprising Results.

Holes having previously been made to take three of the leads from these two coils through the side of the box, the fourth lead goes direct from the coil through the top panel at A, Fig. 4. Now having put the loose ends through the sides of box, all that requires to be done is to follow the instruction given on the wiring plan, Fig. 1, and join up the remainder of the leads. The box was very simply put together with glue and a few very neat rivets; no dovetailing was done, three-ply or fretwork wood can be used, and it is advisable to put the base on after the inside has been properly connected up.

The results are most astonishing, and those readers who want a really good, cheap, and efficient set cannot do better than give this one a trial. It will no doubt

be observed, I have left out some familiar terminals.

When it is desired to use two pairs of phones, the red side of one pair is connected to the left-hand terminal, and the red side of the second pair is connected to the centre terminal, and the remaining side of the first pair also is connected to the centre terminal, and the other side of the second pair is connected to the right side terminal.

Treating the Panel.

When one pair only is in use, connect the red 'phone lead to the left terminal, and the other lead to the right side terminal. If one observes the wiring diagram, it will be seen that there is no internal connection to the centre terminal; the object of this terminal is only to connect up the two separate leads from the 'phones. Instead of the bobbin sliding arrangement on the variometer as shown in my original set, I have in this set thought it advisable to hinge the two coils; this makes the variometer much more efficient.

If cardboard or fibre is used for these formers and the panel, it must be coated with three coats of shellac varnish after all moisture has been dried out. Allow each coat of varnish to dry before proceeding with the others. This operation must be done before assembling, and all holes made for terminals must also have the same treatment. The crystal detector is the most critical piece of apparatus. I found in the course of my experiments that Hertzite and a gold cat's-whisker were very satisfactory.

The Crystal Detector.

The comparatively large currents passed by the rectifier, and the frying effect the currents produce, have a great tendency to cause oxidation of the contact points of the cat's-whisker, hence my preference for a gold cat's-whisker, and a proper selection of the crystal for reflex work.

Any query will receive my usual attention and will be welcomed. Fig. 5 shows the completed set and the variometer particularly.

NEWS FROM HOLLAND.

(From Our Own Correspondent.)

THE authorities have decided to issue a few transmitting licences to Dutch amateurs. Only Radio-Society's and Radio-Organisations are given transmitting licences.

The official amateur wave-length will be 200 metres, and the maximum energy 200 watts. English amateurs within a few weeks may hear many new stations. Our radio telephony station at Hilversum has

erected a new 200 ft. high aerial (the old masts were 70 feet high).

This alteration is very interesting, because it means that Hilversum will radiate greater energy, and be heard more easily in England.

That well-known radio-telephony station, P.C.G.G., will end the telephony transmissions within a few weeks. The owners of P.C.G.G., the Netherland Radio Industry of the Hague, are in liquidation, and their stations will be permanently closed. A two-valve Unidyne was shown at the recent Amsterdam International Wireless Exhibition, and created much comment, the visitors looking on it as they would on a rare animal.

The receiver was tested thoroughly by

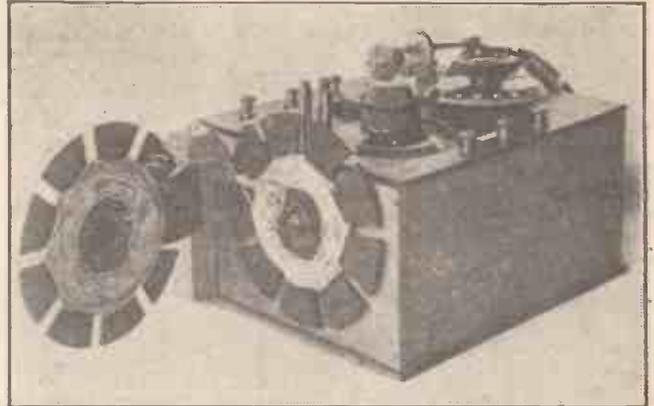


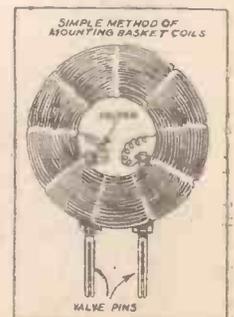
Fig. 5. A good idea of the general appearance of the set is given by the photo

a radio expert, who will give a full detailed report later. He received with normal comfort and with normal loudness, using only an ordinary flash-light battery for the filament, with low-temperature valves.

A SIMPLE METHOD OF MOUNTING BASKET COILS.

AS numerous as have been the suggestions put forward in connection with the mounting of basket coils, the following idea appeals to the writer as being the simplest yet. The free ends of the coil are soldered, or otherwise secured to valve pins, the pins being accommodated within the two most convenient channels in the coil.

Coils so adapted can, of course, only be used with a home-made coil holder in which valve pin sockets are used. If a set of honeycomb coils are already in use the holder can very easily be adapted to take such basket coils. This simple idea will readily be grasped from the accompanying illustration.



CONTROLLING THE WEATHER BY WIRELESS.

A NEW ASPECT OF RADIO SCIENCE.

By G. H. DALY.

There are three methods by which scientists hope to "drain" the wind of its water vapour, and in this article Mr. Daly explains how wireless plays a vital part.

A FEW years ago weather forecasts were regarded as a standing joke owing principally to their inaccuracy and ambiguity. If, for instance, the weather forecast predicted fine weather—a heavy rainstorm was quite likely to occur, and vice-versa. But usually the weather reports appeared to be so worded that they were right whatever happened.

Consequently people grumbled. "Why can't the meteorologists give us correct forecasts?" they exclaimed in disgust when a Bank Holiday which the oracle had said would be fine turned out to be exceedingly wet.

The dream of yesterday is the reality of to-day—and now a weather forecast is rarely incorrect, and the mighty British public growls to-day, not at incorrect forecasts, but at the scientists for allowing the bad weather to continue.

"Why can't those scientific johnnies do something useful?" they say. "Destroying aeroplanes by wireless and turning lead into gold is all very well—but surely, chasing away a few clouds would be infinitely more useful and beneficial to humanity." And it seems as if their growling is again to have effect, for owing to research it is now believed that some sort of control of the weather is possible, at least as far as rain and clouds are concerned.

The Cause of Rain.

As many people are aware, when the forecast states that a depression is coming up from the Atlantic this is usually a sign that wet weather may be expected very shortly (for it is these depressions which generally bring the clouds and rain).

Now, theoretically, there are two ways in which we might prevent the wet weather from reaching this country. In the first place we might stop or divert the depression or wind which brings the rain, or secondly we might remove the clouds and rain from the wind before the latter reaches these shores.

To stop or divert the wind is obviously impossible, but it is now thought that by means of wireless waves we may be able to rid the wind of a certain amount of moisture before it passes over the land and thus, although we should still receive the strong wind, the sky would not be covered with clouds to the same extent as before, and the rainfall would be greatly reduced.

A cloud consists of condensed water vapour, the latter being one of the gases of which our atmosphere is composed. Now, a wind coming from the Atlantic is laden

with water vapour owing to its journey over the sea, and when this wind reaches our shores it is forced upwards by the coastal mountains and, consequently, the wind is cooled and the water vapour in it is condensed into cloud—and so we have rain.

Improving Our Climate.

The same phenomenon occurs if a warm wind laden with water vapour meets a dry cold wind from the Arctic regions. The cold wind forces the warm wind upwards, with the result that the water vapour in

the concentration of wireless waves in certain areas, it has been noticed that when three high-power stations work continuously for any length of time, exceptionally heavy rain is precipitated at a point approximately midway between the three stations. That is, where the three waves meet, as it were. Further research tends to show that the rain only occurs when the wind is blowing from the sea—i.e. when the wind is laden with warm vapour (see diagram).

It should be mentioned that owing to the difficulties encountered in making reliable and constant observations on high-power stations, observations have also been attempted on three convenient broadcasting stations but, unfortunately—from this point of view—without any definite result, and it is quite safe to say that broadcasting stations certainly do not cause rain, probably because of their small power—or it may be owing to the short waves on which they transmit. For it is not yet clear whether it is the high power or the long wave-lengths of the high-power station which causes the rain. However, if broadcasting stations did make rain they could be so arranged geographically that they would cause the rain to fall before it reached this country.

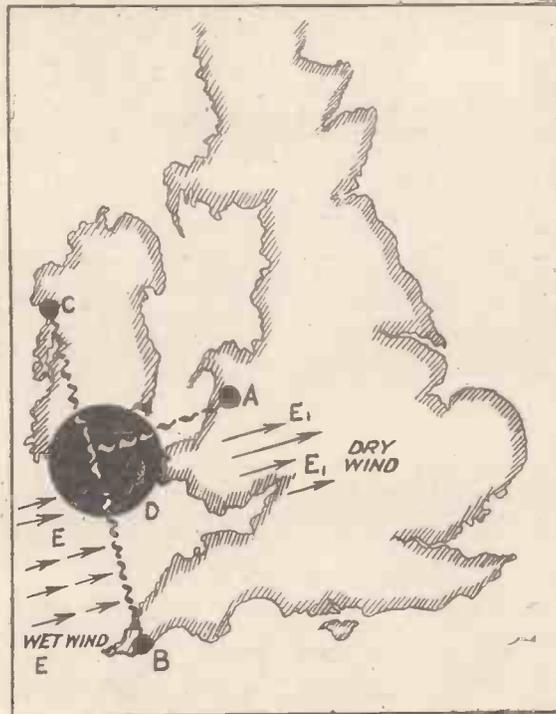
A Prohibitive Cost.

It has been suggested that if three high-power stations were erected so that the point where the waves from the three stations met was somewhere off our west coast, a great percentage of the water vapour in the winds coming up from the Atlantic would be removed at this point, and thus we should get far less wet weather over the land.

As we know that three such stations do cause rain at a central point, we might be reasonably certain of some success, provided the stations were equipped with very powerful transmitters. But at present the cost alone would be prohibitive, and to deal with the westerly coast line of Great Britain a large number of stations would be required. There is one advantage however, namely, that all bad weather occurs within the confines of the troposphere (the name given to our lowest atmosphere) which is but six miles in height, so that we need not worry about the necessity of penetrating very high into the atmosphere.

With regard to the second method of controlling the weather by the disruption of clouds by wireless waves, certain laboratory

(Continued on page 653)



the latter is condensed and rain falls.

It follows, therefore, that if we can cause the water vapour in a wind to be condensed and fall as rain before it reaches our coast we shall have a much drier climate inland.

Radio Rainstorms.

But how is this miracle to be accomplished? There are three methods by which scientists hope to drain the wind of its water vapour, and all three are concerned with the ubiquitous wireless. The first is by the concentration of certain wireless waves in a certain area. The second is by the disrupting of the clouds by wireless waves, and the third by the creation of artificial thunderstorms.

In connection with number one, namely,

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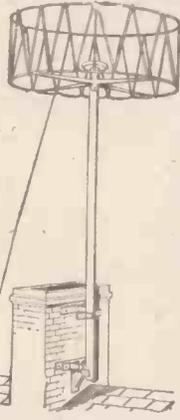
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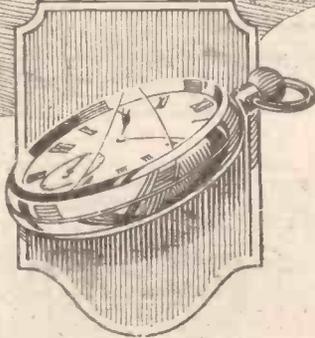
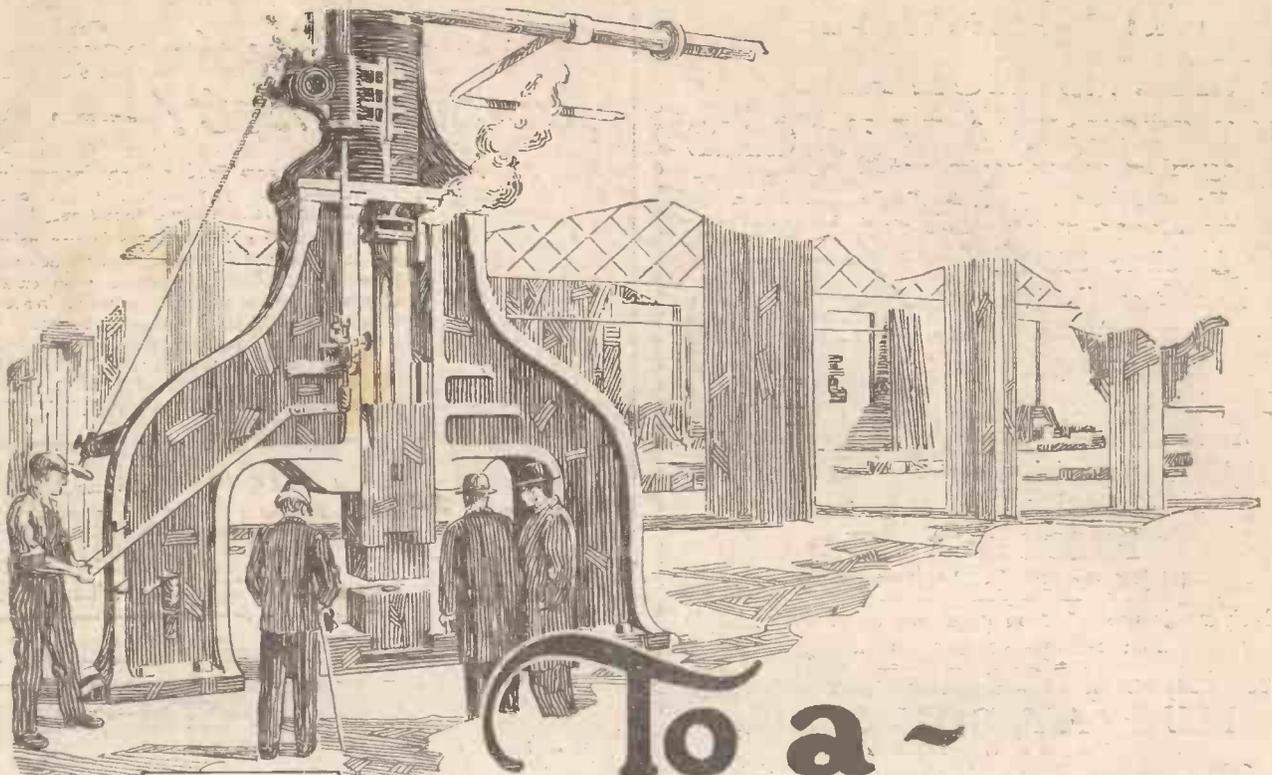
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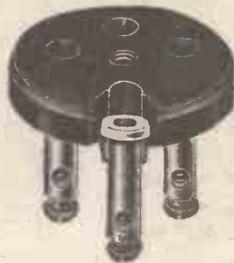
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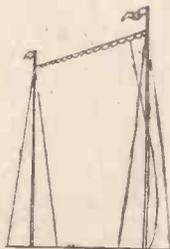
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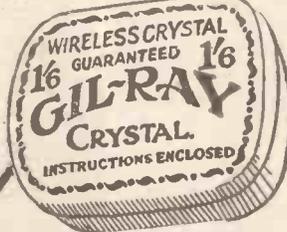
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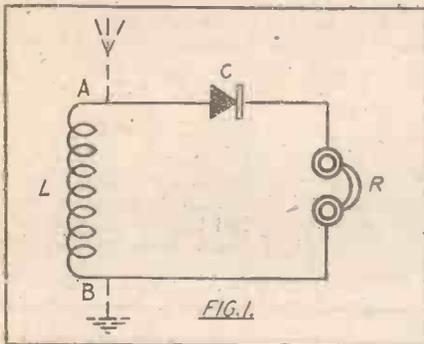
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AN IMPORTANT RADIO PRINCIPLE.

By E. CHATTERTON, B.Sc.

MOST experimenters know from practical experience that low-resistance telephones of, say, 120 ohms, when inserted directly in the anode circuit of a receiving valve, give very poor results when compared with 'phones of higher resistance, say, 4,000 ohms. The reasons for this are usually imperfectly understood, although a very well-known electrical principle is involved, which has many other applications in wireless circuits in addition to that quoted above.

This principle may be briefly stated as follows: "Whenever a recording or measuring instrument is inserted in a



circuit, the maximum proportion of the available power is used in the recording instrument when the impedance of the instrument is equal to the total impedance of the remainder of the circuit."

Proved by Ohm's Law.

A simple example may make this statement clearer. Consider the simple crystal receiving circuit shown in Fig. 1, in which the telephones may be regarded as the recording instrument. The electrical energy available is a fixed quantity, depending upon the aerial and earth characteristics of the receiving station, and the distance away, and power of the transmitter. In order to obtain best results it is clear that the maximum proportion of this energy shall be available for operation of the telephones.

According to the principle stated above, this is the case when the impedance of the telephones is equal to the combined impedance of the remainder of the circuit, which, in this case, consists of the inductance L and the crystal C. The low-frequency impedance of the inductance L will be so small as to be negligible, so that we may state that in any crystal circuit best results are obtained when the impedance of the telephones is equal to the impedance of the crystal.

This may be easily verified by taking an actual numerical example, the calculation being simplified by considering that a direct current is being dealt with. This eliminates the effect of inductance and capacity, leaving only resistance to be considered, when the calculation becomes a simple application of Ohm's law.

Let the resistance of the crystal be C ohms, the resistance of the telephones R ohms, and let the potential across points A

and B equal V volts. The resistance of the whole low-frequency circuit is, therefore, C + R ohms. By Ohm's law, the current flowing through this circuit due to voltage V is:

$$\frac{V}{C + R} \text{ amperes.}$$

It will be seen that if V and C remain constant, the current value decreases as the resistance R of the telephones is increased. The potential drop across the telephones is

given by the expression— $\frac{VR}{C + R}$ volts, this

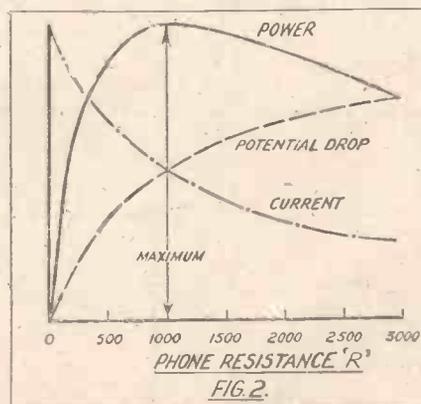
increasing as R increases. The electrical power absorbed in the 'phones is given by the product of voltage and current, and therefore equals:

$$\frac{V}{C + R} \times \frac{VR}{C + R} = \frac{V^2R}{(C + R)^2} \text{ watts.}$$

In Fig. 2 three curves are given, which are calculated from the above formulae, for values of R varying from 250 to 3,000 ohms, assuming that C is 1,000 ohms, and that V is 100 hypothetical units of potential. From these curves it will be observed that as R is increased the current value falls, while the potential drop increases. The product of these two curves gives the curve of power, which is at maximum when R is 1,000 ohms, that is, when the resistance of the 'phones is equal to the resistance of the crystal, thus verifying the principle stated above. In practice the calculation must be modified to some extent, for alternating current is being dealt with, and inductance and capacity must be considered. If, however, impedance is substituted for resistance in each of the above formulae, the same result will be obtained.

Not Applicable to Valves.

How, then does this affect the first example mentioned, where telephones are inserted in the anode circuit of a valve? In this case



the circuit in which the telephones are inserted has an impedance in the neighbourhood of 10,000 to 20,000 ohms, and the impedance of the telephones should, therefore, approach as near as possible to this figure. In practice the telephone impedance seldom exceeds 5,000 ohms, but this is due to practical limitations due to the size of the telephone earpieces.

Many other applications of this principle will be found in wireless circuits. For example, when a crystal receiver is inserted between aerial and earth, the set itself may be considered as the recording instrument, and best results will be obtained when the impedance of that portion of the circuit across which crystal and 'phones are shunted is equal to the impedance of the remainder of the aerial-earth circuit. If a valve receiver is used, this principle does not apply, for a thermionic valve is a potentially operated device—that is to say, the object in this case is to get the highest possible potential drop between the grid and filament of the valve, irrespective of the amount of power used.

Useful Average Resistance.

One conclusion may be drawn from the curve of power shown in Fig. 2. It will be observed that the power decreases rapidly if the resistance of the 'phones falls below the ideal value. If the 'phone resistance exceeds the ideal value the power decreases less rapidly, hence it is advisable that the 'phone resistance should be kept on the high side if any doubt is experienced with regard to the impedance of the remainder of the circuit. When galena crystals are used, 'phones of about 2,000 ohms resistance appear to give best results; but when carborundum or other high resistance crystals are employed, the 'phone resistance can be made considerably higher with advantage.

CONTROLLING THE WEATHER BY WIRELESS.

(Continued from page 646.)

experiments in which concentrated wireless waves of varying frequency have been sent through a moist atmosphere lead us to believe that some types of ether waves appear to cause the moisture in the air to be condensed into clouds and rain, but it is as yet too early to say anything very definite.

It is also well known that some clouds are highly magnetic, and one experiment aims at magnetizing all clouds by means of an electro-magnetic ray, thus causing the clouds to descend to earth in the same way as Humboldt's volcanic cloud, which descends to earth in the vicinity of volcanoes by magnetic attraction—the clouds being then made to disperse by some other method.

Conversely, it is thought that it may be possible to magnetise the clouds and cause them to ascend instead of descend and thus, owing to the ascent in the troposphere, the cloud would be cooled and the moisture would condense and fall as rain where ever desired.

Experiments are also taking place in the creation of artificial thunderstorms, the idea being to cause the atmosphere to send down the rain in the same way as the rain is precipitated in a natural thunderstorm.

In the light of present-day knowledge, therefore, there can be little doubt that practical weather control will be possible in the near future and we shall be able to order the weather very much as we please. Although as yet we can only hope to deal with clouds and rain, some day undoubtedly it will be possible to calm down the wind by means of some wireless ray just as we calm down the sea by throwing oil upon the surface.



The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

IN our opinion, all standard receivers should be provided with some means to protect the filament of the more or less expensive valves against accidental fusing by the H.T. battery. Most sets, however, are not so equipped, so we must employ auxiliary safeguards. In this capacity we can commend to the notice of our readers the Ericsson Fuse Wander Plug. This neat little device, samples of which have been sent us for test, contains replaceable fuse elements which are designed to "blow" at varying currents suitable to various types of valves. In order to ensure a certainty of action the fuse elements consist of small fuse wires in small evacuated glass bulbs; in effect a small valve with a filament that will burn out before the orthodox valve. Needless to say, the fuse elements are very cheap to replace.

Messrs. Ericsson also submit a rotary potentiometer. It is provided with a novel yet perfectly simple circular coil and contact

which provides an adjustment unique in its smoothness besides being most positive in its action. In a suitable circuit its noiselessness is most marked, and to a considerable extent this is due, we should imagine, to a soldered copper spring method of making connection to the revolving contact arm. At 7s. 6d. we consider this component well worth the attention of our readers.

We have received from Messrs. Craig & Smith (of Allen Street, Clerkenwell) one of their "C & S" H.F. Transformers for test. It is of superior finish, made with good quality ebonite and with the windings nicely protected by an external covering of silk thread.



The Ericsson Rotary Potentiometer.

The design is of the conventional plug-in type, the metal valve legs, nuts, etc., being finished with nickel instead of the usual brass. The sample submitted was marked and designed to tune over the wave-length band between 350 and 800 metres. On test it was found that all these wave-lengths were well within its compass, and this transformer can be recommended to readers who are looking for an efficient and well-made component of this kind.

Sillery's Magnetic Invention For Wireless Crystal Sets is a name which tends to indicate something rather wonderful. Added to this name asset there are modest claims which include "an improvement (in reception) of 60 to 100 per cent under all heads, and no batteries required." Further, "The human voice with all its varied inflections is faithfully and naturally reproduced; there is also an absence of hardness or jargon—". Again, "reception is both sweet and melodious." Lastly "the magnetic influence being not only permanent but increasing—".

We have carefully tested the above speciality of the Empire Radio Co., Birmingham, and cannot admit we are greatly impressed. The invention is the placing on the aerial wire of metal loops separated by small straight pieces of wire placed vertically. Undoubtedly this increases the receptive surface of the aerial considerably, and in certain cases should have a marked effect on signals. In our case we cannot

(Continued on page 658.)

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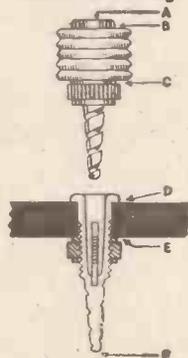
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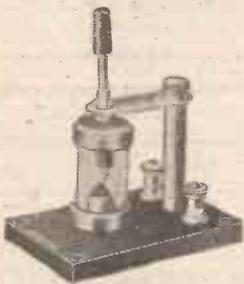
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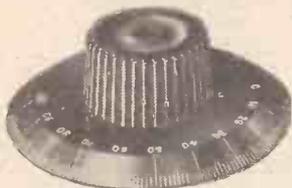
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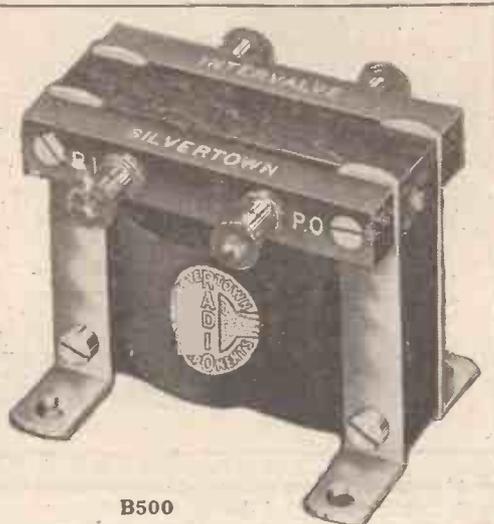
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VARIABLE CONDENSERS.
(For panel mounting.)

Strongly constructed. Moving vanes are shaped to give low minimum capacity. Fitted with a stop to allow of a movement of 180° only.

From 5/6 each.



TELEPHONE HEADPIECES.

The "Stalloy" diaphragms are matched so as to secure a balance of tone and quality. Resistance of 120 to 12,000 ohms. Price (4,000 ohms) 25/- each.



POTENTIOMETERS.
(For panel mounting.)

On rectangular ebonite former, complete with knob and pointer. Former mounted on cast brass frame. Resistance approximately 400 ohms. 7/6 each.

Makers:—THE SILVERTOWN COMPANY,

106, Cannon Street, London, E.C.4.

Works: Silvertown, London, E.16.

BELFAST: 75, Ann Street.
BIRMINGHAM: 15, Martineau Street.
BRISTOL: 4, Victoria Street.
CARDIFF: Pier Head Chambers, Bute Docks.
DUBLIN: 15, St. Andrew Street.
GLASGOW: 15, Royal Exchange Square.
LEEDS: 1, New York Road.



LIVERPOOL: 54, Castle Street.
LONDON: 100 and 102, Cannon Street.
MANCHESTER: 16, John Dalton Street.
NEWCASTLE-ON-TYNE: 59, Westgate Road.
PORTSMOUTH: 49, High Street.
SHEFFIELD: 88-90, Queen Street.

GREAT SUCCESS OF RADIO "STOCKS"

OUR FRIENDS RECOMMEND US

FIRST-CLASS

VARIABLE CONDENSERS

Best British Make. Perfect Finish. Absolutely Finest Value Obtainable

	Ordinary	With Vernier	Square Law	With Vernier
'001	7/3	8/9	9/6	11/-
'0005	5/6	7/-	8/-	10/-
'0003	5/1	6/7	7/6	9/-
'0002	4/5			
'0001	4/2	Dials and Knobs Included in all Condensers		
'00005	3/1			

ACCUMULATORS:—Best British, 4 Vt. 40 Amp. 16s. 6d., 4 Vt. 60 Amp. 19s. 6d., 4 Vt. 80 Amp. 23s. 6d., 6 Vt. 60 Amp. 27s. 6d., 6 Vt. 80 Amp. 33s., 6 Vt. 100 Amp. 38s. 6d.

AERIAL WIRE:—7/22 Best H.D. Copper, 1s. 10d.; Enamelled, 3s. 6d. 100 feet.

ANODE RESISTANCES:—Bretwood Variable, 3s.; Watmel, 3s. 6d.; Lissen, 2s. 6d.; Dubilier and all makes.

CONDENSERS:—(Copper and Mica.) Fixed; to '001 9d.; to '005 1s.; to '01 1s. 9d.; to '1 3s. Edison Bell Fixed Condensers, to '001 1s. 3d.; '002 upwards 2s. Dubilier up to '005 2s. 6d.; '001 upwards 3s.

TRANSFORMERS, L.F.:—"Powquip" 12s. 6d.; "Bucks" 11s. 6d.; "Radstock" 10s. 6d.; "Royal" 20s.—Best of all. All makes stocked.

TRANSFORMERS H.F. ENERGO:—Nos. 1, 2s. 3d.; 2, 2s. 5d.; 3, 2s. 7d.; 4, 2s. 9d.; 5, 3s.; 6, 3s.

SLEEVEING:—(Insulating), 3 feet lengths, 3 for 10d. finest quality.

SWITCH ARMS:—First quality 9d.; Nickel 1s.; second quality 6d.

SWITCHES:—S.P.D.T. 1s. 3d.; D.P.D.T. 1s. 8d.; Panel Mounting S.P.D.T. 10d.; D.P.D.T. 1s.

VARIOMETERS:—Wonderful value: Special All Ebonite Moulded Ball Rotor Double Silk Wound, extremely close coupling, one-hole fixing. A superior article, only 5s. As above, but Tubular Ebonite Rotor, 4s.

All-black Double-cotton Wound, one-hole fixing, 1s. 6d. to 4s. each. All are best value obtainable Igranite and Edison Bell Variometers, 10s. post paid.

HEADPHONES:—N. & K. pattern, 11s. 6d.; Dr. Nesper adjustable, 12s. 6d.; Brown's F., 25s. All makes in stock at lowest prices possible.

LOUDSPEAKERS:—Our special 2,000 ohms, full clear tone, suitable for low-power sets, £1; Sterling Dinkle, 30s.; Amplion Junior, 27s. 6d.; Dragon Fly, 25s. Amplion new models and all makes in stock at lowest prices.

MANSBRIDGE CONDENSERS:—Special offer: "Octopus" brand, best quality obtainable; accurate, permanent, noiseless; beautifully cased, two extra fixing lugs; tested at 350 volts direct current for insulation; there are none better.

-05, 3s.; 1, 3s. 6d.; 25, 3s. 6d. 1 mf., 3s. 6d. 2 mf., 3s. 10d.

Sizes: 2" x 1 1/2" x 1/8" 2" x 1 1/2" x 1/8" 2" x 1 1/2" x 1/8"

COIL HOLDERS:—All Ebonite, really fine, 2-way, 2s. 6d.; better finish 2-way plated, 3s. 6d.; ditto, 3-way, 4s. 6d.; Polar 2-way w/Vernier, 6/-.

Many other makes in stock. State your wants, we will assist you.

BASKET COIL HOLDERS:—Best quality, Plug-in block base, 1s. 2d. each; ditto, no block, 10d. Universal 2-way, 5s. 6d., 3-way, 7s. 6d.

VALVE HOLDERS:—Solid hand-polished Ebonite, 10d. each; Special Anti-Capacity Legless Sunken Socket Tops, prevent valves burning out, 1s. each. Murray's Patent very efficient, with simple fitting showing only 1/4 in. above panel, 1s. 3d. each. Highly recommended.

COILS:—Finest Duplex Basket, Waxless, most efficient for any circuit and any position. Set of 5—Nos. 25 to 100, 1s. 10d.; ditto, for Chelmsford, No. 150, 1s. 3d.; No. 200, 1s. 6d. As above, but extra large air spaces, coils 1/2 in. wide, Sets of 5, Nos. 25 to 100, 2s. 9d. Igranite, O'Keefe, Energo, Lissen Coils, etc., all in stock.

VALVES:—Dutch 4s. 6d.; R. Type, 5s.; French R., 6s. 10d.; French Dull Emitters, finest on market for efficiency and low consumption, 16s. 6d. All makes in stock. Cossor, Mullard, Marconi, B.T.H., etc.; etc. Lowest list prices.

FILAMENT RHEOSTATS:—Microstats, 2s. 6d.; Lissenstats, 3s. 6d.; Ormond, 2s.; our own Extra Special Solid Ebonite of a superior type, 2s.; for Dull Emitters, 2s. 6d., fully guaranteed. Cheapest type; efficient and strong, 1s. 6d. each.

CONSTRUCTORS:—Sets of Parts: We specialise in quoting for complete sets of parts. No matter how small or how large your requirements, we will be pleased to quote you our best terms and also give you technical advice.

CRYSTAL AND VALVE SETS:—Special prices

EVERYTHING WIRELESS AT LOWEST PRICES.

end for Free List.

All goods on 24 hours' approval. Send ample postage, surplus refunded.

RADIO STOCKS

(B. HAINE, Sole and New Proprietor.)

RADIO HOUSE, NEWMAN STREET,
OXFORD STREET, LONDON, W.1.

Phone: MUSEUM 3205.

SUPERADIO PRODUCTS

BRITISH MADE

Superadio Products are Quality Products at Low Prices. Here are a few:

SUPERADIO LIGHTWEIGHT HEADPHONES

(7 1/2 ounces). Wonderful in appearance, performance and durability. 14/9 set

SUPERADIO LOUD SPEAKER

Stands 14 in. high. "A Full-size Instrument at a Junior Price" 27/6 each

SUPERADIO SONGSTER LOUD SPEAKER

Equal to many sold at 27/6 or more 12/6 "

SUPERADIO CRYSTAL RECEIVER No. 1

Ebonite panel, Sloping type Cabinet, very efficient 10/- "

SUPERADIO MASTER CRYSTAL RECEIVER

In Solid Mahogany Cabinet with lid, with side compartment for Phones. If used with a pair of Superadio Headphones, this is equal to most £4 4 0 sets. Receiver only 26/- "

SUPERADION. "The Loud Speaker Crystal"

Does not need "Boosting," speaks for itself 1/6

SUPERADIO Experimenters' set of 6 famous British and Foreign Crystals, 9/- worth of crystals for

4/6

Trade Enquiries Especially Invited. Illustrated Price Lists Free.

VISIT OUR STAND AT THE
WHITE CITY—November 15-29.

SUPERLAMP, LTD.

RADIO MANUFACTURERS

197, OLD STREET, LONDON, E.C.2.

EVENING TRIPS TO AMERICA!

YOU can get there every night with the P.P.V.2, the world's loudest and most sensitive long distance circuit. Simple enough for a child to assemble. Panel cost need not exceed 30/-. Thousands have already logged from 1 to 5 American stations nightly. P.P.V.2 works loud speaker; and carries 20 pairs of headphones.

RADIO-PLAN No. 1 contains—

fullest instructions, pictorial and theoretical diagrams, with directions how to make your own coils for a few pence. If you have never made a set before, you can succeed now.

Expert advice free to purchasers if required.

Price 2/-. Post Free, from:—

PRESS EXCLUSIVES, Wireless Publishers,
2, Wine Office Court, Fleet Street, London, E.C.4

SEBPHONE SUPER SET.

This set tunes in all stations up to Chelmsford.

We have heard Paris Concert without any amplifiers.

Exceedingly loud results obtained by special short circuiting device. Detector consists of the finest combination of SUPERZITE and Pin whisker.

PRICE . . . 25/- (post paid.)

SUPERZITE CRYSTAL AND PIN can be supplied separate 3/- (Post paid) of all Wireless Dealers or direct from—

S. E. BLAND, A.C.G.I., B.Sc.,
WIRELESS AND ELECTRICAL ENGINEER,
82a, Queen Street, LONDON, E.C.4.

Phone: Central 8521.

TO THE RETAIL TRADE

Arrangements have now been completed to supply the

MARS AERIAL

through the following depots:

- HOUGHTONS LTD., 88-89, High Holborn, London, W.C.1
- HOUGHTONS LTD., 70-78, York Street, Glasgow.
- HOUGHTONS LTD., 61A, Long Row, Nottingham.
- HOUGHTONS LTD., 67B, Briggate, Leeds.
- HOUGHTONS LTD., Stoke.
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- A. FRANKS (Wholesale) LTD., 3, South King Street, Manchester.
- BRITISH ELECTRICAL INSTRUMENTS LTD., 3, Hanging Ditch, Manchester.
- PULFORD BROS. LTD., 106, 108, 110, Whitechapel, Liverpool.
- PRIESTLY & FORD, 3, Carr's Lane, Birmingham.
- FREARS LTD., Bristol Bridge, Bristol.
- CHRISTOPHER PRATT & SONS LTD., North Parade, Bradford.
- J. H. TAYLOR & Co., Macauley Street, Huddersfield.
- SOUTH WALES WIRELESS INSTALLATION Co. LTD., 21-22, Edward Terrace, Cardiff.
- GENTS LTD., Faraday Works, St. Saviour's St., Leicester.
- HY. HOLLINGDRAKE & SONS, LTD., Princes St., Stockport.
- GEO. C. LAZENBY, 29, Old Town Street, Drake's Circus, Plymouth.
- BATLEY & SONS, Bellara House, Cloth Market, Newcastle.
- THE PARAGON (Hull) MOTOR Co. LTD., Anlaby Rd., Hull.
- MUNN & UNDERWOOD LTD., 165, Above Bar, Southampton.
- H. L. WOOD & SON, 36, Russell Street, Southsea, Portsmouth.
- RADIO ELECTRIC Co., 21, St. John St., Wolverhampton.
- J. MULCASTER & Co. LTD., Smith's Buildings, Middlesbrough.
- A. LATUS, 2, Church Street, Preston.
- G. MAKIN LTD., Glovers Court, Preston.
- RADIO CRAFT SUPPLIES, 9, The Arcade, Walsall.
- C. T. BRISCOE & SONS LTD., 33, Preston New Road, Blackburn.
- W. H. ORRY, Church Street, Blackpool.
- JONES BROS., 1, Birley Street, Blackpool.
- F. HOWE (Southport) LTD., 60, Sussex Rd., Southport.
- W. THOMASSON & SONS, 1, High Street, Shrewsbury.
- W. S. WILTON & Co., 56, Bromham Road, Bedford.

TO THE PUBLIC

Don't worry about making a super crystal set or a super valve set until you have proved the difference the super aerial will make to your present outfit. The 'Mars' gives 50% increase in volume and clarity—if your present set with 7/22's aerial is good, your present set with the 'Mars' aerial will be just wonderful.

The MARS AERIAL

Costs 9/6. It's worth it!

In case of difficulty in obtaining. Send P.O. for 9/6 to

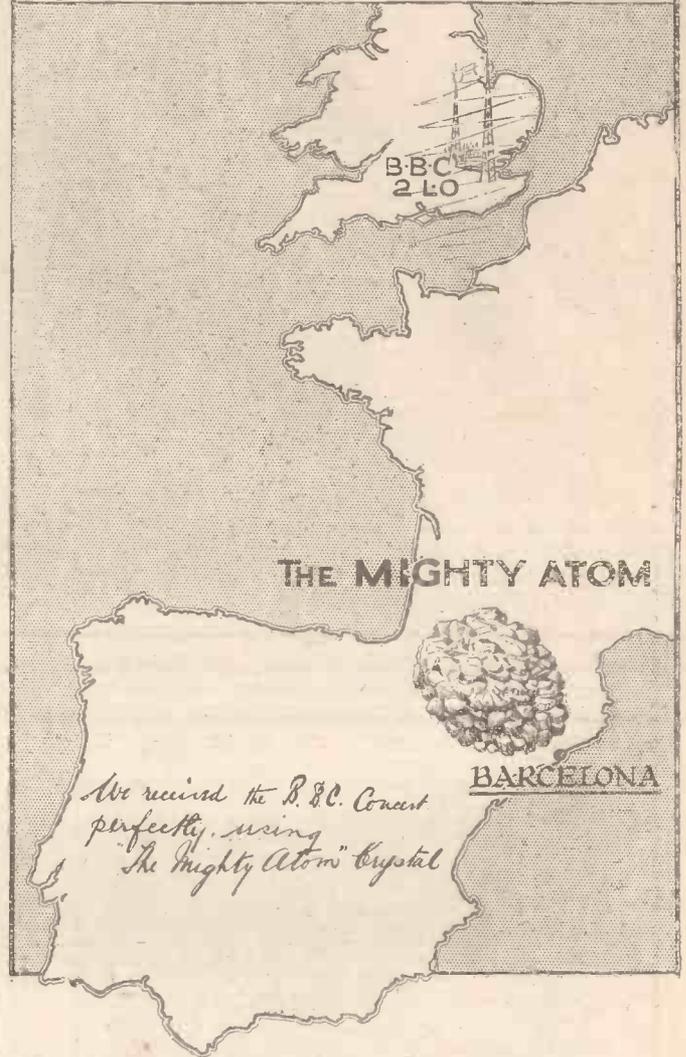
E. & W. G. MAKINSON LTD.
Wellington Works, Wellfield Rd., Preston.

Estab. over 40 years.
Tel. No.: Preston 122. Telegraphic Address: "Gold, Preston." Q 20



"THE MIGHTY ATOM"

A Triumph of Science



Vide the Press.

"THE CRYSTAL THAT MADE WIRELESS HISTORY."
2 L.O. HEARD IN SPAIN ON

"THE MIGHTY ATOM"
THE SUPREME CRYSTAL.

Every crystal guaranteed tested and packed in sealed box with a special cats-whisker in tube, tweezers and directions. OBTAINABLE FROM ALL WIRELESS DEALERS. 1/9

Or Post Free from
BRITAIN'S BEST CRYSTAL LTD.,
234-5, Salisbury House, London Wall,
London, E.C.2.

APPARATUS TESTED

(Continued from page 654.)

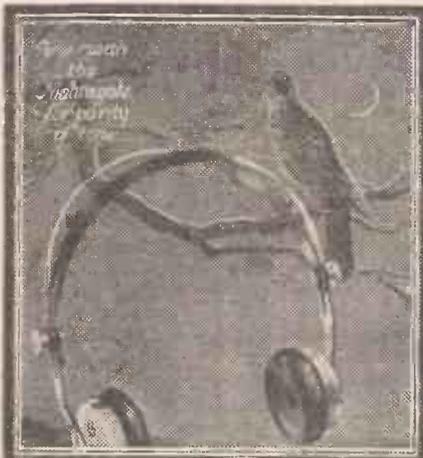
honestly say that such was noticeable, but then our aerial is a fairly good one. However, we cannot believe that there are any hitherto unknown "magnetic influences" at work, and we should advise the proprietors of the invention to introduce a modicum of modesty in their claims, for we are sure that the inventor, Mr. William Sillery, A.M.I.E.E., would not wish his name to be permanently attached to leaflets which embody such verbal extravagance.

* * *

We have just tested one of the smallest valve-crystal sets that we have yet come across. Called the "Jay-Gee," the set comprises a valve-crystal-reflex set in which either crystal or "dual" can be used, the whole set being mounted on a circular panel of about 5 inches diameter. The tuning coils are contained in the base (the set is about 4 inches high) and are tapped, the whole of the tuning being carried out by plugs (attached to the aerial and earth leads) round the side of the set. Extra loading terminals for 5X X are provided and on test the set proved surprisingly efficient for so small a receiver. Retailed at £1 1s. the set should have a ready sale for any listeners within 15 miles of a main broadcasting station and 7 miles of a relay station, for the set is certainly a very good proposition at the price. No rheostat is

fitted, which is rather a pity, though we admit it would be difficult to fit one and yet keep the set to the small space now occupied.

One of the most interesting components brought to our notice within the last few weeks is a variable grid leak which has been put on the market by the Enterprise Manu-



A section of one of the artistic posters issued by Messrs. Siemens to advertise their telephone receivers.

facturing Co., Ltd., of Electric House, Grape Street, London, W.C.2. It is entirely original as far as we know, as the resistance element in the form of a neat little cartridge is removable, it being possible to replace same or introduce another of different value merely by removing the large base screw. The price of the

grid leak complete with a .2 to 5 megohm cartridge is 3s. 6d., or with a 5-10 megohm element, 4s. Spare cartridges can be purchased at 1s. 3d. and 1s. 6d. for the two above values respectively. Furthermore, the same firm is marketing a similar type of Filament Control with which four ranges of resistance values can be used, giving a variation between 0 and 30 ohms.

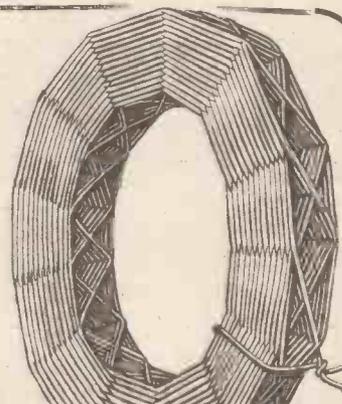
We have received a complete set of samples and have carefully tested them both on a "megger" and in operating circuits. The result was highly successful and in all cases constant and positive adjustments were possible. We believe that if the same high standard of efficiency is maintained throughout the entire production the Enterprise people have introduced a really good grid leak. Certainly it is an advance on any others, more especially from the experimenter's point of view, who with its use will be able to change his grid leak, or filament resistance too, for that matter, in but a few seconds.

We note with interest that it is possible to make either a grid leak a filament resistance or vice versa by the insertion of a suitable cartridge, as the sizes of both are similar. We have tested these ingenious Enterprise products in Unidyne and ordinary circuits, and we can certainly recommend their use in both.

* * *

From Messrs. J. J. Eastick & Sons we have received a sample plug and socket of standard size, the latter being designed for panel mounting. It is quite neat and very well made, and provides a positive and perfectly efficient contact.

Each Reactone Inductance Coil is wound by a special process applying a constant tension to the wire. This ensures absolute uniformity of all coils, enabling each to be guaranteed accurate in calibration, and also makes the coil rigid and strong.



Tension-Wound Coils

for Sharper Tuning, Louder Signals, and Better Reception.

The formation of Reactone Coils, and their heavy gauge wire, ensure extremely sharp tuning and loud signals. Their uniform maximum

air-spacing makes self capacity extremely low (no shellac or wax is used), and their thinness makes very close coupling possible.

Reactone

TENSION-WOUND

Inductance Coils

are supplied in sets of 5 (Nos. 25, 35, 50, 75, and 100) and each set is boxed. Be sure to see the name "Reactone" **4/6**
Special Chelmsford Coil (No. 150) **2/6**
Ask your Wireless Dealer. In case of difficulty send P.O. for 4/9 and your Dealer's name and address to
Sole Distributors for U.K.—V. ZEITLIN & SONS,



144, Theobald's Road, LONDON, W.C.1. Phone: Museum 3795, 6841.
Manufactured by Lewis Harforth & Co., London.

SIEMENS

BATTERIES for H.T. and L.T. PURPOSES

THE HALL MARK



Size No. 827 (36 Volts).



REG. TRADE MARK.

OF QUALITY



Size No. 981 (4 1/2 Volts).

Also manufacturers of

RECEIVING SETS, HEADPHONES, LOUD SPEAKERS, EBONITE, ETC.

Obtainable from all leading dealers.

SIEMENS BROTHERS & Co., Ltd., WOOLWICH, LONDON, S.E.18

THE "AMPLYWHISK"

YOU DON'T KNOW

What your set can do till you have fitted it with the latest improvement in crystal reception. That wonderful device

THE "AMPLYWHISK"

GIVES CORRECT TOUCH TO MANY SENSITIVE POINTS AND MAKES CRYSTAL RECEPTION AS STABLE AS VALVE.

PRICE 6d. EACH Of all reputable Radio Dealers.

If difficult to obtain locally, post free direct from sole distributors, L. APPLE, Ltd., 13, Brewer Street, London, W.1. Trade terms on application. Telephone: Regent 1584.

DON'T BUY A NEW CRYSTAL, but secure to-day

THE "AMPLYWHISK"

RADIAX UNIVERSAL RECEIVERS

Complete or for Home Construction



These powerful regenerative sets will deal efficiently with all wave-lengths, and embody detail refinements which few other sets, however expensive, can boast. They are wonderful for distant reception. Get our list.

As supplied for Home Construction, they are complete with plan, diagram, fully drilled and engraved panel, and every detail required. Get our list. The following is a small selection. Send stamp for full list.

	Construc- tor's Set	Completed & Tested Set
2-valve	No. 24P £4 15 0	25 0 0
3 "	" 25P £7 5 0	£9 2 6
4 "	" 28P £9 15 0	£12 5 0

A Super-Power, beautifully finished Crystal-Set is our Challenge. No. 40 for Broadcast, No. 41 for Chelmsford also, prices £2 2 0 and £2 10 0 respectively. Full list of Sets and Components Catalogue, on request.

RADIAX

RADIAX LTD., 10, Radio House, Percy St., Tottenham Court Rd., London W.1

WE SATISFY YOU
Barclays 306

FIT THE NEW



RADIAX

G.P.

VALVE
AND SIMPLIFY RECEPTION

Here's an economical bright emitter general purpose valve with amplification factor of 9. Filament 3.5 to 4 volt .48 amp. Anode 30 to 90. Use it in any part of your set. Let us send you free and post free the curve for this valve. Just a P.C. will do.

RADIAX LTD., BOLLINGTON, Nr. MACCLESFIELD.

From Dealers **10/-** or Direct.

HULLO EVERYBODY!!

EXTRA POST MUST BE SENT WITH FOREIGN ORDERS.

All Goods on this Page Sent Post Free.

ALL VALVES ON POST SENT AT PURCHASER'S RISK.

VALVES

THORPE K4 .. 17/8
5 PIN
PHILLIPS 4 ELEC-
TRODE .. 12/6
(Both for UNIDYNE)

Bright Emitter

12/6 each.

B.T.H. .. R. Type
Ediswan .. A.R.
Marconi-Osram
R or R 5 V ..
Mullard-Ora ..
Cossar .. P.1 ..
Cossar .. P.2 ..
Myers-Universal
Mullard H.F. (Red Ring)
Mullard L.F. (Green Ring)

Dull Emitter

21/- each Type
B.T.H. .. B.3
Ediswan .. A.R.D.E.
Marconi-Osram D.E.R.

25/- each Type
B.T.H. .. B.5
Ediswan .. A.R.O.6
Marconi-Osram D.E.3
Mullard .. D.F.Ora

DULL EMITTER POWER VALVES
For use with A.R.D.E.
and D.E.R. Valves.
Marconi-Osram Type
D.E.6, 2-2.5 volt, 25
amps. 25/-

DULL EMITTER POWER VALVES
For use with '06 Valves.
B.T.H. Type B.6 35/-
Marconi-
Osram .. D.E.4 30/-
Mullard .. D.F.A.2 30/-

DULL EMITTER POWER VALVES
For use with Bright
Emitters.

B.T.H. .. B.4 35/-
Marconi-
Osram .. D.E.5 35/-
Mullard .. D.F.A.1 35/-
'06 French Metal 17/6
'06 Dutch 12/6
Phillips '04 Type 17/6

HEADPHONES

We can recommend these as being excellent Headphones, with a great reputation for telephone designs behind them. British Thomson-Houston, Sterling, Brown's Featherweight, Geophone, 4000 ohms resistance, each £1 5 0
British Ericsson, 4000 ohms resistance, each £1 6 6
G.R.C., 4000 ohms resistance, each £1 0 0
B.T.H., 4000 ohms resistance, each £1 5 0
Brands Matched Tone, 4000 ohms resistance, each £1 5 0
Brown Type A, 4000 ohms resistance, each £3 2 0
Sterling, 4000 ohms resistance, each £1 5 0
Geophone, 4000 ohms resistance, each £1 5 0

L.F. TRANSFORMERS

Eureka Concert Grand
This is a really high grade transformer for Inter-valve use. We can thoroughly recommend its use where first class results are required. It increases power and the purity of signals. Made in two sizes but only one quality.

"Concert Grand"
Model .. £1 10/-
No. 2 (Second Stage) .. £1 2/6
R.I. 5-1 Ratio .. 25/-
Igranfic, 5-1 Ratio 21/-
The Ferranti, 4-1 Ratio .. 17/6
The Silvertown, 5-1 Ratio .. 21/-
The G.R.C. 5-1 Ratio .. 15/-
The G.R.C. 10-1 Ratio .. 20/-
Marconi Ideal Power .. 35/-
Burndep L.F. 5-1 Ratio .. 25/-
Lissen T. 1 L.F. .. 30/-
" .. T. 2 L.F. .. 25/-
" .. T. 3 L.F. .. 16/6
Success, 5-1 Ratio 15/-
Ditto, Super .. 21/-
Ormond .. 14/11

LOUD SPEAKERS

BABY MODELS
Sterling, 4000 ohms .. £2 15/-
Sterling Dinkie 1 10/-
Brown's 2000 ohms .. 2 8/-
Amplion Junior 1 7/6
Dragon Fly .. 25/-

PARTS FOR 2-VALVE "UNIDYNE" RECEIVING SETS.

The 4-Electrode Valve Thorpe K4 each 17/6
6 Terminals for 10d.
Microstat Filament Resistances each 2/9
1 Variable Grid Leak 2/6
1 Single-Pole Double-Throw Switch 1/9 or 2/-
1 '0005 Variable Condenser, with Vernier 7/3
1 Cam Vernier 2-way Coil Holder .. 9/-
Panel, 5 1/2 in. by 1 1/2 in. drilled to hold 2 5-Pin Valve Holders .. for 2/-
2 5-Pin Valve Holders each 1/8
1 Fixed Condenser, '001 .. 1/2, 2/2, 3/-
1 Fixed Condenser, '0002 .. 1/2, 2/2, 3/-
1 Shrouded L.F. Transformer G.R.C. 10-1 .. 20/-
No. 18 Gauge Tinned Copper Wire 1/2 Necessary Screws, Nuts, and Washers. Free if above lot purchased.
Post Extra.

BRUNET (genuine)

4000 ohm Double 16/6
4000 ohm Single 8/11
2000 ohm Single 7/6
Post Free.

ENERGO

H.F. Plug-in Transformers. Post 2d. each.
No. 1. 150-450 .. 3/6
No. 2. 250-700 .. 3/11
No. 3. 450-1200 4/3
No. 4. 900-2000 4/6
No. 5. 1600-3000 4/9
No. 6. 2200-5000 4/11

FILAMENT RHEOSTATS

Wire Wound Type.
Rotary Action.



IGRANIC

The "different" filament resistance with stationary contact arm, extremely silent in operation, the plain type is recommended for amplifying valves. For the rectifier use the Vernier adjustment.

IGRANIC ohms each
Plain Type .. 4 & 7 4/6
With Vernier Adjustment .. 4 7/-
Plain Type .. 30 7/-
The Raymond 6 1/6
The Ormond 2/-
The T.C.B. Type, B .. 13 4/-
The T.C.B. Type, D .. 30 4/-
The Burndep, Dual, 222 5 & 30 7/6
Microstat .. 2/9
Lissenstat, Minor 3/6
Lissenstat .. 7/6
Lissenstat, Universal .. 10/6
Lissen Auxiliary Resistance .. 1/3

SHIPTON'S

30 ohms .. 3/-
60 ohms .. 3/-
600 ohms Potentiometer .. 4/6
Highly recommended.
T.C.B. 6, 13, 30 ohms .. 4/-
300 ohms Potentiometer .. 5/-
Highly recommended

IGRANIC COILS

Coils: 25, 5/-; 35, 5/-;
50, 5/2; 75, 5/6; 100, 7/-;
150, 7/10; 200, 8/8;
250, 9/-; 300, 9/5;
400, 10/3; 500, 10/6

DUBILIER. Post 2d.

.001, .002, .003, .004, .005, .006, Fixed .. 3/-
.0001, .0002, .0003, .0004, .0005 .. 2/6
Type 577, .01 .. 7/6
Grid Leaks each .. 2/6
Anode Resistance 50,000, 70,000, 80,000, 100,000, on stand complete 5/6

EBONITE

COIL HOLDERS

Polar 2-way, with Vernier .. 11/-
Polar 3-way, with Vernier .. 17/-
Polar-Junior, 2-way Cam Vernier 6/-
Polar Junior, 3-way Cam Vernier 9/6
Polar Universal 2-way .. 10/6
Goswell 2-way coil holder 5/6
Goswell 2-way Vernier Coil Holder 9/-
Goswell 3-way Coil Holder 7/6
Goswell 2-way Panel Mounting 3/-
Franco Cam Vernier 2-way .. 12/6 (glazed)
Franco 3-way .. 17/6
Goswell 3-way Cam Vernier .. 12/6

BASKET COIL HOLDERS

No. 1 .. 2 for 2/-
No. 2 .. 2 for 2/6
(both with plug)
Coil Stand 2-way for Basket Coils 5/6
Universal 2-way for Basket Coils 5/11

'BABY' COIL STANDS

2-way on base .. 3/-
3-way on base .. 4/9 (brass fittings)
2-way ex handles 4/6
3-way do. 5/6 (nickel fittings)
2-way Cam Vernier high class .. 5/9
Several high-grade patterns.
2-way .. at 5/- 5/6
3-way .. at 6/11 7/6

POLAR CONDENSERS

(Variable.) For Panel Mounting only.
A new form of Variable Condenser, constructed with a di-electric of air and high-grade mica, reducing losses to a minimum. Tested for insulation on 1000 volts potential. Adaptable to any type of Panel.
Each
'001 mfd. .. 10/6
'0005 .. 10/6
'0003 .. 10/6
'00025 .. 10/6

'Sterling' Square Law

Variable Condensers
A new type of superior quality, distinctive design of moving plates, with Vernier Adjustment. The auxiliary knob controls the Vernier.
Each
'001 mfd. .. £1 10/6
'0005 .. £1 5/6
'00025 .. £1 3/-



ACCUMULATORS MADE BY WELL-KNOWN FIRM FOR ME.

POST PRICES.
2 v. 40 amps. .. 10/6
4 v. 40 amps. .. 17/6
4 v. 60 amps. .. 20/6
4 v. 80 amps. .. 24/6
6 v. 60 amps. .. 29/-
6 v. 80 amps. .. 34/6
6 v. 105 amps. .. 40/6

EDISON BELL.

'0001 to '0005
Fixed .. 1/3
'002 to '006 .. 2/-
'001 .. 1/3
'0003 with Grid Leak .. 2/6
Variometer .. 10/-
Twin Detector .. 5/-
POST 2d. each.

BRETWOOD (New Model)

Var. Grid Leak .. 3/-
Anode Resistance 3/-
POST 2d. each.

Genuine DR. NESPER HEADPHONES

Adjustable diaphragm, detachable receivers, double leather-covered head-springs, long flexible cords, nickel plated parts. Very comfortable fitting to the head. LOOK FOR THE TRADE MARK. 4,000 ohms .. 12/11
Post 6d. pair.

McMICHAEL'S H.F. TRANSFORMERS

150-300 10/-
300-600 10/-
1,100-2,000 EACH (Manufacturer's advance.)
100,000 ohms Fixed .. 2/6
2 meg. Leak .. 2/6
Both with clips.

WATMEL Var. Grid Leak .. 2/6 Anode Resistance 3/6

NOTE! OUR WONDERFUL MICROMETER ADJUSTMENT GLASS-ENCLOSED DETECTOR. WHY PAY MORE? 1/9 POST 6d. each

WATES MICROSTAT For D.E. or R. Valves .. 2/9
Post Free.

TELEFUNKEN 4,000 ohms HEADPHONES As light as a 17/11 Feather ..

FRENCH THOMSON HOUSTON JUST TRY THEM. 4,000 ohms Per pair 15/11

HAWK COILS HONEYCOMB
25 .. 2/4 150 .. 4/6
35 .. 2/6 200 .. 5/4
50 .. 3/- 250 .. 5/6
75 .. 3/4 300 .. 6/-
100 .. 3/10 400 .. 6/6
POST 2d. COIL

"MURRAY" (Prov. Pat.)
Valve Holders .. 1/3
High Finish. Absolutely Safe. Low Capacity.

FAMOUS N AND K MODEL HEADPHONES
Genuine 4,000 ohms. Beware of Rubbish.
Post 6d. pair. Price 12/11

Formo, open 12/6
47 Bucks "Powquip" 12/6

Manchester "Powquip" 15/6
Ormond, 14/6

Shrouded 'Powquip' 18/-
Standard 'Powquip' 14/6

14
21
Voltmeter, C and S, one-hole fixing, 1/6

15
Grid Leak, 1/-, 1/3, 2/6

16
44
Rheostat, with Dial, Valve-holder, extra valve, 2/6
Bretwood, 1/9

23
24
D.P.D.T., 1/5
S.P.D.T., 1/2

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27, LISLE STREET, LEICESTER SQUARE, W.C.2

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RAYMOND'S VARIABLE CONDENSERS

ALL OUR CONDENSERS HAVE BEEN TESTED AND RECOMMENDED BY LEADING JOURNALS—UNSOLICITED.

- Exclusive Design.
- Stout Vanes.
- Extra Insulation, Very Compact.
- Narrowest Spaces (Pressed Aluminium).
- Centre Rod cannot bend.
- Terminal Connections, Capacity Guaranteed.
- Perfect Efficiency.
- Handsome Design.
- Takes up very little space in panel.
- Nickelled Fittings.
- Beautifully Made.
- New one-hole fixing method.
- Wonderful for Portables.



UNSURPASSED FOR FINE TUNING.

Costs a trifle more, a few pence only, and is just what you want. Nice dial and knob included.

'DE LUXE' MODEL

AS SHOWN, WITH DIAL, KNOB AND BUSH.

- 001 - 7/3
- 0005 - 5/11
- 0003 - 5/4
- 0002 - 4/11

POST 6d. SET.

John Blair, Esq.,
Rexall Pharmacy
says:—
Your Condensers are a REVELATION to me as a Dealer. Sept., 1924.

C. Walton, Esq., Andover.
Tested your Condensers on Megger and got "INFINITY"

NEW MODEL

SQUARE LAW WITHOUT VERNIER

- 0005 .. 7/9
- 0003 .. 6/5
- With Vernier.
- 0005 .. 10/6
- 0003 .. 9/6
- 001 - - 6/6
- 0005 - - 5/3
- 0003 - - 4/11
- 0002 - - 4/6
- Vernier, •0005 3/9

Post 6d. With knob and dial Knob & Dial included. Post 6d. Set.



WITH VERNIER

- 001 - - 9/3
- 0005 - - 7/3
- 0003 - - 6/9

With EBONITE DIAL and Two Knobs. Post 6d. Set.

TWIN CONDENSER

Composed of two equal units of •00025 or •0003 mfd., operated by one Knob and Dial, thereby enabling you to tune two circuits by one turn of the dial. Can be used in series or parallel. Complete as shown, with Knob and Dial:

9/- POST FREE.



SQUARE LAW TWIN

- 00025 .. 12/6
 - 0003 .. 12/6
 - 0005 .. 18/11
- Ebonite Ends. Fine Instrument. Knob and Dial.



VALVE DETECTOR & REACTION FROM Anode Circuit to A.T.C. 1 L.F. Valve.

PARTS FOR P.W. Standard 2-valve Set (Nov. 8th, 1924)

For Telephone reception UP TO 40 MILES. The following is a list of materials and cost of the chief parts for the 2-valve Set.

- 33 ENERGO (see list) Raymond 2.9 to 3/6
- 35 Tumbler Switch, 1/6
- 30 Connector, 1/6

JACKSON BROS. "J.B." VARIABLE CONDENSERS ORDINARY MODELS

	Standard	Super.	Microdenser
•001	8/6	9/6	11/6
•00075	8/-	9/-	11/-
•0005	7/-	8/-	10/-
•0003	5/9	6/9	8/9
•00025	5/9	6/9	8/9
•0002	5/-	5/6	8/-
•0001	4/9	5/3	7/9
Vernier	4/-	4/6	Post 3d. set.

SQUARE LAW

•001	9/6	•00035	6/9
•00075	9/-	•0002	5/6
•0005	8/-	•0001	5/3
•0003	6/9	Vernier	4/6

EBONITE

Post Prices.

	3/16 in.	1/4 in.
6 x 6	1/6	2/-
7 x 5	1/8	2/-
8 x 6	2/-	3/-
9 x 6	2/2	3/3
10 x 8	3/-	4/2
12 x 6	3/2	4/2
12 x 9	4/3	5/8
12 x 12	5/6	7/6
14 x 10	5/6	7/6

Cut to Size. 3/16 in. at 1d. square inch.



VARIOMETERS

The finest Variometer on the market at any price. Inside winding, suitable for broadcast reception on any P.M.G. Aerial, extraordinary close coupling, ensuring large tuning range. Inductance the highest possible—9.5 to 1. Metal feet can be adjusted to four different positions.

EDISON-BELL 10/- Post 6d.



Callers' prices elsewhere

2 for 1/6

53

2 for 2/-

25 S.P.D.T. 1/9 D.P.D.T. 2/8 China Base.

3 EDISON Bell Wedge, 2 for 2/-

4 1- each

36 EBONITE 1/-

37 See Lists.

41 Dragon Fly, 25/-

29 Formo Shrouded, 18/-

6 With Clips, 2 for 1/6

46 Cut from Rod Legless 1/3

48 5-1 11/9

34 43 BASKET 2-way, 4/11.

40 Formo Densur.

32 M'Mich'l H.F.Bar-rel 10/-

51 Enclosed Detector Micrometer Adjustment 2/3

55 One-Hole Fixing, 1/6

Allen Variable Grid Leak, 1/8

54 EBONITE Variometer, with dial. 4/11, 5/11

40 Formo Densur.

32 M'Mich'l H.F.Bar-rel 10/-

42 CAM VERNIER 2-way (see lists).

51 Enclosed Detector Micrometer Adjustment 2/3

55 One-Hole Fixing, 1/6

42 CAM VERNIER 2-way (see lists).

K. RAYMOND 27, LISLE STREET, LEICESTER SQUARE, W.C.2

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SUNDRIES.

- Legless Valve Holder .. 10d.
- Solid Ebonite .. 1/5
- Phone Cords (6 feet) .. 7 1/2d.
- Nugraving .. 3d.
- Similar Sets (Titles or Scales) .. 2d.
- Good Knobs .. doz. 4 1/2d.
- Studs, Nuts and Washers .. 8d. to 2 1/2d.
- Switch Arms .. 15 ft. 5d.
- Copper Foil .. 12 feet 5d.
- 18g. Sq. Tin Copper .. 15 ft. 5d.
- 16g. Sq. Tin Copper .. 12 feet 5d.
- Round Tin Copper, various Sizes.
- Insulated Staples 5 a .. 1d.
- Insulated Hooks 4 for .. 3d.
- Rubber Lead in, 30 feet .. 1/3
- 7/22 Copper Aerials, 100 ft. 1/10 1/2
- Extra Heavy Aerial .. 100 ft. 2/- & 2/3
- Good Valve Holders .. 3d.
- H.T.C. in Stock .. 1/8, 1/9
- H.F. Transformers, 300/600 .. 2/9
- Empire Tape, 1/2 in., 2 yds. .. 1d.
- Ditto, 1/2 in., 2 yds. .. 1 1/2d.
- 6 in. Ebonite Anticap .. 8d.
- Connecticut Switches .. 1/4
- Sorbo Rubber Ear Caps .. 1/4
- Adhesive Tape Roll .. 2 1/2d.
- Allen var. Gd. Lk. .. 1/3
- Allen Anode Res. .. 1/3
- Scales, 0-190, 2d., 3d., 4d.
- Dial and Knob (Ed. Bell) 1/3
- Dial (Ebonite) .. 10d.
- Brunet Headphones .. 14/6
- Twin Flex .. 4 yds. 6d.
- D.C.C. Bell Wire, 10 yds. 5d. (Indiarubber covered)
- Sleeving .. yd. 4d.
- Wander Plugs .. pr. 3d.
- Coloured Plugs each 1 1/2d. (All screw pattern)
- Electron Aerial .. 1/3 1/2
- Polished Boxes, 8 by 6 .. 3/6
- Strong Valve Template .. 4d.
- Egg Insulators .. 1d.
- Reel ditto .. 1d.
- Thick Rubber Lead-in per yd. 2d., 3d.
- Ribbon Aerial 100 ft. 1/10
- Panels Drilled
- Radio Press Envelopes.
- Raymond Fixed Condensers '001, '0001 to '0005, 10d.
- '002, '003, '004 .. 1/-
- '006 1/3; '01 1/9; '02 1/9
- Polar Micrometer Condenser .. 5 6
- 2 Meg. Grid Leak .. 10d.
- Rubber Lead-in 101 doz. yds.
- Valve Windows 6d., 7d., 9d.
- R.I. Choke Coil .. 10/-
- Lissen Ditto .. 10/-
- Bretwood Valve Holder 1/9

SWITCHES ON

- Porcelain D.P.D.T. .. 1/7 1/2
- Porcelain S.P.D.T. .. 1/1
- Ebonite D.P.D.T. .. 1/8
- Ebonite S.P.D.T. .. 1/3
- Min. Panel D.P.D.T. .. 1/-
- Min. Panel S.P.D.T. .. 10 1/2d.
- Tungstallite .. 1/-
- Microrstat .. 2/8
- Tumbler Switches .. 1/4
- (Ebonite) .. 1/4
- Fibre Strip (for Coils) 3 feet 2 1/2d.
- D.C.C. Wire, per 1/2 lb. — 13 g. .. 9d. 20 g. .. 9d. 22 g. .. 10d. 24 g. .. 1/- 26 g. .. 1/1 28 g. .. 1/3 30 g. .. 1/8 Etc., etc.
- Solder, per stick 2d.
- 2 Color Flex .. yard 3d.
- Shellac .. 5d.
- Battery Box .. 4/6 (with clips for 36 v.)
- Nickel Pillar Terminals 2d.
- Nickel Contact Studs 2 for 1 1/2d.
- Nickel Switch Arm .. 1/- (one-hole fixing)
- Loading Coil and plug 8d.
- Condenser Brushes .. 6d.

BRASS PARTS.

- W.O. Terminals .. 1d.
- Small Pillar .. 1d.
- 'Phone 4 B.A. .. 1d.
- 'Phone 2 B.A., 2 for .. 2 1/2d.
- Valve Sockets, 4 for 3d. (Above with Nut Washer)
- Valve Pins and Nuts, 2 a 1d.
- Stop Pins and Nuts 2 a 1d.
- Plug and Socket pr. 1d.
- Spring Washers 4 a 1d.
- Spade Screws .. 1d
- Pin Screws .. 2 for 1 1/2d.
- Spade Tags .. 5 a 1d
- Spring Pillar Terminals 2 1/2d.
- Nuts, 2, 4, 5, 6 B.A. doz. 2d.
- Washers (Brass) 12 a 1d.

DETECTORS, &c.

- Enclosed Brass, Large 1/3
- Ditto, Nickel or Brass, Large .. 1/6
- Small Brass .. 9 1/2d.
- Ebonite, Enclosed .. 1/-
- Burndent .. 5/-
- Easi-Fix Cups 1d. & 1 1/2d.
- Gold Spearpoint .. 3d.
- Neutron Crystal .. 1/6
- Hertzite (Shaw's) .. 1/-
- Midite .. 6d.

VALVES.

- Dutch Detector .. 4/9
- Dutch "R" .. 5/-
- Phillips "R" .. 7/6
- French "Metal" .. 6/11

TOOLS.

- Set of Spanners .. 1/4
- Taps, 0, 2, 4, 6 B.A. set 2/-
- Small Soldering Irons 8 1/2d.
- 7-Twist Drills .. 1/4

SHAW'S HERTZITE.

BEATS ALL OTHER "ITES." 1/-
Impossible to Advertise All the Goods Stocked.

MYERS VALVES.

UNIVERSAL D.E. 12/6 21/-

EXIDE. D.T. 9 Type. 2 Volts. (Glass). (For '06) 5/-

EBONITE PARTS.

- Good Coil Plugs from 4 1/2d.
- Edison Bell Shaped .. 1/-
- Raymond ditto .. 10 1/2d.
- Basket Adapters .. 8 1/2d. Also at 1/- & 1/3
- 2-way Coil Stands .. 2/6
- With Extens. Handle 2/11
- Also at 3/6, 4/-, 4/6
- 3-way .. 4/3, 4/6, 5/-
- Goswell-Cam Vernier 9/-
- Franco .. 12/6
- Polar .. 11/-
- Etc., etc.
- Coil Plug on Stand .. 1/-
- Ditto, Swivel Movement 1/3
- Coil Plug and Clips .. 6 1/2d.

H.T. BATTERIES.

- Best Made 30 v. .. 4/6
- Best Made 60 v. .. 7/6
- Best Made 66 v. .. 8/6
- B.B.C. 9 volts .. 3/-
- B.B.C. 60 volts .. 9/6
- B.B.C. 36 volts .. 5/6
- B.B.C. 16 volts .. 2 6

EBONITE STOCK SIZES

- 6 x 6 .. 1/4
- 7 x 5 .. 1/4
- 8 x 6 .. 1/10
- 9 x 6 .. 2/-
- 10 x 8 .. 3/-
- 12 x 6 .. 3/-
- 12 x 9 .. 4/3
- 12 x 12 .. 5/6
- 14 x 10 .. 5/6
- Cut to size WESTOCK 1 1/2d. sq. inch. in. EBONITE.

CRYSTAL DETECTOR.

Glass enclosed. Micrometer adjustment. 1/9

MURRAY VALVE HOLDER (Patent) 1/3

Blue and Red TUNGSTALITE

MIDITE, GECOSITE. NEUTRON Stocked.

SIMPLEX LEAD IN 1/3

"POPULAR WIRELESS."

FREE TO CALLERS. (Limited number, of course.)

BRASS FORMER

'DOUBLE' 23 spokes 2/11 each side. Make your own coils.

BEST SWITCH ARM.

12 Studs THE LOT 12 Nuts. 12 Washers. 1/-

FAMOUS N and K MODEL HEADPHONES

Genuine 4,000 ohms. BEWARE OF RUBBISH. Price 12 1/11

"METAL" (FRENCH) '06 VALVES, 15/11

DR. NESPER (SEE TRADE MARK) 4,000 OHM 'PHONES 12/11 (NOT DR. "ANYTHING!")

VARIOMETERS.

- Impregnated Board, Wound D.C.C. and Clips, 200/600 metres 2/6
- Very Good Value, Wound D.C.C. and Knob .. 1/8
- Ebonite D.S. Wound, with Ball Rotor and Knob, 200/700 metres 5/11
- Ebonite, 200/600 .. 3/11
- Raymond Inside Wind-inx .. 8/11

RHEOSTATS.

- Small 5 ohms "C" .. 1/3
- One Hole Fixing .. 1/3
- Ormond .. 1/9
- Ebonite Former .. 1/6
- Ditto and Dial .. 1/10
- Igranite, T.C.B., and all known makes.

16g D.C.C. USUALLY IN STOCK

FIBRE STRIP (For Coils) 3 ft. long, 1 in. wide, 2 1/2d. per length.

BREAST DRILLS

0 to 1 chuck Cut Bevel and Gear 4/9

BOXES

7 x 5 9 x 6 12 x 9 8 x 6 10 x 8 12 x 12

BASKET COILS

- DUPEX WAXLESS (5) .. 1/8 1,200/2,000 metres
- WAXLESS SET OF 5 .. 3/9 25, 35, 50, 75, 100
- D.C.C. CHELMSFORD 1/- 1/3
- ENAMELLED Do. .. 1/- 1/2
- WAXED (6) 200/3,600 .. 1/8
- Ditto (7) 150/3,600 .. 1/10
- WAXLESS (2) ST 100 .. 1/-
- Ditto (2) UNIDYNE 1/- (For Broadcasting only)
- D.C.C. COIL FOR CHELMSFORD complete with adapter .. 2/3 (to use with 650 variometer)

BATTERIES 4'5

4 1/2d. & 5d.

MANSBRIDGE TYPE FIXED CONDENSERS

- With 2 Fixing Lugs. '25 Special Price 3/6
- 2 Microfarad .. 3/11

"ORMOND" L.F.

A WONDERFUL TRANSFORMER 13/11

ACCUMULATORS

- MADE BY WELL-KNOWN FIRM FOR ME.
- 2 v. 40 amps. .. 9/8
- 4 v. 40 amps. .. 16/3
- 4 v. 60 amps. .. 17/11
- 4 v. 80 amps. .. 23/8
- 6 v. 60 amps. .. 27/6
- 6 v. 80 amps. .. 33/-
- 6 v. 105 amps. .. 38/6

PHILLIPS

4 ELECTRODE VALVE 12/6

DUTCH '06

VALVES 12/6

GAMAGES PERMANITE 1/-

Experimenter's Sets of 4 Cat's Whiskers 2d.

OUR WONDERFUL H.T. BATTERIES

- 30 v. 4/6 60 v. 7/6
- 66 v. 8/6

BROWNIE "IMPROVED" WIRELESS SET 7/6

RAYMOND CRYSTAL SETS

7/11 9/11 12/11

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Correspondence

A READER'S GENEROUS OFFER.

To the Editor, POPULAR WIRELESS.
Dear Sir,—I have in my possession about 50 copies of "P.W." dating from September 8th, 1923, and including all the "Unidyne" Nos. As I do not aspire to anything more than a crystal set at present, I thought, perhaps, some of your readers might be glad of these back numbers. Being a regular reader of "P.W." I shall be sure of future information if I think of building a valve set. Needless to say, I do not expect any payment for the above, but I thought it a pity to destroy them without writing to you first. I should be glad of applications by letter, as my hours of work vary a lot.

Yours faithfully,

F. T. EATWELL.

43, Turneville Road, West Kensington, London, W.14.

SOME UNIDYNE EXPERIMENTS.

To the Editor, POPULAR WIRELESS.
Dear Sir,—Perhaps an account of my experiences with a one-valve Unidyne receiver may be of interest to you and your readers.

At the time your articles on the subject started to appear, the only four electrode valve obtainable locally was one of unknown origin, and particulars as to its requirements were not stated, but when used on a detector employing H.T., it gave quite good results with 3 volts on the filament and 30 on the plate, all the main B.B.C. stations coming in well.

The valve was then connected up exactly in accordance with the first published diagram, except that having no available 10 to 1 transformer, this was omitted. Results, practically nil. Local station, three miles away, very faint and badly distorted. Results were no better even when a 10 to 1 transformer was connected up, and no manipulation of various grid leaks, coils, condensers, made signals any louder.

These tests were carried out using the grid next the filament as an auxiliary, and this is connected to a terminal on the valve cap. Changing over the connections so as to use the grid next the plate as the auxiliary made all the difference, the local station coming in with a roar, although distant stations were faint. It was not until a variable leak of home construction was inserted that I got really good results, far better in fact than when employing H.T. I might add that I tried every grid leak on the market with one exception, but they would not function. In most cases the variation was not gradual, and in others not stable. A 6-volt accumulator was used with the filament and rheostat across 4 volts, and the extra grid connected to the 6-volt terminal. This naturally suggested trying an extra potential on the grid. This was done by connecting a potentiometer across a flash-lamp battery in series with the accumulator, with the moving contact connected to the grid. This introduced slight parasitic noises, owing to the extra battery employed, but they quite disappeared when another accumulator was used as a source of the extra potential.

The results were simply astounding, distant stations coming in louder than with a two-valve set employing H.T. (H.F. and detector), although I am afraid that using an extra battery gets away from the real idea of the Unidyne principle. Anyhow, those of your readers who may have obtained valves that do not function in the ordinary way may care to try the idea out.

As to results, all B.B.C. and most Continental stations come in well, and on the only two occasions that I have set up, W.G.Y. has been heard easily. The first occasion a broadcast service was heard, and the second the proceedings of some club. The latter occasion was somewhat spoiled by atmospheric conditions.

Tuning is very critical, and I find it necessary to vernier everything, especially the filament rheostat.

In conclusion, may I thank Messrs. Dowding and Rogers for evolving a most interesting circuit, and I should like to ask them whether the extra grid potential used happens to be a characteristic of the valve in use, or whether it would apply to the valves recommended in their articles.

Yours faithfully,

M. J. PANFORD.

90, Wheelwright Road, Erdington, Birmingham.
[That is undoubtedly a characteristic of the valve used.—TECH. EDITOR.]

FURTHER UNIDYNE SUCCESSES.

To the Editor, POPULAR WIRELESS.

Dear Sir,—Permit me to proffer my best thanks to Messrs. Dowding and Rogers for their wonderful discovery, "The Unidyne Circuit." I fixed up a one-valve set as per instructions in "P.W." 124. Made several absurd blunders owing entirely to my extreme ignorance in wireless matters. After some time spent in correcting my misdoings, etc., which, by the way, were entirely a matter of splicing in the wiring behind the panel, I suddenly picked up Cardiff, Bournemouth, London, and also very unexpectedly Belfast, at commencement of opening of new B.B.C. station. I later on turned back

(Continued on page 637.)



Illustration showing the horn of a Brown Loud Speaker being sprayed with enamel.

From first to last a wonderful Loud Speaker—

MANY people hearing the small Brown H.2 Loud Speaker are amazed at its volume. They think—quite naturally—because it is small in size that its volume is likely to be insufficient for a room of average size. On the contrary, by actual comparative test it is easy to prove that a small Brown Loud Speaker gives greater volume—and certainly incomparably better tone—than many other Loud Speakers twice its size.

The secret of its success lies in the tuned reed principle of reproduction used in conjunction with a cone-shaped aluminium diaphragm.

When it is possible to buy a genuine Brown high-resistance Loud Speaker for as little as 50/- is it worth while to prejudice your enjoyment by purchasing one which cannot approach it either for volume or tonal purity?

Remember that from first to last the H.2 is manufactured under strict Brown supervision—the actual tests that it must pass before being released for issue are stringent and exacting. You may be sure that the one that you buy must have actually conformed to the Brown standard of richness of tone and adequate volume.

Prices and Types.

Type H.1, 21 in. high:	Type H.2, 12 in. high:
120 ohms £5 5 0	120 ohms £2 5 0
2,000 ohms £5 8 0	2,000 ohms £2 8 0
4,000 ohms £5 10 0	4,000 ohms £2 10 0
Type Q. (in all resistances) £15 15 0	

S. G. BROWN Ltd.,
Victoria Road,
N. Acton, W.3.
Showrooms:
19, Mortimer Street, W.1.
15, Moorfields, Liverpool.
67, High St., Southampton.



Gilbert Ad. 745.

CLIMAX RADIO

THE BEST FIVE SHILLINGS' WORTH of Radio I Ever Bought.

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RADIOTORIAL

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

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All contributions to be addressed to The Editor, POPULAR WIRELESS AND WIRELESS

REVIEW, The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc. to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

Technical queries are answered by post at a charge of 6d. a query or 1s. for three. All queries must be addressed to the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, E.C. 4, and must be accompanied by a stamped and addressed envelope. Copies of the queries sent should be kept, as the original query cannot be reproduced in the answer. Cash should be sent in the form of postal orders.

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.

Questions and Answers

"HOME CONSTRUCTOR" and others inquire what number of metal plates should be used to make up small fixed condensers. The dielectric to be employed to consist of sheets of mica, measuring .01 in. in thickness. (This is about the thickness of an ordinary stamped postcard.)

the table (.01), and multiplying the resultant number of plates by that ratio.

For similar condensers employing waxed paper as a dielectric, see the Table given in Radiotorial "P.W." No. 128 (November 8th, 1924).

A. C. (Bridgend, Glam.)—Myself and half a dozen friends wish to form a radio club or society, but do not know how to set about the affair.

What is the best procedure when there is no similar institution in the district to which we could go for advice or assistance?

The first necessity is to get an approximate idea of the number of prospective members. In a small town or village this can be done personally by approaching those interested, but where this is not practicable a public meeting can be arranged.

If this is advertised in the local press, and is well attended, all officers can be elected provisionally.

FIXED CONDENSERS. MICA DIELECTRIC. NUMBER OF METAL PLATES.

Length in inches.	Breadth in inches.	.001 Mfd.	.0025 Mfd.	.005 Mfd.	.0075 Mfd.	.01 Mfd.	.025 Mfd.	.05 Mfd.	0.75 Mfd.	0.1 Mfd.	0.25 Mfd.	0.5 Mfd.
2	1	5	12	23	34	46	112	223	335	—	—	—
	1½	4	8	16	23	31	75	149	224	—	—	—
2½	2	3	7	12	18	23	57	112	168	—	—	—
	1	5	10	19	28	37	90	179	268	—	—	—
	1½	3	7	13	19	25	60	120	179	240	—	—
3	2	3	5	10	14	19	46	90	135	179	—	—
	2½	2	5	8	12	15	37	72	108	143	—	—
	3	2	3	6	11	16	51	100	150	199	—	—
3½	2	—	4	7	11	14	33	65	97	128	319	—
	2½	—	4	6	9	11	20	52	77	103	255	—
	3	—	3	5	7	10	22	43	65	86	213	425
	3½	—	3	5	6	8	19	37	56	73	193	365
4	2½	—	3	5	8	10	23	46	68	90	223	446
	3	—	3	5	7	8	20	38	57	75	187	373
	3½	—	—	4	6	7	17	33	49	65	160	319
	4	—	—	4	5	7	15	29	43	57	140	279
5	3	—	—	4	5	7	16	31	46	61	149	298
	3½	—	—	4	5	6	14	26	39	52	123	255
	4	—	—	3	4	5	12	23	34	46	112	224
	5	—	—	3	4	5	10	19	28	37	90	179

The table shown herewith gives the necessary particulars for capacities between .001 and .5 mfd. A mica dielectric is assumed, and if the sheets of mica do not measure exactly .01 in. the figures must be corrected. This is done by finding the ratio of the new thickness to that employed in

Alternatively a secretary and committee can be elected, and a further meeting called to make the final appointments when the arrangements are taking more definite shape.

(Continued on page 665.)

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 664.)

As soon as the demand for such a society is assured the secretary (or person doing secretarial duties pending official appointment) should communicate with The Secretary, Radio Society of Great Britain, 53, Victoria Street, London, S.W.

Full details of the position should be given, and the secretary of the R.S.G.B. will then advise as to further procedure.

R. A. D. (Leyton).—Can you please inform me how (if possible) to prevent fading during the service from 2 LO? I have only a crystal set, which receives the broadcast speeches, etc., beautifully; but myself and wife are often sadly disappointed through the transmission fading away to a whisper, as though the music or speech came from behind closed doors. Can this be attributed to my neighbours on either side of me using valve sets?

"Fading" is really a long-distance phenomenon, and does not affect crystal sets over short distances. Your trouble is almost certainly due to interference from neighbouring sets, and unfortunately there is only one remedy for this, and that is co-operation amongst listeners.

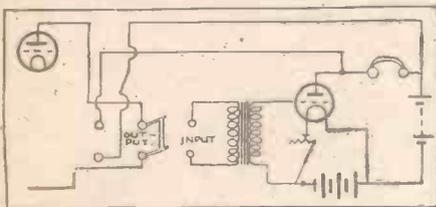
It often happens that interference is caused quite unconsciously, and a tactful talk will therefore be quite sufficient to ensure that care and consideration are used in future. But if serious re-radiation or oscillation completely spoils programmes you should get in touch with the local Radio Society, and also with the B.B.C.

B. F. (Sligo).—I have an H.F. and detector straight circuit set with which I can receive all B.B.C. stations at good 'phone strength. I have also received Hamburg on two consecutive nights, and an unknown French station practically any desired night.

I now wish to add a third valve to increase signal strength, making the set H.F., det., and L.F., but I only wish to use the third valve for certain stations. Can a D.P.D.T. switch be used to cut out this valve when it is desired to use the set as at present (two valves), and, if so, what are the connections?

Would grid bias be necessary or an improvement?

The connections are shown below, though if reaction is used it must be inserted between the plate of the valve and the switch. It will be noticed that when the switch is thrown over to the left-hand position the 'phones are placed in the plate circuit of the preceding valve. No grid bias is shown in the diagram, but it is generally an advantage to insert this, at the point where the lead from the rheostat joins the lead from L.T. to the secondary of the L.F. intervalve transformer; one or more dry cells are



generally connected in series for this purpose and joined to the lower end of the transformer secondary. The positive pole of the cells is connected to the L.T. negative side, so that the grid is permanently negative with respect to the filament. The number of cells which should be added for this purpose varies with different valves, but generally one or two will be sufficient. It will be necessary to vary the H.T. voltage in accordance with variations of the grid bias, but when once a suitable bias value has been found and the correct H.T. adjustment made there will be little need to alter the values. The chief necessity for alteration arises from the fact that as the batteries deteriorate the set apparently requires a higher H.T. voltage than previously, though actually this "increase" is due to the voltage of the battery having dropped so that the figures are no longer a reliable indication of its voltage.

"NEWCOMER" (Bristol).—I wish to construct a one-valve set of the ordinary H.T. type using reaction, but I am anxious to make it very selective for tuning. I have a three-coil

(Continued on page 666.)

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Wires:
"Navalhada, Catgreen, London."

**RADIOTORIAL
QUESTIONS & ANSWERS.**

(Continued from page 665.)

holder on hand and am told that I should use a loose-coupled aerial circuit. Has such a set been described recently in "P.W.," and if so, could I use a .001 variable condenser and a .002 grid condenser in the circuit?

A loose-coupled circuit of this kind was shown pictorially and theoretically in "P.W." 124, together with a description of components. In the latter the value of the grid condenser is given as .00025, but this small variation is immaterial, and your component would be quite O.K. The tuning condenser value is .001, which is the same capacity as that you have on hand, but other readers should note that this value is not very critical. Many experimenters prefer to use a .0005 variable condenser, and if a series-parallel switch is employed it is a rather better value than a .001 for all-round use.

S. O. B. (Bromley, Kent).—I have a four-valve set from which I can get excellent loud speaker results from most British and a good many Continental stations. I am told that fixed condensers across H.T. and loud speaker

Our Query Department.

In future a charge of Sixpence per Query will be made for answering all technical questions submitted to the Technical Staff of POPULAR WIRELESS. A group of three queries will be answered for One Shilling. Postal Orders must be enclosed with all queries and a stamped addressed envelope in addition.

THIS NEW ARRANGEMENT IS NOW IN FORCE.

Since the inception of POPULAR WIRELESS, readers have had all their problems settled for them free of charge, but with the great increase in the circulation and the corresponding increase in the number of queries sent in, the task of dealing with the latter has become gigantic. A large Technical Staff is now employed answering queries, and it is with the object of relieving the pressure on them that we have decided to make the small charges mentioned.

Readers of POPULAR WIRELESS know that the Editor and Staff of this journal have always had, and always will have, their best interests at heart.

(or 'phones when used) would improve results still further. Are these condensers really necessary, considering that already the set is decidedly good?

The condensers are not absolutely necessary in either position—that is, so far as the actual "working" of the set. But you will probably find that the apparatus will not function with its maximum efficiency unless the condensers are used. The presence of these condensers—they should be about .002 to .003 mfd.—is required to provide a path for the H.F. currents that are passing through the plate circuit. If the condensers were not there the high resistance and inductance of the H.T. battery and the 'phones would form a path, but it would have a very high value of impedance and would choke back the H.F. impulses. This would result in a loss of efficiency, and therefore a decrease in signal strength. There is no need to have a condenser across the primaries of all the transformers, if there is one in shunt with the first L.F. transformer that will be sufficient. If you require the absolute maximum out of your set, a great deal can often be accomplished by a little experimenting with the values of these fixed condensers. For instance, you will probably find that large deviations in the size of the condenser across the H.T. battery will not have any noticeable effect, but that if you alter the capacity across the L.F. transformer to any great extent the signal strength will be impaired or increased according as you vary away from or towards the correct value. There is a correct value, though it is not so critical in this case as it is when you are dealing with H.F. circuits.



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6-Volt	{ 20 amp-hours actual	42/9
	{ 30 amp-hours actual	53/6

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Gilbert Ad. 1766.

CORRESPONDENCE.

(Continued from page 663.)

to London, when I received remainder of programme much louder, as it was being relayed from there. This is my first attempt at wireless work, and despite the ridicule of acquaintances, etc., I am more than satisfied with results, which are much clearer and truer than I have received on friends' sets using H.T. I am adding L.F. as soon as parts arrive. Have placed standing order with newsagent for "P.W.," which I would not be without, you bet.

Please accept my best wishes for the future success of "P.W." and the Unidyne, which I am certain is assured for all time.

Faithfully yours,
ERNEST BACKHOUSE.

2, North Row, Warrington.

RECEPTION OF U.S. STATIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am able to confirm Mr. Ralston's report on reception of W G Y, Schenectady, New York, which speaks very highly for your "Unidyne" receivers.

Being rather disappointed at not receiving Captain Eckersley's speech, I decided to try some American stations direct. Tuning round to about 380 metres, I picked up W G Y, and heard the preacher reading the lesson, the words being very clear and distinct, atmospheres having quietened down; the hymn was also well received, my only interruptions being a few splutterings of Morse. I also received another station on about 405 metres, but speech was too faint to be readable. My set is a home-made two-valve, tuned anode and reaction.

Yours faithfully,
A. M. GOODWELL.

41, Bede Street, Sunderland.

THE B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I wish fully to endorse everything your correspondent, Mr. Holloway, writes regarding the B.B.C. programmes.

I am certain that the gentlemen at the microphone end of the works would be astonished, not at the size, but at the smallness of their average audiences in comparison with the number of licences issued, could they but see them.

If people had not sunk an appreciable amount of money in the apparatus, and supposing the sets were hired out, then I venture to assert that thousands would give them up.

What we want is entertainment, amusement, and for the most part we get most insufferably stodgy programmes.

I have talked to many people about it, and have yet to find any satisfied.

Possibly it is a task beyond the wit of man. I know it is very difficult, but unless more imagination and less "education" is put in the B.B.C., I don't give it a very long life.

Yours faithfully,
J. H. FLETCHER.

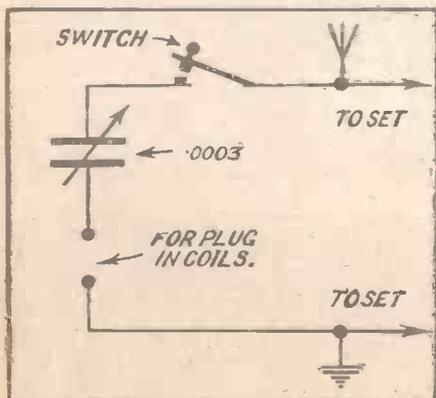
Orchard Bungalow, Sutton Courtney, Berks.

ELIMINATING INTERFERENCE.

The Editor, POPULAR WIRELESS.

Dear Sir,—In reference to a letter from Mr. Holloway, of Croydon, in "P.W." for week ending Sept. 20th concerning "Interference." He states therein that he has tried every wave-trap and eliminator on the market and cannot succeed in totally cutting out interference from London, and apparently he has become extremely dissatisfied because his range for good-reception is confined to London only. It may be of interest to him and other readers of "P.W." that, since 2 LO first commenced transmission, I have succeeded in totally eliminating this station, and during the hours of darkness most of the British stations, Paris, and Berlin, etc., are regularly received at

(Continued on page 668.)



A.J.S.

The
Hall Mark

RADIO OF PERFECTION

AMONG the many reasons why the A.J.S. Loud Speaker appeals instantly to the Radioist is the name—the name of a great manufacturing House famous throughout the Empire. This in itself is a positive guarantee of reliability, sound workmanship and all that goes to build up complete and lasting satisfaction. Yet it is perhaps the least of the A.J.S. Loud Speaker's claims to distinction. Foremost among its merits we place the extreme sensitiveness and perfect truth with which, thanks to the scientific proportions of the non-resonant horn, any volume of sound, whether great or small, is reproduced accurately and with perfect purity. Again, there is its robust construction, artistic matt finish and simplicity of adjustment—a each a deciding feature in choosing from among the many instruments on the market. Note, too, that with the A.J.S. no step-down Transformer is required—it is specially wound to a correct impedance for music or speech, and may be used wherever high resistance is required.

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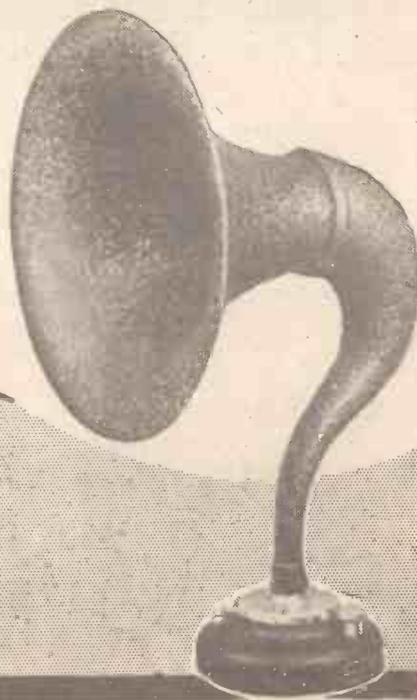
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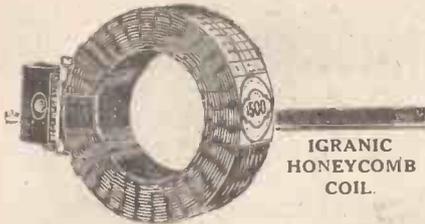
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CORRESPONDENCE.

(Continued from page 667.)

excellent strength on a one-valve reflex. Also, I can eliminate Chelmsford and receive Radio-Paris with perfect clarity. The circuit used is as shown, and is connected in parallel across the aerial and earth terminals of the set.

To eliminate 2 L O a 50-turn basket coil wound on 9 spokes with a 2-inch diameter is used, and for 5 X X 350 turns of 32 gauge wire on a cardboard former with 1 1/2 inch diameter.

Yours truly,

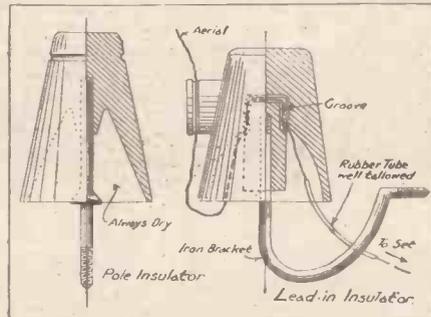
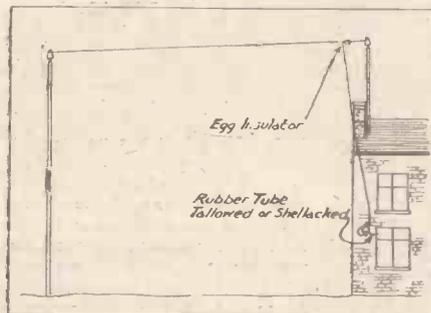
J. W. LUBDOCK.

P.S.—My distance from 2 L O is 4 miles. 4, Boscawen Street, Deptford, S.E. 8.

CONCERNING INSULATORS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Excuse me taking the liberty of writing, but being a reader of your valuable paper POPULAR WIRELESS, I note with interest improvements made in components week by week, but insulators never seem to make much headway, most enthusiasts being content with the usual



egg, reel, or barrel insulator. Having found these quite useless in preventing leakage by wet, I tried the ordinary house telephone insulator, and I have found a marked improvement in reception. Another item is the lead-in tube, the usual conventional type, ebonite tube with brass rod and nuts, being quite unsuitable in wet weather. The above insulators answer admirably. They may cost a little more, but they make up for that by solving a problem. The above diagrams show my arrangement.

Yours faithfully,

A. E. WHITEHEAD.

10, Argyle Place, Clifton Wood, Bristol.

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Everything is so clearly explained that any beginner, without previous experience, can make the most efficient receiving sets obtainable.

Full Instructions are given for MAKING COMPLETE CRYSTAL SETS, ONE AND TWO VALVE AMPLIFIERS, DUAL AMPLIFICATION SETS, ALSO THE VERY LATEST TWO, THREE, AND FOUR VALVE TUNED ANODE RECEIVERS.

160 pages (28 diagrams) 1/3 post free.

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ALL MAKES and Ex-Army 'Phones rewound 4,000 ohms, 4/6 per pair; 8,000 ohms, 1/- extra. Postage, 6d. Remagnetizing, 1/- per pair. Transformers rewound, any ratio, from 5/-. The H.R.P., 48, St. Mary's Road, Leyton, E.10.

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The Home Radio. How to make and use it By Verrill. For those interested in improving their sets or installing more efficient ones. Published 3/6. Offered, now, for 1/9, post free. Quote offer 120.

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SKINDERVIKEN MICROPHONE BUTTON, PRICE 5/-

TECHNICAL NOTES.

(Continued from page 616.)

kinds of animal and vegetable substances. Phenol is the active principle of what is commonly known as carbolic acid.

The various ingredients, after treatment, form a resinous substance which can be moulded to any desired shape and is coloured by the addition of various pigments. Unfortunately, substances such as bakelite are regarded by many people merely as inferior substances for ebonite, and it is therefore important to distinguish between substitutes and what we may call genuine alternatives.

Bakelite, for example, is equal to ebonite in its insulating properties, if not, in fact, superior, and it has many other valuable properties not possessed by ebonite.

'Phone Caps.

Many amateurs have a habit of removing and replacing the caps of their headphones. Unless this is absolutely necessary for some reason, it should be avoided, as the vibration of the diaphragm is considerably influenced by the manner in which it is clamped against the case of the receiver. When the 'phones are assembled in the factory, at any rate in the cases of the better types of 'phones, the receiver-caps are tightened up by means of a machine which exerts the correct pressure. The 'phones are then tested by means of many delicate instruments.

Condenser Faults.

In making fixed condensers for experimental purposes, using sheets of tinfoil and mica clamped between pieces of ebonite sheet, a difficulty often experienced is in getting all the "plates" of each set into proper contact with the screw-bolt which serves also as a terminal. The best way to do this is to crumple a piece of tinfoil into a rough ring and lay this around the screw-bolt at the point where the latter passes through the hole in the tinfoil sheets. When the bolts are pulled up tight, this crumpled ring of tinfoil is pressed against the tinfoil sheets as well as against the bolt and ensures good contact between the two.

Electric Light Aerials.

There must be a very large number of people in this country who use the Ducon electric-light aerial, owing to its convenience and cheapness. But it is perhaps a little surprising to read, in the "Wireless Age," that in America alone no less than four hundred thousand of these Ducon aerials are now in use.

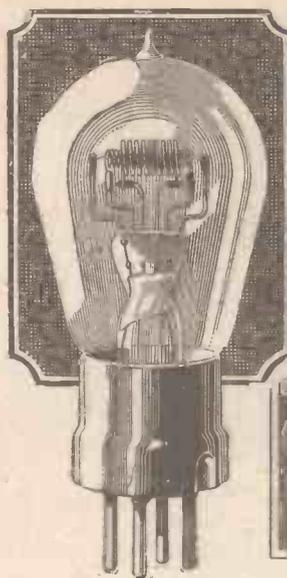
Condenser Shaft.

Trouble is frequently experienced with variable air condensers owing to the shaft being too loose in the bearings, and to the lack of balance in the rotary set of plates; the result of this is that when the condenser is adjusted to a certain position it declines to "stay put" and any vibration produces a gradual change in the setting.

A simple method of overcoming this is to place a small ebonite or fibre ring round the lower end of the shaft, to which a small spiral spring is attached, the other end of the spiral spring being secured to the lower

(Continued on page 670.)

ETHITA
The second to none crystal.



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"Fine knacks for ladyes"

If good trading consists in getting the utmost return for one's outlay, then buying a Louden valve is excellent business.

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The outlay required is only ten shillings.

In return you will get a valve which we consider represents by far the best value yet offered.

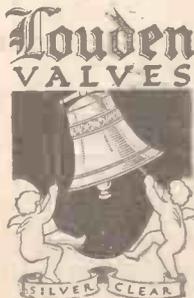
Only one of its good qualities is the saving which it will effect in your accumulator bill.

The current consumption of the Louden valve is exceptionally low (0.4 ampere) whereas that of the ordinary bright filament valve is almost double this figure.

Satisfied users of Louden Valves report that their "accumulators now last twice as long," that the journeys to the charging station are now halved, as also is the accumulator bill.

If this were the only advantage which the Louden Valve possessed over others it would alone be sufficient to recommend it, but when you consider that in addition it gives a reproduction startling in its silver clarity, that it gives the same volume as valves costing considerably more, and that the life of the filament is greatly prolonged by the absence of "bombardment," you will agree that in fairness to your purse you should fit your set with Louden Valves at the earliest possible date.

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White City.



The plain Louden for detecting and Low Frequency Amplifying.
The Blue Louden for H.F. Amplification.
Filament Volts 4-8.5.
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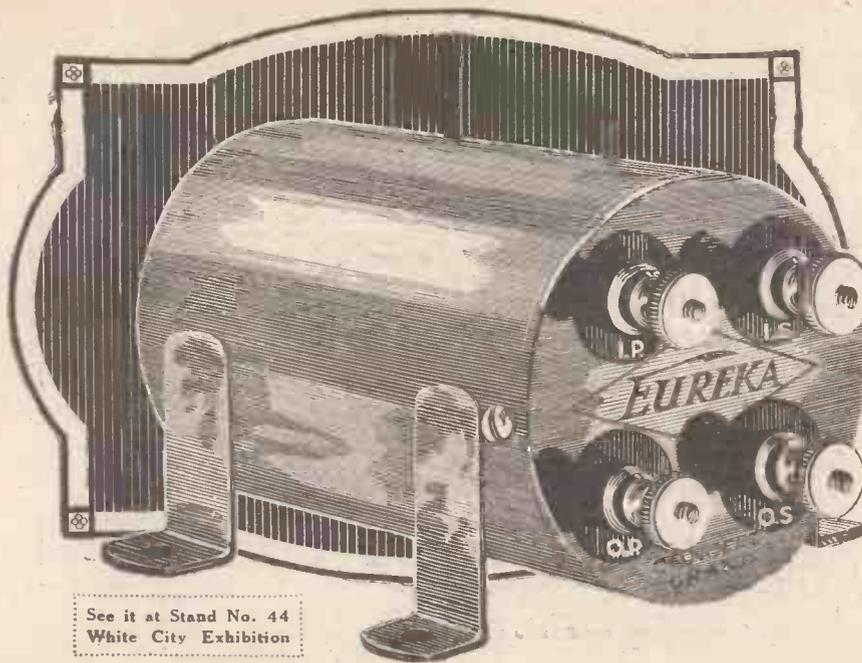
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YOU cannot tell how good the Eureka is by looking at it—the only way is to build one into your Set. We know that it is the finest Low-frequency Transformer on the market and we want to give you the opportunity of proving it.

Here's an offer; go to your Dealer and get from him one Eureka Concert Grand. Build it into your Set and use it. If you do not consider that it is the finest Transformer this country produces—if you are, in fact, in any way dissatisfied with it return it to us within seven days and your money will be refunded in full.

Expect exceptional results from the Eureka and you'll not be disappointed. Its massive coils containing more than 2½ miles of wire, its non-laminated iron core, its coppered steel case, and its exclusive method of impenetrable sealing make the Eureka Concert Grand an exceptional Transformer. Use one in your next Set, and you'll have no regrets.

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Concert Grand .. 30/-
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(For second stage.)

Transformer
De Luxe



Gilbert Ad. 1755

TECHNICAL NOTES.

(Continued from page 669.)

part of one of the pillars of the condenser. This has the same effect as a frictional bearing.

There are various other ways in which a small degree of friction may be provided, sufficient to keep the rotary shaft in any position to which it is set. If a small piece of ebonite tube, about an eighth of an inch in length, be slipped upon the lower end of the shaft, a strip of watch spring about an eighth of an inch in width may be bent to the proper shape and sprung between two of the pillars of the condenser in such a way that its middle part presses against the ebonite tube just referred to. The reader will no doubt readily devise other methods suitable for his particular requirements. All that is necessary is to have some fixed and springy member which presses against the shaft.

Shielding.

According to "Radio Broadcast," shielding a receiver is bad practice. The writer continues: "It in no way affects the fundamental cause of capacity troubles and it adds resistance to the circuit, with resulting inefficiencies. Mount tuning coils and inductances as far behind the panel as possible and always connect the stationary plates of the variable condenser to the grid. A properly designed receiver needs no shielding. But this does not apply to the individual shields about the intermediate stages of the super-heterodyne, though even here the successful elimination of the metal would probably be an improvement."

Grid Control.

At the National Physical Laboratory a method is used as a basis for high-frequency investigations in which a constant frequency output is secured from a valve generator by means of a tuning-fork control. The system is the invention of Dr. W. H. Eccles, the well-known wireless authority. The tuning-fork is maintained in vibration between the poles of a horse-shoe magnet which carries two coils, one connected with the grid circuit and the other with the anode circuit.

The anode current serves to maintain the vibrations of the tuning fork, and in this way the grid and anode currents are maintained at constant frequency. To obtain different values of the frequency, the fundamental frequency is stepped-up by means of a system of cross-coupled valves known as a "multi-vibrator." The constant-frequency device is employed for the calibration of wave meters and for suchlike purposes.

Wireless Clock.

A clock which automatically sets itself correct by means of the wireless time-signals from the Eiffel Tower is made by a firm in Leicester and is known as the "Pul-syn-etic" clock.

The system is as follows: Half-a-minute before the time-signal is due, the master clock switches on the valves and opens the aerial-earth switch of a specially designed receiving set. A "code selector" rejects the warning signals preceding the time-signal, but operates at the time-signal proper and sets the clock exactly right.

(Continued on page 671.)

TECHNICAL NOTES.

(Continued from page 670.)

In order to be sure that the system has operated an arrangement is made by which the functioning of the instrument is signalized by the ringing of a bell and the falling of a drop-shutter which exhibits a notice, "clock synchronised to-day." After the various actions mentioned above have taken place, the clock automatically closes the aerial-earth switch, switches off the valves, and re-sets the code selector ready for the next time-signal.

Wire Connectors.

When connecting two electrical wires together the usual thing is to bare the ends, twist together, solder, and tape over—all of which takes time. A very handy connector is to be put on the market which reduces the time involved in the operation very considerably: It consists of a small brass tube, about half an inch long, threaded inside, and covered over with an insulating cap on the outside. The bared ends of the wires to be joined are twisted together in the ordinary way, and then this metal tube, which is also longitudinally slotted to make it springy, is forced on by screwing. The threads cut into the twisted wires and form a good connection, whilst the wires are also held tightly together. The insulating cap does away with the need for taping. These connectors will cost about a halfpenny each.

Faulty Batteries.

If you find some of the cells of your H.T. battery are faulty, unless the defect is only slight, it is better to remove them, and try to bring them back to proper condition before replacing. If faulty cells remain in series with the good ones, they generally introduce a comparatively high resistance into the circuit, which may cause howling, whilst if they are placed in parallel with good ones, unless great care is taken to equalise voltages, the good ones will pass current through the bad ones, and so run themselves down.

(Continued on page 672.)

"THE HARMSWORTH CHILDREN'S MUSIC PORTFOLIO."

TUESDAY, November 18th, will see the publication of a new fortnightly part work, "THE HARMSWORTH CHILDREN'S MUSIC PORTFOLIO," which aims at giving the famous masterpieces of the world's greatest composers in a form specially simplified to enable beginners or performers of average ability to play them with ease. Each part is to contain nine pieces, together with helpful articles on voice training, piano playing, and the violin. The contents of Part 1 include Schumann's "Almond Tree" and "Dreaming," a Chopin Nocturne and "Valse," Mendelssohn's "Spring Song," Handel's "Largo," and others equally famous. Even finished performers will enjoy playing over these skilfully simplified versions, while everybody interested in teaching the piano to children should certainly subscribe to this new work. The parts are only 1s. 3d. each, and will be on sale everywhere.



—the new and better way to buy your Panel

EVERYONE is beginning to realise the tremendous influence exercised upon the working of a Set by the Panel. A man may buy the finest components and build up a Receiver to the exact instructions of the author and yet get poor results—his entire efforts having been nullified by a leaky panel.

Ebonite varies tremendously in quality because the material from which it is manufactured also varies considerably. Whether sold with its original polish or with a matt surface it is particularly difficult for the ordinary wireless enthusiast to judge its qualities. Particularly is this so when it is sold with a matt surface.

The only safe way of choosing a panel for your next Set is to select a material you can readily identify and which is fully guaranteed—such as Radion, the only insulation material from which the highly polished surface need not be removed when used for Wireless.

How Radion is Sold

RADION is sold in 21 different sizes and each panel is packed in a thick protective envelope. There is no waiting for your dealer to cut your piece from the sheet—and perhaps damaging its surface in so doing. Each panel is cut dead square and its edges accurately ground.

Two Types of Radion

RADION is sold in a highly polished black, and also as a superb material called "Mahoganite," which faithfully reproduces the delightful high-lights and tints so valued in mahogany. Condenser and rheostat dials and knobs can be obtained to match.

Radion Sizes and Prices:

Size	Black	Mahoganite	Size	Black	Mahoganite	Size	Black	Mahoganite
6" x 7"	3/6	4/3	7" x 14"	8/-	10/3	8" x 26"	17/6	21/3
6" x 10 1/2"	5/3	6/6	7" x 18"	10/6	12/9	9" x 14"	10/6	12/9
6" x 14"	7/-	8/6	7" x 21"	12/3	15/-	10" x 12"	10/-	12/-
6" x 21"	10/6	12/9	7" x 24"	14/-	17/3	12" x 14"	13/3	16/-
7" x 9"	5/3	6/6	7" x 26"	15/-	18/6	12" x 21"	19/9	24/3
7" x 10"	5/9	7/3	7" x 30"	17/9	21/6	14" x 18"	19/9	24/3
7" x 12"	7/-	8/6	7" x 48"	28/-	34/6	20" x 24"	39/6	48/-

Special Note:—All 1/8 in. thick—quite sufficient owing to Radion's tremendous strength.

Look for the Name Radion

The safe way to buy your panel, therefore, is to choose a RADION Panel—and look for the name RADION. It is a guarantee against leakage—its beautifully polished surface will enhance the appearance of your Set—its strength renders it ideal for drilling, tapping and engraving—and it will not crack when cut. Get it at your Dealer's to-day—but be sure it is RADION (the name is on every panel).

RADION FOR PANELS

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Gilbert Ad, 1796

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An Elementary Player (age 24): "Everything is different now; playing is no longer a discouraging struggle, but a real pleasure."—Miss A. L. C. (Crosshill, Glasgow).

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64, Bristol House,
Holborn Viaduct,
London, E.C.1.

TECHNICAL NOTES.

(Continued from page 671.)

Use for New Element.

The new element "hafnium," which was discovered a year or two back by Drs. Coster and Hevesy, has now been subjected to a good deal of careful examination and has been found to have some interesting and valuable properties. It is, of course, well known that it is related to the rare-earth elements such as are used in the manufacture of gas mantles, and it was expected that it would show a high light-emissivity; from this it was reasonable to hope that its electronic emissivity would also be abnormally high and (according to the "Engineering and Mining Journal") this is found to be the case. Hafnium is present in zirconium minerals to the extent of from 2 to 20 per cent. When separated from the rare-earth elements, it resembles zirconium very closely in its properties and has a very high melting-point. The element is thus abundant enough to make it available for commercial purposes, and there is good reason to expect that not the least of its uses will be in connection with dull-emitter filaments for wireless valves.

Harmonics.

According to "L'Antenne," the French radio journal, between 162 metres and 650 metres, thirteen different harmonics can be counted in the Eiffel Tower arc transmission.

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Complete Set of Tested Parts for 1-Valve "Unidyne," including Cabinet and Drilled and Engraved Panel ... £3 0 0
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Phillips' Tested 4-Electrode Bright Emitter Valves, 3/5 volts, 15 amp. ... 12/6
ALL POST FREE.
These valves fit the ordinary 4-pin holder.
E. GEORGE, 70, Hailsham Avenue, Streatham Hill, London, S.W.

SOME VIEWS ON BROADCASTING.
(Continued from page 639.)

the opening chords of the Prelude, expressing the abject and dreadful horror experienced by Poe's heroine when she wakes up and finds herself buried alive. And the second movement of this Prelude is supposed to indicate the frenzied struggles to free herself from her coffin.

Another variation of this story is that it represents the burning of Moscow in 1812, and here again some of the chords might be likened to the wild clanging of the church bells which are noticeable in "1812," by Tschaikovsky.

And so I put this question to M. Rachmaninoff. He laughed and looked at me rather quizzically. "There is no such story," he answered. "It is an invention of the public. But curiously enough, in some of my later compositions I have had a story in mind, but it is unnecessary to tell it for the music should speak for itself. But with regard to my C sharp minor Prelude, I never had any such story as you mention in my mind when I composed it."

"Well," I said, "that settles one question, and I hope when you return to England again you will give me the opportunity of demonstrating to you the tremendous strides made in the science and art of broadcasting."

"I shall be charmed," replied M. Rachmaninoff—and so ended my interview.

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MAZDA '08 D.E. VALVES 15/-
"WESTERN" L.F. TRANSFORMERS, Ratio 3-1 and 5-1, Tested and Guaranteed 10/-
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Enclosed Type Cabinet
Fitted with fillets to take 12 x 12 in. panel 2 in. behind inside of doors. Valves can be fitted behind panel, the Cabinet having a sliding back for access to rear of same. Ample accommodation for H.T. batteries, etc.
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Fill volts 1-8 to 2-5, anode 40-100. This valve is even better value than the '06 now out of stock.
ITS PERFORMANCE IS EQUAL TO ANY—AND ITS PRICE UNRIVALLED.
CONCERT TESTED before despatch, and sent on 24 HOURS' APPROVAL. P.W. UNIDYNE VALVES.
Phillips' (Dutch) 4 Electrode DULL Emitter Valves, 1-8 volts 1-6 amp. each 25/-
Phillips' 4 Electrode Bright Emitter Valves, each 12/6
Concert tested 24 hours' approval.
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Will withstand 5,000 volts, Black finish. Will not fracture. 5 x 6 x 3/16, 1/2, 7 x 5 1/4, 8 x 5 1/2, 9 x 5 1/4, 9 x 6, 1 1/6, 12 x 10, 2 1/8, 14 x 12, 4/6 post paid. Other sizes and thickness pro rata.
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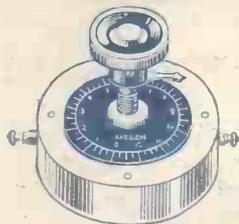
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LISSENIUM

A delightful condenser to use—



A SQUARE law condenser is a necessity for laboratory work where painstaking accuracy is essential, and if a receiver were to be used on one small band of wave-lengths it would be possible to select a suitable square law condenser which would be satisfactory within its limits. The difficulty is, however, that a square law condenser which is suitable for short wave work is hopelessly inadequate for longer wave-lengths, and, conversely, a square law condenser which is suitable for high wave-lengths is totally unsuitable for short wave work. With the numerous stations in this country and all over the world now transmitting on widely separated wave-lengths, we consider it highly desirable that one condenser should be equally appropriate to all wave-lengths. We have, therefore, aimed to produce a condenser which has almost the accurate characteristics of a square law condenser, but which is much easier to tune with, provides a negligible minimum capacity at one extreme of the scale, while at the other extreme it provides a high maximum. In this condenser there has been found one which **FOR ORDINARY WORK OUTSIDE A LABORATORY IS A GREAT IMPROVEMENT ON ANY SQUARE LAW CONDENSER. THE ONE CONDENSER COMBINES ALL TUNING CAPACITIES—AND IT IS ESSENTIALLY A LOW LOSS CONDENSER.**

**TUNING ON SHORT WAVE WORK IS DELIGHTFULLY EASY—
LONG DISTANCE WORK IS IMMENSELY IMPROVED**

The pointer of this condenser makes two revolutions—when small changes of capacity are required you work on the first revolution, and on the second revolution when more critical changes of capacity are desired—**ONE KNOB CONTROL, too.**

With a negligible minimum capacity, its maximum is rated at .001, but actually is higher, **THIS LISSEN MARK II MICA VARIABLE CONDENSER (pats. pending) IS WORTH 17/6 ITS PRICE OF LISSEN ONE-HOLE FIXING OF COURSE—table or panel mounting without alteration.**

With this LISSEN CONDENSER and LISSENAGON (pronounced LISSEN-AGON) coils, a receiver is fitted with the best tuning combination it is possible to have. *Ask for them if you are out for ease and distance.*

A DELIGHTFUL CONDENSER TO USE—AND IMPROVES LONG DISTANCE WORK IMMENSELY

Delivers all its stored up energy—

It is worth while fitting LISSEN FIXED CONDENSERS, too—made with scrupulous care—they are accurate to 6 per cent.—they never vary—never leak—**THEY DELIVER ALL THEIR STORED UP ENERGY, ALL THE TIME.**



Capacities .0001 to .0009, 2/-
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Telephones—Riverside 3380, 3381, 3382, 1072. Telegrams: "Lissenium London."

PARTS WITH HIDDEN POWER—BUILD WITH THEM.

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R/R

A CONTINENTAL BROADCAST TIME-TABLE.

Popular Wireless

and Wireless Review

PRICE 3d.

EVERY THURSDAY.

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



The Assistant Engineer in the Control Room of the Stoke-on-Trent Relay Station.

FEATURES IN THIS ISSUE.

The Unidyne in Holland.
 An "All Stations" Reflex Set.
 Technical Notes.

Broadcasting Syncopated Music.
 Waves and Strays.
 A "Graphite Galena" Detector.

A UNIDYNE NEUTRODYNE REFLEX SET.

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SUPERB RECEPTION AT 60 MILE RANGE

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REMARKABLE UNSOLICITED TESTIMONY

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WEST STREET,
BUCKINGHAM,

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DEAR SIRS,

I MUST WRITE AND THANK YOU AND ALSO LET YOU KNOW THAT BLUE LABEL CRYSTAL IS ALL YOU CLAIM FOR IT. AFTER A SHORT TEST I SCRAPPED QUITE A COLLECTION OF OTHER WELL-KNOWN MAKES. ON A SIMPLE HOME-MADE SET WITH A SINGLE SLIDING BAR, I AM OBTAINING EXCELLENT RESULTS FROM 5XX-60 MILES AWAY, ALSO FROM 2LO WHICH IS ABOUT 50 MILES DISTANT.

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Broadcasting from Holland.

In the earliest days of Broadcasting—long before our own B.B.C. Stations were erected—experimenters had one standard for measuring the efficiency of their Receiving Sets. If it could pick up the Hague Sunday afternoon concert, then it was a good Receiver. This splendid old veteran is still transmitting an excellent programme on 1070 metres from 3 o'clock until 5.30 every Sunday afternoon. As it uses a little over 1 k.w. of energy any 2 Valve Set fitted with a Cossor P.1 and a Cossor P.2. will receive it on a moderately good aerial. Take a trip through the ether to PGGG (its call sign) next Sunday afternoon—you'll enjoy it.

Cossor

A. C. COSSOR, LTD., Highbury, N.5.

Get that International feeling by using Cossor Valves!

THOSE who have not searched the ether for Continental stations have never really dipped into the pleasures of Broadcasting. A song from Spain—a dance from Holland—a typical melody from Italy—all these are yours with a little care and the exercising of good judgment.

Exercise your judgment in buying or building a good Set and the selection of the correct Valves and learn how to use your Set—that's all there is to it.

Numbers of car owners never really appreciate the capabilities of their cars, because they never take the trouble to understand the peculiarities of their engines. In a like manner, plenty of Broadcast listeners think that they cannot get much beyond their local stations, because they have not taken the trouble to learn the capabilities of their Sets, or, perhaps, because they are using the wrong kind of valves.

Obviously, the valve that has been developed specially to give a loud volume of sound from a near-by Station will not function very satisfactorily on the extremely faint signals produced by a Station hundreds of miles away. And a valve designed for long distance cannot be expected to operate a Loud Speaker with any great measure of success.

There are three main functions for a valve. (1) To rectify. (2) To amplify at low frequency, or to act as a note magnifier. (3) To amplify at high frequency.

Any valve that will perform all these diverse operations must be—at its best—a compromise. That is why Cossor Valves are sold in two distinct

types: the P.1 capable of rectifying and amplifying at low frequency, and the P.2—the valve with the red top—specially produced for long distance work in connection with the P.1.

Both of these Valves conform to the master principles which are rapidly making the name Cossor known throughout the whole world—the arched filament, hood-shaped Grid and Anode. This design is the only known method of utilising the whole of the electron stream. Any observant person must have noticed that in the ordinary valve with straight filament and tubular Anode quite an appreciable proportion of the electron stream must inevitably escape from each end of the Anode, to the detriment of the strength and quality of the reception.

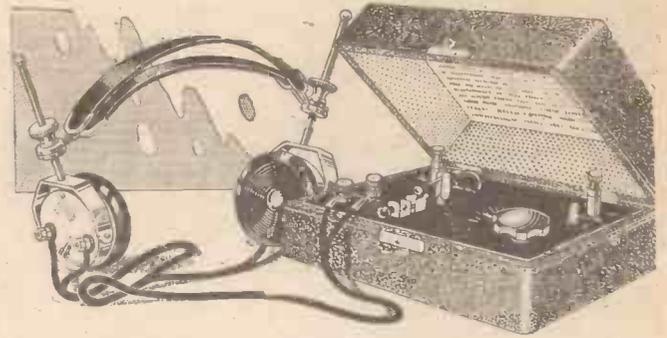
But that is not all. Cossor Valves besides being more sensitive actually last longer. We all know that metals expand when heated, therefore, the ordinary valve utilises either a coiled spring or springs the electrodes apart to prevent the filament, when heated, from sagging and touching the Grid. Obviously, such a drastic method of curing the stretching and contraction of the filament inevitably finds a weak spot—and a fracture is the result.

This cannot happen in a Cossor, because its filament is arched—just like a bridge—for strength and it can always support its own weight.

Therefore when buying Cossor Valves you get not only improved reception but a longer life at the same time. Next time, see that you get Cossor Valves—the only Valve sold in a sealed carton—our patented method of guaranteeing you a new and unused Valve.

Valves

BRIGHT EMITTERS	
P1 For Detector and L.F. use	12/6
P2 (With Red top) for H.F. use	12/6
WUNCELL DULL EMITTERS	
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WR1 For Detector and L.F. use	23/6
WR2 (With Red top) for H.F. use	23/6
Model B. (Without resistance, working direct from 2-volt accumulator.)	
W1 For Detector and L.F. use	21/-
W2 (With Red top) for H.F. use	21/-



Smith won his bet!

CLARKE is an egotistical being. He is convinced that everything he possesses is the best. When he applied this reasoning to his Crystal Receiver, Smithy immediately wagered it wouldn't compare with the "Sparta."

Next day the respective receivers appeared and Smith proceeded to point out the distinctive "Sparta" features—the terminal plugs for inserting long-wave coils, the universally jointed cats-whisker arm, the unique cup allowing instant interchangeability of crystals—and then he asked Clarke to listen.

After just two minutes—*Smith won his bet*; for, as Clarke said, he certainly had never before heard such clear, melodious reception. For perfect crystal reproduction ask your Dealer for the "Sparta."

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Sparta

Crystal Receiver

If your Dealer does not stock the "Sparta," write direct to us. Anyway, make certain of sending a card for List 315B fully describing the complete "Fuller" range.

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'Phone: Ilford 1200 (6 lines). 'Grams: "Fuller, Chadwell Heath."

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- IRISH FREE STATE: Stocks carried by A. W. Doyle, Kelly & Co., 174, Pearse Street, Dublin.
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Condensers of wonderful precision. Stout Vanes, narrowst spacing, capacities guaranteed.



No more burnt out valves! The ERICSSON Patent Wander Plug "blows" when too much juice goes across or when leads get mixed. Plug with fuse 2/- Spare fuses 5d. each.



This dual resistance allows the use of bright or dull emitters. Resistance can be varied from 6 to 60 ohms. Works like velvet. Complete 3/6



POPULAR WIRELESS

AND WIRELESS REVIEW.

November 22nd, 1924] THE RADIO-WEEKLY WITH THE LARGEST CIRCULATION. [Every Thursday, Price 3d

Technical Editor:
G. V. DOWDING, Grad.I.E.E.

Editor
NORMAN EDWARDS, M.Inst.R.E., F.R.G.S.

Scientific Adviser
Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

Those Call Signs.

NOW that Dundee is on the air there are no fewer than three British stations with call-signs that can be confused easily. The difference between 2 D E and 2 B E is very slight, and either of them would sound like 2 B D to a distant listener. It would not matter so much if the name of the station were announced more frequently, but some announcers will apparently never consider their long-distance listeners in this respect.

Morning Transmissions.

HAVE you noticed how the morning broadcasting hours are filling up? Although the B.B.C. do not commence operations until 1 p.m., there are plenty of Continental stations working before that hour, and the German stations are particularly industrious. Their morning transmissions are mostly of a useful type—time, weather, and market reports—and they serve to keep the ether interesting all day.

Mr. Reith's Book.

"BROADCAST Over Britain," is the title of the book by the Managing Director of the B.B.C., and just published by Hodder & Stoughton, price 6/- net. A special review of this book appears under the heading, "Mainly About Broadcasting," in this issue.

Wireless Exhibitions.

ALL the Exhibitions appear to have done excellently this year. London's Albert Hall show was a crowded one, and both Manchester and Plymouth scored great successes. Figures for the White City Exhibition are not available yet, but Nottingham put up an excellent show at the Empress Rink, and I hear that the wiring of the "P.W." 24-valve set attracted great interest there.

A Record?

ONE rather interesting experience at the Nottingham show fell to the Exhibitor at Stand 9. On the opening day of the Exhibition he sold every set—valve and crystal—that he had on show!

Radio and Criminals.

CRIMINAL CATCHING by the aid of wireless is to have a thorough trial in France. The Sureté Générale (French Scotland Yard) are installing a powerful transmitter, and all the important police stations will listen-in continuously. Descriptions of crime and criminals can be broadcast instantly, and thus a radio net will be spread to catch the burglars and bandits that prey upon society.

Deliberate Jamming?

IS jamming sometimes intentional? A Colnbrook correspondent tells me that for several months there has been deliberate interference in that area. When a £3 reward was offered the trouble suddenly ceased, but broke out again just as badly after a few weeks, and is still spoiling reception there. In the last prosecution for illegal transmitting the offender got off with a fine, but I believe the Post Office will take a serious view of the next case of this kind.



Dr. Eccles, F.R.S., President of the Radio Society of Great Britain.

The Last Word.

REGENT STREET is not the place for radio! A crowd collected there recently to hear a loud-speaker demonstration, so the police objected to the obstruction. The magistrate at Marlborough Street Police Court was obviously interested in the loud speaker, but he had the last word himself—and fined defendants £2 and £3 3s. costs.

In the States.

OVER £200,000 per day is spent upon radio apparatus in the U.S.A. Mr. Hoover, Secretary of Commerce, estimates the number of American listeners to be twenty millions, and he is now advocating that broadcasting should be organised on a national basis, similar to the arrangement in this country.

5 X X on Sundays.

WHEN the new high-power station is erected in the Midlands the B.B.C.

hope that the hours of service will be much longer than 5 X X is able to give. But in the meantime the news that Chelmsford is to be permitted to broadcast on Sunday afternoons will be welcomed by listeners.

Helping the Industry.

NOTTINGHAM station opened on September 16th, and by the end of October 16,000 licences had been sold there. This represents a sum of £8,000 in about six weeks in one district; and when added to the expenditure on sets and accessories it shows that Radio has now become a considerable British industry.

The Swansea Station.

STEADY progress is being made with the relay station, and it is announced that Swansea will open on December 12th. I hear that the new Leeds-Bradford station at Stanley Road, Harehills, Leeds, will probably be in operation before this issue of "P.W." is in the hands of our readers.



Unlucky Stations.

LEEDS is one of those unlucky stations that, for no apparent reason, get more than their fair share of trouble. It not only had to shift its quarters because of interference with military wireless, but lately it has been troubled by a French station, which, using almost the same wave-length, heterodyned its carrier wave. And wasn't Leeds the only B.B.C. station to be struck by lightning?

Saving Time.

A SOUTHAMPTON correspondent inquires if it is true that there are two studios at 2 L.O., and if so, what are the advantages? He has evidently not noticed that in the London programmes very little time is lost between items. The occasional use of a second microphone means that an orchestra can assemble before it whilst the preceding item is still in progress in the other studio.

(Continued on next page.)

NOTES AND NEWS.

(Continued from page 677)

Peace. Perfect Peace!

"YOU can cut out interference from the neighbouring power-station by a frame aerial, or by earthing your outside aerial," says a contemporary, in answer to a correspondent. And for perfect quiet he could, of course, disconnect the 'phones, if he liked!

W G B S.

GIMBEL BROTHERS, the owners of the famous Philadelphia broadcasting station WIP, have now opened a similar station in New York. It is situated at their department-store on 33rd Street, and transmits on 316 metres. The call sign is W G B S.

G B S. and Radio.

WHEN the B.B.C. first approached Mr. George Bernard Shaw to broadcast they asked him not to talk of politics or religion. His reply was a characteristic one. "Politics and Religion are the only things I ever talk about—they are the only things worth talking about!" he said.

Wireless for the Beginner.

OWING to the great pressure on our space, it was not possible to include Mr. Blake's fourth article for the beginner in last week's or this week's issue of "P.W." But the Editor tells me that this interesting series for amateurs will be resumed in next Thursday's issue.

A Reminder.

TO-DAY'S issue of "P.W." is on sale one day earlier than usual, and readers who did not see the previous announcement should notice that in future "P.W." will always be obtainable on Thursdays instead of on Fridays.

Radio and Gramophones.

MR. ARTHUR BURROWS tells me that within the last ten months no less than three million gramophone records of the Savoy Bands Dance Music have been sold. This certainly does not look as if the gramophone trade is being ruined by radio, as some of our kill-joys affirm.

An Italian Sensation.

MYSTERIOUS reports are still coming from Rome regarding the system of wireless control which has been invented by Signor Fiamma. A crew-less submarine chaser was recently made to proceed to sea and performed all sorts of evolutions far from the shore, whilst its control apparatus was tested by Navy, Army and Ordnance officials.

Intentional Interference.

SOME remarkable wireless control work has also been done in America, and in this country there have been several good displays, including that at Wembley, when an electrical sub-station in the Palace of Engineering was operated wirelessly from Manchester. But the Italian tests appear to have been exceptionally severe, including as they did intentional jamming from all the neighbouring wireless stations.

New French Stations.

IN addition to the new station in the Pyrenees, France is planning other broadcasting developments. Les Ateliers Lemouisy, of Paris, have a new station in hand, which will work on 320 metres, and another is proposed for the Department of Loire-et-Garonne. This will probably be erected at Agen, and will broadcast concerts, etc., on a wave-length of 300 metres.

Turning the Tables.

AMERICAN fans have never quite recovered from their triumph of three years ago when Paul Godley came to England and "showed the Britishers how to receive short-waves." But recently the

WHAT THEY SAY.

"A short time ago it was my lot to listen in to some gentlemen giving a recital of certain poems and ballads. If they had been reciting the multiplication tables the result could not have been more monotonous or uninspiring."—Mr. B. W. Barton-Bekett, at the County Library Conference.

"From his room in Downing Street, the Prime Minister, through his ordinary telephone, and with but a few minutes' warning, can address his fellow-countrymen to the number of many millions in any time of special need."—Mr. J. C. W. Reith in "Broadcast over Britain."

"Sir Landon Ronald is not one of those who see in wireless nothing more than a kind of toy, or who regard its transmission of music as a travesty. People who will have nothing to do with broadcasting will find themselves badly left," he said, "for it has come to stay, and to be one of the biggest factors in the world of music."—"Calliban," writing in the "Musical Times."

"We hope before long to be able to transmit lectures from Oxford and Cambridge, probably by land-line to the new high-power station, Birmingham, Sheffield, and others of the newer universities are already keen to help us."—Mr. J. Stobart, Director of Education to the B.B.C.

"The listener-in is an independent creature. He takes what he wants. . . . What I that old blatherskite talking again? We can imagine him saying when some political orator is turned loose on the air. 'Enough of him, I'm through,' and he whirls his dial and soothes his liberated feelings with the latest bit of noise called 'jazz' for want of a better name."—"Philadelphia Inquirer."

"Wireless knows neither boundaries nor distance. It is the most democratic of all inventions."—The "Democrat."

THE WEEK'S QUERY.

At 3 o'clock on Sunday morning I got out of bed and picked up the Western Electric House, Springfield, Mass.
Is this a record?

tables were rather neatly turned on them by two Australian amateurs, who made a special trip to America to see why Australian signals had never been copied there.

San Francisco's Failure.

THEY called on the San Francisco Radio Clubs and made searching inquiries regarding the reason why Australia had never been received in the U.S.A. The Radio Clubs rose in a body, and proved first, that the Australian signals never reached the States; and secondly, if they did, nobody could read them through the jamming! Then the wily Australians smiled and asked the Americans to step along and hear for themselves!

A Trans-Pacific Triumph.

AN incredulous party of expert "hams" was then piloted down to the R.M.S. "Tahiti," lying in San Francisco bay, and the two Australians tuned-in a few of their home stations for them, just to show how it was done. The Americans bore up wonderfully well considering, but they still scratch their heads when they read the Australian report on the voyage. It concluded by expressing the hope that "Our friends in America will be better acquainted with radio-frequency amplification soon!"

Some Continental Changes.

LAUSANNE is on the air again, after being laid up for a few weeks for repairs, and I hear that Rome (ICD) will soon be using increased power. The latter has been working on 426 metres, but both wave-length and times of transmission have been altered frequently.

A Cup Winner.

JOHN L. REINARTZ (I-XAM) has been awarded the Radio Cup by the Executive Radio Council of America. His work on short-wave transmission was considered by them to be the greatest advance in the radio art for the year.

Buying a Loud Speaker.

IS the British wireless trade in a hopeless muddle? The other day a man I know wanted to buy a loud speaker, and had to go to five different wireless shops in London before he could find a dealer prepared to let him hear the instrument he wanted to purchase. This is bad enough in itself, but the sequel is more interesting because it points the moral.

Up-to-date Dealing.

AFTER hearing the instrument that he fancied he would like, tested up against others, he bought a more expensive model from the up-to-date dealer. The latter benefited by a bigger sale and the customer was pleased with his purchase—but those four other dealers are still unconsciously turning away good business!

Revolutionary Radio.

THE largest crystal in the world has just been deposited in the South Kensington Museum. As it came from the Red Sea, a Bolshevik's whisker must be used with it, says the "Sunday Pictorial."

A Dramatic Door.

"THE wireless play has come to stay," is one of America's slogans, and lately much good work has been done in making the broadcast drama "snappy." WGY is paying particular attention to stage noises, and they have a wonderful portable door in the studio there with which exits and entrances can be made very effectively. It will creak to order in one or both hinges, the former being for night-work and ghost scenes only!

BROADCASTING SYNCOPATED MUSIC.

A CHAT WITH THE SAVOY HAVANA AND ORPHEANS BANDS.

By "ARIEL."

"We are now going over to the Savoy Hotel—" That is a phrase every listener is acquainted with, and in this article "Ariel" recounts an interesting interview he had recently with the famous Havana and Orpheans bands.

PERHAPS no dance band enjoys such widespread popularity and renown as that which celebrated recently, in a very brilliant manner, the occasion of its first birthday. I mean, of course, the Savoy Orpheans, which is the first international syncopated orchestra ever formed. Though thus unique in its character, it has a very strong rival, both in merit and popularity, in its brother, the Savoy Havana Band.

I had the honour of being present at the birthday party of the Savoy Orpheans. To



The Savoy Orpheans Band.

each guest at this party a book was presented, beautifully written and magnificently got up, which told many exciting facts about the evolution of modern dance music.

In the Famous Ballroom.

It was after perusing this unique volume that it occurred to me to go round and get from the conductors of both the Savoy Havana and the Savoy Orpheans their opinion on the subject of modern dance music and broadcasting. I had no doubt that they would have many novel and striking points of view.

It was thus that one evening I found myself in the ballroom of the Savoy Hotel, listening to the exhilarating strains of the Savoy Orpheans, and watching the dancers who moved in rhythm to their music. As soon as the band had paused for a well-earned rest, I approached the conductor with my question ready: "What do you think of broadcasting in relation to modern dance music?" I enquired by way of an encouraging opening. Fortunately, this conductor is never at a loss for an answer. He did not even seem taken aback by the scope of my question.

The Origin of "Jazz."

"Broadcasting is of the greatest assistance to us," he replied instantly and without a moment's hesitation. "It creates an enthusiastic public far wider than we could reach from the Savoy ballroom alone. People want to dance to our playing. Even those who cannot dance are eager to hear us. And what is more, broadcasting bene-

fits dance music itself. For in proportion to our audiences the demand increases, and so must the supply."

"Then, unlike the theatre managers, you think that all the benefit is on your side?" I remarked, laughing.

"Not at all," he rejoined quickly. "We are of the greatest value to broadcasting. Both we and the B.B.C. receive a constant stream of letters from listeners all over the world, assuring us that the items provided by the Savoy Orpheans are the most popular part of the programme. Even those strange

beings who can see no good in broadcasting at all have admitted that they have listened with pleasure to our playing."

"But what is there in modern dance music," I asked, "and in yours in particular, which makes its popularity so wide-spread, and arouses so much interest in its development?"

"Ah," said the conductor wisely, "now you are asking for the whole history of modern dance music. And it has a very important history. Do you suppose that if a broadcasting station had existed in the mid-Victorian period people would have listened to dance music unless they wanted to dance? Not a bit of it! Dance music in those days was merely a sentimental tune set to a suitable rhythm. It had no value of its own."

"When did modern dance music begin?" I inquired with interest.

"It may be said to have begun with ragtime," said my mentor.

"That, of course originated with the negroes, who broke up the accepted dance rhythms, and played tricks with ordinary tunes. Then came the period of the Dixieland Jazz Band. Each member of the band treated the melody in his own way, and embellished it as he liked, without paying any attention to what the rest of the band was doing. The result ought to have been horrid, but it actually proved very popular."

The Art of Syncopated Music.

"But such haphazard methods could not last. The instruments of the dance bands were reorganised, and expert musicians orchestrated the new music according to the old rules. Thus, from mere ragtime,

we have reached the era of syncopated music."

"But you have not yet explained," I objected, "why this syncopated music of yours is so popular with wireless audiences."

"I was coming to that," he said with a frown. "You journalists are always in such a hurry. You see, it is in syncopated music that dance music and classical music have met for the first time. Syncopated music is, in itself, a perfectly serious art, but it is not a solemn art. You can do anything with syncopated music, but anything you do is bound to have some pep in it. It is made up of real and elaborate orchestration, combined with one or several exciting rhythms. The result ought to be like champagne. It ought to be light and sparkling. It ought to go off with a pop and explode with a gurgle. But if it is not light and sparkling, well—it is worse than bad champagne."

What Jackie Coogan Thought.

But I had rather unkindly monopolised all the conductor's respite. He had now to return to his baton. Feeling rather bewildered, I strode across the floor and attacked the conductor of the Savoy Havana, who was mopping his brow as a result of his labours.

Just as I reached him the Orpheans struck up the "March of the Tin Soldiers," and I remembered how a few weeks before I had brought Jackie Coogan to that ballroom, to conduct the same band, playing the same tune. Jackie had been very thrilled by the experience, and had thought that it would be much more exciting to be a conductor than to be a film star.



The Savoy Havana Band.

Approaching the conductor of the Savoy Havana, I remarked tentatively that the present position of dance music seemed to be more confusing even than Einstein's theory. Would he give me his reasons for its popularity?

He considered for a moment, and replied gravely:

"I think it is because it is so soothing that people like to listen to it."

"Soothing!" I gasped in horror. "If

(Continued on page 680)

AN AUTOMATIC OSCILLATION ELIMINATOR

By Professor M. DAISOMONT.

LIVING in a city where radio-amateurs are very active, we have been so much troubled by oscillators, during broadcasting hours, that we endeavoured to evolve a simple and effective oscillation eliminator.

After many experiments we succeeded in producing an eliminator which is efficient, automatic, inexpensive and can be installed on all receiving sets. But it must be understood that our eliminator does not prevent radiation when the experimenter or the

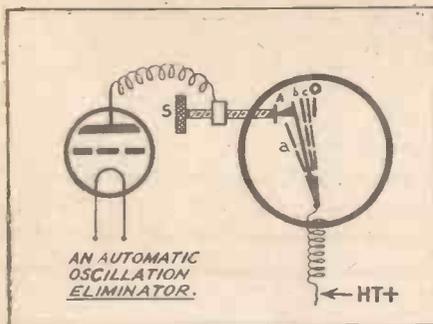


Fig. 1.

amateur who has one in use, is not acting in a bona fide manner; it is so easy to short-circuit the eliminator, and even with our apparatus, the amateur who wishes to produce radiation from his antenna can do it; but that will always be possible with all possible eliminators. On the other hand, the amateur or the experimenter who has adapted our eliminator to his set and who has adjusted the apparatus, will never trouble his neighbours by radiation: the eliminator that we are going to describe, cuts out radiation before it can do any harm.

The principle of the eliminator is as follows: When a valve begins to oscillate, the plate current of that valve becomes less intense. Working with a bright emitter valve, we found a plate current of 2.4 milli-amp. when the valve did not oscillate, and only 1.2 milli-amp. during oscillation. The pointer of the milli-ammeter ran a distance of at least half an inch on the scale, and this was the origin of the eliminator.

Interrupts the Plate Circuit.

This eliminator consists of a moving pointer, set in motion by an electro-magnetic field, the motion of which is sufficiently great in amplitude, for a current of 3 or 4 milli-amps.

When we look at Fig. 1 we find A, which is a platinum contact, a should be the position of the pointer for the plate current, but the contact being at A, more to the right, contact will be perfect; b is the point where oscillation becomes dangerous, and c where oscillation is the strongest. It can easily be seen that in the positions b and c, the plate-circuit is interrupted. This interruption is automatic. The instrument must be of the dead-beat type, and perfectly

reliable. It was tried for wave-lengths between 100 and 2,000 metres, and found perfectly satisfactory. S is the screw to make the adjustment for the particular valve in use.

When the plate current decreases in the oscillating valve, it increases in the following L.F. valves; the eliminator can, therefore, be constructed to work when the current increases.

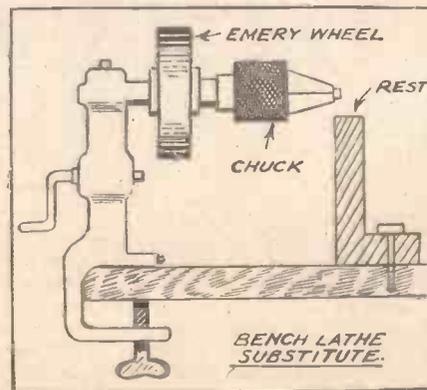
A BENCH LATHE SUBSTITUTE

THE home constructor who has a small lathe at his disposal is a much-to-be-envied individual, as there are so many small jobs he can do so much better than his fellow-constructor without a lathe. The "King of Tools" costs a lot of money, however, but a very efficient substitute need not cost more than 12s. to 15s. at the outside.

One of the small grinding wheels which clamp on to the bench can often be picked up for 7s. or 8s. secondhand, and a few shillings more new. The emery wheel spindle runs at a very high speed on turning the crank handle, and this is a valuable feature.

Has Many Uses.

A power drill chuck, costing about 3s., can with a little contriving be fitted on the spindle end. This chuck will grip screws, terminals, drills, metal rods, etc., and also hold a small taper mandrel for turning small objects, a tool rest being extemporised from a block of wood.



The emery wheel is in itself most useful, as it saves a lot of filing and sharpens drills, chisels and other small tools very quickly. Once the tool is fitted up there are all sorts of "small lathe" possibilities opened up to the ingenious amateur.

BROADCASTING SYNCOPATED MUSIC.

(Continued from page 679.)

you only knew the brain-splitting discussion I have been listening to!"

"Oh, you have been talking to my colleague?" he replied, laughing. "Get him on the subject of syncopated music and he is off in the clouds immediately. My own reasons for our popularity are much simpler. I believe it is mainly due to the fact that we transmit better by wireless than any other kind of music. Our rhythms are so definite, and every point so well emphasised, that little or nothing is lost to the most remote listener."

A Good Suggestion.

I felt rather thankful to find myself on such safe ground, and asked the conductor if he did not feel at times rather uncanny, playing to so many unseen listeners.

"Not at all," he answered. "In fact, it is most exhilarating to think that the people we see before us only represent the smallest fraction of our audience. Do you know," he added, "I believe we have an audience of over one and a half millions. I believe we have even entertained Spanish outposts in the most obscure parts of Morocco."

"And to think it is all done by that little instrument," I sighed, gazing with mock sentimentality at the microphone hung from the roof of the ballroom.

"Yes," he agreed solemnly. "I often think it is like the eye of Siva. It observes everything, but never offers a remark. In fact, it is just like my dog which never answers me back."

"Then you, too, are of the opinion," I said, "that it is not just as dance music that people appreciate your playing?"

"No," he said, "there are many people who listen to us, who would never think of dancing. They take us as a concert. In fact, we are their favourite concert. The only criticism I have to make on the broadcasting of our items is that, as in the case of a classical concert, each item should be announced separately before it is played, and not all of them *en bloc* at the beginning."

Matter of Proportion.

"In that case, you believe that broadcasting has very great possibilities?" I remarked.

"Of course I do," said he. "The enthusiasm we feel for our work is in proportion to the numbers of our audience, and as our enthusiasm increases, so will our art develop and its possibilities augment. Thus, broadcasting should give every art a new impetus and a wider scope."

But it was now time for the Savoy Havana to begin again, and my companion had to leave me. I did not feel strong enough to tackle another discussion of syncopated orchestration and its historical development, so I quietly left the ballroom. I felt that, if I were simply to put before my readers the opinions given me by the conductors of these two famous bands, I could safely leave it to them to decide with which reasons they agreed. My private opinion is that the popularity of the Savoy Havana and Orpheans needs no explanation. Their merit speaks for itself.

FURTHER IMPROVEMENTS IN THE UNIDYNE REFLEX SET. A "UNIDYNE NEUTRODYNE."

By G. J. MARCUS.

Frame aerial reception with this receiver has been obtained up to fifty miles from a main broadcasting station and more than one hundred miles from 5 X X.

THE following is a more detailed account of the Unidyne Neutrodyne Reflex set briefly described in "P.W." of August 23rd and October 18th. The writer has since received many letters on this subject, and it was thought that these

The connections are made with tinned copper wire (No. 16); either round or square-sectioned wire may be used, but the latter always looks neater and more businesslike. As most portable sets have to withstand a certain amount of rough

improved. Reaction will be smooth and delightfully easy to control.

The neutrodyne reflex circuit is ideal for transatlantic reception; owing to the elimination of the H.T. battery, signals are tuned in against a background of perfect silence. "Mush" is largely cut out, and there are no troublesome internal noises due to a faulty cell. As an example of the sensitivity of the neutrodyne reflex it may be mentioned that W J Z, W G Y and K D K A have been regularly received during the summer months. In fact, East Pittsburg on 100 metres has been heard at comfortable strength without any aerial at all.

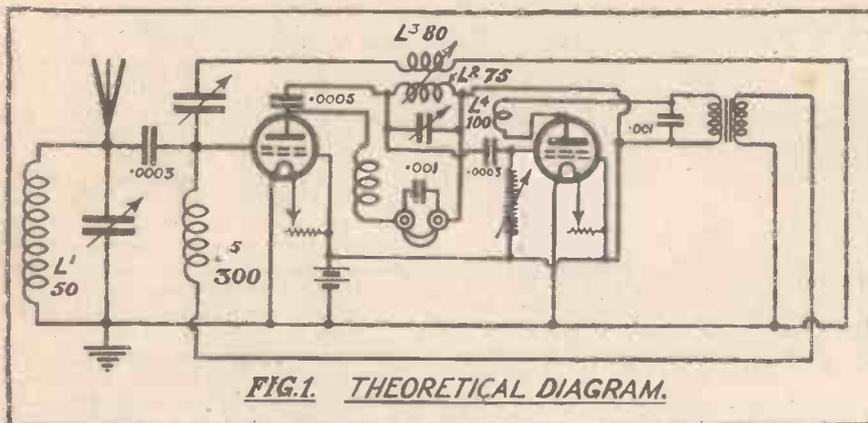


FIG. 1. THEORETICAL DIAGRAM.

further particulars might be of interest to Unidyne enthusiasts.

The set was intended for portable work, and had to be as small and light as possible; for this reason the famous Unidyne principle was incorporated in order to get rid of the troublesome H.T. batteries. This was an important step towards making the receiver really portable; twenty or more flash-lamp batteries are a formidable addition to a set which is quite heavy enough already. Now that dull emitter valves with two grids can be bought for a moderate price, it is absurd to retain an unnecessary H.T. battery. On the writer's set the only source of local energy consists of two Hellesen dry cells, which are quite sufficient for the modest needs of the dull emitter valves.

Eliminating Howling.

In order to get the most out of a limited number of valves it is necessary to make use of some form of dual amplification, which is simultaneous amplification at high and low frequency from the same valve. One of the chief drawbacks to reflex circuits is their liability to oscillate and howl; in this circuit the neutrodyne system of H.F. amplification is employed to eliminate all howling and instability by neutralising the self-capacity of the first valve. By this method there are no losses through grid damping (Fig. 1).

The various components are mounted on an ebonite panel measuring 18 in. by 9 in.; through the generous dimensions of the panel these components can be set well apart from one another in order to avoid any risk of interaction (Fig. 2).

handling it is advisable to clamp the leads to the terminals with strong nuts as well as by soldering.

Constructional Details.

Vernier control of the filament current is very useful for long-distance reception, so it is a sound idea to purchase good carbon rheostats. The coils and radio chokes can either be bought or made at home. The aerial, anode and neutrodyne coils are Nos. 50, 75 and 80 respectively. The value of the neutrodyne coil is not critical, but it should be roughly of the same number of turns as that used for the anode. The reaction is a No. 100 coil.

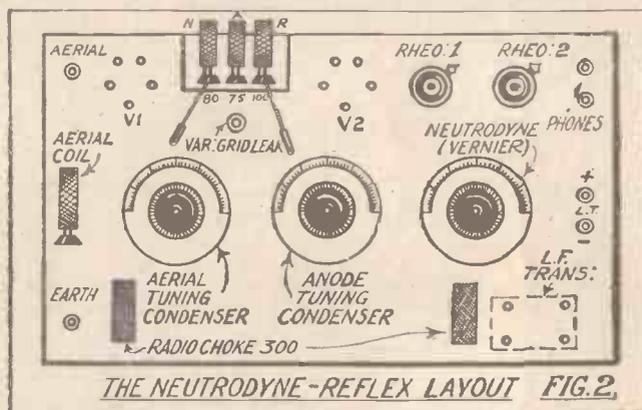
The neutrodyne, anode and reaction coils are attached to a three-way coil-holder; the reaction coupling must be as loose as is consistent with good signals. The neutralising condenser is a small vernier—the micro-condenser made by Radio Communication Company is very suitable for this purpose. If this condenser is properly adjusted—this is a delicate operation, and it may be necessary to reverse the leads to the neutrodyne coil—the sensitivity of the set will be enormously

Loud Speaker Results.

All the B.C.C. stations come in on the loud speaker when conditions are at all favourable; on a very poor aerial over twenty Continental transmissions have been picked up within an hour.

Frame aerial reception is possible within fifty miles of a main broadcasting station, and a hundred miles or more of Chelmsford. The neutrodyne control of the H.F. valve is largely responsible for this unusual sensitivity.

Since the only battery consists of two small cells, this circuit is especially suitable for a portable set; a strong attaché case measuring 20 in. by 10 in. will easily contain all the components and the battery. A loop aerial of 24 turns can be wound round



THE NEUTRODYNE-REFLEX LAYOUT FIG. 2.

the lid in order to receive broadcasting when no other form of aerial is available. The lid can be shut and the set carried about without any appreciable loss of signal strength.

This is not a set, however, that should be attempted by other than fairly experienced amateurs who are familiar with the operation of neutrodyne and reflex sets, as it may take a little experimenting before the best results are obtained.

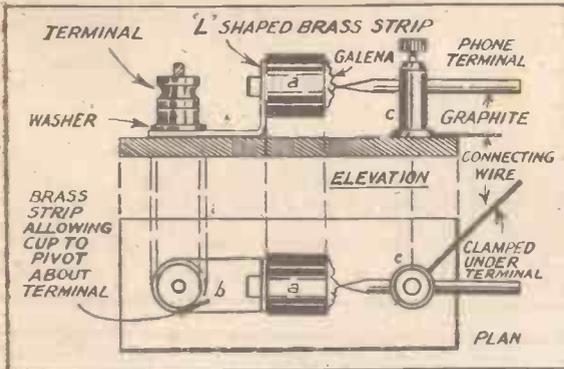
A "GRAPHITE-GALENA" DETECTOR.

By LIEUT.-COMMANDER H. W. SHOVE, D.S.O., R.N.

THE greatest disadvantage of the ordinary Hertzite crystal detector is the constant readjustment necessary to the cat-whisker. Particularly with dual amplification circuits is this a source of trouble and annoyance, as the incorrect setting of the crystal will often cause howling, in addition to loss of signal strength. The Perikon detector, while its adjustment is

cat-whisker type. It can be made as follows:

On a suitable insulating base mount a crystal cup (a), containing an ordinary galena (Hertzite, etc.) crystal, in the manner shown in the figure. The object of the "L" shaped brass strip (b) is to enable the cup to be turned about when "searching" the crystal. In front of the cup mount a small telephone terminal (c), the hole being approximately at the same height from the base as the centre of the crystal cup. The terminal should be fairly close to the cup, as the graphite is of high resistance, so should be as short as possible. Now take the "lead" from a hard pencil (a Koh-i-Noor is best) and carefully sharpen one end. Pass the "lead" through the terminal and adjust, so that the point touches the crystal.



Adjusting the Detector.

Search in the ordinary way for sensitive spots. The contact should be firm but not too firm, or the point of the graphite may be damaged. When a sensitive spot has been found, carefully tighten the binding screw of the terminal, and you will have a detector whose setting will remain good for a considerable time. Needless to say the brass strip L should not be too springy or every little jolt or vibration will cause the strip to vibrate and thus put the crystal out of adjustment.

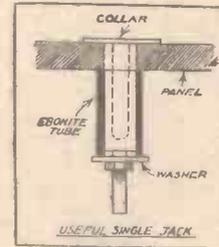
more permanent, has not the same sensitivity as Hertzite. Carborundum involves complication in the shape of a battery and potentiometer.

Easily Made.

A little-used, but very excellent, form of detector, especially for dual sets, is the "graphite-galena." This is more stable even than the Perikon and the writer has not found its sensitivity inferior to the

A USEFUL SINGLE JACK.

NEAT and useful sockets lying flush with the panel for use with ordinary valve pins can be made inexpensively in the following manner. The materials required are a number of valve sockets of the usual pattern, about 6 in. (or as required) of 1/4 in. bore ebonite tubing—that



used for "lead-in" connections being suitable—some washers, either 2 B.A. or 4 B.A., as desired, and a small amount of solder. The valve socket is fixed in a vice and the top filed smooth and carefully tinned; one side of a washer

is given the same treatment, and touched with flux and placed on the valve socket. Next a tapered iron is well heated and the point placed in the hole until the flux "fries" and then carefully withdrawn, leaving the washer firmly adhering to the socket, thus forming a collar.

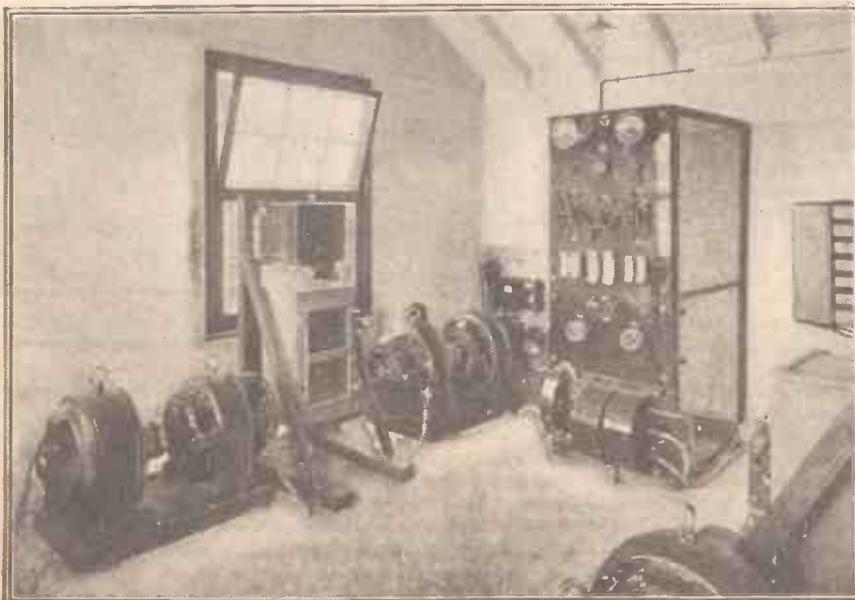
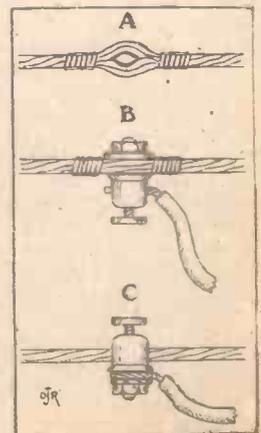
After this a piece of ebonite tube is cut to length according to the thickness of the panel and the length of the socket used. A 1/4 in. hole is drilled in the panel, the socket inserted, and the tubing placed over the end, a nut and washer holding the whole firmly in position as shown.

SIMPLE LEAD-IN JOINTS.

THERE is, of course, nothing to equal a good soldered joint, especially where the aerial and earth leads are concerned, but the amateur who is not sufficiently advanced to undertake a soldering job must naturally resort to the next best thing which, in the writer's opinion, is a firm grip contact as outlined in the accompanying illustration.

A small loop may be made by dividing the strands of the aerial wire, and binding each side with some No. 22 or 24 S.G.W.

copper wire as shown at A. The shank of an ordinary terminal is then clamped tightly in the loop and the lead-in is attached to the terminal in the manner indicated at B. Alternately, the terminal may be arranged as shown at C, where the aerial wire is clamped in same and the lead-in connected to the shank.



Generator and switchboard at the Belfast broadcasting station.

TWO-WAVE BROADCASTING. TRANSMITTING A "DUAL" PROGRAMME.

By **SEXTON O'CONNOR.**

Double-wave broadcast transmission has already been successfully "tried out" in America and on the Continent, and in this article our contributor gives a concise explanation of well-known systems.

IT is no easy matter to select a nightly programme which will appeal with equal interest to the very varied tastes of an audience of the size to which the circle of listeners-in has grown. This

so desire could then regale themselves to their hearts' content with dance music and other joyous items on 350 metres, leaving the "intellectuals" free to take refuge in the more austere fare provided

in the higher regions of 800 metres. Although it may appear at first sight impossible to transmit a "dual" programme of this kind from the same station without mutual interference and confusion, this is by no means the case.

Double-wave broadcast transmission has already been successfully "tried out" both in America and on the Continent, whilst "multiplex" systems of telegraphy (where several Morse messages are simultaneously sent and received on different wave-lengths) have been in operation for some time both in this country and elsewhere.

In view of probable developments in the future, it may be of interest to explain shortly some of the ways in which simultaneous transmission and reception on different wave-lengths can be carried out.

Using the Same Aerial.

In the simplest case, two separate aeriels are used. Each is fed by a separate oscillation generator at a particular wave-length, and is controlled by its own microphone. Mutual interference between the adjacent aeriels is, in this case, avoided by means of an elaborate system of rejector

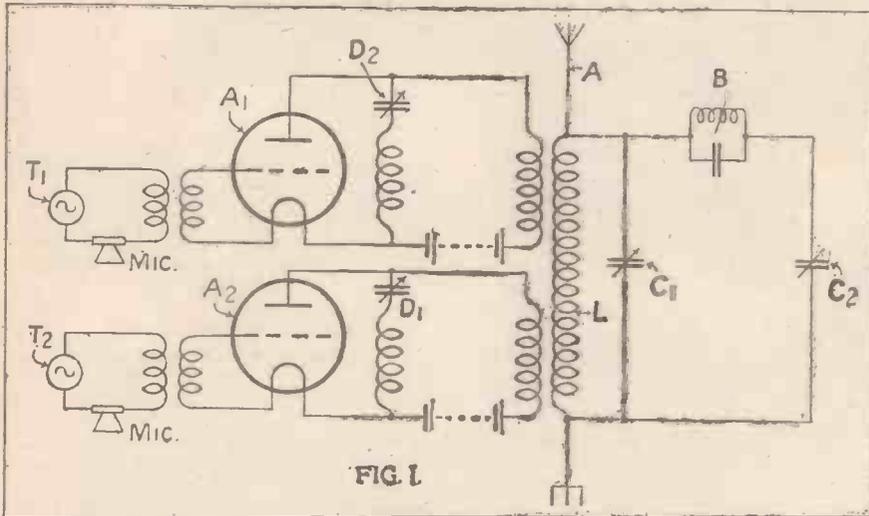


FIG. 1

difficulty is fully appreciated by the Broadcasting Company, who make every effort to ascertain and provide for the wishes of the majority of their audience. But with the best will in the world the most that can be done is to make a reasonable compromise. Accordingly, classical music takes its turn with jazz and opera with Shakespeare, whilst the University lecturer makes way for the professional humorist.

Already Proved Possible.

The problem would to a large extent be solved by the suggestion that has recently been made to transmit nightly, and simultaneously, two distinct types of programme on two separate wave-lengths. Those who

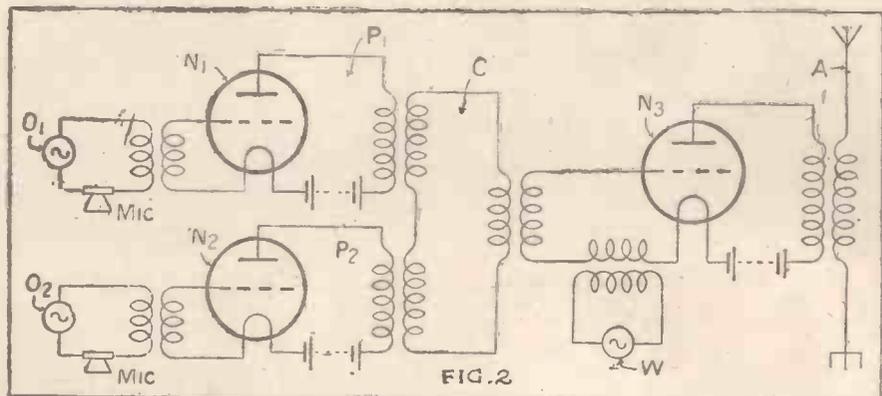


FIG. 2

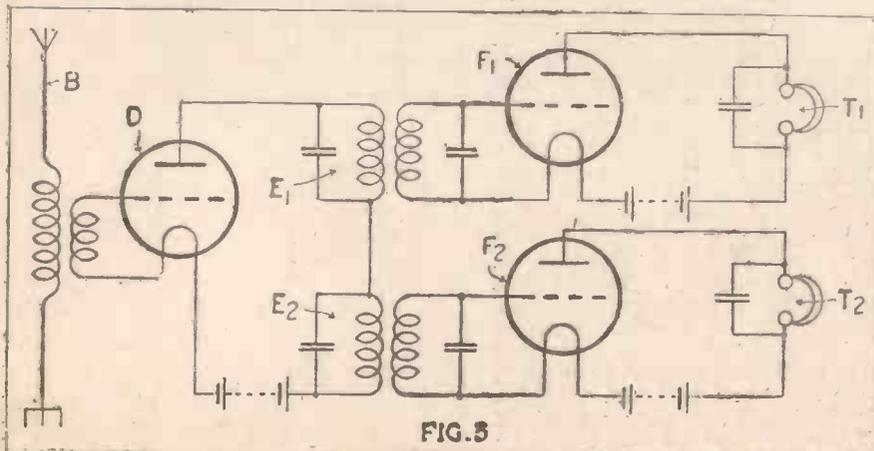


FIG. 3

circuits, blocking out the undesired radiations.

It is, however, possible to utilise the same aerial for both wave-lengths, as is commonly done in the case of multiplex telegraphy. There are two ways in which this can be done. In the first and older method the aerial is not tuned to a definite frequency, but is aperiodic in the sense that it will respond to two (or more) wave-lengths. In the second method the aerial is tuned to a definite frequency, but the single carrier wave fed to it is first modulated by two sub-frequencies, each of which is, in turn, "moulded" into speech form by independent microphones.

The circuit shown in Fig. 1 is an example of the first method. Two amplifiers, A1, A2, are coupled to the aerial inductance. Each of the amplifiers is fed with a separate

(Continued on page 684.)

TWO-WAVE BROADCASTING.

(Continued from page 683.)

"carrier wave," generated by a valve or other oscillator, T1, T2, and modulated by microphones as shown. There are consequently two different high frequencies (each carrying separate speech) flowing in the aerial circuit. It is interesting to see how these are prevented from mutual interference.

The aerial circuit is first tuned to the wave from T1 by means of a shunt condenser C1, so that the oscillating circuit

quencies, feeding these frequencies to it and providing rejector or acceptor circuits wherever necessary in order to avoid undesirable interference between the various coupled circuits.

As regards reception, no particular modification of the receiving set is necessary if the listener only desires to hear one programme at a time. All that is required is that the receiver should give sharp tuning. If the two wave-lengths are not fairly widely separated, some trouble may, of course, arise from interference by the undesired carrier waves; but these difficulties are identical with those hitherto experienced by listeners when two stations, both within range, are transmitting simultaneously.

If, however, it is desired to receive both

that the transmitting aerial is fed with a single-frequency carrier wave (from W), modulated by two sub-frequencies (from O1 and O2), each of which is, in turn, moulded into speech form. The frequencies O1 and O2 must, of course, be above audibility, so as not to interfere with the speech when rectified at the receiving end.

The receiving circuit is shown in Fig. 3. The aerial is tuned to the frequency W. The plate circuit of the first valve D is doubly tuned at E and E1 to frequencies corresponding to O1 and O2 at the transmitter. Separate receivers, F1, F2, are then coupled to each of the circuits, E1, E2, as shown, and the transmitted items are heard independently in the 'phones, T1, T2.



An American Remote Control Broadcasting Set. (Westinghouse Photo.)

for this particular wave-length is A, L, C1. The aerial system is next tuned to the wave-length from T2 by means of a second condenser C2, which is in series with a rejector circuit B across the aerial inductance. The rejector circuit is sharply tuned to the frequency T1, so that these waves cannot pass it, although it does not "reject" waves from T2, as these are of a different frequency.

Consequently the "tuned" aerial system for T2 consists of the aerial inductance L, the two condensers, C1, C2, in parallel, and the closed circuit B, taken as a whole. The aerial is therefore able to build up oscillations of two independent frequencies, namely T1 and T2.

Preventing Interference.

In order to prevent interference coupling between the plate coils of the two amplifiers, A1 and A2, an acceptor circuit D2 (tuned to the frequency of T2) bypasses any voltage effects due to energy transferred from the amplifier A2, thereby preventing it from reaching the plate of the amplifier A1 and affecting the output of that valve.

A similar acceptor circuit D1, tuned to the frequency of T1, likewise guards the plate of the valve A2 from energy transferred to it from the valve A1.

This is really not so complicated as it may appear at first sight. The whole principle consists in tuning the aerial so that it will vibrate to two different fre-

quencies simultaneously, as may happen in providing entertainment for a family of divergent tastes, the aerial has two branch circuits somewhat similar to those described for transmission, each branch being fitted with a separate tuner and with a blocking circuit to reject the undesired wave. By coupling a separate receiving set to each tuner, both programmes can be heard independently.

Two Programmes on One Aerial.

A simpler method, suitable for short-range reception, consists in making the receiving aerial aperiodic by connecting a resistance in series with the loading coil. Two separate high-frequency amplifiers are connected in parallel across both the resistance and aerial inductance, the plate circuit of each of the amplifiers being tuned to the required wave-lengths. Each valve will then extract the particular wave-length to which it is tuned from the double energy flowing in the aerial.

Fig. 2 illustrates a second method of dual transmission in which only a single carrier wave is employed, instead of two. Each of the two amplifiers N1 and N2 is fed with a different frequency from generators, O1, O2, in series with independent microphones. The output from both amplifiers is fed into a combining circuit C, which is linked to a modulator valve N3. This valve is also coupled to a circuit W which generates the main carrier wave, so

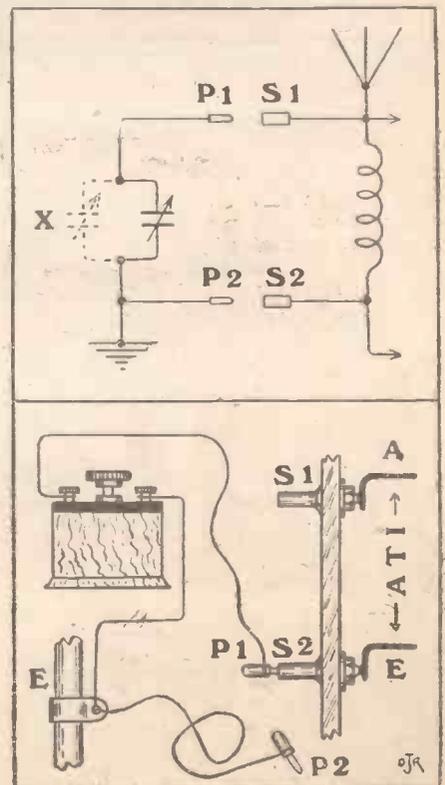
SERIES-PARALLEL ARRANGEMENT.

By O. J. R.

A VERY simple and inexpensive method of placing the aerial tuning condenser either in series or parallel with the A.T.I. is shown in the accompanying sketch, the change-over being effected by means of two plugs, P1 and P2, and two sockets, the latter being attached to the receiver panel and connected up to the A and E terminals as shown in the lower diagram.

The Flexible Plug.

When P1 engages S1, and P2-S2, the condenser is in parallel, and when P1 engages S2, and P2-S1 are disconnected, then the condenser is in series. X represents the optional vernier condenser which, of course, is connected in parallel with the main condenser. The flexible plug leads should be kept as short as possible.



Tune the Table-Talker with the "Matched Tone" Headphones



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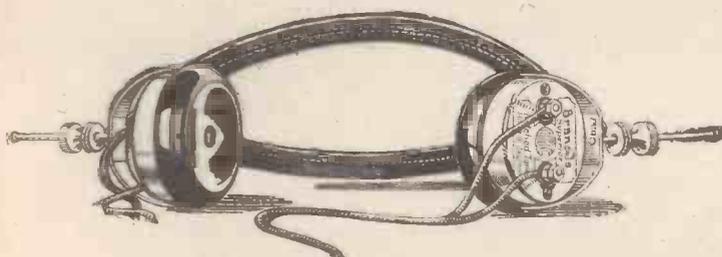
YOUNG Bill is decidedly quiet. This most unusual phenomenon is duly commented upon. Mother says that it looks as though wireless has provided a remedy for which she has been looking for years. Previously the whole house was aware of his presence by a piercing whistle or a cracked and tuneless rendering of an all too popular melody. A gentle trot from room to room characterised his movements and occasionally a shrill college yell. Now there are endless experiments which occupy his time. But if only he would cease to impress on us the technical advantages of Brandes Products. Technicalities don't interest us because we believe our own ears. The reception given by the *Table-Talker* was vigorous yet pleasant and beautifully natural—we might be right in the Studio.

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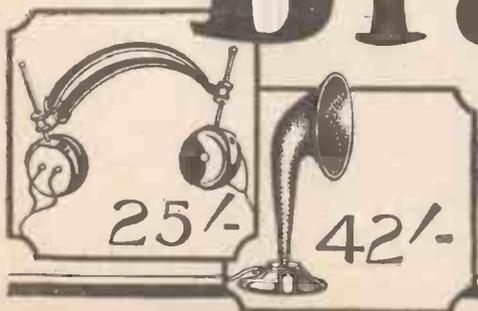
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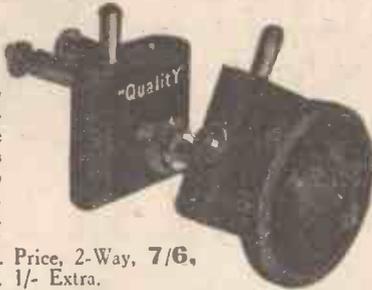
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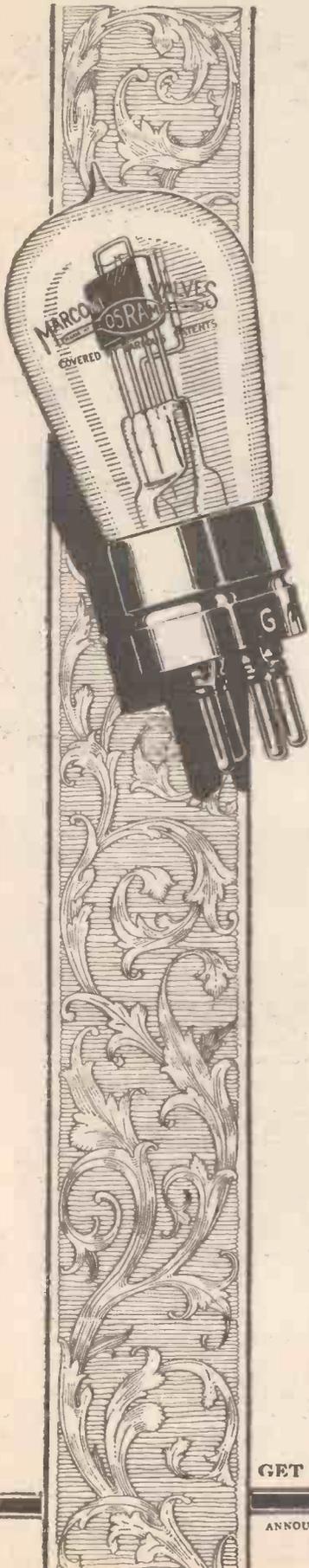
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| Dreaming | - | Schumann |
| Spring Song | - | Mendelssohn |
| Minuet | - | Bocchevini |
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| Serenade | - | Schubert |
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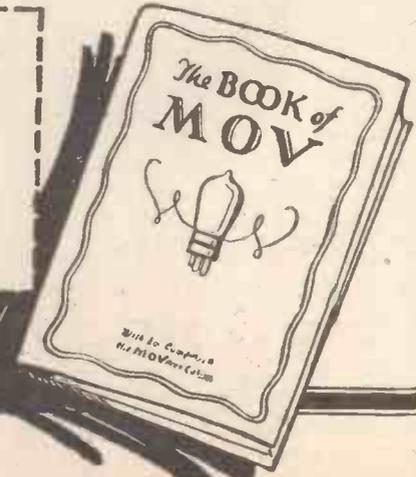
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HOW TO BUILD AN "ALL STATIONS" TWO-VALVE SUPER SELECTIVE SET.

By W. P. AVELING.

This is a Reflex regenerative receiver with an extra low-frequency amplifier. Crystal rectification is employed, and its extreme selectivity will enable the constructor to tune out local stations—a feature absent from the majority of dual amplification receivers.

THIS set will give good, clear loud-speaker results with one valve only, while the use of the extra L.F. provided gives signal strength about equal to a "straight" three-valve circuit—i.e. 1 H.F., D., and

Cardiff and Manchester studios, which even in 2 L O's silent periods are difficult to log with one valve), as well as French, German, and Spanish stations between, say, 350 and 500 metres.

also be got by a very slight movement of the reactance knob, but the control is not quite so gradual.

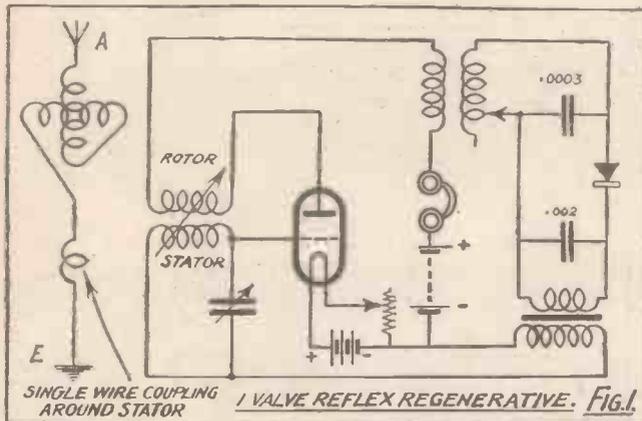
Components and Materials Required.

The cost of this set, without valves, cabinet batteries, etc., will be about £5 10s. to £7, depending upon the class of components used; and the writer cannot emphasise too strongly that only first-class parts should be employed, especially the L.F. transformers should be good.

Following is list of components, etc., that will be required:

- 1 sheet matted ebonite, 18 in. x 10 in. x ¼ in. (or ⅜ in. for preference).
- 2 crystal detectors (or a twin detector).

(Continued on page 690.)



On a regulation single aerial of 100 ft. one valve will work a loud speaker so as to render it nicely audible in a quiet room; this at a distance of less than five miles from 2 L O. When the extra L.F. is switched on, the loud speaker thunders out at about the strength of a three-valve "straight"

The tuning of this set, frequently a trouble with

L.F., and infinitely purer owing to employment of crystal rectification, and its extreme selectivity enables one to tune out the local broadcasting stations, a thing utterly impossible with the majority of one or two valve circuits (Figs. 1 and 2).

Simple to Operate.

It is a matter of common knowledge that there is no wireless receiving set which will work equally efficiently under all the varying conditions imposed upon it, and the aim of the writer in designing this set (which is the outcome of considerable experimental work) has been to embody in it as many useful functions as possible with the minimum of complication and maximum of efficiency for the reception of broadcasting free from local interference.

The outstanding features of the set are its extreme selectivity and remarkable clarity and comparative strength of signals received, it being possible after dark at less than five miles from 2 L O to cut that station out completely and clearly receive all the other B.B.C. stations (excepting the elusive

dual or reflex circuits plus reactance, has been simplified, and if the constructional instructions are carefully carried out, it will only be necessary to refer to the chart published below, set the dials in accordance therewith, and bring in the desired station by slowly moving the two vernier condenser controls.

The tuning is very sharp and critical, and this circuit differs from the usual in that the signal is brought to it by means of a single loop of 24 S.W.G. D.C.C. magnetically coupled around the stator of the vario-coupler. This coupling minimises danger of re-radiation and renders tuning constant, for all components except the A.T.I. (variometer) which is the only element affected by variations due to differing aerials. The writer has found that the position of the rotor, once the degree of coupling has been ascertained, need not be altered appreciably, it being sufficient to cut out resistance on the rheostat until the set oscillates, and then give a very slight movement to the rheostat knob, throwing in one or two turns of resistance: the same effect can

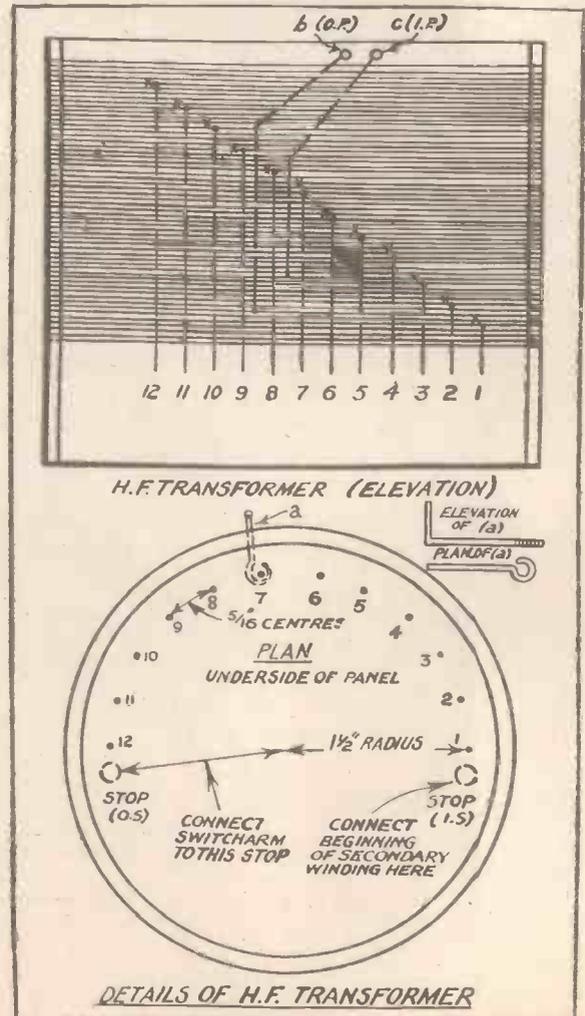
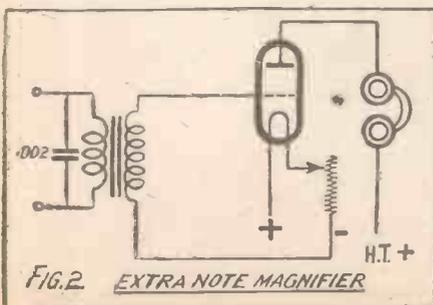


Fig. 3.



**AN
"ALL STATIONS" SET.**

(Continued from page 689.)

- 1 variable condenser, '0003, with vernier attachment built in (similar to Jackson Bros.).
- 1 vernier condenser (for H.F. transformer).

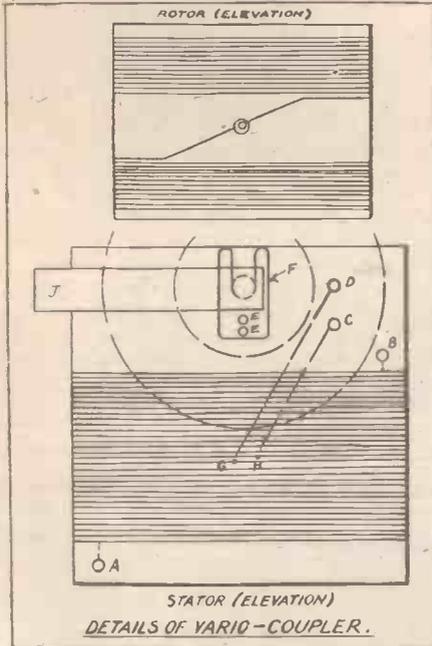


Fig. 4.

- 3 fixed condensers (two of '002 and one of '0003 mfd.).
- 2 L.F. transformers, shrouded, 5 to 1 or one 5 to 1 and two 3 to 1.
- 1 switch arm, 1 1/2 in. radius (for H.F. transformer).
- 12 studs and two stops for above.
- 1/4 lb. 24 S.W.G. D.C.C. wire.
- 8 or 9 inches of 3 1/2 in. ebonite tube or card-

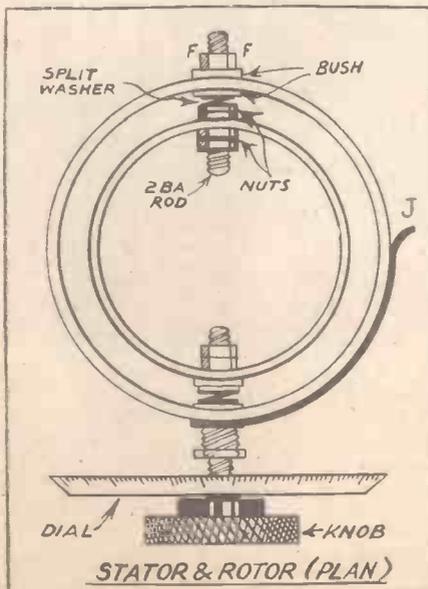


Fig. 5.

board former (for H.F. transformer and vario-coupler).

About three inches of 2 1/2 in. ebonite tube or cardboard former, for vario-coupler.

1 variometer (to tune in all stations, say, 350 to 550 metres).

2 rheostats.

2 valve-holders.

9 terminals.

1 D.P.D.T. switch } for panel mounting
1 S.P.D.T. " } with card template
" } for drilling.

1/4 lb. 16 or 18 S.W.G. square or round tinned wire.

2 doz. 1 in. 4 B.A. esk. bolts, nuts, and washers.

3 coil blocks (for loading coils).

Labels or transfers for marking panel.

1 ft. 2 B.A. screwed rod (brass).

1 doz. 2 B.A. nuts and washers.

Spring washers, say, 1/2 doz.

2 only screwed bushes, 2 B.A. (for one-hole fixing) for vario-coupler.

1 dial and knob for vario-coupler.

1 small knob 2 B.A. for vernier condenser and two pieces ebonite, 3 in. x 1 in., one piece 1 in. x 1/2 in., piece mica 3 in. x 1 in. and small quantity copper foil.

First of all, we will make the H.F. transformer and vario-coupler, neither of which can be purchased ready made.

Reference to diagram (Fig. 3.) will give all details of the H.F. transformer, which consists of a 3 1/2 in. tube on which are wound 53 turns of 24 S.W.G. D.C.C. wire for the secondary and 10 turns of 24 S.W.G. D.C.C. wire for the primary, both primary and secondary being wound at the same time side by side (the secondary being tapped and the primary in one length—not tapped) as follows:

Winding the H.F. Transformer.

Pierce or drill a hole in former, pass wire through and secure, marking this I.S. (input secondary), when five turns have been wound on, slip a rubber band over the turns temporarily to hold in position, and then pierce a hole alongside the 10 turns already wound, and through this second hole pass the end of another piece of 24 S.W.G. wire, about 10 ft. long, and mark this I.P. (input primary). Then taking the secondary wire and the 10 ft. of primary we wind on a further 10 turns of each, side by side, the primary wire is then taken through another hole, and this end is marked O.P. (output primary). Note.—All these beginnings and

ends of wire had better be fastened to screws or studs attached to the former, as shown in Fig. 3.

We may now continue to wind our secondary for another five turns (this will make 20 turns of secondary to this point). Make a hole in former and bring through a loop; this will be the first tap; after that we put on three further turns, again bring loop through (for the second tap), and so on, tapping every three turns until the 12th is reached, making 53 turns of secondary and 10 of primary.

Making the Vario-coupler.

Lightly shellac the windings and put aside to dry.

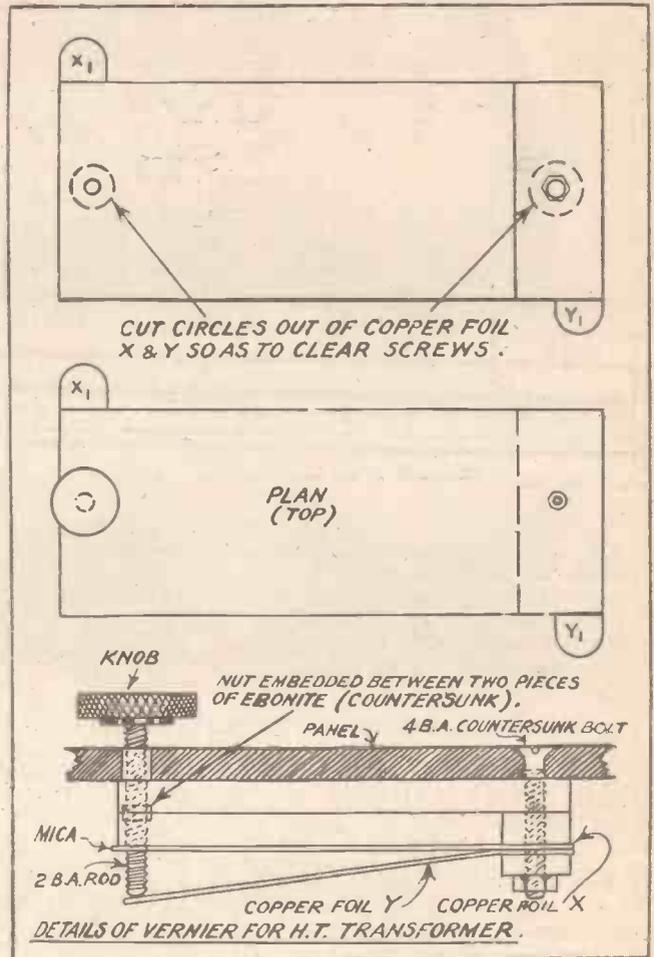


Fig. 6.

The other component peculiar to this set is the vario-coupler, which is made up as per Figs 4 and 5; 24 S.W.G. D.C.C. is used, the stator being wound with 50 turns and the rotor with 25 and 26—i.e. 51 all told, as shown. To revert to the stator: when 25 turns have been wound on, pierce two holes about 1/4 in. apart alongside, through which pass about a foot of 24 S.W.G., fixing one end to stud or screw affixed to stator, then make one turn tightly round stator and bring other end of short length of wire through the second hole, fixing to a second stud or screw (this is the one turn magnetic coupling), then continue winding on from the 25th turn until 50 turns are reached. The rotor can then be wound, taking care to make soldered joints at the beginning

(Continued on page 691.)

AN
"ALL STATIONS" SET.
(Continued from page 690).

and end of winding. Shellac windings, and when dry assemble the stator and rotor as shown in sketch.

By making slots in one end of stator to take the screw bushes we are enabled to solder up and complete the rotor and slide it into position, with the necessary washers

To the other stop we make a connection with the switch arm (which becomes the O.S.)

Test each component thoroughly before assembling, by means of a pocket lamp battery and 'phones or lamp. If you already have a crystal set, you can test your L.F. transformers by connecting L.F. I.P., and O.P. to 'phones terminals, bringing 'phones to L.F., I.S., and O.S. If no signals come through, try usual battery tests for primary and secondary windings separately.

Get good quality ebonite, use soft solder (blowpipe solder), and be most careful of

sake of clarity, the reflex and note magnifier circuits are shown on two separate theoretical diagrams, but the wiring diagram will make the switch gear very clear, whilst the disposition of the components of the reflex and note magnifier will be seen from "general lay-out" sketch. Should signals be weak, try the usual method of reversing the primary L.F. transformer leads in the reflex circuit (i.e. with switches in position 1). If no improvement, then reverse your crystal detector connection on top of panel.

If carefully constructed you will not find this set too difficult to manage; it is very stable and easily controlled.

First of all, set dials to your local station, as per attached tuning chart. If your aerial is less than 100 P.M.G. standard, then add slightly to the figures given. Try out the 1 valve (reflex) first.

The Set in Operation,

Turn on rheostat (about $\frac{1}{2}$ or $\frac{3}{4}$ way if M.O. 5 valves are used with a 6-volt accumulator), tighten up reactance knob very slowly until a hiss is heard, when you should ease off just a trifle. Next work the tuner and vario-coupler vernier simultaneously until signals are heard. Stop, and slowly rotate tuner until loudest; next slowly work vario-coupler vernier until loudest; then H.F. vernier (or even a stud either way of chart setting) until loudest, finally give an extra turn or so to rheostat until hiss is heard, when you should turn back slowly until you clarify the reception. This done, carefully note all your readings and compare with tuning chart herewith, and as your station's tuning compares with the chart, so will that of other stations. All this takes a long while to write, but is very quickly done after a little practice, and in the winter months the writer has within 5 miles of 2 L.O., and while that station was working a noisy concert party, tuned in within 10 or 15 minutes, one after another and all clearly audible, with an absolutely silent background, Bournemouth, Newca. Je, Glasgow,

(Continued on page 692.)

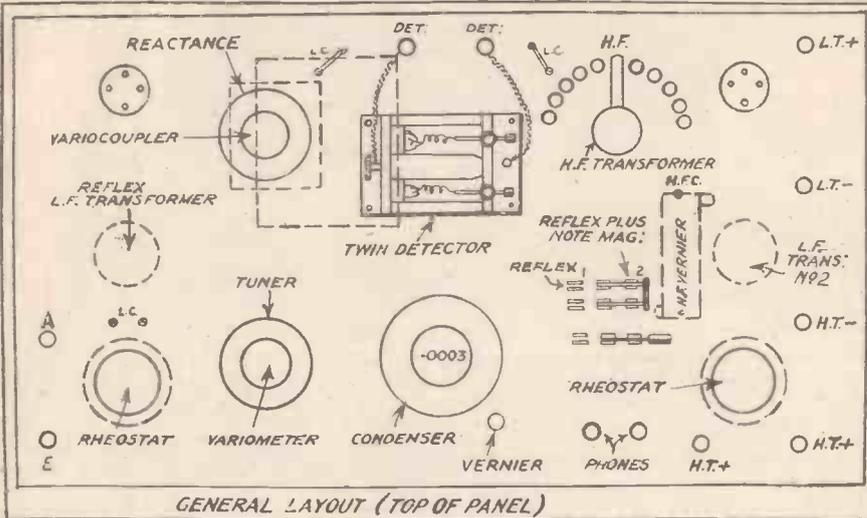


Fig. 7.

your joints, or you will not get the H.F. to function.

Be sure of the quality of the fixed condensers.

The Wiring Connections.

The wiring diagram, Fig. 8, gives all details as to wiring. It will be noted that H.T. and L.T. are joined in this circuit. For the

of to keep it sprung centrally and prevent fouling when being rotated.

We have also to make a vernier condenser for the secondary of our H.F. transformer, and this is perhaps done with the least trouble and in the smallest space, as shown on accompanying Fig. 6.

A study of Fig. 7 will give the general lay-out of the circuit, and here the writer would like to emphasise the importance of adhering as closely as possible to this lay-out, if successful working of the set is to result.

Drilling the Panel.

Drill the panel to suit components (try to get single-hole fixings for condenser and variometer).

It will be seen that the holes for the H.F. transformer should be drilled on a radius of $1\frac{1}{2}$ in. at $\frac{1}{16}$ in. centres (studs being $\frac{1}{8}$ in. diam. this gives a clearance of $\frac{1}{16}$ in.). As this radius ($1\frac{1}{2}$ in.) gives a circle of 3 in. only, and the transformer is $3\frac{1}{2}$ in. diam., it will be necessary to attach small wire extension pieces (12) (see Fig. 3) to which secondary windings may be soldered and, owing to the small clearance of $\frac{1}{16}$ in. above mentioned, it will be necessary to "stagger" or alternate the washers on the studs as follows. 1st stud: push through, slip wire extension piece over, then a brass washer, and lastly screw on nut; 2nd stud: push through, slip on washer, then the wire extension piece, and lastly nut. 3rd stud same as first, and so on to the 12th. As regards the two stops, the one to the left of No. 1 (looking topside of panel) is used to solder to I.S.

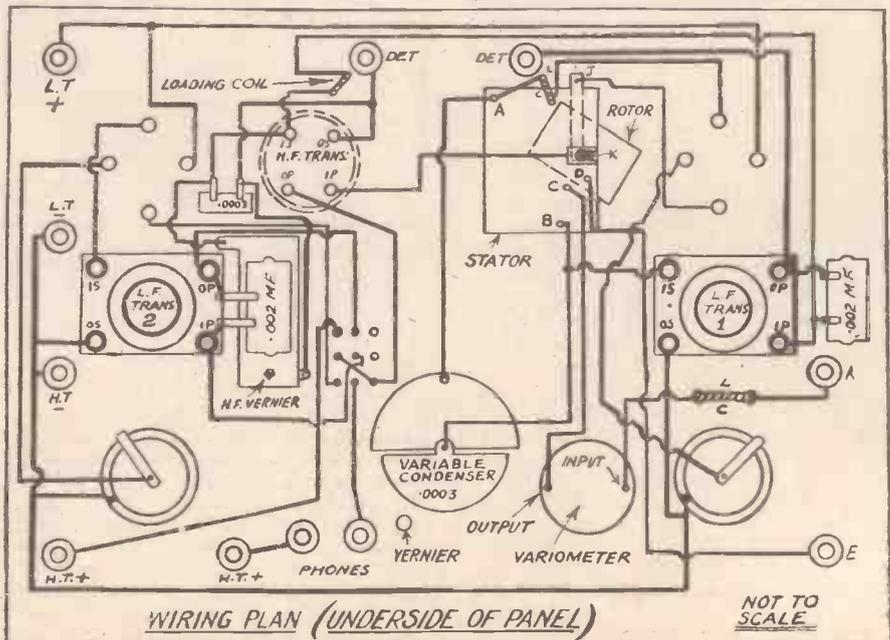


Fig. 8.

POLISHING A WIRELESS CABINET.

FROM A CORRESPONDENT.

MOST amateurs who make their own cabinets would like to finish them off with a good workman-like polish, but after trying to follow involved and often misleading book instructions, are disappointed with results.

The shellac on hand for various other wireless purposes will make a good job of polishing your case. Presuming your shellac varnish is made up in the right proportion, 4 ounces shellac to 1 pint of methylated spirit, you will then need a wide-mouthed bottle, into which pour a little varnish; add equal quantity of methylated spirit, which may be labelled "Polish," and the undiluted "Varnish." A wad of cotton-wool, four pieces of old linen, six inches square, a little knife powder, and a teaspoonful of linseed oil is all you need for mahogany or walnut.

Finishing Off.

Rub the wood down well with fine sandpaper, soak the wool with polish—hold it over the mouth of bottle and tip two or three times—place in centre of the four linen squares, gather up corners, and you have resulting a round pad with the polish oozing through the four thicknesses of linen surface. Now smear a little linseed oil over the face of pad with the finger (put it out in a saucer or tin lid for convenience) using as little as possible.

Commence to rub all over one side of the cabinet in circles without lifting the pad from the wood, until the pad is dry. Repeat on other sides. If you have any mouldings, you will find the pad misses the deeper parts. Give these a coat of the "varnish" with a soft brush. By this time the first side coated will be dry, if in a warm room.

Go all round again, adding as you go a sprinkle of knife powder on the wood, well rubbed in across the grain, while the pad is still wet. As you rub the pad out dry, you will find the powder has clogged the outside layer of rag; take it off, throw away, and carry on with remainder till all sides are done. Leave to dry in for half an hour, then go over the whole again, giving an extra rub to any parts needing it, using a little more powder if necessary, with as little oil as will allow the pad to slip.

It is now ready for the finishing touch—"spiriting." If the fourth rag is clogged, use a clean piece; half fill the pad with polish, adding methylated to fill; go lightly and quickly from side to side instead of in circles, working across the board, without passing over any part twice. Cork your bottles, and keep pad in lever top tin for future use.

Staining White Wood.

For oak, one coat only with the polish pad to stop the pores, followed by wax polish; beeswax, shredded, covered with turpentine and left till dissolved is the best to use, but "Ronuk" or similar prepared polish will do. Use little wax and much elbow grease.

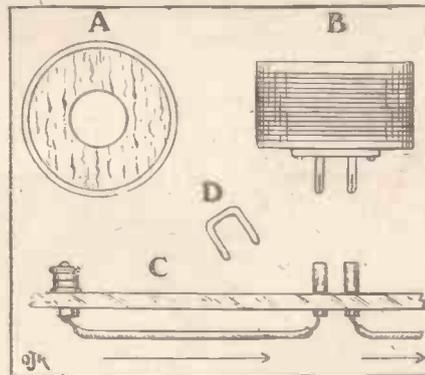
For white wood to imitate mahogany. Stain first with Vandyke brown in water, rubbed on with a sponge. When thoroughly dry give a coat of varnish with a soft brush. Rub down with fine sandpaper when dry, and proceed to polish as before, but with your polish stained with a little Bismarck brown dissolved in meth.

This on the Vandyke gives a nice mahogany colour, and could also be used for a mahogany cabinet if darker colour is required.

A good mirror-like surface can best be obtained by holding the work in a good light while rubbing, remembering that the gum coming through the rag in fine solution is rubbed on to fill inequalities, helped by the powder, which cuts down mountains and fills valleys, the resulting smoothness making the shine.

A SIMPLE LOADING COIL.

A NUMBER of very useful loading coils of various values can be easily made up from odd lengths of cylindrical cardboard formers in the manner to be described. A wooden disc is firmly glued into one end of each former, a hole about 1 in. in diameter being first bored in the



centre as shown at A. Over this hole is fitted a small piece of sheet ebonite, to which is attached two ordinary valve pins. The ends of the coil windings are connected to the nuts of the valve pins, inside the former.

Diagram B shows a side view of a completed coil. Two valve sockets are mounted on the panel as shown at C, these being connected in series with the lead from the aerial terminal and accurately spaced to engage the coil plugs.

When no loading coil is required it is only necessary to short circuit the two sockets either by means of a simple wire connector as shown at D, or with a more elaborate two-pin plug made up from two valve pins and a brass link.

AN "ALL STATIONS" SET.

(Continued from page 691.)

Brussels (then on 405/10), Birmingham, Aberdeen and, of course, the École at Paris on 450 metres, and on one or two occasions he has heard a band at Manchester simultaneously with a lecture from 2 L.O. All this on a 100 ft. single aerial, about 30 ft. high.

The set as designed will receive from about 325 to 550 metres, and loading coil blocks have been incorporated for future use to extend to other wave-lengths, but this is another story. Meanwhile, of course, these blocks are bridged or shorted.

An extra (separate) H.T. + terminal has been added to enable varying H.T. to be applied to valve 1 and valve 2. Two terminals have also been put at top centre and connections made on top so as to render it easy to change crystal detector.

Another refinement may also be added where it is desired to leave all settings ready for local station loud speaker work, and that is insert a rheostat between the L.T. — terminal on the accumulator and the L.T. — terminal on the panel, turning the current on and off through this rheostat, acting as a switch but with the advantage of feeling the current through the other rheostats and to the valves, gradually, thus obviating a sudden, full load on the valves.

Tuning Made Easy.

With this attachment the set can be carefully tuned in, and when done with simply turned off by means of the master rheostat, and any novice may then simply turn on the master rheostat full and be certain of being correctly tuned in and of receiving whatever transmission is going on that particular wave-length.

TUNING CHART.

Wave-length	Station	Tuner.	Cond.	H.F. Trans.
353	Cardiff	16	72	4
365	London	30	76	5
375	Manchester	40	84	6
385	Bournemouth	50	88	6
400	Newcastle	56	98	6
420	Glasgow	65	108	7
450	École	74	130	8
475	Birmingham	82	148	9
495	Aberdeen	86	158	10

NOTE.—Owing to the wide variation in sundry makes of variometers, the figures in above "tuner" column may not quite compare, but the H.F. transformer column should be correct, as also the variable condenser figures, as these latter were obtained on two separate condensers at different times. Dubilier fixed condensers were used throughout.

However, by working to a wave-meter or local station at first, the other stations can be easily found by interpolating the above figures and making allowances referred to under the section on Operatio-

HOW TO MAKE A CRYSTAL RECEIVER WITH NOVEL DETECTOR.

By J. LAURENCE PRITCHARD
(Technical Editor, "Harmsworth's Wireless Encyclopedia.")

The set described in this article is variometer tuned and is capable of receiving on the ordinary broadcast wave-lengths, and embodies quite a novel form of crystal detector.

A GLANCE at the crystal receiver in Fig. 1 will show a novelty in the form of a crystal detector which is quite original. Its originality of design, however, was quite a secondary considera-

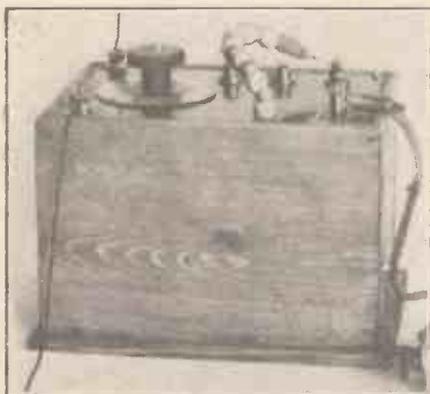


Fig. 1. The complete set.

tion, the first being to design a crystal detector without the faults inherent to a great many.

The first source of weakness which it was desired to eliminate was the uncertain electrical contact found in many detectors of the ball-and-socket type. In this type there are at least two possible places where bad contact may occur, one is between the cat's-whisker rod and the ball-and-socket joint inside which it slides, while the second is the joint between the outside of the ball-and-socket and the supports in which it is housed.

An Ingenious Detector.

In the detector of the set illustrated, one continuous wire is connected from the cat's-whisker, or, rather, from the snake's fangs

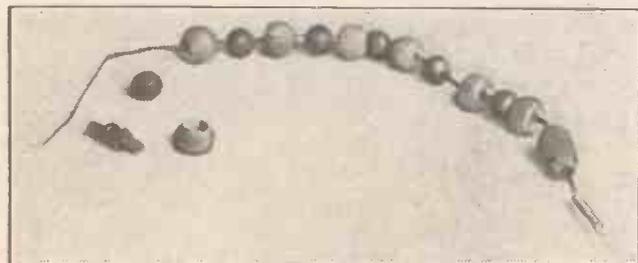


Fig. 2. The ingenious crystal contact "snake."

itself, direct to the terminal to which it connects. Another drawback to the ordinary detector which it was desired to remove was the direct control of the cat's-whisker. In

the ordinary type, of detector an extremely steady hand is necessary, and even then, if the hand is not withdrawn carefully, the cat's-whisker arm is likely to be jolted and the setting lost.

In the snake detector the control of the crystal is effected by a rotating knob, which is some distance away from the crystal on the panel itself. Another advantage is that as many crystals as can be fixed within the radius of the snake's movement may be employed, the change from one to any other being made almost immediately.

The receiving set itself is variometer tuned and capable of receiving on the ordinary broadcast wave-lengths. An oblong box measuring internally $7\frac{1}{2}$ in. long, 5 in. wide, and $5\frac{1}{2}$ in. in depth is made from wood $\frac{3}{8}$ in. in thickness, and has a moulded base overlapping slightly. The top edges of the case are rounded over to give a better appearance. Fillets are fitted $\frac{1}{4}$ in. down from the top, to which the panel is afterwards screwed.

Three Crystals Used.

A panel is cut to fit the top of the case. Aerial and earth terminals are screwed to the back and front of the left side of the case respectively. These should be sufficiently far in to clear the fillets. Two telephone terminals are fixed to the right of the panel and towards its front edge. A G.R.C. variometer is used, and is screwed midway between the longer sides of the panel and 2 in. from the left edge. The variometer should be removed at this stage in case it receives damage during the constructional work on the panel.

Three crystal cups are fixed in line at a distance of 1 in. from the back edge of the panel and $\frac{3}{8}$ in. apart. The centre one is $2\frac{1}{2}$ in. from the right side of the case. The cups are connected together by means of a thin strip of copper placed under the nuts on the underside. Each crystal cup is screwed to a length of 4 B.A. stemming by means of a tapped hole on its underside. The stemming has a large, flat, round nut

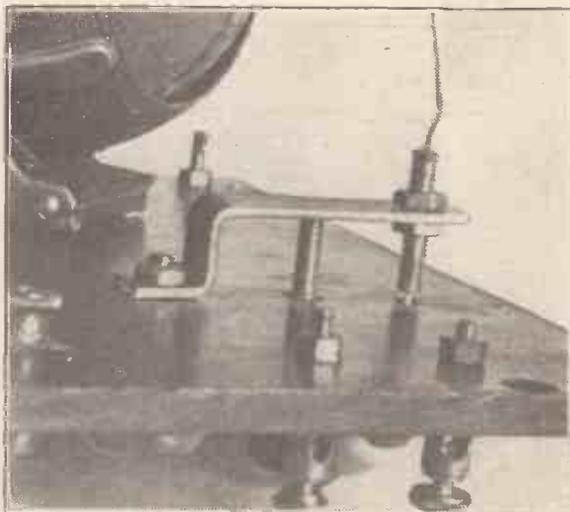


Fig. 3. A "close up" of the tension adjuster under the panel.

screwed on at one end and a round terminal nut on the underside of the panel. By this arrangement the stemming is rigidly fixed and the crystal changed without removing the panel from the case.

The principle on which the detector works is quite simple. A number of ball-and-socket joints are made by employing a number of round wooden beads of which every other one is hollowed out on both sides.

The beads are threaded on to a flexible wire having an obstruction at one end so that it cannot be pulled through. When the last bead is fixed and the wire pulled tight, the pressure between each adjacent bead locks the string of beads into a rigid arm. Even where the pressure of the wire is not great the snake will be rigid enough to remain in the position in which it is put, and yet be still capable of being moved to any desired spot of the crystal.

Constructing the "Snake."

It will remain in the exact spot where it is put without springing back or moving in the slightest degree. A microscopic adjustment is fitted which will be explained during its construction.

Having a knowledge of the principles of the detector, its construction will be found extremely simple. Seven round beads of $\frac{1}{2}$ in. diameter and six of $\frac{3}{8}$ in. diameter, are required. These may be obtained from a dealer in artist's materials of all kinds or a bead shop. Many drapers also stock them for ornamental buttons and tassels. The larger diameter beads are drilled or turned out cup-shape on either side of the central

(Continued on page 694.)

A CRYSTAL RECEIVER WITH NOVEL DETECTOR.

(Continued from page 693.)

hole, so that the edges just made make contact with the smaller beads.

The snake's head is shaped from an oblong piece of wood $\frac{3}{4}$ in. long. A central hole of $\frac{1}{8}$ in. is drilled right through. If the hole in

tension is not sufficient to affect the rigidity of the snake's body.

A close-up view of the fine adjustment device is illustrated in Fig. 2. The central hole in the end is opened out to $\frac{3}{8}$ in. diameter for half its length. The beads are now threaded in order on a length of flexible wire and the head also put on at the end. A spring is made from a piece of Bowden cable by stretching it out to form a contraction spring. It is then cut off $\frac{3}{4}$ in. in length. It is slipped over the wire at the head end and fits into the enlarged hole. The other end is securely soldered to the end of the wire. At the same time the snake's fangs are soldered into position. One is of

distances of 1 in. and $\frac{1}{2}$ in. from one end, as shown in the illustration. The bent end is attached to the panel by means of a 2 B.A. countersunk screw and nut. A 2 B.A. hole is drilled in the panel over the hole at the other end of the brass strip. Midway between these two holes a 2 B.A. tapped hole is required.

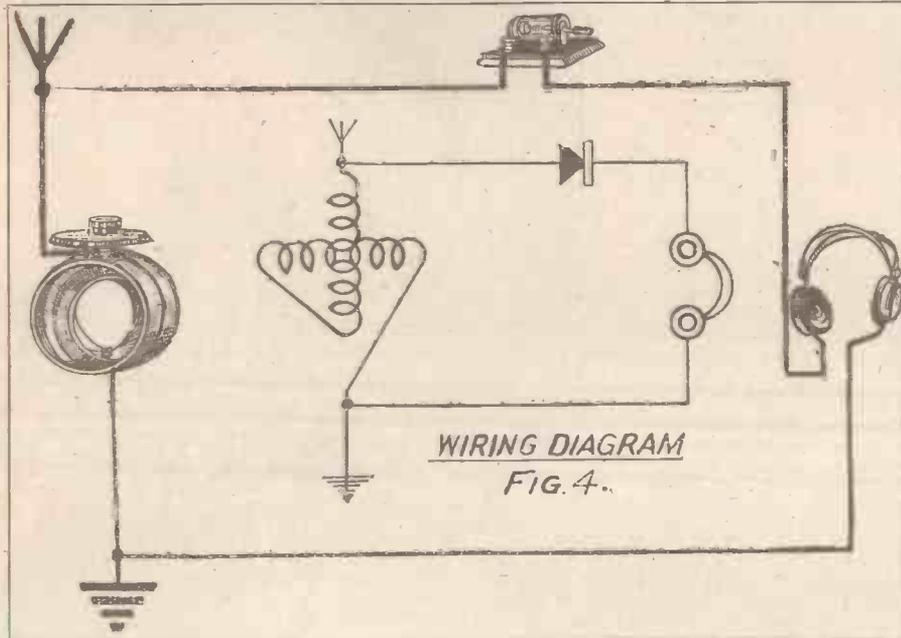
The Detector Adjustments.

A coarse adjustment to the wire is given by soldering it in a hole drilled through the centre of a short length of 2 B.A. stemming. The stemming passes through the hole in the strip, and adjustment is made by means of a lock nut screwed to either side of it. A length of 2 B.A. screwed rod having a small knob rigidly attached at one end is screwed into the tapped hole, the outer end pressing against the middle of the brass strip. When the adjusting spindle makes light contact with the brass strip, the coarse adjustment should be set so that the snake's body can be easily moved about to any desired position without falling down. The lock nuts are then tightened securely.

The Set in Operation.

The wiring of the set is extremely simple and is carried out to the diagram given in Fig. 4. The underside of the set wired up is given in Fig. 5. After it is screwed to the case it is ready for operation. Having tuned in the station with a preliminary setting of the crystal, the adjustment knob is rotated until the best pressure is obtained. To increase the pressure the adjusting knob is turned in an anti-clockwise direction, which has the effect of slackening the wire slightly and thus expanding the spring carrying the cat's-whisker. A close-up view of the snake's head with one of the fangs making contact with the crystal is illustrated in Fig. 6.

If desired a crystal detector of conventional design can be used, in which case the



the beads is smaller than this size they should be enlarged with the same drill. The back end of the snake's head is rounded off to the same curve as the smaller beads.

The Contact "Fangs."

The fine adjustment is obtained by giving the wire which runs through the beads a spring action, so that the snake's fangs or cat's-whiskers are capable of moving in or out of the snake's mouth by varying the tension on the wire. This variation of

silver and the other of brass, so that the best combination with a given crystal may be used.

The snake is now put aside while the tension adjuster is made and fixed. This is arranged on the underside of the panel and is clearly seen in Fig. 3. A $2\frac{1}{2}$ in. length of $\frac{1}{8}$ in.

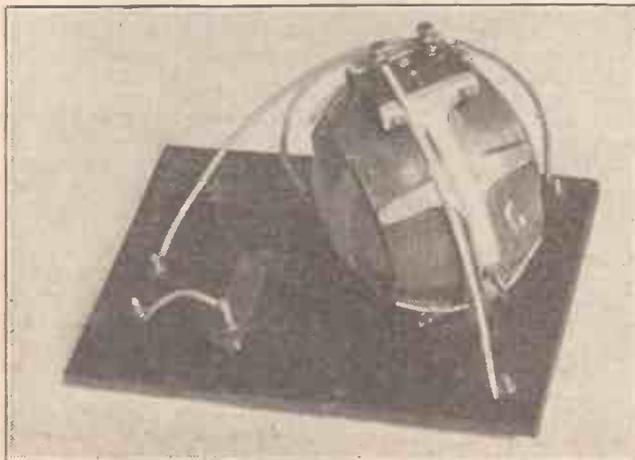


Fig. 5. Note the simple under-panel wiring.

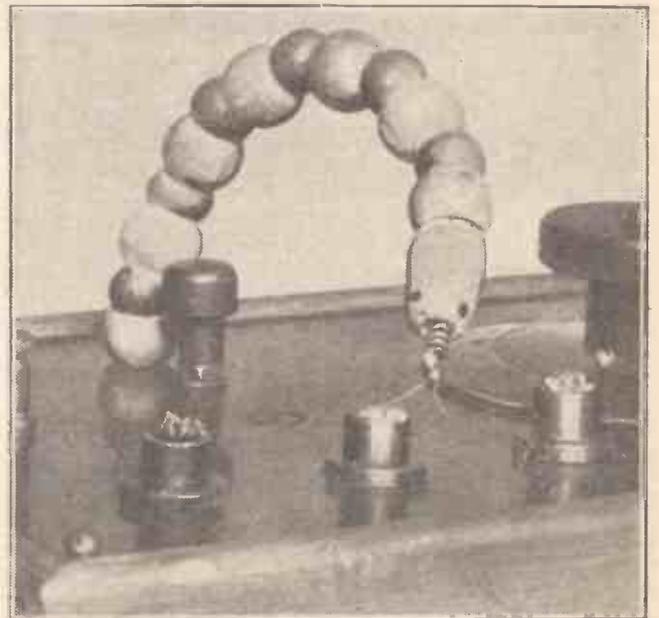
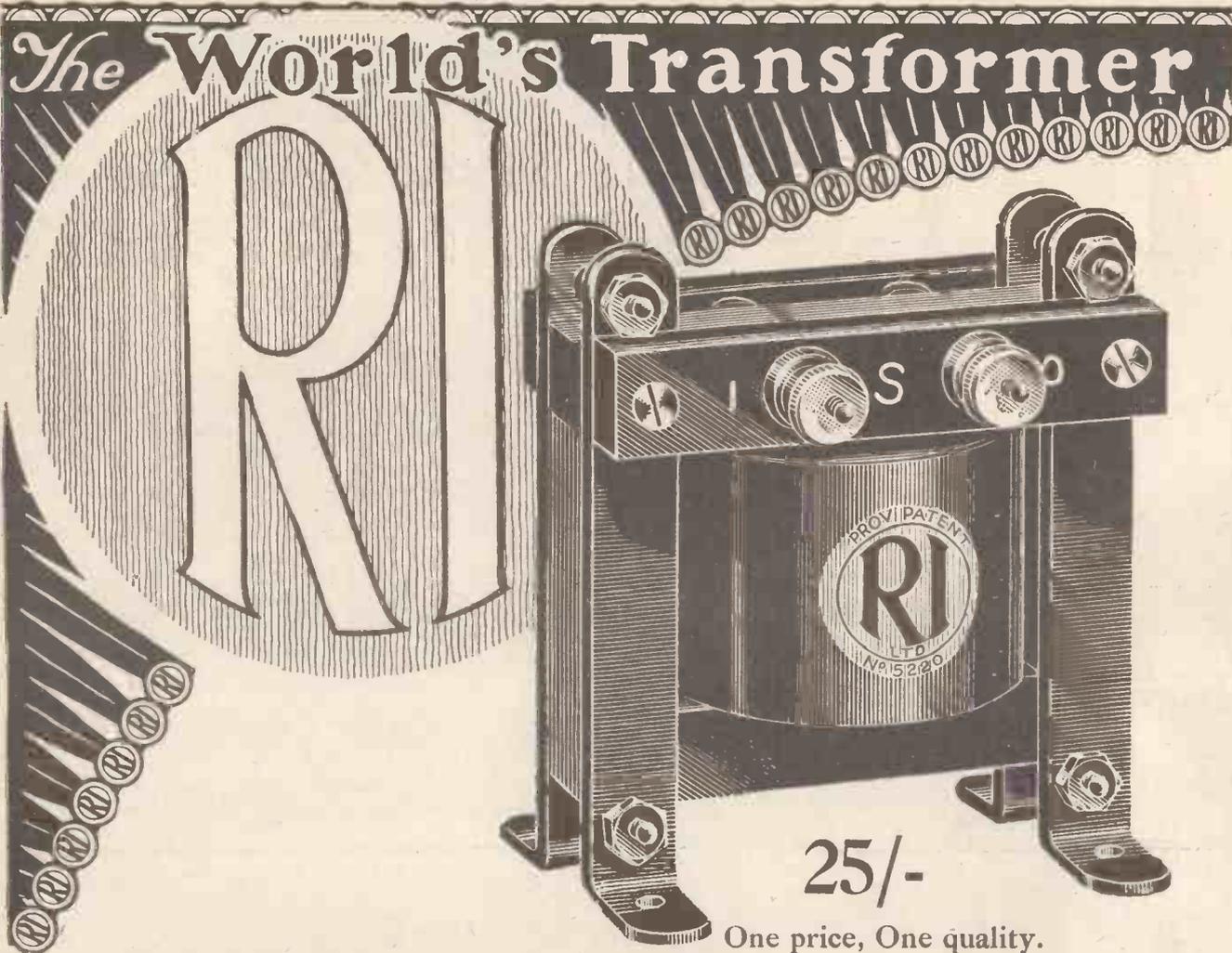


Fig. 6. One of the "fangs" making contact with the crystal.

by $\frac{1}{8}$ in. brass strip is drilled with a 2 B.A. clearance drill at either end. Two right-angle bends are made at

circuit remains exactly the same. The diagram, Fig. 4, for the sake of clarity, shows an ordinary detector and also emphasises the simple nature of the circuit employed.



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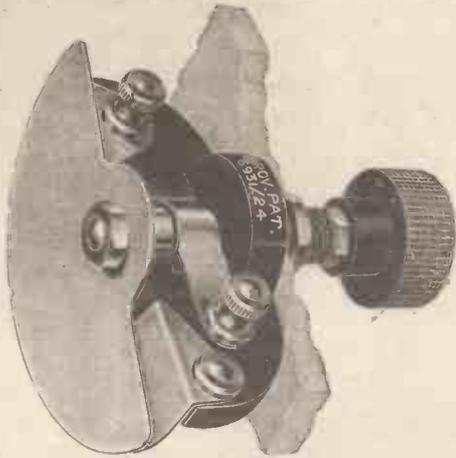
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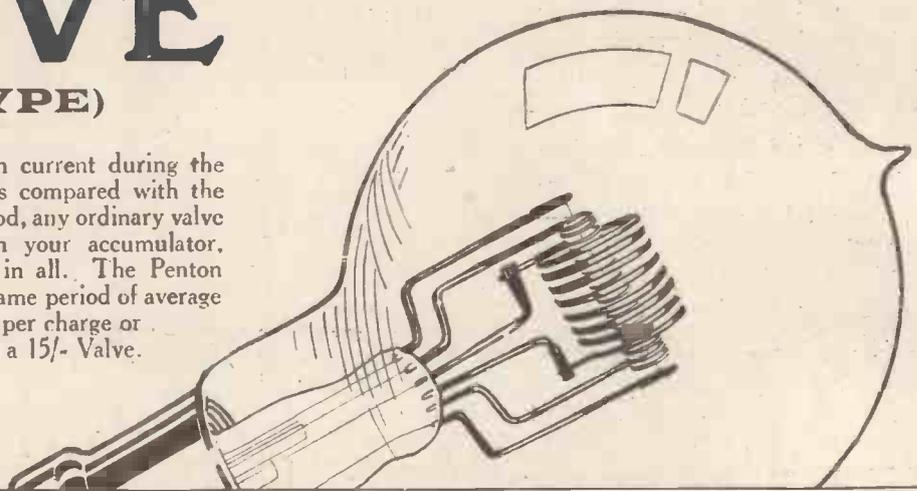
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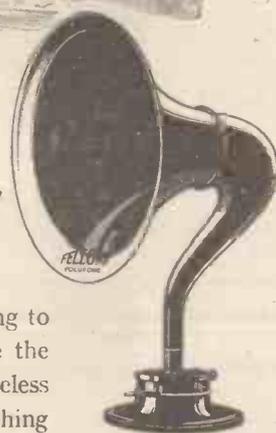
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BRITISH TELEPHONY TRANSMISSIONS.

Station.	Call Sign.	Wave-length in Metres.	Station.	Call Sign.	Wave-length in Metres.
Aberdeen	2 B D	495	§Hull	6 K H	335
Belfast	2 B E	435	*Leeds	2 L S	346
Birmingham	5 I T	475	§Liverpool	6 L V	315
Bournemouth	6 B M	385	London	2 L O	365
*Bradford	2 L S	310	Manchester	2 Z Y	375
Cardiff	5 W A	351	Newcastle	5 N O	400
†Chelmsford	5 X X	1,600	§Nottingham	5 N G	322
†Croydon	G E D	900	§Plymouth	5 P Y	335
§Edinburgh	2 E H	328	§Sheffield	6 F L	301
Glasgow	5 S C	420	§Stoke-on-Trent	6 S T	306

* Twin relay station. † Experimental high-power station. ‡ Air Ministry station. § Relay station.

Time (G.M.T.)	Station	Days	Remarks	Time (G.M.T.)	Station	Days	Remarks
13.00	London	Tues., Thurs., and Fri.	Time Signal and Concert.	18.00	Newcastle	Weekdays	Scholars' Talk.
15.00	Cardiff	Weekdays	Concert, etc.	18.00	Bournemouth	Tuesday	" "
15.00	Bournemouth	Friday	" "	18.30	Birmingham	Weekdays	" "
15.15	London	Mon., Tues., Wed., Thurs. and Fri.	Talk to Schools, etc.	18.30	Aberdeen	Mon. & Thurs.	Girl Guide and Boys' Brigade.
15.30	Aberdeen, Birmingham, Glasgow, and Manchester	Weekdays	Concert, etc.	18.30	Manchester	Thursday	Boy's Brigade, etc.
15.30	Bournemouth	Mon., Tues., Wed., Thurs. and Sat.	" "	18.35	Newcastle	Irregular	Weather Forecast (Farmers)
15.45	Newcastle	Weekdays	" "	19.00	All Stations	Weekdays	Time Signal, 1st Bulletin, Talks, and Weather Forecast
16.00	London	"	Time Signal and Women's Topics	19.30	" "	"	Concert, etc.
16.00	Belfast	"	Concert, etc.	21.30	" "	"	Time Signal, 2nd News Bulletin, Talks and Weather Forecast.
16.45	Newcastle	"	Women's Topics	22.00	" "	Mon., Wed., and Sat.	Savoy Bands.
17.00	Cardiff and Birmingham	"	" " etc.	Through-out Day	Croydon and other Air Stations	Daily	To aeroplanes, etc.
17.00	Bournemouth and Manchester	"	Children's Topics.	15.00	London	Sunday	Time Signal, Concert, etc.
17.15	Aberdeen	Tues., Thurs., and Fri.	" "	15.00	All Stations (except Belfast)	"	"
17.30	Birmingham, Belfast and London	Weekdays	" "	17.00	" "	"	Children's Talks, etc.
17.30	Aberdeen	Mon., Wed., and Sat.	" "	20.00	" "	Sunday (Irregular)	Religious Service.
17.45	Cardiff	Weekdays	" "	20.30	" "	Sunday	Religious Address, Concert, etc.
18.00	Glasgow	"	Farmers' Weather Forecast.	21.00	Belfast	"	" "
				22.00	All Stations	"	Time Signal, Weather Forecast, News, etc.

CONTINENTAL TELEPHONY TRANSMISSIONS.

G.M.T.	Station.	Wave-length in Metres	Days.	Nature of Transmission and Remarks.	G.M.T.	Station.	Wave-length in Metres	Days.	Nature of Transmission and Remarks.
06.25	Hamburg	392	Weekdays	Time signal, etc.	10.55	Leipzig	452	Weekdays	News, etc.
06.55	Münster	407	Daily	Time signal.	10.55	Frankfurt	467	Weekdays	Time signal, Concert.
07.00	Frankfurt	467	Sundays	Religious service.	11.00	Leipzig	452	"	News.
07.00	Berlin (L P)	3150	Weekdays	News and market quotations almost hourly during day.	11.00	Frankfurt	467	"	News.
				Weather report.	11.00	Stockholm	440	Sundays	Divine Service.
07.05	Lausanne (H B 2)	850	"	" "	11.00	Stuttgart	437	Weekdays	News.
07.40	Eiffel Tower (F L)	2600	"	" "	11.05	Breslau	415	"	Talk.
07.55	Hamburg	392	Sundays	Time signal.	11.10	Zurich	650	Sundays	Concert (irregular).
07.55	Amsterdam (P C F F)	2100	Weekdays	News and market quotations almost hourly during day.	11.15	Eiffel Tower (F L)	2600	"	Time signal.
				News etc.	11.15	Berlin (Voxhaus)	430	Weekdays	News.
09.00	Berlin (Voxhaus)	430	"	Concert.	11.30	Münster	407	"	Market news.
09.00	Komarov	1800	Sundays	Concert.	11.45	Hamburg	392	"	" signal.
09.15	Berlin (Voxhaus)	430	Weekdays	News, etc.	11.55	Berlin (Voxhaus)	430	"	" "
09.40	Berlin (L P)	680	Sundays	Concert.	11.55	Hamburg	392	"	" "
10.00	Kbely	1150	"	"	11.55	Münster	407	Daily	" "
10.00	Münster	407	"	Religious service.	11.55	Leipzig	452	Weekdays	" "
10.00	Vienna	530	"	"	11.55	Breslau	415	Sundays	Time signal and weather.
10.15	Hamburg	392	"	Concert.	11.55	Königsberg	460	Daily	Time signal.
10.15	Breslau	415	Weekdays	Weather, etc.	12.00	Leipzig	452	Weekdays	Market report.
10.15	Königsberg	460	Weekdays	Market news.	12.00	Rome (I C D)	3200	"	Concert (irregular).
10.30	Lyons (Y N)	470	Daily	Concert.	12.00	Cartagena (E B X)	1200	"	" "
10.30	Stuttgart	437	Sundays	"	12.00	Ryvang (Denmark)	1025	Thursdays	Concert.
10.30	Kbely	1150	Daily	News.	12.05	Berlin	430	Weekdays	News.
10.30	Königsberg	460	Sunday	Talk.	12.15	Kbely	1150	"	" "
10.40	Eiffel Tower (F L)	2600	Weekdays	Market quotations.	12.15	Hamburg	392	Sundays	Concert.
10.50	Berlin (L P)	2800	Sundays	Concert.	12.15	Geneva (H B 1)	1100	Weekdays	Weather.
10.50	Stuttgart	437	"	Service.	12.15	Eiffel Tower (F L)	2600	"	News.
10.55	Eiffel Tower (F L)	2600	Daily	Time signal.	12.25	Breslau	415	"	Time and weather report.

CONTINENTAL TELEPHONY TRANSMISSIONS—continued.

G.M.T.	Station.	Wave-length in Metres	Days.	Nature of Transmission and Remarks.	G.M.T.	Station.	Wave-length in Metres	Days.	Nature of Transmission and Remarks.
12.30	Lausanne (H B 2)	850	Weekdays	News, time signal, etc.	18.00	Eiffel Tower (F L)	2600	Sun., Tu. and Thur.	Talk
12.45	Radio Paris (S F R)	1780	"	Tzigane Orchestra.	18.00	Zurich	650	Weekdays	Weather report.
12.45	Kbely	1150	"	News, etc.	18.00	Brussels (S B R)	265	Daily	Concert.
13.00	Brussels (B A V)	1100	"	Weather report.	18.15	Kbely	1150	"	News, etc.
13.00	Eberswalde	2930	Irregular	Concert.	18.30	Hamburg	392	Sun. and Friday	Talk.
13.00	Munich	485	Weekdays	Time, weather, and news.	18.30	Breslau	415	Daily	"
13.00	Radio Paris (S F R)	1780	Daily	News and concert.	18.30	Leipzig	452	Weekdays	"
13.00	Komarov	1800	Weekdays	News, etc.	18.30	Königsberg	460	Mon., Wed., Fri.	"
13.15	Königsberg	460	"	Market news.	18.30	Frankfurt	467	Mon., Wed., Thur., Fri., and Sat.	"
13.15	Berlin (Voxhaus)	430	"	News.	18.30	Frankfurt	467	Mon., Wed., Thur., Fri., and Sat.	"
13.30	Hamburg	392	Th., Fri.	Market news.	18.40	Münster	407	Daily except Sat.	Weather.
13.45	"	392	Mon., Tu., Wed.	"	18.55	Hilversum	1050	Mondays	Children's hour.
14.00	Berlin (Voxhaus)	430	Mon. to Friday.	Market prices.	19.00	Vienna	530	Irregular	Concert.
14.00	Hamburg	392	Weekdays	Talk.	19.00	Königsberg	460	Daily	"
14.00	Breslau	415	"	"	19.00	Hamburg	392	"	"
14.00	Rome (Centocelle)	1800	"	News, etc.	19.00	Gothenburg	690	Wed.	"
14.30	Münster	407	"	"	19.00	Stuttgart	437	Daily	"
14.40	The Hague (P C G G)	1070	Sundays	Concert.	19.00	Stockholm	470	Tues. and Thurs. and Sun.	"
15.00	Münster	407	Weekdays	News, etc.	19.00	"	440	Wed., Fri., Sat.	"
15.00	Königsberg	460	"	"	19.15	Zurich	650	Daily	"
15.00	Berlin	430	"	"	19.15	Lausanne (H B 2)	850	Irregular	"
15.00	Leipzig	452	Mon., Tu., Wed., Fri., and Sat.	"	19.15	Leipzig	452	Daily	Concert, etc.
15.00	Frankfurt	467	Sundays	Concert.	19.20	Eberswalde	2930	Thurs. and Sat.	"
15.00	Breslau	415	"	"	19.20	Lyngby (O X E)	2400	Weekdays	News.
15.00	Stuttgart	437	"	"	19.30	Stuttgart	437	Daily	Concert, etc.
15.00	Paris (School of Posts)	450	Irregular	"	19.30	Munich	485	Daily except Sats.	Concert.
15.10	Frankfurt	467	Weekdays	News.	19.30	Münster	407	Daily	"
15.30	"	467	Daily	Concert.	19.30	Berlin	430	"	"
15.30	Munich	485	Weekdays	"	19.30	Berlin	430	"	"
15.30	Berlin	430	Daily	"	19.40	Hilversum	1050	Sundays	"
15.30	Königsberg	460	"	"	19.50	Berlin	430	Irregular	Racing results.
15.30	Hamburg	392	Sundays	"	20.00	Königsberg	460	Mon., Tu., Th., Fri., Sat.	Concert.
15.30	Leipzig	452	Weekdays	"	20.00	"	460	Sundays	"
15.40	Eiffel Tower (F L)	2600	"	News.	20.00	Geneva	1100	Irregular	"
15.45	Paris (School of Posts)	450	Wed.	Talk (irregular).	20.00	Lyngby (O X E)	2400	Weekdays	News.
16.00	Breslau	415	Weekdays	Concert.	20.00	Copenhagen	750	Irregular	Talk.
16.00	Frankfurt	467	Sundays	Talk.	20.00	Ryvang	1025	Tues. and Fridays	Concert.
16.00	Lyngby (O X E)	2400	"	News.	20.10	Ymuiden (P C M M)	1050	Saturdays	"
16.00	Lausanne (H B 2)	850	Weekdays	Talk (irregular).	20.10	Hague, The (P C G G)	1070	Irregular	"
16.00	Kbely	1150	"	News.	20.15	Brussels (S B R)	265	Daily	News and concert.
16.00	Zurich	650	"	Concert.	20.15	Stuttgart	437	Daily except Wed.	Concert.
16.05	Hamburg	392	Mon. Wed. and Fri.	Talk.	20.15	Königsberg	460	Daily except Sun. and Wed.	"
16.30	Paris (School of Posts)	450	Thursdays	Concert.	20.30	Paris (School of Posts)	450	Daily	"
16.30	Radio Paris (S F R)	1780	Weekdays	News.	20.30	Radio Paris (S F R)	1780	"	News and concert.
16.30	Stuttgart	437	"	"	20.30	Rome (I C D)	1800	Irregular	Concert.
16.30	Breslau	415	Sundays	Concert.	20.30	Frankfurt	467	Daily	Talk.
16.45	Radio Paris (S F R)	1780	Daily	"	20.30	Leipzig	452	Weekdays	"
16.45	Stuttgart	437	Weekdays	"	20.30	Munich	485	Irregular	"
16.45	Hamburg	392	Sundays	Talk.	20.40	Hilversum	1050	Fri. and Sun.	Concert.
17.00	Leipzig	452	Daily	"	21.00	Berlin	430	Daily except Tues.	Time and weather
17.00	Komarov	1800	Irregular	Concert and news.	21.00	Frankfurt	467	Daily except Tues.	Concert.
17.00	Cartagena (E B X)	1200	"	Concert.	21.00	Hamburg	392	Daily	Talk.
17.00	Hamburg	392	Weekdays	News, etc.	21.00	Eiffel Tower	2600	Irregular	"
17.00	Frankfurt	467	"	"	21.00	Barcelona (E A J 1)	325	Weekdays	Concert.
17.00	Munich	485	Daily	"	21.00	Lyngby (O X E)	2400	"	News, etc.
17.00	Brussels (S B R)	265	"	Concert.	21.15	Stuttgart	437	Sun., Mon. and Sat.	Time and weather.
17.00	Barcelona (E A J 1)	325	Weekdays	"	21.30	Paris (Petit Parisien)	345	Irregular	Concert.
17.15	Zurich	650	Mon., Wed. and Fri.	Talk, etc.	21.30	Frankfurt	467	"	Talk.
17.20	Berlin	430	Daily	Talk.	21.30	Madrid (Radio Iberica)	392	Daily	Concert.
17.30	Stuttgart	437	Irregular	"	21.40	The Hague	1050	Irregular	"
17.30	Munich	485	Weekdays	"	21.50	Hamburg	392	Weekdays	Ten-minute Talk.
17.30	Frankfurt	467	Mon., Tu., Th., Fri. and Sat.	"	22.00	Radio Paris (S F R)	1780	Irregular	Dance Music.
17.30	Frankfurt	467	Thurs. Fri. and Sat.	"	23.00	Eiffel Tower (F L)	2600	Weekdays	Weather, etc.
17.30	Eiffel Tower	2600	Weekdays	Closing prices.					
17.40	Hilversum	1050	Irregular	Concert.					
17.45	Radio Paris	1780	"	Racing results.					
17.50	Lausanne (H B 2)	850	Weekdays	Weather report.					
18.00	Hamburg	392	"	News, etc.					
18.00	Stuttgart	437	Mon., Tu., Wed., Th., and Fri.	Time and weather.					
18.00	Eiffel Tower (F L)	2600	Mon. Wed., Fri.	Concert.					



Look to your Valves

GENERAL PURPOSE VALVES:

Type R. ... 12/6 each
 Filament Voltage.....4 volts
 Filament Current.....0.7 amp.
 Maximum plate voltage...100 volts
 Plate resistance.....27,000 ohms.

Type B3 ... 21/- each
 Filament voltage.....1.8 volts
 Filament current.....0.35 amp.
 Maximum plate voltage...80 volts
 Plate resistance.....27,000 ohms.

***Type B5. ... 25/- each**
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 Filament current...0.06 amp. (at 3 v.)
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 Maximum plate voltage...120 volts
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***Type B6 ... 35/- each**
 Filament voltage.....3 volts
 Filament current.....0.12 amp.
 Maximum plate voltage...120 volts
 Plate resistance 9,000 ohms.

***Type B7 ... 37/6 each**
 Filament voltage.....6 volts
 Filament current.....0.06 amp.
 Maximum plate voltage...120 volts
 Plate resistance 9,000 ohms.

*For use with Dry Cells



They are chiefly responsible for the quality of reproduction. Badly exhausted valves, otherwise "soft" valves, are short-lived and give poor results. "Soft" valves cost less to make than "hard" valves, but they are expensive and unsatisfactory in use. B.T.H. Radio Valves are exhausted by a special patented B.T.H. process which produces an exceedingly high vacuum.

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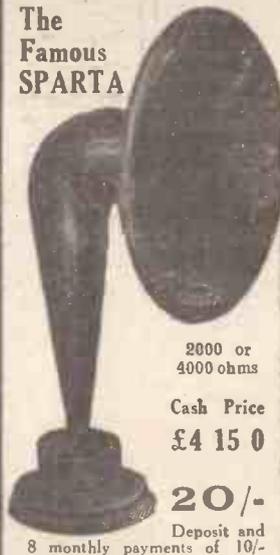
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RADIO JOTTINGS FROM AMERICA.

FROM OUR OWN CORRESPONDENT.

EVER since Nikola Tesla, the famous American scientist, perfected his first wireless controlled car in 1898, numerous attempts have been made to extend the use of such remote operation with success. Not long ago, John Hays Hammond, Jun., sent an obsolete United States warship out on the ocean without a man on board and made it perform manœuvres. So it was not a new performance which was made by a Wisconsin youth recently in demonstrating a wireless-controlled automobile, but it afforded, for probably the first time, an intimate knowledge of how the thing is done.

The old-time coherer, of course, was utilized. The coherer, in its most simple form, is a tube of carbon granules which cling together and complete a circuit when a wireless wave is impressed upon them. One surge of current from the transmitter control key, corresponding to a telegraphic dash, will make a circuit that is immediately broken by a tapper on the side of the coherer which loosens the granules and prepares them for the next surge.

Wireless Control.

In the latest device, an antenna is strung along the top of a miniature automobile. One "spark" lights one of three lamps on the spar, which signifies that the apparatus is ready for operation. The next "spark" starts the motor, which puts the car in motion.

By this means of "sparking" waves upon the car, tail-lights, head-lights, side-lights, and direction-finder lights may be turned on, the gears may be reversed and speeded up, and, in fact, every action that can be made by a human in an ordinary automobile is accomplished by means of wireless.

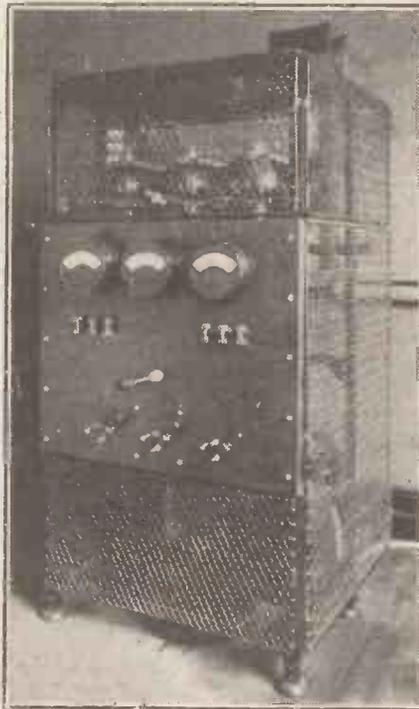
It should not be thought, however, that wireless actually operates this car, or, in fact, any similar device. Wireless merely actuates power already contained in the automobile. If it were possible to actually impress motivating power upon the car, then the long-sought-for "wireless power transmission" would be a reality. As yet, however, wireless power transmission is a long way off, the nearest approach to it at present being the Marconi wireless beam and the Matthews "death ray," neither of which, however, has been proven practical for transmission of power through the air for great distances.

Many years ago, "On the Banks of the Wabash," a song dear to the heart of every Hoosier, was composed by Paul Dresser. Now, in a day far removed, in the town of Dresser, Indiana, named after the composer, and located on the banks of the Wabash river, an experiment is being conducted which is probably destined to become as world-famed as the sentimental song.

It is a new type of "wired wireless," worked out in a manner never before

attempted. By this new method, an aerial wire, 1,500 feet in length, supported by telegraph poles, is placed parallel to telegraph wires which extend across the country and is used for sending and receiving. Wireless waves are imposed upon the telegraph wires from the antenna without interruption to that mode of communication.

The name of this system of wired wireless is long and complicated. It is called "The Duplex Automatic Carrier Current Telephone System," and was worked out by the engineering department of the Westinghouse Electric and Manufacturing Company. The



Part of the transmitter at C K A C, the Canadian La Presse station.

transmitting is done by means of a five-valve 250-watt transformer which induces, with its long aerial, radio waves upon the telegraph line. At the receiving end the message is picked off of the telegraph line with another long aerial.

There is remarkably low loss of power by this system, and the feat of directing messages is possible. Calls may be made on the ordinary automatic dial telephone without the aid of operators, from one party to another.

The "Low Loss" Craze.

Many amateurs in America have been quite upset over the new "low loss" epidemic which is sweeping the nation and rendering sets, formerly considered efficient, as poor as a husband's excuse, in the minds of those amateurs. Everything must be

low loss, so that all of the infinitesimal amount of wireless energy received may be trapped and utilised without dissection and loss of parts. So now the old type condenser with the generous end insulating panel must be discarded and a new one, made mostly of metal, replaced. The old tuning coils which were tapped for various wave-lengths and wound on a tube also must be relegated to the waste pile.

In place comes the self-supporting coil, in which there are no dead-end losses, no stray currents nor inductive losses, and condensers which have no dielectric losses, no oil interference in the friction contacts, nor inequality of capacity between stator and rotor.

To effect these improvements, the condenser is made with an all-metal frame, which forms contact with the rotor. To compensate for this difference in capacity, the stator, which is held in place by two very small insulating pieces, has plates slightly larger. The reason that a very small amount of insulating material is used is because all such material has a dielectric loss, or leakage, which absorbs energy.

There can be no brush contact between movable parts, because this is found to be inefficient, as there is oil in all metals, which works to the surface and forms an insulating film. To do away with this, there must be a "pig-tail" soldered wire connection.

In general appearance, low loss apparatus look like skeletons, with their thick, low resistance parts, ample air space, and lack of "body," which was supplied by rubber composition in the old type condensers and coils.

A New Sodian Valve.

It was a great gamble to put the so-called "sodian" detector valves on the market, for they were expensive to buy, complicated to use, and were worthless as amplifiers. But the inventor had great faith in them, claiming that his ionization principle of rectification made the most sensitive and most quiet detector in existence.

However, he realised that the produce was not perfected, and continued experimenting. As a result, a new sodion tube has been made, which has a solid, instead of a liquid, anode, and has a filament which requires less power.

The valve is of unique structure, having a heating wire wound around the outside of a glass tube to "ionize" the sodium gas, and a protecting glass covers all. There is an anode electrode and a semi-cylindrical collector inside the valve, in addition to a filament. This valve cannot reradiate and has to be used in special circuits.

There is little doubt that the present electronic valves can be improved upon, and if the sodion principle is superior, there is no reason to believe that with improvements this valve will not have wider use.

A USEFUL CONDENSER AND AN EASILY MADE DETECTOR.

THE condenser about to be described was intended for three uses, though probably the reader will find many others.

Firstly, if used with air as the dielectric it should make an efficient vernier with micrometer adjustment. (Fig. 1.)

Secondly, if used with mica as dielectric it should have a fairly high maximum, and very low minimum capacity.

Thirdly, if the plates are reduced to about $\frac{1}{4}$ in. square and air is the dielectric employed, it should make an efficient variable neotrodyne condenser.

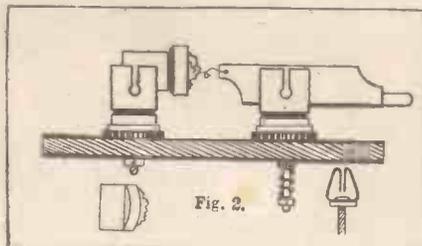
The diagram is self-explanatory, and for the first two uses mentioned above the plates should be about $2\frac{1}{2}$ in. square. There are two small points which might be mentioned, and these are that to get the maximum capacity the thickness of the plates should be as nearly equal as possible to the thickness of the small brass hinge, and that the screws bolting the plates to the ebonite strips should be of the flat-headed countersunk type, the heads being filed flush with the plates after the latter are bolted up. The mica may be fixed to either of the sheets with shellac varnish.

The Crystal Detector.

The cats-whisker mount shown should revolve and have either a rubbing or flex connection, and gives all the necessary movements and a firm or delicate touch for wire or second crystal, such as bornite or tellurium. The latter can be mounted in a small cup soldered to bar.

For the holder cut a thin piece of

brass and bend double, and squeeze cats-whisker between in vice or with pliers. Thin down the other end of the bar and plainly mark so as to readily distinguish which is which in your collection. The crystal cup can be made from a thin piece of brass tubing—old cartridge-cases are



good—a piece of flat brass being soldered to one end. (Fig. 2.)

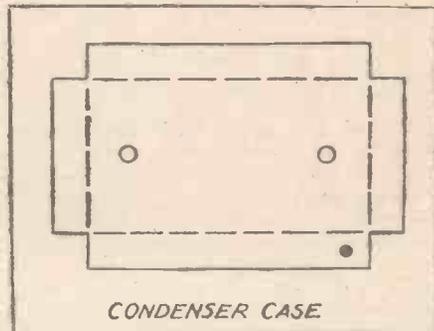
Mounting the Crystal.

There is no doubt that Wood's metal is the best cement for crystals, and the following method minimises the risk of hurting the crystal. Place a piece of quite wet linen over a piece of Moldine or Plasticine, and press crystal into this, and then place the cup over the crystal. Melt some Wood's metal in a spoon and pour into cup, which is open at far end. The metal immediately sets and very little heat is imparted to the crystal. If the mounted crystals are kept in their particular pill boxes when not in use you know where you are and dust trouble is minimised.

TWO USEFUL HINTS.

A Novel Condenser Case.

CUT a gramophone record to shape, as shown in sketch. This may be cut with a pair of scissors, if the record is first held in front of the fire to soften. When the shape is cut out, again soften the



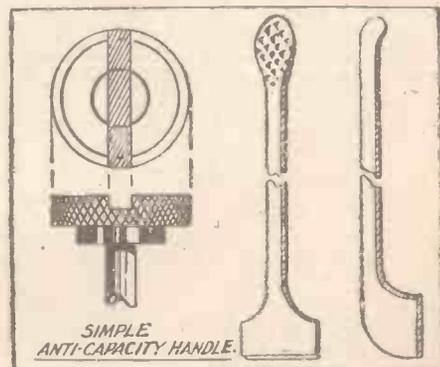
record till it is easy to bend, then bend as shown by dotted lines, bringing the corners together. The corners may then be rounded off and sealed with a hot iron, such as a poker or anything of that description. The case can then be finished off with glass-paper to the maker's satisfaction. This type of case has been thoroughly tested and has been subjected to 2,000 volts A.C. between holes and through the thickness successfully, no sign of leakage being noticed.

* * *

Simple Anti-Capacity Handle.

A VERY useful way to convert the desired knobs of the set requiring anti-capacity handles may be carried out in the following manner:

First file a small groove right across the knobs to take the handle; this may be



made any shape. Two are given here—one a spade type that will permit operation from above, the other to act lengthways. The spade pattern is filed out of a small strip of ebonite and milled or roughed at top for a grip; the bottom, of course, is filed to fit the groove in the knob. The other pattern is shaped as shown, but will not require to be milled.

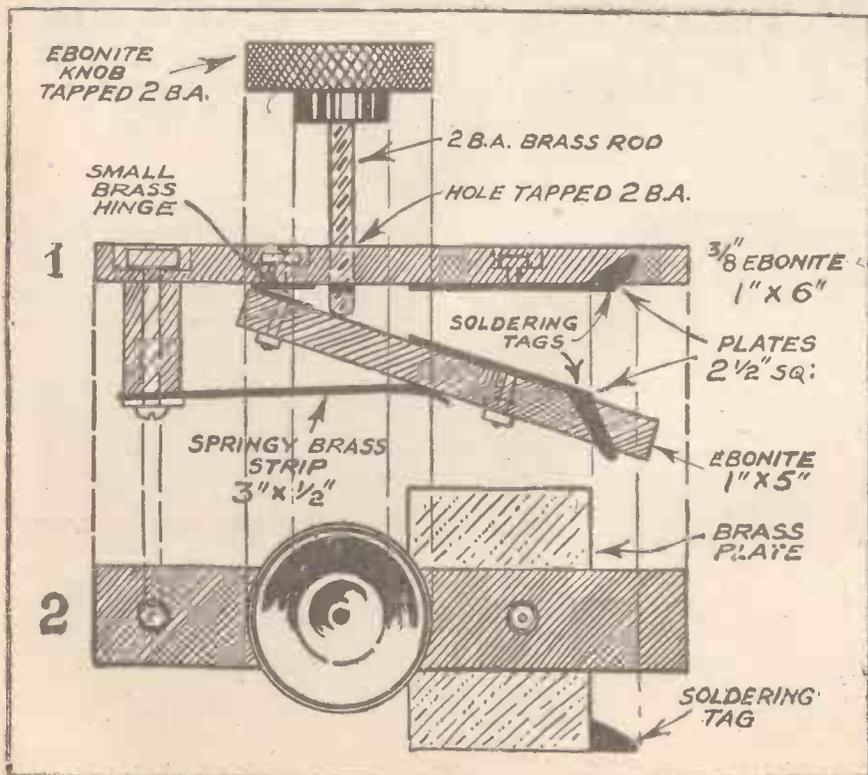


Fig. 1.

Mainly About Broadcasting

by
The Editor

THIS winter has seen quite a number of wireless books put on the market.

Mr. Burrows, Captain Eckersley, Captain Frost, Captain Lewis, John Henry, all have recently published books, and now I have just received another wireless book, a very handsome, solid-looking volume, by Mr. J. C. W. Reith, the Managing Director of the B.B.C.

When this book was placed on my desk, I first of all caught a glimpse of the title, "Broadcast over Britain," and, to tell you the truth, I felt rather peeved. "What," I said, "another book on wireless!" Closer scrutiny of this particular volume revealed the author as Mr. J. C. W. Reith. That night I took it home and read it from cover to cover, and it is certainly one of the most outstanding wireless books not only of the year but of all time.

Mr. Reith, besides being a most successful Managing Director of the B.B.C. and a business organiser of high ability, also wields a very pretty pen. This Managing Director of the B.B.C. is no mean essayist, and his volume, just published by Messrs. Hodder & Stoughton, price 6/- net, is a book which is not only interesting because of its subject matter, but is, if I might say so, even *more* interesting because of the style and common-sense philosophy of its author.

The B.B.C.'s Post Bag.

Mr. Reith, writing about broadcast licences, says: "It is difficult, and, indeed, impossible, to speak with any assurance of the number of people who listen to broadcasting. In our first twenty-one months—that is, till the end of September, 1924—approximately 950,000 licences had been issued, over 50,000 new licences being taken out, in September alone. It is natural to assume that there are several people involved in each licence. The difficulty is to know what average figure to take. Taken at five, the audience is already over four million. For any special occasion an infinitely greater number of people can gather."

Discussing the B.B.C.'s post-bag, Mr. Reith has this to say: "Periodically letters come in, one per a thousand or two, which make one doubt the sanity of the correspondent—in fact, there is little room for anything other than doubt. I imagine that editors are familiar with the type." [They are!] "The situation to us was very peculiar. It was entirely new. It might have induced considerable disgust with one's fellow-creatures, but that, I presume, was our inexperience. It is often possible to trace ulterior motives and inspirations in them. They are usually anonymous and almost invariably written 'on behalf of hundreds of listeners in this district.' If the programme staff had been thorough blackguards, the virulence and vituperation conveyed by some of these rare communications could not have been increased.

"It is, as someone has said, royal to do good and to be abused. We make neither

claim nor pretensions to perfection; it is, of course, everybody's business to teach us, and we are very glad to learn."

A Good Spirit.

Here you have a clue to the success of the B.B.C. They lack conceit; they are ready to learn. They are ready at all times to give their careful consideration even to anonymous letters and even to those choice individuals who waste their spare time and their postage stamps by blackguarding the B.B.C.'s attempts and who are experts in destructive criticism. But the B.B.C. do not get on their high horse; frankly, I thought they did once upon a time, but

light shades of the borderland. Darkness presses in on all sides, and the intensity of the darkness is increased by the illuminations which here and there are shed, as the investigators, candle in hand and advancing step by step, peer into the illimitable-unknown.

A Compliment to Knowledge.

As knowledge increases so does ignorance, and some say that ignorance is advancing faster than knowledge. This is a compliment to knowledge. There is a system in every star, a world in every atom.

It is hard in the very short space at my disposal, and by quoting one or two short



The Aerial at Mill Hill School used by Mr. Goyder for his New Zealand Transmissions

that was nearly two years ago. These days you will find the utmost consideration given to even the most futile suggestion, and it is indicative of the spirit of public service which has so distinguished the activities of the B.B.C.

Mr. Reith has something to say about the ether in his last chapter which I cannot refrain from quoting.

"The interest is enhanced by the knowledge that the operations of broadcasting are dependent for their propagation on the mysterious and fascinating medium we call ether.

"When we speak of the ether we speak more or less as fools, for the more that is discovered, the more apparently contradictory facts are revealed. It would seem to have properties which formerly were regarded as mutually exclusive. While it fascinates it mystifies, and the more it is explored, the more it mystifies. With all manner of its characteristics and properties definitely and mathematically proved, it is still only a conception of the mind.

"When we attempt to deal with ether we are immediately involved in the twi-

extracts from his book, to convey to the reader the peculiar charm and style which distinguishes Mr. Reith's writings.

The Captain of the Ship.

If he were not Managing Director of the B.B.C., I could well wish him the time and opportunity to devote his energies to further writings, but this book alone should be sufficient to make clear to devotees of broadcasting that in the Managing Director of the B.B.C., and in the captain of that phenomenal ship which in two years has practically earned the name of "National Institution," they have a man who combines rare qualities of business and organising ability with an imagination and literary grace which many of our so-called stylists and essayists of more advertised fame might well envy.

I most heartily recommend this book to every reader of POPULAR WIRELESS, and to those who perhaps find the price a little high, I would suggest that an inquiry at their library will put in their hands in a very short space of time a volume which might aptly be termed "The Philosophy of Broadcasting."

Technical Notes

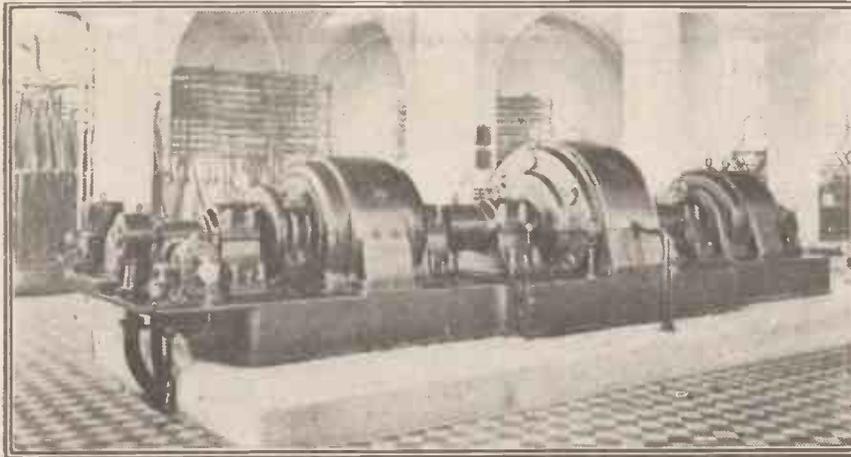


Conducted by J. H. T. ROBERTS, D.Sc., F.Inst.P.

Recording Stations.

AN interesting game has sprung up amongst American listeners. Albums are issued by the Ekko Co., similar to ordinary stamp albums, and stamps have been printed representative of all the broadcast stations in America and Canada. With

centrally situated between the great wireless stations of Nauen and Salonika. He considers that owing to its position, the effects of the two transmissions may have been combined and brought about sparks between metal parts in proximity to the explosives which were so unaccountably



The H.F. alternator (500 kw.) at the St. Assise wireless station, near Paris.

each album come twenty "proof of reception cards." "Radio Digest" continues—"When a radiophan (in English "experimenter") dials a new station, he fills the blanks on the card, encloses a dime to cover cost of stamp and mailing, and sends the card to the station in question. The album thus represents a bonified ("bonafide") list of radiocasters heard by the fan. The position of a station's stamp on a page is determined by its power, those having the greatest power being at the top of the page. The colour of the stamp depends upon the wave-length."

A good deal of useful information, together with maps, is also included in the album, which eventually becomes a document much prized by the owner.

Wireless Rays.

The recent discussion which took place in this country, upon the possibility of interfering with aeroplane engines by means of wireless or other "rays," is recalled by information from Paris with reference to investigations which have lately been conducted by a Roumanian scientist, General Negrei. Director of the Technical Dept. of the Roumanian Army, and Prof. of Ballistics at the Bucharest Military School. He has been examining the possible causes for the mysterious explosion which took place in May last at Bucharest and points out that Bucharest is

centrally situated between St. Assise (Paris) and one of the American wireless stations.

I give the opinions of the Roumanian scientist as a matter of interesting speculation, but most people will think it more probable that the disasters referred to were due to some less mysterious cause, probably accidental.

Radio Photographs.

Amongst the exhibits at the annual exhibition of the Royal Photographic Society in London recently were a number of photos transmitted by wireless, a noticeable improvement having been effected in reducing the streaky effect which has previously been such a marked feature of those photographs.

Radio Phototalks.

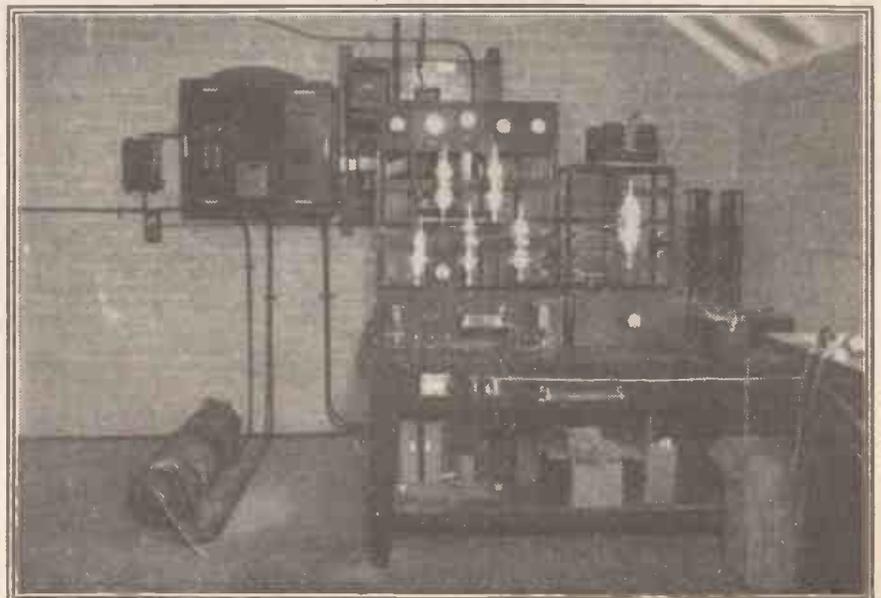
Related in some way to the subject of radio photographs is that of the illustrated broadcast lecture. This is a new vogue in the U.S., and although the photos are not broadcast in the wireless sense, they are broadcast in the literal sense, since they are published in one of the daily illustrated papers on the morning of the day the lecture is to be broadcast by wireless. The "Daily News" station, WMAQ, is the one to introduce this feature, and every Saturday morning pictures are given in the paper illustrating the trip or the country to be visited (supposing it is to be a "travel" lecture). In the evening, when the lecture starts on the broadcast, all the listener has to do is to take the illustrated page and place it before him on the table, put on the 'phones or switch on the loud speaker, and follow the talk with the aid of the photos. This seems an excellent idea, and a very real approach to the broadcasting of pictures and speech simultaneously—in the practical sense though not in the technical.

Useful Insulators.

Often you require to run a wire or busbar along a part of the interior of the set, or on a base-board, and you are at a loss for a small

(Continued on page 735.)

detonated. Negrei believes that his theory also explains the burning of two steamers at Toulon, which is half-way between Paris and Bizerta, and the burning of a ship in the Atlantic, which at the time was about



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16 x 12 x 1/4	11/6	22 x 11 x 1/4	15/3	12 1/2 x 9 1/2 x 1/4	7/6

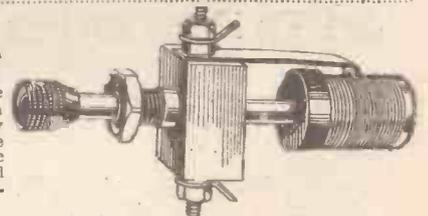
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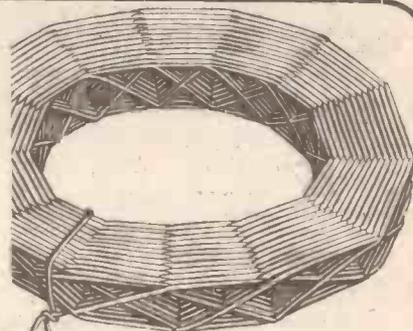
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WAVES AND STRAYS.

By HIGHAM BURLAC.

The Personal Narrative of a Proud Parent.

MY name is Shellybun, Henry Joshua; aged 49, Chartered Cheesemonger, of The Towers, Grove Street, Peckham. I am in a fair way of business, glad of it, but no thanks to this wireless. Up to about November 14th, or it may have been December 5th, 1922, my affairs ran smoothly and there was always a little hymn-singing round the piano on Sunday nights, followed by cold beef and pickles. In fact, my household was typically *borgewar*. "Borgewar" is what a Communist calls a man who takes baths and doesn't get into debt. (N.B.—My boy Samuel begs me to state that I ought to have spelt *borgewar* "bourgeoise." Some of this new-fangled Latin he's learning at school, I suppose).

The Conspirators.

To get on. At or about dates above-mentioned, my eldest, Samuel, very promising lad, though too clever for his old dad, went to spend an evening with a schoolmate; name of Kitchen; father in the rope trade: very respectable people. Appears that young Kitchen knew the nephew of a man whose cousin's son was one of these Marconi operators. Wireless. You know!

Samuel came here gabbling a lot of nonsense his mother couldn't make head nor tail of, had his temperature took and was dosed with Fever Curer. Persevering stuff, though expensive and unpleasant. Next day, Saturday, the boy demanded his moneybox, a thing sacred to holidays, and therefrom abstracted two shillings. What must he do but buy a lot of trashy wire before his mother could say "Jack Robinson." Then he remained in his room for five hours, refusing all food and drink, emerging only once to consult my "Grand Lexicon of Science and Art (1843)."

At the end of this period of sequestration, Samuel was observed to hurtle out the back-door and into the garden, where he strung a kind of wire clothes-line. With an agility the like of which we had not suspected possible in the boy—for Samuel is known to his school-mates as "Puddeny"—he scaled the rain-pipe and fixed one end of the wire to a chimney stack. This accomplished, he disappeared and eventually brought back young Kitchen, the two of them retiring at once to Samuel's bed-chamber.

"Gorrim!"

Hours passed, and except for the stamping of their hoofs overhead and occasional bumps, nothing was heard of them. Shripping references to bedtime, hooted up the stairway by his mother, brought no reasonable response from Samuel, and accordingly I ascended to the bedchamber and entered without ceremony. The boys, who were crouched like beasts of prey over a carcass, did not heed my arrival. Young Kitchen played with some absurd muddle of wire and cardboard, while Samuel held a watch-like contrivance to his right ear. I noticed that his eyes bulged and his mouth was open.

Suddenly young Kitchen yelled, "Hey! Cheers! I've found the short."

Samuel jumped as though these words had pierced his marrow, and shouted, almost at the same moment:

"Gorrim! gorrim! 'Sgrand. Don't shift 'er." I ventured at this juncture, which I perceived was a crisis, to urge upon the lads a kindly injunction to act in no precipitate manner, lest something irreparable should be perpetrated. At the sound of my voice Samuel raised his hand imperiously, as though commanding me to hold my peace. This, I confess, was a new departure, an altogether unprecedented gesture in our relations as parent and child; hence I persisted in my outcries, observing



Some members of the Wireless and Experimental Association at a recent field day.

each moment the more acutely that the lads were utterly absorbed in their mischief.

Presently Samuel removed the watch-shaped instrument from his ear and said: "Well, pa, since you won't let me listen, have a go yourself."

A Summoning Affair.

"What is all this rigmorole, my boy?" I asked, taking from him the earpiece, which I then perceived to be similar in its outward appearance to a telephone receiver. "Trying to tap the telephones, are you? Good job I found you out." I applied the thing to my ear. "Yes," I continued, "without a doubt you've got through. I can hear 'em talking all over the show. 'London calling,' eh? Here, you've been and bawled up some business gent's trunk call. Samuel, you'll have to stop it or it'll be a summoning affair."

"But it's wireless, pa," complained Samuel.

"That's it—argue. I wish you was like your brother 'Arold."

Just then I heard some musical noises. "Hum! 'Strawny thing. Singing songs, someone is. You've tapped one of these electrophones!"

"Aw, pa—let's listen! We've not heard any music yet," wailed Samuel, whilst young Kitchen, I observed, twined his legs round the bed-rail.

"Just a moment, my boy. Let your father be the judge of this. It might blow up."

"Blow up! There's nothing to blow up. It's wireless." Samuel's voice was agonised.

Then I heard a band. Most select, I'm sure. I sat down on the bed and tapped out the time with my foot. Just as matters were settling down nicely for the last lap between the fiddles and the clarionets, Samuel rudely snatched the telephone away and the two boys instantly crouched again over their unlawful pursuit, and I was about as much an outsider as an undertaker at a wedding.

A Wonderful Thing.

Next day I put the case to Gulger. He's a collector for the Pearl and knows all about law.

"No," said Gulger, "it's right enough. My eldest did it a month ago. Clever young chap, he is. It's the real wireless telegraphy. Come's from Hawstralia, some say."

So I helped Samuel that evening. Found him very selfish about the telephone, so

went and bought another. Being afraid of fire I removed the apparatus to the sitting-room. Samuel proved to be very argumentative about tuning and seemed to imagine I knew nothing about electricity. Why, I was reading the "Grand Lexicon of Science and Art" before he was born.

Eventually I decided to look fully into the matter, wireless being a new thing, and everybody inventing things every day that might bring in a fortune. But somehow I

always get distracted by the music or whatnot. Heard one of these "talks" last week, all about "Eruptions in the Lower Andes." Don't know in what part of the body the Andes is situated, but Gulger says the Andes is a parasite of the mackerel. The "Encyclopedia Britannica" I've bought came home to-day and looks like being useful.

Taking it all by and large, this wireless is a wonderful thing—thanks to my boy Samuel; though I don't call it *real science*, though very distracting from work.

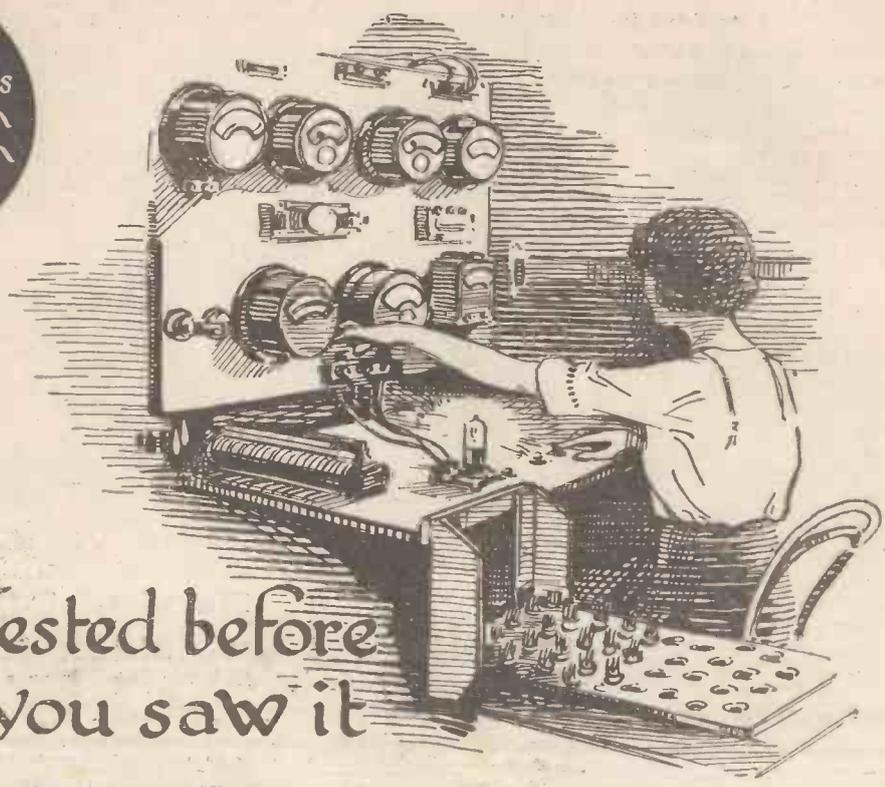
The Verdict.

Samuel is a natural engineer. That's a fact. He knows all about wireless. Picked it up in no time. The way that boy talks is a fair caution. Had a real engineer to tea the other night, and I noticed with pride that when my Samuel tried to give him a few tips he dried right up and changed the subject. Samuel says he reckons that engineers don't know much about wireless.

Doesn't seem so comfortable about the house these days, owing to numerous engineering works of me and Samuel, and I've had to let the garden go. But you ought to hear Big Ben on our loud speaker. As plain as anything, sir, using two stages and feed-back. We

(Verdict: "Guilty.")

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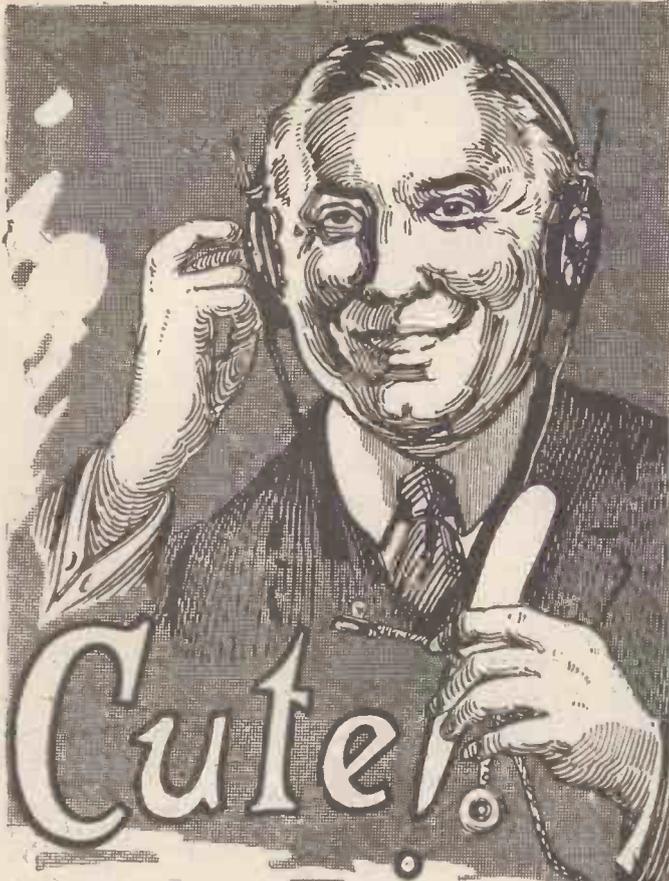
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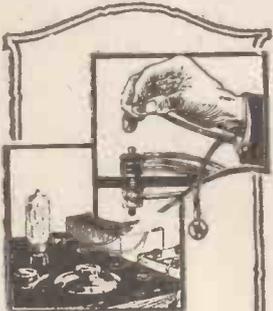
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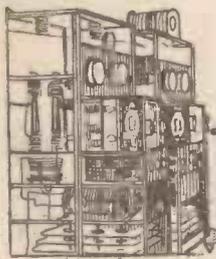
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Barelays N.P. 2.



Artistes of the Aether

By "Ariel"



Some of the artistes who have given you pleasure when listening-in.

THE general excellence of the provincial programmes continues, and it is a great pity that one at least cannot be relayed to London every night. Perhaps comparisons are odious.

2 L O Scores !

A recent London Sunday programme, however, might well have been S.B. to other stations besides Newcastle. It was in the safe hands of the J. H. Squire Octet, and as was only to be expected from past experience, the results were eminently satisfactory. In addition to the solos of the leader, Mayer Gordon, on whom the "mantle" of Wieniawski has surely fallen, assistance was given by Messrs. Anthony Pini ('cello), F. Thurston (clarinet), and Frank Reade (piano), with two excellent singers in Miss Sair Rosin and Mr. Tom Kinniburgh.

An All-Star Programme.

For its All-Star Programme, 2 L O had a fine list of soloists, including the B.N.O.C. stars, Miss Gertrude Johnson, Norman Allin, and William Heseltine, the latter taking the place of Mr. Walter Hyde, in addition to Miss Carmen Hill, and Daisy Kennedy the violinist, with Mr. Ronald Gourley, inimitable as usual in making a classical work out of such diversities as "The Lass with the Delicate Air," "Robin Adair," "Why Did I Kiss that Girl?" and Rachmaninoff's famous "Prelude." The best of the military bands was chosen in that of H.M. Royal Air Force; but one sees no reason why the Wireless Orchestra should not have been utilised.

To S.B. the John Masefield programme, however, without giving an alternative programme, was sheer waste of power and current.

Concerted Singing.

Choral singing has long been a vital part of English music, though four-part singing has to be extremely well done to attain success. Amongst the vocal quartets which linger in one's memory may be mentioned the Meister Glee Singers, the Westminster Singers, the Mayfair, and the Gresham, and, judging from their first appearance last week, the new Salisbury Singers are on a fair way to beating all. The chief reason possibly lies in the fact



Miss Constance Morris.

that it is led by Mr. Leonard Salisbury, late of the Gresham Singers, and few vocalists have had a wider or more comprehensive training.

Commencing his training at the age of seven, and like so many other vocalists in the choir, a chance hearing of the Meister Glee Singers aroused his ambition to make a similar body of artistes, and there is no doubt that he has succeeded. The Salisbury Singers comprise, in addition to himself, Messrs. Charles Hawkins (alto), Gerald Adams (tenor), and Graham Smart (baritone).

Mr. Robert Chignell is another well-known bass-baritone, as well as a composer. Winner of several scholarships at the Royal College of Music, including the Courtenay Scholarship, he studied under Gustave Garcia, and Sir Charles Stanford, the latter for composition. He fought in the South African war, as well as in the great war, and has toured the world with the Sheffield Choir.

His compositions number many orchestral works, as well as a concerto for violin and orchestra, and an opera, "Romeo and Juliet," the prelude to which was performed



The Misses Violet and Amy Cockburn.

at Harrogate in 1912. Mr. Chignell has also had operatic experience, and is a great favourite with listeners-in.

Birmingham.

Much thought is invariably spent on the Birmingham programmes, and Mr. Joseph Lewis has found a new art-form for broadcasting in Radio Fantasy No. 1, "Crown of the Year," written by John Overton. In this was admirably combined music, poetry, and drama, and with Messrs. William Macready, Percy Edgar, Harold Howes, and Mr. Lewis himself, the cast was admirable. Comedy was also well represented by almost the same cast later in the week, with "Number Thirteen," by G. Robinson, and including Miss Edna Godfrey Turner and Donald Edwardes.

Humour of the Hour.

This difficult item of the programme is always safe with Mr. Walter Todd, who in addition to a wide experience with the London and provincial concert halls, has done a lot of broadcasting, and is shortly making a tour of all stations.

Belfast.

Following the official opening of the Belfast station, some admirable programmes

have been broadcast, and although local talent has been in many cases utilised, yet some of the most eminent artistes have "crossed the water." Amongst them may be mentioned Mr. Foden Williams and Miss Adelina Leon, the 'cellist.



Mr. Leonard Salisbury.

Manchester.

Attention has been well drawn to Manchester, firstly by its Hallé concerts, which have been relayed to London, giving Londoners an unique experience of hearing what is really the most famous orchestra in the world, and which owes its name to Charles Hallé the husband of the celebrated violinist, Mme. Norman Neruda.

Musically some excellent programmes have been devised as usual. Amongst the artistes have been George Parker, Nora Delmarr, and the clever young elocutionist, Constance Morris, who was one of the first artistes to broadcast from 2 Z Y at Trafford Park Station. Just recently she was one of the artistes chosen for the special midday classical concerts at Huldworth Hall, and on the 10th inst. she broadcast again from 2 Z Y. A beautiful delivery and an innate gift for expression are the distinguishing features of her performances.

For the performance of the "Magic Flute" (Mozart), a well-trained cast included Lee Thistlethwaite, Nell Davis, and Lydia Steafel.

Bournemouth.

Variety is the keynote struck for this station, and during the last few weeks it is difficult to pick out one programme more attractive than another.

On the musical side mention must be made of a most happy idea in programmes, "A Night of Memories," in which the Wireless Orchestra, under Captain Featherstone, with the aid of some good singers recalled all the old songs and ditties of a past but possibly more musical generation. The singers were those two Bournemouth favourites, Miss Violet Cockburn (soprano) and Miss Amy Cockburn (mezzo-soprano), and their singing both in duets and solos increased their reputation still further.



Mr. Walter Todd.

THE "UNIDYNE" IN HOLLAND.

FROM OUR OWN CORRESPONDENT.

FOR exhibition purposes the Bower Electric Co. was so good as to loan me a two-valve Unidyne receiver (one detector and one L.F.), which was exhibited at the recent International Wireless Exhibition held at Amsterdam.

Well-known Engineer Surprised.

This was the first Unidyne in Holland, and the visitors examined it as if it were a rare animal, and they were all surprised to hear that such an apparatus worked with only 6 volts for the L.T., and no other H.T. battery was necessary. One of our best wireless engineers, Mr. T. J. C. Nonnekens, tried the Unidyne on a bad aerial, directly after arrival at the exhibition, and was surprised to hear such clear and loud signals. At first I must tell you it is a custom in Holland to use a 4-volt accumulator with a resistance, and that the Dutch amateurs saw in that extra two volts (six volts is necessary for the Unidyne) a kind of H.T. battery, but I can assure you that even with the best valves on the market 2 volts for the H.T. is much too low, and that the Dutch amateurs never tried such a circuit as the Unidyne.

After the exhibition I tried the Unidyne at home, and am surprised at the wonderful results. Never before has a two-valve receiver given me such satisfaction as the Unidyne, and I am convinced that an apparatus on this principle has more value

than a "super reflex" or other American invention. Here follows my report.

The aerial used is of the single wire, reversed L type, 150 ft. long, with down leads, and 30 ft. high. Earth is connected to two earth plates, two metres under the ground. First two Thorpe K.4 valves were used, with a 6-volt accumulator battery. On the short wave I heard some ship and coast communication, and three English broadcasting stations, Paris (Le Petit Parisien), and Stuttgart.

Experiments with Dull Emitters.

The loudness of the telephony was sufficient to hear distinctly. Also Chelmsford, 5 X X, and Radio-Paris were very loud on telephones. I think the loudness of the signals was as good as with an ordinary receiver, but much clearer. Our own radiotelephony station at Hilversum came in with good loudness on a small loud speaker (Brown). Then I changed the valves and used two Phillips low-temperature valves, which have a normal current consumption of 0.15 ampere at 1.8 volts.

I used an accumulator battery of 4 volts, and obtained the same good results as with the Thorpe K.4 valves.

I now tried, in place of my accumulator, an ordinary flashlight battery (4½ volts), and was surprised to hear the signals and telephony with the same volume as an

ordinary receiver, using a 6-volt accumulator and H.T. This is the most interesting reception I have had in all my long years of experience.

The current consumption was 0.25 ampere for 2 valves.

"A Set Worth Trying."

I also tried with a 6-volt accumulator, one Thorpe K.4 valve as detector, and one Phillips low temperature, as an L.F. amplifier, and results were most excellent. Adding more high tension on the plate gave no better signals. The current that flows through the filament must be well adjusted to obtain the best signals.

I congratulate the inventors on having produced a set for amateur receivers so simple and efficient.

In my opinion it is a distinct advance in the direction of obtaining a receiver, which will operate on nothing more than one small dry battery, which will only require renewing every few months, like an electrical door bell battery.

As a matter of fact a six volt .06 four electrode valve, is the only i.c.m. now required to make this possible.

At the same time that this article will appear in "P.W.," our Dutch amateurs will have read in our "Radio World" my report on the Unidyne, which has been accepted here as a set worth trying.



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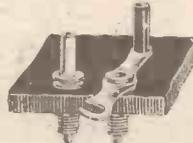
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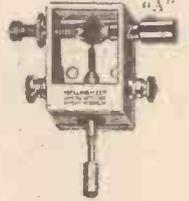
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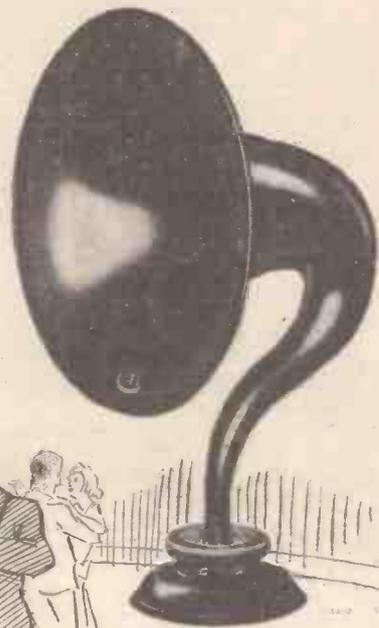
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By A. H. B. PAYNE.

If you are making your own inductance coils the information in this short article will prove extremely useful.

THOSE who like making their own coils (and it is an interesting and profitable hobby) will be interested in the following description of a former that can be used for winding slab, duolateral, lattice, or basket coils, as desired. Further, the drilling guide or jig, designed by the writer to facilitate the accurate drilling of the holes for the pegs, is somewhat of a novelty and as useful as it is simple.

The Former.

The former consists of two discs of hard wood (beech is very suitable) $2\frac{1}{2}$ in. diameter, by $\frac{1}{2}$ in. thick. These should be obtained from a wood-turner, and should be turned together on the chuck, so as to form, when bolted together, virtually one disc 1 in. thick. Round the periphery at the centre (that is, round the line of junction) an odd number of holes—nine, eleven, thirteen, or fifteen—according to the maker's requirements, should be drilled to take wooden pegs $\frac{1}{8}$ in. diameter and 4 in. long. (See Figs. 1, 2, 3, and 4.) These should be a rather tight fit.

The two discs are first bolted together with a piece of 4 B.A. brass rod, with a nut at one end and an ordinary terminal at the other. It is also advisable to insert two wood screws, as shown at S (Fig. 3). This row of pegs is for winding basket coils, single or double, in the well-known fashion; and the provision of wooden pegs of good diameter results in a well-spaced and open coil, thus reducing self capacity to a minimum.

Why the Former is Split.

The object in having the former in two halves now becomes apparent. It is that, on completing the winding of a coil, the screw and bolt may be withdrawn, allowing the former to be removed without disturbing the pegs. These may then be withdrawn one at a time and the coil sewn with thread or wool simultaneously, thus obviating the danger of the coil falling to pieces in the handling, or the necessity for waxing or clogging it with varnish. This is a great advantage, as will be agreed by those who have had experience of handling a fragile unwaxed coil after the pegs have been withdrawn.

Lattices and Honeycomb Coils.

For winding coils of the duolateral or lattice type a double row of pegs near the edges of the former is required. These may be much smaller in diameter than those for the basket coils. Wire nails (round) will serve nicely if the heads are cut off. (See Fig. 4.) A suitable number is 24 per row (48 in all) equally spaced round the circumference of the former, but staggered one row against the other so that the pegs of one row oppose the spaces between the pegs of the other.

It is not my province in this article to describe the methods of winding the various

types of coil enumerated. For this I would refer the reader to the many excellent articles on the subject which have appeared from time to time in this journal or to one of the text-books dealing specifically with the subject.

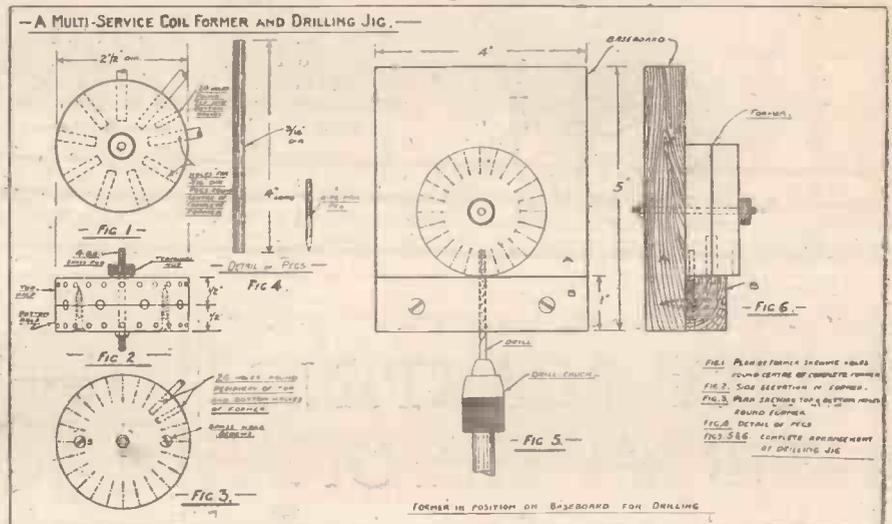
Drilling Made Easy.

It is no easy matter, by the ordinary method, to drill a large number of holes round a disc with ratchet or hand brace so that they are truly radial and in a perfectly straight line, yet the neatness and beauty of the finished coil depends entirely

from the bottom edge of the former. To drill the holes on the top edge it is, of course, only necessary to reverse the former on the base-board.

Spacing the Holes.

With regard to spacing the holes radially, this is done by gumming or pinning a disc of paper on top of the former on which paper the "spokes" required have been marked with a protractor or other convenient device. As each hole is drilled the former is rotated on its spindle so as to bring the next position in line with the axis



upon this. The simple "gadget" illustrated in Figs. 5 and 6 will, however, remove the main difficulty and enable the veriest novice to do this successfully.

A base-board of wood, A, Figs. 5 and 6, about 4 in. by 5 in. by $\frac{3}{4}$ in. thick, has a fillet of hard wood, B, Figs. 5 and 6, firmly screwed to its front edge, as is shown in both figures. It is important that this fillet should be true and square. A hole is made in the base-board to take the 4 B.A. "bolt" that goes through the former, the nut being removed and put on underneath the base-board when in position. This hole must be so placed as to allow the circumference of the disc just to touch the inner edge of the fillet B. (See Figs. 5 and 6.)

Now two guide holes are drilled (with the same drills as are to be used for drilling the peg holes in the former) through the fillet. (See Figs. 5 and 6.) The larger hole will be $\frac{1}{2}$ in. from the base-board, and will ensure the holes that are drilled in the former, with this as a guide, coming exactly in the centre or on the line of junction between the two halves of the former.

The smaller guide hole will be nearly at the bottom of the fillet, say $\frac{1}{8}$ in. from the base-board, and will drill holes that distance

of the guide hole. This will be quite clear from Fig. 5, which shows a hole being drilled.

The jig, as a whole, may be clamped to a table or bench, or held in a vice. If a little care has been taken to ensure that the guide holes are square and true through the fillet, the resultant peg holes are bound to be radially true and the two rows of pegs absolutely parallel.

This will be amply reflected in the resultant coils. The writer has built coils on such a former as described that, for efficiency and appearance, compare very favourably with the highest-grade commercial specimens.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per photo.



The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

MESSRS. V. R. Pleasance of 60, Fargate, Sheffield, have sent us samples of two wireless tools which should prove of utmost interest to the radio constructor. One is the **Aermonic Bending pliers** with which it is possible to bend true right angles in 16 gauge square wire, and the other the **Aermonic Marker** for marking out positions of valve sockets. No amateur constructor's tool box is complete without these two most interesting and useful items.



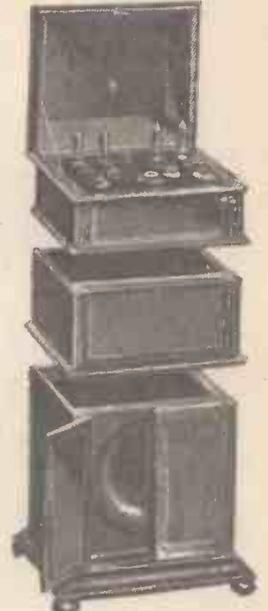
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Peter Curtis, Ltd., of 75A, Camden Road, London, N.W.1, have sent us two Paragon Curtis One Piece Mica Condensers. They consist of one solid block of hard black composition with no wax filling, the composition evidently being moulded around the plates. A further improvement is that these condensers are designed for vertical mounting so that they occupy the most insignificant area of some 3 in. by $\frac{1}{2}$ in. on a panel.

We have received a sample of that well-known crystal Tungstalite for test. It was tried out both in ordinary crystal and in valve-crystal circuits. In all cases results were commendably satisfactory, and in point of sensitivity and stability we consider it is as good if not better than any crystal we have yet had brought to our notice. It is sold in tubes with a blue label at 1s. 6d., and we consider it well worth the attention of our readers at that price. Messrs. Tungstalite, Ltd., also sent us the originals of some of the many unsolicited testimonials they have received.

Messrs. Charles Pratt, of Ashley Street, Nottingham, have sent us a sample of one of their Kra-Unit double filament resistances. It is of conventional wire wound pattern,



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(Continued on page 726.)

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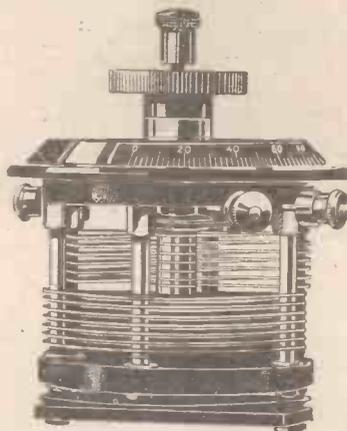
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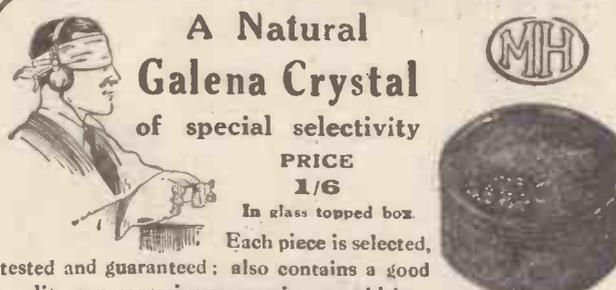
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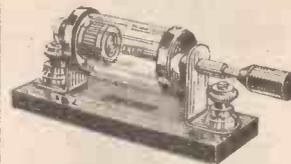
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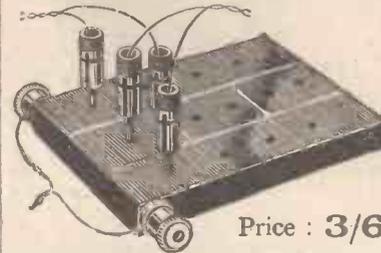
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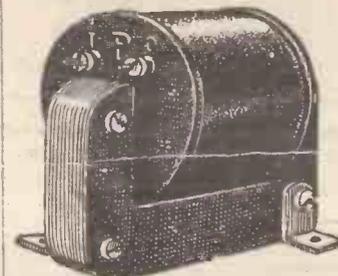
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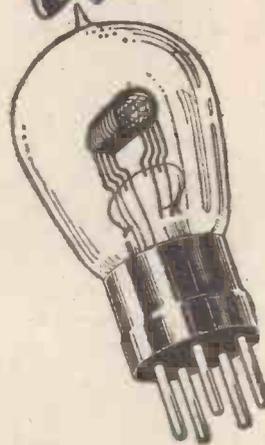
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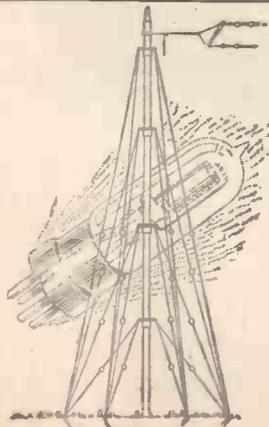
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Wireless and Electrical Engineer,

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Phone: Central 8521.

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All contributions to be addressed to The Editor, POPULAR WIRELESS AND WIRELESS

REVIEW, The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

Technical queries are answered by post at a charge of 6d. a query or 1s. for three. All queries must be addressed to the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, E.C. 4, and must be accompanied by a stamped and addressed envelope. Copies of the queries sent should be kept, as the original query cannot be reproduced in the answer. Cash should be sent in the form of postal orders.

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 specialties 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 intentions 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.

of the spacing-washers used also helps to determine the resultant capacity. In column 2, against each of the diameters, will be found five different thicknesses for the spacing-washers.

The variable condensers are of the moving vane type, in which the moving vanes are semi-circular in shape and overlap the fixed vanes by the whole of their area when in the position giving maximum capacity. The Table gives the total number of fixed and moving plates necessary for any required capacity. The thickness of the metal plates has a considerable effect upon the capacity of a condenser, especially when the spacing washers are very thin. The figures given in this table are calculated on the assumption that No. 22 S.W.G. metal plates are employed. If other gauges of metal are used, the following corrections must be made, the five figures in each case being for use with the five thicknesses of the spacing-washers in the order in which they occur in the tables.

Using No. 24 S.W.G. metal, increase values in Table by 9, 6, 4, 12 and 6 per cent.

Using No. 20 S.W.G. reduce values in Table by 12, 8, 6, 16, and 8 per cent.

Using No. 18 S.W.G. metal, reduce values in Table by 30, 20, 15, 30, and 22 per cent.

As an example, suppose we wish to construct a condenser having a capacity of .0005 mfd., using vanes of No. 18 S.W.G. metal 3 in. in diameter, the spacing-washers being 1/4 in. thick. From the Table the number of plates required, if the metal was No. 22 gauge, would be 40.

Referring to the corrections given above, as we are using No. 18 S.W.G. metal, this value must be reduced by 20 per cent. The number of plates required, therefore, is 40-20 per cent. = 32.

VARIABLE CONDENSERS. AIR DIELECTRIC.
NUMBER OF FIXED AND MOVING PLATES.

Diameter of Moving Plates in Inches.	Thickness of Spacing Washers.	Capacity in Mfd.										
		.00005	.0001	.0002	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.001
2	3/8 in.	9	12	23	34	44	55	66	77	88	99	110
	1/2 in.	6	17	34	49	67	81	97	113	133	145	161
	5/8 in.	12	22	43	65	86	107	128	140	171	191	213
	3 mm.	8	9	18	25	35	43	51	60	68	76	85
2 1/2	3/8 in.	4	8	14	21	27	34	40	47	53	60	67
	1/2 in.	4	11	20	30	40	50	60	70	80	88	98
	5/8 in.	7	14	27	39	52	65	78	90	103	116	129
	3 mm.	4	6	11	16	21	26	31	37	42	47	52
3	3/8 in.	3	5	10	14	17	23	28	32	36	41	45
	1/2 in.	4	8	14	20	27	34	40	47	53	60	66
	5/8 in.	5	10	18	27	35	44	53	62	70	79	87
	3 mm.	3	4	8	11	15	18	22	25	28	32	35
3 1/2	3/8 in.	3	4	7	11	14	17	20	23	27	30	33
	1/2 in.	3	6	10	15	20	25	29	34	39	43	48
	5/8 in.	4	7	13	20	26	32	38	45	51	57	63
	3 mm.	2	3	6	8	11	13	16	18	21	23	26
4	3/8 in.	3	4	7	11	14	17	20	23	27	30	33
	1/2 in.	3	6	10	15	20	25	29	34	39	43	48
	5/8 in.	4	7	13	20	26	32	38	45	51	57	63
	3 mm.	2	3	6	8	11	13	16	18	21	23	26
4 1/2	3/8 in.	3	4	7	11	14	17	20	23	27	30	33
	1/2 in.	3	6	10	15	20	25	29	34	39	43	48
	5/8 in.	4	7	13	20	26	32	38	45	51	57	63
	3 mm.	2	3	6	8	11	13	16	18	21	23	26

"UNIDYNE AMPLIFIER" (Woking).—Can a Unidyne L.F. amplifier (as described in POPULAR WIRELESS No. 104) be used to amplify the signals from a crystal set so as to work a small loud speaker?

The Unidyne L.F. amplifier is not suitable for use in conjunction with a crystal, because it is a potential-operated device, and the high resistance of the crystal is detrimental to its efficiency.

T. B. S. (Croydon).—Can you tell me how to work out what extra resistance is required when using a dull emitter instead of a bright emitter on the same accumulator?

First of all, it is necessary to discover the resistance of the dull emitter valve which is to be used. If it is one of the types which take .06 amps. at 3 volts, then the resistance of its filament will be 3v (in accordance with Ohm's law $R = \frac{V}{I}$) that is, 50 ohms.

Now if a 6-volt accumulator is to be used, obviously the total resistance in circuit must be such that when it is divided into 6 it gives .06, and no more. .06 divided into 6 will give this value, which is 100 ohms, and this will be required in the circuit. The filament of the valve will contribute 50 ohms, leaving another 50 to be provided; 10 ohms will be covered

Our Query Department.

In future a charge of Sixpence per Query will be made for answering all technical questions submitted to the Technical Staff of POPULAR WIRELESS. A group of three queries will be answered for One Shilling. Postal Orders must be enclosed with all queries and a stamped addressed envelope in addition.

THIS NEW ARRANGEMENT IS NOW IN FORCE.

Since the inception of POPULAR WIRELESS, readers have had all their problems settled for them free of charge, but with the great increase in the circulation and the corresponding increase in the number of queries sent in, the task of dealing with the latter has become gigantic. A large Technical Staff is now employed answering queries, and it is with the object of relieving the pressure on them that we have decided to make the small charges mentioned.

Readers of POPULAR WIRELESS know that the Editor and Staff of this journal have always had, and always will have, their best interests at heart.

by the wiring and the ordinary filament resistance, and thus a fixed resistance of 40 ohms should be employed in the particular example given.

In formula form,
$$R = \frac{V_2}{C} - \frac{V_1}{C} \text{ ohms}$$

where
R = total additional resistance required, which will include that provided by the filament rheostat in use;
C = normal current consumption of the dull emitter valve which it is desired to use;
V1 = the voltage specified for the dull emitter valves by the makers;
V2 = the voltage of the accumulator or battery in use.

"FLAT-DWELLER" (Hammersmith, London, W.).—I am unable to erect an outdoor aerial, so I wish to use a frame aerial. Would a one-valve dual circuit give good strong broadcasting in the 'phones at this address, using an aerial of this type?

At your distance a set of this kind will generally work quite satisfactorily with a frame aerial. The frame should take the place of the A.T.I., the tuning condenser being in parallel. You will not get loud speaker strength, of course, but on 'phones the signals should be quite loud.

Before trying a frame aerial, however, we would advise you to see what results can be obtained with three or four wires hung across the room and joined to the set in the usual manner. This aerial, if placed so that it is directional for 2 L.O., should give better results than the frame, while the usual tuning apparatus of the set will need no modification. If the frame aerial is used, the variable condenser

(Continued on page 731.)

APPARATUS TESTED

(Continued from page 720.)

except that it is provided with two resistance coils and an additional control. Thus two valves can be controlled individually by the one rheostat. Both windings can be paralleled or placed in series to provide alternative resistance ranges for one valve. It is, in fact, quite an interesting component and should appeal to the experimenter.

A .06 dull emitter valve at 15s. is an attractive proposition, although doubtless many amateurs will wonder whether such an article can be really efficient at that low price. Messrs. F. J. Browse & Co. have sent us a sample of the Receptor Dull Emitter valve, to which the above description applies, and after a careful series of tests we are able to report that it is a really good all-purpose valve. Slightly over 3.5 volts were required to obtain best results, while our ammeter indicated a consumption of .075 amps. It proved slightly microphonic, but not more than most dull emitters. In an amplifying capacity we discovered that some 3 volts grid bias is advisable, although in single stages such proved to be unnecessary. For such a low consumption filament this valve possesses quite interesting properties in point of mechanical strength. We risked giving it a few hard knocks and were able to do so without putting it out of action. The Receptor certainly leads the way in introducing a

real dry battery valve at a reasonable initial cost.

We have received from Messrs. C. A. Vandervell, Ltd., a sample of a new L.F. transformer which they are shortly putting on the market. It is an item of interest, inasmuch as it is of quite an original design, being of a squat solid shape totally enclosed in a black metal case.

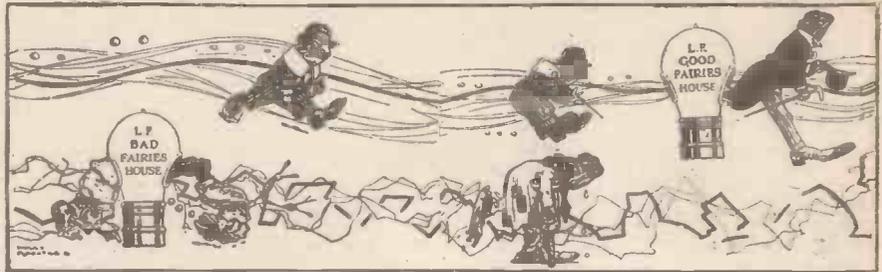
On test very good results were recorded when the instrument was used in the several critical positions in the various circuits we employ when dealing with this type of component. Amplification proved to be both efficient in respect of volume and the resultant tone was commendably distortionless, except in the highest frequencies, when the transformer was employed in a second stage of "straight" L.F. The slight harshness here noticeable was almost completely eliminated by loading the secondary winding with a variable grid-leak.

We have no details in respect of the selling price of the C.A.V. component, but providing this does not exceed that of the

majority of other first-class transformers, we should imagine it will command a very ready sale.

Amateurs who find ebonite rather expensive will find the new material sold under the name of "Insulite" an excellent substitute.

We have tested this material thoroughly, and find it makes an excellent substitute for the more heavy and costly ebonite, and are, in fact, using it on more than one of our experimental sets. Readers need not be afraid of surface leakage, as the substance has been in use for short-wave reception on 40 metres or so for a considerable time, and no noises or other faults denoting surface leakage at even those high frequencies have been noticed. The firm that supplies "Insulite" are also running a very useful valve insurance scheme whereby on payment of the small sum of sixpence per valve, any valve posted to purchasers and arriving damaged will be replaced free of charge. This is a scheme that might well be adopted by other valve dealers.



One of the amusing episodes in the life of an electron, as pictured by "The Book of the M.O.V.," which has been issued by the M. O. Valve Co., Ltd.



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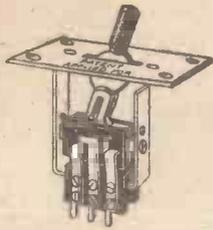
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For use with A.R.D.E.
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150-300 .. 10/-
300-600 .. 10/-
1,100-2,000 EACH (Manufacturer's advance.)

100,000 ohms

Fixed .. 2/6
2 meg. Leak .. 2/6
Both with clips.

WATMEL

Var. Grid Leak .. 2/6
Anode Resistance 3/6

NOTE! OUR WONDERFUL MICROMETER ADJUSTMENT GLASS-ENCLOSED DETECTOR. WHY PAY MORE? 1/9

POST 6d. each

WATERS MICROSTAT FOR D.E. or R. Valves

Post Free. 2/9

FRENCH THOMSON HOUSTON

JUST TRY THEM.
4,000 ohms .. 15/11
Per pair

FAMOUS N AND K MODEL HEADPHONES

Genuine 4,000 ohms. BEWARE OF RUBBISH. Price 12/11.

HAWK COILS HONEYCOMB

25. 2/4 150 .. 4/6
35. 2/6 200 .. 5/4
50. 3/- 250 .. 5/6
75. 3/4 300 .. 6/-
100. 3/10 400 .. 6/6

"MURRAY" (Prov. Pat.)

Valve Holders .. 1/3
High Finish. Absolutely Safe. Low Capacity.

Formo, "Powquip" open 12/6

Bucks "Powquip" 12/6

Manchester "Powquip" 15/6

Ormond, 14/6

Shrouded 'Powquip', 18/-

Standard 'Powquip', 14/6

14

2' Voltmeter, C and S, one-hole fixing, 1/6

15

Grid Leak, 1/-, 1/3, 2/6

16

44 Rheostat, Bretwood with Dial, Valve-holder, extra value, 1/9

23

24 D.P.D.T., S.P.D.T., 1/5 1/2

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RAYMOND'S VARIABLE CONDENSERS

ALL OUR CONDENSERS HAVE BEEN TESTED AND RECOMMENDED BY LEADING JOURNALS—UNSOLICITED.

- Exclusive Design.
- Stout Vanes.
- Extra Insulation, Very Compact.
- Narrowest Spaces (Pressed Aluminium).
- Centre Rod cannot bend.
- Terminal Connections, Capacity Guaranteed.
- Perfect Efficiency.
- Handsome Design.
- Takes up very little space in panel.
- Nickelled Fittings.
- Beautifully Made.
- New one-hole fixing method.
- Wonderful for Portables.



UNSURPASSED FOR FINE TUNING.

Costs a trifle more, a few pence only, and is just what you want. Nice dial and knob included.

'DE LUXE' MODEL

AS SHOWN, WITH DIAL, KNOB AND BUSH.

- 001 - 7/3
- 0005 - 5/11
- 0003 - 5/4
- 0002 - 4/11

POST 6d. SET.

John Blair, Esq., Retail Pharmacy, Millom, says:— Your Condensers are a REVELATION to me as a Dealer. Sept., 1924.

C. Walton, Esq., Andover. Tested your Condensers on Megger and got "INFINITY"

NEW MODEL

SQUARE LAW

- 0005 .. 7/9
- 0003 .. 6/4
- With Vernier.
- 0005 .. 10/6
- 0003 .. 9/6

Post 6d. Knob & Dial included.

WITHOUT VERNIER

- 001 - - 6/6
- 0005 - - 5/3
- 0003 - - 4/11
- 0002 - - 4/6
- Vernier, •0005 3/9

With knob and dial Post 6d. set



WITH VERNIER

- 001 - - 9/3
 - 0005 - - 7/3
 - 0003 - - 6/9
- With EBONITE DIAL and Two Knobs. Post 6d. Set.

TWIN CONDENSER

Composed of two equal units of •00025 or •0003 mid., operated by one Knob and Dial, thereby enabling you to tune two circuits by one turn of the dial. Can be used in series or parallel. Complete as shown, with Knob and Dial.

9/- POST FREE.



SQUARE LAW TWIN VARIABLE CONDENSERS

EBONITE ENDS. KNOB AND DIAL

- 00025 - - - 12/6
- 0003 - - - 12/6
- 0005 - - - 18/11

VALVE DETECTOR & REACTION from Anode Circuit to A.T.C. 1 L.F. Valve.

PARTS FOR P.W. Standard 2-valve Set (Nov. 8th, 1924) For Telephone reception UP TO 40 MILES. The following is a list of materials and cost of the chief parts for the 2 valve Set.

- EBONITE, 12 x 9 x 1
- 001 Var. Condenser.
- L.F. Transformer.
- 2 Rheostats.
- Grid Leak & Condenser.
- Two valves (Bright).
- Two coils (Igramic).
- 2-way coil holder.
- Valve Sockets.
- Terminals and Wire.

All above are **75/- BEST QUALITY.** Panel Drilled, the lot

SPECIAL !! CRYSTAL SET AND 1-VALVE AMPLIFIER. Fittings for Chelmsford. Enclosed box. Splendid quality. Post 1/6 **39/11**

"HART" Accumulators stocked.

MYERS VALVES. UNIVERSAL D.E. 12/6 21/-

BROWNIE "IMPROVED" WIRELESS SET, 7/6 Post 1/-.

"POLAR" MICROMETER CONDENSER 5/6

DIAMOND WEAVE BASKET COILS (6) EXTRA AIR SPACE (DUPLIX WAXLESS) Equal to Honeycomb. 25, 35, 50, 75, 100 (wave-lengths marked). Post Free 3/9

JACKSON BROS. "J.B." VARIABLE CONDENSERS ORDINARY MODELS

	Standard	Super.	Microdenser
•001	8/6	9/6	11/6
•00075	8/-	9/-	11/-
•0005	7/-	8/-	10/-
•0003	5/9	6/9	8/9
•00025	5/9	6/9	8/9
•0002	5/-	5/6	8/-
•0001	4/9	5/3	7/9
Vernier	4/-	4/6	Post 3d. set.

SQUARE LAW

•001	9/6	•00025	6/9
•00075	9/-	•0002	5/6
•0005	8/-	•0001	5/3
•0003	6/9	Vernier	4/6

EBONITE

Post Prices.

Size	Price	Size	Price
8 x 6	3/10 in. 1/8	2/-	
7 x 5	1/8	2/-	
8 x 6	1/8	2/-	
8 x 6	2/-	3/-	
9 x 6	2/2	3/3	
10 x 8	3/-	4/2	
12 x 6	3/3	4/2	
12 x 9	4/3	5/8	
12 x 12	5/6	7/6	
14 x 10	5/6	7/6	

Cut to Size, 3/16 in. at 1d square inch.

VARIOMETERS

The finest Variometer on the market at any price. Inside winding, suitable for broadcast reception on any P.M.G. Aerial extraordinary close coupling ensuring large tuning range. Inductance the highest possible—95 to 1. Metal feet can be adjusted to four different positions.

EDISON-B&L 10/- Post 6d.



35 Tumbler Switch. 1/6



30 Connector. 1/6

Callers' prices elsewhere

53 2 for 1/6 29 2 for 2/- 49 Formo Shrouded, 18/-

25 S.P.D.T. 1/9 D.P.D.T. 2/6 China Base.

EDISON Bell Wedge, 2 for 2/-

36 EBONITE 1/- 37 Dubilier Fixed 25/- 41 Dragon Fly, 25/-

5 With Clips, 2 for 1/9

54 EBONITE Variometer, with dial. 4/11, 5/11

33 ENERGO (see list) Raymond 2/9 to 3/6

22 M' Mich'l H.F. Barrel 10/-

34 Wates Micro-stat 4/11.

43 BASKET 2-way. 2/9

FERRANTI INTER-VALVE TRANSFORMER 17/6

BASKET HOLDER Without Terminals, 1/-, 1/3 each With Terminals, 2 for 2/9

42 3-AM VERNIER 2-way (see lists).

55 One-Hole Fixing. 1/6

51 Enclosed Detector Micrometer Adjustment 2/3

"R.I." NEW MODEL IN SEALED BOX Don't Buy Otherwise. Post 25/- Free

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SUNDRIES.

- Legless Valve Holder .. 10d.
- Solid Ebonite .. 1/5
- Phone cores (6 feet) .. 7 1/2
- Engraving .. 7 1/2
- Similar Sets (Titles or Scales) .. 3d
- Good Knobs .. 2d
- Studs, Nuts and Washers doz .. 4 1/2
- Switch Arms 8d to 1/-
- Copper Foil .. ft 2 1/2
- 18g. Sq. Tin Copper 15 ft .. 5d.
- 16g. Sq. Tin Copper 12 feet .. 5d.
- Round Tin Copper, various Sizes, .. 4d
- Insulated Staples .. 4d
- Insulated Hooks 4 for 3d
- Rubber Lead in .30 test 1/-
- 7/22 Copper Aerial 100 ft. 1/10
- Extra Heavy Aerial 100 ft. 2/- & 2/3
- Good Valve Holder .. 8d.
- H.F. Transformers 300 600 .. 2/9
- Empire Tape, 1/2 in. 2 yds. .. 1d.
- 6 in. Ebonite Anticlan Handles .. 4d
- Connecticut Switches .. 1/4
- Sorbo Rubber ear Caps .. pr 1/4
- Adhesive Tape Roll .. 2 1/2
- Allen var. Gd. Lk. .. 1/3
- Allen Anode Res. .. 1/3
- Scales, 0-130. 2d., 3d., 4d.
- Dial and Knob (Ed. Bell) 1/3
- Dial (Ebonite) .. 10d.
- Brunet Headphones .. 14/6
- Twin Flex .. 4 yds. 6d.
- D.C.C. Bell Wire, 10 yds. 5d (India rubber covered)
- Sleeving .. vd 4d.
- Wander Plugs .. pr 3d.
- Coloured Plugs .. each 1 1/2 (All screw pattern)
- Electron Aerial .. 1/3 1/2
- Polished Boxes, 4 by 6 .. 3/6
- Strong Valve Template .. 4d
- Egg Insulators .. 1d
- Reel ditto .. 1d
- Thick Rubber Lead-in per yd. 2d., 3d.
- Ribbon Aerial 100 ft. 1/10
- Raymond Fixed Condensers '001, '0001 to '0005. 10d
- '002, '003, '004 .. 1/-
- '008 1/3 : '01 1/9 : '02 1/9
- Polar Micrometer Condenser .. 5/6
- 2 Meg. Grid. Leak .. 10d.
- Rubber Lead-in 10 yds. 1/-
- Valve Windows 6d., 7d., 9d.
- R.I. Choke Coil .. 10/-
- Lissen Ditto .. 10/-
- Bretwood Valve Holder 1/9

SWITCHES ON

- Porcelain D.P.D.T. .. 1/7 1/2
- Porcelain S.P.D.T. .. 1/1
- Ebonite D.P.D.T. .. 1/8
- Ebonite S.P.D.T. .. 1/3
- Min. Panel D.P.D.T. .. 1/-
- Min. Panel S.P.D.T. .. 10 1/2
- Tungstallite .. 1/-
- Microstat .. 2/6
- Tumbler Switches (Ebonite) .. 1/4
- Fibre Strip (for Coils) 3 feet 2 1/2
- D.C.C. Wire, per lb. — 2s 9d. 20 g. 9d.
- 2. g. .. 10d. 24 g. 1/3
- 26 g. .. 1/1 28 g. 1/3
- 30 g. .. 1/8 Etc., etc.
- Solder .. per stick 2d.
- 2 Color Flex .. yard 3d.
- Shellac .. 5d.
- Battery Box .. 4/6 (with clips for 36 v.)
- Nickel Pillar Terminals 2d.
- Nickel Contact Studs 2 for 1 1/2
- Nickel Switch Arm 1/- (one-hole fixing)
- Loading Coil and plug 8d.
- Condenser Brushes .. 6d.

BRASS PARTS.

- W.O. Terminals .. 4d.
- Small Pillar .. 1d.
- 'Poone 4 B.A. .. 1d.
- 'Poone 2 B.A., 2 tor. .. 2 1/2
- Valve Sockets 4 for 3d.
- (Above with Nut Washer)
- Valve Pins and Nuts, 2 a 1d.
- Stop Pins and Nuts 2 a 1d.
- Plug and Socket .. pr 1d.
- Spring Washers 4 a 1d.
- Spade Screws .. 1d
- Pin Screws .. 2 for 1 1/2
- Spade Tags .. 5 a 1d
- Spring Pillar Terminals 2 1/2
- Nuts, 2, 4, 5, 6 B.A. doz. 2d
- Washers (Brass) 12 a 1d

DETECTORS, &c.

- Enclosed Brass, Large .. 1/6
- Ditto, Nickel or Brass, Large .. 1/6
- Small Brass .. 9 1/2
- Ebonite, Enclosed .. 1/-
- Burndep .. 5/-
- Easi-Fix Cups 1d & 1 1/2
- Gold Spearpoint .. 3d
- Neutron Crystal .. 1/6
- Hertzite (Shaw's) .. 1/-
- Midite .. 6d.

VALVES.

- Dutch Detector .. 4/9
- Dutch "R" .. 5/-
- Phillips "R" .. 7/6
- French "Metal" .. 6/11

TOOLS.

- Set of Spanners .. 1/4
- Taps, 0, 2, 4, 6 B.A. set .. 2/-
- Small Soldering Irons 6 1/2
- 7-Twist Drills .. 1/4

SHAW'S HERTZITE.

BEATS ALL OTHER "ITES." 1/-
Impossible to Advertise
All the Goods Stocked.

MYERS VALVES.

UNIVERSAL D.E. 12/6 21/-

EXIDE. D.T.9 Type. 2 Vols. Glass (For '06) 5/-

EBONITE PARTS.

- Good Coil Plugs from 1/4
- Edison Bell Shaped .. 1/-
- Raymond ditto .. 10 1/2
- Basket Adapters .. 8 1/2
- Also at 1/- & 1/3
- 2-way Coil Stands .. 2/6
- With Extens. Handle 2/11
- Also at 3/6, 4/-, 4/6
- 3-way .. 4/3, 4/6, 5/-
- Goswell Cam Vernier 9/-
- Franco .. 12/6
- Polar .. 11/-
- Etc., etc.
- Coil Plug on Stand .. 1/-
- Ditto, Swivel Movement 1/3
- Coil Plug and Clips .. 6 1/2

H.T. BATTERIES.

- Best Made 30 v. .. 4/6
- Best Made 60 v. .. 7/6
- Best Made 66 v. .. 8/6
- 3.B.C. 9 volts .. 3/-
- B.B.C. 60 volts .. 9/6
- B.B.C. 36 volts .. 5/6
- B.B.C. 18 volts .. 2/6

EBONITE STOCK SIZES

- 6 x 6 .. 1/4
- 7 x 5 .. 1/4
- 8 x 8 .. 1/10
- 9 x 6 .. 2/-
- 10 x 8 .. 3/-
- 12 x 8 .. 3/-
- 12 x 9 .. 4/3
- 12 x 12 .. 5/6
- 14 x 10 .. 5/6
- Cut to size .. WESTOCK 1/-
- 1/4 sq. inch. in. EBONITE.

CRYSTAL DETECTOR.

Glass enclosed. Micrometer adjustment. 1/9

MURRAY VALVE HOLDER (Patent) 1/3

Blue and Red TUNGSTALITE

MIDITE, GECOSITE NEUTRON Stocked

SIMPLEX LEAD IN 1/3

"POPULAR WIRELESS."

FREE TO CALLERS (Limited number, of course.)

BRASS FORMER

'DOUBLE, 23 spokes 2/11 each side. Make your own coils.

BEST SWITCH ARM.

1 Stud THE LOT 12 Nuts. 12 Washers. 1/-

FAMOUS N and K MODEL HEADPHONES

Genuine 4,000 ohms. BEWARE OF RUBBISH. Price 12 11

"METAL" (FRENCH) '06 VALVES, 15/11

DR. NESPER (SEE TRADE MARK) 4,000 OHM 'PHONES 12/11 (NOT DR. 'ANYTHING!')

VARIOMETERS.

- Impregnated board, Wound D.C.C. and Clips, 200/600 metres 2/6
- Very Good Valve, Wound D.C.C. and Knob .. 1/6
- Ebonite D.S. Wound, with Ball Rotor and Knob, 200/700 metres 5 11
- Ebonite, 200/600 .. 3/11
- Raymond inside Wind- ing .. 8/11

RHEOSTATS.

- Small 5 ohms "C" .. 1/3
- One Hole Fixing .. 1/3
- Ormond .. 1/9
- Ebonite Former .. 1/6
- Ditto and Dial .. 1/10
- teranic, T.C.B., and all known makes.

16g D.C.C. USUALLY IN STOCK

FIBRE STRIP (For Coils) 3 ft. long, 1 in. wide. 2 1/2. per length.

BREAST DRILLS

0 to 1 shank Cut Bevel and Gea 4/9

BOXES

7 x 5 9 x 6 12 x 9 8 x 6 10 x 8 12 x 1 2

BASKET COILS

- DUPLEX WAXLESS (5) .. 1/8
- 1,200/2,000 metres
- WAXLESS SET OF 5 .. 1/11
- 25, 35, 50, 75, 100
- Ditto with extra air space 3/9
- D.C.C. CHELMSFORD 1/- 1/3
- ENAMELLED Do. .. 1/- 1/2
- WAXED (6) 200/3,600 .. 1/8
- Ditto (7) 150/3,600 .. 1/10
- (For Broadcasting only)
- D.C.C. COIL FOR CHELMSFORD complete with adapter 2/3 (to use with 650 variometer)

BEST BATTERIES 4'5, 5'0.

MANSBRIDGE TYPE FIXED CONDENSERS

With 2 Fixing Lugs 2s Special Price 3/6 2 Microtarad 3/11

"ORMOND" L.F. 13 11 A WONDERFUL TRANSFORMER

ACCUMULATORS

- MADE BY WELL-KNOWN FIRM
- 2 v. 40 amps. .. 9/6
- 4 v. 40 amps. .. 16/6
- 4 v. 60 amps. .. 17 1/2
- 4 v. 80 amps. .. 23/6
- 6 v. 60 amps. .. 27/6
- 6 v. 80 amps. .. 33/-
- 6 v. 105 amps. .. 37/6
- HART ACCUMULATORS STOCKED.

PHILLIPS 4 ELECTRODE VALVE 12/6

DUTCH '06 VALVES 12/6

GAMAGE'S PERMANITE 1/-

COSSOR 'WUNCCELL' 21/- FEW ONLY.

Experimenter's Sets of 4 Cat's Whiskers 2/-

OUR WONDERFUL H.T. BATTERIES

30 v. 4/6 60 v. 7/6 66 v. 8/6

BROWNIE "IMPROVED" WIRELESS SET 7/6

RAYMOND CRYSTAL SETS 7/11 9/11 12/11

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RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 725.)

used for tuning it should be as small as possible—say .002—but a good plan in your case would be to try and dispense with the condenser altogether. This can be done by experimenting with the number of turns on the frame, and it is often possible to tune in exactly to 2 L.O. without a condenser by using the correct number of turns and spacing.

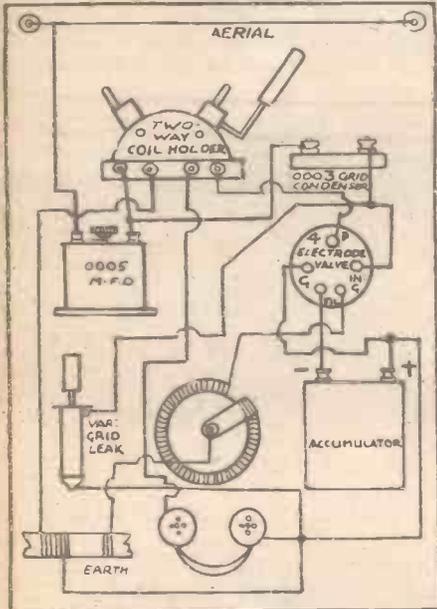
“ONE VALVE WITHOUT H.T.” (Erdington).
—I wish to build the one-valve Unidyne set which was described in “P.W.” No. 112. I have a copy of this number of “P.W.” which I obtained from the Back Number Department, but unfortunately I cannot understand how to wire up the 5-pin four-electrode valve, because I am not familiar with diagrams, etc. Has a plainer diagram of the pictorial type appeared in “P.W.” subsequently? I am a new reader, and have not seen “P.W.” previous to October.

The pictorial diagram shown herewith gives the point to point wiring, and it should be used in conjunction with the instructions contained in “P.W.” No. 112.

It is sometimes an advantage to connect a .001 or .002 mfd. fixed condenser across the 'phone terminals, but generally the set will oscillate very readily without it.

As this is your first valve set you should also read “How to operate your POPULAR WIRELESS Unidyne set,” which appeared in “P.W.” No. 117.

If the set fails to work properly at first, owing to your inexperience of wiring, etc., you should also see the Radiotorial columns of “P.W.” No. 118, but in



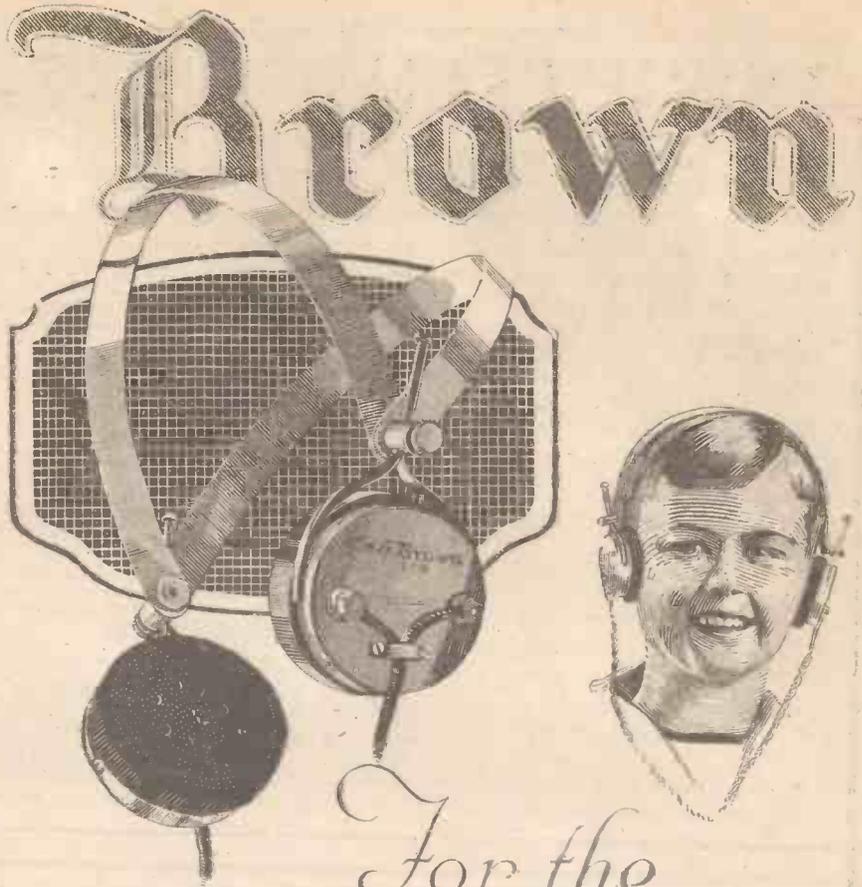
most cases the one-valve set does not give much trouble, even to the novice, although it naturally takes some time to get the full results from the set.

Back numbers of “P.W.” are obtainable from the Amalgamated Press (1922) Ltd., Back Number Department, Bear Alley, Farringdon Street, E.C.4, price 4d., post free.

H. P. (Bristol).—Will you please tell me the points at which I should connect a loading coil for a variometer-tuned crystal set, as I am desirous of getting Chelmsford?

Loading a variometer set to receive the high wavelengths is not generally as satisfactory as a condenser-tuned set, and you are well outside the normal range of the Chelmsford station (100 miles for a crystal set). In case, however, you desire to try, you should note that it is not sufficient to merely break the aerial circuit and insert the coil there. The latter must be placed in the aerial circuit at a point between the leads which go to the 'phones and crystal. In this way the difference of potential across the ends of the coil, and across the variometer, is applied to the detector circuit.

If, however, the detector circuit is connected only across the variometer—which is the case when the loading coil is connected to the aerial circuit outside the tuner—only a small part of the received energy is in a position to operate the detector.



For the Children's Hour

THAT newest of all institutions—the Children's Hour! How the children look forward to that all-too-brief interval in the day when Aunties and Uncles do their utmost to brighten their little lives by song and story.

If there are kiddies in your home be sure you have enough headphones to go round. For this purpose there are none better than Brown Featherweight Headphones. They are so comfortable and can be so easily adjusted to fit any head—large or small.

Even with cords their weight does not exceed six ounces—an important consideration where children are concerned. And owing to their simplified design and robust construction they are not easily damaged by rough use—the inevitable lot of all children's possessions.

When choosing your next 'phones, remember that Brown Featherweight Headphones are manufactured under typical Brown supervision, by the same workers responsible for the ultra-sensitive A type of world fame, and from the identical grade of raw material.

In spite of their extremely low price, they are exceptionally efficient and capable of giving years of faithful service.

Prices :

F-type	
120 ohms -	22/6
4,000 ohms -	25/-
D-type	
120 ohms -	48/-
4,000 ohms -	52/-
A-type	
120 ohms -	58/-
4,000 ohms -	62/-
8,000 ohms -	66/-

From all Dealers.

S. G. Brown, Ltd.—Victoria Road, North Acton, W.3.
Showrooms; 19 Mortimer St., W.1., and 15 Moorfields, Liverpool.

Brown Headphones—appreciated throughout the World



The FAIRYCYCLE

Regd. Trade Mark

It's Great Fun for the Kiddies!

As a gift a Fairycycle is unequalled. It amuses them for hours, keeps them out of mischief and gives them healthy and beneficial exercise. The Fairycycle is far superior to spurious imitations, and is built to withstand any amount of rough treatment. The low centre of gravity makes it extremely safe and easy to ride.

Specification: Adjustable plated handle-bar, cycle saddle (adjustable), ball bearing wheels, 12-in. wheels with 5/8-in. wired on tyres, frame of solid drawn mild-steel cycle tube brake and free-wheel.



59/6

Be sure the name Fairycycle in letters of gold is on the machine you buy. Don't fail to look for the red triangle trade mark on the frame of this wonderful machine. Obtainable from all good Toy Shops and Stores.

Retailers are requested to replenish their stock early
Mrs.: LINES BROS., LTD.,
 9, Fore Street, London, E.C.2.

HEADPHONE REPAIRS

Rewound, re-magnetised and re-adjusted. Lowest prices quoted on receipt of telephones. Delivery three days.—**THE VALLEY MAGNET CO.** London, S.E.18. Phone 888-9 Waltham. Est. 26 years.

SIMPLE AND CLEAR

Wonderful results from using the new & improved **CATSEYE** ^{PRICE} 2/6

FIXED DETECTOR

Listen-in in comfort at once. No waiting, no adjusting. Users are delighted. Order from your dealer, or send P.O. 2/6 and 1/4 stamp to—



COMREX Co. (Dept. 3), 119, Fleet St., E.C.4.

EBONITE

Sheet rod and tubing in all sizes kept in stock and cut to any required size while you wait or sent by post on receipt of cash. We can turn anything in Ebonite.

BURGE, WARREN & RIDGLEY, Ltd.,
 91/92, Great Saffron Hill, London, E.C.1.
 Phone Holborn 50

Correspondence

RE THAT SIMPLE SUPER CIRCUIT.

The Editor, POPULAR WIRELESS.
 Dear Sir,—I have been overwhelmed with letters, inquiring full particulars of the "Simple Super Circuit" you published a short while ago. I apologise to my many correspondents to whom I have not replied through the post, as it would require a large office staff to fulfil some of their demands; so I therefore take this opportunity of describing such particulars as were common to most inquiries:

Grid Leak.—"L.J.C." variable, 2 meg. max.
 Grid Leak Condenser.—'0003 fixed.
 A.T.I. Condenser.—"J.B." '0005 mfd.
 E. to L.T. Condenser.—"J.B." '0003 mfd.
 H.T. and L.T.—Negatives are common.
 Valves Used.—"Ediswan" A.R.D.E.
 Both filaments are controlled by "Microstats," as vernier adjustment is necessary.
 H.T.—24 volts.

Transformer Details.—"Brunet" 1-4; I.P. to grid coil; O.P. to H.T. positive; I.S. to H.T. and L.T. negatives; O.S. to grid of 2nd valve. Both primary and secondary have a '002 fixed condenser in parallel.

The 'phones in the printed diagram, are not necessary for the efficiency of the circuit; but were only included to show how the circuit can be adapted for a single valve.

A '004 fixed condenser is placed in parallel across the loud-speaker terminals, and one of the same size bridges the H.T.

Coils.—Grid, 78, honeycomb; plate, 88, honeycomb.

A.T.I.—I cannot publish particulars of my A.T.I. coil, but I think perhaps a 35 "Igranite" would be the nearest approach in standard coils. The coils are mounted on a 3-way coil holder, the plate coil on the right-hand side (movable), the A.T.I. in the centre (stationary), and the grid coil on the left-hand side (movable). The grid-coil is wound with No. 22 D.C.C., as also is the plate, but the grid coil is wound in the opposite direction to the A.T.I. and plate coils. Efficient results depend greatly on the setting out of components.

Yours faithfully,
 L. R. EVERARD.

BROADCASTING EDUCATIONAL TALKS.

The Editor, POPULAR WIRELESS.
 Dear Sir,—As you ask for readers' views on broadcast educational talks, I should like to say that to some of us they are one of the greatest attractions of all the B.B.C.'s splendidly varied programmes.

Owing to wireless, we have an interest in music we never had before, and are very grateful for any broadcast information which helps us to understand and enjoy the programmes better, as most of us cannot afford to buy expensive books on such subjects (and, in any case, should not know what to purchase). Good poetry, well read, is another joy that can only come to most of us through wireless, and jolly as the Savoy bands are, I feel sure that many regular listeners derive more lasting pleasure from these talks than from the cheerful monotony of the dance music.

Sincerely yours,
 A. H. M.

11, Trafalgar Road,
 Southport.

A NEW INDOOR AERIAL.

The Editor, POPULAR WIRELESS.
 Dear Sir,—I notice in a recent issue a letter by Mr. Aveling which is evidently intended as a gentle reminder that I was not the first person to conceive the idea of the indoor aerial described under the above title. I should like to point out that the

(Continued on page 733.)

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12945, 12955, 12965, 12975, 12985, 12995, 13005, 13015, 13025, 13035, 13045, 13055, 13065, 13075, 13085, 13095, 13105,

CORRESPONDENCE.

(Continued from page 732.)

aerial, as described in the article, is my own invention, and that if your correspondent happened to think of the same or a similar idea, then it is merely one of those little coincidences which prove that (ahem!) "all great minds think alike."

If Mr. Aveling has a grievance against me for having hit upon the simple yet perfectly obvious method of crimping copper tape by means of gear wheels, then surely we may possibly both be hung if the inventor of corrugated iron roofing ever hears about it.

I did not think the idea worth patenting and so I passed it on, in its raw state, for the benefit of "P.W." readers. No doubt you will remember that the articles were submitted to you several months prior to their publication, and, if I remember rightly, it was during the early part of last April when I first began to experiment along these lines, so that, after all, had I applied for a patent I might have been given priority.

Mr. Aveling says: "Possibly Mr. Rankin was unaware of the provisionally patented copper wire corrugated aerial."

Now, in the first place, my invention was a copper tape or ribbon aerial, no wire being used whatever. Secondly, I have never seen any other similar device either on the market or in the Patent Office records; and, lastly, I would ask Mr. Aveling how is it possible for anyone to be "aware" of any provisional patent unless same is extensively advertised as a commercial product.

I must say that the present day radio inventor is much too presumptuous; he forgets there are others in the field besides himself. I am a fairly well seasoned inventor, and whenever I hit upon an idea which is likely to benefit individual readers of such a well-distributed paper as "P.W.," then—volla!—it goes, and I chance criticism or challenge. This is my policy, and so will it always be.

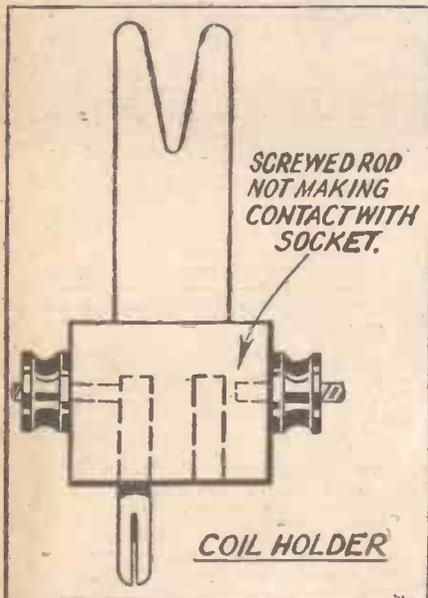
Yours faithfully,
OSWALD J. RANKIN.

18, Myrtle Road,
Sutton, Surrey.

AN UNUSUAL UNIDYNE FAULT.

The Editor, POPULAR WIRELESS.

Dear Sir,—I thank you for yours of the 23rd inst., and in reply wish to state that the Unidyne is now working splendidly. In accordance with your reply, I thoroughly tested all components without finding any trace of trouble. Thinking that possibly the valve was at fault, I went to Messrs. Bower Electric, Ltd., and I should like at

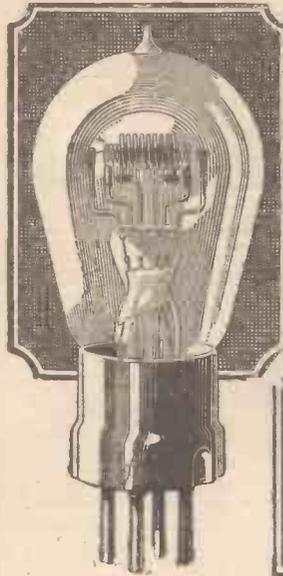


this moment to express my sincere thanks for the kindly courtesy displayed by the representative who attended on me. The valve was willingly changed, but still no results were forthcoming. I am enclosing rough sketch of the trouble. I think you will agree that a fault of this description rarely occurs. I found it out by testing with an accumulator.

Again thanking you for the interest shown.
Yours faithfully,
F. HILL.

20, Cologne Road,
Battersea, S.W. 11.

(Continued on page 734.)



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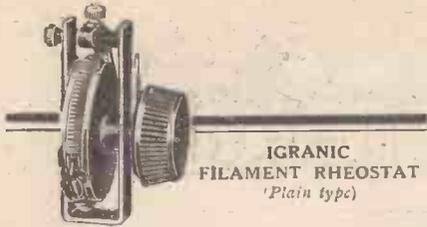
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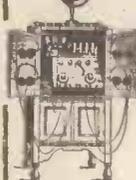
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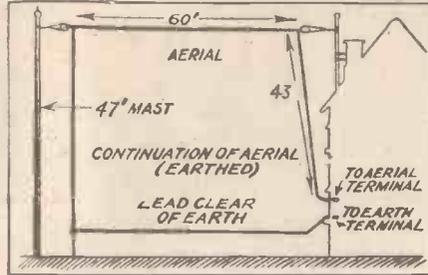
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CORRESPONDENCE.

(Continued from page 733.)

A NOVEL AERIAL.

The Editor, POPULAR WIRELESS.
Dear Sir.—In the issue of September 13th last, page 80, "Radio" gives suggestions for experimenting with aerials. I followed out his suggestions, and was astonished at the results. I signals up to 600 metres. London and Bournemouth come in with the strength



of Chelmsford, but the peculiar part is that Chelmsford does not come in as strong as I formerly got London and Bournemouth. Perhaps "Radio" will explain. Anyway, it certainly is a thing that wants following up. I enclose a sketch of aerial as tried out with this idea, and hope others will give it a trial.

Yours faithfully,
W. A. PELLY.
10, Cavendish Avenue, Eastbourne.

THE SIMPLIFIED ONE-VALVE UNIDYNE.

The Editor, POPULAR WIRELESS.
Sir,—I have constructed the simplified one-valve Unidyne, using, however, a .001 variable condenser without vernier, as I had one by me and do not possess a .0005. I am also using an ordinary two-way coil-holder, not a cam-vernier. There are also certain alterations in the panel, as I am using plugs and jacks for the 'phones. As I have only recently moved to this address, I have not yet been able to erect an efficient aerial. On the evening of October 29th, being desirous of receiving the election results, I slung up a temporary aerial, average height 6 ft., length 41 ft., five strands of 25 S.W.G. The aerial (if it can be so called) is screened on the 2 LO side by two fruit trees covered with foliage. The wire for about 6 ft. of its length being within 6 in. of these trees. I received 2 LO at a strength which was uncomfortably loud on the 'phones, and have been so doing ever since. Last night, 5th instant, I received Radio Iberica (Madrid) on the same aerial and set. I first picked the station up at 11.5, and held it easily until 11.30, when the atmospherics becoming very bad, I "shut down." The reception was badly distorted, but quite as loud as 2 LO on a crystal at this distance.

I feel I must write and thank Messrs. Dowding and Rogers for their invention.

Yours faithfully,
G. W. NORRIS.
134, Meads Lane, Seven Kings, Ilford.

CRYSTAL SET POSSIBILITIES.

The Editor, POPULAR WIRELESS.
Dear Sir,—Now that the winter is on us, with consequent more favourable conditions for long-distance reception, a good deal of experimental work will no doubt be done to explore the possibility of reception at long distance using merely a crystal detector. May I suggest as a subject for investigation the comparative efficiency of tuning by variable condensers in series and in parallel respectively?

Last winter I myself did a fair amount of work in long-distance reception on a single crystal set, and, like many others, found it quite possible to hear quite distinctly all the main B.B.C. stations on nearly every evening of the week. Radiola (then on low power), Ecole Supérieure, Eiffel Tower and Brussels could also be heard.

Contrary to all precepts, I found that my set worked much more efficiently when I used my aerial tuning condenser in parallel rather than in series, and results also improved when I used a smaller plug-in coil and increased the capacity of my condenser.

As my station is within five miles of 2 I.O, I was forced to use loose couplet coils in order to cut out the local station. Here again I found that it paid to use plenty of capacity and a small inductance. When I used a .001 variable condenser to tune the secondary coil, results were much better than when I used a larger coil and a .0005 condenser.

I should be very much obliged to any of your readers for information as to their own experiences. I find that if I am able to hear a distant station using one valve, I can generally also hear it when I cut out the valve and switch on the crystal.—Last week, for instance, I succeeded in hearing on my crystal fairly clearly Stuttgart, Berlin, Frankfurt-on-Main, Münster, and Madrid.

Yours faithfully,
"CRYSTAL."

APOLOGY.

With reference to our recent advertisements and sales under the description Headphones "F. Thomson-Houston," we have to admit and express our regret that the above description implies or represents that such headphones are the special make of The British Thomson-Houston Co. Ltd., of London and Rugby, whereas they are the goods of the French Thomson-Houston Co., and we withdraw any further advertisements and sales of headphones under the said name or description.

Dated 7th day of November, 1924.
GIBSON'S, Wireless Crystal Receiver Specialist,
32, Tavistock Road, PLYMOUTH.

PANELITE.
Will withstand 5,000 volts. Black finish. Will not fracture. 6 3/8 x 3/16. 1 1/2 x 5. 1 1/2 x 5. 1 1/2 x 5. 1 1/4 x 9 x 6. 1 1/8 x 9. 2 1/2 x 10. 2 1/8 x 14 x 12. 4/6 post paid. Other sizes and thickness pro rata.
RADIO PANEL CO. (Dept. "P").
143, Fetter Lane, London, E.C.4.

HEADPHONES

With new type headbands. Very comfortable and sensitive. Postage 6d. per pair.
4,000 OHMS 9/6 PER PAIR

Equal to any at double the price. Money returned if not entirely satisfied. Each pair guaranteed. Hours, 9 to 12.

T. BUXTON, 10, Crofton Avenue,
Hillsborough, Sheffield.

FLEXITE.

The ideal CRYSTAL for all REFLEX CIRCUITS. Will stand up to a High Input. Is stiff, hard, and Super-sensitive all over. Will improve your set 30 per cent. PRICE, 1/6 post free.
CRISP LUCY, Wollaston, Wellingboro'.



The Uncle Tom Crystal Set.

The greatest and most efficient Novelty Crystal Set since Adam! His hat is the coil—his whisker is the cat's whisker—his diamond stud is the crystal! Perfect results guaranteed. Tested 13 miles from 5 N.O. Why not have a Set that is good to look at—and gives long signals? He is 9 1/2 high made of hand-painted china. China—the perfect insulator. An ideal present, ready for use. Price 18/3 Post listening-in. Free

P. Patent No. 19519. Satisfaction or cash refunded.
J. P. GOWLAND, Wireless Manufacturer, Dept. P, 18, Ellison Place, Newcastle-on-Tyne. A few agencies still open.

ACCUMULATORS.

C.A.V., Fullers, etc. Guaranteed brand new and perfect. but slightly soiled. We refund cash with carriage both ways if returned within 7 days.

2v-40a	8/6	4v-100a	32/6
2v-60a	11/6	6v-40a	25/6
4v-40a	17/6	6v-60a	32/6
4v-60a	21/9	6v-80a	40/6
4v-80a	27/6	6v-100a	46/6

Special Line:—
2v-100a (Actual) C.A.V. ... 27/6
MAUDE RUBBER CO. 58 PRAED ST. LONDON, W.2.

Note:

We guarantee to refund your money in full if not satisfied.

MAKE A TRIAL PURCHASE.

Alto Super-sensitive Crystals	10d.
Crystal Detectors, unmounted and glass enclosed	1/4
Plug-in Coil Holders for mounting basket coils	1/-
2-Way Coil Holder with Knob	3/8
Alto Filament Resistance, with Knob and Pointer	1/6
Alto Fixed Condensers, .0001 to .006	10d.
Wound Inductance Coils, 6" x 3" dia. 1/8	1/8
Ormond Variable Condensers: .001, 8/-; .0005, 6/-; .0003	5/6
Alto Transformers, shrouded	14/-
open	12/-
The Famous D.T.G. Dull Emitter Battery	5/-
Alto Accumulator, 30 amp. actual, 4 volts.	22/-
Alto Headphones, "Lightweight"	12/6

All well-known Components in Stock.
Remit twopence for postage when ordering.
WILSON BROS.,
361, BOLTON ROAD, PENDLEBURY.

TECHNICAL NOTES.

(Continued from page 706.)

and convenient insulator. The small glass-head tacks which are used for holding down photographic prints answer this purpose admirably. The sharp steel spear is easily pushed into the wood, and does not disfigure the latter should it need subsequently to be removed, whilst the glass head makes a very good insulator. Moreover, these tacks are quite cheap. The wire should be given a single turn round the glass shank, or if the wire is too thick for this it should be bound against the glass by means of finer wire.

No Lead-in.

There are cases where the bringing of a lead-in may be very inconvenient, and it is sometimes recommended to use either a capacity coupling to the outside aerial, or an inductive coupling. In the former case, the outside aerial is connected to a sheet of tinfoil, say one foot square, pasted on the outside surface of the window, another similar sheet of tinfoil being pasted opposite to it on the inside of the window, and connected to the aerial terminal of the set. The second method consists in placing a coil or loop in the aerial circuit, outside the house but parallel and near to the wall; a second and similar loop is placed near to the wall on the inside of the house, opposite to the outside loop. The signal energy is received by induction between these two loops. In either case the need for a direct connection between outside and inside of the house is obviated. But, of course, the coupling is not so efficient as a direct one.

Tuning.

When tuning on a set equipped with a loud speaker, although it is more convenient to use 'phones for the actual tuning, the loudness may be too great for the 'phones, and methods have to be adopted for cutting down volume which are often inconvenient. A simple way to use the 'phones for the tuning whilst keeping the rest of the circuit practically as it will be when the loud speaker is again in action, is to connect the 'phones across the transformer terminals and place a shunt resistance across the terminals as well. By means of this resistance, which takes the form of a rheostat, preferably a carbon rheostat, the volume of sound in the 'phones can be cut down to a suitable and comfortable amount.

The Crystal.

There has been a good deal of discussion of late amongst wireless experts with regard to the possibilities of the crystal detector. Some say that it has outlived its usefulness, and is little more than a relic of the past; whilst others claim that it will become more popular in the future than at present, when new circuits will be found to enhance its applicability. The popular reflex circuit permits the use of the crystal detector with excellent results, since there is ample energy to obtain good detection. With increases in the power of the broadcast stations, the crystal will give greater and greater distance, and may possibly, at fairly short distances, give good loud speaker reception. Experiments are under way in France, with a special arrangement of batteries and resistances, with a view to operating crystal

(Continued on page 736.)



SEE IT AT STAND NO.

44

White City Exhibition.

Made in two types:
Concert Grand 30/-
Eureka No. 2 (for second
L.F. Stage) 22/6

Guaranteed indefinitely against breakdown.

OUT of all the scores of Transformers on the market today, how many carry—either in letter or in spirit—the guarantee that is at the back of every Eureka? Not only must it satisfy your most critical demands—and you shall be the judge—within a reasonable period of trying it out, or your purchase price will be refunded in full, but we will actually guarantee it against breakdown *throughout its normal life.*

We make this offer for two reasons: first, because we have the most complete confidence in our Transformers, and, secondly, because the unique construction of every Eureka prevents the possibility of any atmospheric influence acting upon it.

As is well known, the air is often heavily charged with dampness, which can be readily absorbed by any ordinary Transformer exposed to it for any length of time. This dampness—sooner or later—will probably cause a breakdown in the insulation of any exposed winding, or at least create a serious falling off in signal strength.

But look at the Eureka, see its massive coppered-steel case, and

know that the whole of its contents is hermetically sealed—actual tests have even demonstrated that fourteen days under water does not harm the Eureka in the slightest degree.

Thus the insulation—tested at 2,000 volts by Faraday House—is absolutely permanent.

But insulation is only one of the Eureka exclusive features—anyone who has had the opportunity of using one will enthuse over its wonderful volume and purity of tone.

If you are building a new Set—or bringing your existing one up-to-date—be sure to fit a Eureka Transformer and have no regrets.

Portable Utilities Co., Ltd., Eureka House, Fisher St., London, W.C.1

Gilbert Ad. 1798.



Home to those Wonderful Mullard Valves

THE rain and biting wind seem to lose their power when you think of the happy evening before your cosy fire with a perfect wireless concert.

Those Mullard H.F. and L.F. valves make such a wonderful difference. You could almost thank them for the splendid enjoyment they give.

You are going back to all that makes life worth living; a welcome meal, your armchair, your pipe and then the pure joy of broadcasting concerts.

If you have not yet experienced the wonderful difference these Master valves make in your radio reception, purchase them on your way home to-day and complete the pleasure of your winter nights.



Mullard H.F. Red Ring Valves for H.F. AMPLIFICATION AND DETECTION - - 12/6 each

Mullard L.F. Green Ring Valves for L.F. AMPLIFICATION - - - - - 12/6 each

These valves only require a 4-volt battery.

Ask your dealer for leaflet M8 and avoid accidents to your valves by using the Mullard Safety Disc, free on request.

Mullard

THE • MASTER • VALVE

Obtainable from all Radio Stores, Electricians, etc.

Advt. The Mullard Radio Valve Co., Ltd., Balham, S.W. 12

LISSENIUM



LISSESTAT (patents pending) gives the most acute tuning possible **7/6**



LISSESTAT MINOR (patents pending) is replacing thousands of discarded and inefficient rheostats. Provides LISSESTAT control at a popular price **3/6**



LISSESTAT UNIVERSAL (patents pending)—with its protective device for dull emitters **10/6**

All types have LISSEN ONE-HOLE FIXING, OF COURSE.

SENSITIVITY

and its allied control, the LISSEN GRID LEAK



SMOOTH OUT YOUR LOUD SPEAKER DISTORTION BY PUTTING A LISSEN VARIABLE GRID LEAK ACROSS THE SECONDARY of the last transformer or across the loud speaker itself. First position is best. The difference will be very noticeable.

DON'T MIX YOUR PARTS—There is a LISSEN Part for every Vital Place.

PARTS THAT PULL TOGETHER—When you know that every vital part in your receiver is pulling strongly with each other, you know that you have a receiver which is the best you can ever get. With all LISSEN Parts you will get results which would never be possible with mixed parts.

LISSEN LIMITED, 8-16, Woodger Road, Goldhawk Road, Shepherd's Bush, London, W.12.

'Phones—3380, 3381, 3382, 1072 Riverside.

LISSEN PARTS—WELL THOUGHT OUT, THEN WELL MADE.

'Grams—“LISSENIUM, London.”

CONTROL

and what it means.

The express train—

the huge liner—

the record breaking car—

the super aeroplane—

Efficient—powerful—capable of covering great distances at tremendous speed. Each and every one dependent upon efficient control. So, too, with the radio receiver used for distant reception—EFFICIENT VALVE CONTROL IS ESSENTIAL.

For the purpose of covering distance—for bringing in that elusive station—efficient control is of vital importance, and efficient control means LISSESTAT CONTROL.

RECEIVERS FITTED WITH LISSESTAT CONTROL ARE EQUIPPED FOR THE FINEST DETECTION POSSIBLE.

Every valve you use has different characteristics—every circuit, too. Whether you are out for distant stations, or undistorted reception of nearby stations, you will find the LISSEN VARIABLE GRID LEAK very important in its effect. Only by using it can you be sure that you are using the correct grid potential for every condition of reception.

It covers a wide range of resistance values, with continuous variation throughout.

LISSEN ONE-HOLE FIXING, OF COURSE—**2/6**
POSITIVE STOPS BOTH WAYS.

LISSEN VARIABLE ANODE RESISTANCE, 20,000 to 250,000 ohms, same outward appearance as the LISSEN **2/6**
Variable Grid Leak



TUNGSTALITE HIGH-TENSION BATTERY

"Keeps on Working!"

VOLTS
60

36 Volts **7/6**

60 Volts **12/9**

100 Volts **21/-**

Give us a visit at the British
Wireless Exhibition, White
City, W.12.

Nov. 15th to 29th, 1924.

The result of prolonged research, a product of selected high-grade materials and experienced craftsmanship, this Astoundingly Efficient Battery is the prized possession of all who are anxious to secure for their apparatus those ideal conditions so essential for good performance.

ASK YOUR DEALER TO-DAY FOR A TUNGSTALITE 60-VOLT BATTERY AND SOLVE YOUR HIGH-TENSION PROBLEM FOR EVER.

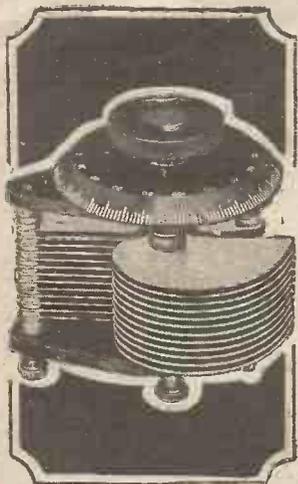
Obtainable from all Stores and from:

TUNGSTALITE LTD.,
HEAD OFFICE:
47, Farringdon Road, London, E.C.1

YORKSHIRE

41, Call Lane, LEEDS.

LOOK TO YOUR TUNERS *for* dielectric losses



Whether your present condensers are Metal or Ebonite End Plates and your receiver unaccountably lacking power — be sure your trouble lies in the bad insulating properties of the insulation between the two sets of plates. High dielectric losses cause leakages, absorptions, inability to oscillate on the lower degrees of the scale. These signal-weakening losses follow the use of poor quality End Plates or insulating bushes. Your only safeguard against condensers in this category is simplicity itself. Always purchase Condensers bearing our monogram—it is the insignia of low dielectric loss—actually J.B. are recorded (N.P.L.) 0.05 ohms—a negligible quantity.

Incorporation of J.B. Condensers gives you the highest tuner efficiency. Fit them—preferably the J.B. Square law.

*001	- 9/6	*0025	- 6/9
*00075	- 9/-	*0002	- 5/6
*0005	- 8/-	*0001	- 5/3
*0003	- 6/9	Vernier	4/6

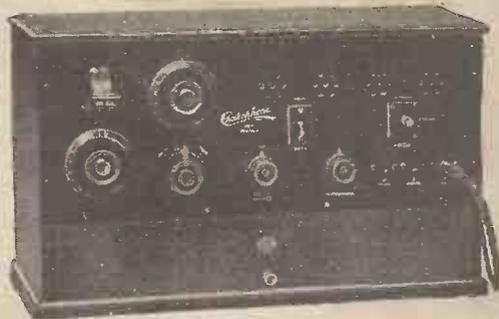
As Condenser Manufacturers we have long realised the vital electrical duty of variable condensers. J.B. Condensers represent both high mechanical and electrical design.

J.B. Instruments are obtainable from all dealers or direct from the manufacturers: Post, one, 6d.; two, 9d.; three, 1s.

JACKSON BROS.
8, POLAND ST.-OXFORD ST.
LONDON - W.1.
(First Floor) Telephone: GERRARD 7414

Barclay's 351

THE *Chackophone* No. 7 REGD. SET



"THE SET YOU CAN BE PROUD OF"
4 VALVE SET COMPLETE.

No Extras **£26 11 9** Carriage
Whatever. **Paid.**

Also made in two and three valve models at equally keen prices.

ASK YOUR WIRELESS DEALER FOR A FREE DEMONSTRATION.

Full particulars free on request.

THE **EAGLE ENGINEERING CO., LTD.,**
WARWICK.

London Depot:

8, GREAT RUSSELL STREET, W.C.1.
Museum 2848.



Continental Series, No. 3

Broadcasting from Switzerland

Although using comparatively little power as yet, there are three Swiss Stations that can be readily heard in this country—Zurich, Lausanne, and Geneva. The Broadcasting Station at Zurich transmitting on 650 metres is responsible for an excellent concert programme commencing at 7.15 every evening. Why not tune in? Don't forget to use a Cossor P.2 as the high-frequency amplifying valve.

Cossor

That "urge" for distance!

—with the correct valves

WE all know the man who, making his debut as a motor cyclist, declares that he only wants a machine for pottering around the lanes. But see him a few months later really bitten by the germ of motor cycling. His only regret is that his machine is not fast enough.

And so it is with wireless. The man who buys or builds his Crystal Set to-day is the long-distance enthusiast of to-morrow. Sooner or later we all get this tremendous urge for distance. No matter how good the local broadcasting station; we must seek means of tuning it out so that we may pick up a note or two from some station a few thousand miles away.

But with improved designs in Receiving Sets, increased knowledge and better H.F. Valves, long distance reception has changed considerably within the last year or so.

Then, the man who received W G Y was considered an expert; to-day, the man who cannot receive K D K A on two valves is clearly a novice.

After all, long distance reception is more or less a combination of three things: (1) The possession of a Receiver using at least one stage of high-frequency amplification. (2) The patience to learn accurate tuning and (3) The correct type of Valves.

Assuming that you can conform to 1 and 2, all that stands between you and the regular reception of other European Stations as far distant as Zurich, for example, is a Valve definitely designed for high-frequency amplification.

The first, and still the country's accepted standard, was the Cossor P.2, the Valve with the red top. This Valve, incorporating all the features which are rapidly making the name Cossor known throughout the world, the arched filament, the hood-shaped

grid and anode, marked an evolution in Valve design.

It broke away from the accepted tradition that every Valve must necessarily be a general purpose valve. Obviously high-frequency amplification demands very different characteristics to low-frequency amplification. Its success was never in doubt. The instant users inserted a P.2 into the socket, the Set leaped into life. Signals which all the time had been passing unheard were picked up with ease. Stations that were, on favourable occasions, just audible could be received at excellent 'phone strength. But there's no black magic about Cossor superiority. It lies in the design.

Everyone knows that a Valve functions as a result of the electron stream given off by the filament. Increase the stream, within reasonable limits—and signals become louder. Alternatively, decrease the stream and signal strength falls off, as you can easily prove by turning the knob of your rheostat.

Now in the Cossor every possible effort has been made by arching the filament and making it conform to the contour of the grid and anode, to capture those elusive electrons. In the ordinary Valve, on the other hand, an appreciable proportion leaks away from each end of the tubular grid and anode with a resultant loss in efficiency.

Remember, in long-distance reception you are dealing with infinitesimal currents generated some hundreds of miles away. You cannot afford to take risks with inefficient Valves.

Choose the Cossor P.2—the Valve with the red top—specially designed for the work. *Remember, all Cossor Valves are now sold in sealed boxes. This patented method of packing ensures every purchaser getting a new and unused Valve.*

Valves

BRIGHT EMITTERS		
P.1. For Detector and		
L.F. use	..	12/6
P.2. (With Red top) for		
H.F. use	..	12/6
WUNCCELL DULL EMITTERS		
Model A. (With resistance in base for use with 2, 4, or 6-volt accumulator.)		
W.R.1. For Detector and		
L.F. use	..	23/6
W.R.2. (With Red top) for		
H.F. use	..	23/6
Model B. (Without resistance, working direct from 2-volt accumulator.)		
W.1. For Detector and		
L.F. use	..	21/-
W.2. (With Red top) for H.F. use	..	21/-

THE SOLUTION OF THE CRYSTAL PROBLEM

IMPORTANT INTERVIEW

OF SPECIAL INTEREST TO ALL READERS OF "POPULAR WIRELESS"

- Mr. AMATEUR: "Good evening, Mr. Expert, I'm lucky to have run across you just when I so much require your advice."
- Mr. EXPERT: "Why, what is it, old man? What can I do for you?"
- Mr. AM: "Well you see, it's this sore question of crystals, I've been spending a small fortune on one thing or another"
- Mr. EX: "So sorry, old chap, but why on earth didn't you come and see me before? I could have put you right in an instant!! Now look here"
- Mr. AM: "Yes!"
- Mr. EX: "What *you* want is a rectifier which is sensitive at *every* point of contact"
- Mr. AM: "Yes, go on."
- Mr. EX: "One which is so easy to work that you can manipulate it in the dark, and one which *does not* give out a week after you've purchased it."
- Mr. AM: "Sure, that's what I'm seeking."
- Mr. EX: "And there mustn't be any of that nonsense about handling it with forceps, with gloves on, or keeping the air out."
- Mr. AM: "Do you mean all these precautions are *unnecessary*?"
- Mr. EX: "Why, of course, if you get the right stuff."
- Mr. AM: "Yes, but what about range, tone, and volume!"
- Mr. EX: "That's just where my stuff scores. You can work eight phones with *my* crystal, and for picking out distant stations it is quite remarkable."
- Mr. AM: "But perhaps you just struck lucky and got hold of a particularly good specimen."
- Mr. EX: "No, no, old chap, I don't do things that way; my crystal is *synthetic* and one piece is exactly like another. I guarantee that. Besides, just you listen while I read you a few lines from 'Popular Wireless' last week."
- Mr. AM: "What, an advertisement?"
- Mr. EX: "Heavens, no! I mean the test made by the Technical Editor."
- Mr. AM: "Carry on, I'm listening."
- Mr. EX: "Oh, here it is on page 720 under 'Apparatus Tested.'" "We have just received a sample of that well-known crystal TUNGSTALITE for test. It was tried out both in ordinary crystal and in valve-crystal circuits. In all cases results were commendably satisfactory, and in point of sensitivity and stability we consider it as good if not BETTER THAN ANY CRYSTAL WE HAVE YET HAD BROUGHT TO OUR NOTICE."
- Mr. AM: "That sounds good enough. I believe what *you* say and what 'Popular Wireless' says rather than these extravagant advertisement claims. Tungstalite is the crystal for me in future. Where can I get a specimen?"
- Mr. EX: "Oh, I always carry a spare Tungstalite; I'll lend you mine to go on with You can buy a piece of Tungstalite (Blue Label) for 1/6 from any decent radio dealer."
- Mr. AM: "I am infinitely obliged to you, and I shall never forget your valuable information. Good-night!"

POPULAR WIRELESS

AND WIRELESS REVIEW.

November 29th, 1924] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Thursday, Price 3d

Technical Editor :
G. V. DOWDING, Grad.I.E.E.

Editor :
NORMAN EDWARDS, M.Inst.R.E., F.R.G.S.

Scientific Adviser
Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

The "All Blacks."

ON Saturday, November 29th, an impromptu entertainment by the "All Blacks" will be S.B. to all stations from Cardiff. The famous New Zealand Rugby team has been touring Great Britain, and 5 W A has managed to secure their services in this unusual rôle for the benefit of listeners all over the country.

5 X X's New Rôle.

ONCE a week, starting next month, two concerts will be given simultaneously in the B.B.C.'s London studios. One will be S.B. by land-line, and the other will be broadcast from 5 X X, the two programmes presenting a vivid contrast so as to appeal to high-brow and low-brow alike.

So 5 X X may ere long earn the distinction of being the B.B.C.'s high-power, high-wave-length, high-brow station!

Dual Entertainment.

FURTHER plans for dual entertainment on different wave-lengths are being laid for the New Year. Once a week there will be an "outside" programme—not drawn up by the B.B.C.—broadcast on 1,600 metres, and on another evening one of the provincial programmes will be put through to 5 X X in the same way.

Another Record.

RADIO records are no sooner established than they are outdone, but that set up by Monsieur J. L. Menars is not going to be beaten easily. He claims that he has succeeded in picking up 108 American amateurs on a two-valve set in *one hour*! Eleven of these were working from the Pacific Coast, and in addition he tuned in several amateurs from Cuba and Puerto Rico.

Phew!

ANOTHER record claimed by the Frenchman—who lives near Pau—consists of receiving 19 New Zealanders and two Australians on the same morning, as well as overhearing a concert from Honolulu!

An Appointment.

CAPTAIN H. W. LITT has been appointed engineer-in-chief of the new high-power station, which the B.B.C. is erecting in the Midlands in the New Year. He will commence his duties on a site near Daventry, on January 1st.

Captain Litt's Record.

ONE of Captain Litt's first successes was with simultaneous broadcasting, and many of the difficulties in this direction were finally overcome by him. He

will also be remembered by listeners for his excellent work in the control-room, during the broadcasting of the King's speech at the opening of the British Empire Exhibition at Wembley.

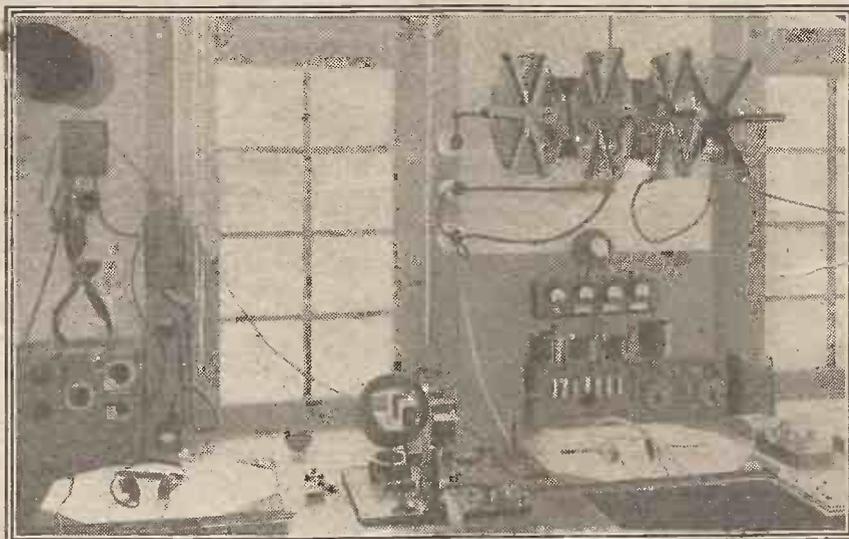
German Revisions.

THE German broadcasting stations have been revising their wave-lengths, and DX listeners should note the following alterations: Bremen 330 metres, Breslau 418, Berlin I (Voxhaus) 430,

the performance, in the same way that George Robey does with his electrophone at the London Hippodrome.

Dundee's Call Sign.

WHEN the Broadcasting Time-table which appeared in last week's "P.W." was compiled the particulars of the Dundee station had not been settled. Readers should therefore note that the call



The operating room at one of the largest Dutch aerodromes.

Berlin II 505, Frankfort 470, Hamburg 395, Königsberg 463, Leipzig 454, Munich 485, Münster 410, Nuremburg 340, and Stuttgart 443.

Canadian Enterprise.

CANADA, with its lonely prairie-farms, open spaces, and vast horizons, has taken very readily to radio. Much of the development is due to the enterprise of the Canadian National Railways, whose trans-continental trains are all fitted with receiving sets, and who are supplying apparatus at cost price to about 100,000 of their employees.

A Stage "Fan."

MR. DAVY BURNABY, of "The Co-optimists," is the keenest wireless enthusiast on the stage. At home he listens-in to the B.B.C., and in his dressing-room at the theatre he has a set with which he can tune-in to broadcasting or listen to the dialogue on his own stage. By means of a concealed microphone he can keep an ear on

sign is 2 DE, and the wave-length is 331 metres.

Swansea's Director.

MR. CHARLES KILDOR PARSONS, who has been appointed station director at Swansea, was formerly engaged with the Beecham Opera Company. Since joining the B.B.C. he spent one year at 5 NO, and since June he has been attached to the Cardiff station. He takes a 5 W A colleague with him to Swansea in the person of Mr. C. Colburn, who has been appointed as engineer-in-charge there.

An Undecided Wave-length.

COPENHAGEN is still undecided about its wave-length, and tests are being carried out to decide whether 750 metres or 471 metres give maximum results. The station is generally working on the latter wave on Sunday, Wednesday, and Thursday evenings.

(Continued on page 742.)

NOTES AND NEWS.

(Continued from page 741)

A Subtle Distinction.

AUSTRALIA'S test signals from an experimental transmitter were received "clear, steady, and strong" at the Marconi Co.'s stations at Hendon, Broomfield, and Brentwood.

I see that Mr. Marconi calls it "a major advance in world communication,"—apparently to distinguish it from the earlier "private" successes, by amateurs!

Two Czecho-Slovakian Stations.

WHERE are Komarov and Kbelý? asks a correspondent who has tuned in the former, but cannot find it on a map.

Kbelý (1,150 metres) is near Prague, and Komarov also is in Czecho-Slovakia (near Brunn, the ancient capital of Moravia). Tuning in the latter's 10 p.m. Sunday concert (on 1,800 metres) is an excellent performance, as Komarov is only a one-kilowatt station.

Wireless Progress in Germany.

WHEN Münster station was officially opened last month, Dr. Bredow, the German Secretary of State, announced that wireless sets were being installed at the rate of 2,000 weekly in Germany.

And in Spain.

FULL particulars of the new Spanish stations are now to hand. Seville (E.A.J.5) transmits on 350 metres at 6.30 p.m., 7.5 p.m., and 7.40 p.m. And Barcelona (E.A.J.1) works on 325 metres from 5 to 7 p.m. and 9 till 11 p.m. The latter station is only testing at present.

Round the World.

WHEN the British amateurs communicated with New Zealand, it was assumed that in reaching the Antipodes they could never be beaten, as they had transmitted right across the world. Now M. Léon Deloy, the French amateur, claims two-way communication over a greater distance. He got through to New Zealand when it was dark across the Atlantic, in America, and across the Pacific; and signals travelling by this route would, he claims, have to travel more than half-way round the world!

The Swansea Relay Station.

SWANSEA'S Relay Station, which will be opened on Dec. 12th, will probably relay the Cardiff programmes. The B.B.C. have acquired a piece of ground on Town Hill for the transmitting station, and the Mayor of Swansea will be asked to perform the opening ceremony for this, the last of the B.B.C.'s promised relays.

Relief for the Isolated.

OVER five thousand lepers are to be kept in touch with the outer world through a radio set, which has been presented to them by an electrical company. It has been sent to the leper colony

on the Island of Cullion, in the Philippines, and will be installed and operated by the lepers themselves.

Testing Readers' Sets.

FOLLOWING the publication of photographs, showing "P.W.'s" workshop, it is sometimes assumed that the technical staff is regularly engaged in testing sets for readers. Already on several occasions it has been pointed out that this is quite impossible, and parcels containing readers' sets forwarded for this purpose have to be returned unopened.

Well-known American Station.

A CORRESPONDENT who writes from Worcester, Mass., gives me some interesting details regarding WBZ (pronounced "W.B.Zee"), the Westinghouse Electric Co.'s station at Springfield, Mass. The studio is in the Brunswick Hotel, Boston, 100 miles away, and the time

WHAT THEY SAY.

"Blossom said she wanted a wireless set so that she could listen; and I said I would get her one, because it would be a nice change for me, but I didn't let her hear me say that last bit!"—John Henry, in "Still Calling."

"You two are a pair of hopeless idiots. Your prologue is beyond human patience. Instead of supplying a very brief description of what the listeners would see if they were in a theatre, and leaving Shakespeare to tell his own story, you are kind enough to help the lame dog of Stratford over the stile by telling the story yourself in your own inimitable way, leaving him to repeat it superfluously and to damn your impertinent vanity."—George Bernard Shaw, in a letter to members of the B.B.C.'s staff (quoted in the "Radio Times.")

"The badly transmitted gramophone records and casual conversations occasionally heard should not be allowed to prejudice listeners against transmitting amateurs in general."—Captain Ian Fraser, C.B.E., M.P.

"We are not trying to force education down people's throats. The lectures only occupy 20 minutes of a programme, and we have already received a great volume of correspondence saying how much they are enjoyed."—The B.B.C.'s Director of Education, interviewed by the "Daily News."

"The B.B.C. cannot experiment in private, so being essentially progressive people, they must experiment in public, and they must experiment on you and me. After all, it is only by trying things that you can discover what is good for you."—Filion Young, writing in the "Sunday Chronicle."

"Already in broadcasting's brief history many people have been brought more intimately in touch with London than they could otherwise have been in possibly a lifetime."—Sir Alfred Bower (London's New Lord Mayor) writing in the "Star."

The Week's Query.

"(Why does my accumulator seem done up (run down) when I turn my rheostat full on (all "off")?"

signals broadcast are relayed from Arlington (Virginia) by receiving them from the ether and re-broadcasting them.

Another "DX" Station.

I AM indebted to this correspondent also for the news that CNRO, the Ottawa Station (415 metres approx.), is now working upon two kilowatts. Readers who have been successful with CKAC, the well-known Montreal station, should certainly try for Ottawa, which is reported to be a good long-distance record breaker.

A Radio Dinner.

CONGRATULATIONS to the Mullard Radio Valve Co., who recently gave a dinner to a number of the original employees associated with Mr. Mullard in starting the business, five years ago.

It was a most enjoyable spread, and I hear that one of the waiters, looking at the empty dishes afterwards, said he could well believe that Mullard's were famous for their success in creating a vacuum round a plate!

Signals from KDKA.

THE experimental short-wave transmissions from KDKA are proving highly successful, and a Canadian Government steamer reports that they travel as well in a northerly direction as they do across the Atlantic. Strong signals were received by the steamer when off Cape Sabine (North-West Greenland), which is only 11 degrees from the North Pole.

Photographing Sound.

WOULD you like to make a permanent record of speech or music received by wireless?

Dr. Fournier d'Albe—whose work on television is probably well-known to readers of this journal—has now invented sound-photographs which he calls "Radiotonograms," by means of which speech and music can be seen! With practice the radiotonograms could be read at sight, and it may be possible to modify them for use as music-rolls in a player-piano.

Wireless Time from Stars.

MAKING the stars work is the latest idea of a French scientist, and it will shortly be tested out at the Eiffel Tower. He suggests that as the light of a star crosses the eyepiece of a telescope it should be made to operate a selenium cell, and this in turn could be made to broadcast a musical note, so that listeners would actually "hear" the star. Broadcast without human intervention, this time signal would be accurate to within a millionth of a second.

A Wonderful Tribute.

COMMENTING upon the election of Sir Oliver Lodge as an honorary member of the Institute of Electrical Engineers, the "Electrician" states: "Though we do not believe in ascribing the invention of electrical applications to any one person, it is not going too far to say that Sir Oliver's early work . . . forms the foundation of present day wireless communication." The journal adds: "In honouring Sir Oliver Lodge, if somewhat belatedly, the Institution has honoured itself . . ."—an opinion which will be universally shared.

Trans-world Wireless.

I LISTENED in for New Zealand one evening last week, and like most of us I could not hear a whisper from the Antipodes. But G20D was getting through to Australia, apparently without any difficulty. He was working A3BQ, and although he was giving "R's" and "K's" freely I was unable to trace even the faintest reply.

ARIEL.

HOW I RECEIVED AUSTRALIA ON A TWO-VALVE SET.

EXCLUSIVE ARTICLE FOR "P.W."

By FREDERICK WALKER.

Although it is only a few weeks since British amateurs picked up amateur signals from New Zealand, another record was quickly set up by Mr. Walker, who received messages direct from Australia on two valves. In the following exclusive article Mr. Walker tells how he picked up the Australian signals, and gives details about his receiver.

HAVING started radio in 1920 and progressed from "crystal to valve" reception, I have always been particularly interested in the "DX" side of my hobby—i.e. long distance work on the least number of valves.

It was in 1922, when the transatlantic tests were in full swing, that I first received a real DX station—U 8 A Q O calling England. That was on 200 metres, using

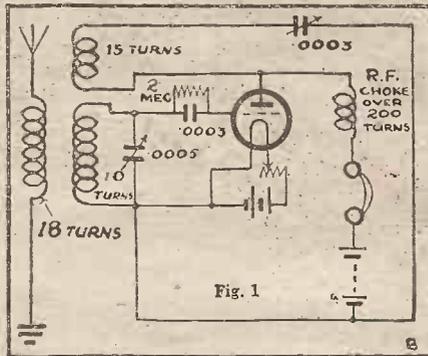


Fig. 1

two valves (1 H.F., 1 D.). Since then I have been gradually going lower and lower, and with each change of wave greater "DX" became more common. H.F. became a problem on 100 m. and impracticable on any wave lower.

Thus, at the beginning of this year, a set was made up consisting of 1 D. and 1 L.F., using aperiodic aerial coupling, and with this arrangement many U.S. and foreign stations were received.

This same arrangement was in use when Australia was picked up for the first time at 18:40 G.M.T., November 12th, 1924. At 18:30 I sat down and tuned the set to 90 metres, in order to try for any New Zealand amateurs that might be transmitting. Turning the dial slowly round, I suddenly heard a very weak station on about 92 metres sending very slowly, and with a "marking wave."

Signals Very Loud.

He gradually became stronger, and at last the word "Fisk" was made out. This gave me the cue at once as I knew Mr. Fisk was a prominent wireless engineer in Australia. At 18:50 the signals became quite easily readable, and the message read: "Iccm iccm de fisk fisk = A 2 M E A 2 M E abedefghijklmnopqrstuvwxyz iccm A 2 M E."

This was repeated several times and was quite "readable strength" at 19:15 when I went away for 10 minutes; but on returning at 19:25 a 2 M E had faded right away, and could only just be heard. By 19:30 he had disappeared altogether.

The circuit at that time was wired up as a

1 valve set, and the L.F. separate and joined up by flex. This led to some slight noise in the 'phones when the table was knocked.

However, things were left in exactly the same order until the next night when listening was resumed at 18:30. On the stroke of the half-hour A 2 M E was heard very much louder than the previous night; in fact, it was so loud that doubts were at first entertained as to whether the signals did originate in Australia.

However, these doubts were soon quelled when A 2 M E was heard sending: Iccm A 2 M E iccm de fisk vvvvvv abc—xyz nw st. bi till 1900 G.M.T., — nw broad dalite vjl de 2 M E nw 08:00 A 2 M E."

Another Station Heard.

On looking it up in the call book V J L proved to be an Australian boat, but the writer has it since, on good authority, that the call has been given to an Australian land station. The signals from A 2 M E were very much better towards the end of their message than at 18:30, in fact they could be read six feet from the 'phones!

At 18:50, when A 2 M E was "standing by," a very weak station was heard on about 93 metres sending "C Q C Q g A 3 B Q aus. Hr Q R A of A 3 B Q = M. Howden. Box Hill, Victoria, Australia = C Q C Q g A 3 B Q aus. Pse K."

The signals were R 4 to R 5 and faded a lot. The note was like a tonic train

cycles, of about 500 cycles. Nothing further was heard of A 3 B Q until 19:15, when he was heard communicating with "G O O Z" and said: "first dalite hr. nw. pse. rpt. Q R A. ur Q R K but Q R Z = G O O Z de A 3 B Q."

At 19:18 A 3 B Q was getting weaker and weaker, and was not heard again after this time.

A 2 M E, however, had been heard at 19:00 but only sent his usual "iccm de fisk A 2 M E abc—xyz. nw hi till 19:30." His strength was still about R 7. Nothing more was heard of either station that night.

On Friday, Nov. 14th, A 2 M E was heard but very weak, and fading badly. The log reads as follows: 18:30—"Iccm de Fisk g A 2 M E. Are you receiving Mr. W. ?—Kind regards. Newman."

18:36—"Iccm de Fisk.—If you are receiving Mr. W., kind regards. Newman." "Nw. hi till 0:900 G.M.T."

V J L, V J Z di 2 M E—tks fr report being received in England each nite and

America pse report at what time you first received in the morning. pse report on—at 5:40 6 a.m.—Newman, A 2 M E."

19:02—"Iccm de fisk abc—xyz. hv hi till 09:30 G.M.T."—(Fading.)

19:33—"Iccm 2 M E"—(Fading away.)

No other Australian stations were heard on the 14th.

The circuit used is given herewith, and is taken from "Q.S.T." (Fig. 1).

Fig. 2 gives the full circuit with L.F. The aerial circuit consists of an untuned primary coil (basket, wound with 18 S.W.G.) of 18 turns. This is coupled to a secondary coil of the same gauge wire of 10 turns tuned by a '0005 condenser in parallel. The reaction is another basket coil of 15 turns of 18 S.W.G., D.C.C. wire, and has a fixed coupling. The reaction is varied by the '0003 variable condenser in series with the reaction coil, the movable plates being connected to the - H.T. and - L.T.

The grid condenser is '0003 capacity and the leak 2 megohms. The choke coil is very important as the circuit will not oscillate without it. Any coil, basket or honeycomb, with over 200 turns will work satisfactorily in this respect.

The valves were Dutch "hard" amplifying valves, which will take up to 80 volts on the plate without going "blue." They make very good detectors. The condenser across the H.T. is important and should be '001 or thereabouts. The inter-

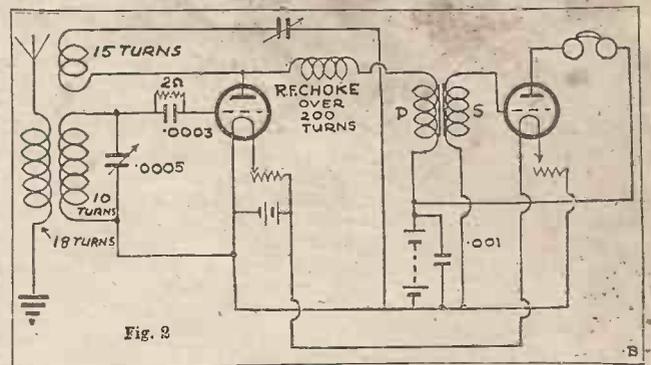


Fig. 2

valve transformer is an ex-army one, 5 to 1 ratio.

All the parts of the set are mounted on a deal board, and only ebonite used for supporting the condensers. The aerial is a long low one running S-N, 20 feet high, and a little over 100 feet long, and of No. 10 S.W.G. copper wire.

Three Essential Points.

The lead-in is brought from one end through a hole drilled in the centre of the window pane. The earth consists of three

(Continued on page 803.)

AMATEUR RADIO IN BELGIUM.

By PROFESSOR M. DAISMONT.

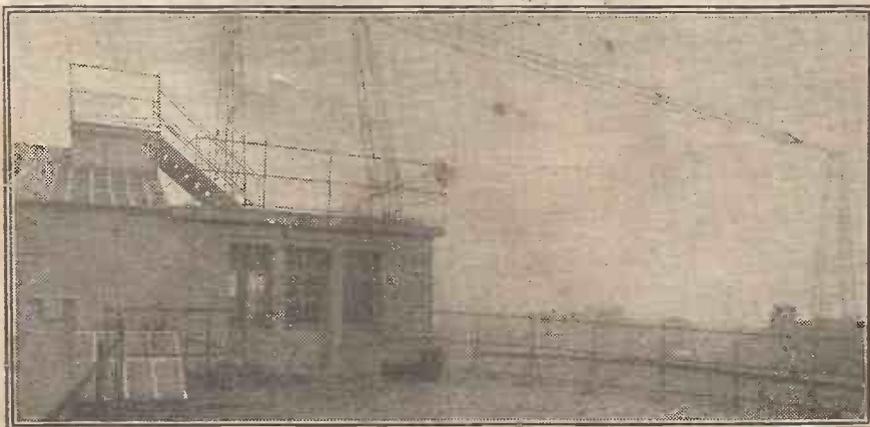
AMATEUR wireless work in Belgium goes back to the earliest times of the practical use of wireless signals.

In Belgian colleges and universities they taught all about the experiments of Hertz, the invention of the coherer, and the first transmissions and receptions made by Sir Oliver Lodge and G. Marconi.

When wireless was first used on ships, and for the transmission of news, time signals, etc., many Belgian wireless amateurs

occupation most of them were found undamaged, and, when possible, returned to their owners!

During German occupation reception and transmission of wireless signals was strictly forbidden. But we know of amateurs who received all the war news from the Eiffel Tower on completely concealed sets, and who communicated that news to their friends to uphold their courage; some of them even transmitted interesting war



Aerial system at the Brussels Broadcasting Station.

made their own sets: very simple sets indeed. From the first experiments in Belgium (between Brussels and Malines and Antwerp in 1900 by Guarini) to 1914, Belgian amateurs did not know very much about the practical use of valves. Just before the war valves were only known in the university laboratories, and many experiments were made there after the famous inventions of Fleming and Lee de Forest.

Pre-war Experiments.

But the amateurs worked only with crystal sets. They used coils wound on cardboard tubes. The inductive coupling was in constant use, for the necessity of separating so many emissions made by damped waves. Many clock- and watch-makers had their sets to take the time signals from Eiffel Tower and Norddeich. Magnetic and electrolytic detectors were rarely used; but attempts were made to record the signals detected by the crystal; a sort of microphone amplifier made this possible; for photographic recording they resorted to the galvanometer of Einthoven.

Then came the great war. How long ago it seems to the writer of these few lines, when he remembers that terrible noon, when Norddeich threw into the ether those famous words: "Germany declared war on France and Russia." And many amateurs in Belgium heard and understood that fateful message.

As soon as war was declared all amateur sets had to be brought to the Belgian Government officials, and many were stocked in Ghent. Curiously enough, after German

depended on France; also for the purchase of valves, though many came from Holland too.

The first aim of amateurs was to pick up telephony from the Eiffel Tower: then from Holland; then came the happy "short wave" days, when British broadcasting began. Belgian amateurs rejoiced at the splendid programmes coming over from England, and we may be sure that they owe very much to England. Unfortunately, although they could receive the British broadcasting very well, most of them were unable to buy British wireless products and books, the rate of exchange on England being too high.

Nowadays, Belgian amateurs can listen in to their national station of Brussels, made after British models, and can hear very easily all German stations. The British broadcasting station of Chelmsford has the same success as the French Radiola station, and can be received on the crystal set of old times.

Recent Developments.

Belgian amateurs have their own periodicals, as "Radiophonie pour tous," "Radio-Belge," etc., and especially the Flemish "Radio," a monthly paper of high standing. Receiving sets are only allowed under Government approval; 20 francs per annum must be paid, and no reaction is allowed on the aerial circuit. Amateur transmission is practically forbidden.

A new high-power wireless station is being erected at Ruysslede, near Bruges. Two of the six masts, 285 metres high, are already constructed. This station will carry out transatlantic transmissions, especially to the Belgian Congo. The receiver for this station will be at Liedekerke.

The sets now used by the amateurs range from the simplest crystal set to the multi-valve set; the tuned-anode system is perhaps the most popular. Many commercial sets are bought by rich people, and the "Ondolina" of the Société Belge de Radiotélégraphie has a very good name.

British, French, and American work is very much appreciated, and among the British papers POPULAR WIRELESS is very popular with many Belgian amateurs.



The transmitter at the Brussels Station.

HOW TO MAKE A CRYSTAL SET FOR 5 X X

BY J. LAURENCE PRITCHARD (Technical Editor, "Harmsworth's Wireless Encyclopedia").

This neatly designed set will amply repay the amateur who constructs it. It is specially designed for the reception of the 1,600 metre station 5 X X.

A WELL-DESIGNED crystal set capable of receiving 5 X X, the new Chelmsford broadcasting station, is illustrated in Fig. 1. The inductance coil is of the cylindrical single-layer type, having 9 tappings. The switch to which the

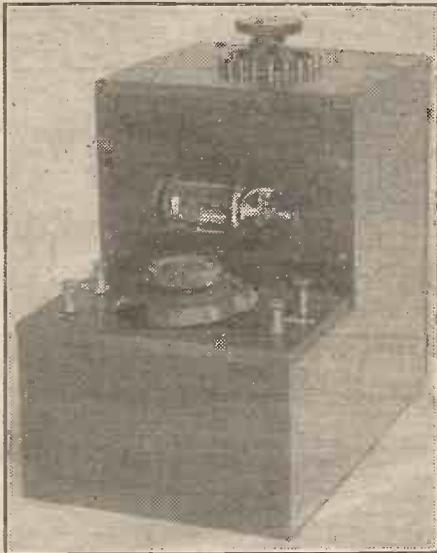


Fig. 1. The Complete Receiver.

tappings are connected is mounted in the centre of the top panel. This panel also supports the tapped inductance, which is fixed to it at one end, so that the inductance coil hangs vertically from it. The lower front of the instrument contains a small variable condenser for tuning between the studs. The vertical panel, between the two horizontal ones, supports the crystal detector, which is of the enclosed glass variety.

primarily intended to be a high-class receiver, well-seasoned and figured mahogany is employed. In selecting the wood, the edges should be examined for tiny cracks, which have a tendency to develop later into comparatively large splits.

The wood should be thoroughly dry, free from bad places and unwarped. Less expensive wood may be used, but if the work is to be of a high-grade character, mahogany is recommended. As little wastage as possible should be the aim in making the case, and to this end the various pieces should be set out to scale on a sheet of paper beforehand. By fitting the narrower sides of the case together as illustrated in Fig. 2, which shows the layout of the various pieces, a considerable saving of wood may be effected. It will be found that a plank of $\frac{3}{8}$ -in. mahogany, 8 in. wide and 24 in. long, will be suitable. If an odd piece 5 in. long and $3\frac{1}{2}$ in. wide is obtainable for the front side, this will be all the better, as, besides obviating any waste material, the grain of the wood is kept horizontal on all four sides.

Three Panels Used.

The wood is planed up quite smoothly while in the plank, after which it is sawn to the sizes given in Fig. 2. The back of

quired to file and scrape their edges flush with the sides of the case. These operations would undo any papering or finishing work.

The centre panel measures $5\frac{1}{2}$ in. by $4\frac{1}{2}$ in., and is cut from best quality $\frac{1}{4}$ -in. ebonite. In the centre of this panel a good quality crystal detector of the glass-enclosed type is mounted. Two countersunk holes are drilled 1 in. from the top and bottom of each of the shorter sides,

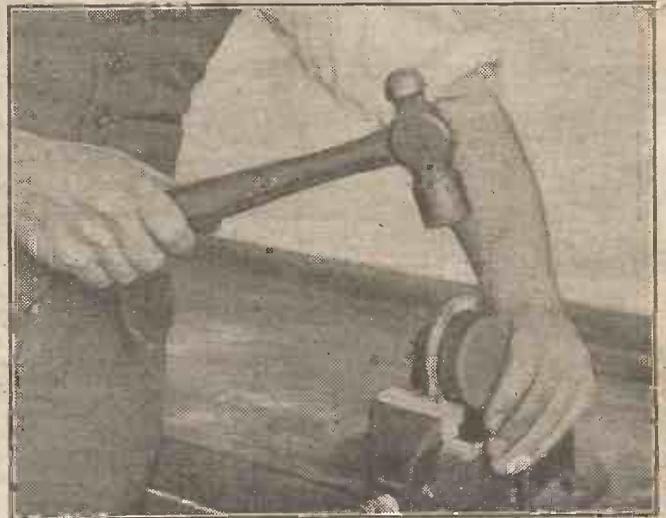


Fig. 3. Bending the contact switch back plate.

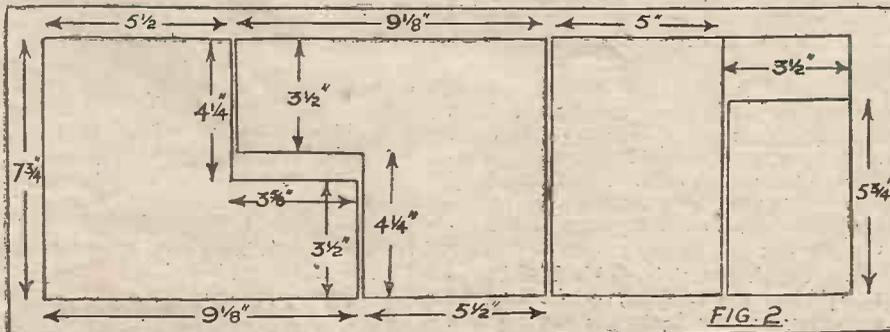
through which holes countersunk brass wood screws secure it to the case.

The lower horizontal panel measures $5\frac{1}{2}$ in. by $3\frac{1}{2}$ in. by $\frac{1}{4}$ in. ebonite. In the centre, a variable condenser of .0005 mfd. is fixed. A 3-in. graduated dial is employed for marking the condenser setting. Aerial and earth terminals are placed $\frac{3}{4}$ in. from the left side of the panel, the earth terminal being 1 in. from the front edge, and the aerial terminal $1\frac{1}{2}$ in. behind it. The two telephone terminals occupy the same relative positions on the right of the panel. Countersunk screws are employed to fix the panel to the case.

Constructing the Switch.

The switch panel measures $5\frac{1}{2}$ in. square, and is also cut from $\frac{1}{4}$ -in. ebonite. The switch is of high-grade construction, and is mounted centrally to the panel. A $\frac{3}{8}$ -in. central hole is drilled, into which a brass bush is tightly pressed from the underside of the panel. The bush is $\frac{5}{8}$ in. long, and has a central hole of $\frac{1}{8}$ in. At one end a flange $\frac{1}{8}$ in. thick is provided, which prevents the bush from pushing through. Nine contact studs, having heads of $\frac{1}{4}$ in. diameter and $\frac{1}{4}$ in. deep, are fixed round a radius of 2 in. They are spaced to occupy

(Continued on page 746.)



Making the Case.

Aerial and earth and two telephone terminals are placed on the lower horizontal panel on opposite sides to the variable condenser. The case is the first item for construction. As the set is

the case fits into the side pieces, while the front piece is screwed to their front ends. Screwing and gluing are employed to make a lasting joint. When the glue is dry the case is filed and scraped as smooth as possible. It is left in this stage until the three ebonite panels are fitted, as it is re-

HOW TO MAKE A CRYSTAL SET FOR 5 X X

(Continued from page 745.)

slightly less than half of the diameter of the circle on the radius of which they are set.

A back plate of $\frac{1}{2}$ -in.-square brass is bent to occupy a similar position to the contact studs of the other half of the circle. To

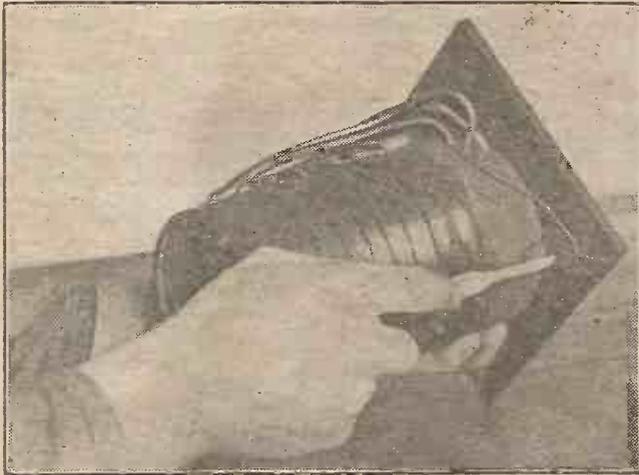


Fig. 4.—Attaching the tuning coil to the switch plate.

bend this rod it is hammered over a short rod of iron of $1\frac{1}{4}$ in. diameter. The operation is shown in Fig. 3. The ends of the back plate are rounded, and 2 B.A. blind tapped holes drilled at either end. Short countersunk screws turned in from the under side of the panel secure the back plate in position. The switch arm consists of three laminations of thin sheet brass.

Constructing the Tuning Coil.

Three strips of hard brass are cut to measure $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. At a distance of $\frac{1}{2}$ in. from the centre and on either side of it two small holes are drilled in each strip by which short rivets secure the three pieces together.

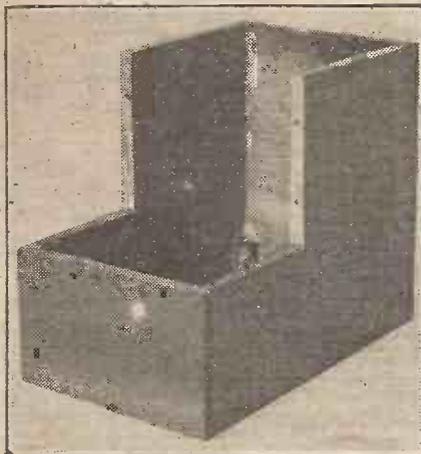


Fig. 5.—The case after polishing.

The top strip is countersunk a little so that the rivet head projecting may be filed off flush. Should the rivet show, the joint may be filled in with solder. The arm is filed up square on all sides and tapered at

either end to $\frac{1}{4}$ in. The length of the tapered portion is about $\frac{1}{2}$ in. Clamping the arm in a vice as near the centre as possible a hole is drilled and tapped in the centre 2 B.A. size.

The appearance of the switch is very much improved by lacquering the brass points, and if this is done it should be just before the final assembly. The switch spindle is a $1\frac{1}{2}$ -in. length of $\frac{1}{16}$ -in. brass rod screwed 2 B.A. for a distance of $\frac{3}{8}$ in. at each end. At one end two lock nuts are tightened against each other, and a flat washer, spring washer, and a second flat washer added in the order given. The spindle is then pushed through from the under side of the panel. On the top side the contact arm is screwed on and filed and bent to the contact studs.

At this stage the three panels are screwed to the partly finished case, so that their edges may be filed up and scraped flush with the sides of the case. While the panels are still in position, the case is papered up ready for polishing. The panels are removed during

the polishing process. Few amateurs have a sufficient knowledge of french polishing to make a high-class finish, and this part of the work is best given out to a professional polisher if the best results are required.

During this period the inductance may be wound and the switch finished off. The inductance is wound with 9 coils of 18 turns of No. 26 gauge double silk and cotton covered wire. A space of $\frac{1}{8}$ in. is made between each coil.

The inductance coil is wound on a 4-in. ebonite tube $6\frac{1}{2}$ in. long. A novel method of making the tappings is employed. The commencing end of the inductance is soldered to a round-headed screw turned into a tapped hole $\frac{1}{2}$ in. from the lower end of the tube. Eighteen turns are wound on, and the first tapping soldered in the slot of a similar screw in line with the first. By this method the wire need not be cut in making a tapping. At the point where the wire passes over the screw the insulation is removed with a sharp knife.

Fixing the Coil.

Subsequent tappings are wound in a similar manner until there are nine coils. A thin coating of shellac is painted over the coils to keep them rigid. Short lengths of tinned wire are soldered to the switch studs for connection to the tappings of the inductance.

The switch cannot be finished off before these wires are soldered, as the heat of soldering slightly heats the ebonite and causes the studs to sink unevenly. The method of making the heads of the studs flat is to file them very carefully with a super-fine file, covering as many studs as possible in one movement of the file. A connecting wire is soldered to the back plate of the switch, after which it may be finally assembled.

At the top end of the inductance tube an oblong piece is cut away so that the connecting wires may be brought to the outside of the tube. This is illustrated in Fig. 4, which also shows the method of attaching the tube to the switch plate. Two right-angle brackets are screwed to the opposite sides of the top end of the inductance tube, and are in turn secured to the switch panel by screws turned into blind tapped holes.

The case after polishing is shown in Fig. 5. At a distance of $\frac{1}{2}$ in. from the bottom a square fillet is glued into each corner for supporting the base. One of the fillets is partly seen in this illustration. It will be noticed that the screw holes by which the panels are attached are already drilled, thus making the completion of the set a matter of assembly and wiring.

Approximate Adjustments.

The circuit diagram for the wiring is given in Fig. 6. The first stage of the assembly is illustrated in Fig. 7, where the

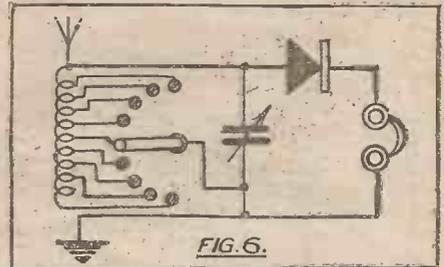


FIG. 6.

tapped coil and switch panel are screwed in position. The vertical panel with connecting wires to the crystal detector is next fixed. The front panel is the last to be attached.

For British broadcasting one of the first three studs will be suitable, depending upon the aerial conditions and the condenser set-



Fig. 7.—The first stage of assembly.

ting. The Chelmsford station, 5 X X, will come in on the fifth or sixth stud.

Best results will be obtained with maximum coil and minimum condensed settings.

The care with which the instrument is constructed will be amply repaid in its long life, good reception, and freedom from breakdown.

THE "SUPER" CRYSTAL. GENERATING OSCILLATIONS.

By **SEXTON O'CONNOR.**

The work of the young Russian engineer, Mr. O. V. Lossev, in connection with oscillating crystals, is further discussed in this article by a well-known contributor to "Popular Wireless."

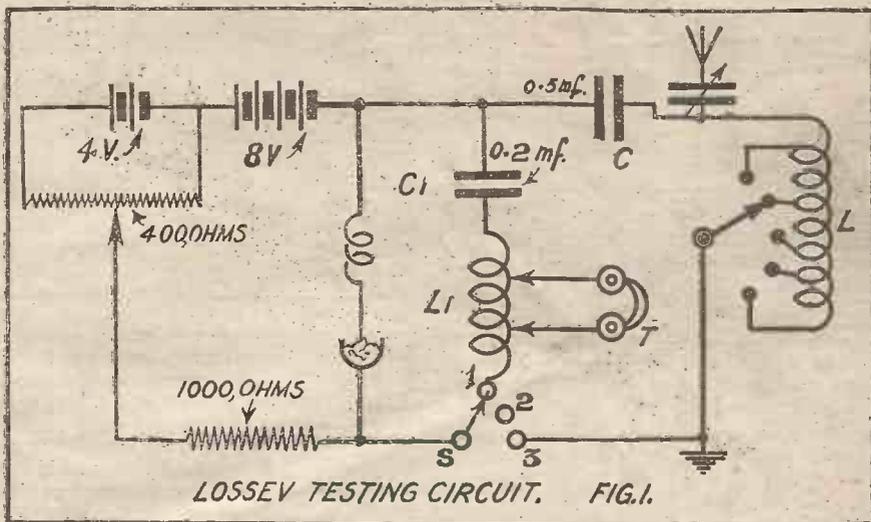
THE announcement that certain crystals can be made to generate sustained oscillations by methods that are within the reach of the ordinary amateur has created widespread interest in wireless circles generally. Knowledge of this fact as a bare laboratory experiment is not in itself new, for it was fully demonstrated

large variety of minerals are capable of functioning in this manner, amongst them being pyrites (iron sulphide) and carbon, chalcopyrites and zinc, and galena or zincite in contact with either carbon or steel.

Of these the zincite-steel or zincite-carbon contacts appear to give the best results, particularly if the zincite has first

varied in the operation of testing for a sensitive spot.

It should perhaps be explained that the production of sustained oscillations is due to a peculiarity of the characteristic curve of the crystal—produced by plotting current flow against applied voltage. Up to a certain point the curve is more or less a straight line, showing that the crystal possesses a comparatively constant resistance. At a particular value of voltage, however, the current, instead of increasing with the applied E.M.F., actually drops, indicating that energy is being given out by the system instead of being absorbed and converted into heat.



LOSSEV TESTING CIRCUIT. FIG. 1.

more than fifteen years ago by a series of experiments made by Dr. Eccles on double galena contacts.

The theory of self-oscillation has since been advanced from time to time by various amateur experimenters, as an explanation of well-authenticated instances where C.W. signals have been received on a bare crystal in the absence of any apparent heterodyne generator. It has also been held to account for "freak" reception by crystals over extraordinary ranges, where no re-radiating aeriials have been present, the generated oscillations in this case serving to boost or amplify the incoming waves.

Finding the Sensitive Spot.

Full credit for turning this interesting phenomenon to practical account must, however, be given to a young Russian engineer, Mr. O. V. Lossev, of Nijni Novgorod. In his native town, co-workers with Mr. Lossev have succeeded in using his crystal circuits, not only for long-range reception, but also for transmission over short distances up to a mile. In the latter case the same crystal serves both as transmitter and receiver, giving a complete duplex or two-way set at a comparatively insignificant cost.

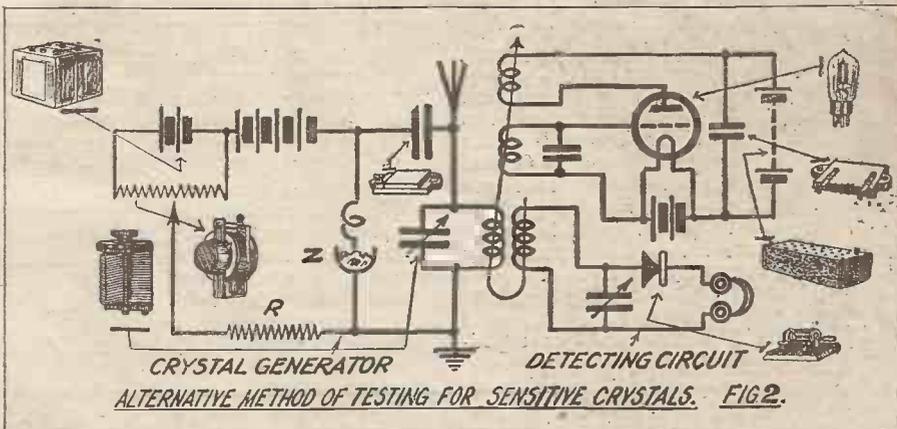
The original Lossev circuit, devised for the purpose of testing the suitability of any given crystal combination and to ascertain the precise conditions under which self-oscillation is set up, is shown in Fig. 1. A

been fused in an electric arc furnace. For the zincite-carbon combination the cat's-whisker may consist of a piece of carbon filament from a broken electric lamp; or a needle or springy steel wire may be used.

H.F. Amplification.

The same peculiar property is also shared by the thermionic valve and the Poulsen arc. Such systems are usually said to possess "negative resistance," and they are all capable of energising suitable oscillatory circuit shunted across their terminals.

In the circuit of Fig. 1 the internal branch L1, C1 being .2 mfd. Such a circuit when energised will create oscillations of audible frequency. The telephones are therefore tapped, as shown, across one or two of the turns in the coil L1, whilst the surface of the zincite is being searched by the cat's-whisker. At each spot the tapping point is gradually moved to and fro along the potentiometer. The presence of a sensitive spot is indicated by the occurrence of a "throb" or



ALTERNATIVE METHOD OF TESTING FOR SENSITIVE CRYSTALS. FIG. 2.

It is obvious that in order to generate oscillations some local source of power must be present. In the circuit shown in Fig. 1, the power supply comes from a high-tension battery of from six to ten dry cells. Two of these are bridged by a high-resistance wire to form a potentiometer by which the applied voltage can be

audible pulsation in the 'phones. It will be noticed that the oscillator is so arranged that the positive voltage is on the crystal and the negative on the cat's-whisker.

When a suitable spot has been discovered, the switch S is moved to the point 2, and the 'telephones (which should not exceed

(Continued on page 748.)

SOME INTERESTING 'PHONE EXPERIMENTS.

By J. D. SWEETMAN.

SOME eight or nine months ago a pair of good 'phones was found to have broken down, and an examination showed that one of the windings of one earpiece had "burnt-out." The defective earpiece was detached from the other, and this latter has since been in use for tuning a set with which a loud speaker is used.

The obvious remedy of having the defective winding replaced was not carried out, in view of the results of some experiments, which will be explained. The defective bobbin and its pole-piece were taken from the case and the loose end of the good winding taken to the terminal to which the burnt-out winding had been connected. On trying the modified earpiece on a valve set it proved to be more sensitive than it and its fellow had been before the breakdown occurred, and, curiously enough, the tone and signal strength were much improved. It worked so well, in fact, that when used with a sea-shell fitted up to take a single earpiece the loud-speaker results were very pleasing.

Shell Loud Speakers.

The series resistance of the original pair of 'phones was 8,000 ohms, so that the single-pole earpiece is of 2,000 ohms resistance. Placed in parallel with a 3,000 ohms loud-speaker it robs the latter of a good deal of signal strength, but when in series with it the strength of the 2,000 ohms instrument is undiminished and there is a good step-up in the 3,000 ohms loud speaker. It should be pointed out, however, that a small sea-shell loud speaker cannot be expected to give the same volume of sound for a given input as a loud speaker of more conventional design with a well-shaped horn. The shell, however, seems to have the quality of toning down music in just the same way that non-metallic tone-arms sometimes improve the quality of reproduction in a gramophone.

The two single earpieces resulting from the separation of the head set have been tried on a simple crystal receiver. It was found that signal strength was about the same when tested separately; in parallel one with the other the lower resistance 'phone (single pole-piece) was stronger than the unmodified 'phone, and in series (6,000 ohms) the head set was practically as good as before the breakdown.

Improving the 'Phones.

These results suggested other experiments that proved fruitful. For instance, it was thought that some increase in sensitivity in very high-resistance 'phones (4,000 ohms) used in connection with valve sets might be obtained by connecting the windings in parallel instead of in series. It is known that many head sets of high resistance which give excellent results with a crystal set often prove less sensitive when used with a valve set, and an improvement might be effected by connecting the windings in each earpiece in parallel.

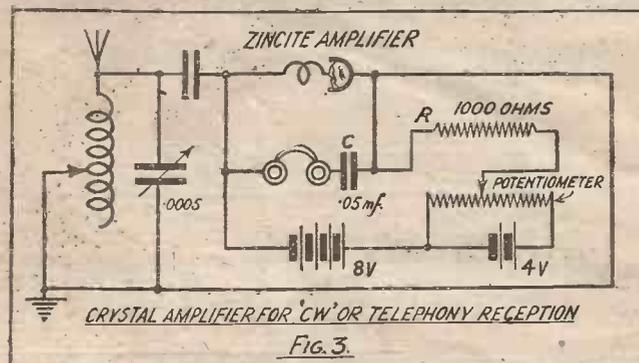
The resistance of the head set would, in the case of a set of 8,000 ohms originally, then be 2,000 ohms, usually about right for valve sets. Experiments were carried out on these lines with satisfactory results. But it was found that we could go farther than this, and a test was made with a head set with one of the windings in each 'phone shorted. The resistance in this case was 4,000 ohms for the set, as the original resistance of the set was 8,000 ohms. In the case of a set of 8,000 ohms there was a decided improvement in signal strength,

THE "SUPER" CRYSTAL.

(Continued from page 747.)

120 ohms resistance) are inserted between the points 2 and 3 so as to be in series with the aerial circuit, which is then tuned to the incoming waves.

The presence of the high resistance R in the supply circuit creates a potential drop,



which varies with the current passing through the crystal, and so applies a flexible or varying voltage across the crystal contact.

If the aerial circuit is slightly detuned from the incoming energy, beats will be set up in the case of C.W. signals, and will give heterodyne reception. If, on the other hand, the aerial is tuned exactly to the carrier wave-length of incoming telephony, the local and received oscillations will be in phase. The two waves, therefore, combine to increase signal strength, the system acting as a high-frequency amplifier.

During the time that the crystal is functioning as a generator of high-frequency oscillations, it is operating, as previously explained, over a "kinked" or non-straight

but with a set of 4,000 ohms the results were about equal to those obtained before rearrangement of the connections.

"Spare" Windings.

It will be seen from this that, as may quite possibly be the case where some head sets are concerned, high-resistance 'phones which were bought for use with crystal sets, but are now used with valve receivers that have succeeded the crystal, may profitably have one winding in each earpiece shorted. Apart from the improved sensitivity that may result—especially where a number of head sets in series are employed at one time—there would always be a spare winding in each 'phone should a breakdown occur.

It may be mentioned that, although it was thought that the permanent magnets in the earpiece containing the single pole-piece might in time become demagnetised, after many months of use there appears to be little, if any, diminution of the strength of pull exerted on the diaphragm.

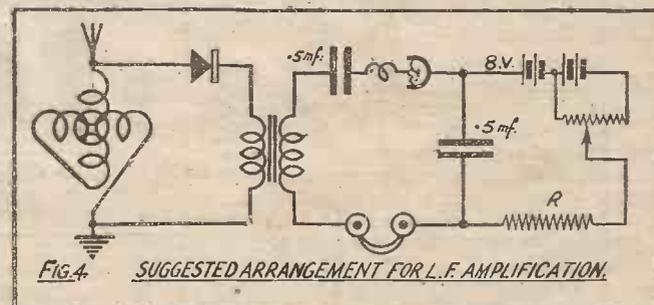
part of its characteristic curve. The result is that not only does it amplify the incoming waves, but it rectifies them at the same time, thus allowing the signals to be heard directly in the 'phones.

Fig. 2 shows an alternative method for testing specimen crystals which avoids the necessity for switching over from an audio to a radio-frequency circuit as in Fig. 1, and the possibility of losing the sensitive spot in this process. The crystal Z under test is connected up as shown on the left-hand side of the figure, and is coupled to a detecting

circuit containing an ordinary hertzite crystal and a pair of 'phones. A wave-meter—or an ordinary oscillating valve—tuned to roughly the same frequency as the aerial circuit of the crystal generator, is then loosely coupled to both the other circuits as shown.

As soon as a sensitive spot is found, the crystal oscillations will combine with those from the valve, and a

"beat" note will be heard in the telephones. A complete "super" crystal circuit for amplifying and detecting telephony or C.W. signals is shown in Fig. 3, whilst Fig. 4 illustrates an arrangement that has been suggested for low-frequency crystal amplifi-



cation. Results in low-frequency amplification have not, however, so far proved as satisfactory as those obtained on the high-frequency side.

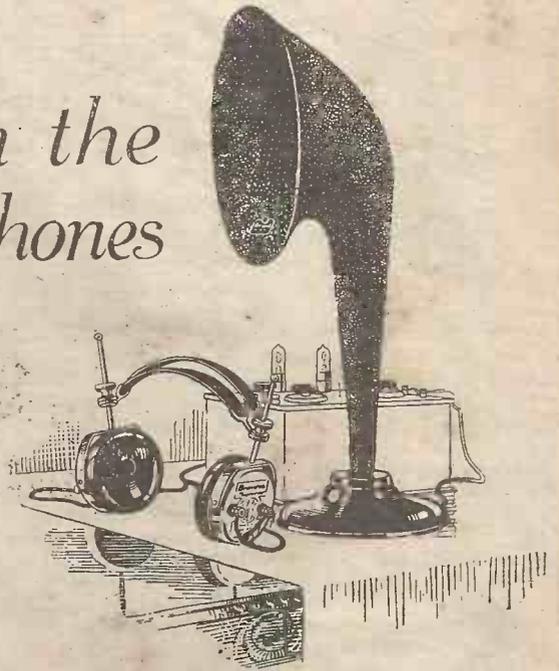
Tune the Table-Talker with the "Matched Tone" Headphones



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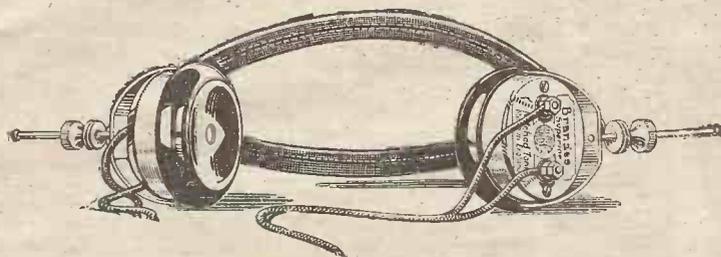
A MARYLLIS dances. Once it was just now and then, but to young Bill that seems æons and æons ago. Now it's interminable—with the help of Brandes' Products. They are quick to define naturally the intoxicating rhythm, the joyous lilt of saxophone wizardry. Young Bill grumbles, but why shouldn't she? That lithe young body, flushed cheeks and sparkling eyes—how hard to resist syncopated melody when the *Table-Talker* brings it with all its real tone and rhythmical fascination. "Joie de vivre, Bill!" she says, and somehow he forgets his grouse when *somebody else's* sister comes in to help "flay the carpet," as Father puts it.

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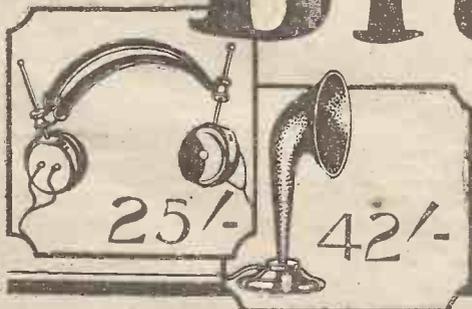
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"Good night, everybody," says my Volutone Loud Speaker, and I find myself saying "Good night, thank you, good night." And, after all, why shouldn't I? I know that my Volutone has been a very real friend to me. All through the summer he was with me, indoors and out of doors, and now that shorter days and long, dark evenings are here, I value his friendship more than ever. Ready to talk if I want to listen, to play to me or to sing to me. And if I join in his song (as indeed I do) is he annoyed? What a friend of friends!!

On a boisterous evening when we are all laughing and fooling, the Volutone plays with the loud pedal down and fills the room with music. On such a night as this, when I sit quietly by the fire, he sings softly and sweetly for me alone.

Yes, I will say good night to my Volutone. "Good night, old friend, until to-morrow. Good night, Everybody."

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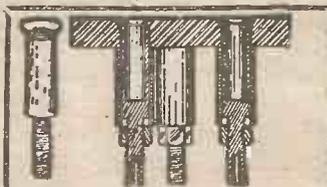


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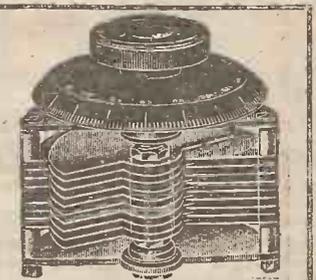


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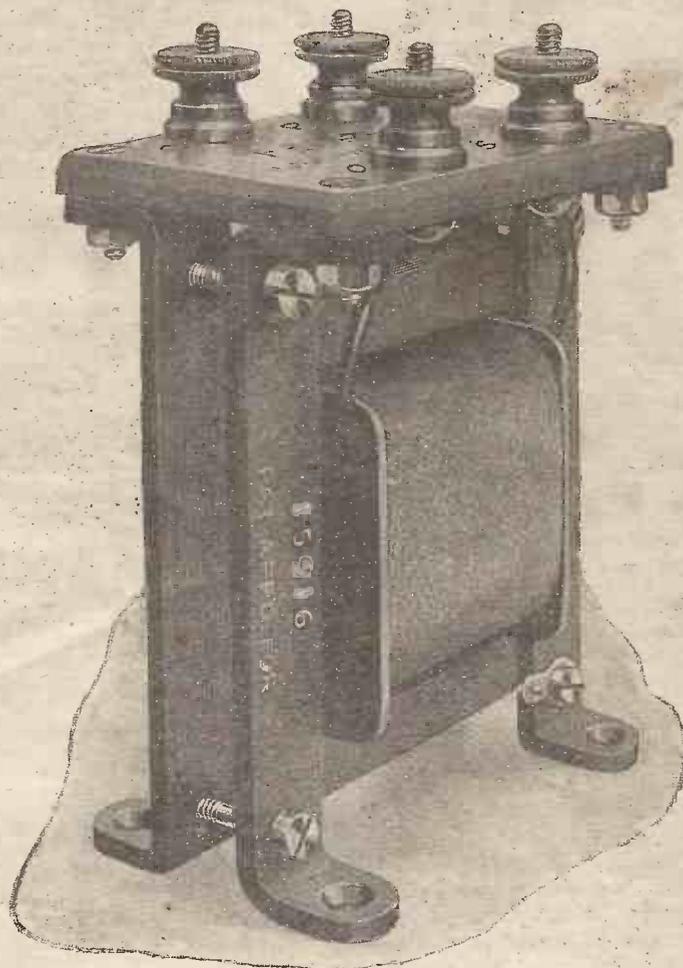


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NO more waiting for your turn—no more missing the very piece you wanted to hear. As many headphones as your set will stand can be added in a second by means of the Newey "Snap" Terminals. All the family can listen in with a small set and extra visitors can easily be accommodated.

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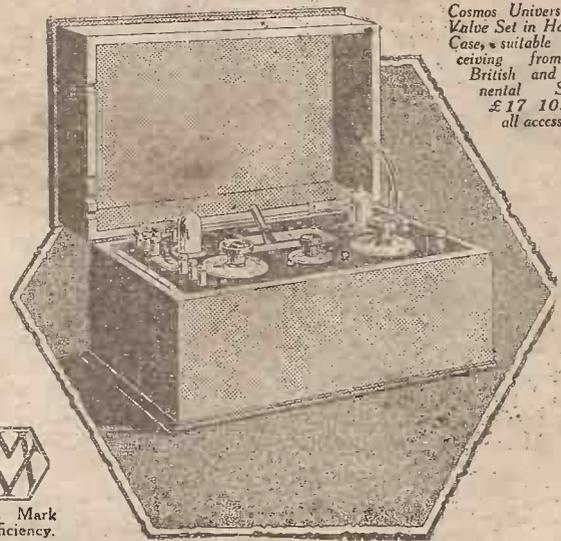
- PHONES +
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By E. BLAKE, A.M.I.E.E.

PART IV. AN ELEMENTARY EXPLANATION OF RECEPTION.

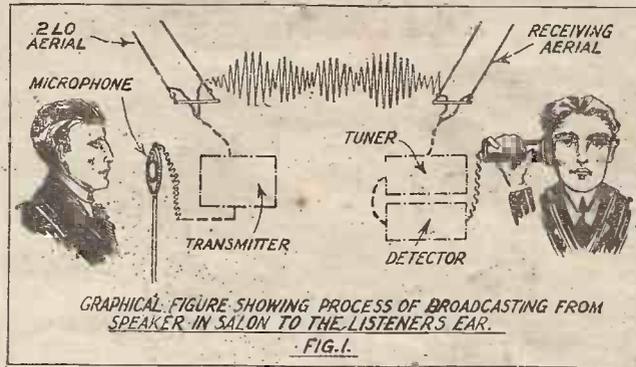
HAVING in last week's article arrived at the point where our wireless waves, moulded into speech or song, are being radiated in all directions from the B.B.C. aerial, we must now transfer our attention to the receiving set.

Reaching up into the ether, like the feeler of an insect, your aerial is right in

aerial. This is the process of tuning the receiver to the waves.

The tuning of one system to another means bringing to a maximum its ability to respond. In "spiritualism" the medium has to be "en rapport" with the spiritistic influence. Telepathy, if there be such a thing, is the attuning of one person's mind to that of another. If a strong singer sings one note near the piano the piano will respond on the same note, one particular wire vibrating in sympathy with the sound uttered. These are examples of tuned systems.

firstly, because they would not go even if we tried, and, secondly, because if a miracle happened, and they *did* go, we should hear nothing—at least, nothing short of a second miracle. Well, we have to change this swift current into a more negotiable form; in fact, as I have previously explained, we have to *de-modulate* it, and get right back to everyday sound waves again. Therefore, after tuning, the next process is *detection*. Most readers of "P.W." will know that the first instrument in a set of wireless receiving units is the tuner; then comes a detector—either a crystal or a valve used as a detector. These two units are the two essentials of any wireless receiver; any other instruments are generally used for strengthening the signals—for instance, amplifiers.



the track of the waves as they flit round the globe. What is readily apparent is that this aerial in co-operation with a simple crystal or one-valve set produces audible sounds which are practically exact copies of the sounds made by the orchestra or singer, ten, forty, or two hundred miles away. The chain which stretches from the singer to the distant listener is composed of the following links, in the order mentioned: Singer's vibrating vocal cords, sound waves, microphone, electrical counterpart or model of air waves, wireless waves (that is, the "carrier" waves modulated by the microphone), receiving aerial, receiving set, telephones, sound waves, the listener's ear (see Fig. 1). After a number of stages the process ends where it began—with sound waves.

Tuning the Receiving Aerial.

The wireless waves in their outward swoop cut across your aerial and leave some of their electrical power in the aerial's wires. In other words, when the wireless waves pass across the aerial they cause a high-frequency oscillating current to flow in it. This is the beginning of the copy of what takes place at the broadcasting station, for it will be remembered that the waves were caused by a high-frequency oscillating current in the B.B.C. aerial. To get back to the original sound waves as made by the singer, we have to retrace, as it were, every step.

Therefore, in order to get as exact a copy as possible in our aerial of the oscillating current in the B.B.C. aerial, we must arrange for the electrons in our aerial to move freely to and fro at exactly the same frequency as do the electrons in the B.B.C.

those in the 2 L O aerial. Evidently they must be provided with a swing of equal length. If you have a swing whose ropes are 6 ft. long, try how you will you cannot make it freely swing so quickly as a swing whose ropes are 3 ft. long. Give them equal lengths of rope, and they will swing in unison. So that in our electrical parallel the path of the electrons in the receiving aerial must be equal in length to that in the sending aerial for the maximum effect (i.e. strongest signals) to be obtained. The path of the electrons is shown diagrammatically in Fig. 2, which is a figure of the "aerial circuit." It will be seen that the oscillating surges of electrons take place between the aerial and the earth through a coil of wire and a condenser. The latter, which has an attractive theory (to which the attention of the studious reader is directed), is used for adjusting the length of the swing, or the electrical length of the circuit. The coil of wire is used partially for the same purpose and partially as a tap for the electrical effects of the aerial currents to be conveyed to other parts of the receiver, en route to the telephones.

The Detector.

Having succeeded in tuning the aerial to 2 L O, what are we now to do with our high-frequency oscillating current, which is moving up and down in unison with Capt. Eckersley's currents in London?

We cannot pass them into the telephones,

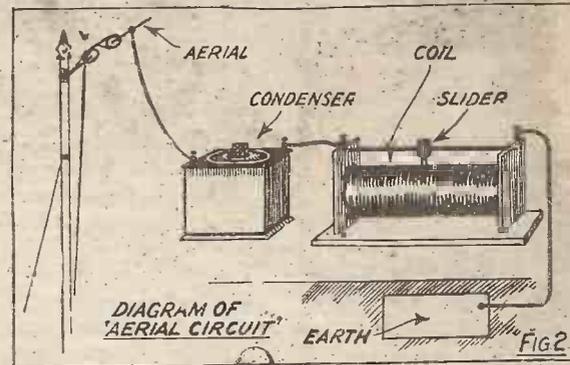
The Tuning System.

Referring again to Fig. 1 for a moment, it will be seen that the receiving aerial is connected to two instruments—i.e. the tuner and the detector. Readers who use only *one* instrument to hear wireless waves will readily understand that such an arrangement embodies both the tuner and detector in one case.

The detector, be it a crystal or a valve, is just a means of converting the high-frequency currents into another form, to which the telephones and finally the ear can respond. It is now simply a matter of changing the high-frequency oscillations to low-frequency pulsations, and then to sound

Electrical "Length."

Tuning a wireless receiver to 2 L O means bringing it to an adjustment such that the electrons in the aerial swing in unison with



waves, when we shall have completed the cycle of events.

Next week we shall analyse a typical receiver and see how this is done.

ARE YOU GETTING GOOD RESULTS?

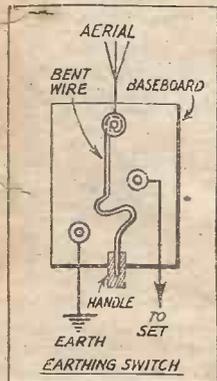
If your set is giving really good results, why not let other amateurs have the benefit of your achievements by sending constructional details (with photographs and rough diagrams) of your set to Popular Wireless? All accepted articles and photos are well paid for.

Constructional Notes

Conducted by Dr. J. H. T. Roberts, F.Inst.P.

Earthing Switch.

A VERY simple and easily-made earthing switch is illustrated in the accompanying diagram. Three terminals and a piece of copper or brass wire are all that is required; if, however, the switch is to be separately mounted on its own base, a small piece of ebonite sheet will be required also. The wire should be about No. 18, or even thicker, and should be bare. It is bent into the shape shown, a short length being left for use as a handle. If preferred, this latter portion may be provided with a covering of ebonite rod, drilled to size and pushed on. When the arm is over in the right-hand position, the set is connected for use. When the arm is in the left-hand position, the set is disconnected and the aerial is earthed.

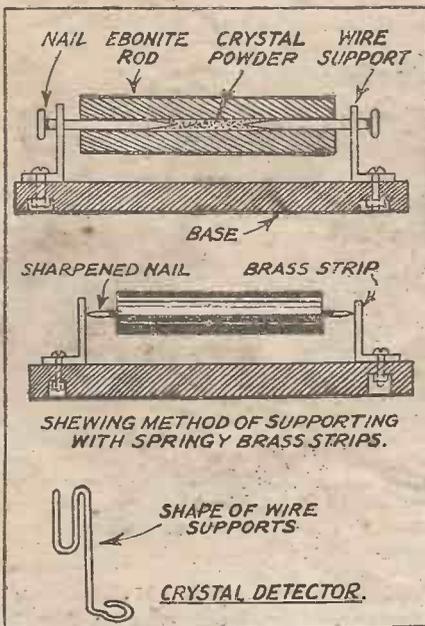


When the arm is over in the right-hand position, the set is connected for use. When the arm is in the left-hand position, the set is disconnected and the aerial is earthed.

Crystal Detector.

A fixed crystal detector that can be mounted up between spring supports, after the manner of a grid leak, is shown herewith. A short piece of ebonite rod is taken, say, 1 inch or 1½ inches in length, and this is drilled along its axis, right through, with a drill about one-sixteenth of an inch diameter. The bore of the hole does not matter very much, however, provided it is fairly small. Two small nails are then procured, which fit fairly tightly into the hole. The tacks used for upholstery are suitable (covering removed), but any others which are available may be used, care being taken that the metal is one which will operate with the crystal which is to be employed. A small quantity of the crystal is then ground up into powder, and one of the pins placed in position. The

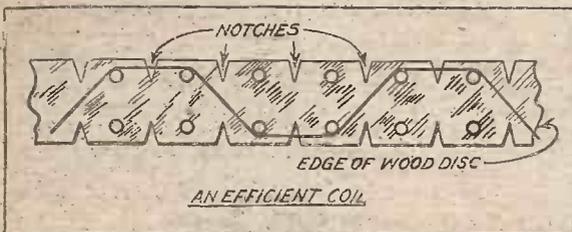
are filed off, and the exposed ends sharpened, springy-brass strips may be used as supports. These should have a depression made where the point of contact is to come, by laying them on a piece of lead sheet, or very hard wood, and indenting them by means of a blunt instrument, such as a centre-punch, giving a fairly light blow with the hammer.



An Efficient Coil.

The accompanying figure shows a method of winding a coil which has considerable self-supporting properties and is efficient in action. It is really an exaggerated honeycomb. The figure and description are taken from "Radio Broadcast." The winding former is a disc of wood about 3 inches in diameter and ¾ in. thick. Into the edge of the disc, one-eighth of an inch from each surface, are driven two rows of evenly spaced pins, twenty-five in each row.

In order to facilitate the final part of the work, notches should be filed in the edges as shown. The coil is wound by passing the wire over two right-hand pins, diagonally across, and over two left-hand pins, and so on. After the last turn is wound, the coil is sewn with a waxed thread and a flexible needle made of a piece of twisted wire. The needle is passed beneath the coil through the notches. If preferred, varnish may be used as a binder, but the thread enables the binder to be dispensed with, which is an advantage. Finally, the pins are removed and the coil slipped off the former. The coil may be mounted in any convenient fashion: the most simple way is to place a

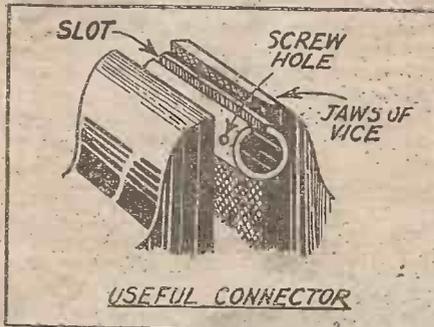


powdered crystal is poured into the hole, and the other pin pushed in at the opposite end. For the supports, short pieces of springy-brass wire are arranged, as shown in the drawing, the supporting wire coming between the head of the nail and the end of the ebonite rod. If the heads of the nails

strut across the centre. These coils may be substituted for single-layer inductances in practically any circuit, and have in some cases been found much superior to spider-web coils.

Useful Connector.

The small brass tubular connectors which are used for joining wires together end-to-end may be much improved in usefulness by the simple process of cutting a slot longitudinally, as shown in the figure. Remove the finger-screws from both ends and place the barrel in the vice; the axis being parallel

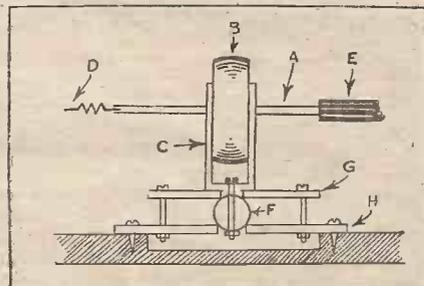


to the jaws of the vice. Then make the slot carefully by means of a hack-saw or a small tube-cutting saw. The barrel should be so placed in the vice that the screws (if they were in position) would be horizontal, the slot being then cut on the uppermost surface.

When the barrel has been slotted in this way it may be used for connecting together not only wires but also strips, the latter being inserted into the slot and clamped by means of the screw in the ordinary way. This makes them useful for obtaining a connection to the terminal-strips of dry batteries. Moreover, their use for holding wires is not interfered with, especially if the slot is not made too wide.

A Micro-Crystal Detector.

To make up this instrument most parts of an ordinary detector may be used. It will be seen in sketch that the bar A is threaded to take an easy fitting milled edge, nut B being a running fit between the two sides of U-shaped bracket C. This is for the purpose of varying the pressure of whisker on crystal.



Note the whisker D is cranked, thus enabling a further movement to be given by knob E. F is a ball screwed to bottom of bracket and clamped between the plates G and H, thus giving the whole device a universal movement.

The crystal itself may be held in any convenient position which allows a fair area of contact, and for convenience may be mounted on a base which is capable of a slight lateral movement

THE BRITISH WIRELESS EXHIBITION WHITE CITY NOVELTIES

By W. S. SHOLL, A.M.I.E.E.

Mr. Sholl, as special representative of this journal, outlines the chief exhibits at the White City Wireless Exhibition. Details concerning the prizes offered by "Popular Wireless" to amateur constructors will appear in our next issue, when it is hoped that the winners' names will be announced.

THE British Wireless Exhibition, which was opened by Professor Low on Saturday, November 15th, and continues until Saturday, November 29th, is undoubtedly the practical man's show, and represents and reflects the opinions of both business man and enthusiast alike.

No fewer than sixty exhibitors have their specialities on view, the exhibits revealing



Rather too large to use. An interesting piece of Midite crystal.

many entirely new types of components and accessories which represent the last word in quality and value for money.

Starting at the Uxbridge Road entrance, we find the Fellows Magneto Co. well in the limelight with a double stand on which their well-known complete sets, including the popular "portable," are displayed, also the "Louden" valve which, although of recent introduction, is already popular.

Passing on to the Victoria Electrical Co., of Manchester, we find a nice show of variable condensers, sets, and components, the latter including excellent rheostats and neatly engraved terminals. A bold move has been made in the introduction of square law condensers at the same prices as the ordinary variable types.

A Variometer Wound "On Air."

Accumulators in great variety are the line at the exhibit of Oldham & Sons, Ltd., whose stands, "four deep," give ample accommodation for a fine display.

Next door we find "Electron" wire going strong and demonstrating its varied purposes in a model house.

The next exhibit, by the Igranic Co., keeps a large crowd interested in following the workings of a coil-winding machine which turns out the well-known Igranic original duo-lateral coils.

Some really splendid lines are on view

here, including a new "skeleton wound" variometer literally wound "on air."

The new coil holder is remarkable value, and the close coupled coil, with aperiodic aerial inductance, one of the best things we have seen. The display windows in "full dress" make up a striking exhibit.

The next block, of four stands, is held by Pettigrew & Merriman, and here we find a most interesting show of high-grade components including the Newey snap terminal which combines quick contact and disconnection with an attractive finish.

Set-Ezi components are another contribution to the needs of both the manufacturer and the home constructor, the special line on view being the Erla fixed condenser, which is produced without the usual moulded casing.

Soundproof Testing Room.

Silvertown components are well known and justly popular, and we find the L.F. transformer well to the fore, also a number of very well-made items, such as fixed condensers, H.F. transformers, and a quite new loud speaker, the "Silvervox," for which reasonable claims are made and appear to be well founded.

Among crystals "Tungstalite" has achieved no little popularity, the new blue label brand having many adherents in the ranks of "crystal merchants." An attractive display of this synthetic compound is to be seen on Stand 21.

Seagull Ltd. have some nice things in complete sets, among which a three-valve receiver with loud speaker rather took our fancy.

The City Accumulator Co. are "live wires" indeed, and their two-valve receiver in fumed oak cabinet at £5 is one of the sensations of the season.

Their new headphone is a beautiful instrument, weighing a mere 5½ oz. with cord, and not only having solid ebonite ear caps, but a watch-like finish, even the magnets inside being finished bright and lacquered.

The portable set is not only a sound job, but has received the unreserved endorsement of many famous musicians, which forms a striking tribute to the artistic merits of the instrument.

A sound-proof room has been provided on the stand, which is a happy idea, and lends itself greatly to the convenience of testing and demonstrating.

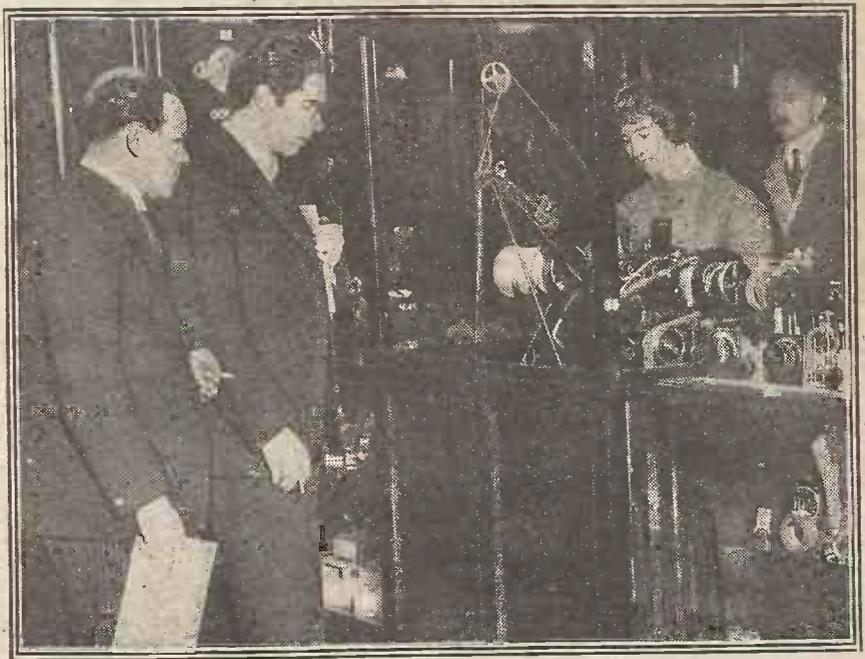
Nearby we find the Penton valve, which is an interesting proposition, being a half-way house between the rather extravagant bright emitter, and the costly and fragile dull emitter. On the same stand we find a rather good idea in filament rheostats.

Among the noted crystals of the synthetic type we find Neutron going strong on Stand 28. The turn-out of the packing appears to be as excellent as the crystal itself.

Gambrell Efficiency inductances and a new unit receiver are showing at Mr. J. V. Mulholland's stand.

Everybody knows the famous Fuller lines which are in full force at Stand No. 33. In addition to the popular "block" accumulator we have the Sparta loud speaker and a new comer in the shape of the Little Sparta.

(Continued on page 803.)



Professor A. M. Low visits one of the stalls after opening the White City Wireless Exhibition.

Six Sixty

IT QUICKLY PAYS FOR ITSELF—



The purchase of a "Six Sixty" valve is a profitable investment since it consistently saves the cost of a very large number of accumulator rechargings.

An accumulator charge lasts from 10 to 12 times as long when the "Six Sixty" is used. It quickly pays for itself and continues to economise whilst giving better reception.

These are facts which merit your investigation. Test them. Get a "Six-Sixty" by post to-day.

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1.8 to 2
FILAMENT CURRENT
25 AMPS.

20/-

Post Free.

Cash with Order.

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ELECTRON COMPANY, Ltd.
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"ADICO" BATTERY BOARD

ADICO Battery Board and 14 ordinary Pocket Lamp Batteries (any make) makes a perfect 63 volt H.T. Battery plugged every 4½ volts. No soldering, no adjusting, perfect connections.

ADICO Battery Board is well finished, polished solid mahogany and solid brass clips.

ADICO Battery Board is simplicity itself. Any child can fix the batteries. Full directions on wrapper.

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Trade Enquiries Solicited.

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HUNT'S NEW MODEL

CRYSTAL DETECTOR



Fig. 429

One-way screw switch to control L.T. current. Price 2/- each.

Leading in Wire.



Description.	100 yds.	12 yds.
Fig. 204. 4 mm Rubber-Coated Cable	23/-	3/-
" 205. 5 mm. do. do.	31/-	4/-
" 207. 7 mm. do. do.	48/-	5/9
" 209. 9 mm. do. do.	65/-	8/-

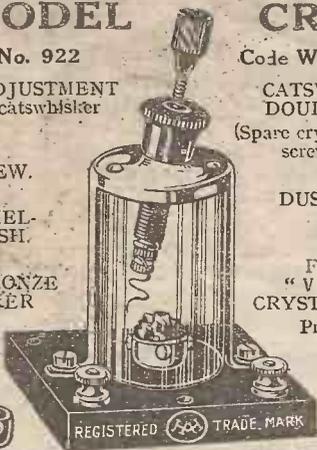
FIGURE No. 922

MICROMETER ADJUSTMENT (without tuning cat'swhisker or cup).

LOCKING-SCREW.

HEAVILY NICKEL-PLATED FINISH.

PHOSPHOR-BRONZE CATSWHISKER FREE.



Code Word "VERNIER."

CATSWHISKER OR DOUBLE CRYSTAL. (Spare crystal cup with fixing screws supplied free.)

DUST-PROOF GLASS CYLINDER.

Fig. No. 922 "VERNIER" CRYSTAL DETECTOR

Price 4/- each. Less Crystals.



Fig. 411

Press down switch to control voltmeter circuit, etc. Price 2/- each.

REGISTERED  TRADE MARK.

A. H. HUNT, LTD.
(Dept. 12) H.A.H. WORKS,
TUNSTALL ROAD,
CROYDON, SURREY.

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Mainly About Broadcasting

By
The Editor

MR. GEORGE BERNARD SHAW has been lecturing the B.B.C., and the B.B.C. seem to have enjoyed it, for, as no doubt many of my readers noticed in a recent issue of "The Radio Times," Captain C. A. Lewis has written a very entertaining little interview with the great author.

He told how, for twelve months, the B.B.C. had been "after G. B. S.," and, owing to their skill, they eventually found a bait which Mr. Shaw could not resist. In reply to suggestions as to the broadcasting of one of Mr. Shaw's plays (which were sent to him by two of the people concerned with the B.B.C. Radio Play Department), Mr. Bernard Shaw replied: "You two are hopeless idiots." The cap may have fitted; I do not know; but it is interesting to note how a really great man's rudeness is accepted as a compliment in certain cases. G.B.S. can be very rude when he likes, but there is a piquancy about it which makes the whole affair very entertaining.

The B.B.C. admit that they have followed Mr. Shaw's advice in the matter of broadcasting plays, and they are to be most heartily congratulated on having secured not only Mr. Shaw as a broadcaster, but as an entertaining adviser as to the supervision and conduct of a department, which one would have thought would have been conducted in the way outlined by Mr. Shaw long before the B.B.C. succeeded in wringing from him his opinion on the production of wireless plays.

Lord Gainford's announcement on the night of the B.B.C.'s second birthday that the company would make a greater use of the high-power station at Chelmsford was very welcome. Lord Gainford said that once a week it was proposed that, starting in December, two concerts should be given from the London studio, one broadcast simultaneously to all stations by land-line and the other transmitting from the high-power station. Further, commencing in January, one programme a week will be relayed from an outside source and will be broadcast from 5 X X only. There will also be one programme a week from a provincial station relayed from the high-power station.

This was a very suitable announcement to make at the B.B.C.'s second birthday, and the fact that 5 X X is now to have a definite home in the Midlands will be welcome news to Londoners for more than one reason, though what the Midlanders will have to say about it remains to be seen.

That birthday night, by the way, must have been rather an hilarious affair, despite the fact that Captain Eckersley turned up late; but he soon made up for lost time,

judging by what I heard of him while listening-in, and I certainly would have given quite a lot of money to have been present, or to have peeped through the door and seen the "Aruncular Four"; judging by the laughter and cat calls they must have been dressed up rather comically.

It was a great pity that Mr. Arthur Burrows was not called upon to recite those touching little lines about the Arab stealing away into the night. Seeing that "Uncle Arthur" made those lines the most famous ever broadcast, somebody should have seen that he was prevailed upon to have recited them once again on that birthday night.

Hearing Mr. Rex Palmer sing once more

if other readers of POPULAR WIRELESS succeed in setting up further "DX" records, they will telegraph or telephone me at once. I am always ready to pay well for exclusive articles of this nature for publication in POPULAR WIRELESS.

Two rather significant items caught my eye when glancing through the newspapers the other day. One read as follows: Mr. Trevor Williams, chairman of the Gramophone Company, Ltd., at the annual meeting of the shareholders yesterday, said that the last two years showed that the greater the vogue of broadcasting the larger the demand for gramophones.

And the other item read: The number of wireless licences taken out is stated to be approximately 997,000. Many old licences have not been renewed.

So it would appear that at least one gramophone concern has realised that broadcasting is not so injurious as the scare-mongers tried to make us believe.

Just as the box-office receipts at Covent Garden showed an increase when the Opera was broadcast, so it is clear that the broadcasting of certain songs, orchestral pieces, etc., induces people to buy a gramophone or some records in order to recapture the items which take their fancy. As George Robey would say, "S'obvious."

The second item is incomplete, but nevertheless very interesting, the number of licences taken out is approximately 997,000—but "many old licences have not been renewed."

The question is, how many people have renewed their licences and how many have not?

The figure 997,000 represents the total taken out since broadcasting began, not the number recently renewed at the pressing invitation of the P.M.G. Does the number of unrenewed licences amount to much, or is the figure insignificant, and one which does not indicate a waning interest in broadcasting? No doubt exists in my mind that the number of people who have not cared to renew their licences is quite small, but as a matter of interest, I hope the figure will be published.



Showing the microphone and piano at the Montreal broadcasting station, La Presse, C K A C, who recently conducted a special transatlantic test on 425 metres.

made one again wish that he appeared more frequently before the microphone. The B.B.C. Beauty Chorus was doubtless a title given to the individual charm of the members of the chorus, because the voices of the chorus were very plain, and proved once again that choruses sung in a large hall reproduce with much better effect than in a studio where all echoes are eliminated.

Mr. Frederick Walker, of Walton-on-Thames, claims to have picked up direct wireless messages from Australia. While listening-in on a 90-metre wave-length for amateur signals from New Zealand he heard instead faint Morse signals, which read as coming from Mr. Fisk, of the Marconi Company, in Australia. He also picked up the call sign 3 B Q, which is the private code of Mr. Howden, Box Hill, Victoria, Australia. Mr. Walker told a Press representative that the signals were quite readable.

Mr. Walker has written a special and exclusive article for POPULAR WIRELESS which appears in this issue, and I hope that

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless" Every photograph accepted and published will be paid for at the rate of 10/6 per photo.

Technical Notes



Conducted by J. H. T. ROBERTS, D.Sc., F.Inst.P.

Making Crystals.

I HAVE received a good many letters from readers with regard to the note in POPULAR WIRELESS, October 25th, on Artificial Crystals. Many describe their experiments, and in a number of cases ask for

is reported in "Popular Radio" that as a result of a large number of experiments on this subject, it has been found that the best reception is obtained with polished wire, which should afterwards be enamelled over to prevent any chemical action on the surface. Ordinary enamelled wire serves quite well.

Plated Diaphragms.

In this connection it is interesting to note that corrosion has a very bad effect also upon the diaphragm of a telephone-receiver, and one company now markets "bi-metallic" phones in which the diaphragms are made of silicon steel, entirely gold-plated. The same company also makes gold-plated bus-bar and aerial wire, as well as a bi-metallic lead-in wire.

Zone-listening System.

The new wireless regulations in Australia provide for a fee for receiving sets which is graduated according to the distance of the set from the broadcast station. The first zone includes all territory within 250 miles, the second from 250 to 400, and the third the remainder of the

country. The new regulations permit paid advertising to be sent from the broadcast stations, and a rather peculiar clause in this regulation provides that no advertisement may be refused except by the postmaster-general.

Novel Lightning Arrester.

A lightning arrester on a new principle has been patented by the Westinghouse Electric and Manufacturing Co. A fault with many types of lightning arrester is that when an arc has once been established across the gap, the arc is liable to continue even though the voltage has dropped to a safe value. The new arrester employs two metal plates, with a layer of lead peroxide between them, a thin sheet of asbestos preventing contact between the metal and the lead peroxide. The latter substance has the peculiar property that, although it is a fairly good conductor when cold, it becomes

a bad conductor on being strongly heated, owing to chemical change which takes place due to the heat. Consequently, whenever an arc forms through the peroxide, it automatically cuts itself off, so to speak, and if the overload voltage is more than momentary, another arc forms in a new place, which arc is again cut off, and so on. Thus the moment an overload ceases, the arc is automatically extinguished.

Spiral Cat's-whisker.

If a thin strip of metal, such as fine phosphor-bronze, be rolled up and then drawn out into a fairly stiff spiral, this is said to make a cat's-whisker, which not only stays in adjustment much better than the more usual and more flexible forms, but possesses a larger area of good contact and does not, therefore, necessitate so much searching of the crystal surface.

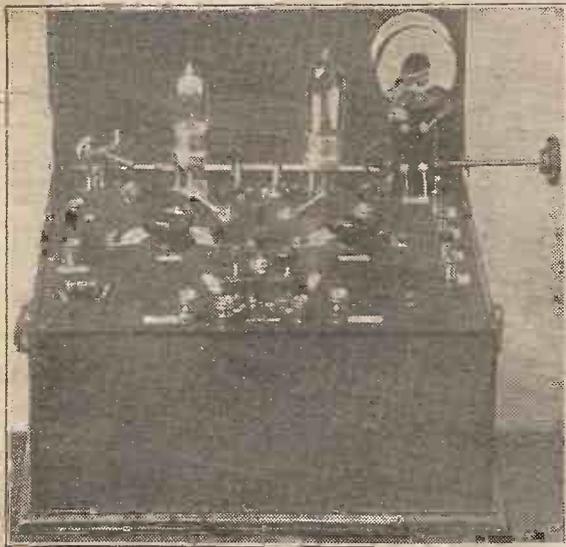
Making Dial Turn Smoothly.

You have probably noticed that on some sets the dials turn with a velvety feel whilst on others they are stiff and scraping. The velvety effect can easily be obtained, however, by the following very simple method. Cut out a circular piece of felt, slightly smaller than the dial, with a hole in the centre to accommodate the shaft. The dial and shaft are removed and the felt ring placed in position, the shaft being then replaced. If the felt is of the proper thickness and if the hole in the centre is of the right size, there will be no need to secure the felt by means of adhesive.

Fixed Condenser Plates.

An interesting method for the making of plates for fixed condensers is described in a patent of G. W. Pickard, the object being to produce a condenser having the least possible distance between plates, as well as low losses from leakage or in the dielectric. A number of mica sheets are taken and upon these a thin metallic coating is formed, either by special electro-plating methods, or by the sputtering of a cathode in a discharge tube. In the specification, much

(Continued on page 805.)



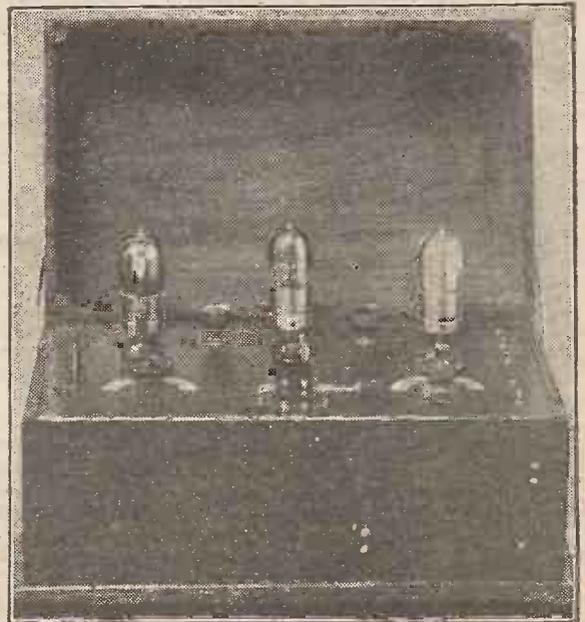
A newly made two-valve reflex set, by Mr. G. W. Humphrey, 170, Blomfield Terrace, London, W.2.

further information as to how to introduce sulphur into the molten metal, whilst at the same time turning out crystals instead of amorphous material. One writer says he has had some success with passing sulphur trioxide (SO_3) into the molten metals, but this is slow and not very satisfactory.

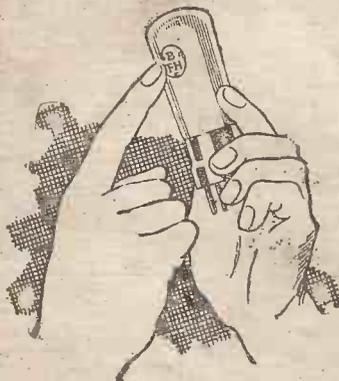
I could, of course, give you methods of making certain crystalline metallic sulphides, but these are rather elaborate, and would in general require the resources of a metallurgical laboratory, which the average wireless experimenter has not at hand. Therefore, I should be much obliged if any readers who may happen to have made crystalline metallic sulphides, by any method simple enough for description in these Notes, would be good enough to give me particulars. It does not matter whether the method is applicable to a number of sulphides; it will be interesting if only tried for one, so long as it is simple and reliable.

High-frequency Effects.

The effect of oxides and contamination generally upon the surface of an aerial wire in increasing the H.F. resistance of the wire is found to be considerably exaggerated when working with very short waves, that is, with exceptionally high-frequencies. It



A three-valve amplifier—another fine example of Mr. Humphrey's work.



The Significance of the Marking

GENERAL PURPOSE VALVES:

Type R. ... 12/6 each
 Filament Voltage.....4 volts
 Filament Current.....0.7 amp.
 Maximum plate voltage...100 volts
 Plate resistance.....27,000 ohms.

Type B3 ... 21/- each
 Filament voltage.....1.8 volts
 Filament current.....0.35 amp.
 Maximum plate voltage...80 volts
 Plate resistance.....27,000 ohms.

*Type B5. ... 25/- each
 Filament voltage.....2.8-3 volts
 Filament current...0.06 amp. (at 3 v.)
 Maximum plate voltage...80 volts
 Plate resistance.....17,000 ohms.

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Type B4. ... 35/- each
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 Maximum plate voltage...120 volts
 Plate resistance 6,000 ohms.

*Type B6 ... 35/- each
 Filament voltage.....3 volts
 Filament current.....0.12 amp.
 Maximum plate voltage...120 volts
 Plate resistance 9,000 ohms.

*Type B7 ... 37/6 each
 Filament voltage.....6 volts
 Filament current.....0.06 amp.
 Maximum plate voltage...120 volts
 Plate resistance 9,000 ohms.

*For use with Dry Cells



The B.T.H. Monogram on a valve means a great deal to the buyer. For one thing, it signifies an exceedingly high vacuum produced by a special patented process. It means a valve which has been thoroughly tested in every respect before leaving the factory. Above all, it signifies a valve of great sensitivity, absolutely free from distortion - a valve which will last longer and give infinitely better results than "soft" foreign (or English) valves.

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**WONDERFUL
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**WEMBLEY
 LOUD SPEAKER
 22/6**

Stella 'Phones, and Stella Loud Speakers.

Those who have not visited the Exhibition have still one chance left to see the best show of the year.

**TO-DAY IS
 CLOSING DAY**
Come This Afternoon!

If you cannot possibly see Stella to-day, do the next best thing—send for Stella leaflets giving full particulars of the finest values in Wireless 'Phones and Loud Speakers.

DO ONE OR THE OTHER TO-DAY!

STELLA  WORKS

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STAND 34, WHITE CITY EXHIBITION

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There is a GECOPHONE component for every requirement—from a simple crystal set to the most elaborate multi-valve receiver.

Build your set entirely with GECOPHONE Components and Ensure Complete Satisfaction.

GECOPHONE Double Headphone, with 6 ft. flexible cord and tag—
 120 ohms 22/6
 2,000 " 24/-
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 Prices from 15/0.

GECOPHONE 55 ohms Variable Filament Resistance 7/6

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GECOPHONE Intervalve Transformer.
 4 to 1 Ratio - - - 25/-
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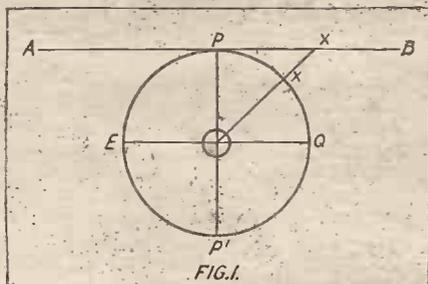
FREE, 20 pages of illustrations, technical descriptions and prices. GECOPHONE COMPONENTS are sold by all leading Electrical Wireless Dealers and Stores.

HOW TO DETERMINE THE TRUE DIRECTION OF DISTANT WIRELESS STATIONS.

By LIEUT-COMMANDER H. W. SHOVE, D.S.O., R.N.

For real "D X" work a knowledge of the real direction of a station is of great value, and in this article our contributor offers advice to amateurs who are out for long-range reception.

NOW that the longer nights are once more creeping steadily upon us, the thoughts of many wireless enthusiasts are, no doubt, beginning to turn to the fascinating problem of "getting America." In order to perform this feat,



it is, of course, necessary to avail oneself of every favouring circumstance possible. And in this endeavour the knowledge of the real direction of the station one wishes to receive becomes important for two reasons. Firstly, because, as is well known, reception is better when the aerial is arranged to run in a direction from the set exactly opposite to that of the station it is desired to receive. Secondly, because of considerations of the screening effect of surrounding objects.

If one is fortunate enough to be able to place one's aerial pretty much as one likes, the reception can be vastly improved by careful attention to these points. And even if, like the great majority of listeners, one is more or less circumscribed in the matter, yet a knowledge of the direction whence the waves are arriving may help to explain difficulties in the reception of particular stations, and also to enable the listener to make the best of what may be decidedly adverse conditions.

The "Great Circle."

Most landmen, if asked whence come the waves which produce in their receivers the inspiring strains of the jazz band performing actually on "its native heath," or the nasal tones of the "goldarned" announcer—the first time the writer heard one he thought the strange accent must be due to incipient oscillation, and instantly loosened the reaction!—most people, if this question were put to them, would vaguely indicate the west. And, since New York—and, indeed, all the well-known Transatlantic stations—are farther south than any point in Great Britain, they would assume that the true direction was somewhat to the southward of that cardinal point. In this, however, they would be wrong.

In order to understand why this is so a little theoretical navigation is necessary. We all know, of course, that the world is,

roughly speaking, a sphere. Actually, in geometers' parlance, it is an "oblate ellipsoid," but, except for the most accurate astronomical or geodetic calculations, no appreciable error is introduced by assuming that it is perfectly spherical. Now, a straight line—the shortest distance in open space—between any two points on the surface of a sphere will obviously have to tunnel through the substance of the sphere.

If we are confined to movement on the surface—as both human beings and wireless waves practically are on the earth—then any path between the points must be a curved path, and consequently not the shortest possible in open space. There are an infinite number of such paths, but all of them are more or less curved. And evidently the shortest will be that which, at every point of the journey, keeps most nearly to the straight tunnel mentioned above.

The nearest point on the surface to any point in the tunnel is, of course, the top of

places and the earth's centre cuts the surface. Any section of a sphere by a plane is a circle—try slicing an orange if you have any doubt about this—and all the circles formed by planes passing through the centre are of equal size, and the largest that can be cut from the given sphere. Such a circle is known in navigation as a "Great Circle," and navigators, in making long ocean voyages, endeavour to keep as near the "great circle track" as circumstances—such as intervening land, regions of ice, or of prevailing bad weather, etc.—permit. These circumstances do not, of course, affect the ether wave, which always follows the "Great Circle."

The Conical Projection.

You cannot trace a "Great Circle" on an ordinary map. Most of the maps in an ordinary atlas are on what is known as the "conical projection." On such a map, while distances and proportionate sizes of



A view of the switchboard at the Brussels Broadcasting Station.

a straight vertical shaft from tunnel to surface. A vertical shaft, as everyone is aware, if sunk deep enough, will eventually reach the centre of the earth. Hence we see that in order to pass by the shortest practicable route between any two places on the earth, we must keep along that track wherein a plane passing through the two

areas are more or less accurately shown, directions, or in nautical parlance, "bearings," are not. No map or chart can be absolutely accurate in all respects, since a curved surface cannot be accurately reproduced on a flat sheet.

Hence all maps and charts are more or more or
(Continued on page 762).

HOW TO DETERMINE THE TRUE DIRECTION OF DISTANT WIRELESS STATIONS.

(Continued from page 761.)

less of a compromise. The ordinary user of an atlas wants the nearest thing he can get to a "picture" of the country represented. Cartographers therefore give him his "conical projection." But the navigator is more concerned with how to set his course in order to get to his destination than with a picture of the seas he sails. He therefore makes use of other "projections." The commonest is that known as "Mercator's Projection."

We need not concern ourselves with this, beyond remarking that its purpose is to enable the navigator to represent a steady course by compass by ruling a straight line upon it. Its construction does not readily admit of marking a "great circle track," and the proportions of regions near the Poles are much distorted; indeed, the actual Poles cannot be shown at all. But the navigator does not care about this distortion.

He uses his Mercator's chart for all regions for which he can do so because of the convenience in marking off steady courses by compass. For "Great Circle" work, and to represent the Polar regions, another, "the Polar," projection is used.

This is drawn by laying an imaginary flat sheet across the "top" of the earth, so as

just to touch it at the Pole. Places are "projected" on to the sheet by producing the radii of the earth through them to meet the sheet. Thus the point X would be marked X' in the fig. (Fig. 1), which is a section of the arrangement by a plane passing through the Poles (P, P') at right angles to the equator (E Q), A B being the edge of the sheet and O the centre of the earth. It will be seen that in this case the equatorial regions will be distorted and we cannot represent the equator at all, since the radii O Q, O E will be parallel to the sheet and never meet it. This chart is of little use when steering by compass, for a steady course—which cuts the meridians of longitude at the same angle—will be represented by a spiral—known as "the Rhumb Line," though quite unconnected with any issue of prag!—and not by a straight line which the navigator can lay down with his ruler. But it has the valuable property that all "Great Circles" are represented by straight lines.

How to Take Bearings.

Meridians of longitude are straight lines radiating from the Pole. Parallels of latitude—"small" circles formed by "slicing" parallel to the equator—on the other hand, are shown as concentric circles with the Pole as centre. Fig. 2 is a chart on the "Polar Projection," showing the Northern Hemisphere north of lat. 30°. The "Great Circle Tracks" joining London to a number of well-known places are shown by the dotted lines.

It will be seen that the true bearings of all these places are north of the E. and W. line—i.e. the angle between the "Great

Circle Track" and the meridian of London is in every case less than a right angle, although all the places, except Moscow, are in more southerly latitudes. The actual bearing of New York from London is N. 66° W., though the latitude of the former (41° N.) is over ten degrees more southerly than that of the latter (51° 30' N.). Thus the ideal aerial direction to receive New York in London is S. 66° E. from the set to the free end.

So far we have considered "true" bearings. If using a compass to determine the direction in which to point your aerial, do not lose sight of the fact that the needle points not to the geographical but to the "magnetic" Pole. The difference between these directions, called the "variation," is at London at the present time about 13½° W., the N. end of the compass needle pointing too far W., and, of course, the S. end too far E., by that amount. So the correct direction of the free end of your aerial from the set for the best reception of New York will be S. 52½° E. by compass. That is, of course, in the absence of special local conditions. If you have a compass showing only "points," the nearest bearing is S.E. ¾ E.

Don't forget, by the way, that if you put the compass near anything magnetic—phones, transformers, or indeed anything of iron or steel or which is carrying an electric current—you will cause another error—"deviation." So keep it at least six feet away from such objects when taking bearings.

Making a "Polar Chart."

To those desirous of constructing a "Polar Chart" to ascertain the true bearing of any station, the following instructions may be of service.

Take a large sheet of paper, and in the middle mark a point to represent the North Pole. Draw vertical and horizontal straight lines through this point accurately at right angles to each other. These represent the meridians of 0° (Greenwich), 180°, 90° E, and 90° W. (see Fig. 2). Mark off every 10—or other convenient number of—degrees in each quadrant, using an ordinary protractor as supplied with any good set of drawing instruments. Draw in and number the radii as in Fig. 2. This completes your longitude scale.

With the Pole as centre and any convenient radius—depending on the size of the paper—describe a circle and mark it 45° N.—i.e. 45° of north latitude. Multiply the radius of this circle by the following constants:

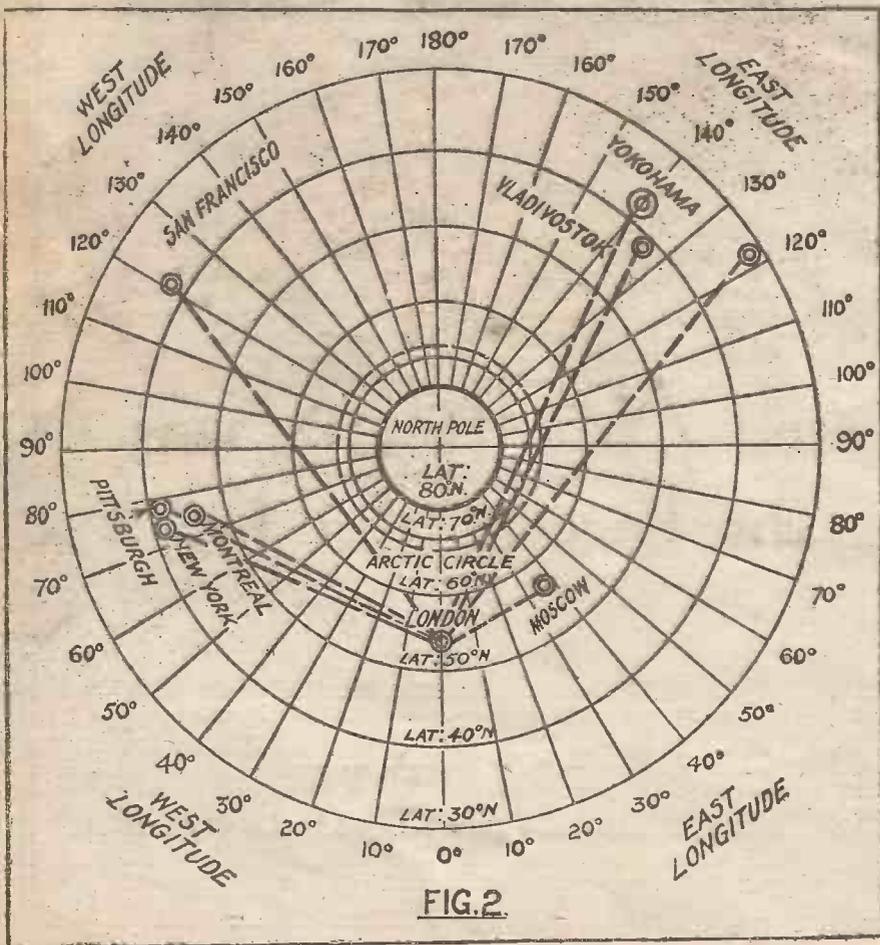
For 30°	.. ..	1.732
" 40°	.. ..	1.192
" 50°	.. ..	0.839
" 60°	.. ..	0.577
" 66½°	.. ..	0.435
		(the Arctic Circle).
" 70°	.. ..	0.364
" 80°	.. ..	0.176

(These are actually the "cotangents" of the latitudes.)

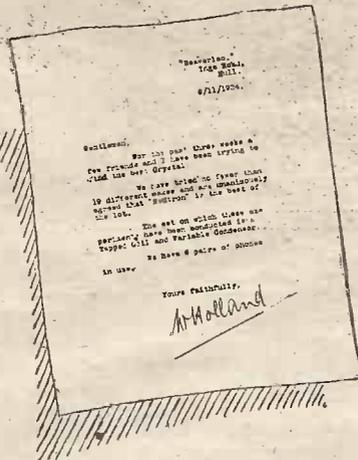
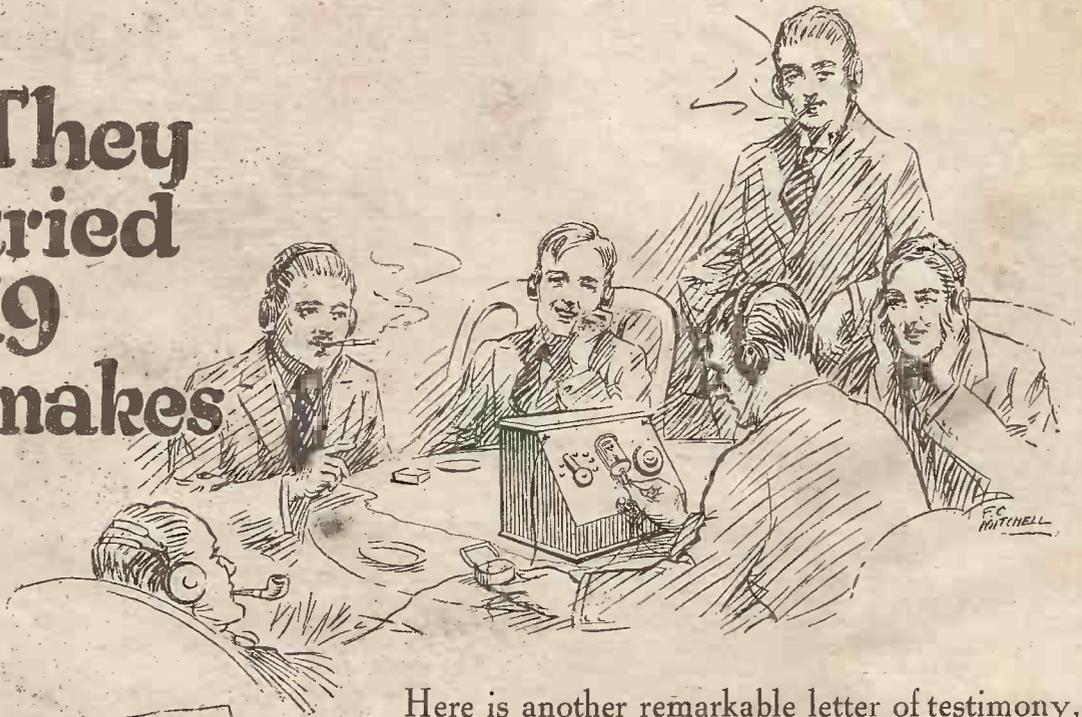
Describe circles with these radii and mark each with the corresponding latitude.

If you know your own and the other station's latitude and longitude—these can be obtained from any good atlas—you should have no difficulty in marking the spots, and by joining them ascertaining approximately the true bearing, which is the angle the joining line makes with your own meridian.

It should be noted that distance is not accurately shown on this chart.



They tried 19 makes



Here is another remarkable letter of testimony, one of several received in the same mail. It is photographically reproduced on the left, and reads:—

"For the past three weeks a few friends and I have been trying to find the best crystal. We have tried no fewer than 19 different makes, and are unanimously agreed that "Neutron" is the best of the lot. The set on which these experiments have been conducted is a Tapped Coil and Variable Condenser. We have 6 pairs of phones in use." and did you notice the last sentence?—

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HOW TO MAKE A ONE-VALVE REFLEX RECEIVER WITH REACTION.

By J. LAURENCE PRITCHARD.
(Technical Editor "Harmsworth's Wireless Encyclopedia.")

Including batteries, telephones, valve, and—everything, this set can be made for just over seven pounds. Minus 'phones, batteries etc., which many constructors possess already, it will be seen that this most efficient set works out at a very low cost, and will well repay the amateur the time and money spent on it. This week's cover of "P.W." shows a pictorial lay-out of the circuit.

THE reflex, or dual amplification set, affords a great deal of scope for experimental work, and should offer considerable interest to the constructor who wishes to try circuits other than those regarded as straightforward circuits.

Some of the better-known commercial instruments are based upon the reflex principle, which is sufficient evidence of

conditions normally devolving upon two valves. It should be stated, however, to clear up any false impression, that the efficiency of the reflex set is not, at the present time, equal to a straightforward set having twice the number of valves. Two "reflexed" valves in a reflex set give results comparable with a three-valve set employing a straightforward circuit.

panel. The detector has a screw adjustment, which gives a fine control over the cat's-whisker. The galena or silicon class will probably be found the best to use in the reflex circuit, which is often very dependent upon a certain crystal for its successful operation.

Construction of the Case.

In the centre of the panel and towards the back edge a set of four valve sockets is screwed to form a valve-holder. Aerial and earth terminals are placed to the left back edge of the panel, and three battery terminals to the corresponding right side. The centre of the front edge of the panel carry two telephone terminals.

The case, illustrated in Fig. 3 is of unusual design and has an extremely solid and attractive appearance. It is constructed throughout from $\frac{3}{4}$ in. deal or other wood as desired. Four pieces of wood are required measuring 11 in. long and $4\frac{1}{2}$ in. deep. To obtain the sloping sides, a mark is made $\frac{3}{4}$ in. from each end of one of the longer sides in each of the four pieces. A line is now drawn from each of the eight marks made to the corresponding and not diagonally opposite corner, thus cutting off one of the right-angle corners. The ends are mitred and the case is then glued and pinned, taking care to keep the pins well away from the corners. The appearance of the case is very much improved by rolling off the corners to a large radius bend. A spoke-shave or file will get most of the sharp corners reduced. A piece of coarse

(Continued on page 766.)

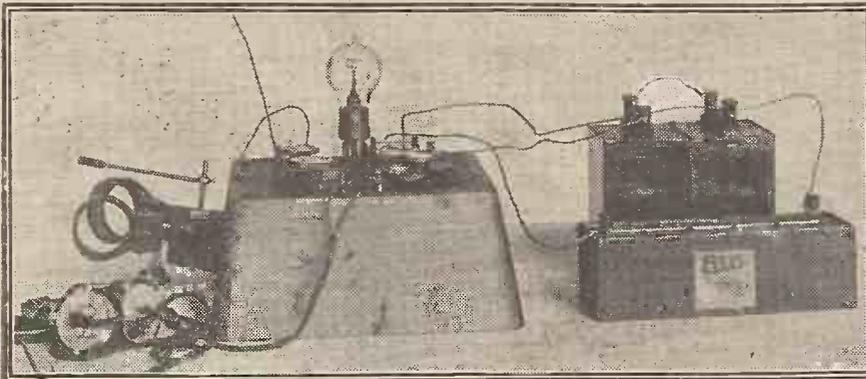


Fig. 1. The complete set connected up ready for use

the popularity of the various forms of dual amplification circuits. It should be the aim of the wireless experimenter to obtain the longest range and the best volume from a reasonable number of valves, rather than to aim at producing the biggest set.

Preparing the Panel.

Economy of operation is probably more nearly approached in the reflex set than in any other circuit at present developed, as one valve is required to carry out the func-

A single valve reflex set connected to aerial and earth, batteries and telephones, is illustrated in Fig. 1. As will be seen from the foregoing list of parts, little extra to the requirements of a single valve receiver are required for the reflex set. To obtain good results, all materials should be of good quality, and with values as stated.

The ebonite panel, if of the shiny surface variety, should be well matted on both sides. The panel is quite small, and therefore electrical losses through surface leakages are probable unless the matting is well carried out. In the lay-out of the panel, which measures 8 in. square, two variable condensers are arranged in line towards the front edge of the panel. Behind the condensers a filament resistance is placed on the left and a good quality glass-enclosed crystal detector on the right. In the set constructed a Burndept detector is employed, being removed from its base for mounting to the

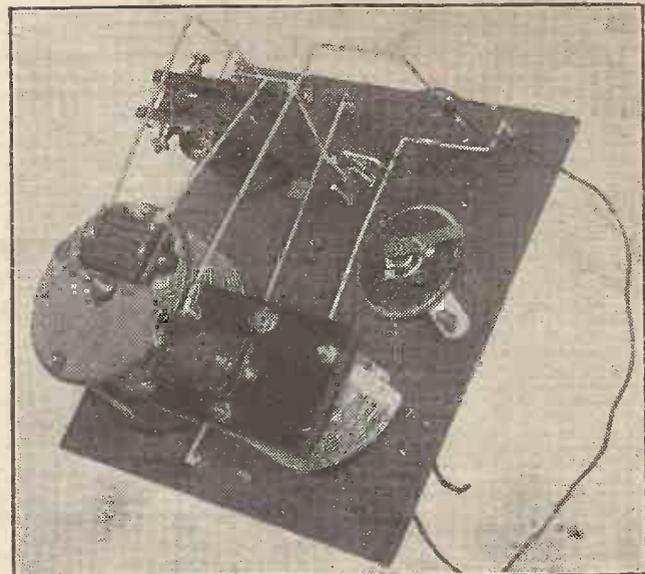


Fig. 2. A view of the underside of the panel

List of materials required and approximate cost.

	£	s.	d.
1-in. ebonite panel, 8 in. square (say)	0	3	6
2 variable condensers .0005 mfd.	0	5	6
1 filament resistance	0	1	9
1 L.F. transformer	0	19	6
Crystal detector	0	4	0
1 Marconi valve	0	12	6
4 valve sockets (say)	0	0	2
1 2-coil holder	0	4	6
1 fixed condenser .0003 mfd.	0	2	0
1 fixed condenser .001 mfd.	0	2	0
2 Wander plugs	0	1	0
Flexible and $\frac{1}{8}$ -in. tinned wire (say)	0	1	3
Terminals and screws	0	0	9
$\frac{3}{4}$ -in. deal or other wood for case (say)	0	2	0
Sheet Oakley's "Strong 2-in. glass paper	0	0	4
1 L.T. battery 6 volt	1	15	0
H.T. battery 66 volt	0	15	0
Pair high resistance telephones	1	0	0
2 inductance coils, aerial coil No. 35 or 50, reaction coil No. 50 or 75 plug-in, each 5/6 (max.)	0	11	0
	£7	1	9

A ONE-VALVE REFLEX RECEIVER.

(Continued from page 765.)

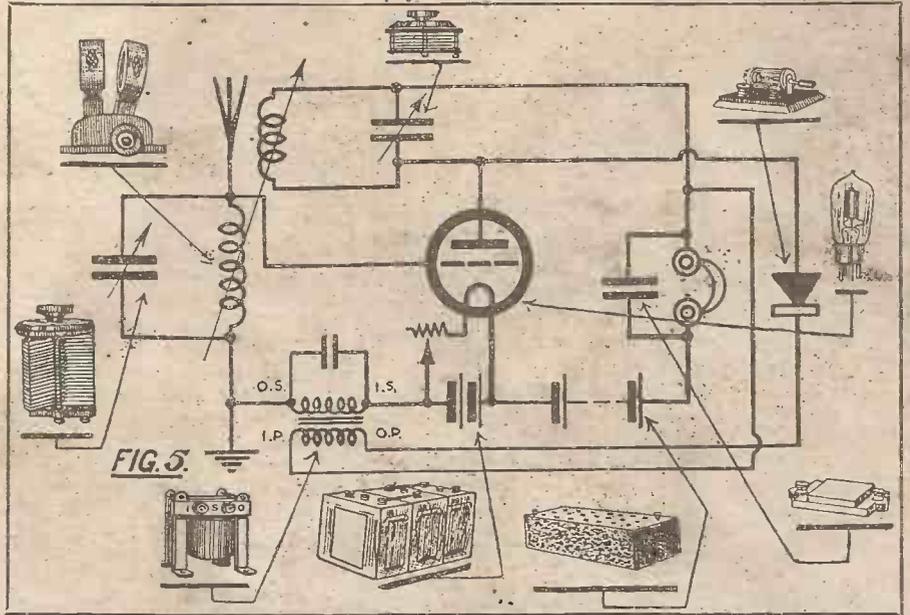
glass paper known as Oakey's "Strong 2" is held as illustrated in Fig. 3, for obtaining a clean curve round each corner. A strong sweeping motion is required covering the entire corner from each of the flat sides. Square fillets of wood are tacked into the top edges of the case to form supports for the panel, to which the latter is subsequently screwed.

The Panel Lay-out.

A dimensioned lay-out for the panel is given in Fig. 4. From the previous description of the arrangement of the components, there should be little difficulty in fixing them correctly in position. In the panel lay-out the position of the low-frequency transformer is given in dotted lines. It is bolted to the underside of the panel, more or less under the crystal detector. With the exception of the two-coil holder, all the components are secured to the panel, so that the wiring need not be carried out in the restricted space inside the case.

Wiring is carried out with $\frac{1}{8}$ in. tinned wire. The panel is placed upside down on the top of the case during the wiring stages, which gives it a firm support and prevents possible damage to the crystal detector and the control knobs of the set. The four connecting wires to the coil holder are flexible insulated leads, electric lighting flex being very suitable.

The circuit diagram is given in Fig. 5. Particular care should be given to the wiring, as the circuit is rather confusing. Aerial and earth terminals are connected to the



variable condenser to the right, when the panel is turned upside down for wiring. A short connection is taken from the aerial connecting wire to the grid of the valve. From both these wires two flexible leads about 12 in. long are soldered for connection to the fixed coil of the two-coil holder, which, as illustrated, is screwed to the inside left side of the case. The aerial circuit is thus completed.

A lead joining one of the terminals of the secondary winding of the L.F. transformer joins the earth wire. The other side of the secondary winding connects to the low-tension negative terminal. A fixed condenser of .0003 mfd. capacity is wired across

the secondary of the transformer. The low-tension positive terminal, to which high-tension negative also connects, joins direct to one of the filament sockets of the valve-holder. The high-tension positive terminal joins to the telephone terminals. The wiring exactly at this stage, is illustrated in Fig. 2.

Final Wiring Connections.

One of the primary terminals of the transformer connects to the other side of the telephones, one side of the telephone condenser of .001 mfd. capacity, and then direct to one side of the anode coil and condenser. The other primary terminal of the transformer joins one side of the crystal detector. The wiring of the crystal detector is completed by joining its remaining terminal to the anode of the valve and to the sides of the anode coil and condenser at

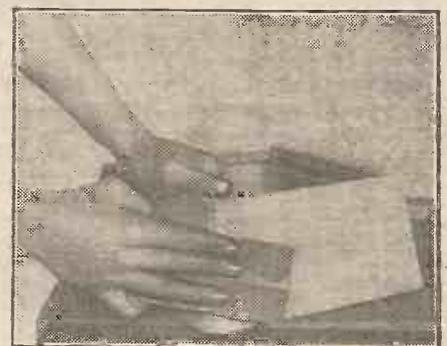
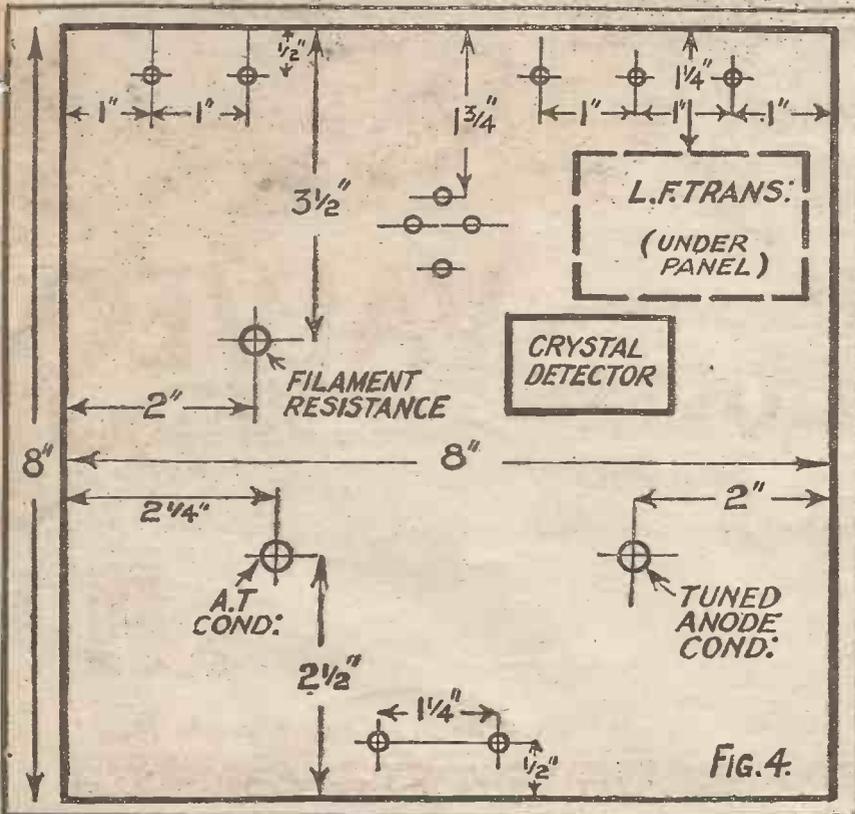


Fig. 3. Preparing the case.

present unattached. The circuit is completed by finishing the low-tension circuit through the filament resistance and the telephone condenser to the other side of the telephone terminals. Holes are drilled through the sides of the case to which the coil-holder is attached, the connecting wires passing through these holes. The fixed condensers are attached to the end plates of the variable condensers. No interaction was experienced from the condensers in these positions, but should the set appear unstable, they may be set at right angles to the end plates.



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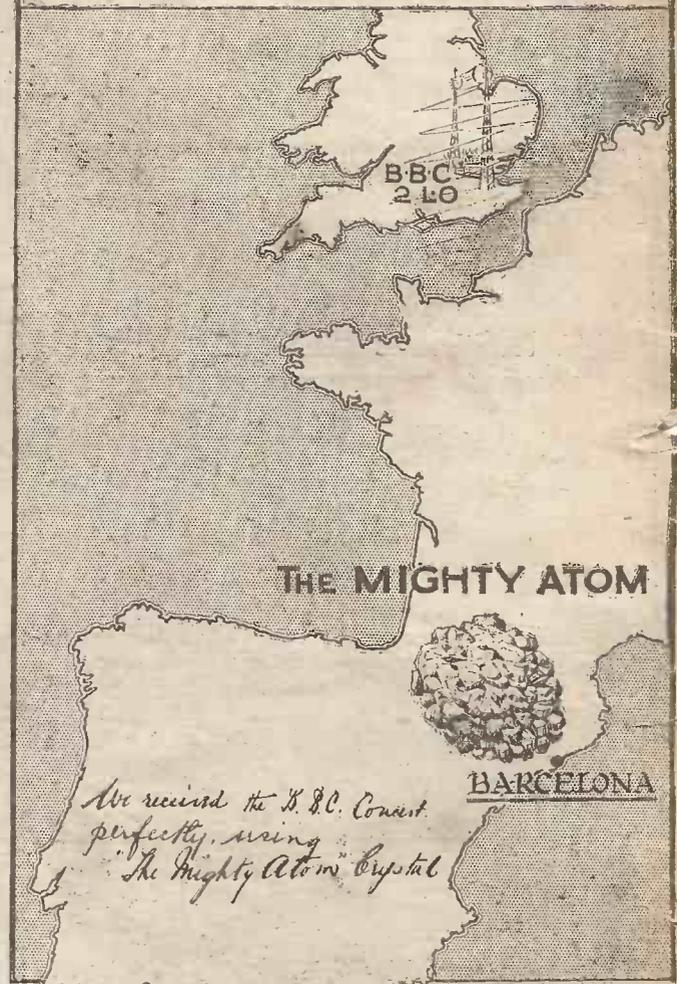
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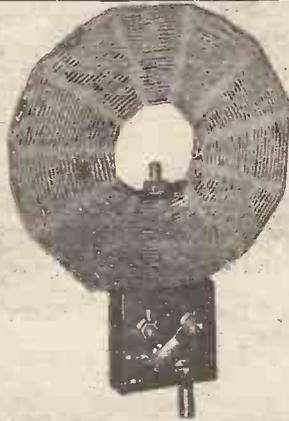
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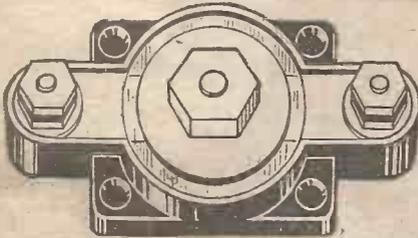
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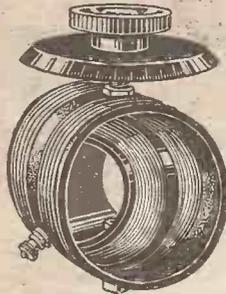
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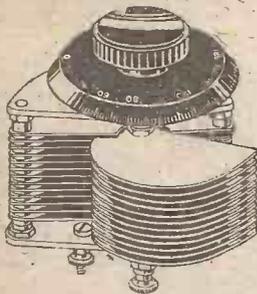
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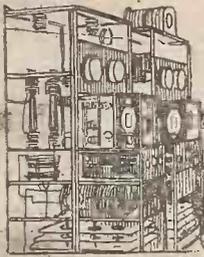
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Artistes of the Aether

By "Ariel"



Some of the artistes who have given you pleasure when listening-in.

THERE is always a certain fascination about anniversary days, and it is not always easy to frame a really appropriate programme. For Armistice Day it was only natural that military and impressive music should occupy a prominent place in programmes of all stations.

2 L.O. included that fine work of Sir Edward Elgar, "For the Fallen," and other items were Sullivan's "In Memoriam" and "A Shropshire Lad" by George Butterworth, a brilliant young English composer who lost his own life in the war.

Later in the evening the scheme included selections from a revue entitled "Domheim Days," written by that versatile musician, "singer and composer, too," Robert Chignell. This was written for the Army of Occupation at Cologne, and first produced at Cologne Opera House by the composer himself. Concluding with that highly popular concert party, "The Roosters," they duly hatched out some of the best of their army reminiscences.

At Other Stations.

Belfast framed a scheme which comprised "Memories, a Tribute, and a Celebration." For this two well-known artistes, Miss Grace Ivell and Miss Vivian Worth, were engaged.

Both these artistes are exceedingly popular with broadcasting audiences, and will be remembered not only for their several performances at all stations, but for the part they took when John Henry inaugurated his own studio. Both have won their laurels individually, and have appeared at the Alhambra, Queen's Hall, Palladium and other big concert halls.



Miss Grace Ivell, M.B.E.

Miss Ivell's appearance on Armistice Day was a particularly appropriate choice, for she did great work during the war, winning thereby the Order of M.B.E. She was in Miss Lena Ashwell's first concert party to go abroad to the troops, and worked hard in France, Malta, Italy, Egypt, Palestine and in Germany.

Items at Bournemouth.

Miss Worth is a winner of the open scholarship of the Royal College of Music, and came into contact with Miss Ivell, when joining with her in a quartet at St. Paul's Cathedral, just after the war. Recognising their mutual value in duet singing, the couple joined issues and have certainly "made good."

Bournemouth, always to be relied upon for the best, added an appropriate touch

by the fact that all the artistes taking part had seen active service, many were severely wounded, and the decorations included a D.C.M., M.C., and M.M. The orchestra was, as usual, finely conducted by Captain Featherstone, M.V.O. Few musicians have had wider experience.

With over thirty-five years' army service, twenty-two of which were spent abroad, in Malta, Singapore and India, as a soldier-musician in the First Battalion of the Buffs, the 2nd Royal Irish Rifles and the 2nd King's Shropshire Light Infantry, he has certainly had his share of military work, serving also right through the Great War.

Famous orchestras have been heard, vicariously, perhaps one might say, as they have been played from the halls instead of taking part in the actual studios, but none the worse "for a' that."

A Famous Orchestra:

The Halle Orchestra, from Manchester, was an object lesson in itself for sheer artistry of playing. Probably no other orchestra in England has such a reputation to uphold as this body of over seventy picked players, and conducted now by Mr. Hamilton Harty. It made its first appearance in 1857 at the Art Treasures Exhibition in Manchester, and was formed by Sir Charles (then Mr.) Halle, whose wife, by the way, was the famous violinist Norma Neruda. The success was due to Sir Charles, and though it has toured all parts of the country, even being heard in the Queen's Hall as recently as last week, its headquarters is at Manchester, and it has played a vitally important part in the musical history of this country.

From its inception two noteworthy features have made the work of the organisation famous, the personnel of the players and the compositions performed. The former are recruited from the finest virtuosi players, the latter are works of the highest musical calibre. Sir Charles Halle himself was not only a great conductor, but one of the greatest pianists of his day, and appeared in this capacity in no less than 369 concerts.



Miss Vivian Worth.

Equally important from the artistic standpoint was the relaying of the Philharmonic Society's concert at Liverpool. The orchestra, conducted by the famous Felix Weingartner, presented such works as Beethoven's "Coriolanus Overture," "Les Preludes" of Liszt, and a Brahms Symphony.

Third came the City of Birmingham Symphony Orchestra, conducted by Sir Landon Ronald, with Beatrice Harrison as solo 'cellist in the Haydn Concerto.

"Old Times" Programmes.

Though there is much to be said against too many S.B. programmes, thanks are due to 2 L.O. for two recent programmes, the "Old Times" and the performance of "La Cigale." Many years have flown beneath the Bridge of Time since we laughed and cheered genial Gene Stratton, went "over the sticks" with Joe Elvin, and laughed with "Our Marie" and that naughty Johnny Jones next door, and to many of us the "years that the locust hath eaten" present more pleasure than the vista of those to come.

Even youth loves to shrug its shoulders at the "piffle" we elders used to enjoy, forgetting their own "Jazz" and shimmy-shakes, etc. So one and all owe a debt of thanks to Ray Wallace, Jaye Kaye, imitable as Dan Leno, Frank Woods, and Charles Coborn. But one would like to ask dear old Charlie to give us something else from his wide repertoire than the famous "Monte Carlo Wells" and "Two Lovely Black Eyes," even if sung in unpeeped different languages.

As for "La Cigale," did every band and concert resound with "In Old Madrid"? To quote the Vicar of Mirth, Mr. Vivian Foster, "Yes, I think so."

An Eminent Pianist.

On the high-brow side we have had two notable players, one no less than the eminent pianist Herbert Fryer, whose recitals took place at Wigmore Hall last week. Mr. Fryer made his first broadcast appearance at 2 L.O. on March 28th, playing with the Light Symphony Orchestra under Mr. Percy Pitt. Last week he broadcast again from the same station. A student of the Royal Academy and Royal College of Music, finally he studied with Busoni, and made his first public appearance at Steinway Hall in London at the age of twenty-one. Since then he has had great success.



Mr. Herbert Fryer.



Capt. Featherstone, M.V.O.

LISTENING-IN TO ZR 3.

RADIO AND A GIANT AIRSHIP.

By G. H. DALY.

AS I write this the giant airship ZR 3 is passing over the coast at Bordeaux bound "West," as the Cunarders say when they are going to New York.

Every now and then I can hear the high-pitched note of her wireless transmitter as she informs the various land stations of her position, and it brings back to me very vividly the time when I, too, switched on the power and tapped out a message from an airship in the far-off days of the war.

Fortunately, the weather is favourable. According to the last weather report from Valencia wireless station, an anti-cyclone spreading over England and France, so that the operator of the ZR 3 is having a calm time of it—so far.

Flying in an airship during fine weather gives one a feeling of exhilaration seldom experienced on Mother Earth, or in the prosaic wireless cabin in which I am listening to the ZR 3. For I am also bound "West" on the sea below.

The Trailing Aerial.

Flying in bad weather, however, is a different story. The first the operator knows about it is a sudden bump, which causes the vessel to heel over and, maybe, to drop like a stone for a considerable number of feet—when the pit of one's stomach evinces a keen desire to touch the roof of one's mouth.

Then the fun begins. Any loose articles, such as signal books or telegraph pads, slide gracefully off the minute operating bench into some inaccessible corner. To preserve your balance it is necessary to hang on like grim death to the sides of the vessel, and you wonder vaguely why you ever took on this sort of job—still more so if the accumulators happen to break loose.

In the middle of it all a message comes through which must be got away at once. Owing to the movement of the ship your sending is anything but readable, and the operators on the ground stations wonder why they employ such rotten telegraphists on those airships.

Suddenly you notice that the transmitter does not appear to be radiating properly, the aerial ammeter is hardly reading at all. Anxiously you open a panel in the deck at your feet and look out beneath the airship. Yes, the aerial is still there, trailing some 500 feet below.

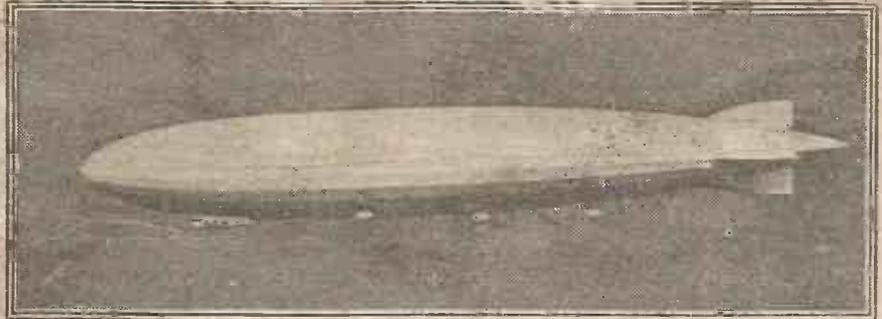
Presently the trouble is located. The clip which makes contact with the aerial and your transmitter has jerked loose. This is tightened, and—oh joy!—up goes the needle of the aerial ammeter as you gingerly press the Morse key.

By the angle of the ship you can tell that she is now ascending. The commander is evidently taking her to a higher altitude to avoid the gale. Up and up she goes, until presently the movement of the airship becomes easier, and the bad weather has been left behind. The airship is now on a level keel again, flying steadily along while the gale has its revenge on some dogged

little tramp steamers diving into the heavy seas down below.

Talking of aeriels reminds me of my first trip in an airship, which took place in the early days of the war on a "blimp," as they were somewhat irreverently called.

I may say right away that I did not enjoy the experience. In the first place, the aerial, which had to be unwound from a large reel like a fishing rod, became entangled and wouldn't unwind. Eventually, however, I managed to disentangle it, but only to find that the crystal of the Lefroy receiver had gone off. Finding a point on a crystal amidst the chronic vibration of the airship engine, which, if I remember correctly, was knocking



The giant German-made airship ZR 3.

badly, was anything but a simple matter. More by luck than judgment, I found a new point, and proceeded to call up the base wireless stations, and received—nothing. Evidently there was still something wrong, although I was prepared to swear that the complete installation was perfect when I left the ground.

In those days, of course, valves had not been heard of, except experimentally, and even the standard TC and TB crystal receiver were only just about to make their debut into the air.

All amplification of signals was accomplished by means of Brown relays, which were then carried in the cockpit, until at a later date some genius suggested slinging them in the tail, where they were subjected to less vibration but were quite inaccessible.

After thumping and knocking the box containing the relays for a considerable time, I eventually did hear signals from the base. And no wonder, for, on looking over the side, I found we were right over the base wireless station, having returned owing to engine trouble. I had been too busy before to glance at anything except the wireless set. In those days the wireless gear was jammed right up against the airship engine, and induction from the magnetos was a constant source of trouble. But in a modern airship like the ZR 3 the wireless cabin is quite a commodious place, and situated as far away from the engine as possible. In this respect airships have a decided advantage over aeroplanes, for in the latter the wireless set must always be near the engine, even in

multi-engined machines, whereas on airships the nearest engine gondola may be a hundred feet or so away from the wireless cabin.

Early wireless days on aeroplanes were very similar to those on airships, only the former, in most cases, had more powerful transmitters and seldom used receivers. On seaplanes the Rouzet transmitter was the favourite type, and consisted of a generator and rotary spark gap driven by a belt drive from the engine.

Thunderstorm Dangers.

This set had a big fat spark at the rotary gap, of which I was very proud, when I first went up, until the pilot told me casually that every time transmitted was likely to be my last as well as his, owing to the possibility of the spark igniting any stray petrol vapour and setting fire to the machine. I restricted my sending to a minimum after that.

To return to the ZR 3. Through the port I can see that there is a bank of fog coming up, and if the ZR 3 runs into it she will possibly be using her wireless to obtain a bearing or position from some land station.

Ushant (FFU) is her nearest D.F. station, but if she is too far out to sea one of the Cunarders or White Star boats, some of which are equipped with direction-finding gear, will give her a bearing. At the moment there are a number of them at sea, including the "Aquitania," "Laconia," and "Adriatic."

Apart from the work of maintaining communication with land, and obtaining bearings and positions, the wireless set on an airship is also useful for ascertaining the approach of a thunderstorm, which is a constant source of danger to aircraft. If, for instance, the aircraft operator hears bad atmospheric in the 'phones steadily increasing he knows that a thunderstorm is approaching, and if the vessel has a frame aerial he can ascertain the direction from which the storm is coming, so that the commander can avoid the storm.

S.O.S.

If the ship does happen to pass through the storm it is usually necessary to wind in the aerial, which will otherwise become heavily charged. The body of the airship, which acts as the earth, will also become charged, and so there is a possibility of sparking taking place which may ignite either the hydrogen gas or petrol vapour.

However, if anything does happen, there is always the wireless, with its magic S.O.S., which will cause every operator within range, whether he be in the mighty "Leviathan" or on the grimy "Mary Ann" (from Cardiff to Pernam with coals), to rush their ships to the assistance if required.

SIDELIGHTS ON WIRELESS

AN ARTICLE FOR EVERY READER.

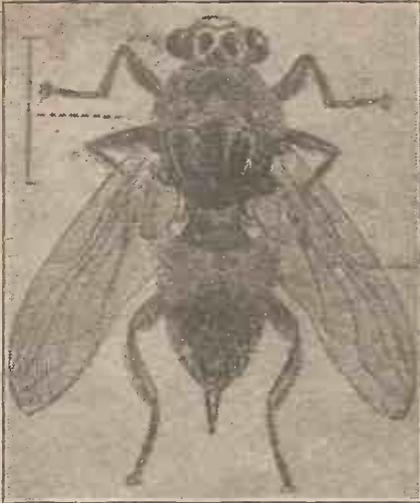
GREAT AND SMALL IN WIRELESS.

By Dr. J. H. T. ROBERTS, F.Inst.P.
(Staff Consultant, "Popular Wireless.")

Technical and non-technical readers of "P.W." will find a mutual interest in this article by Dr. Roberts, which is published most aptly under the heading of "Sidelights on Wireless."

HAVE you ever reflected on the great diversity in the magnitudes of the various factors which go to the working of a wireless set? If not, you will probably be surprised to find that they range, one would almost say, from the infinitely small to the infinitely great.

Suppose, for example, you turn your attention to the diaphragm of one of the headphones. You are, of course, aware



Here is the photo of a common house fly. Dr. Whitney, of America, worked out the amount of power received by a small loop aerial in San Francisco from New York, and found that the energy expended by a house fly in walking one inch up a vertical wall was equal to that which would be received by such a loop aerial during a period of 35 years, and—

that when the diaphragm is emitting a sound it is in a state of vibratory motion; this motion is imparted by the diaphragm to the air and in turn sets in motion the diaphragm or "drum" of the ear, such motion being finally perceived by the auditory nerve as the sensation of sound.

Modes of Vibration.

But if you examine the diaphragm of the headphone you will be quite unable to observe, by the eye, that there is any motion taking place. This is partly because the rapidity of the vibrations is somewhat too great for visual observation, but more particularly because the extent, or "amplitude" of the vibrations, as it is more properly called, is of an extremely low order of magnitude. How small the motion is we shall be able to consider presently.

An even more remarkable observation in this connection is that not only does the ear perceive motions of the diaphragm which are utterly beyond the power of sight, but it is readily aware of the smallest

change in the mode of vibration of the diaphragm.

It is the vibration in different modes which gives rise to the extra or harmonic vibrations known as "overtones," and it is largely upon the selection of overtones, and their relative intensities, that the ear judges of the "quality" of the sound; for example, whether it is the sound of a human voice, or a violin, and so on.

You know there is not the slightest difficulty in distinguishing the quality of a sound as reproduced in the telephone and this shows you how extraordinarily acute is the ear in detecting and interpreting differences in the mode of vibration of the diaphragm,

An Analogy.

To return to the question of the extent or amplitude of the vibrations, it has been calculated that when a headphone is connected to a crystal receiver, under ordinary conditions, the centre of the diaphragm of the telephone moves to and fro through a distance probably much less than one hundred-millionth of an inch.

It is difficult to form any conception of what is meant by such a small distance, but some sort of idea may be arrived at in the following way. Suppose a sheet of ordinary paper, such as that which you hold in your hand, is of such thickness that one hundred sheets make up an inch; evidently the thickness of one sheet will be about one

hundredth of an inch. If then you could take a razor and split a single sheet of paper into a hundred sheets, then take one of those sheets and split it likewise into another hundred sheets, and then take one of those and split into another hundred sheets—one of the final sheets would be a thickness of about one hundred-millionth of an inch.

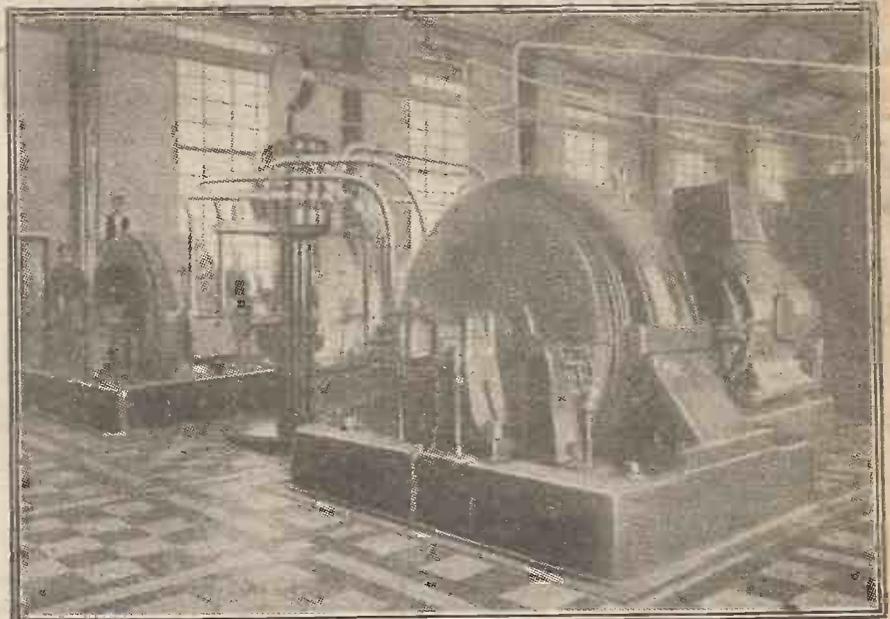
The Human Ear.

And this is the thickness of the space through which the diaphragm of your headphone is vibrating under ordinary conditions!

Of course, although this is the sort of amplitude which produces conveniently loud sound-sensations, the ear can actually perceive the sound when the amplitude of the vibratory motion of the ear drum is only about one millionth of this amount. Experiments have been made upon the minimum amplitude necessary for human audibility, and whilst the figure varies with different individuals, it has been found that the ear can detect a vibratory motion of something like one-millionth of one-millionth of an inch. (To visualise this, imagine taking your sheet of paper and splitting it into two hundred parts, as already mentioned, repeating the operation five times altogether!)

There is good reason to believe that many animals have hearing which is much

(Continued on page 774.)



—here is a photo of a huge generator for supplying the power which, when applied to the radio transmitter, produces a result which makes a giant wireless station appear a weakling when compared to a house fly.

SIDELIGHTS ON WIRELESS.

(Continued from page 773.)

more sensitive than that of human beings, so that one cannot but marvel at the extraordinary delicacy of the ear considered as an acoustical detecting instrument.

The power received by an aerial under ordinary conditions is also of amazing smallness. It is a matter of common remark that the energy received by the aerial is very small, but just how extremely small it is would hardly be realised without the aid of a simple calculation. It is easy to show that the power received, even by a good outdoor antenna, is usually considerably less than one-millionth of one million horse-power, and it has been estimated, in popular language, to be an extremely small fraction of a "fly power."

Energy Collected on Aerials.

Dr. Whitney, of the General Electric Co., of America, recently made a calculation of the amount of power received by a small loop aerial in San Francisco from a broadcast station in New York. He found that the energy expended by a house-fly in walking one inch up a vertical wall was equal to that which would be received by such an aerial during a period of 35 years!

In a valve set this power received from the aerial merely has a "trigger" action in liberating the energy supplied locally by the H.T. battery. But in a crystal set the only energy available is that which is received from the aerial, and although the crystal requires to be much nearer to a broadcast station than San Francisco to New York, so that it receives a very much larger amount of energy than that in the case just considered, nevertheless the energy upon which it operates is excessively small. This is the reason why careful attention to insulation of the set, and particularly of the aerial, is so important a factor for good reception on a crystal set.

The current which passes from a pocket battery through a flash lamp would ordinarily be regarded as a very small current, but this is thousands of times as great as the current which flows in a receiving aerial, and it has to be considered that before the energy is eventually conducted into the headphones, a large percentage of it has been lost, whilst after admission to the 'phones a further very large percentage is lost and the energy eventually received by the ear is an exceedingly small fraction even of the exceedingly small energy received by the aerial.

Gas in a "Hard" Valve.

If a crystal could be equipped with a 'phone which was a hundred per cent efficient, that is, such that it converted all the electrical energy put into it into sound energy, such a crystal set would probably give signals equal to those (using ordinary 'phones) yielded by a five-valve set.

To go from the very small to the very large, no doubt you fondly imagine that a "hard" valve, in which the vacuum is as high as can be commercially obtained, there is little or no gas remaining within the bulb, and you will probably be surprised to learn that there are about a million

million gas molecules present in every cubic centimetre of the "evacuated" space.

This is, of course, a small fraction of the number which would be present at atmospheric pressure. At the latter pressure there are something like ten million million molecules per cubic centimetre, and each molecule in rushing about makes about ten thousand million collisions per second with its neighbouring molecules. So you see that a molecule of a gas under ordinary conditions has a pretty rough time.

In a wireless valve, however, although there are still a very large number of molecules present, the number of collisions between them which is what really matters

knows that electromagnetic disturbances in free ether are propagated with the very great velocity of about 186,000 miles per second, or sufficient to travel round the earth about $7\frac{1}{2}$ times per second. This speed is a standard quantity in physics, and is more usually referred to as the "velocity of light."

There are many reasons for believing that it is impossible for anything in the physical universe to move with a velocity exceeding the velocity of light. If a body could be projected with a velocity approaching the velocity of light, the mass of the body would be considerably increased, and it can be shown that if the velocity of the



Eric Roy, aged 15, of School House, Tippetty, Aberdeenshire, with two of his home-made sets.

from the point of view of producing a "vacuum") is very small, or to express the matter in a more scientific way, the "mean free path" (that is, the average distance travelled by a molecule between successive collisions) may be considerably larger than the dimensions of the vessel.

When you apply a potential difference between filament and anode by means of the high-tension battery, the electrons are accelerated and eventually attain, as you are no doubt aware, a high velocity, but perhaps you would be surprised to know how high that velocity may be. The velocity acquired by an electron in moving through a potential difference of 20 volts, for example, is about 1,600 miles per second.

Facts Concerning Velocity.

Wireless waves provide us with another subject for wonder, on account of their enormous velocity. Probably every reader

body became equal to the velocity of light, the mass would become infinite, so that an infinite force would be required to produce any further acceleration (or increase in speed).

Probably the nearest approach to such velocity in the case of moving particles is to be found in some of the electrons which are projected from certain radio-active substances, velocities up to one-tenth of the velocity of light having been recorded.

The great velocity of wireless waves is responsible for the interesting fact, which at first sight seems somewhat paradoxical, that persons in a concert hall may hear the sound of a singer's voice after that sound has reached the ear of a wireless listener hundreds of miles away.

Sound travels at about 1,100 ft. per second, so that a person sitting in the concert hall 100 ft. from the singer would receive the sound in about one-tenth of a second. A microphone 10 ft. away from the singer would receive the sound in one-hundredth of a second, and subsequent transformation, wireless transmission, and reproduction of the sound in a wireless receiver, probably occupies no more than another hundredth of a second. Thus the wireless listener hundreds of miles away may hear the singer's voice in one-fifth or one-tenth of the time required for the sound to travel across the concert hall.



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AN INTERFERENCE ELIMINATING CIRCUIT. CUTTING OUT UNDESIRED STATIONS.

By **BERNARD GRIPTON** (Member of the Manchester Radio Scientific Society).

Although this circuit may present novel features to British amateurs, it has already been tried out in America, and was recently described in the "Radio News" of that country by Mr. Edward Lerchen. Mr. Gripton, however, working independently, has evolved the same circuit, but with several important improvements. Appended to his article is a letter to the Editor of this journal reporting on the circuit described by Mr. Gripton.—The Editor.

AS an amateur residing close to the Manchester station of the British Broadcasting Company, I have been conducting experiments since broadcasting commenced with a view to receiving the other stations of the British Broadcasting Company and cutting out the undesired interference of the Manchester station. This problem has always appealed to me, and appears to have a highly desirable end if full advantage is to be taken of the several programmes.

During the time mentioned I have tried out a number of rejector circuits, or "wave

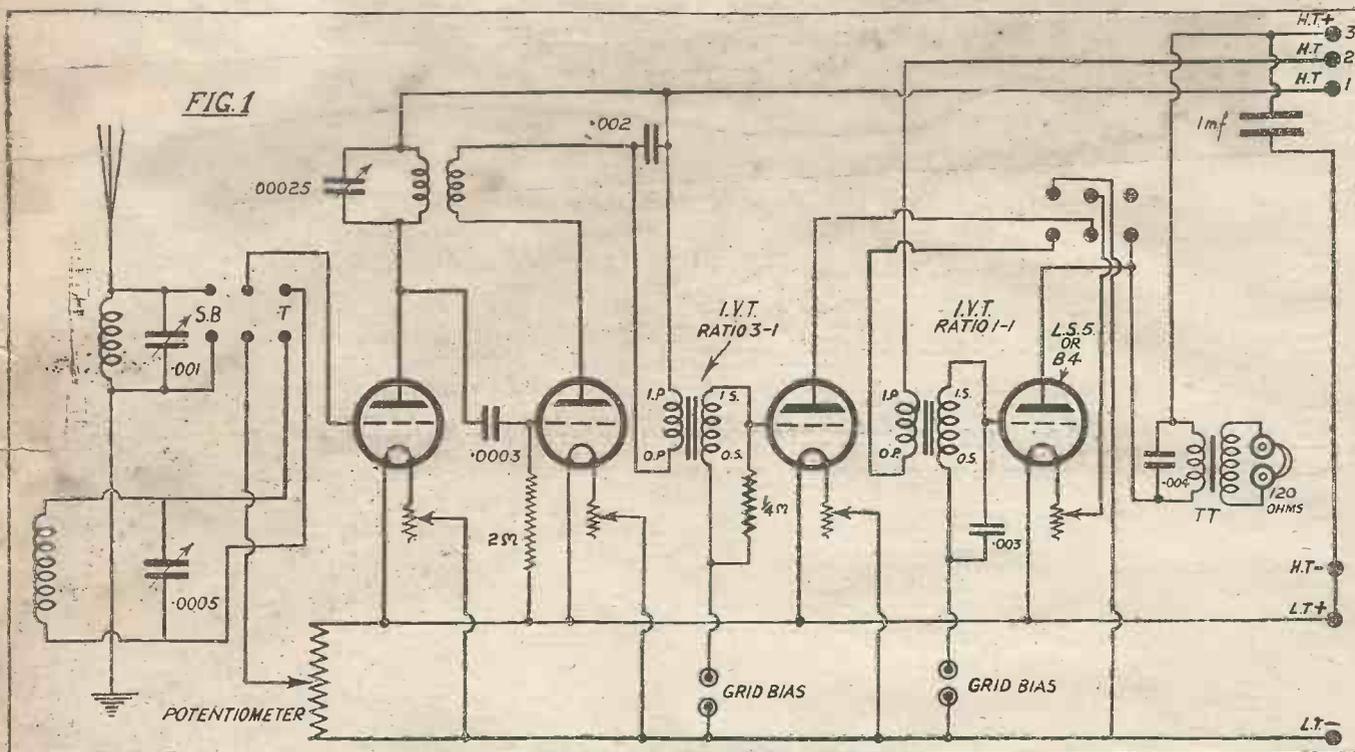
we have all heard quite a lot, I consider it not only desirable but necessary that some proof of efficiency should be furnished, and therefore a suitable letter has been obtained from the chairman of my society to the effect that he has tested the circuit thoroughly and found it satisfactory. This certificate will be seen at the end of these notes.

Normal Type of Receiver.

I had better first explain the conditions under which my tests have been made. I understand my house is situated $2\frac{1}{2}$ miles

To work the interference eliminator circuit a special trap is used as a separate additional unit which is not built into the set proper in any way. Inasmuch as the trap can be built and tried out at the outside cost of a few shillings, I can strongly recommend any readers who are interested to give it a trial, especially if they happen to have a set by them which is already loose-coupled.

The circuit of the set used is shown in Fig. 1. The plug-in inductances are Igranic. Primary No. 35, secondary No. 50; Anode No. 75, and the reaction either No. 75 or



traps," several with indifferent success. I propose to describe the best circuit, and incidentally one of the simplest, and with it I can cut out all interference from 2 Z Y (Manchester) and listen to any of the other stations of the British Broadcasting Company. The most difficult test here in Manchester is to receive the London and Bournemouth broadcasting stations whilst 2 Z Y is transmitting, as they now work on wavelengths only ten metres either side of the Manchester wave. I can do this with the circuit I am about to describe, and there is little, if any, loss of signal strength.

With sets of this description, of which

north of the Manchester station. The aerial is single-wire inverted L type, 35 ft. long, with 32 ft. down lead. It is 28 ft. high at the open end, and a line towards the lead-in points to the Manchester station.

The set is an ordinary loose-coupled three- or four-valve tuned anode one, viz., H.F., D., and one or two L.F., built on conventional lines, with reaction on to the anode coil, although I may say special consideration has been given to the disposition of components and the wiring so as to reduce any undesired reaction effects. The fourth valve is an L.S.5, and there is grid bias.

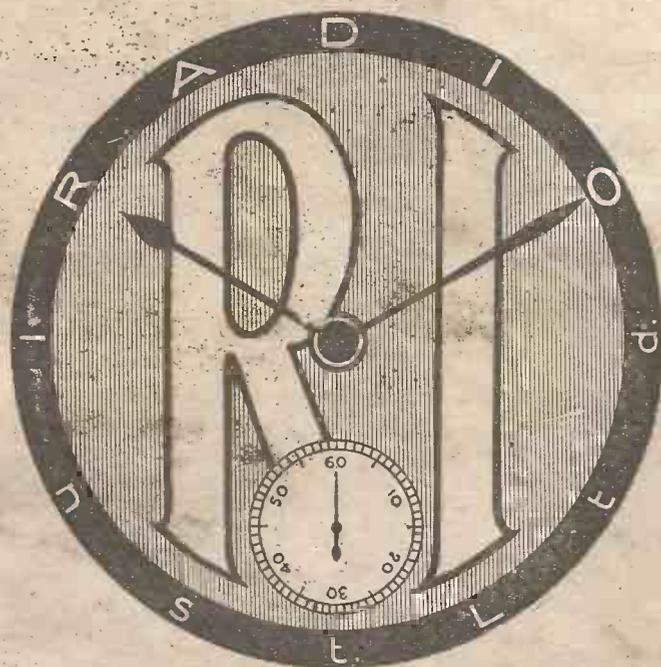
No. 100. I find a No. 75 coil for reaction the best when using the set in conjunction with the trap, as it can then be placed fairly close to the anode coil.

Aerial Efficiency.

It will be noticed there is potentiometer control of the grid of the first valve, and it is much easier to work with the trap circuit to commence with the slider near the positive end. If a potentiometer is not included, it will be necessary to wire the lead permanently to the positive side of the filament battery.

(Continued on page 781.)

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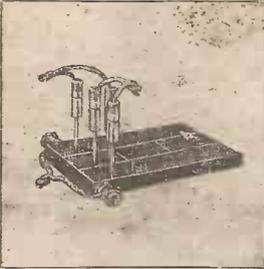
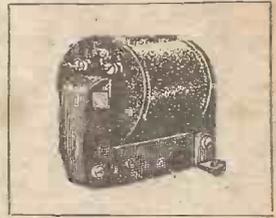
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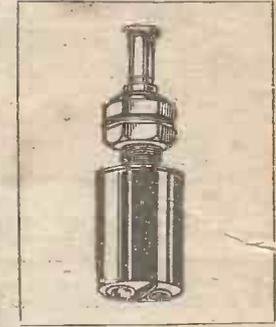
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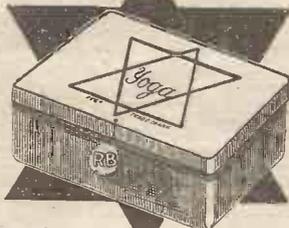
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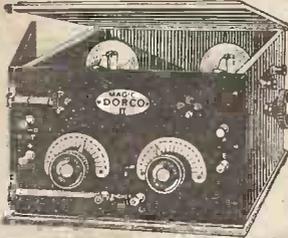
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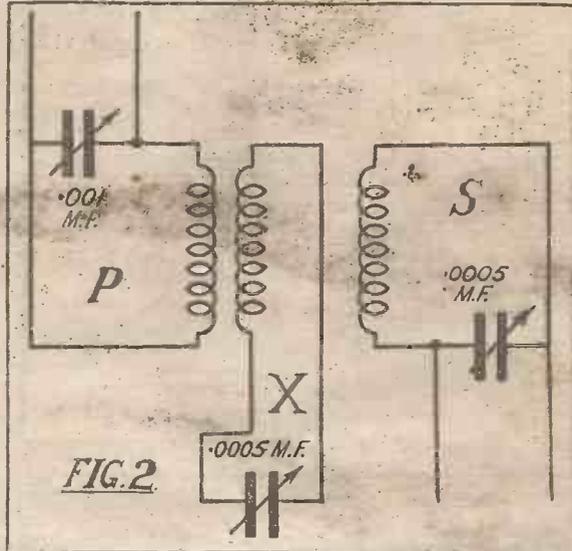
5, Victoria Avenue, Bishopsgate, E.C.2.

AN INTERFERENCE ELIMINATING CIRCUIT.

(Continued from page 776.)

The difficulty encountered with this eliminator circuit is that whilst it will work splendidly on most aerials, it will not work within the same fine limits on others. This is, of course, the unpleasant factor which prevents it being a sound proposition commercially.

A number of tests have been carried out with this trap circuit on various aerials, with excellent results as regards selectivity.



It must be accepted in considering any rejector circuit that it is absolutely essential to have an efficient aerial system. The aerial resistance must of necessity be low.

Many will appreciate without question that in erecting receiving stations in given places it is absolutely impossible in the ordinary way to definitely say an efficient earth and aerial will be made, and, therefore, whilst it is highly advisable to take every precaution to see that the aerial and earth arrangements are the best possible, no one can say how the system will actually turn out. Aerial systems cannot possibly be standardised. Possibly more by good luck than anything else I find my own aerial has a low resistance.

Simple Wave Trap.

Your own aerial system may be quite suitable for the successful working of this trap circuit, and if you are seriously interested, I do hope you will give it a short trial.

The idea of this trap circuit is to interpose a special coil between the primary and secondary coils, and tune it to the undesired wave so that the interference is got rid of by absorption. The electro-magnetic coupling between the primary and secondary coils is cut by the trap coil, but although the passage of the undesired frequency is blocked by the trap coil, other frequencies are allowed to pass. The coil does not act as a damping plate, as it can be tuned. The trap coil and condenser make a small closed oscillatory circuit.

Fig. 2 shows the coil coupling arrangement. The trap coil X is inserted between the primary and secondary coils. The coupling between P and X, and also X and S, is independently variable. This is important, and means that the coupling of the coils cannot be handled by plugging all the coils in the usual type of three-coil holder. The primary and secondary coils are carried in a two-coil holder, but the trap coil must be supported in such a way that it can be moved about so as to occupy any desired position between the primary and secondary coils, whilst always maintaining its vertical position. It will be appreciated that the primary and secondary coils must also occupy a vertical position. The coupling between P and S is fixed, the coils being left at an angle of 90 degrees during all tuning.

The easiest way to construct the trap is to wind 50 turns of No. 26 D.C.C. wire on a basket former with $\frac{3}{8}$ in. centre and 11 spokes. The correct size of coil is made if the winding is carried out in the "two over and two under" fashion. The coil can be dipped in ordinary melted candle grease and the spokes removed.

The finished coil is fastened to any standard basket coil mount, which in turn is plugged into a coil socket fitted to the ebonite top of a small box containing a .0005 mfd. variable air condenser. The whole unit is remarkably simple to construct, and the only important point to bear in mind is that the basket coil must be mounted in such a way that it can be moved between the primary and secondary duo-

lateral coils, and that all the coils must be in the same line. This will be made quite clear on reference to Fig. 3.

The Eliminator Coil.

There are only two critical adjustments of the trap circuit: (1) The position of the trap coil in relation to the primary and secondary coils; and (2) the amount of capacity to be put in the trap circuit which is controlled by the trap condenser.

To work the circuit, first tune the receiver to the desired station, leaving the primary and secondary coils at right angles to each other, and then insert the trap coil with the trap condenser at full capacity. Move the coil about until the position is found where the interfering station has completely disappeared or has gone down to a very weak signal, and then start adjusting the trap condenser and also the condensers and reaction coupling on the set.

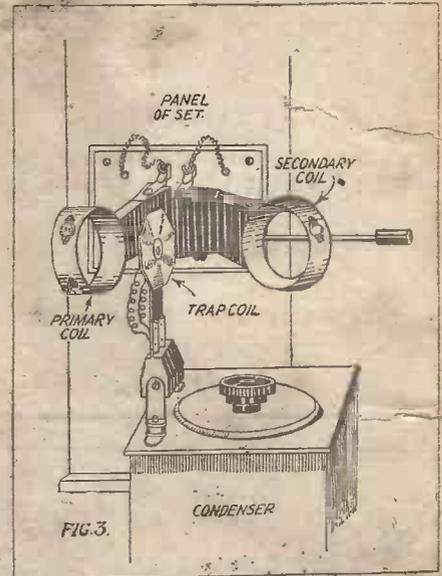
If your aerial is a suitable one, I think you will not have much difficulty in cutting out interference from a local Broadcasting Company station and receiving any of the other stations of the Company, even when their wave-lengths are only ten metres different from that of your local station. If your aerial is not suitable, you will still, I think, be able to cut out and receive other stations which are impossible to you without interference in the ordinary way, although you may not be able to work with absolute satisfaction on waves which differ only slightly in length from that of the local interfering station.

The values for the trap circuit I have mentioned are those I have found most suitable for dealing with the Manchester station wave of 375 metres, but the number of turns in the coil will no doubt have to be suitably increased if the interfering wave is of greater length. This, however, is a very simple matter.

I shall be greatly obliged if any amateur experimenter who carries out tests on the lines indicated will be good enough to report results to the Editor, who will, I feel sure, be pleased to hear from him.

A Manchester Telegram.
The Editor, POPULAR WIRELESS, London.

Dear Sir,—At the request of our member, Mr. Bernard Gripton, 25, Richmond Avenue, Sedgley Park, Manchester, I recently visited his home to examine and see in operation an interference eliminator circuit which



he has been interested in for some considerable time, and on this particular occasion I had the opportunity of working the set myself.

I am very pleased to say that the apparatus came up to all expectations, and successfully eliminated the interference from 2Z Y Manchester, enabling me to receive quite clearly London and Bournemouth's programme.

The simplicity of operation is very marked, and, in my opinion, it is a device which will be of extreme value to the general public. I have therefore very great pleasure in certifying that Mr. Gripton's apparatus actually works under the conditions named above.

Yours faithfully,
J. E. KEMP.

(Chairman, The Manchester Radio Scientific Society.)

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per photo.



The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

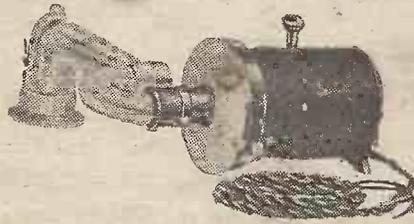
AS Mr. W. J. Hayes, of 43, Effingham Road, Lee, S.E.12, states, there are a good many different makes of terminals on the market, but we agree that his "Safety Set" terminals are original and very efficient components. Immediate connection and easy disconnection, should a strain be put on a telephone cord, are the two main essentials, and at 3d. each the single type and 4d. the double, they should command a ready market.

* * *

The "Cushion" detector which is sold by the Wireless and Electric Co., Ltd., of 18, Fitzroy Street, London, W.C.1, is provided with a patent anti-vibration arrangement between the actual detector and its base. Added to this the detector, a sample of which has been sent us, is a well-finished component, with bright nickel fittings and a glass cover with an opaque base to facilitate adjustments. It is to be sold retail at 3/6, and is to be recommended at this price. By the way, the managing director of the above company was previously works manager of the Marconi Scientific Instrument Co.

Amateurs desirous of obtaining a good direct earth cannot do better than employ a Climax Earth Tube. These cost 5/- each and are, according to the sample sent us, strongly fashioned copper tubes, with terminals for connecting purposes.

Climax Patents, Ltd., 182, Church Street, W.8, also sent us a Climax Sure Set Crystal Detector, and it is without doubt one of the neatest little components we have ever seen. It is fitted to a panel with two little plugs and sockets, while its adjustment is purely automatic: one has only to turn a little control knob until best signals are obtained. It is sensitive and



A Sparta gramophone loud-speaker attachment.

stable in operation and ornamental in its black and nickel simplicity, and quite unique in the invisibility of its cat's-whisker and crystal. Were it not efficient in use it would be worth 4/6 as a novelty.

* * *

Despite the numbers of crystal detectors upon the market there is noticeable a great lack of originality in design, and most new products are merely based upon familiar models, with very little attempt to meet the old problems in a new manner.

In the crystal detector forwarded to us by the British Central Electric Co., Ltd., 6/8, Rosebery Avenue, London, E.C., we are pleased to notice a genuine attempt to solve the mechanical difficulty of crystal contacts. The crystal itself is firmly held, and can be revolved at will. The cat's-whisker will engage the crystal effectively, or a second crystal can be employed by the turn of the knob. A transparent cover affords protection from dust whilst allowing all adjustments to be made when in place, and at 4/3 we consider the instrument is sound value for money. It may be purchased without dustproof cover for 3/6.

* * *

We have recently tested a complete range of "Discol" H.F. transformers. We find them to be quite efficient and capable of covering their specified ranges under specified conditions.

In "Unidyne" circuits they function almost as well as the specially designed basket coil types advocated. In view of the fact that so many H.F. transformers prove to be absolutely useless in the above circuits, readers are advised to give the

(Continued on page 788.)



That's what I want!

Customer: I am wanting some parts to build a new set.

Dealer: We have the "Pygmalion" parts four valve set complete for £2:19:11.

Customer: Quite unsuitable for my purpose, I want the best and only the best will answer my requirements.

Dealer: Well, you are quite right, nothing but the best is of any use if you really want good results. The Best are M.H.

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A series of H.F. Plug-in Transformers in six ranges of wavelength. They are made of our highly polished non-loss ebonite. The windings are carried in staggered slots, well protected, ensuring low self capacity and high efficiency.

Each and every transformer is tested to a standard oscillation, and any not coming within very narrow limits are rejected. Perfect matching is thus ensured.



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Any number of each transformer can be supplied matched, at no extra cost, if specified when ordering.

Send for particulars of other M.H. products.

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HIGH-GRADE COMPONENTS ARE WORLD FAMOUS.

Our Standard receiving apparatus is used in every quarter of the globe, and our components are in demand everywhere. We have a set or component for every requirement. We also have imitators; for efficiency insist on having M.H. Products.

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IN CONJUNCTION WITH B. HESKETH LTD
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The New System of Simplified Wireless Construction

The W.P. Ezi-Wiring Series

As the Pioneer Publishers of Wireless literature THE WIRELESS PRESS can claim another noteworthy achievement in the publication of this splendid "EZI-WIRING" series:

2/- each
Postage 2d.

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A Three-Valve Portable Receiver By Hugh S. Pocock.

This receiver can be used in any situation with a temporary aerial or with the frame aerial incorporated in the receiver itself.

No. 2.

A Three-Valve Receiver By F. H. Haynes.

The tuning arrangements of this receiver are self-contained and cover a band of wave-lengths between 200 and 2,000 metres. All the B.B.C. stations are therefore within the range of this receiver when used in conjunction with an average outdoor aerial. A straightforward three-valve set, consisting of a high-frequency amplifier, detector, and note magnifier, with reaction on the aerial inductance.

No. 3.

A Two-Valve and Crystal Reflex Receiver By W. James

Reflex receivers are capable of giving a very high degree of amplification per valve. This two-valve and crystal receiver, unlike many reflex receivers, will be found perfectly stable in operation, and will be capable of giving loud speaker strength with a radius of thirty miles of a main B.B.C. Station.

No. 4.

A Four-Valve Combination Set By W. James

A four-valve receiver of this type is ideal for general reception both with telephones and a loud speaker. Switches are provided so that two, three, or four valves may be used at will. An entirely new principle is used to cut out the H.F. Valve, no switches being employed. Loud-speaker results from most of the British and Continental Broadcasting Stations can be obtained with this receiver.

To the wireless enthusiast who is keen to build an efficient valve receiver, but who is not sufficiently informed to master the technical circuit, the W.P. Ezi-Wiring Series is a welcome innovation. Apart from other aids to easy construction, the *wiring diagrams are shown in four colours*, a unique feature which ensures the merest novice being able to understand them.

In addition, there are detailed constructional explanations, progressive working diagrams and layouts showing the disposition of the various components. Photographs of the completed set are included in each book.

Every item which can possibly facilitate accurate, speedy, and faultless construction has been adequately dealt with. There are no loose sheets; and each book contains full instructions on the operation of the set concerned.

We leave you to draw your own conclusions from this satisfied customer's appreciation.

"Reading an advertisement in a weekly wireless publication with particulars of a book published 2/6 for home constructors, I made it my business to purchase one. I was extremely disappointed to find it contained only what had already appeared in wireless books, and the instructions were very out-of-date. The shopkeeper very kindly offered to exchange this book. Seeing your Ezi-Wiring No. 2 Three Valve, I chose that, and I must tell you that against the book I first purchased IT IS EASILY WORTH 10/-."



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<p>VALVES</p> <p>B.T.H. R4 .. 12/6 " B3 .. 21/- " B2 .. 35/- " B5 .. 25/- Cossor P.1 : P2 .. 12/6 Mullard H.F. : L.F. .. 12/6 Ediswan A.R. .. 12/6 " A.R.D.E. .. 21/- " A.R.06 .. 25/- Ingersoll R. .. 9/- " D.E.06 .. 20/-</p> <p>All valves are tested before sending, and are at customers' risk only.</p> <p>LOUD SPEAKERS</p> <p>Amplion Junior .. 27/6 De Luxe .. 50/- " Dragon Fly 25/- " Standard .. 25/5 Baby Brown .. 50/- Solent R.E. .. 42/- Brandes Table .. 42/- " Talker .. 42/- Sterling Primax .. 47/7 B.T.H. .. 45/-</p> <p>All orders in strict rotation.</p> <p>H.T. BATTERIES</p> <p>Phoenix 26 volt .. 7/3 " 60 .. 11/6 " 90 .. 15/3 Siemens 30 .. 3/3 " 66 .. 14/6 Ediswan 50 .. 9/9</p> <p>Including carriage.</p>	<p>HART ACCUMULATORS</p> <p>4 v 20 act. .. 24/11 4 v 30 .. 30/2 4 v 40 .. 35/8 6 v 20 .. 37/- 6 v 30 .. 45/11 6 v 40 .. 55/1</p> <p>Including carriage.</p> <p>HEADPHONES</p> <p>Brown F .. 25/- " A .. 62/- B.T.H. .. 25/- Sterling .. 25/- Western Electric .. 25/- Dainty .. 15/- Brandes .. 25/- Dr. Petrie Power .. 13/6</p> <p>L.F. TRANSFORMERS</p> <p>Marconi Ideal .. 35/- R.I. new type .. 25/- Silvertown .. 21/- Igranic .. 21/- Ferranti .. 17/6 Lissen T1 .. 30/- " T2 .. 25/- " T3 .. 16/8 Ingersoll King .. 20/- Eureka 2nd .. 22/6</p> <p>Concert " Grand .. 30/- Royal .. 20/- Amplitran .. 13/6</p> <p>TELEPHONE TRANSFORMERS</p> <p>Igranic .. 18/6 R.I. .. 20/-</p>	<p>IGRANIC COILS</p> <p>25 5/- - 25 5/- 50 5/2 75 5/6 100 7/- 150 7/10 200 8/8 250 9/- 300 9/5</p> <p>COIL HOLDERS</p> <p>W. & M. 5/- Basket 5/6 Polar 6/6 .. B.M. 4/6 Ingersoll Vernier .. 5/6 Aermonic Nickel .. 7/6 Toowai .. 3/6</p> <p>RHEOSTATS</p> <p>Ormond .. 2/- Solent .. 2/- Peerless 6 ohm .. 4/6 " 30 .. 5/- Burndept. .. 5/- " Dual .. 7/6 Microstat .. 2/9 Lissenat Minor .. 3/6 " Major .. 7/6 Solent Unique .. 3/6 One-Hole Fixing .. 1/6 Lissen Push Pull .. 2/9 Series Parallel .. 3/9</p> <p>SATURNIUM, THE CRYSTAL, 2/3</p>	<p>CRYSTALS</p> <p>Cymosite .. 27/6 Tungstallite Blue .. 1/6 " Red .. 1/6 Neutron .. 1/6 B.T.H. in Cup .. 1/3 Saturnium for results 2/3</p> <p>VARIOMETERS</p> <p>Solent .. 2/6 Igranic .. 10/- Belling Lee .. 4/6 W. and W. aerial .. 8/- Seamark Anode with Reactance 10/- and 12/6 Anode with Reactance 10/- and 12/6 Ingersoll .. 2/6 Ebonite rotor .. 4/6</p> <p>GRID LEAKS</p> <p>Dubilier .. 2/6 Lissen variable .. 2/6 Watmel variable .. 2/6</p> <p>ANODE RESISTANCES</p> <p>Lissen .. 2/6 Watmel .. 3/6 Dubilier .. 5/6 Mullard .. 2/6</p>	<p>Copper Aerial .. 2/6 Electron .. 1/8 Ribbon .. 3/6 Square Tinned Wire 4 foot strip .. 4d. Lead in Tube 6 inch 15-in 1/3 9-inch 9d. Basket Coil Holders .. 1/6 Burndept Detector .. 5/- Ingersoll .. 1/6 and 2/- Mic Met .. 6/- Spearpoint Whisker .. 3d. Nickel Studs doz. .. 7d. Condenser Vanes, pair .. 1d. Valve Pins .. 1/9 Phone Cords .. 2/6 Utility Switches .. 5/- Spot on Ebonite .. 1/- S.P.D.T. on Ebonite .. 1/6 D.P.D.T. .. 2/3 Tumbler Switch .. 2/3 Ebonite Panels cut to size .. 2d. Ebonite Knobs .. 2d.</p> <p>INSULATORS</p> <p>Small Egg .. 11d. " Shell .. 12d. " Reel .. 2/6 Large Shell .. 6d. Barrel .. 4d. Solder Irons 1/6 2/6 3/6 W.O. Terminals .. 2d. Phone .. 2d. Spade .. Large .. 2d. " Med. .. 2d. " Small .. 1d. " Red or Black .. 1d. Contact Studs doz. .. 6d. Nuts 2 to 8 B.A. .. 2d. Washers .. 2d. Screws 2 B.A. .. 4d. " 4 to 8 B.A. .. 3d. Switch arms 1/- and 1/3 Slider Bars .. 3d. " Knobs G.W. .. 1/- " Ebonite .. 4d. Crystal Cups 3d. and 4d. Wander Plugs 3d. and 4d. Brass Rod .. 3d. Earth Clips .. 4d. Pulleys .. 4d. and 1/- Cleats .. 4d.</p> <p>VALVE HOLDERS</p> <p>7d., 9d., 1/-, 2/-, 3/6 Aermonic .. 1/6 Valve Sockets 1d. and 2d. Phone Boards .. 2/6 Coil Plugs 1/-, 1/3, 1/6 Basket Coil Holders .. 1/6 Burndept Detector .. 5/- Ingersoll .. 1/6 and 2/- Mic Met .. 6/- Spearpoint Whisker .. 3d. Nickel Studs doz. .. 7d. Condenser Vanes, pair .. 1d. Valve Pins .. 1/9 Phone Cords .. 2/6 Utility Switches .. 5/- Spot on Ebonite .. 1/- S.P.D.T. on Ebonite .. 1/6 D.P.D.T. .. 2/3 Tumbler Switch .. 2/3 Ebonite Panels cut to size .. 2d. Ebonite Knobs .. 2d.</p> <p>ALL GAUGES D.C.C. and Enamelled Wire.</p> <p>VARIABLE CONDENSERS</p> <p>001 8/- - 0005 5/- 0003 5/8 - 0002 4/6 With Knob and Dial Square Law 001 8/3 - 0005 7/- 0003 6/6 - 00025 6/- No Knob or Dial With Vernier 001 13/6 - 0005 12/6 0003 11/6 Knob and Dial Sterling Stocked.</p>
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Complete satisfaction guaranteed with this astonishingly low-priced valve. 4 or 6 volts. Current consumption. 1/2 amp. 4-pin fitting. Can be used as Amplifier or Detector. Type L.V.S. 5/11 post free.

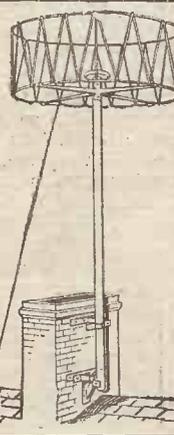
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COILS.—Finest Duplex Basket, Waxless, most efficient for any circuit and any position. Set of 5—Nos. 25 to 100, 1/10; ditto, for Chelmsford, No. 150, 1/3; No. 200, 1/6. As above, but extra large air spaces, coils 1/2 in. wide, Sets of 5, Nos. 25 to 100, 2/9. Igranite, O'Keefe, Energo, Lissen Coils, etc., all in stock.

VALVES.—Dutch, 4/6; R. type, 5/-; French R., 6/10; French dull Emitters, finest on market for efficiency and low consumption, 16/6. All makes in stock: Cossor, Mullard, Marconi, B.T.H., etc.

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Experimenting with crystals is a thing of the past—for why seek to improve on perfection?—if you buy the

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From its characteristic curves it would appear to be particularly useful in Reflex Circuits.

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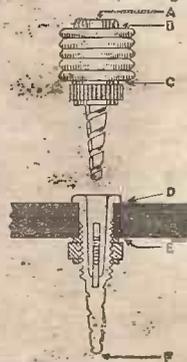
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Solder all connections,
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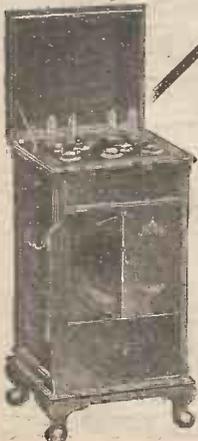
2-volt, 40 amp.	9/6	charged
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4-volt, 40 amp.	16/6	
6-volt, 60 amp.	26/6	

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EVER-READY H.T. BATTERIES.**



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TWO, THREE and FOUR VALVE WIRELESS RECEIVERS

PANELS ONLY	COMPLETE SETS
Two Valve . . £12 0 0	Two Valve . . £17 10 0
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FOR purity of tone coupled with volume they are a revelation and must be seen and heard to be fully appreciated.

A PAYMENT DOWN OF ONLY £4 7 6 will secure the finest 2-Valve Receiver, completely equipped, regardless of cost, balance payable in convenient monthly instalments. 4-Valve Cabinets from 30 Gns., or as illustrated 50 Gns.

Demonstrations daily and particulars from the London Distributors:

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Phones: Kensington 8558/9 and 5540.

APPARATUS TESTED

(Continued from page 782.)

"Discol" type their consideration when the occasion demands.

Quite a coincidence, but whilst we were testing some valves the other day we filled up odd moments turning over a pile of newspaper cuttings. One of these proved to be the wireless notes of a well-known Sunday newspaper, in which it was averred that dull emitter valves had not yet reached the efficiency of bright emitters. We were testing two B.T.-H. dull emitters, and results gave the lie to the written word. It is a regrettable fact, but there is still quite a lot of suspicion abroad in respect of dull emitters, though not in the services, for we have seen B4's in use by both the R.E.'s and the R.A.F.

The B.T.-H. Co. had sent us samples of two types, the B3 and the B6, the specifications of which are as follows: B3, general purpose valve, 1.8 volts, .35 amps., max. anode volts 80, plate resistance 27,000 ohms; price 21/-. B6, Power valve, 3 volts, .12 amps., max. anode volts 120, plate resistance 6,000 ohms; price 35/-. To those who have not used B.T.-H. dull emitters they are a revelation, but with previous experience of B4's we knew what to expect.

We used the B3's in all three positions, with an accumulator and with dry batteries and in dual circuits. In every instance results were superior to those obtained with standard bright emitters. The B6's em-

ployed in 1st and 2nd stages of L.F. really surprised us, inasmuch as signals were received as loudly and clearer than with three stages of standard bright emitters. As a matter of fact, we cut the plate voltage down to 9 volts before standard results were obtained. Every additional few volts above this, up to 45 or so, resulted in sheer gain.

They are slightly microphonic, but with all due respect, not as microphonic as one particular B.T.-H. bright emitter we possess. Grid bias does not prove essential, but is a distinct advantage.

Taking everything into consideration we have come to the conclusion that a valve set is hardly complete without at least one B.T.-H. dull emitter, but perhaps this is more

common knowledge than we imagine—we hope it is.

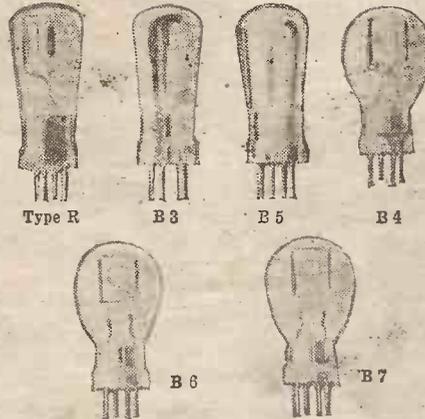
From Messrs. H. Clarke & Co., of Old Trafford, Manchester, we have received a range of components for test. Clarke's, of course, are the people who introduced the



An Atlas combined grid leak and condenser.

porcelain coil plugs and so we were not surprised to discover among the above an Atlas coil so fitted. This coil is very well made, being gratifyingly rigid in construction. It is so wound that considerable air space between turns and layers is obtained, while on test it proved highly efficient in respect of both tuning and coupling.

The Atlas coil holder, which retails at 8/9 is provided with a micrometric adjustment, which besides being smooth and positive in action is so designed that the moving coil cannot move independently of the controlling handle. This we consider a really commendable feature and provides just that one refinement which a component needs to possess to be better than others of different makes. The Atlas filament control is unique in design and smooth and certain in action; at 6/6 we consider it a proposition we can recommend to our readers. Similarly, the Atlas variable grid leak is distinctly unconventional, and we congratulate Messrs. Clarke for so consistently leaving the beaten track. Like the filament resistance it is one-hole mounting, and proved on test to be reliably constant. This, too, at 2/6 we consider very good value for money.



The complete range of B.T.-H. receiving valves, all of which, with the exception of the R type, are dull emitters.

The verdict of the Radio World-



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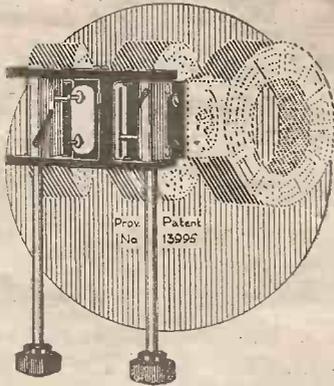
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be kept, as the original query cannot be reproduced in the answer. Cash should be sent in the form of postal orders.

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 specialties 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 questions 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.



R. T. L. (Chadwell Heath).—I have two dull emitter valves (Det. and L.F.) of the 06 amp. type, and notice that when I move in the room where the set is a ringing noise is

heard in the telephones. What is the cause of the noise, and would grid bias or better filament control cut it out, as it is very disturbing and quite spoils the programmes for a moment or so and makes distant transmission very hard to tune in, as it is almost impossible to tune without moving?

The ringing is due to mechanical and not electrical causes, and is the outcome of small mechanical shocks to the valves. These valves are so sensitive that any slight vibration makes the electrodes inside vibrate also, and that gives rise to current variations in the telephones which, in turn, give out the ringing noise you mention. Unfortunately, the only real cure is to stand the set or valve sockets on "Sorbo" rubber or thick felt, so as to damp out any mechanical shocks due to movement in the room, etc. Most dull emitters have a tendency to vibrate in this manner, and for this reason they are known as "microphonic" valves. You will find the same ringing can be induced in a bright emitter if you tap it rather hard, though it will not be so pronounced owing to the different construction of the valve.

"INQUISITIVE" (Cardiff) encloses a circuit which he has evolved from the "P.W." Set. and asks if it would be efficient or would it cause interference?

The circuit would not be successful. The best method of adding reaction to the "P.W." Set is to couple aerial and anode coils together in a two-coil-holder. This arrangement can then be connected to the circuit at the same points as the fixed coils would have been. It may be necessary to reverse the anode coil, in the same way that a reaction coil is reversed.

"INTERESTED" (Johannesburg).—What is a "Sykes" microphone, and upon what principle does it work?

The "Sykes" microphone, which was adopted by the B.B.C., is electro-magnetic in principle and does not depend upon the loose-contact principle of the carbon microphone.

Essentially it consists of an extremely light coil, arranged so as to lie in an intense magnetic field between a pair of opposite magnet poles.

(Continued on page 794.)



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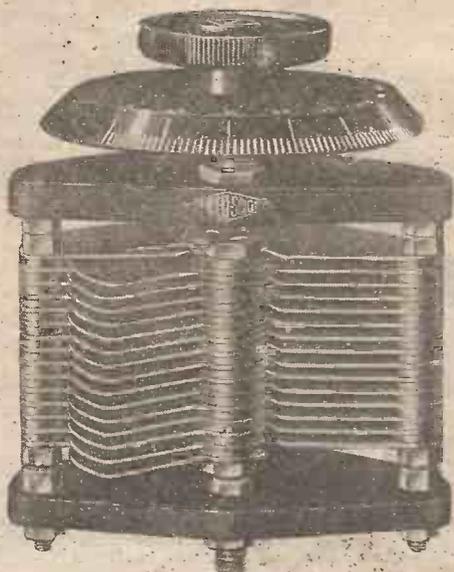
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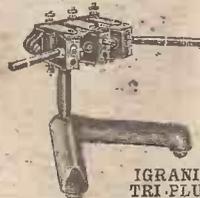
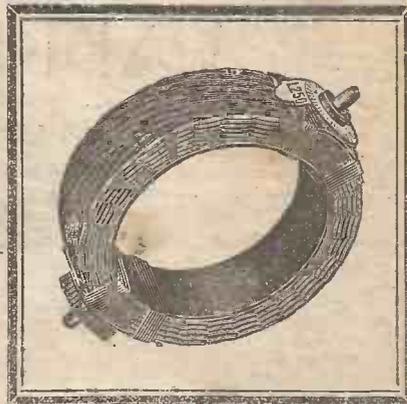
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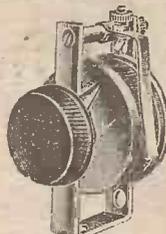
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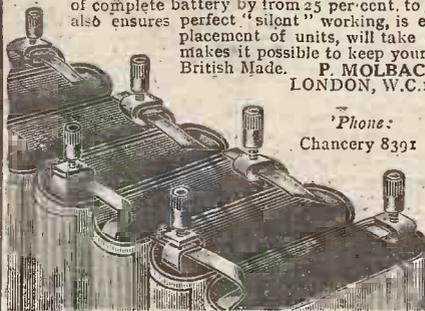
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Asked the meaning of the word revolution, a small boy said that it was "something on Saturday as it wasn't on Wednesday." HOVIMO Connectors are a revolution in H.T. Efficiency. Their use avoids soldering and cheapens cost of complete battery by from 25 per cent. to 50 per cent. The HOVIMO also ensures perfect "silent" working, is everlasting, allows easy replacement of units, will take ordinary wander-plug, and makes it possible to keep your H.T. at an equal voltage. British Made. P. MOLBACK, 27, HIGH HOLBORN, LONDON, W.C.1.



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WE couldn't improve the technical qualities of B.T.H. Headphones. They were and are perfect in tone, clarity and volume. We have, however, embodied a great many constructional improvements in the latest pattern, which make it the most comfortable and convenient instrument of its kind. Here are some of the more important features of the new B.T.H. Headphones:—

Weight, with cord, only $9\frac{1}{2}$ ozs.

No hair-catching projections.

No "scissors" movement of headbands.

Adjustable to any head by a single movement, without the manipulation of screws or nuts.

No screws or nuts employed in construction, and therefore nothing to work loose.

Minimum number of separate parts.

Body of ear-piece made of non-resonating material.

Diaphragm rigidly clamped around periphery between surfaces of non-resonating material.

Permanent magnets are really permanent and are not affected by lapse of time or external changes of polarity.

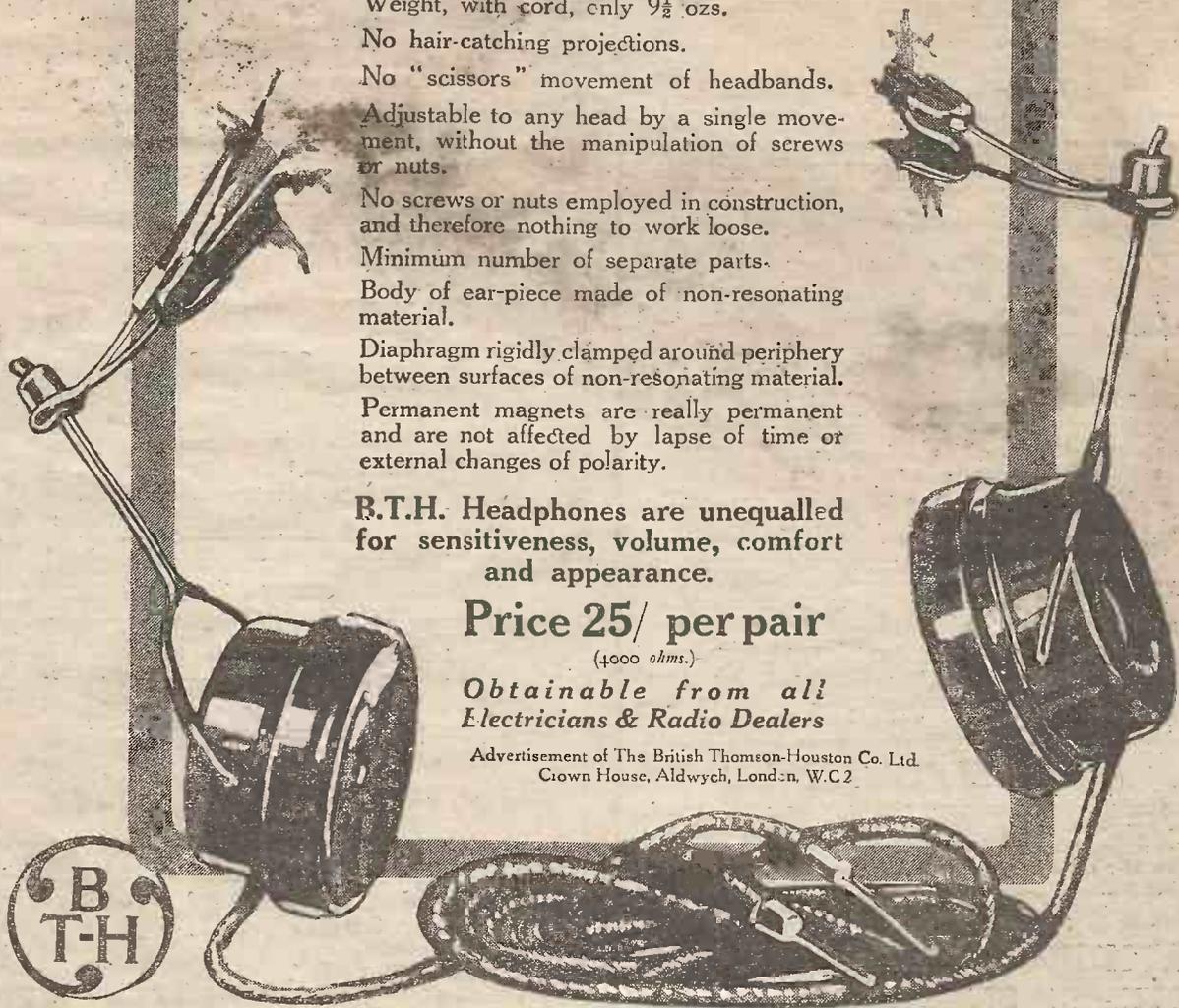
B.T.H. Headphones are unequalled for sensitiveness, volume, comfort and appearance.

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Advertisement of The British Thomson-Houston Co. Ltd.
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RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 790.)

The movement of the coil in the magnetic field due to its vibration gives rise to induced currents in the coil, the potential of which depends upon the speed of movement of the coil across the field.

This potential is applied to a non-inductive resistance in such a way that the resulting wave-form corresponds exactly with the sound waves acting on the microphone.

The invention was due to an Englishman, Mr. Adrian F. Sykes, B.Sc., A.M.I.E.E.

M. F. T. (Bishop's Stortford).—I often see it advised that telephones should be connected the right way round in a valve circuit, but my own 'phones are not marked at the terminals or on the leads. Is there any method of finding out in which direction they are wound, so that there is no risk of demagnetising them?

If the polarity of the windings of the 'phones is not marked, it is not very difficult to determine by means of a dry cell and a suitable resistance. Remove the earcaps and diaphragms from the 'phones, and to each earpiece connect one terminal of a dry cell, the other terminal being connected to a resistance. The purpose of having the resistance in series is to prevent too great a current from passing into the windings of the magnets.

Now hang a series of pins on to the poles of the magnet and connect the free end of the resistance to the other end of the magnet's windings. If on making this connection the pins drop off the magnet, reverse the dry cell and then repeat the experiment. If the weight of pins is arranged with care, it will be found that the current will always tend to knock off the pins when flowing in the "opposing" direction.

If, however, the pins remain attracted to the magnet when the current is flowing through the windings, the direction of flow is correct. The terminal of each 'phone should therefore be suitably marked so that the permanent plate current will always assist the fixed magnetism of the 'phones.

J. W. A. (Watlington, Oxon).—I wish to erect an aerial, and am confused by the numbers

of different types in use. Which is the best one for the reception of broadcasting on a crystal set? I have plenty of room in which to fix it, and I could get it 20 ft. high without any trouble, and higher if necessary or advisable.

Our Query Department.

In future a charge of Sixpence per Query will be made for answering all technical questions submitted to the Technical Staff of POPULAR WIRELESS. A group of three queries will be answered for One Shilling. Postal Orders must be enclosed with all queries and a stamped addressed envelope in addition.

THIS NEW ARRANGEMENT IS NOW IN FORCE.

Since the inception of POPULAR WIRELESS, readers have had all their problems settled for them free of charge, but with the great increase in the circulation and the corresponding increase in the number of queries sent in, the task of dealing with the latter has become gigantic. A large Technical Staff is now employed answering queries, and it is with the object of relieving the pressure on them that we have decided to make the small charges mentioned.

Readers of POPULAR WIRELESS know that the Editor and Staff of this journal have always had, and always will have, their best interests at heart.

I am also in doubt as to the earth. Should this connection be made to the actual ground itself by a buried plate similar to those used in the Post Office for telegraph working?

You will probably find that a 100 ft. single aerial will be best for the reception of broadcasting. See that it is well insulated at both ends. Loudest signals will be obtained if the lead-in end of the aerial points towards the station that is required to receive. Use 7/22 enamelled copper wire, and keep your aerial as far away from trees as possible, and, as height is the all-important factor, get it as high as practicable. It should be at least 30 ft. high for really good results. For an earth plate you will find that a sheet of copper will give excellent results, or a large sheet of galvanised metal will be quite O.K. Bury to a depth of about 3 ft. or more if possible, in damp ground, and make sure that the earth lead is well soldered to the metal sheet. You will find that a water pipe or tap will make quite an efficient earth if it is possible to use the direct method.

S. C. C. (Dagenham, Essex).—What is meant by the reactance of a circuit?

Reactance is a function of the inductance, capacity, and impressed frequency.

The reactance due to an inductance is given by $2\pi \times \text{frequency} \times \text{inductance}$ in henries. The reactance due to capacity is given by

$\frac{1}{2\pi \times \text{frequency} \times \text{capacity}}$ in farads, both results being expressed in "apparent ohms." An inductance in series with a capacity has reactance equal to the sum of the reactance of the inductance and the reactance of the condenser.

R. J. H. W. (Abingdon).—I have a crystal set and a two-valve set (detector and L.F. amplifier), and I should like to increase the range of both these receivers by a valve amplifying at radio-frequency on the tuned-anode system. What are the connections for adding H.F. amplification to an existing receiver?

I wish to experiment with tuned-anode H.F., and should like to know if a single H.F. valve is added to a valve detector, can another H.F. stage be placed in front of this, so as to make the set two H.F. and detector, without material alteration to the wiring?

The accompanying diagram shows, at the top, the connections for adding a tuned-anode H.F.

(Continued on page 799.)

BRITAIN'S BEST VALUE.

"A.G.F."
SUPER-TONE
HEADPHONES
ARE
THE BEST
WHY?

BECAUSE—

Only expert supervision, materials, and skill are used in construction.

The special design and construction of each ear-piece concentrates the action of the magnetic poles on the most sensitive point of the diaphragm, thereby giving super-sensitivity and a deep rich tone, absolutely free from all inherent metallic noises.

LADIES—The Headband has been specially designed to give you the maximum comfort.

OUR FREE TRIAL

Post your order at once along with cash for 22/6, and if, for any reason whatsoever, you are not satisfied, we invite you to return 'phones within seven days, free from damage and in new condition, when full amount of cash paid will be refunded.

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ARTHUR G. FOULDS, LTD.,
DUNEDIN STREET, EDINBURGH.

It MUST be a "MARS"

—the secret's in the spiral spin.



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"Popular Wireless" says: "We have no hesitation in recommending the 'Mars' Aerial wire to the attention of our readers, and intend to discard 7/22's in the case of our own aerial in future."

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If you want the best aerial get

It's good
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—Try It.

The
MARS
SUPER
AERIAL

9/6 FROM ALL LEADING DEALERS OR FROM THE SOLE MANUFACTURERS AND PATENTEES: E. & W. G. MAKINSON, LTD., WELLINGTON WORKS, WELFIELD ROAD, PRESTON.



INDISPENSABLES TO MAXIMUM RADIO EFFICIENCY



GOOD COMPONENTS DESERVE A GOOD PANEL

Uniform Fine Grain, Dead Matt Finish. **GUARANTEED** Non-Metallic Surface, free of leakage.

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Special panels for Receivers described in this or any previous issue of "Popular Wireless"—CUT, EDGES SQUARED and GROUND, 1d. per square inch. Prices for drilling and engraving upon request.

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8 x 6 x 1/4	2/6	21 x 10 x 1/4	14/6	18 x 6 x 1/4	6/9
8 x 6 x 3/8	3/3	24 x 12 x 1/4	17/6	12 x 8 x 1/4	6/-
10 x 8 1/2 x 1/4	5/3	24 x 5 1/2 x 1/4	2/9	10 x 8 x 1/4	6/9
12 x 10 x 1/4	7/8	12 x 7 x 1/4	4/7	7 x 5 x 1/4	2/3
12 x 12 x 1/4	8/6	12 x 6 x 1/4	4/6	10 x 9 x 1/4	5/8
14 x 12 x 1/4	10/-	22 x 11 x 1/4	15/3	9 x 5 1/2 x 1/4	3/5
16 x 12 x 1/4	11/6	16 x 9 x 1/4	9/-	10 x 5 x 1/4	3/3
18 x 12 x 1/4	13/-	12 x 1 x 1/4	8/3	12 1/2 x 9 1/2 x 1/4	7/6

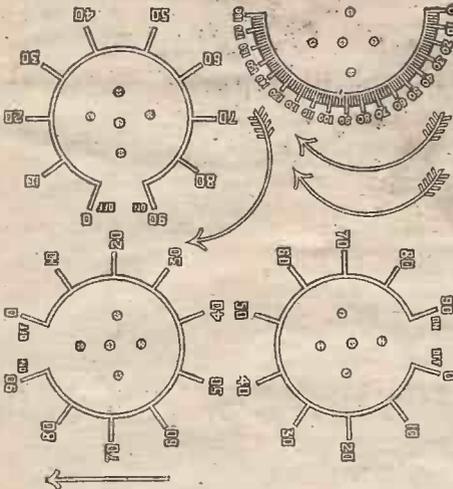
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AERIAL EARTH TUNER
REACTION CONDENSER
TELEPHONE SERIES
CRYSTAL ANODE INPUT
H.T. H.T. ON ON
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H.F. H.F. L.F. L.F.
VALVES A.T. A.T. I
OUTPUT H. F. G. A. T. G.
REG. LOUD SPEAKER
ON (A) (E) (D) DET.
AMPLIFIER PARALLEL,
MAX. A.T.L.C. REGEN.
OFF OFF OFF OFF
+ + + + +
POTENTIOMETER DUAL
LOADING COIL. FINE
1 2 3 4 5 6
7 8 9 10 11 12
REACTION GRID BIAS
A B C D E F G GRID LEAK
COARSE REVERSE
10V RESISTANCE JACK
2nd RESISTANCE DUAL
CAPACITY VERNIER
VARIOMETER H. F. G

COMPLETE AS SHOWN

6d.

PARAGON-CURTIS ONE PIECE MICA CONDENSER



ACCURATE AND UNIFORM CAPACITY.

Technical and Constructional Authorities reiterate their opinion that the successful home construction of receivers implies the close adherence to the original specification. The ordinary method of fixed condenser manufacture prevents any guarantee of uniform capacity. The method adopted, however, in the PARAGON-CURTIS not only guarantees uniform capacity throughout production, but guarantees also 5 per cent accuracy.

It will be realised that in any published circuitous specification of fixed condensers of a specific value—the PARAGON-CURTIS you buy is uniform and accurate—essential for perfect reception.

.0008 to .006	2/6
Complete with Grid Leak Clips	2/9
Grid Leak	1/6

CURTIS CONSTANT-TUNED H.F. AMPLIFIER

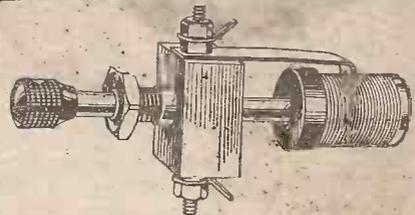
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That better reception is obtained if filament control is perfect can only be understood by fitting the CURTIS. 0 to 40 ohms; quick and slow action; D.E. valves may be used in conjunction with 6-volt battery if your Rheostats are CURTIS.

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ASSHOWN, WITH DIAL, KNOB AND BUSH.

001	7/3
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0003	5/4
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POST 6d. SET.

UNSURPASSED FOR FINE TUNING.

John Blair, Esq., Rexall Pharmacy, Millom, says: "Your Condensers are a REVELATION to me as a Dealer. Sept., 1924. C. Walton, Esq., Andover: "Tested your Condensers on Megger and got 'INFINITY.'"

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With knob and dial.

WITH VERNIER.

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With EBONITE DIAL and Two Knobs. Post 6d. Set.



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00025	12/6
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TWIN (without Vernier)
Equal units of 00025 or 0003. 9/6
Complete with Knob and Dial.

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"J.B." VARIABLE CONDENSERS. SQUARE LAW

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0005-8/-	0001	5/3
0003-6/9	Vernier 4/6	

"J.B." ordinary type Standard Super Micro-condenser

001	8/6	9/6	11/6
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00025	5/9	6/9	8/9
0002	5/-	5/6	3/-
0001	4/9	5/3	7/9

Complete with Knob and Dial

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001	30/-
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Do. Universal	10/6
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T1 Transformers	30/-
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Coils: 25, 4/10, 30, 35, 40, 4/10, 50 5/-, 60 5/4, 75 5/4, 100 6/9.	
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Lissen choke	10/-
Aux. Res.	1/3



41 AMPLION BASKET Dragon Fly, 2-way, 25/-

48

McMICHAEL'S H.F. TRANSFORMERS

150-300 10/-
300-600 10/-
1,100-3,000 each (Manufacturer's advance.)
100,000 ohms Fixed .. 2/6
32 2 meg. Leak 2/6
Both with clips.

Genuine DR. NESPER HEADPHONES

Adjustable diaphragm, detachable receivers, double leather-covered, head-springs, long flexible cords, nickel plated parts. Very comfortable fitting to the head. LOOK FOR THE TRADE MARK.

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We can recommend these as being excellent Headphones, with a great reputation. G.R.C., 4,000 ohms resistance, each £1 0 0

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9 x 6	2/2	3/3
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12 x 9	4/3	5/6
12 x 12	5/6	7/6
14 x 10	5/6	7/6

Cut to Size, 3/16 in. at 1d. square inch.

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001, 002, 003, 004, 005, 006, Fixed	3/-
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Type 577, 01	7/6
Grid Leaks, each	2/6
Anode Resistance	
50,000, 70,000, 80,000, 100,000, on stand complete	5/6

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Coils: 25, 5/-; 25, 5/-; 50, 5/2; 75, 5/6; 100, 7/-; 150, 7/10; 200, 8/8; 250, 9/-; 300, 9/5; 400, 10/3; 500, 10/6	
Fl. Rheostat	4/6
Potentiometer	7/-
30-ohm Rheostat	7/-

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MICROSTAT For D.E. or R. Valves 2/9 Post Free.

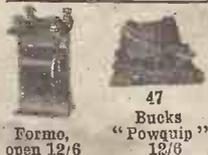


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47 Bucks "Powquip" 12/6



Manchester "Powquip," 15/6



Standard "Powquip," 14/6

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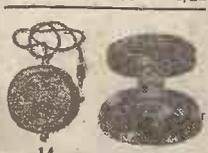
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TELEFUNKEN 4,000 ohms HEADPHONES As light as a Feather 17/11



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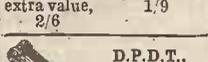
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No. 1. 150-450	3/6
No. 2. 250-700	3/11
No. 3. 450-1200	4/3
No. 4. 900-2000	4/6
No. 5. 1600-3000	4/9
No. 6. 2200-5000	4/11



14 Voltmeter, C and S, one-hole fixing, 1/3



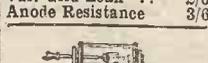
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IGRANIC ohms each.
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With Vernier Adjustment .. 4 7/-
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No. 1	2 for 2/-
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Coil Stand 2-way for Basket Coils .. 4/11
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2-way on base	3/-
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Several high-grade patterns	
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- The 4-electrode valve, Thorpe K4 each .. 17/6
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Try our **10/11**
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- No. 2, (Second Stage) .. £1 2/6
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LOUD SPEAKERS BABY MODELS

- Sterling, 4000 ohms .. £2 15/-
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- Amplion Junior .. 1 7/6
- Dragon Fly .. 25/-
- Ultra .. 27/6

- Lead-in tubes: 6d., 7d., 8d.
- Valve Pins and Nuts 2 a 1d.
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- Nickel Contact Studs .. 2 for 1 1/2d.
- Nickel Switch Arm .. 1/-
- (one-hole fixing)
- Loading Coil and plug .. 8d.
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- Condenser Brushes .. 6d.

- 2-meg. Leaks .. 10d.
 - Cheap Fixed .. 6d.
- ## RAYMOND FIXED CONDENSERS.
- .001, .0001 to .0005 .. 10d.
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 - 22 g. .. 10d. 24 g. .. 1/-
 - 26 g. .. 1/1 28 g. .. 1/3
 - 30 g. .. 1/6 Etc., etc.

- Terminals complete—
- Brass Pillar .. 1d. 1 1/2d.
- W.O. or 'Phone .. 1d. 1 1/2d.
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- Stocked (Best) .. 4 1/2d.
- Pulleys .. 2 1/2d.
- 4 Taps and Wrench .. 2 1/2d.
- Screwdrivers .. 6d.

LARGE NUMBER OF BARGAINS TO CALLERS ONLY

ACCUMULATORS

- 2 v. 40 amps. .. 9/6
- 4 v. 40 amps. .. 16/6
- 4 v. 60 amps. .. 18/6
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NEUTRON CRYSTAL

- Neutron Crystal .. 1/6
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- Also at 3/11, 4/3, 4/6 up.

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- 66 N. & K. .. 7/11
- 60 v. .. 7/6
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- 60 B.B.C. .. 5/6
- 36 B.B.C. .. 9/6
- 9v. B.B.C. .. 2/6
- 1.5 (D.E.) .. 1/9
- Doitto .. 2/- to 3/-

"DE LUXE" SUPER LOUD SPEAKER

2,000 ohms 24/-

A "REAL" BARGAIN

- Legless Valve Holder .. 1/-
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- Adhesive Tape Roll .. 2 1/2d.
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PHILLIPS' '04 TYPE VALVE

15/11

- Microstat .. 2/6
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- Flex, (Red and Black) per yd. .. 3d.
- Shellac .. 5d.
- Loading Coil and Plug .. 8d.
- Contact Studs 4 for 1 1/2d.
- Nickel ditto 2 for 1 1/2d.
- Nickel Switch arm .. 1/-
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1 MFD. .. 3/6

2 MFD. .. 3/11

D.P.D.T. SWITCHES.

- Min Panel .. 1/-
- On China Base .. 1 1/2
- On Ebonite Base 1/11, 2/6
- S.P.D.T. SWITCHES.
- Miniature Panel .. 10 1/2d.
- On China Base .. 1/1
- On Ebonite 1/3 to 1/9
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TOOLS

- Set of Spanners .. 1/8
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- Small Soldering Irons 1/7
- 7 Twist Drills .. 1/11



SHIP ON

- STRIP RHEOSTAT, 7 ohm (with fuse), 3/-
- 30 ohm, 3/-
- 60 ohm, 3/-
- POTENTIOMETER, 600 ohm, 4/6

DUBILIER TYPE FIXED CONDENSERS.

The cases are a moulded composition of extremely high insulation quality, are non-hygroscopic, .002 Ruby mica only is used for dielectric, and the conductive surfaces are cut from the best copper sheet.

- .001 to .0005 .. each 1/-
 - .002 to .006 .. each 1/3
- Post Free.

RAYMOND PLUG IN COILS.

- 25 .. 3/9 150 .. 6/-
 - 35 .. 3/9 200 .. 7/-
 - 50 .. 3/9 250 .. 7/6
 - 75 .. 4/- 300 .. 8/-
 - 100 .. 5/6 400 .. 9/6
- Set of 4 for B.B.C. wave lengths .. 14/11

FOR NEUTRODYNE CIRCUITS.

"Colvern" Ind. Vernier. The low maximum of any vernier is adversely affected by capacity effects and any vernier which is employed to give fine tuning MUST NOT be in association with the main tuning condenser.

PRICE 2/6. Post 3d.

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"RAYMOND" FIXED CONDENSERS.

- Ebonite Base, Terminal Fittings. Post Free.
- .001, .0001 to .0005, 1/2 .. 1/3
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- .01 and .02 .. 1/9
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MANSBRIDGE TYPE CONDENSERS

Best quality obtainable. Accurate, permanent, noiseless, unaffected by atmosphere, beautifully case, double insulators, two extra fixing lugs, made entirely of finest materials, pass all tests, guaranteed.

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EXTRA AIR SPACE (DUPLEX WAXLESS) Equal to Honeycomb. 25, 35, 75, 100 (wave-lengths marked). Set of 5, 3/9

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PARTS FOR 7 CIRCUIT CRYSTAL SET (Percy Harris).

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- With adapter .. 2/3
- D.C.C. Extra Air Space .. 2/11

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16g D.C.C. USUALLY IN STOCK

- Twin Flex 4 yds. .. 6d.
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- Ditto, Extra Heavy 100 ft. 2/3
- Anti Cap. Handles 8d.
- Tumbler Switches 1/-

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7/11 9/11 12/11

- 2 B.A. rod per ft. .. 2 1/2d.
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- 'Phone Sords 6 ft. 1/-, 1/3
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- Best Slewing 3 yds. 10d.
- Rubber Lead-in 10 yds. 1/-
- Thick ditto, 1d., 2d., & 3d.
- Aerial, 7/22 100 ft. 1/10 1/2
- Ditto, Extra Heavy 100 ft. 2/3
- Anti Cap. Handles 8d.
- Tumbler Switches 1/-

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1/16 sq. - 15 feet 6d.

18 sq. - 15 feet 5d.

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- 5 Waxless Coils 200/2000 .. 1/5
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- Switch Arm 12 Studs, 12 Nuts, 12 Washers. Lot 10 1/2d.

FIBRE STRIP (For Coils)

3 ft. long, 1 in. wide, 2d.

BREAST DRILLS 0 to 1/2 chuck

- Cut Bevel and Gear 4/-
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- Various 1/3, 1/6, 1/9, 1/11
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New 3-pole Laminated Magnets, which ensure an even magnetic pull and still greater volume. Windings well insulated. Large size earpieces and leather headbands of standard "N & K" comfortable design. Technically, "N & K" Headphones represent the last word in Wireless Reception. IMPOSSIBLE TO EQUAL FOR CRYSTAL SETS.

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The resistance element is a wire spiral wound on a solid metal rod and insulated by vitreous enamel applied at a temperature of 1,300° Fahrenheit, and capable of standing an electric pressure of 2,000 volts. The cooling far exceeds that obtained by any other method, making a single standard pattern equally suitable for one, two, or three valves.

Neither the insulating material nor the resistance element can be burnt, broken, or displaced. The wire resistance element gives a perfectly smooth adjustment. It is solid, and therefore cannot be mechanically damaged. It is in intimate contact with a cooling mass of metal, and therefore cannot be burnt out. No noise can be set up in the receiving set. These are marked points of superiority over all types of rheostat including those employing granular or fibrous material.

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- (1) Solid, rigid coil.
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- (5) Large and well-spaced terminals.
- (6) Steel grub screw fixing for contact brush.
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- (8) Riveled brush, with perfect brush contact.
- (9) Takes any panel up to 3/8 in. thick.
- (10) Bakelite knob with blind brush. Will not work loose.

Price:—Climax Rheostats, 6 ohm pattern, 3/6 each. Postage 3d.
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CLIMAX PATENTS, Ltd.,
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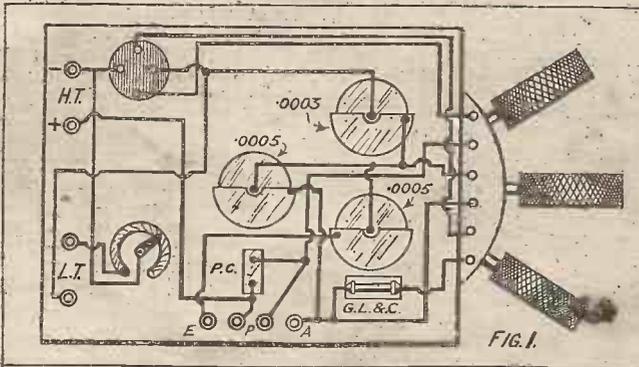
Correspondence

THAT "SIMPLE SUPER-CIRCUIT."

The Editor, POPULAR WIRELESS.

Dear Sir,—In response to requests from readers I am furnishing some constructional details of the "Simple Super-Circuit" described in a recent number of POPULAR WIRELESS.

The wiring diagram is shown in Fig. 1 and the panel lay-out in Fig. 2. The apparatus necessary is as follows:—Two .0005 mfd. variable condensers, one



.0003 mfd. variable condenser, three-coil holder, nearly every movement in the room. His selection of records, which he sometimes announces, consists mainly of selections from French comic operas and "jazz tunes."

It does not make any difference whether the H.T. negative is connected to L.T. positive or negative, because direct current is prevented from reaching

AN INTERESTING AMATEUR STATION.

The Editor, POPULAR WIRELESS.

Dear Sir,—I note, in reading the Correspondence in a recent issue of your paper, that Mr. C. Burrows, of Belfast, reports reception of a station in France, but whose call sign he is not able to give.

I am inclined to think that it is a French amateur that he is referring to; because I have heard a similar station working on about 500 metres on the days that he mentions.

I tuned this station in about 11.15 on a Sunday evening, and several times since at about 7.15 p.m. on a Monday, Tuesday, and Wednesday.

He transmits gramophone records amongst which are "Horsy, Keep Your Tail Up" (played at an enormous rate and, I presume, by the Savoy Bands, since the singer gives the chorus in English) and "Last Night on the Back Porch." After every two or three records he called out in a very high-pitched voice, "Allo, allo, ici poste Radiotéléphonique huit é I (Hallo, hallo, 8 é I calling, ne quittez pas! ne quittez pas (stand by, stand by)."

Then follows the sound of the record being placed on the gramophone and the scraping of the needle. Judging by the sound of the music, I should imagine that the motor is being wound up while the record is playing.

Having a list of French amateur call signs, I looked up this particular one. Here it is: 8 é I: Société, anciens Etablissements Ancel, 36, Rue de Liège, Paris.

I have received this station on a single valve reflex with the anode and aerial coils coupled together. The signal

strength is tremendous. In fact, one can hear nearly every movement in the room. His selection of records, which he sometimes announces, consists mainly of selections from French comic operas and "jazz tunes."

Hoping that this somewhat lengthy letter will be of use to you,

I am, Yours faithfully,
W. J. ATTERTON.

110, St. Alban's Avenue,
Bedford Park, W.1.

A MODIFIED "P.W." CIRCUIT.

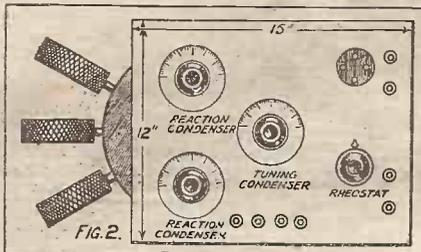
The Editor, POPULAR WIRELESS.

Dear Sir,—Owing to the very large number of communications I have received since you published my letter some weeks ago, giving results obtained on the "P.W." set, I venture to enclose herewith rough diagram of the circuit, as slightly modified by myself, with particulars of components.

I may say I have never yet seen any circuit giving the aerial coil coupled to another, as in this case, and I attribute my success largely due to this method of coupling and to the placing of a variable resistance across the anode coil. You will see I have eliminated the several switches suggested for the "P.W." Combination Set.

With an improved aerial and earth the results from the B.B.C. stations have been astonishing, while I get Burslaw and other Continental stations very well indeed; and on August 23rd I enjoyed listening for some time to an American station direct, the music being loud and clear and the announcer having a very strong American accent. This is a remarkable achievement for one valve, so I am informed, and I have been challenged on the point; but I was

(Continued on page 800.)

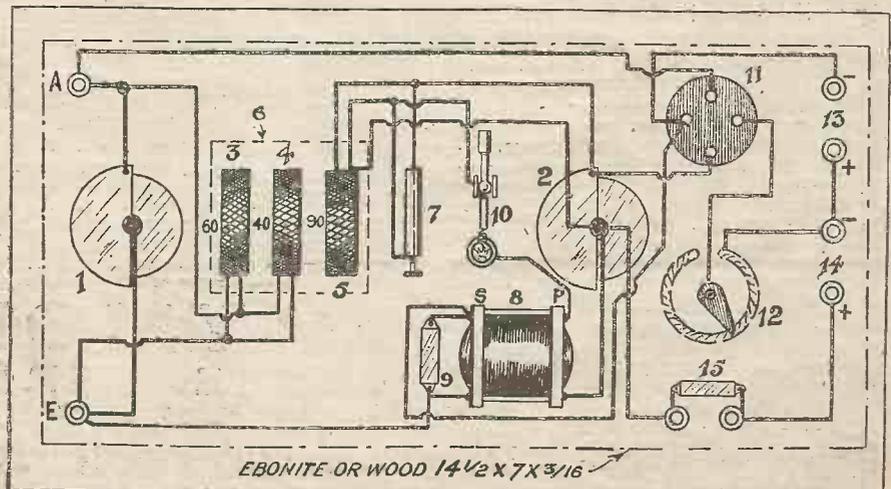


the grid by the condenser between the filament and the aerial inductance.

The value of the variable condenser across the aerial coil was given as .0005 mfd., but there is no objection to the use of a condenser with a greater capacity.

It was stated in the article that the best H.T. voltage was generally somewhere about 80 volts. This, however, is when an indoor aerial is used. For use with an outdoor aerial a 66-volt battery will be sufficient, because it is easier to make the set oscillate with an outdoor aerial than with the indoor type.

Yours faithfully,
104, Fentham Road,
Edington, Birmingham. PHILIP MASON.

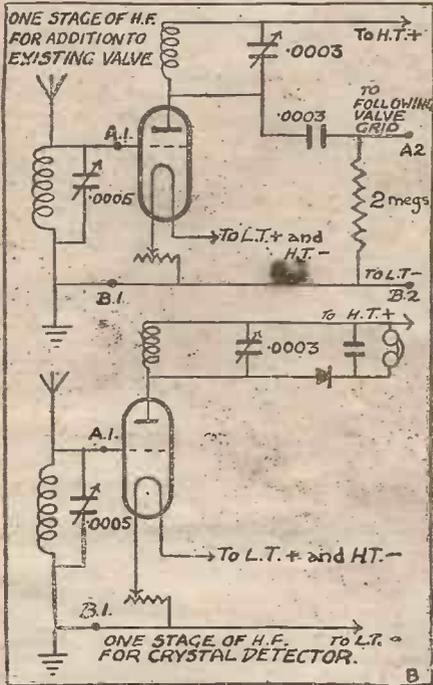


EBONITE OR WOOD 14 1/2 x 7 x 3/16

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 794.)

amplifier to an existing valve set. The aerial is shown directly coupled, but, of course, loose coupling may be used, if desired, although the extra control is apt to make the tuning rather complicated. Connected as shown, a 35 coil for the aerial may be used; but if the aerial condenser is connected in series to sharpen tuning, a larger coil is necessary, about 70 turns generally giving best results. For the anode circuit a 75 coil is used, and the other values are as indicated.



The H.F.-crystal arrangement shown in the lower part of the diagram is obviously very similar, but the phones and crystal are connected in series across the anode circuit. It will be seen that the filament rheostat is placed in the negative lead, but the connections should be tried in the reverse position, also, as occasionally this is an improvement with valves which do not require a slight positive bias on the grid.

If it is desired to add a second stage of H.F. to an existing stage, the alteration is made at the points A1, B1.

The aerial circuit is disconnected at A1, B1, and another valve is connected to these points by its L.T.-lead and the output to grid and filament, as marked in the top of diagram as B2 and A2 respectively. The 2 megohm leak is a good standard value for the fixed type, but for critical working a variable leak gives best results.

T. W. T. (Birmingham).—I have a first-class crystal set with which I get splendid results, and I am now anxious to experiment with valve crystal reception. From all that I can gather, there are many ways of adding valves to crystals, but most of the descriptions I have seen demand rather a lot of alterations to the wiring of the crystal set. I wish to avoid doing this, and to keep the crystal set as a complete unit, because it is a particularly good instrument which I am loath to alter. Can you tell me of a book showing how valves could be added to such an instrument, without alteration to its internal connections?

You apparently did not see "P.W." No. 121 (Sept. 20th issue), in which we published a description of such arrangements. The article was entitled, "Adding Valves to a Crystal Receiver," and is illustrated by diagrams showing the various connections referred to. If this copy of "P.W." cannot be bought locally without difficulty, you should write direct to The Amalgamated Press (1922) Ltd., Back Number Dept., Farringdon Street, E.C.4, from whom copies are obtainable, price 4d. each, post free.



21/- TRUE MUSIC : MINOR :

"An infinite capacity for taking pains" is still our motto, and never was it better illustrated than in the TrueMusic Minor.

This wonderful little instrument gives ample volume and perfect articulation for all purposes. Its sensitiveness can be judged from the fact that excellent results have been obtained 6 miles from 2 LO on a crystal set.

No illustration can do justice to its appearance. The whole of the outside—horn and base—is finished in nigger brown, and the inside of the horn (which is of copper) is sand-blasted. The wonderfully rich and warm effect of the brown and copper must be seen to be appreciated.

The TrueMusic Minor is the Loud Speaker for every home.

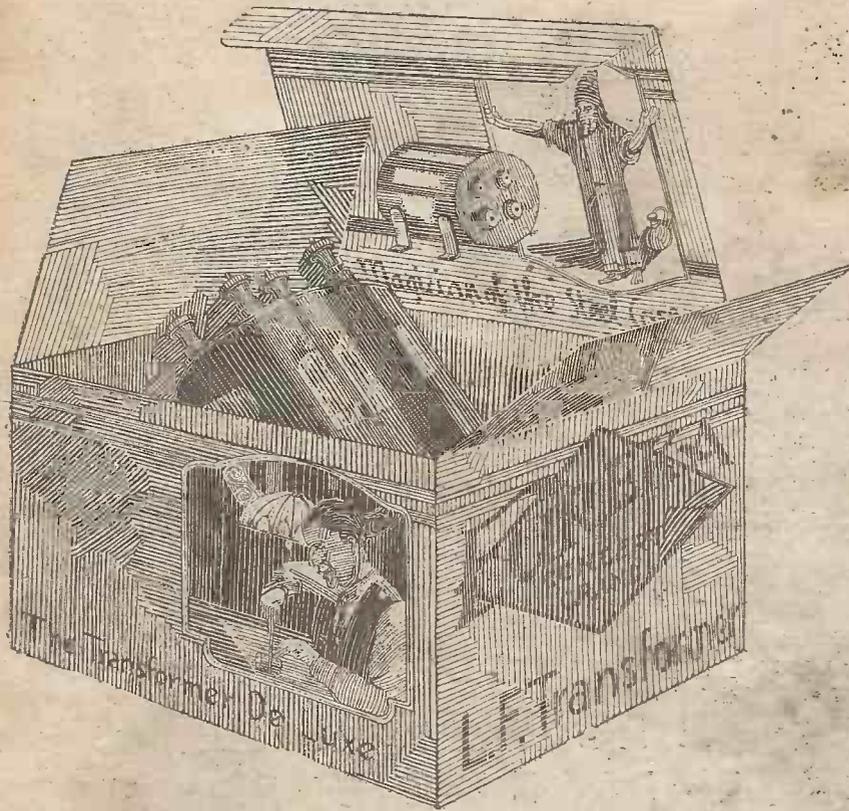
You can get yours from the nearest dealer. If you have any difficulty write to us direct.

LOUD SPEAKERS:

	£	s.	d.
TrueMusic Minor	21	0	0
TrueMusic Junior	2	10	0
TrueMusic Standard	5	0	0
TrueMusic Concert Grand	6	10	0
T.M.C. Clear as Crystal Headphones	22	6	

T M C

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WIRELESS enthusiasts would be amazed to know the number of ingenious tests—from the examination of the wire to the actual measurement of signal strength—that every Eureka has to undergo. They might be surprised to know that the fine copper wire for its coils costs considerably more than that used in other transformers, because it must be absolutely *joint-free*. Through the whole of its 2½ miles of wire there are no soldered joints. And this is where most breakdowns occur. The sudden surges of current in transformer coils soon find out the weak spot and break down the insulation.

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PORTABLE UTILITIES CO. LTD.
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The few shillings more you may have to pay for a Eureka is a positive insurance against failure. Why buy a cheaper Transformer with only a short guarantee? Remember no Transformer ever wears out—it can only fail when its insulation breaks down. Not only do we take extreme precaution in the winding of the coils, but when the final tests have been declared O.K. every Eureka is permanently sealed in its steel case. Fourteen days in water could not harm it, and Faraday House required no less than 2,000 volts to break it down. Obviously, therefore, a Eureka is more or less a life-time investment.

Made in two types
Concert Grand .. 30/-
Eureka No. 2 .. 22/6
 (For second stage.)

EUREKA

Low frequency Transformer

Gilbert Ad. 1834

CORRESPONDENCE

(Continued from page 798.)

quite confident on the matter, and am pleased to find in a recent issue of your paper that another wireless enthusiast in another part of this country was successful in picking up American telephony at the same time.

Yours faithfully,
 A. MAIR.
 Glencoe, Scotland.

FAULTY UNIDYNE NOW WORKING.

The Editor, POPULAR WIRELESS.
 Dear Sir,—I wish to thank you for the information received regarding my set (two-valve Unidyne). I have placed the fixed condenser .001 across the L.F. transformer, and now I am getting very good results. With an indoor aerial of 100 ft. I can tune in with ease, Newcastle, (Glasgow, Manchester, Belfast, Bournemouth, and Birmingham, the latter loud-speaker strength).

If you wish to use this letter for publication you can do so.

Wishing the POPULAR WIRELESS and staff every success.

I am,
 Yours truly,
 F. J. MORRALL.

264, Main Road,
 Glascote, Tamworth, Staffs.

THE RADIO-BELGIQUE STATION.

The Editor, POPULAR WIRELESS.
 Dear Sir,—Re Mr. Burrows' letter in "P.W." recently. The station which he heard is no doubt Radio Belgique, which says "Alo, alo," between every item. I get not better than any B.B.C. excepting Bournemouth, but his wave-length varies slightly during transmission. Wave-length 265 M, call sign S B R.

Yours faithfully,
 C. SHEPHERD.

25, Addison Road,
 Southsea.

RE NOVEL CIRCUIT.

The Editor, POPULAR WIRELESS.
 Sir,—I should like to supplement the remarks of Mr. A. C. Bates in your recent issue (No. 128) relative to the above circuit.

Mr. Chitos is certainly to be complimented, and any further information re same which he may be able to impart will be greatly appreciated.

My own trouble in this set, like that of Mr. Bates, is hand capacity. Using an indoor aerial Bournemouth and the Liverpool Relay Station come in splendidly, whilst Radio Iberica, Madrid, with one stage of L.F. amplification can be tuned in at good headphone strength on every evening in the week, when the local station (2 Z Y) has ceased operations. I am using the new Radion G.P. valve with 60 volts on the plate.

Thanking Mr. Chitos and POPULAR WIRELESS for the publication of the circuit, which has given me unbounded pleasure.

I am,
 Yours faithfully,
 E. VIVIAN WORTH.

1, The Crescent.

REGARDING TECHNICAL QUERIES.

The Editor, POPULAR WIRELESS.
 Dear Sir,—In response to your request I am writing to let you know the results re my set. I am pleased to tell you the reception is now A 1, and I wish to tender my most sincere thanks to you for your help. Since I altered it (it was such a simple job when you had explained what was needed that I did it myself), Newcastle comes in too loud on three valves on 'phones, but it is fine on two valves. Bournemouth is very strong, and I have been able to pick Birmingham, Manchester, Glasgow, Hamburg, Madrid, Opera Berlin (?), Breslau, and Paris (Petit Parisien) up at good 'phone strength. This is with the same coil, No. 50. On Thursday night I also had someone giving a lesson in some foreign language after the B.B.C. had closed down. I note in a recent "P.W." in future there will be a fee charged for technical inquiries, and I must say it is worth it, especially to anyone like myself, who is unable to get about and ask advice from other amateurs. In future I shall not hesitate to take advantage of your terms. Thanking you once again for your kindly help and wishing "P.W." and its staff every success,

I am,
 Faithfully yours,
 THOMAS WALL.

64, Northgate,
 Hartlepool, Co. Durham.

SOME HISTORIC BROADCASTING.

The Editor, POPULAR WIRELESS.
 Dear Sir,—I have read with much interest an article in "P.W." of November 1st dealing with the early days of broadcasting. While the author rightly gives the "birthday" of pukka wireless concerts as 1922, it may be of interest to your readers to know that the germ of such entertainments was abroad some years previously.

(Continued on page 801.)

CORRESPONDENCE.

(Continued from page 802.)

am sorry I cannot give these, as I have been gradually unwinding large basket coils until the correct and best sizes were reached. I am using a silvered-hard Dutch valve with about 78 volts H.T. Filament temperature is also important, and a good rheostat such as a Lissenstat Minor should be used.

Wishing your topping paper all the best,
I am, yours truly, A. H. C. NICKLIN.
112, Palace Road,
Tulse Hill, London, S.W.2.

"MATTING" EBONITE.

The Editor, POPULAR WIRELESS WEEKLY.
Dear Sir,—I notice in "Technical Notes" in a recent issue of "P.W." a paragraph on Matt Surfacing Ebonite. I found that in the case of a large panel (mine was about 26 in. by 10 in.) the surface is in the form of "hills and hollows," and that rubbing down with sandpaper or emery paper is a very tedious job, because one has to rub the "hills" off. I therefore hit upon the idea of using a cloth-covered cotton-wool rubber, the finest powdered emery and water. The fine emery powder is put in a saucer, dry; the rubber is fairly freely wetted, and the panel rubbed lightly from end to end until the emery on the rubber becomes slightly pasty, when the rubbing may be done with more pressure. Those who try this method will quickly be able to arrive at the correct amount of emery and the proper quantity of water: the rubber must be kept wet enough to allow of free movement. If reasonable care is used I find that a beautiful silk-like finish is obtained, which is far superior to any dull finish that I have seen.

Yours, etc. A. C. BATTY.
36, Leadenhall Street, London, E.

HOW I RECEIVED AUSTRALIA.

(Continued from page 743.)

wires fan-shaped under the aerial, each wire about 25 feet long and buried under the lawn at a depth of 11 inches. At the end of each "spoke" there is a brass tube six feet long, soldered, and driven in the ground. The lead-in from the earth is brought up the side of the wall on P.O. insulators and through a glass tube in the window frame to the set. No. 10 S.W.G. wire is used throughout in the earth system.

The success of the set may perhaps be attributed to three things: (a) Thick, heavy gauge aerial wire; (b) good earth (ends of brass tubes are always in water); (c) not crowding set behind panel, thus little capacity between wires.

In addition to having heard over 400 British and Continental amateurs, over 200 U.S. stations have been heard, the greatest DX being U 7FR at Medford, Oregon, over 5,000 miles distant. It is hoped that these notes will help others to obtain that "great and glorious feeling" which comes with real DX.

WIRELESS EXHIBITION.

(Continued from page 755.)

the latest addition to the fast growing family of baby speakers.

A giant specimen of natural crystal is to be seen on the stand of Harding, Holland and Fry, Ltd. This monster specimen weighs just on 14 lb., and is estimated to be nearly 100 per cent. sensitive.

A brightly efficient and most compact variable condenser, with corrugated plate and a minimum clearance, appears in the shape of the Formo-densor, also the popular Formo L.F. transformer on stand No. 41.

Turning to receiving sets of an advanced type, we are very favourably impressed with

(Continued on page 804.)

ETHITA
Beats them all. Try it



—at the 'home' of the Loud Speaker

THE years that have elapsed since S. G. Brown, Ltd., produced the first Loud Speaker ever built for Wireless use have certainly not been wasted. Continual progress has been made—not only in the actual design of Brown Wireless Instruments—but in methods of manufacturing that would permit economies being effected without sacrificing quality.

Taking into consideration the intricate mechanism of the Brown Loud Speaker and the exceptional results that it gives, its cost is remarkably low. In fact, it is only due to the demand—not only from this country but from all over the world—being so immense that its present low selling price can be reached.

demonstration that you can appreciate that it is entirely without a rival both in volume and tonal purity.

Its exclusive tuned reed and cone-shaped aluminium diaphragm enables the Brown H.2 to give ample volume for the room of average size. Don't be misled by its small size, but remember that its horn has been designed by experts who have made a life study of acoustics and the science of sound reproduction.

Before buying your Loud Speaker be sure to hear a Brown—for it is only when you are successful in hearing a

S. G. BROWN, Ltd.,
Victoria Road, N. Acton, W.3.

Showrooms:
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- Type H.1, 21 in. high:
120 ohms £5 5 0
2,000 ohms £5 8 0
4,000 ohms £5 10 0
- Type H.2, 12 in. high:
120 ohms £2 5 0
2,000 ohms £2 8 0
4,000 ohms £2 10 0
- Type Q. (all resistances)
£15 15 0

Brown Loud Speakers
Gilbert Ad. 183r

The big factory responsible for Brown Loud Speakers also produces many thousands of pairs of F. type (Feather-weight) Headphones every week. Here we see a powerful press about to shape a white hot magnet. All Brown Wireless Instruments are manufactured throughout at the North Acton works.

WIRELESS EXHIBITION.

(Continued from page 803).

the exhibit of Hart Collins, Ltd., the 4-valve cabinet receiver being a fine example of its kind.

Read and Morris have some really beautiful examples of pure craftsmanship and design. The cabinet receivers are true replicas of authentic period designs, and the whole of the controls are hand turned from best ebonite, giving a delightful finish and sense of touch to the hand. The components are splendidly made, and include a number of new ideas, the latest of which is the "Ant-holder," a quite new anti-microphonic, anti-shock, and anti-capacity holder for dull emitter valves.

Among the novel crystal receivers the "Brownie" stands out as well made, efficient and a fine example of economical production. At 7s. 6d. this little receiver is wonderfully good value. The New Times Sales Co. have an extensive exhibit of Peto-Scott products, both in the complete receiver and in parts for home assembly. Although officially "banned" by the N.A.R.M., we find, on a large number of the stands, many of the products of the members of the above association. In this connection we note a prominent display of Gecophone and Polar lines on the stand of Wireless Service, Ltd.

The Aker Company have an interesting show of batteries, both primary and secondary, also Heywoods' crystals, which are a highly efficient and specialised series of rectifiers.

Microhm specialities make an interesting display, the exhibits comprising a number of well produced variable condensers and grid leaks. A well made cabinet is a fitting finish to a good set, and we found some very nice examples of the cabinet maker's craft exhibited by Henry Joseph & Co., Ltd.

Those in search of fine tuning gear will find the very thing in the "Colvern" two-plate Vernier condenser, and at the modest figure of half-a-crown. This beautiful little gadget is quite one of the features of the show.

Eureka transformers are on view at the stand of Portable Utilities, whose policy of turning out a fine instrument, not intended to compete with cheap or shoddy transformers, has been amply justified.

The Bullphone loud speakers make an imposing array on the stand of Mr. W. Bullen, the instruments presenting a

(Continued on page 805.)

CABINETS for Wireless CONSTRUCTORS



Send for Constructors' List (P.W.) FREE.

A RIGID (CAT-WHISKER) DETECTOR
The Whisker is enclosed in a pointed ebonite tube which by means of the spring brass arm and thumb-screw can be firmly fixed on any part of the crystal.
The tension of the whisker has fine screw adjustment by turning the small ebonite knob.
Ward, Werradee Road, South Norwood, London.

ENGRAVING
PANELS IN LARGE OR SMALL QUANTITIES ENGRAVED BY SUCCENS, 57, FARRINGTON ST., E.C.4.

PASSMORE'S NOVELTY STORES,
126, CHEAPSIDE, E.C.2.
MAIL ORDER DEPARTMENT P.W.
SEND 3d. FOR OUR LATEST 80-PAGE WIRELESS CATALOGUE.

INVALUABLE TO ALL WIRELESS CONSTRUCTORS
ONE GROSS OF ASSORTED B.A. SCREWS, NUTS, 2/- and WASHERS,
J. H. BENNETT, STATION ROAD, WILLESDEN JUNCT.
Everything for Wireless.
PANELITE
Will withstand 5,000 volts. Black finish. Will not fracture. 6 x 6 x 3/16, 1/-; 7 x 5, 1/1; 8 x 5, 1/2; 9 x 5, 1/4; 9 x 6, 1/8; 10 x 9, 2/12; 12 x 10, 2/9; 14 x 12, 4/6 post paid. Other sizes and thickness pro rata.
RADIO PANEL CO. (Dept. "E"), 143, Petter Lane, London, E.C.4.

BRITISH SYNTHETIC CRYSTAL
Surpassing all others in quality. Limited quantity still free for export in bulk. Apply: Ashworth & Smith, 27, Blackfriars St., Manchester

BUY TESTED PARTS
Ensure the success of the set you make by using Components which are tested and guaranteed accurate before despatch. As used by foremost workers in amateur sets.
Complete list free for Postcard containing your name and address. Write at once.
BOWYER-LOWE CO. LTD. LETCHWORTH

The Uncle Tom's Crystal Set
The greatest and most efficient Novelty Crystal Set since Adam! His hat is the coil—his whisker is the cat's-whisker—his "diamond" stud is the crystal! Perfect results guaranteed. Tested 13 miles from 5 N.O. Why not have a Set that is good to look at—and gives loud signals? He is 9 1/2" high made of hand-painted china. China—the perfect insulator. An ideal present ready for 18/3 Post listening-in. Price 18/3 Free P. Patent No. 19519. Satisfaction or cash refunded.
J. P. GOWLAND, Wireless Manufacturer, Dept. P. 18, Ellison Place, Newcastle-on-Tyne. A few agencies still open

A TYPE FOR EVERY VALVE.
Exide
The Long Life Battery
219-229 SHAFTESBURY AVENUE, W.C.2

HEADPHONE REPAIRS
Rewound, re-magnetised and readjusted. Lowest prices quoted on receipt of telephones. Delivery three days.—**THE VARLEY MAGNET CO., London, S.E.18.** Phone 888-9 Woolwich Est. 26 years

INVENTIONS
Patented, Trade Marks and Designs Registered. Particulars and consultations free.
BROWNE & CO., Patent Agents, 9, Warwick Court, Holborn, London, W.C.1. Established 1840. Telephone Chancery 7547

07 VALVES FOR 12/6
L.F. and Detector, Fil. volts 1.8 to 2.3, anode 20-100, Concert tested and sent post free on 24 HOURS' APPROVAL.
"P.W." UNIDYNE D.E.'S.
Ditch 4 Electrode D.E. 1.8 volt, 16 amp. 25/- ordinary, 4-volt - - 12/6
Concert tested, post free, 24 hours' approval.
ANEOLOY PRODUCTS (Dept. P.25), Eton Works, Upland Road, London, S.E.22.

ETHITA
THE MASTER CRYSTAL

CUT OUT CATWHISKERS
Use instead the famous New improved **CATSEYE** Price 2/6
FIXED DETECTOR
Connect up and listen in comfort at once. No waiting. No adjusting. Order from your dealer or send P.O. 2/6 and 1ld. stamp to—
COMREX Co. (Dept. 3), 119, Fleet St., E.C.4.

P.W. UNIDYNE
THE VALVE SET WHICH GIVES VALVE VOLUME WITH CRYSTAL CLARITY
Complete Set of Tested Parts for 1-Valve "Unidyne" including Cabinet and Drilled and Engraved Panel.
Do. for 2-Valve "Unidyne" ... **£3 0 0**
Do. for 2-Valve "Unidyne" ... **£4 17 6**
VALVES EXTRA ACCORDING TO CHOICE.
Philips' Tested 4-Electrode Dull Emitter Valves, 1.6-1.8 volts, 15 amp ... **25/-** each
Philips' Tested 4-Electrode Bright Emitter Valves, 3.5 volts, 5 amp. ... **12/6** "
ALL POST FREE.
These valves fit the ordinary 4-pin holder.
E. GEORGE, 70, Hailsham Avenue, Streatham Hill, London, S.W.
Be sure to mention **POPULAR WIRELESS** when replying to Advertisements . . .

MIKRO Ltd.,
The Proprietors and Patentees of the
SKINDERVIKEN BUTTON
and
LOUD SPEAKER CRYSTAL SYSTEM
are now in a position to supply parts to all experimenters who wish to make their own sets.
WRITE TO-DAY FOR PRICE LIST AND BOOKLET—
"The Marvels of the Microphone."
3rd Edition Post free 6d. (P.O., not stamps).
32c, CRAVEN STREET, CHARING CROSS, W.C.2.
SKINDERVIKEN MICROPHONE BUTTON, PRICE 5/-

WIRELESS EXHIBITION.

(Continued from page 804.)

particularly bold and substantial appearance suggestive of power and efficiency.

Rofly terminals are well known, and we find an interesting exhibit of these and other lines; crystal cups, etc., on Stand 51. Nearby we discover the "Bretwood" grid leak and anode resistance, which uses a plastic compound as the resistance element. The tests on both the megger and the neon lamp are most convincing, and added to our high opinion of this excellent resistance.

Some really excellent ideas are shown by Peter Curtis, Ltd., in the Duodyne instruments, also the new aperiodic H.F. transformers, which should be a great help in the problem of H.F. amplification.

The new fixed condensers are on the right lines, and promise to retain their capacities indefinitely.

Coming to the POPULAR WIRELESS Silver Cup Competition, we find a series of most interesting entries embracing ~~the~~ freaks, but many good examples of serious work. At the time of writing, and in view of going to press somewhat early, we are unable to pronounce as to the actual awards. These will be announced at the first available opportunity.

The exigencies of space forbid a further or more detailed review of the exhibits, and we trust our readers will have availed themselves of a visit to the exhibition whenever possible.

Our impression of the show is one of a marked practicability and enthusiasm which will make a distinct appeal to the serious worker who is desirous of learning the latest and best in wireless.

TECHNICAL NOTES.

(Continued from page 758.)

importance is attached to the theory that in condensers in which the dielectric is not properly compressed between the plates losses occur due to the actual mechanical motion of the plates, caused by the alternate charging and discharging and the consequent alternating attractions between the plates.

Simple Spanner.

A very simple box-spanner for the small nuts used behind the panel may be made from a piece of copper tubing about a quarter, or three-eighths, of an inch outside diameter, and about three inches long. One end of the tube is given a fairly open flare by driving it upon a punch or such-like object. The other end may be flattened in such a way that the tip of a screwdriver makes a fairly tight fit into it.

The copper bit is then forced upon the end of the screwdriver and, on being applied to a hexagonal nut, it will be found that quite a moderate pressure causes it to obtain sufficient grip on the nut for tightening purposes.

Square-Law Condensers.

There seems to be a great vogue in the so-called square-law condenser, one of the advantages to be gained from the use of such

(Continued on page 806.)

A.J.S.

for

RADIO PERFECTION

EACH of the three A.J.S. instruments illustrated above comes easily first in its own particular class. Behind them are the vast experience and unequalled resources of a famous Manufacturing House.

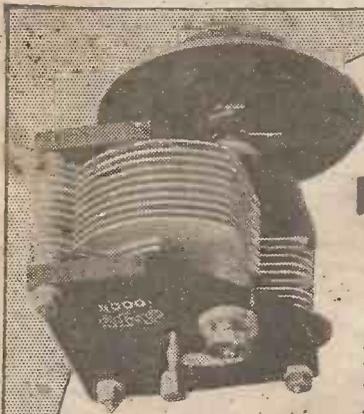
The A.J.S. Loud Speaker not only reproduces music or speech with a purity and volume that must be heard to be appreciated—appearance also has been considered. Its perfectly proportioned curves and artistic matt finish are a triumph of British workmanship.

Quite an exclusive idea is the A.J.S. "Unitop" Four-Valve Cabinet Receiver. It is an exceptionally handsome and compact piece of furniture, easily portable, and representing supreme Wireless efficiency in the least possible space.

A.J.S. Variable Low Loss Condensers, with or without polished Walnut case, merit the closest investigation. Full specification will be found on the left, *but to appreciate their real worth, as well as to see other A.J.S. Instruments, you should call on your nearest A.J.S. Dealer, or write for illustrated list.*

A.J. STEVENS & CO. (1914) LIMITED

WIRELESS BRANCH, WOLVERHAMPTON
Phone: 1450. Wireless Call Sign: 4 K L J. Grams: "Reception, Wolverhampton."



**A.J.S. PATENT
VARIABLE LOW LOSS
CONDENSERS**

Fitted with vanes so shaped as to give a negligible minimum capacity and a greater maximum than can be obtained with other types. There is no rubbing contact. Fitted with Ebonite End Plates, adjustable brass bushes, knobbed dial, complete with 22-gauge aluminium vanes, .08 spacers.

	s.	d.
.0002 mfd. capacity	10	6
.0003 " "	11	6
.0005 " "	12	6

In Polished Walnut Case and Electro-Plated Terminals.

	£	s.	d.
.0002 mfd. capacity	1	5	0
.0003 " "	1	6	0
.0005 " "	1	7	6

THE UNITOP CABINET RECEIVER

Constructed to contain the A.J.S. 4-Valve Receiver, the "Unitop" Cabinet combines supreme wireless efficiency in the least possible space. It forms a compact and attractive article of furniture, and can easily be carried outdoors to any function where it may be required. Of finest materials and workmanship only, complete with 4-Valve Receiver and all accessories, in Mahogany or light or dark Oak.

30 Guineas.

Without Accessories—

£24 10s.

THE A.J.S. LOUD SPEAKER

The A.J.S. claims to be the last word in Loud Speaker design. The accurate proportions of its non-resonant horn give it those correct acoustic properties which ensure the true reproduction, while its extreme sensitiveness enables the utmost volume of sound to be produced with complete absence of distortion.

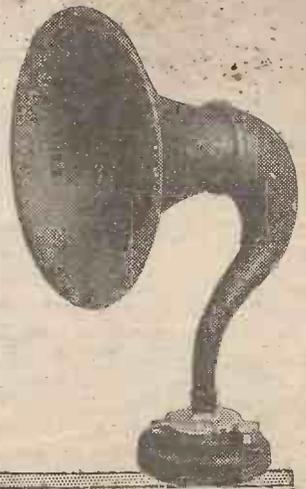
PRICE:

With Metal Horn and Electro-Plated Fittings.

£4 15 0.

With Oak or Mahogany Horn and Electro-Plated Fittings.

£5 10 0



TECHNICAL NOTES.

(Continued from page 805.)



—the extra few shillings that will give you a de-luxe Receiver

WITH perhaps a mistaken idea of economising, numbers of wireless enthusiasts when building their first Set have selected their components with praiseworthy care and ignored the importance of the panel.

How absurd this is, will be apparent to all seasoned experimenters. They know perfectly well that even the most expensive components can only give a fraction of their effective results if the panel is permitting high frequency currents to leak in all directions.

So pay great attention to the panel and remember that even radio experts cannot tell the difference between various qualities of ebonite by merely looking at it. Your best safeguard, therefore, is to select Radion—every panel of which is guaranteed leakproof. Its beautiful polished surface (whether in black or Mahoganite) should not be removed. It will help to resist dust and moisture, both of which are enemies of clear reception.

Radion is the highest grade of insulation material in the world and has been specially developed for wireless use. Its use has been advocated by all the principal Magazines—indeed, you will find that Radion is recommended very extensively in most of the constructional articles recently published.

If an expert, therefore, uses and recommends Radion in preference to ordinary ebonite, you may be sure that it is exceptionally good.

Radion Sizes and Prices :

Size	Black	Mahoganite	Size	Black	Mahoganite	Size	Black	Mahoganite
6" x 7"	3/6	4/3	7" x 14"	8/-	10/3	8" x 26"	17/6	21/3
6" x 10 1/2"	5/3	6/6	7" x 18"	10/6	12/9	9" x 14"	10/6	12/9
6" x 14"	7/-	8/6	7" x 21"	12/3	15/-	10" x 12"	10/-	12/-
6" x 21"	10/6	12/9	7" x 24"	14/-	17/3	12" x 14"	13/3	16/-
7" x 9"	5/3	6/6	7" x 26"	15/-	18/6	12" x 21"	19/9	24/3
7" x 10"	5/9	7/3	7" x 30"	17/9	21/6	14" x 18"	19/9	24/3
7" x 12"	7/-	8/6	7" x 48"	28/-	34/6	20" x 24"	39/6	48/-

Special Note:—All 3/8 in. thick—quite sufficient owing to Radion's tremendous strength.

RADION  PANELS

American Hard Rubber Co. (Britain) Ltd.,
13a, Fore Street, London, E.C.2

From all Dealers

Gilbert Ad. 1842

a condenser being some increase in the facility with which tuning is obtained. A square-law condenser is one in which an even range of wave-lengths is obtained for the whole of the scale reading, so that there is no crowding at one end of the scale. A number of so-called square-law condensers have recently appeared on the market, the characteristic feature being obtained by means of specially shaped condenser plates, which bear special geometrical relations to one another. It may be noted that many condensers which claim to be "square law" do not strictly give a straight line variation, although the departure from the straight line may not be considerable.

Aerial Insulators.

In addition to using material of high insulation resistance for aerial insulators, an ingenious method for the mechanical formation of the insulators has been proposed and patented by an official of the Air Ministry. The insulator consists of links of the insulating material, after the manner of the links of a chain, and they are formed in such a way that the material is of triangular cross-section, the base of the triangle being outwards and the apex inwards, so that each link is, so to speak, flat on the outside surface and knife-edged on the inner part. It will be evident that such links will in general engage with each other at point-contacts where the two interior knife-edge surfaces meet. By this means the surface leak, which is usually the most serious fault of an insulator, is reduced owing to the extreme smallness of the surface area at the points of contact of adjacent links.

Grid Bias.

In order to facilitate the application of a grid bias battery to a low-frequency amplifying valve, a simple and ingenious valve-holder has been introduced by W. Humphrys (221,571-24) in which a break is made in the grid-socket, the upper and lower portions being in line in the ordinary way, but disconnected from one another. Two small brass screws are inserted in the side of the ebonite, one making contact with the grid-socket and the other with the lower extension of the same, so that if the grid-bias battery is connected to these two small screws, the necessary bias is introduced. The device may be made in the form of an adaptor, with valve-pins below and sockets above, the adaptor being inserted in the valve holder and the valve being inserted into the adaptor.

German Microphone.

A somewhat new version of the familiar hot-wire microphone has been developed in Germany, and is known as the Kathodophone. The ordinary hot-wire microphone depends upon the placing of a fine electrically heated wire in a slot in a suitable metal screen, in such a way that sound-waves in the air cause motions of the air to and fro in the slot, which have the effect of producing corresponding variations in the temperature and therefore in the resistance of the wire. In the German version the electrically heated wire is coated with oxides, so as to increase its thermionic emissivity, and the thermionic current from the wire is driven

(Continued on page 807.)

TECHNICAL NOTES.

(Continued from page 806.)

across the intervening air-space to a neighbouring metal plate. Sound-waves in the atmosphere have the effect, as mentioned above, of causing oscillations in the air in the vicinity of the heated filament, with corresponding variations in the discharge-current, the latter being then magnified by valves in the usual way. Owing to the absence of a diaphragm, or any other system having its own natural frequency of vibration, the translation of the sound-variations into electrical variations by this method is claimed to be very faithful.

New Aerial.

New aerials seem to spring up like mushrooms, and, like the latter, some are good but many are not. A very convenient type of aerial, however, is the Ashton aerial, and, in addition to its convenience, it is claimed to give excellent results where space is limited and where only one mast can be erected. This aerial consists of seventeen vertical loops, each about six feet long, connected together in series and laced upon porcelain bobbins between two circular galvanised iron spreaders, one being near the top of the mast and the other about six feet below. The whole arrangement resembles a kind of vertical cylindrical cage. The lead-in wire is taken from the lower spreader.

Grid Leak.

If you happen to have one of the small glass tubes, with metal tips, which are sometimes used for electrical fuses, this can be adapted to make a fixed grid leak. The leak itself consists of a narrow strip of paper, or a piece of thread or fine string, soaked in

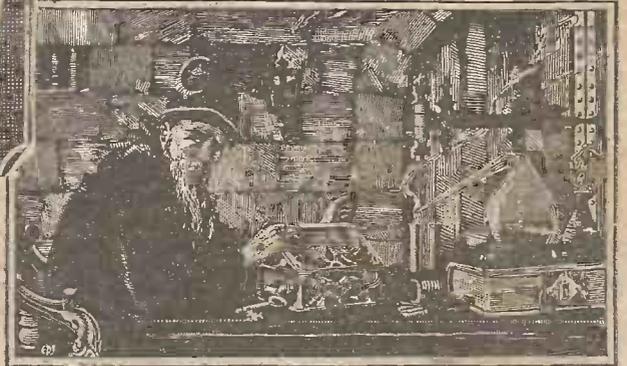
(Continued on page 808.)

SUCCESSFUL MUSIC WORK.

MUSICIANS, teachers of music, and parents are unanimous in their praise of the new "HARMSWORTH CHILDREN'S MUSIC PORTFOLIO," Part 1 just issued, price 1/3. In this wonderful new work, the greatest masterpieces of music have been specially simplified. All technical difficulties have been removed and, at the same time, none of the actual beauty of the original compositions has been lost. Thus children, or beginners, can now play the finest music in the world with the same ease with which they formerly played little trifles of indifferent merit. The simplification has been done so cleverly that even a skilled performer can obtain full enjoyment from playing over the musical gems in the "HARMSWORTH CHILDREN'S MUSIC PORTFOLIO." There are nine famous pieces in Part 1, including a Chopin Nocturne, Handel's "Largo," and Mendelssohn's "Spring Song." Special practical articles on learning the piano, the violin, and voice training will appear in each issue of this popular work, in addition to the superb music programme. The music, of course, is printed on good paper, full size. Finer value for 1/3 has never been offered to music lovers. The work will be complete in about 24 fortnightly parts, and intending purchasers would be well advised to place a standing order with their newsagent or bookstall for the delivery of each part as published.



Louden



The Secret

Magicians and Sorcerers had their "Secrets of Healing" and "Secrets of Success," which they would dispense for a consideration, but in these less romantic times success is more apt to be won on sheer merit.

Take the case of the Loudon Valve. Four months ago it was unheard of—to-day there are thousands of enthusiastic "slaves of the lamp" who will never go back to the old type of valve.

Why? Well, because however you consider the Loudon Valve it is a sound investment.

It costs only ten shillings. It takes so little current that your accumulators will last twice as long as they do with ordinary bright filament valves, and in spite of the fact that the anode is "full of holes" volume is, if anything, above the normal, showing that a full use is made of the electron stream.

It is the unwanted charges that escape through the turns of the anode, and, strangely enough, this is precisely what we intend should happen.

It gives a silver-clear reproduction which is the delight of all who have heard it, and the life of the filament is exceptionally long.

So, naturally, the Loudon is outstripping all other valves in popularity.

There is no secret—only merit.

10/-



The plain Loudon for detecting and Low Frequency Amplifying.
The Blue Loudon for H.F. Amplification.
Filament Volts 4-8.5.
Filament Amps. 0.4.
Anode Volts 40-50.

FELLOWS WIRELESS

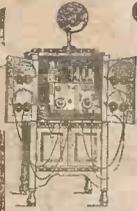
Manufactured throughout in Great Britain. All Loudens are Silver Clear and free from "mush." The current consumption is very low and the life long.

Louden Valves - Silver Clear

ADVT. OF THE FELLOWS MAGNETO CO., LTD., PARK ROYAL, LONDON, N.W.10.

B.P.S.6

"MORRIS" Solid Oak Standard Cabinet with Lock



for any kind of receiver. Bottom cupboard with lock. Height, 5 ft. 6 in.; width, 2 ft.; depth, 15 1/2 in.
 Back panel removable.
 Further particulars on application.
 PRICE £4 10 0.
 Part Carriage and Packing 7/6 ex.
SOLID OAK WIRELESS TABLE, with large drawer and bottom shelf for accumulator, length 25 in., width 16 in., height 26 in. 27/6 Carriage Paid.

M. VERSTRAETEN (Dept 5), Melville Chambers, 50a, Lord St., Liverpool.

WIRELESS INVENTORS
PATENTS—TRADE MARKS. Advice, Handbook and Cons. free.—B. T. KING, C.I.M.E., Regd. Patent Agent (G.B., U.S.A. & Canada), 146a, Queen Victoria St., E.C.4. Phone Central 652. 33 yrs. refs.

TELEPHONES RE-WOUND

101,000 ohms. Guaranteed. All makes 5/- except Brown "A" 6/-, and Sullivan, Wax filled, 10/- per pair. Ex-army converted to high resistance, 2/6 each ear-piece. Re-magnetising 5d per earpiece. Postage extra 8d. per pair.
 W. JOHN MILLER, 38, Farringdon St., E.C.4. 2nd and 3rd floor. Phone: Central 1950.

FIXED CONDENSERS EASILY MADE.

Blackite Blocks, 7d. each.
 Mica & Copper Foil, 7d. per packet
 With full instructions for making 20 sizes of fixed condensers.
 Blackite for filling back of block or holes in panels. 1/- per tin. All post free.
WM. NORTH,
 2, Colmore Place, Oldfield Lane, Leeds
Usual terms to the trade.

THE NATURAL CRYSTAL

ETHITA

TRADE MARK
IS SECOND TO NONE.
 Sample, post free, 1/-. Please send local dealer's name, e.c. Proprietors, The Bright Co., London, N.8. Phone Mount View 1296. Sole Wholesale Agent for London & Home Counties only: A. J. Conway, 36, Greenwood Road, London, E.8. Phone Clissold 4936.

2/3

"EXTRACON" THE VARIABLE CONDENSER. MICA. VARIABLE—FIXED. 001.
 Satisfaction or money back.
 Why not write your order now?
JOHN WALKER & CO.,
 28, The Grove, Vauxhall, S.W.8

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.

2v-40a	8/6	4v-100a	32/6
2v-60a	11/6	6v-40a	25/-
4v-40a	17/-	6v-60a	32/6
4v-60a	21/9	6v-80a	40/-
4v-80a	27/6	6v-100a	46/-

Special Line:—
 2v-100a (Actual) C.A.V. ... 27/6

PHONE REPAIR SERVICE

ALL MAKES and Ex-Army. Phones rewound. 4,000 ohms, 4/6 per pair; 8,000 ohms, 1/- extra. Postage, 6d. Remagnetizing, 1/- per pair. Transformers rewound, any ratio, from 5/-.
 The H.R.P., 46, St. Mary's Road, Leyton, E.10.

SUPERTONE HEADPHONES. LIGHTWEIGHT BRITISH MADE

Per Pair **12/9** Post Free.
 Every pair Guaranteed for 12 months. Money refunded if not satisfactory.
THE GROVEDALE COMPANY,
 1, Grovedale Road, Holloway, N.19.

BEGINNERS GUIDE TO WIRELESS

If you wish to make wireless sets which are **UNBEATABLE IN PRICE, QUALITY, OR EFFICIENCY** this is the book you must have.
 Everything is so clearly explained that any beginner, without previous experience, can make the most efficient receiving sets obtainable.
 Full instructions are given for **MAKING COMPLETE CRYSTAL SETS, ONE AND TWO VALVE AMPLIFIERS, DUAL AMPLIFICATION SETS.** ALSO THE VERY LATEST TWO, THREE, AND FOUR VALVE TUNED ANODE RECEIVERS.
160 pages (28 diagrams) 1/3 post free.
Satisfaction Guaranteed or Money Returned.
SAXON RADIO Co. (Dept. 14.) South Shore, Blackpool

TECHNICAL NOTES.

(Continued from page 307.)

Indian ink and allowed to dry. This is then simply inserted in the fuse-case in place of the fuse and proper contact is made with the metal tips. The whole may then be inserted in the original fuse clips, or, if these are not available, spring clips may readily be made from small strips of springy brass. Different values of the leak may be obtained by using different thicknesses of string, or by using two or more cotton threads (soaked in the ink) in parallel.

Single-Valve Loud Speakers.
 A good deal is heard about working a loud speaker from a one-valve set, but, generally speaking, it may be said that such claims are exaggerated. It is true that with a reflex circuit there is a possibility, when everything is at its best, of operating a loud speaker, and the same may be said of super-regenerative one-valve sets, but here the feat is accomplished at the expense of clarity and quality of tone. It is still true that in general the most simple and most satisfactory way of obtaining loud-speaker results is to employ the necessary low-frequency amplifying valves.

Safety Battery Tester.
 Most valve users who value their accumulators use a battery tester, in the shape of a syringe and hydrometer combined, for testing the specific gravity of the acid. These little appliances, which are invariably cylindrical, have a tendency to roll off the table, and, being made of glass, the results are often unfortunate. Further, if they are not placed down gently on the table, since the lower end of the glass touches the table, there is again danger of breakage. In general the device, although very useful, is one which is particularly prone to accident. All this, however, is very easily overcome by the simple expedient of placing a small square of rubber upon the lower end of the glass. The rubber should be about one inch square and about an eighth of an inch in thickness, a hole being cut in the centre to permit of its being pushed upon the lower part of the glass tube. This prevents it from rolling off the table and also keeps the lower part of the glass tube from contact with the table. The other end is kept out of contact with the table by the rubber bulb, so the instrument can be dropped carelessly on the table without breakage. I believe a glass battery tester, with this little rubber square attached, is made by Messrs. Etienne of Cie, 61, Great Eastern Street, E.C.

Eliminating the L.T.
 According to some experiments recently made in America, it is possible to obtain a sufficient stream of electrons through a wireless valve, without heating the filament, if a very high voltage is applied across the anode circuit, something of the order of 200,000 volts having been mentioned. The elimination of the low-tension battery is greatly to be desired, but I think most valve users will feel that the remedy, in the above case, is rather worse than the disease.

WHEN replying to advertisements please mention "Popular Wireless and Wireless Review" to ensure prompt attention.

Exide ACCUMULATORS, ETC.

NEW AND GUARANTEED.

20 Amp. 2 Volt 8/10 4 V.	17 8 6-V.	£1 6 6
40 " " 11/3 " "	21 2 6 "	1 13 6
60 " " 13/6 " "	1 7 0 "	2 0 6
80 " " 16/0 " "	1 12 0 "	2 8 0
100 " " 18/6 " "	1 17 0 "	2 15 6

D.T.G. Type 5/- Dis. to Trade. Carriage 1/- extra
 Valves: Marconi, Cossor, Ora, B.T.H., 12/6
 Phones: B.T.H., W.E., Geophone, 25/- Alto, 12/6
 H.T. Batteries, 36-Volt 8/6, 60-Volt 13/6
 Cash with order. Goods despatched per return.
LOWKE & SONS, Ltd., NORTHAMPTON

SECTIONAL STEEL MASTS

BULL DOG BRAND.
 Light, strong and cheap. An engineering job throughout. Complete with ground anchors, pulley, insulators, staywires, wire rope, cleat, thimbles base plate, drawing, and full instructions. 30 ft. 42/-, 40 ft. 60/-, 50 ft. 90/-. Carr. paid.
HAMILTON MAY, Doone Cottage, Weybridge, Surrey

THIS CONCERNS YOU. NOTE OUR PRICES.

VALVES.

	R. Type.	Dull Emitters.
FRENCH	6/9	17/6
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