POPULAR WIRELESS AND WIRELESS REVIEW, December 5th, 1925. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

46 Grad 19

CONSTRUCTING A TWO-VALVE "CHITOS" RECEIVER.

Popular Wireless

Every Thursday PRICE 3d.

No. 184. Vol. VIII.

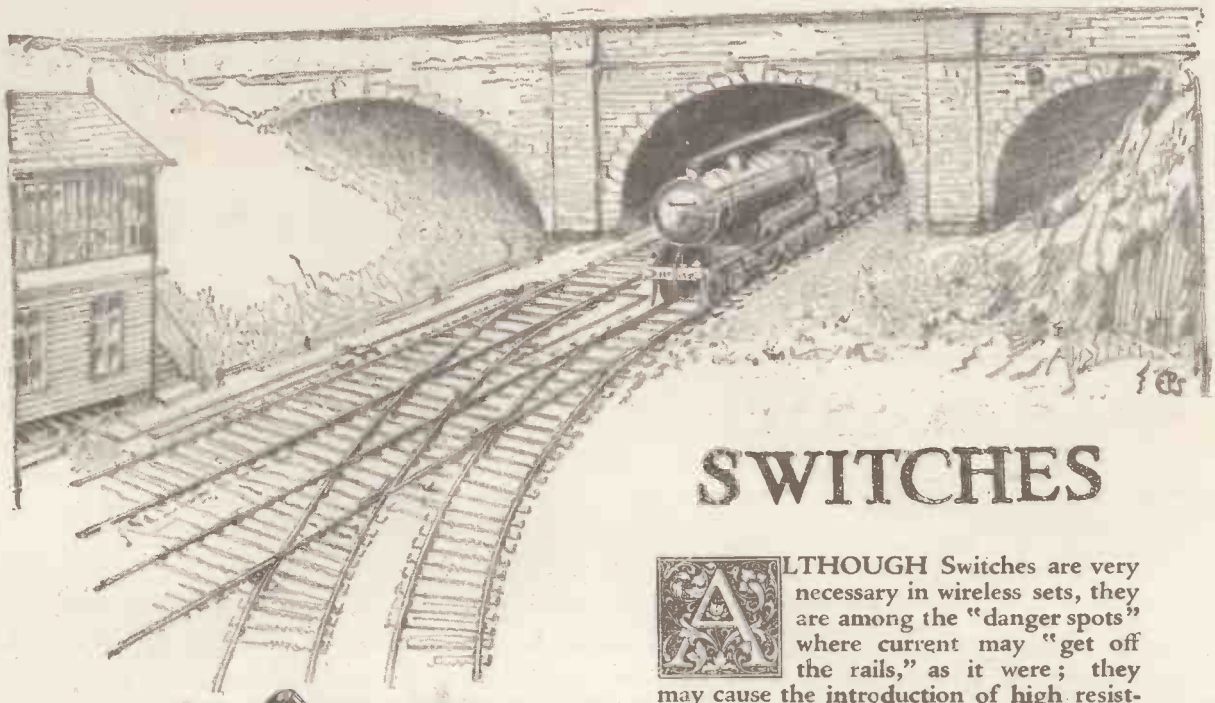
and Wireless Review

December 5th, 1925.

Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.

CONTENTS.

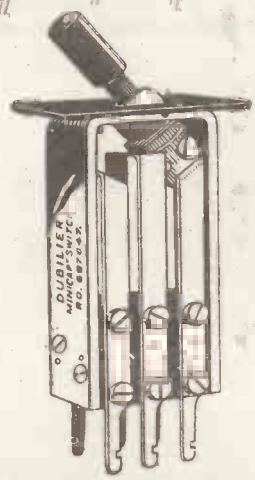
Our cover photograph this week shows the station director of W R N Y, the "Radio News" broadcasting station of America, erecting the station aerial on the Roosevelt Hotel, New York.



SWITCHES

ALTHOUGH Switches are very necessary in wireless sets, they are among the "danger spots" where current may "get off the rails," as it were; they may cause the introduction of high resistance owing to faulty or dirty contacts, and in addition they may introduce very undesirable capacity effects between the opposing terminal strips.

When the Dubilier Minicap Switch was designed, these particular problems were solved—the first by the use of definite self-cleaning rubbing contacts, the second by a special arrangement of the terminal strips, as shown in the illustration. The terminals have substantial tags for soldering, and the frame is solidly constructed of a special metallic alloy.



The Dubilier Minicap Switch.

8/-

The Minicap is a double-pole double-throw switch useful in all circumstances for general purposes.

Manufactured by the Dubilier Condenser Co. (1925) Ltd., in addition to the following:—Fixed Mica Condensers, Variable Air Condensers, Anode Resistances, Grid Leaks, the Dubrescon Valve Protector, the Ducon Aerial Adaptor, the Mansbridge Variometer. The Company are also sole concessionaires for the products of the Mansbridge Condenser Co., Ltd.

Whenever any of these products are required, the wisest course is to

Specify Dubilier.

REGISTERED DUBILIER TRADE MARK

DUBILIER
CONDENSER CO (1925) LTD

B.T.H. New Type AMPLIFIERS

Amplification of the rectified signals is not merely a matter of increasing the volume of sound; correct tone values must be maintained so that the loud speaker will respond to the notes of the double-bass with the same readiness as to those of the piccolo. This can only be assured by correctly designed and built amplifiers.

B.T.H. New Type Amplifiers *are* designed and built correctly, and the inclusion of the latest B.T.H. Transformers definitely ensure uniform amplification over a wide range of frequencies.

Single Stage

SINGLE STAGE AMPLIFIER

This amplifier is enclosed in a handsomely finished wooden box and all the battery connections are brought out by means of a multiple braided cable, fitted with identification tags. A dual filament rheostat is provided whereby either bright or dull-emitter valve can be used. Provision is made for the application of necessary grid bias.

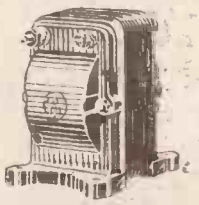
Price (without valve or batteries)	**£3**	**6**	**0**
Royalty		**12**	**6**

Two Stage

TWO STAGE AMPLIFIER

This amplifier is built on similar lines to the above, and is fitted with a switch so that either one or two valves may be employed. As in the case of the single stage amplifier, the battery connections are brought out by means of a cable. Dual rheostats are fitted for the use of either dull or bright-emitter valves. Grid bias leads are also provided. This amplifier is the ideal for loud speaker reception of perfect tonal quality.

Price (without valves or batteries)	**£6**	**5**	**0**
Royalty	**£1**	**5**	**0**



B.T.H. L.F. Transformer.

Here is illustrated the B.T.H. L.F. Transformer, the result of extensive research and experiments. The windings are mounted on to a bobbin of synthetic insulating material and perfectly insulated throughout.

Ask your dealer for a demonstration, also for Leaflets R 7430 and R 7335

Insist on B.T.H.—the best of All.

2400 *Advertisement of The British Thomson-Houston Co. Ltd.*

B T-H

Five Questions

every valve user ought to ask before buying his next Dull Emitter

Is it truly economical?

MERELY because a valve is described as a dull emitter does not necessarily mean that it is cheap to run. Its current consumption may increase as the Valve becomes older. Or, as is often the case, its emission may fall off and the valve will get less sensitive. The fundamental principle underlying every dull emitter calls for some method of increasing the electron emission of the filament. The old way was to use thoriated tungsten. The new way, discovered and patented by Cossor, is to deposit on the filament wire a triple coating of a special electron-producing material. This coating—built up layer upon layer upon a metallic base—can never lose its productivity. Thoriated tungsten, on the other hand, can be easily ruined by the use of an excessive voltage, with the result that the valve becomes practically useless.

Has it long life?

YOU don't want to buy a valve which will only last a few months. Long life is just as important as current economy. The length of time a valve will last depends entirely upon its filament—the only consumable part. Some valves obtain low current consumption at the risk of fragility. Not so the Wuncell which has a comparatively stout filament consuming only .3 amp. at 1.8 volts. In the Wuncell long life is coupled with true economy. Its filament temperature never exceeds 800°C.— whereas all bright emitters and some so-called dull emitters function at 2000°C. Heat has a most destructive influence on filaments. The lower the working temperature, the longer the valve will last. A "cold" valve for example would be almost everlasting. You will hardly be able to see the dull red glow of a Wuncell in daylight—even in the dark it can only be compared to the luminous dial of a watch.

Is it efficient for long distance work?

EVEN a long life, economical valve wouldn't be much use if inefficient. So your new dull emitter must be at least as efficient as a bright emitter. Almost every wireless enthusiast wants to pick up long distance Broadcasting. For this reason the special Wuncell W2 (with an identifying red top) has been developed. This valve has exactly the characteristics which will enable it to respond to weak oscillations and amplify them to a strength which will permit effective rectification.

The standard Cossor electron-retaining principles of construction — in which an arched filament is almost entirely enclosed by a hood-shaped Grid and Anode—are responsible for wonderfully high standard of performance. Wuncell users are everywhere testifying to the efficiency of their valves. The old idea that to obtain current economy meant a sacrifice in sensitiveness or volume is being rapidly dispelled by these superb new Cossor Dull Emitters.

Will it give pure tone?

MORE than 80% of the valve sets in operation to-day are used for Loud Speaker work. It is important, therefore, to choose a dull emitter capable of giving a generous volume of really good tone. The new Wuncell W3 has been evolved specially for Loud Speaker use. Although utilising the same unique Cossor principles of construction—the electron-retaining hood-shaped Grid and Anode—its characteristics have been modified in order to permit an immense volume without distortion. Its Grid—always a vital feature in a power valve—is tremendously rigid. Each turn of the wire is securely anchored in two distinct positions—36 in all. The filament is triple mounted for extra strength. As a result microphonic noises have been completely abolished and a grand mellowness of tone is the result.

And finally—who makes it?

NOT the least important of these five questions is the experience of the manufacturer. Valves are not like electric lamps. They are far more intricate. They cannot merely be made to specification. Each step must be watched with eagle eyes. Every process of manufacture must be carefully checked for possible imperfections. The most delicate tests must be used to safeguard the predetermined standards of performance. Cossor Valves have acquired a world-wide reputation. There is hardly an experimenter of note who has not chosen them above all others for their outstanding qualities. Their super-sensitiveness—their freedom from microphonic noises—their sheer dependability under all circumstances—their long life—their high standard of uniformity—all these features have made the name Cossor synonymous with all that is finest in valve design.

Prices:
W1. For Detector and L.F. 14/-
W2. For H.F. use 14/-
Voltage 1·8 Consumption ·3 amp.
W3. For Loud Speaker use 18/6
Voltage 1·8 Consumption ·5 amp.

Cossor

Prices:
WR1. For Detector & L.F. 16/-
WR2. For H.F. use 16/-
For use with 2-, 4- or 6-volt accumulator.

Issued by A. C. COSSOR LTD., Highbury, London, N.5

Gilbert Advt. 4064

Popular Wireless

Scientific Adviser: Sir OLIVER LODGE, F.R.S.
Consultants: Dr. J. H. T. ROBERTS, F.Inst.P.; J. F. CORRIGAN, M.Sc., A.I.C.; C. E. FIELD, B.Sc.

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

Technical Editor: G. V. DOWDING, Grad.I.E.E.
Assistant Technical Editors: K. D. ROGERS, P. R. BIRD.

RADIO NOTES AND NEWS.

The Broadcasting Bell—Dublin Calling—2 O D Chats with China—Clear Reception at 10,000 miles—Indian Broadcasting Stations—"P.W." Radio Sounds Competition.

A Trap for Tramcars.

"MY set is situated within four yards of a main street, and try as I will I cannot out out the tramcars with it," says a Leicester reader.

This looks as though a better conductor is needed somewhere, doesn't it?

Passing "P.W." On.

I SHOULD like to take this opportunity of thanking the many kindly readers who have written me offering to send their out-of-print "P.W.s" to other readers in need of them. I am keeping a record of these names and addresses, by which many a much-desired copy of "P.W." has been secured for those unable to obtain it otherwise. Other readers with old copies which must be cleared out immediately, might like to know that the local hospitals are now pretty sure to contain someone who would be glad of them.

A Good One-Valve Performance.

THE modest little straight one-valve set that was described in "P.W.," No.142, is proving itself an excellent long-distance (DX) set. One Johannesburg reader writes: "Using a Mullard 06, Lissen grid leak and condenser, and Burndept coils, the results were as follows: J B, our local station, 3 miles away, could be heard plainly the other side of the room. I can pick up Durban (400 miles away) quite easily, and Cape Town (about 1,000 miles) can be heard after careful tuning."

The Trinadyne Again.

ANOTHER "P.W." set that has been going strong of late, is the Trinadyne. Given a good crystal detector, this is a set that can hand over "distortionless dope" to the loud speaker with a volume that is really quite remarkable. It's not at all a bad set to handle, either; and one Burnham-on-Crouch reader tells me "The writer of the Trinadyne articles may be pleased to know that I have thoroughly tested his three circuits (1 valve, 2 valve, and 3 valve), and find they are all good. I quite agree with his assertion that it is a well-behaved circuit."

The M1.

SEVERAL keen-eyed readers have noticed the picture of the ill-fated submarine M 1, which appeared as an advertisement for condensers in "P.W." last week. Such advertisements must be prepared and go to press some long while before they appear, and I need hardly say that nothing but an unfortunate coincidence accounts for the use of the picture at such a time.

Mr. Albert Sammons, the famous violinist, playing at 2 L O.

National Mourning.

THE suspension of programmes by the British broadcasting stations after the death of Queen Alexandra had been announced, gave an impressive solemnity to the European ether on November 20th; but distant listeners and those who tuned in too late to hear the announcement, did not easily connect the silence with a nation's mourning. I think that if it had been possible, the most fitting tribute would have been the broadcasting of the great bell of St. Paul's Cathedral, which is tolled only on the death of a member of the royal family.

The Broadcasting Bell.

FAILING this, could not London or all the stations be fitted

(*Continued on page 790.*)

NOTES AND NEWS.

(*Continued from page* 789.)

with a broadcasting bell, to be rung only in a great national sorrow, or similar nation-wide tribute? Not only could our own listeners share in such mourning, but overseas listeners would hear the sounds of a nation's grief.

Dublin Calling.

A GREAT many "P.W." readers appear to have overheard the very first transmissions from the new station at Dublin. Amongst the early reports I received was one from that indefatigable ether-comber, Mr. E. Tarplee, of Gloucester, who says, "I picked up Dublin, 2 R N, on a 1-valve receiver at very good strength. Putting on a 2-valve amplifier, all the items were received very clearly indeed, and the strength was not far short of being equal to Daventry. Unfortunately there was very bad fading at intervals, but this may have been due to adjustments upon the transmitter."

An Unconscious Compliment.

THE B.B.C.'s policy of getting famous comedians to talk to listeners is evidently meeting with success. One unconscious humorist wrote to Savoy Hill, saying: "George Graves was very good. Put him on again. He is a coming comedian and should make a name for himself!" Nobody enjoyed the joke more than George Graves himself.

The One-Valve Ultra-Audion.

"I THINK for a good one-valve set there is nothing to beat the Ultra-Audion," says Mr. F. W. Lilley, of Hengrave, Bury St. Edmunds, in a letter to the editor. This opinion is based upon the fact that Mr. Lilley has tuned in all the B.B.C. stations except Sheffield, as well as Madrid, Zurich, San Sebastian, Vienna, Oslo, Berlin, Frankfort, Stuttgart, and the Paris stations. He is particularly proud of receiving Plymouth, as apparently this is a very difficult station to receive in the Suffolk area.

Our Christmas Number.

NEXT week's issue of "P.W," will be the finest number ever published. It will be specially enlarged and full of interesting articles which no reader can afford to miss. The price will be 3d. only, and there will be a record demand, so make sure of your copy by ordering it in advance.

2 O D Chats with China.

FOR the first time in history, Britain has just succeeded in talking direct with China. This record-breaking feat has been carried out by G 2 O D (Mr. E. J. Simmonds, of Gerrard's Cross), and the Chinese station reports that his speech was "well received" on 44·5 metres. When Mr. Simmonds changed over to telegraphy his signals thumped through at practically maximum strength (R-8 to be precise), and communication for hours at a time was maintained with ease. This conquest of China means that there are only a few coy countries in the world who have not heard British amateurs calling—and, between you and me, there is tremendous competition amongst the transmitters for the honour of being "first-across" to the rest of the world.

Clear Reception at 10,000 Miles.

THE world's pioneer broadcasting station, East Pittsburg (K D K A), has just been celebrating its fifth birthday. Ten thousand miles away, at Poona, India, a "P.W." reader listened in and heard the birthday programme clearly, using the short-wave set described in "P.W." Nos. 140 and 141. On the same circuit this reader has succeeded in logging several of the European broadcasting stations, and all the Indian stations except Madras.

The Indian Broadcasting Stations.

AS a great many readers will be hoping to hear the Indian stations, I give below the complete list as forwarded by this correspondent: Bombay, 2 F V, 385 metres; Colombo, 400 metres; Calcutta, 5 A F, 425 metres, 1½ kilowatts; Madras, 20 watts; and Bombay, 2 A X, 50 watts.

SHORT WAVES.

"I hope the day will come when we lecturers will learn a new broadcasting technique."—The Master of Balliol, at the opening of the B.B.C.'s new studio at Oxford.

* * *

"The B.B.C. has played up to the public, and not down to it. It is thanks to them that no man need feel a fool if he is caught with a headphone on."—"The Observer."

* * *

"If it is worth while relaying restaurant music on other days of the week during lunch-time, there is surely good reason for doing so at the week-ends."—John Gilpin, junr., in "The Motor."

* * *

"Driver of huge motor-van, held up by owner of little two-seater: 'Hi, there! Can't you get your blinkin' crystal set out of the way?'"—"News of the World."

Broadcasting Committee Meets To-day.

TO-DAY, Dec. 3rd, at 4 p.m., evidence will be given by the B.B.C. before the Broadcasting Committee in the House of Lords. The meeting will be under the chairmanship of the Rt. Hon. the Earl of Crawford and Balcarres, K.T., and members of the public will be admitted. At a similar meeting to-morrow evidence will be tendered by the Wireless League.

Savoy Orpheans at Queen's Hall.

AERIAL friends of the Savoy Orpheans will be glad to hear that they are giving another concert of syncopated music at the Queen's Hall, London, on December 9th. So many were unable to get seats for the last one that this concert is the result of innumerable requests. Gershwin's "Rhapsody in Blue" will again, I hear, be the feature of the programme, which, with this exception, will be entirely new. The "Rhapsody" is acclaimed as the most remarkable composition that America has ever provided; it was broadcast, as you may remember, from the Savoy ballroom last summer, with Gershwin himself playing the enormously difficult solo part. At Queen's Hall, the soloist will be Billy Thorburn, the pianist of the Savoy Orpheans.

Great American Wireless Conference.

THE Fourth National Radio Conference recently opened at Washington was one of the most important wireless assemblies ever held. Speeches were made by some of the great public men of America, as well as by the leading figures in the radio world.

In his opening speech Secretary Hoover quoted some striking figures, showing the increase of high-power radio during the past year. "When the Conference assembled a year ago," he said, "there were 115 U.S. stations equipped to use 500 watts or more. Now we have 197 such stations, an increase of over 70 per cent."

Still Going Strong.

THE mere expansion in the number of stations does not tell the whole story, for according to Secretary Hoover: "A year ago all stations of 500 watts and over were using a total of 67,500 watts. To-day they use 236,500 watts, or a 250 per cent increase!"

One noticeable feature of the gathering was the taken-for-granted opinion that radio is only in its early youth, and that it will continue to grow with increasing strength.

"P.W." Radio Sounds Competition.

ON another page in this issue of "P.W." will be found the names of the Consolation Prize-winners in the Radio Sounds Competition.

As a direct result of this competition a great many interesting facts about the transmission of sounds have come to light, and these will be outlined in an article which will appear in "P.W." very shortly.

New Vienna Station.

THE DX hounds (long-distance listeners) are now in full cry after the new Vienna broadcasting station. One or two correspondents have picked up foreign signals upon the same wave-length as 5 N O, and one Reading listener informs me that he believes the station to be Vienna, using the call-sign O T W.

Testing Talent in the U.S.A.

NOW that the B.B.C. is experimenting with different announcers and programme procedure, they may come round to the latest American idea of broadcasting auditions. As practised at the W R N Y station (New York), this is more like torture than broadcasting! One night per week the would-be wireless stars are invited to give their turn before the microphone, and they are broadcast to the public in the following manner:

The Chorus of Critics.

IN addition to the studio in which the aspirant is performing, another studio is connected up to the transmitter. Here are gathered the specially-chosen critics, armed with rattles, bells, klaxon-horns, etc., and each critic wears a pair of 'phones in which he can hear the item being transmitted. If he likes it he remains silent, and listeners are able to hear the item, too. If he disapproves, he rattles his rattle, claps his clapper, or generally raises Cain, until the control room has to protect listeners against the din by cutting the item off!

Receiving America.

INSTEAD of calling a Z "zed," the American announcers invariably pronounce it as "zee." This means that Boundbrook's call sign, W J Z, wil be pronounced W J Zee, and will sound more like W J B or W J C than W J Z! Don't forget this little peculiarity if you are tempted to sit up late for America!

ARIEL.

Miss Mollie King, the well-known American actress, examining the D X aerial on the s.s. "Leviathan."

AN INTERVIEW WITH Dr. ALFRED GOLDSMITH.

THE INTERNATIONAL BROADCASTING TESTS.

By L. W. CORBETT.

(Our Resident Correspondent in New York Formerly on the London Staff of "P.W.")

We are pleased to publish this interview with one of America's foremost radio authorities. Besides his research activities, Dr. Goldsmith is also Hon. Secretary of the Institution of Radio Engineers.

IT is only a matter of a few weeks now before the new W J Z will be heard on the air. This station, it will be recollected, is to take the place of the existing W J Z in New York City, and will be located in New Brunswick, N.J., and will operate with a power of anything up to fifty kilowatts.

The present W J Z employs a power not exceeding 1,500 watts, and many people are sceptical about the possibilities of W J Z serving its old listeners in the city when the move is made. New Brunswick is only about fifty miles from the Statue of Liberty—it may even be less—so the doubt is not caused by any anxiety on the part of amateurs that the fifty kilowatts will be insufficient to give really reliable service at this range, but it is due more likely to the fact that it is generally felt the local stations will close-in on W J Z's frequency and prevent listeners in New York City reaching out to New Brunswick.

This station has a tremendous audience right in Manhattan, as its programmes are of the highest quality, and it is a rule of the Radio Corporation of America that no advertising matter whatsoever shall be allowed to contaminate the emissions from this station. There is sure to be a hue and cry then, if the new W J Z will not satisfactorily serve its old friends.

New Station Nearly Ready.

One thing is sure, however; many outside listeners will benefit by the change, and they are not likely to "kick." Included in this last category are the DX readers of this article. While they will probably not benefit by the quality of the new W J Z, they will certainly be given the opportunity to add another feather to their DX caps, for the new fifty kilowatter is pretty sure to be heard in European countries under favourable conditions.

The station will no doubt be actively engaged in the International Broadcasting Tests which take place next January. And while on the point, you are respectfully requested to remember I have mentioned this before) that in America the letter "Z" is pronounced as "Zee" and not "Zed." Much confusion has arisen among DX amateurs who have overlooked this point, and mistaken the "z" for an "e" etc. "This is station 'Double-you-Jay-Zee' of the Radio Corporation of America," is something after the style of the announcement you may expect to hear.

Desiring to be better informed on matters pertaining to super-power, I one day walked into the famous Woolworth Tower Building on lower Broadway, took the express elevator to the required floor, and requested that Doctor Goldsmith's secretary convey my regards to him, and would he kindly give me an interview; all in one breath.

An appointment was arranged, and some time later, at the prescribed hour, I was ushered into the Doctor's presence.

"We cannot definitely say when the new W J Z will be ready," he informed me, after the usual preliminaries.

"Nothing has been finally settled yet. We have made provision for the use of fifty kilowatts of power, but it may be found that so much will be unnecessary. We do not know enough about transmission to make any definite statement, and everything I say can only be taken as more or less generalities."

Effects of Super-Power.

"What do you consider will be the effect of super-power on atmospheric disturbances?" I inquired, bearing in mind that Doctor Goldsmith's statements might very well apply to the Daventry station. "And on fading?" I added.

"Naturally the volume from a fifty-kilowatt station will exceed that of a lower power station, and atmospheric disturbances will not be so noticeable at short ranges. While the volume of the programme will be greater, static will not become louder, and therefore the super-power will be able to drown such interference much more effectively than does a low-power station.

"We have no reason to believe that fading will be eliminated by the use of super-power," he continued. "It will naturally not be so annoying though. As an example, suppose a station a hundred miles away is being received, and fades periodically. Suppose when it fades the volume is decreased from maximum to one-tenth or less of its original value; the decrease may be so great in proportion that it will be almost impossible, or quite impossible, to hear the station when it fades.

(Continued on page 792.)

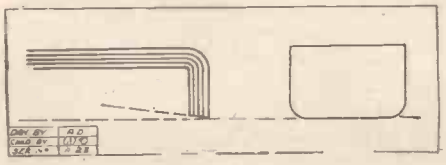
Dr. Alfred Goldsmith at work in his offices in the famous Woolworth Building, N. Y.

LAYING OUT OF A SET.

IN arranging your panel give first consideration to the wiring position of the components, as symmetry is dearly purchased if attained only by the sacrifice of efficiency. If possible mount your valves behind the panel and keep your H.T. terminals and batteries behind also. This may save many burnt-out valves. See that your panel is well supported, as ebonite will warp under strain if kept in a warm room. Do not put accumulators inside the set, as the acid fumes are likely to attack joints and components.

Marking and Drilling Panels.

Do not use blacklead for marking out your panel. Use a scriber or an ordinary



hatpin ; this not only eliminates the possibility of leakage, but enables you to mark out more accurately. In positioning terminals or components near the edge of the panel, remember that the latter will be supported on wood near the edges, and set your components sufficiently far in to allow plenty of clearance. Remember that you are marking out from the back of the panel, and arrange your components accordingly. Before drilling, place your components in their approximate positions and make sure that you have enough clearance, and that the variable condensers will turn without fouling any other component. Drill carefully with light pressure, and place a smooth piece of wood under the ebonite to prevent the hole breaking out on the other side.

Switch Contacts.

Have all terminals and other external fittings lacquered ; if this is not done they will rapidly turn black under the influence of the sulphur in the ebonite. Do not use nickel-plated components, as, although they look very nice, they offer a high contact resistance.

NEXT WEEK.

SPECIAL CHRISTMAS NUMBER.

Order your next week's copy of "P.W." It will be greatly enlarged and will contain many new and striking features which will appeal to all classes of amateurs. Next week's issue will give you extraordinary value for your 3d.

If contact studs are mounted on the panel they should be carefully levelled with a smooth file after mounting, and the brass dust from this operation brushed out of the panel before other components are mounted. The under side of the brush laminations should be filed off at an angle and the corners nicely rounded as shown in the sketch. This ensures smooth and good contact in operation.

H.T. BATTERIES.

PURCHASE as large a type of battery as you can afford, on the grounds of ultimate economy. Choose a battery which carries some guarantee of satisfactory performance, and see it tested before purchasing, as it sometimes happens, even in the best makes, that a faulty connection is made between cells. Keep your battery in a cool place. It is better to buy your battery in, say, 30-volt units than in a block of 60 or 100 volts, as the damage is more localised in the event of one cell corroding its zinc and oozing over the bottom of the section.

H. T. from Mains.

Always connect a large condenser, say 2 mfd., across the H.T. terminals of your set, as this will cut out undesirable noises due to faults in the battery. This condenser should not be left connected to the battery when the set is not in use.

If finance permits, it is true economy to use accumulators for H.T. supply, as, although the first cost is higher, this is quickly cancelled by the reduced upkeep charges, to say nothing of the improved performance.

If you are lucky enough to have electric light installed, an accessory can be purchased to relieve you for ever of the troubles of H.T. supply, and in certain cases the filament supply can also be taken from the mains.

Those little 4½-volt "flash lamp" batteries are highly successful and quite inexpensive for H.T. purposes especially in the case of one and two-valve sets. Cases to hold the necessary dozen or so can be obtained or special connecting-clips used.

AN INTERVIEW WITH Dr. ALFRED GOLDSMITH.

(*Continued from page* 791.)

"If, however, the volume of the station is increased to ten times its original value, and then it fades, it is probable that its minimum value will be ten times louder than it was before the power increase, and that it will be audible all the time quite satisfactorily although a decrease in volume will be apparent when the station fades just the same. This is the only way I can see of super-power helping the listener to overcome fading."

5 X X to be Relayed.

"What will be the range of the new W J Z ?" I asked.

"That is a very difficult question. It all depends on what is meant by range. Take 2 L O, for example. Ask the B.B.C. engineers what is the range of that station. In all probability the answer will be somewhere in the neighbourhood of a hundred miles, if that. Yet 2 L O has been heard in America. We hope to be received in England this winter, perhaps more or less with reliability, given good conditions. Yet we consider our service range to be about 450 miles, neglecting fading. The fact that we are located in the country is advantageous. If our antenna was atop a New York building, I would cut down the above figure by fully fifty per cent."

It will interest readers to know that the power employed by the new W J Z is to be greatly in excess of that used by K D K A when this latter station's programmes were relayed by the B.B.C. last year and, also, New Brunswick is some three or four hundred miles nearer to England than Pittsburg, the home of K D K A.

Leaving the question of super-power, I next asked Doctor Goldsmith what he thought were the possibilities of the complete success of the International Broadcasting Tests.

"As far as city dwellers are concerned over here, I don't think they have a great chance of success. Interference from other receivers mishandled in the neighbourhood is very disheartening, and nobody gets a chance to hear the British transmissions. I think that this is the reason why so few European stations were heard last year. Up in Belfast, Maine, where we are right in the country on the Atlantic Coast, we have no trouble at all in receiving such stations as 2 L O. At that point, too, the transmissions from Chelmsford last winter were received and retransmitted to New York. We shall probably use this same method during the coming winter when we intend to relay the Daventry station a lot."

Thermopile Possibilities.

Again deviating from my original subject, I asked Doctor Goldsmith what, in his opinion, were the possibilities of the Thermopile described recently in POPULAR WIRELESS.

"A very good idea, but I think that the apparatus is liable to become overheated too quickly. An apparatus designed with the same end in view, and fully as efficient as the accumulator, would, I believe, find a ready market. Several engineers are working on this idea, but at present I cannot give any particulars."

I welcomed on behalf of POPULAR WIRELESS this piece of criticism, and pointed out that the overheating was not excessive in the thermopiles designed by Doctor Roberts, and Doctor Goldsmith was very interested. I was unable to go further into the question, however, for the Doctor had already stretched a point by seeing me, for in so doing he had to absent himself from a meeting. I thanked him for his courtesy in seeing me at so busy a time, and was soon dropping, pellet-like, in the gilded lift (pardon me for saying "elevator" in a previous paragraph) to the ground floor of the Woolworth Building, and to Broadway —the tail end of the "Great White Way."

A D.X. Unidyne 2 Valver

Another article giving explicit instructions for the making of a particularly fine long-range DX 2-valve Unidyne—the incomparable H.T.-less set.

By G. V. DOWDING, Grad.I.E.E., and K. D. ROGERS

(Inventors of the Unidyne).

Constructional work by G. V. COLLE and C. A. MEADOWS

(Technical Staff).

OWING to the extreme difficulty experienced by most listeners in obtaining clear long-distance reception it has been decided that an easily controlled long-range receiver, which is reasonably selective, should be of interest to readers.

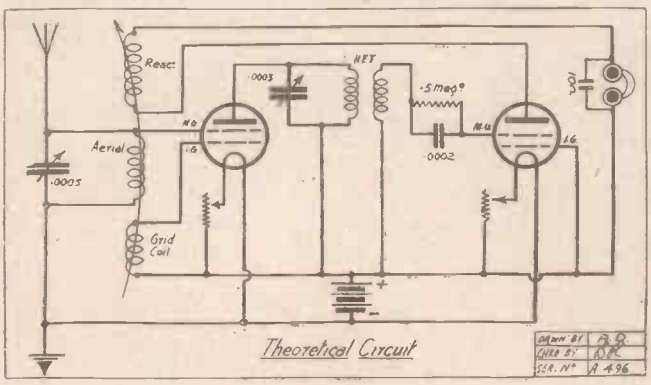
Accordingly, the technical staff of POPULAR WIRELESS decided to turn their attention to the design and construction of a receiver which would enable listeners to tune-in distant stations without the terrible amount of "mush" and interference generally experienced when one endeavours to get away from the local station. Selectivity has always been a strong point in Unidyne receivers, and that is why this system of wireless reception has been employed in the set, the construction of which is to be considered hereunder.

Besides selectivity the Unidyne is also noted for extreme silence of background, a point which is of great importance when DX work is undertaken.

New Reaction Control.

In the set to be described two valves are used, one acting as an H.F. amplifier, and the other as a detector, H.F. transformer coupling being employed. There is nothing new in this, but a study of Fig. 1 will show that a fresh form of reaction control has been incorporated, which control gives a very fine adjustment of regeneration.

It will be seen that parallel aerial tuning is used and reaction is carried out mainly by coupling a coil in the anode circuit of the detector valve to the aerial coil. In addition to this, however, further reaction (but of a milder type) is obtained by placing a coil in series between the inner grid of the H.F. valve and the positive lead of the battery and coupling this coil also to the aerial.



The carbon type of rheostat is shown in the photographs accompanying the articles, but there is no reason why any filament resistance which gives fairly fine adjustment should not be used.

In the construction of the set the components mentioned in the list on this page should be used, though in the case of the H.F. transformer, the constructor may prefer to wind his own, and details of this will be given later. As will be seen from Fig. 2, a panel 10 × 8 in. is required, and this is mounted in a box about 4½ to 5 in. deep. It is essential that a good coil holder be used, as vernier movement of the coil is necessary if long-distance reception is to be attempted.

The actual construction is a simple matter and needs very little explanation. The panel drilling dimensions will be found in Fig. 2, and these are correct for the components mentioned in the list on the right. Should other components be used, however, it will, of course, be necessary to modify these dimensions and, if very wide variance occurs, the constructor may have to alter the lay-out to some extent.

There is one little point which should be mentioned about the variable condensers. It will be seen that vernier control is incorporated in each, and constructors should make quite sure, when buying these components, that the bushes of the condensers are tight. If slackness is present, especially in the H.F. condenser, it is very probable that the constructor will be unable to get his set to oscillate.

A photograph of the completed receiver taken before the transfers were placed on the panel.

The drilling of the panel is undertaken with metal working drills, the large holes

LIST OF PARTS REQUIRED.

1 Panel, 10 × 8 × ¼ in. (Peto-Scott), with Cabinet	13	6
1 ·0005 Variable Condenser (Peto-Scott)	10	6
1 ·0003 Variable Condenser (Peto-Scott)	9	3
1 Lotus 3-way Coil Holder	10	6
2 Lissenstat Major Rheostats	15	0
2 Dubilier Fixed Condensers (·0002 and ·001 mfd.)	5	6
1 Dubilier Grid Leak (·5 megohm)	2	6
6 Terminals (W.O. type)		6
10 Valve Sockets (brass)	1	0
4 Peto-Scott Flush Mounting Sockets		6
1 Bowyer-Lowe H.F. Transformer, 300 to 600 metres	7	0
Wire, screws, transfers, etc.	2	0

(*Continued on page* 794.)

A DX UNIDYNE 2-VALVER.

(*Continued from page 793.*)

necessary for the mounting of the condensers being enlarged by means of a reamer, if a large drill is not available. When the components have been mounted, the wiring should be undertaken, 16-gauge square tinned copper wire being used for the purpose, every care being taken that all joints are well made.

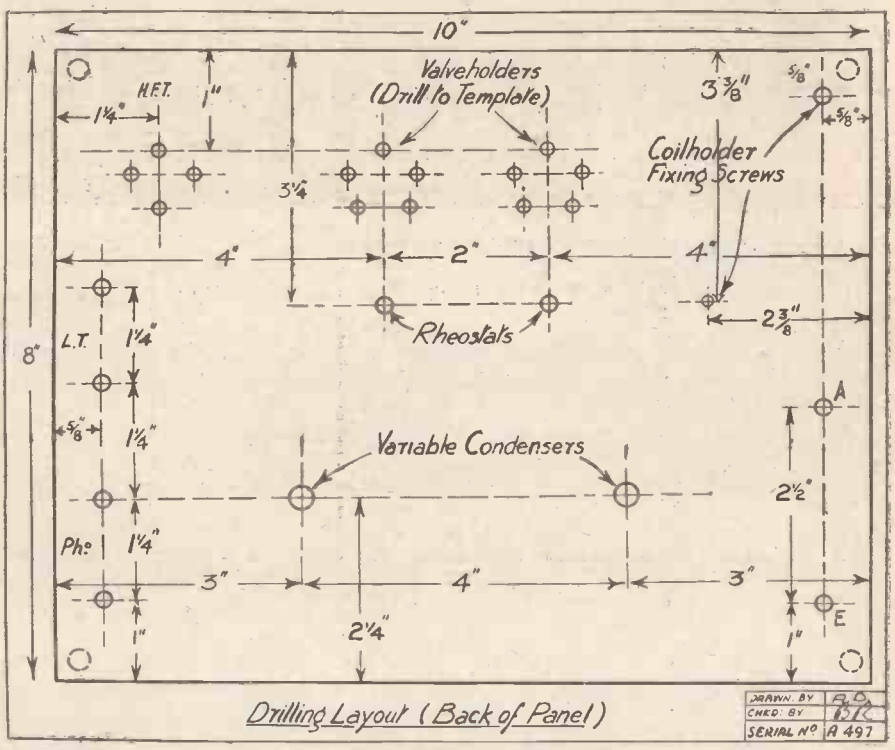
As Unidyne receivers rely solely upon the L.T. battery for the energy to operate the valve it is of extreme importance that dry joints or poor connections be guarded against in every portion of the receiver. It has come to the notice of the technical department of POPULAR WIRELESS that in at least 60 per cent. of the cases of readers having trouble or complete failure with their sets the cause has been poor connections and, in most cases, dry soldered joints.

To obviate these dry joints it is essential that the soldering iron be really hot and clean and well tinned, while a small quantity of flux, if possible, should be employed in making the joint. When the wiring of the Unidyne DX receiver has been completed according to Fig. 3, the constructor is advised to check all his connections by means of the point-to-point list given on this page, after which he can be tolerably sure that no mistake in the wiring has been made, and can make preparations for testing the receiver.

The main items in the accessories for this set are, of course, the two valves and the tuning coils, including the H.F. transformer. Taking the latter first we have already mentioned that the constructor may like to make his own, and, if this is the case, we advise him to utilise the spider coil method of winding rather than attempt to make the transformer in the more usual slot method. The two coils required will be of 75 and 85 turns respectively for the primary and secondary windings, and should be wound with 26 D.C.C. wire on cardboard formers with 13 slots, and a centre diameter of 1 in.

The usual four-pin mounting may be employed and any convenient holder used.

(*Continued on page 795.*)



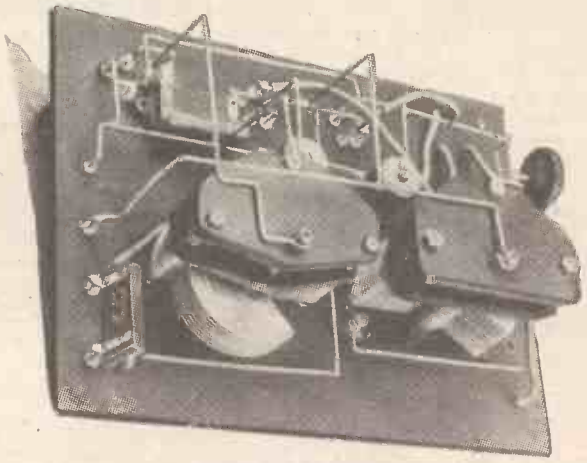
POINT-TO-POINT WIRING.

Aerial terminal to fixed plates of ·0005 mfd. variable condenser and to the main grid of the first valve, also to socket of the fixed (centre) coil holder. Earth terminal to moving plates of ·0005 variable condenser, to plug of fixed coil holder, and to negative which is connected direct to the filaments of both valves.

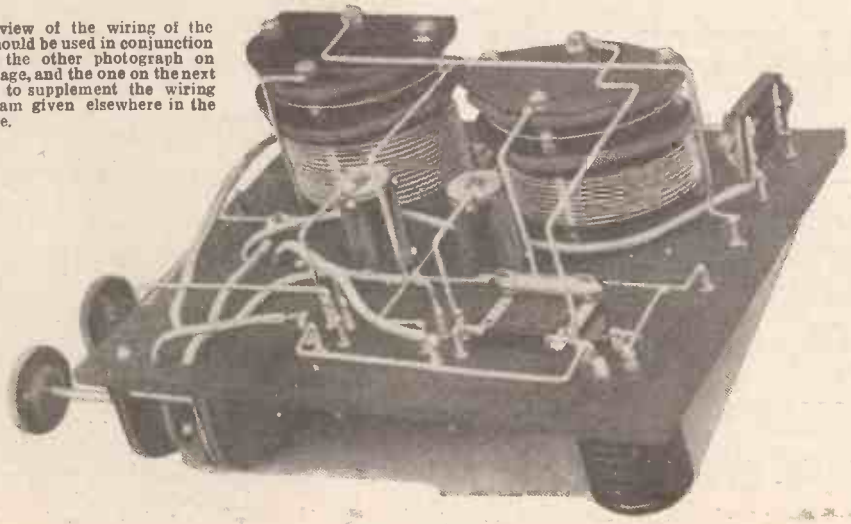
The other filament sockets are connected to their respective rheostats, the other sides of the rheostats being connected together and to positive.

Inner grid of first valve is connected to the socket of the top moving coil holder. The plug is connected to positive.

Plate of first valve is connected to O.P. of the H.F. transformer, and to moving plates of the ·0003 mfd. variable condenser. Fixed plates and I.P. of transformer are connected to positive. "I.S." of transformer to one side of grid leak and condenser, the other side of which goes to main grid of second valve. "O.S." and inner grid are taken to positive. Plate of second vaive to socket of bottom moving coil holder (reaction), plug to one side of 'phones, other side of 'phones to positive. A ·001 fixed condenser is placed across the 'phone terminals.



A clear idea of the disposition of the components can be obtained from the above photograph.



The view of the wiring of the set should be used in conjunction with the other photograph on this page, and the one on the next page to supplement the wiring diagram given elsewhere in the article.

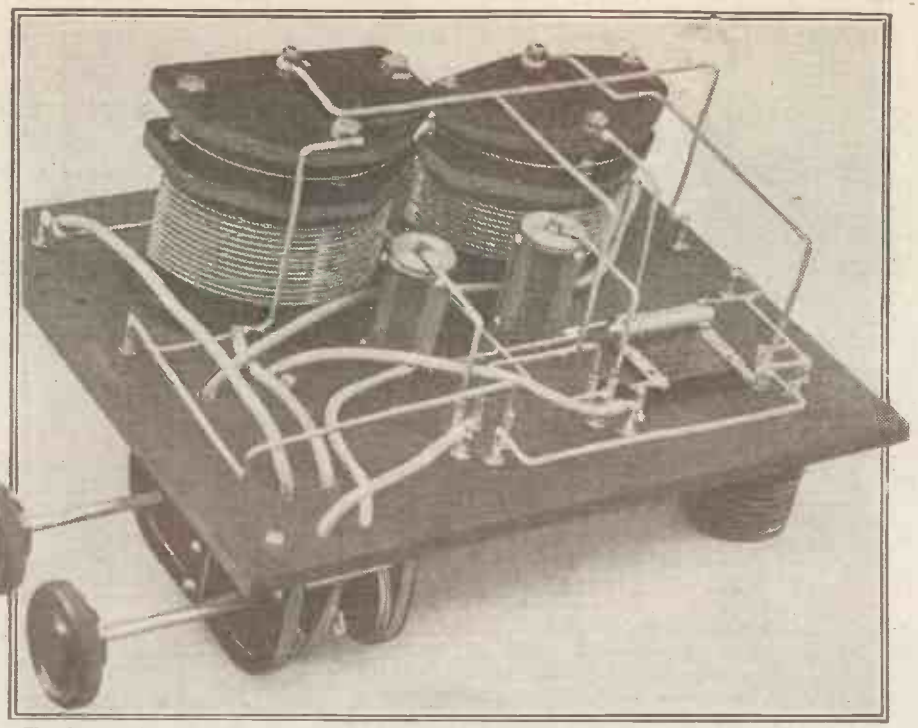
A DX UNIDYNE 2-VALVER.

(*Continued from page 794.*)

The transformer shown in the photographs and used in the test of the receiver under discussion is of Bowyer-Lowe make, covering a wave-length range of from 300 to 600 metres. This transformer has given every satisfaction.

The coils shown in the photographs are of Lissen manufacture, and have proved very satisfactory, though we have also used Tangent coils with success. For broadcast wave-lengths the best results were obtained with a 35 or 50 aerial coil (in the centre), a 200 reaction coil (nearest the operator), and a 75 grid coil in the third position of the holder. We see no reason why amateurs should not wind their own coils if they desire. But should they do so we advise them to make them of the basket or spider type. For 5 XX, 150 aerial, 300 react, and 100 grid coils should be used with an H.F. transformer to cover 1,600 metres. The operation of the receiver is extremely simple and differs in no way from that of the usual H.F. detector, except in the control of reaction. Distant stations are picked up by having the valves just *not* oscillating, this state being reached by varying the coupling between the aerial and reaction coil.

The main reaction coil is then left where it is, and final adjustments are made by varying the coupling between the grid coil and the aerial.



The above photograph shows in an exceptionally clear manner the connections to the coil holder on the left of the panel.

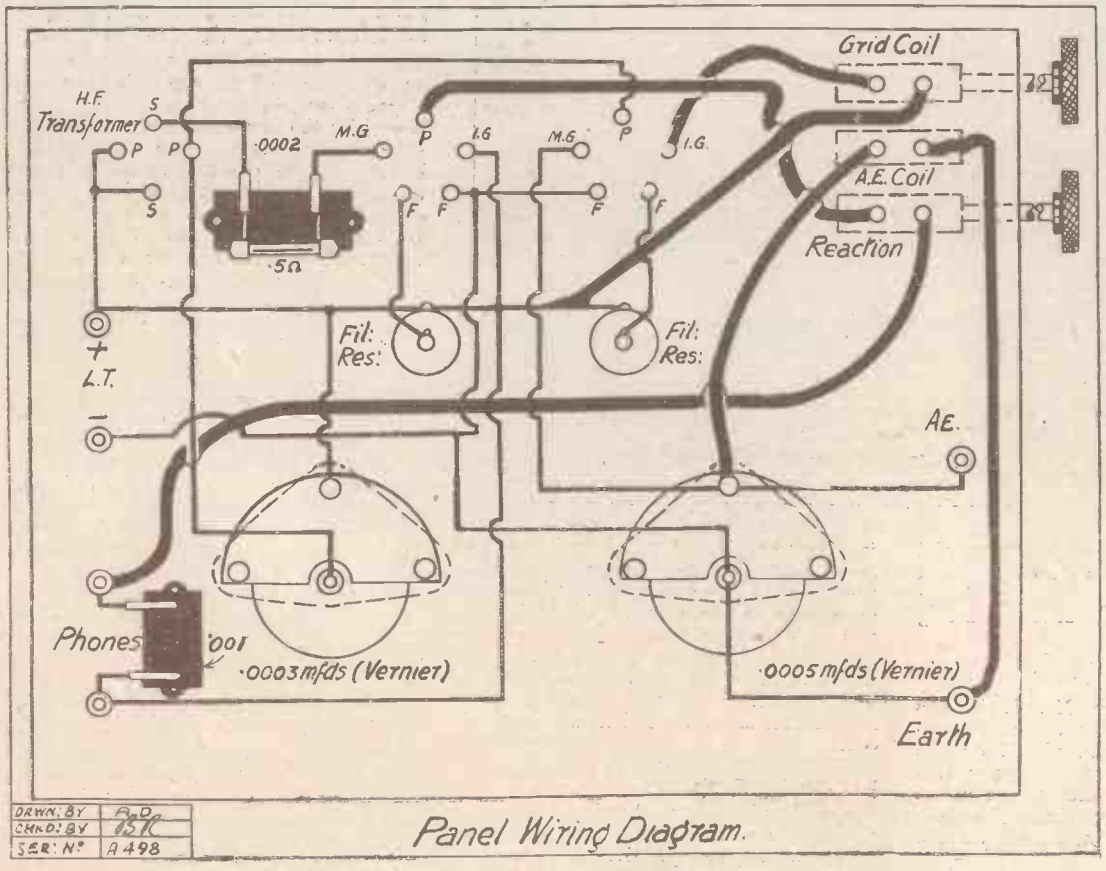
Suitable Valves.

As regards valves we recommend either the Thorpe K.4 five-pin valve or the U.C.5, either of which have given excellent results. No H.T. battery is, of course, needed, but constructors should not make the mistake of trying to work the set from a 4-volt accumulator, for, while a one-valve Unidyne may work fairly well with so low a voltage, the two-valve sets all require a 6-volt L.T. supply.

It will probably take a little time before constructors are fully conversant with the correct operation of this receiver, as it slides in and out of oscillation so quietly that often it is difficult to tell if the set is oscillating or not. Tapping the aerial terminal with a moist finger is a fairly good test and will be useful to those who are strange to the handling of Unidyne receivers.

Interference.

But because the set does not "howl" or oscillate fiercely it must not be thought that it will not radiate and cause interference. Quite serious heterodyning can be caused by an oscillating Unidyne, and so the same care to guard against interference must be taken with this set as with a receiver using H.T.



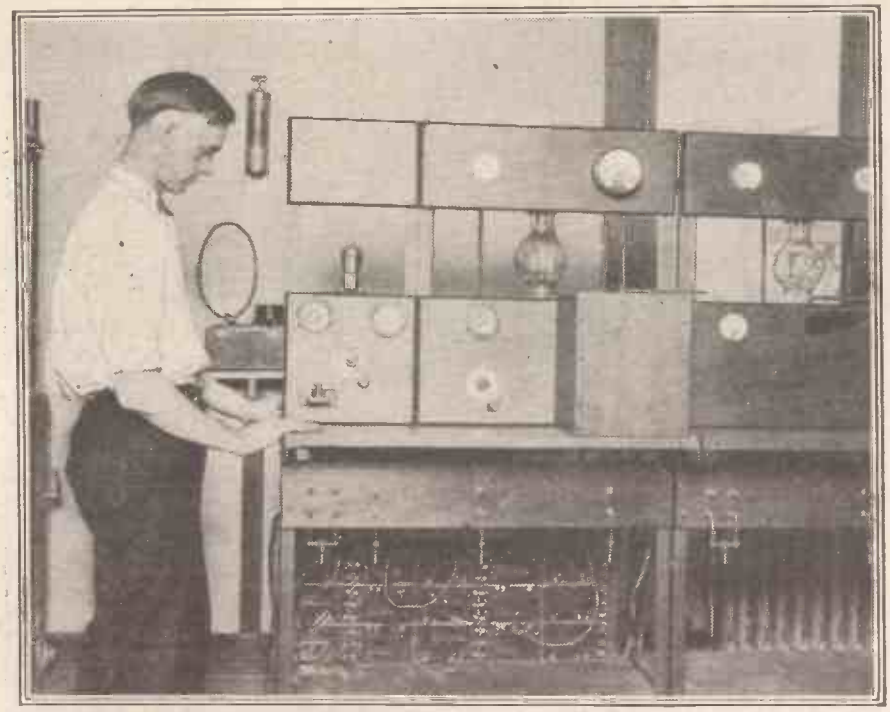
Panel Wiring Diagram.

Technical Notes

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

Radio Picture Transmission.

MANY readers of this journal will have read lately of the demonstration given in London, by Mr. Thorne Baker, of a system of wireless transmission of pictures. He placed a picture in the sending apparatus at one end of the room and reproduced it by wireless transmission in the receiving apparatus at the other end of the room. He states, moreover, that his system is capable of application to broadcast methods and that all the "listener" would require, in addition to his receiving set, would be the extra apparatus for turning the cylinder on which the picture is produced, and for actuating the sensitised paper with which the cylinder is wrapped around.



The transmitting apparatus, with which a crystal wave-length stabiliser is used, at K D K A.

If these experiments prove to be successful on the larger scale, it would certainly seem that a most important extension of the value and entertainment of broadcasting had been made.

Inexpensive Apparatus.

In the United States, Mr. C. Francis Jenkins, the world-famous expert in television, has produced and placed on the market a simple and inexpensive apparatus for the transmission and reception of pictures by a somewhat similar method, and these sets of apparatus are offered at a low price for the express purpose of stimulating interest in the subject. Prizes are also offered each month for the best results obtained.

Variometers Again in Favour.

In the earlier days of broadcasting, the variometer enjoyed a greater popularity than it has done more recently. It was found very useful for simplicity of tuning, and variometers were easily made to tune over the broadcast range. Since Daventry came on the scene, however, the variometer seems to have fallen on evil times, but latterly some manufacturers have again taken it up—the Dubilier-Mansbridge variometer and the Igranic may be cited as examples—and it looks to be on the way into favour again. Parallel condensers and series-parallel switches increase the range and usefulness of the variometer. One of the drawbacks of the commercial variometer was the delicate winding, but this has been much improved in the later types. There would seem to be room for still further improvement in the way of more robust instruments and combination with reaction coil.

Loud-speaker Howls.

The low-frequency howl which often develops in a set with loud speaker is the subject of frequent questions from readers, most of whom are aware, in a general way, that the trouble is due to a reaction effect (acoustical instead of electrical) but do not know how to prevent it. The simplest way, of course, is to turn the loud speaker away from the set; this will usually prove sufficient. But other simple precautions may be taken as well. For example, the use of anti-microphonic valve holders will help, and insulating tape may also be applied to "deaden" the valves. The vibration from the loud speaker is picked up principally by the panel and parts of larger area, rather than by the valves themselves, and transmitted to the valves; it is for this reason that anything in the nature of anti-microphonic supports helps towards a reduction of the nuisance.

The question of the composition and construction of the valve "cap" or "base" is one which has been much considered in relation to the general scheme of "low-loss"; it has also, however, a bearing on the suitability of the valve for special purposes. It is well known that the inter-electrode capacity has an important influence on the behaviour of the valve, especially for the shorter wave-lengths. The inter-electrode capacity depends upon a number of factors, but principally upon the amount of "base" composition between the electrodes and the nature of the same.

Low Capacity Valve Effects.

Attempts have been made to remove as much as possible of this composition, leaving the valve base more or less in the form of a skeleton, with good results upon the performance.

It might at first be thought that the removal of a portion of the insulating composition of the valve base from between the electrodes was in the nature of "splitting hairs." That it really does have an important effect, especially, as mentioned above, in short-wave work, is confirmed by the experiences of a well-known transmitting amateur, who states that he has found the greatest difficulty in obtaining a valve of sufficiently low internal capacity for his work on low wave-lengths. It is for this reason that a small power valve is often found superior to a large one.

The particular amateur mentioned describes a valve which he found suitable for his purpose, and which he used with great success on 5 and 45 metres. At 5 metres a current of 0·4 was obtained with 800 volts on plate and 5 on filament; at 45 metres, 1·1 with 900 volts on plate and 6 on filament; and at 150 metres, 1·3.

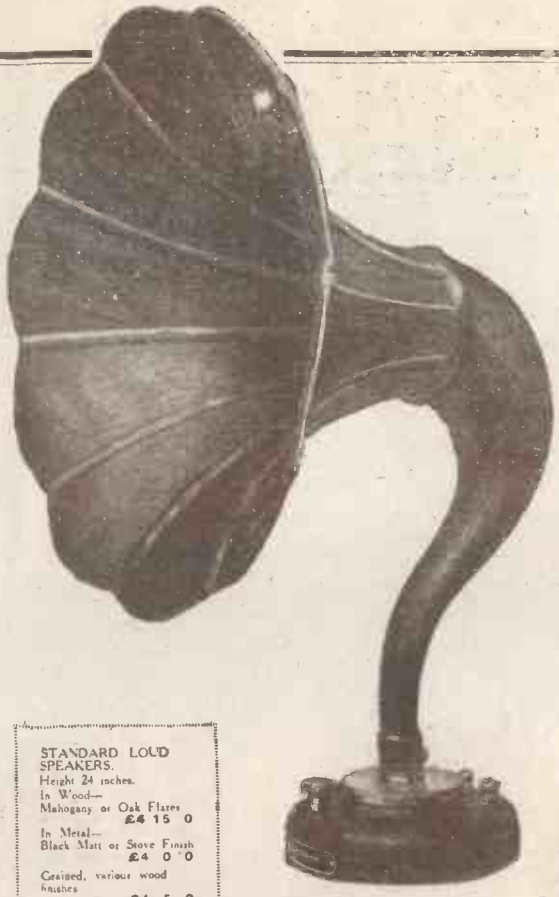
He adds that there is scope for a similar type of low-capacity valve for reception on very short waves, in which air dielectric, small pinch, and distributed base would appear to be essential.

A Safety Device.

A useful little component is the "Protex" fuse for accumulators. This consists of a small length of channel-shaped insulating material, fitted with a terminal at each end, and a spade for attachment into the circuit. A piece of fuse wire, of appropriate gauge, is connected in the two terminals and in this way protects the accumulator and the set in case of excessive current drawn from, or fed into, the accumulator.

(*Continued on page* 837.)

They Reproduce Faithfully



MUSICIANS speak of the violin as though it has a soul. How many loud speakers deserve such praise? The A.J.S. models certainly have a good claim. In addition to reproducing the high and the low notes with equal fidelity, all the over-tones receive instant response. It is this fact which gives to our instruments the soul of the violin.

They are beautifully made in our own factories, and each one has to pass the exacting test of delivering an enormous volume of undistorted speech and music.

The Mahogany and Oak flares are constructed by an A.J.S. patented process, which makes them better in appearance, mechanically, and as reproducing instruments.

We have designed, for those who prefer the hornless type, cabinet models which are fine examples of artistic woodcraft, without in any way sacrificing their qualities of reproduction.

If metal horns are preferred, these may be obtained with glossy black or matt finish. We also supply them so skilfully hand-finished with colour and graining that it is difficult to believe that they are metal and not the highly-polished woods they are made to resemble. These grained models can be obtained in two shades of Oak, Mahogany, Rosewood, and Walnut.

Visit our Showrooms in London and Glasgow and hear these loud-speakers at your ease.
We will gladly send to those interested publication No. 118, which describes our full range.

STANDARD LOUD SPEAKERS.
Height 24 inches.
In Wood—
Mahogany or Oak Flares £4 15 0
In Metal—
Black Matt or Stove Finish £4 0 0
Grained, various wood finishes £4 5 0

JUNIOR LOUD SPEAKERS
In metal. Height 19-in
Black Horn £1 15 0
Grained wood finish £1 17 6
Cabinet Model in Mahogany £4 15 0
Pedestal Model in Mahogany or Rosewood £22 10 0

A.J.S. Headphones

THESE headphones give loud and clear signals; they are particularly sensitive, and are designed to give fine tone. They do not clamp the ears, being very light and comfortable to wear. They are very easy to adjust, but once set they remain, even after removal from the head. High resistance only **£1.**

A·J·S

A. J. STEVENS & CO. (1914) LTD.
RADIO BRANCH, WOLVERHAMPTON.
Telephone: 1748 (7 lines). *Telegrams:* "Reception, Wolverhampton."

LONDON SHOWROOMS:
122/124, CHARING CROSS ROAD, W.C.2
Telephone: Regent 7161/2. *Telegrams:* "Ajayessco, Westcent, London."

GLASGOW SHOWROOMS:
240/250, GREAT WESTERN ROAD, GLASGOW.
Telephone: Douglas 3449. *Telegrams:* "Reception, Glasgow."

ISSUED BY THE PUBLICITY DEPT. A.J.S.

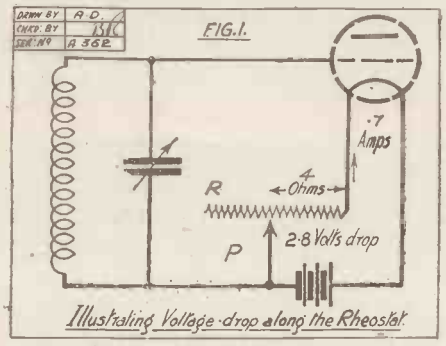
"AUTOMATIC" GRID BIAS.

A CONVENIENT METHOD.

By SEXTON O'CONNOR.

The constructor will appreciate the simplicity and reliability of the method suggested in this short article.

So much stress is laid nowadays on the importance of using correct grid bias, particularly on the L.F. side of amplification, that it is difficult to understand why the point is so frequently ignored in actual practice. The modern type of valve is no longer designed in slipshod fashion. The internal impedance and magnification factor is carefully calculated



for the particular work it has to perform, and characteristic curves are issued by the manufacturers, showing its performance under given conditions of grid and plate voltages.

In these circumstances, the neglect of proper provision for controlling the initial value of grid voltage simply illustrates the old adage of "spoiling the ship for a ha'porth of tar." It may be a small point in itself, but as representing the difference between good and bad quality loud-speaker reception it is well worth more serious attention.

Using the Filament Rheostat.

It may be argued that the usual method of potentiometer control involves the use of special grid cells and extra adjustments, both of which are undesirable from the point of view of simplicity and ease in handling the set. This may to some extent hold water as a "selling point," but is a poor argument where undistorted loud-speaker reception is the main consideration.

There are two methods of securing grid-bias potential without using a special dry-cell battery. One of these consists in utilising the potential drop across the filament rheostat; the other, less well known in practice, involves the insertion of a high-resistance wire in the plate circuit.

The first method is illustrated diagrammatically in Fig. 1. It will be seen that the grid connection is taken directly to the negative pole of the accumulator—i.e. the most negative point in the system—whilst the filament rheostat R is inserted between the sliding arm P and the negative leg of the filament.

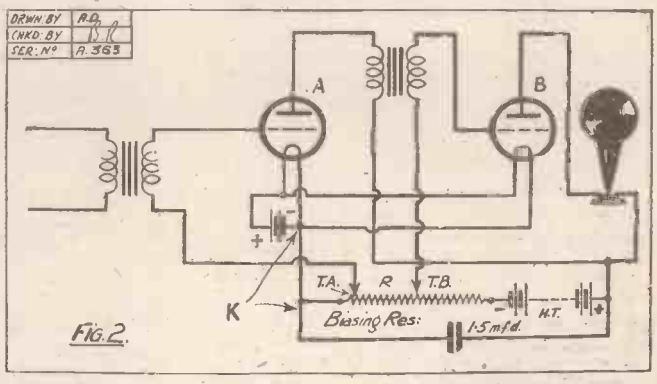
In the case of an ordinary bright-emitter valve, the average filament current can be taken as ·7 amp. The usual value of the total rheostat resistance is between 7 and 9 ohms. If, for example, 4 ohms of this is in circuit with the filament, it follows that the voltage drop or potential difference between the end of the filament proper and the pointer P equals 4 × ·7, or nearly 3 volts. In other words, the grid is in this way automatically "set" nearly three volts below the most negative end of the filament, a value that is quite sufficient for ordinary H.F. amplification or for the first L.F. stage.

Not Suitable for D.E's.

This method of grid adjustment is, however, unsuitable for use with dull-emitter valves, where the filament amperage is small. It will readily be seen, for example, that with a filament current of ·05 amp. it would be necessary to have 20 ohms of the rheostat in series to give a drop of 1 volt—which is a potential difference only equal to that naturally acquired by an insulated grid without any externally applied bias.

Another drawback to rheostat grid control is that any adjustment of the rheostat necessarily alters the basic "setting" of the operative grid potential. If, for example, there is only 2 ohms of the rheostat wire in circuit, the voltage drop across the grid and filament (with a bright-emitter valve) falls immediately to 1·4 volts. For obvious reasons it is desirable to waste as little of the accumulator juice as possible across the rheostat, and this in itself is inconsistent with the provision of an adequate negative bias on the grid.

A more convenient and reliable method of providing an "automatic" grid bias is illustrated in Fig. 2, and depends upon the use of a high-resistance winding R inserted in the plate circuit between the negative terminal of the H.T. battery and the negative pole of the filament accumulator. This plan was first suggested by Mr. R. H. Wilson, and is recommended by Dr. van der Bijl in his standard text-book on Thermionic Tubes, though the actual arrangement shown is due to Mr. P. W. Williams (Patent No. 209184.)



Resistance in the Anode Circuit.

The point of common potential between the plate and filament circuits is marked K in the figure. Tracing the potential fall through the first valve circuit, we start from H.T.+ and pass through the valve A to the point K, which represents the most negative point on the filament. This point is, however, clearly at a higher voltage than the negative pole of the H.T. battery where the plate circuit ends.

Consequently, the tapping point, T A, taken to the grid of the first valve, must be at a negative potential relatively to the filament (point K), whilst the second tapping, T B, to the grid of the second valve is at a still lower level to the common filament potential.

About 1,500 ohms Necessary.

The steady value of plate current in a loud-speaker set ranges from seven to fifteen milliamps according to the number and type of valves in use. Taking a typical value of 10 milliamps, the voltage drop over a resistance R of 500 ohms would be 5 volts, or with a 1,000-ohm resistance 10 volts, the latter being quite sufficient to cover the bias ordinarily recommended for a second-stage power amplifier.

This voltage drop will not fluctuate to any appreciable extent for ordinary adjustments of the filament rheostats. In the case of dull-emitter valves, it is safer to count upon a reduction of 25 per cent in the plate current and a corresponding diminution in the available voltage drop across the resistance R. In practice this diminution could be counterbalanced by increasing the value of the resistance R, without any loss in efficiency, since the effect of even 1,500 volts additional ohmic resistance in the plate circuit is small by comparison with the total resistance (generally 30,000 ohms or upwards) including the plate-filament space inside the bulb.

The resistance R and H.T. battery should be shunted by a condenser of between 1 and 2 microfarads, to provide a shunt path of low impedance for the L.F. currents flowing in the plate circuit.

BROADCAST NOTES.

By O. H. M.

The Post Office and the Future—Gramophone Broadcasts—Lunch Time Transmissions—A Sound Scheme—Another Telepathy Experiment—Better Broadcast News ?

THE Post Office has made a determined move in the great game of deciding the future of broadcasting in this country. Although I have no reason to change the opinion expressed last week as to the lines on which the Committee has already agreed, it is still perhaps worthy of note that the different interests involved have by no means abandoned the contest for ascendancy.

The cryptic communique which followed Sir Evelyn Murray's evidence at the opening session on November 19th has been causing a good deal of dissatisfaction in Parliamentary circles. Apparently certain officials have been indiscreet enough to indicate that they have already decided to make broadcasting a part of the telephone service, and that the concurrence of the Government Committee is a mere matter of form.

This has not escaped the attention of members of Parliament, but whatever the Post Office may decide, and indeed whatever the Broadcasting Committee may decide, the final word rests with Parliament. I would counsel all those who are interested in broadcasting to devote particular attention to the progress of events at this juncture.

Gramophone Records.

The vexed problem of the use of gramophone records in broadcasting programmes has been revived in much more acute form than ever before. Although it is true that less than 10 per cent. of total broadcasting time is occupied by gramophone records, the number of those who desire this form of broadcast entertainment appears to be decreasing considerably. The general opinion seems to be that except for the hour's broadcasting of new records at lunch time on Thursdays, there is no real justification for the inclusion of gramophone records at other times.

Curiously enough, if gramophone records were not announced as such it would oftentimes be extremely difficult to identify them, or distinguish them from ordinary performances. But I imagine that practically the whole of the present agitation has its origin in the unfortunate necessity of using a gramophone record to fill in the time which the Dickens broadcast was supposed to occupy. It is perhaps a striking tribute to the generally accurate timing arrangements of the B.B.C. that when, as on the occasion of the Dickens broadcast, there was an error of 15 minutes, it attracted almost universal attention.

I anticipate that there will be a steady reduction in the present small proportion of time devoted to gramophone records.

More Transmissions Needed.

A curious new agitation has started against the lunch time transmissions. Some listeners are complaining that nobody but traders benefit from the special concerts put cut from 5 X X between 11 and 2 p.m. daily. This is quite wrong. A close investigation has proved that a very large class of night workers is now for the first time provided with an opportunity of enjoying broadcast programmes.

Moreover, these lunch-time concerts are of increasing value to hospital patients and to sick people all over the country.

I think it would be very wrong to cancel this innovation, but the attack brings us back to consideration of the necessity of continuous broadcast programmes from 11 o'clock in the morning until midnight. In the case of Daventry this is now almost achieved, but there are still a few gaps unoccupied, such as that between 2 o'clock and 3.15. These must be filled up as soon as possible.

Technical Considerations.

Since Captain Eckersley and Captain Round published their general schemes for recasting the British broadcasting system, a curious calm has settled on the whole problem.

Mr. Phillip Snowden, M.P., ex-Chancellor of the Exchequer, broadcasting from 2 L O.

This, of course, is partly due to the fact that the Broadcasting Committee is precluded by its terms of reference from considering technical problems. On the other hand, I think it is a grave pity that the subject should be allowed to go into the background as it has done.

Competent technical opinion is united on the lines of the new system of regional transmitters. Until such a system is put into operation there is bound to be increasing trouble from interference of all kinds.

Moreover, there is no chance of adequate alternative programmes until the new system is working. Another point is that the substitution will take at least 15 months.

If, therefore, the scheme is to be in operation by February or March, 1927, it must receive Post Office sanction before the end of this year. The B.B.C. is known to be convinced not only of the soundness of the scheme but of its economy and utility. This being so, I, as a humble listener, would like to see something done about it at once, and I shall be very much in the position of a rebel both to the B.B.C. and to the P.O. if the matter is allowed to slide until the New Year.

Mass Telepathy.

I am glad to hear that my remarks about the levity with which the massed telepathy broadcast was conducted has had some effect. It is one very good thing about the B.B.C. that they are certainly ready to acknowledge their mistakes and to accept suggestions.

This case is no exception. I am informed that a massed telepathy test is now being organised and will be carried out on scientific and strictly competent lines early in the New Year.

Broadcast News.

I hear that the newspaper interests are petitioning the Broadcasting Committee to place still further restrictions on news. They are likely to have a big shock, as I am informed on the best of authority that it has already been decided to allow the broadcasting of news at all times of the day and night after the end of 1926.

After all, this is only acting in line with broadcasting in United States, where news is broadcast as soon as it is available, and apparently no newspaper has suffered in any particular. There is a great difference between broadcast news and the news which appears subsequently in the columns of the newspaper.

The former is a mere skeleton, the latter is amplified and is coloured with human interest. Far from damaging newspapers, modern experience goes to prove that broadcasting the skeleton of news actually helps circulation, and makes the appetite of the public keener.

Extensive Experimenting Emphasises Ediswan Worth!

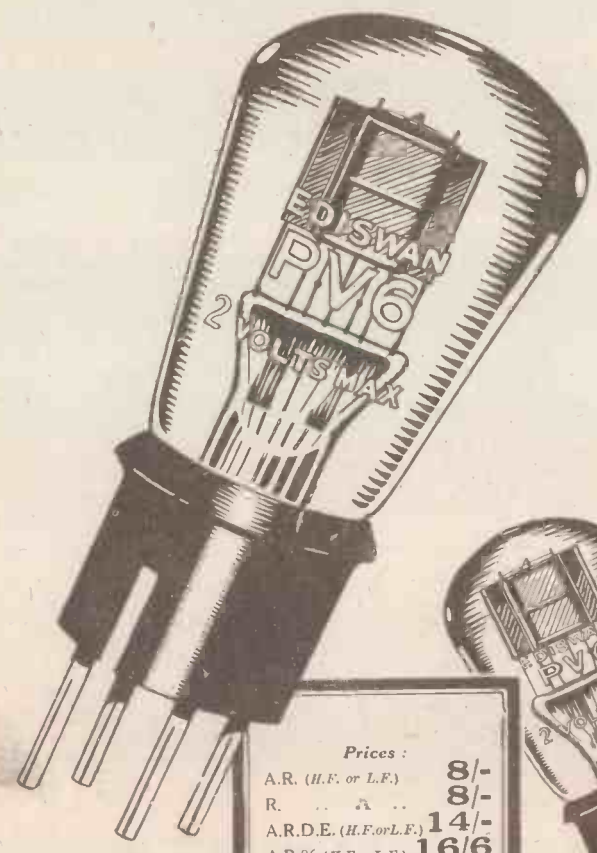
The greater your adventures in Wireless, the greater will be your appreciation of Ediswan Valves—the clearer will each experiment demonstrate that Ediswan Valves are unexcelled by any other make in the World.

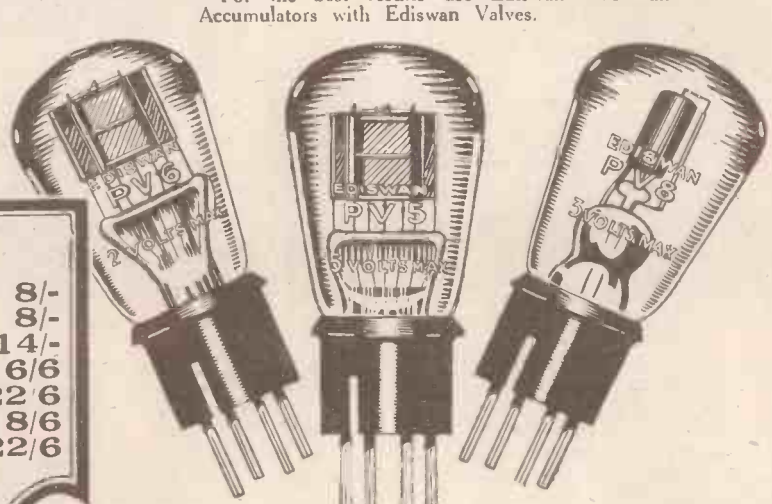
The best results will obviously be obtained by Ediswan co-operation. There is an Ediswan Valve for every specific purpose.

THE VALVES TO USE.		
Receiving	Accumulator or battery. Volts.	Power.
A.R. A.R.D.E A.R.06.	4 2 3	P.V.5. P.V.6. P.V.8.

As time goes on you will be all the more astonished at the long life of these valves and of their unusual economy.

For the best results use Ediswan H.T. and L.T. Accumulators with Ediswan Valves.





Prices :	
A.R. (*H.F. or L.F.*)	8/-
R.	8/-
A.R.D.E. (*H.F.orL.F.*)	14/-
A.R.06. (*H.F.orL.F.*)	16/6
P V.5.D.E. ..	22/6
P.V.6.D.E. ..	18/6
P.V.8.D.E ..	22/6

ASK YOUR WIRELESS DEALER FOR . .

EDISWAN VALVES

Will Improve ANY Set

THE EDISON SWAN ELECTRIC CO., LTD., 123/125, Queen Victoria Street, London, E.C.4.

THE BATTERY FOR DULL EMITTER VALVES

Exide

THE LONG-LIFE BATTERY

TYPE D T G.

If you use ·06 Dull-emitter valves, the Exide D T G cell is the most economical Battery you can buy—cheaper than any dry battery.

With one valve, two D T G cells (connected in series) will provide current for 290 hours.

Unlike dry cells, these need not be thrown away, but can be re-charged repeatedly, and after each charge will provide current for a further 290 hours—three hours every night for over three months.

The type D F G is big brother to the above D T G type, and gives 2¼ times the capacity at only twice the price.

Two D F G cells will run a three-valve set (·06 D.E. valves) for 200 hours between charges.

These types are supplied in a dry-charged condition needing only the addition of accumulator acid to make them ready for immediate use.

TYPE D T G	TYPE D F G
Price each 5/-	Price each 10/-
Capacity 20 amp. hrs.	Capacity 45 amp. hrs.

These cells are also suitable for operating Bells, Telephones, Clocks, Signalling Circuits, etc.

THE Chloride ELECTRICAL STORAGE COMPANY LIMITED.

CLIFTON JUNCTION, NR. MANCHESTER.

The largest Battery Works in the British Empire.

LONDON : 219-229, Shaftesbury Avenue, W.C.2. 'Phone : Regent 8070.

BIRMINGHAM : 58, Dale End. 'Phones : Central 7629/30.

MANCHESTER : 1, Bridge Street. 'Phone : Central 2075.

BRISTOL : 22, Victoria Street. 'Phone 6460.

GLASGOW : 40-44, Tureen Street. 'Phone : 985 Bridgeton.

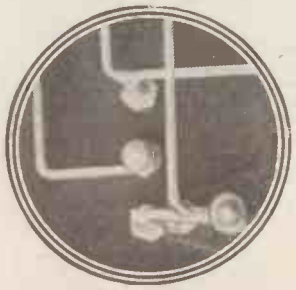
OBTAINABLE FROM ALL EXIDE SERVICE AGENTS OR FROM YOUR USUAL DEALER.

A quick application of a hot iron and solder to a clean joint will result in an efficient connection.

HOW TO WIRE UP YOUR SET.

By H. MEADOWS
(Technical Staff, "Popular Wireless.")

WIRING up a set for the first time may present difficulties to the home constructor who has had no previous experience, but when the principal points have been mastered it becomes quite easy.



A "close-up" of several neatly soldered joints.

The tools required are neither numerous nor expensive.

A soldering iron for wiring should weigh about ¾lb.; a larger one is not recommended, as it will prove troublesome to get in between components which may be rather close together.

Two pairs of pliers will be necessary, a pair of "cutters" and a pair of "round-nosed," also a 6 in. or 8 in. flat file.

Of course, other tools may be purchased if desired, but those mentioned above will be found quite sufficient.

There are many different kinds of wire that can be used; round or square tinned copper wire, wire already provided with insulating covering, wire which needs no solder, etc But square section tinned copper wire (busbar) is mostly used on account of its rigidity and low H.F. resistance. Of the multitude of fluxes, "Fluxite" is undoubtedly one of the best for our purpose, as it has none of the disadvantages of liquid fluxes, which splash when heat is applied to them. The effect on an ebonite panel is disastrous, and they should on no account be used. A few sticks of soft solder will complete the outfit.

Heat the iron in a gas or similar flame—for instance, a primus stove—and while it is getting hot scoop a little of the flux into a clean, shallow tin lid, with a few short pieces of solder cut from one of the sticks.

When the iron is sufficiently hot the flames around it are tinged with green, and heat should be felt if it is held several inches from the hand.

File the tip of the iron for about an inch all round, and dip it into the tin lid containing the flux and solder, turning it over in the mixture until all the filed portion is evenly coated with solder. It is then "tinned" and ready for use.

The Preliminary "Tinning."

Before commencing the wiring, go over the set very carefully and make sure every point which is to have a lead soldered to it is clean and bright. If there are any that are greasy or dirty, clean them up with the file, taking care, of course, to clean away any resulting "brass dust" from the panel.

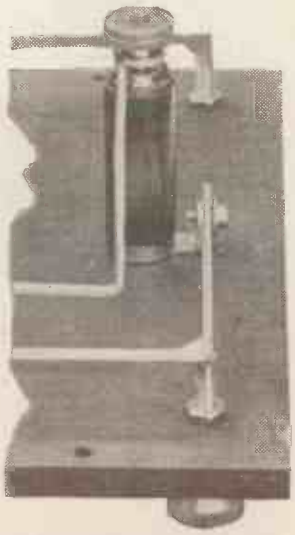
Showing how a series of soldered terminal connections should be made.

Apply a little flux to all the points, melt some solder on the tip of the iron, and rub it gently over the prepared surfaces.

Hold the iron on the job for a few seconds, and on removing it the surface should be "tinned" similarly to the iron. Take care that no flux gets on the panel while tinning or soldering any joint, or, should this happen, clean it off immediately before it has time to set, otherwise surface leakage will occur, with a consequent loss of signal strength.

Having tinned all terminals, valve legs, etc., decide which lead you will do first, and cut and bend the wire to shape, using the square part of the round-nosed pliers to make right-angle bends and the pins, of course, to make loops. Smear a little flux on the ends of the lead, and tin each end by applying some molten solder on the end of the iron.

Hold the lead in position and place the iron on to the joint, with a little more solder, and hold still until the solder has run all around the joint. Remove the iron and let the solder set.



An intermediate soldered connection neatly made in a lead.

If due attention has been paid to these points, the resulting joint should be firm and bright; if, however, it is rough and dull the iron was too hot. On the other hand, should the solder seem sluggish and reluctant to run, the iron is not hot enough. It should melt solder readily as soon as applied to it.

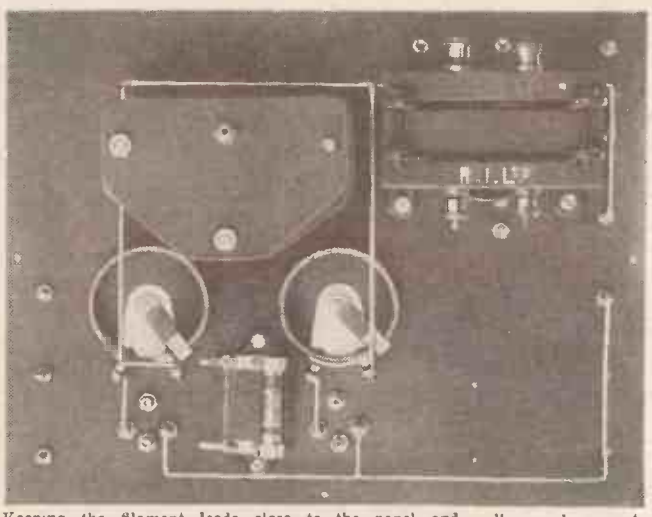
Should any joint appear unsatisfactory, in order to meet trouble half-way and avoid it coming loose later on, make quite sure that it is strong; if it is not, resolder it.

Proceed with the wiring carefully and systematically. If, as is usual, the wiring is being followed from a wiring diagram, it is a good plan to mark each lead on the diagram when it is in position on the set.

Space all leads well, and do not hesitate to lengthen any other lead, if by doing so it will keep grid and plate leads as short as possible.

The wiring on a wiring diagram usually closely resembles the actual wiring, and by following the diagram carefully good results are assured. If it is a "P.W." constructional article from which the set is built, and photographs of the finished set are included, the clear photographs of the wiring and components given will also be of assistance when endeavouring to decide how to shape a long and complicated lead.

(Continued on page 806.)

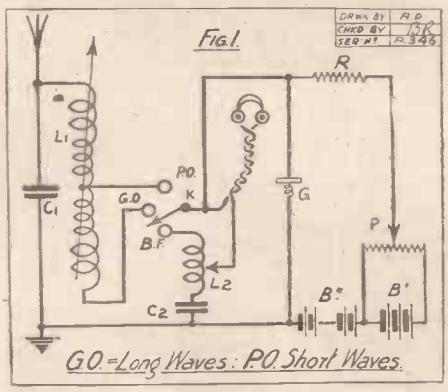


Keeping the filament leads close to the panel and well spaced prevents dangerous "shorts" and is the first step in systematic neat wiring.

MORE ABOUT THE OSCILLATING CRYSTAL.

Details of circuits worked out and actually tried by a well-known Russian Radio engineer.

THE oscillating crystal, developed by a Russian, M. Lossev, has been attracting considerable attention in Europe these past few months, and many and remarkable are the tests, circuits, and results gained by radio amateurs on the Continent and British Isles. Among the most important, perhaps, from a standpoint of practicability and utility for the average amateur are those



worked out and actually tested with success by one of M. Lossev's friends, M. Vinagradow, a radio engineer formerly with the big Belgian radio company, and now doing some special radio work for one of the biggest technical magazines in Europe.

A Long-Wave Circuit.

These circuits, by the way, are not due to M. Vinagradow, but were taken by him from the inventor himself and tried out before any judgment was passed. M. Vinagradow says that, while there is a wide difference of opinion in Europe, the one camp claiming that the oscillating crystal is useless, the other that it will soon replace the valve, he, personally, considers them to be very promising.

The first diagram gives an idea of a receiver made for zincite crystal which allows for the reception of the higher wave-lengths from 2,600 to 13,000 metres. The batteries B1 and B2 are ordinary dry batteries, B1 being only one element and B2 being two elements of 4·5 volts, placed in series. The potentiometer P has a resistance of about 400 ohms, being made of 9 metres (about 29 ft. 6 in.) of nikeline wire (42 S.W.G.).

The resistance R is really an H.F. choke, and should have as large an inductance as possible, a very low self capacity, and be wound in sections on a multislotted former, filling the first, then passing to the next. It is a good idea to wind with enamelled or silk insulated copper wire of about 42 S.W.G., of which some 1,250 feet will be found necessary.

The coil L2 should have an inductance of about 0·03 henry, and can be wound on a wooden former 60 mm. long by 20 mm. diameter. In this case some 475 ft. of insulated copper wire of 28 or 30 S.W.G. Two honeycomb coils of 250 and 500 turns each can be used. If the inductance is wound by the experimenter, he must be careful to arrange for a tapping after 50 turns for the connection with the telephones. It should also be wound in sections.

Practical Details.

The condenser C2 should have 0·25 mfd. capacity.

The condenser C1 should have a capacity of ·1 mfd.

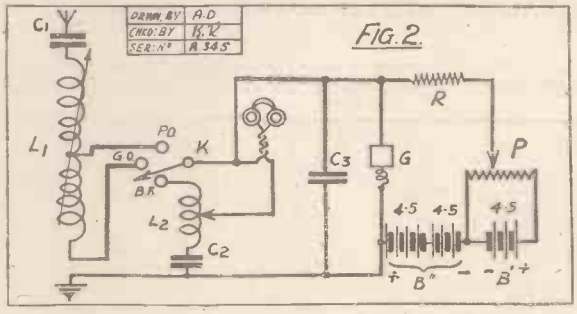
The variometer L1 is made of two coils, turning one within the other, the exterior coil being composed of two sections of 38 turns each, wound with 24 S.W.G. wire. The interior or rotor part of the variometer is composed of two sections of 50 turns each of the same wire.

The detector is composed of a pointed steel wire of ·34 S.WG., wound in a spiral, and the zincite crystal (Zn0). The cleavage should be red and the surface black. *It is the red part which contains the sensitive points.* The detector should be placed on a piece of sponge or soft rubber, to increase the stability of the system.

The three contacts of the switch K should be widely enough separated to avoid all possibility of two of these contacts being covered or touched by the switch point at the same time.

In Fig. 2 is shown a diagram for a circuit to be used for reception below 1,000 meters. Here the capacity of the condenser C3 is ·004 mfd.

For proper operation of these sets the switch should be placed in the position P.O., the steel point of the cat's-whisker placed on the red part of the crystal, at the same time removing the



potentiometer P. In the telephones will be heard the usual whistling of low-frequency oscillations produced in the circuit C2—L2. Search the crystal for a sensitive point, if the first fails to produce this whistling and when this spot is found, place the commutator K in the position P.O. or G.O., according to the wave-lengths required—P.O. for short waves, G.O. for long waves. Turn the variometer L1 to bring in the station desired.

At this moment the continued oscillations are tuned in the circuit L1, C1, and the set is operating like the ordinary regenerative valve circuit. C.W. stations are now heard in whistling notes, damped waves on a sort of lower blowing note. By means of the potentiometer P the maximum intensity can be found in just the same manner as one works with regeneration in ordinary valve sets.

WIRING UP YOUR SET.

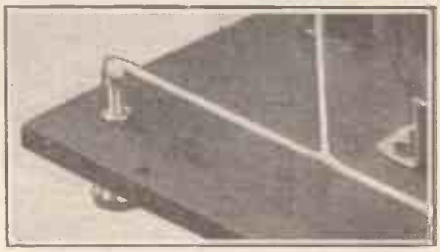
(*Continued from page* 805.)

When a set is constructed on a wooden baseboard, the wiring should be kept well away from such, as wood is absorbent, and if it should get damp, leakage is apt to occur.

On certain components tags are provided for connections, and when soldering to them be quite certain that there is a good contact between the tag and the terminal to which it is attached.

Flex leads are sometimes necessary when connections are to be made to moving coil-holders, plugs, and sockets for change-over connections, or for grid bias battery plugs. Whenever flex leads are shown, keep them short, and use a good quality flex, as cheap and poor quality flexible wire may break inside the covering, causing a lot of worry before the fault can be located.

When all the wiring is finished, get a piece of clean, dry rag and wipe any traces of flux off the joints or panel. If any brass filings or spots of solder are on the panel, brush them all off, and pay especial care to



An illustration of efficient terminal and vertical intermediate connections.

valve legs. If by any chance a film of flux has found its way between them, scratch between them diagonally with the tang of the file, scoring the ebonite deeply if it is at all likely to cause a leak. Check the wiring from the list of point-to-point connections, and then the set is ready for test. If every instruction has been carried out the set should work.

Tracing Bad Joints.

While it is working test for loose connections by tapping the panel.

If everything is tight nothing should be heard except a "ping" caused by the valves.

Any loose connection or bad contact will cause a loud crackling when the panel is tapped, and this means that the wiring may have to be overhauled again. It may, however, be caused by a valve or coil fitting loosely, or a lead from the batteries to the set, or even by a dud telephone cord. Above all, when in difficulties, remember that patience and a hot iron will work wonders.

Help yourself!

TAKE your choice of any part of the world. With an Ormond Condenser station after station can be tuned in quickly and sharply, no matter how closely the wave lengths approximate. Paris, Madrid, Rome, Breslau—any part of Europe, any part of America. With an Ormond Condenser nothing is simpler. But it must be an ORMOND—the result of 25 years' British manufacturing experience.

Ormond Low-Loss Condensers

SQUARE LAW (Patent applied for.)

Supplied in the following sizes:

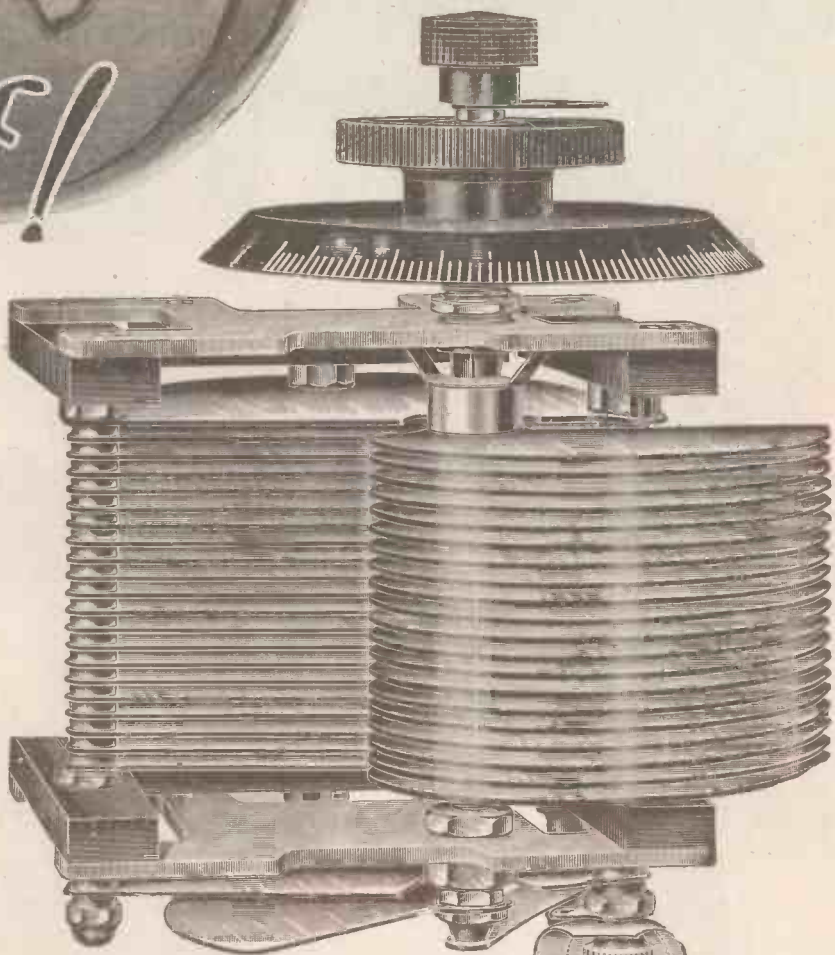
Size.	Price with Vernier.	Price without Vernier.
·00025	8/-	6/6
·0003	9/-	7/6
·0005	9/6	8/-
·001	10/6	9/-

Complete with knob and dial.

We specialise in turning Brass and Steel Screws and Machined Parts and Accessories of all descriptions.

Ask your dealer to show you these Ormond Condensers—the best dealers stock all Ormond products.

ENGINEERING ORMOND COMPANY



See the Inspection Label on every Condenser.

139-205, Pentonville Road, King's Cross, London, N.1.

'Phones: Clerkenwell 9344, 5, and 6.
'Grams: "Ormondengi, Kincross."

Factory:—Whiskin Street, Clerkenwell, E.C.1.

25 YEARS' BRITISH MANUFACTURING EXPERIENCE.

A 2 VALVE Chitos SET

The Set designed and described by P. R. BIRD
(*Assistant Technical Editor*).

Constructional work by
G. V. COLLE and H. MEADOWS
(*Technical Staff*).

ALTHOUGH the first details concerning the Chitos circuit were published in "P.W." nearly two years ago, it is still one of the most popular "hook-ups" among "P.W." readers. It owes its popularity to its almost "super" selectitity and sensitivity. It is not a simple circuit to handle, and readers who do not know it are warned that its extreme liveliness can cause considerable interference if it is not carefully controlled.

The panel layout, it will be observed, provides both a pleasing symmetry of appearance and an accessibility of controls.

Actually it is a modification of a transmitting circuit, and to this is due the fact that oscillation is so freely available. Very excellent results have been obtained by hundreds of constructors who have built Chitos receivers, and many are of the opinion that it is the best one-valve hook-up that has ever been evolved. That but very few failures indeed have been recorded is proof of the straightforward nature of its design.

The Chitos circuit, with a stage of L.F. amplification added to it, is a combination capable of providing extraordinary volume and excellent reception ranges. To work a small loud speaker with the one-valve Chitos is by no means an uncommon feat in the case of the local station, and many readers have comfortably accomplished it, so that the possibilities of a two-valve Chitos should be apparent.

So far full constructional details of such a receiver have not been given; the one described in this article will be quite new to "P.W." readers. Not that we did not realise the capabilities of such a set before this, but we have withheld the publication of such for a reason vaguely indicated above. A Chitos one-valve is "lively"; a Chitos two-valve is, if anything, more lively. But we feel that by now there exists a greater appreciation of the value of a silent ether than hitherto! It comes with experience, and with the increase in the number of valve users.

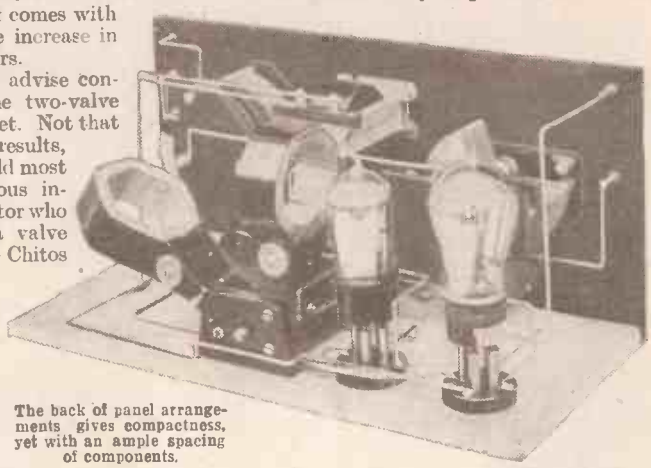
We therefore do not advise constructors to make the two-valve Chitos their first valve set. Not that they would fail to get results, but in so doing they would most undoubtedly cause serious interference. The constructor who knows how to handle a valve set will discover in the Chitos a receiver of real merit, and it is to him that this article is particularly addressed.

As will be seen by Fig. 1, the combined circuit introduces no complications. Except for the insertion of an H.F. choke, readers will recognise the original Chitos with a straightforward L.F. amplifying stage added. The choke is necessarily introduced for stabilising purposes, and, incidentally, it permits both stages to employ the one H.T. battery.

Vernier condensers are essential in this receiver, as also are first-class filament resistances, for the filament control is, in the Chitos, one of the most important tuning adjustments. The variable grid leak is another very important item, and must be of high efficiency if really good results are to be obtained.

LIST OF COMPONENTS.

	£	s.	d.
1 panel, 13 x 6½ x ¼ in., with cabinet and baseboard (Peto-Scott)	1	6	0
1 ·0005 variable condenser, with vernier (Peto-Scott) ..		10	6
1 ·0003 variable condenser, with vernier (Peto-Scott) ..		9	6
2 Lissenstat major rheostats ..		15	0
1 Lissen H.F. choke		10	0
1 Bretwood variable grid leak		3	0
1 2-coil holder (Peto-Scott) ..		13	6
1 max-amp. transformer, Blue Band (Peto-Scott)		19	6
2 base mounting valve-holders		3	6
8 Terminals		1	0
Wire, screws, transfers, etc. ..		3	0

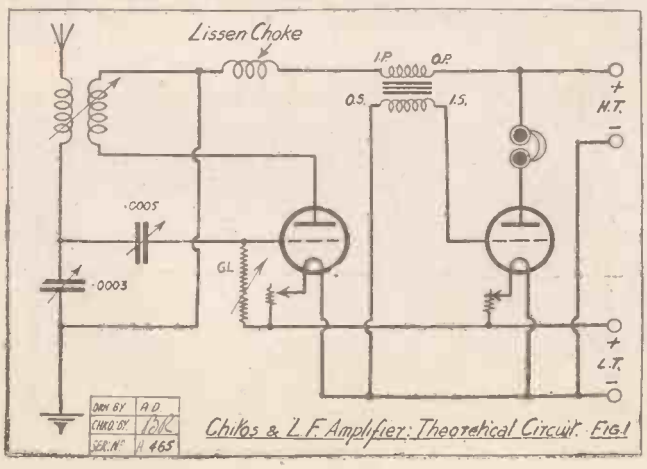


The back of panel arrangements gives compactness, yet with an ample spacing of components.

Two variable condensers, a variable coil coupling, a variable grid leak, and at least one filament resistance figure in the tuning of the Chitos receiver, so that it will be seen that quite a number of components must be entirely above suspicion.

Lissenstat majors, although rather expensive, are excellent for the purpose, as is also the Bretwood variable grid leak

(*Continued on page* 810.)



Chitos & L.F. Amplifier: Theoretical Circuit. Fig. 1

A 2-VALVE CHITOS SET.

(*Continued from page 809.*)

specified in the accompanying list of components. The L.F. transformer is by no means a critical item; any one of good make can be used. The H.F. choke must be of fairly low capacity, and the Lissen can be recommended.

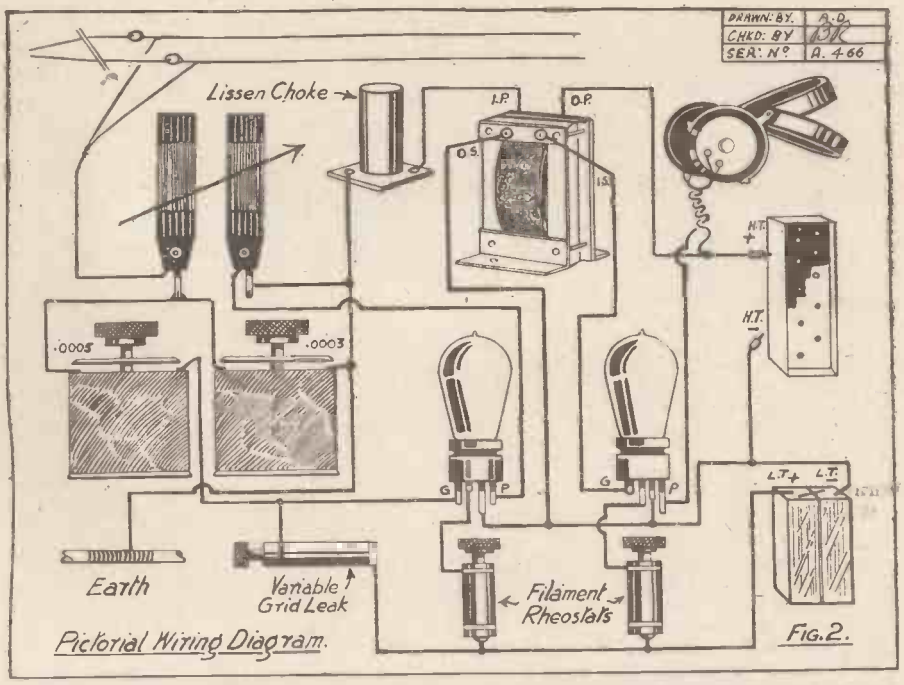
The components shown in Fig. 2, the pictorial diagram of the circuit, are not supposed to resemble any particular makes, but are fairly representative in appearance and show very clearly how the circuit is actually wired up.

Drilling the Panel.

Having obtained all the necessary parts, the work of assembly should be commenced by marking out and drilling the panel in accordance with the details given in Fig. 3. The holes for the coil holder should be drilled very carefully in accordance with the measurements given, in order to ensure neat fitting. By the way, the coil holder, if any other than the type specified is used, must be provided with a vernier action.

Constructors will appreciate that it is wise to give careful consideration to any alternative components that might be on hand, and which they desire, if possible, to use, more especially if it is pointed out that the receiver is designed on compact lines. There is plenty of room if the lay-out shown in the photographs and the panel measurements are adhered to, but there is not much room to spare.

In order to make a nice permanent job of the set the terminal holes in the panel should be threaded so that the terminals screw into position, and do not fit through loosely before they are fixed by means of nuts. It is frequently the case that nuts tend to loosen subsequent to the application of heat incidental to soldering.



Pictorial Wiring Diagram. FIG. 2.

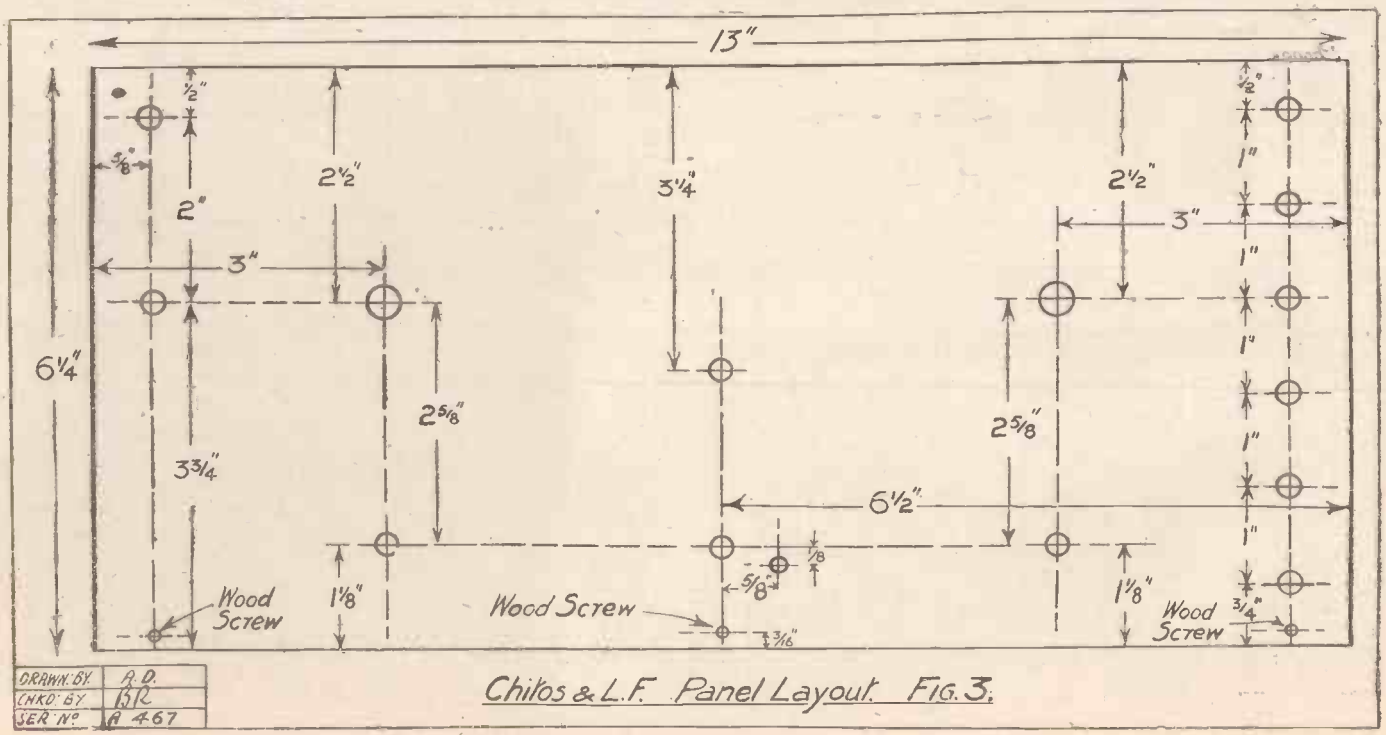
It cannot be too often pointed out that ebonite must be drilled carefully with metal-working drills, otherwise there is a danger of cracking and chipping occurring, as the best of ebonite is rather brittle.

Having drilled the panel, the terminals can be mounted and the panel screwed to the baseboard. Subsequent to this all the other components can be mounted. The H.F. choke should be fixed by means of two metal-thread screws driven into threaded holes which do not quite pass through the panel. This tends to preserve the front appearance of the latter; except for this, of course, small counter-sinking screws and nuts can be used in holes taken right through. The L.F. transformer, too, should be mounted behind the panel in the same way and in the position indicated in the photographs—i.e. equidistant from each end and an inch or so from the top edge of the panel.

An Unusual Feature.

An unusual feature of this receiver will probably come to the notice of the constructor at this juncture, and that is the total absence of fixed condensers. It is not claimed that none *can* be used, but our experience is that the circuit is better without them. There is no reason why the constructor should not try the effect of a ·001 or so across the 'phones, or across

(*Continued on page 811.*)



Chitos & L.F. Panel Layout. FIG. 3.

A 2-VALVE CHITOS SET.

(*Continued from page* 810.)

the primary of the L.F. transformer; in certain instances they might prove beneficial.

Anyway, after all the components have been mounted the wiring can be proceeded with. Soldering wherever possible is recommended, although only non-acid fluxes, such as Fluxite, should be used.

The filament wiring should be carried out first, and this can be kept low and near the baseboard. Special note should be taken that there is no connection between L.T. and earth. This is unusual, but the omission is an essential feature of the circuit.

Wiring Details.

When the leads to the H.F. choke are soldered on, the precaution should be observed not to let the soldering iron come into contact with the casing of the choke, or to heat its terminals too much, otherwise the casing composition will be melted.

There is little else in connection with the wiring that needs to be emphasised. The wiring diagram, Fig. 4, the point-to-point check, and the photographs should make everything perfectly clear. Especially the last-named should prove useful in showing the constructor the best direction for each lead to take.

POINT-TO-POINT CONNECTIONS.

Aerial terminal to one side of A.T.I., the other A.T.I. connection being taken to the moving plates of both variable condensers. The fixed plates of the ·0005 condenser are taken to grid of first valve and to one side of variable grid leak. The fixed plates of ·0003 variable condenser are connected to earth. Plate of first valve goes to one end of reaction coil, and the other end of same is connected to earth and through H.F. choke to I.P. of transformer, O.P. to H.T.+, I.S. to grid of second valve, and O.S. to L.T.−, completing transformer connections. The plate of second valve is taken to one 'phone terminal, the other going to H.T.+. H.T.− is connected to L.T.− and direct to outer filament connections of both valves. L.T.+ is taken through Lissenstats to inner filament connections, and also to variable grid leak.

The completion of the wiring should be followed by a careful survey of the whole receiver, in order to check over, not only the connections, but the action of the coil holder, noting whether the coils clear everything, and also whether they clear the valves and whether the valves clear the wiring, etc. Also, the variable condensers should be examined carefully, and any tendencies towards scraping vanes gently corrected.

Any ebonite dust or flux remaining should be removed, and a little methylated spirit on a soft rag comes in very useful for this purpose.

Transfers should be fixed on to the front of the panel to give it a "professional" appearance, and then the set is ready for the preliminary test.

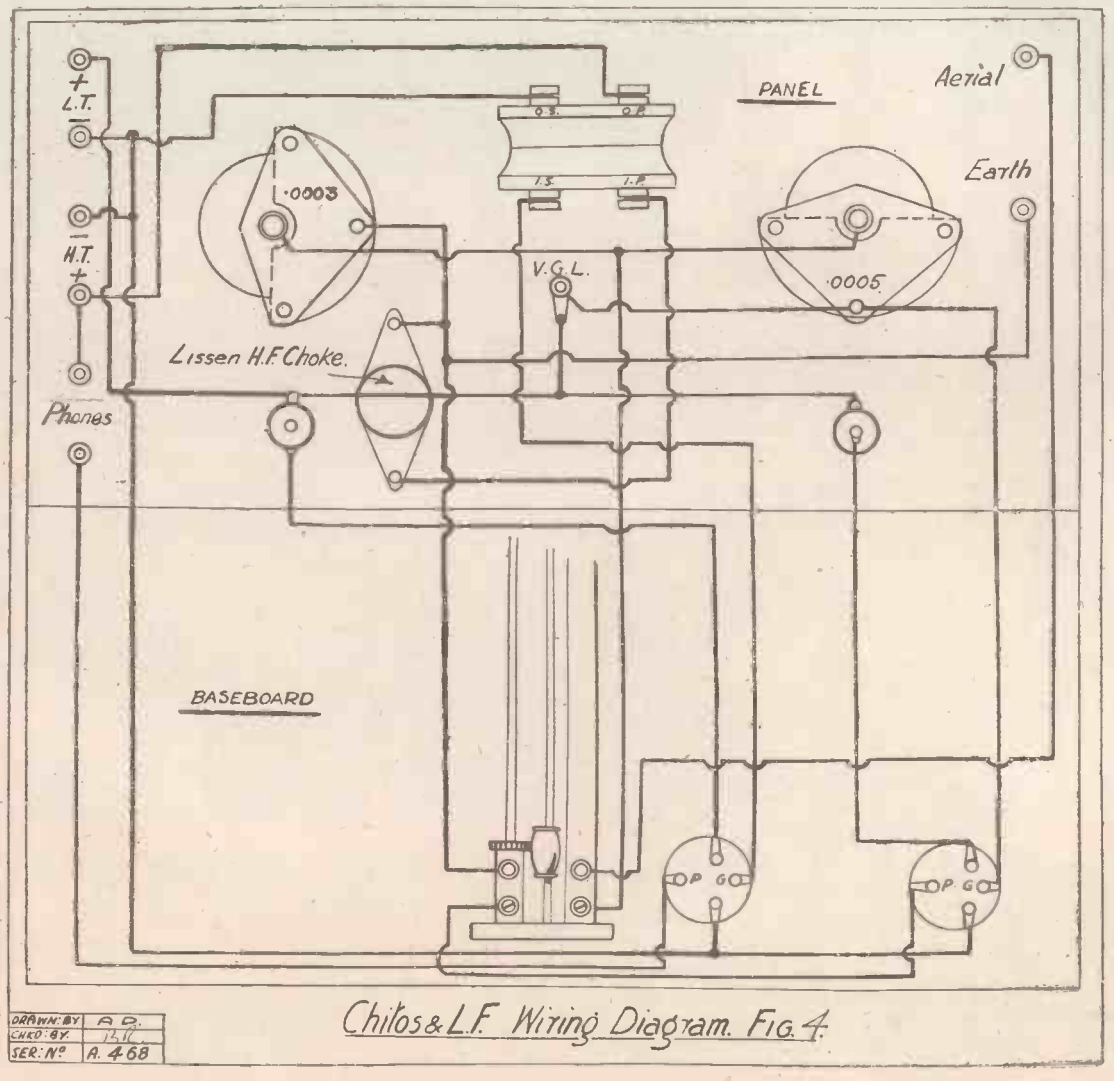
The Receiver in Operation.

A Mullard Red Ring or any H.F. valve operates well in the first position, and any good L.F. valve in the second, 60 or so volts H.T. being used, although this should be varied while tuning until the best working value is decided upon.

The range of reception, and, indeed, the signal volume obtained with this receiver, will depend to a very great extent upon how the set is handled. There are no hard and fast tuning rules that can be laid down. The coils generally found to be most suitable for normal wave-length broadcasting are 100 turns for the aerial and 45 to 50 for reaction. 5 X X requires a 300-turn aerial coil and a 150 to 200-turn reaction.

The operation of the receiver follows ordinary lines up to a point. The reaction adjustment and the adjustment of the variable condensers is straightforward enough, but these must be supplemented by filament and grid leak adjustments. A careful balancing of all these will provide the excellent results of which the set is undoubtedly capable. It is not quite such an involved business as it would appear to be at first sight, and a little experience in the case of those who already have handled valve sets will show it to be fairly simple. It is not, however, it must be repeated, a receiver that should be placed in the hands of the tyro. Like most other sets of a "super" nature, it is "super" even to its controls!

Once having obtained a working knowledge of the operation of the Chitos receiver, however, it will be found that it is quite a nice set to handle. It has a flexibility and smoothness of reaction control equal to that of a Reinartz, although being slightly more complicated. It will be noticed, however, that although all the adjustments are interdependent, they are, nevertheless, all *logically* interlinked.



Chitos & L.F. Wiring Diagram. Fig. 4.

HINTS ON TUNING COILS.

SEVERAL good types of plug-in coils are on the market, and the only fault to be found with most of these is the unreasonably high price, which is prohibitive to the man with large aspirations and small income. There are, however, one or two faults to be looked for in some coils of this type. Firstly, examine the coil and make sure that vulcanised fibre is not employed in its construction. Vulcanised fibre, during its manufacture, is saturated with a solution of zinc chloride, and traces of this salt are left in the finished product, causing considerable high-frequency losses by virtue of its highly hygroscopic nature.

Secondly, the covering of the wire, usually double cotton, should be impregnated with some moisture-resisting varnish. This statement will appear iconoclastic to many in view of the many articles published on the increase of self-capacity due to varnishing, but cotton readily absorbs moisture from the atmosphere, and a trace of moisture not only introduces large H.F. losses, but also increases the self-capacity many times more than the varnish would. Therefore, make sure the windings are impregnated.

Long-wave Coils.

Thirdly, see that the mechanical construction of the coil is sound, and that the gauge of the plug is standard. Nothing is more annoying than the coil which, once placed in the holder, needs a vicious tug to disengage it. The coil should be rigidly attached to the plug body, with no possibility of relative motion, and the plug body should be constructed of ebonite rather than of moulded composition. The outer layer of the coil should be covered to protect it from mechanical damage.

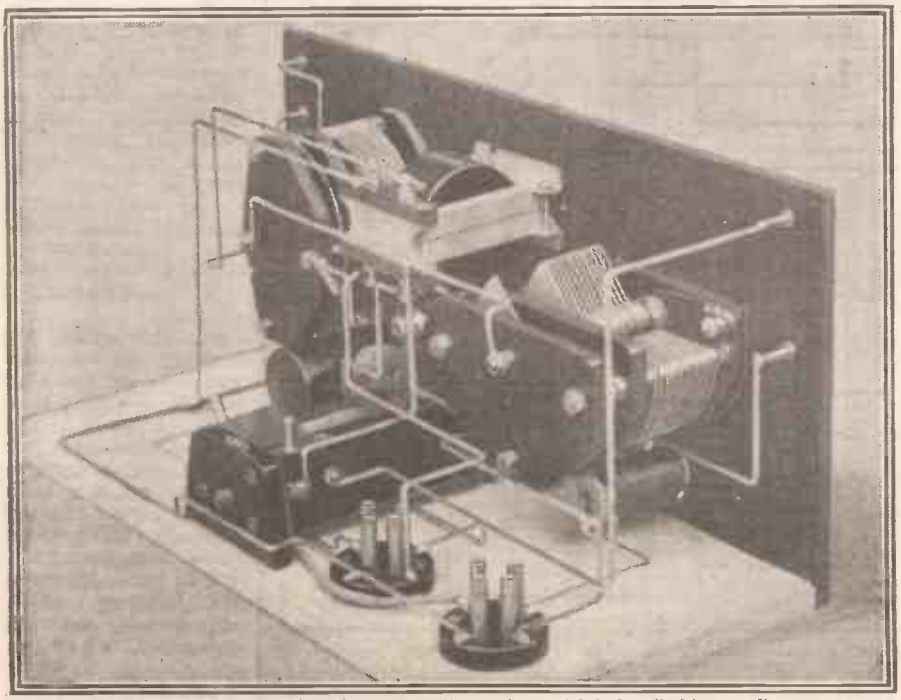
If your means are limited, basket or single-layer coils wound with wire not smaller than 26 S.W.G., and protected from moisture by varnish, are at least as efficient as, and considerably cheaper than, coils of the honeycomb or duolateral types for broadcast reception, whilst for the higher wave-lengths pile-wound coils of three or five layers of finer wire—say 32 S.W.G.—may be employed without appreciable loss of signal strength.

Tapped Coils.

Tapped coils can be used with very good results for wave-lengths up to 4,000 metres, and possess the advantage that tuning to stations of various wave-lengths is accomplished more readily and much more cheaply.

The coil should be wound on an impregnated card former, using wire of a fairly large gauge for the short wave tappings (say 24 S.W.G. D.C.C.), and a finer gauge (say 30 or 32 S.W.G.) for the higher tappings. The lower tappings should be single-layer wound, whilst for economy of space the higher tappings may be pile wound. A convenient way of taking the tappings is as follows: A piece of insulating sleeving is inserted under the tapping turns, and after the coil has been varnished with thin varnish and thoroughly dried by baking, the covering can be scraped from the wire and the tapping connections soldered on.

A double brush should be fitted to short-circuit the section next to the last in use, and this will be found to practically eliminate dead-end effects.



Another back-of-panel view of the two-valve Chitos receiver which is described in preceding pages.

FOREIGN RADIO NEWS

From Our Own Correspondent.

Italy Plans Changes.

A REORGANIZATION of Italian stations is impending. Some of the changes have already been announced in these Notes. Among the others projected are the moving of the Rome 6,000-watt station to Naples, and the erection of a new 12-kilowatt station in Rome. It is understood that the Marconi people have obtained the contract for this last.

Plans are being studied for one station in Southern Italy, possibly at Tarento, and for one in Sicily.

Riga Gets Going.

Stimulated by the example of their elder sisters, the Scandinavian States, the smaller Baltic Republics are beginning to show considerable radio activity. Some weeks ago Esthonia entered the field, and now Latvia has followed this lead. So far the country has only one station, but it is a very well equipped one, at Riga. It works with 2,000 watts, and uses a wave-length of 488 metres. As Riga is one of the best musical and dramatic centres in Northern and Eastern Europe, it should be well worth while to try and pick up its programmes.

Chinese Station Alters Wave-length

The Shanghai station has altered its wave-length to 356 metres. It broadcasts a daily two-hours' programme, in which announcements are made both in English and in Chinese. The hours of transmission are, by European (Greenwich) time, from 2 to 4 a.m.

India Enters the Field Seriously.

So far India has shown backwardness in radio matters, but things are now looking much brighter, and a scheme is being studied for a network of stations, some independent, some relaying the Madras and Calcutta programmes. A beginning of the new series has been made by the erection of a new broadcasting station at Rangoon in Burma.

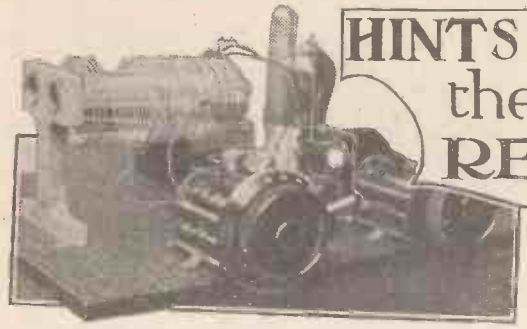
Political Enthusiast Causes Trouble.

Some annoyance has been caused in Budapest by the action of a mysterious amateur who, on the birthday of Archduke Otto, regarded by many as the rightful King of Hungary, broadcast stirring political appeals on behalf of the young Pretender's cause.

The offence, from the viewpoint of the anti-Royalists, was aggravated by the fact that the politico-radio enthusiast seized this opportunity, not only to sing the praises of his youthful hero, but to indulge in much vituperation concerning political opponents, and included therein a number of indiscreet not to say grossly libellous statements concerning their private characters.

Every effort was made to trace the offender, whose apparatus was strong enough to interfere with reception from normal stations, but without success, and people are wondering how far this new terror is likely to develop.

(*Continued on page* 839.)



HINTS on WORKING the 10-Metre RECEIVER

By E. J. SIMMONDS, M.I.R.E., F.R.S.A.

The article on Constructing a 10-metre Receiver, which we published exclusively from the pen of Mr. Simmonds in a recent issue, aroused considerable interest, and in this article Mr. Simmonds offers some useful advice on its correct operation.

SINCE I described a fortnight ago the construction of my 10-metre short-wave receiver, I have had many inquiries from amateurs asking for details on how to operate such receivers. This is rather a difficult matter to explain, as the methods of operation will vary tremendously with the types of receivers employed, but I think that if I describe one or two little points necessary to the operation of the set mentioned above, this will probably clear up a lot of the difficulties referred to by my correspondents.

Of course, as I have said many times before, the design of a short-wave receiver is, next to the choice of its components, the most important factor towards its successful operation.

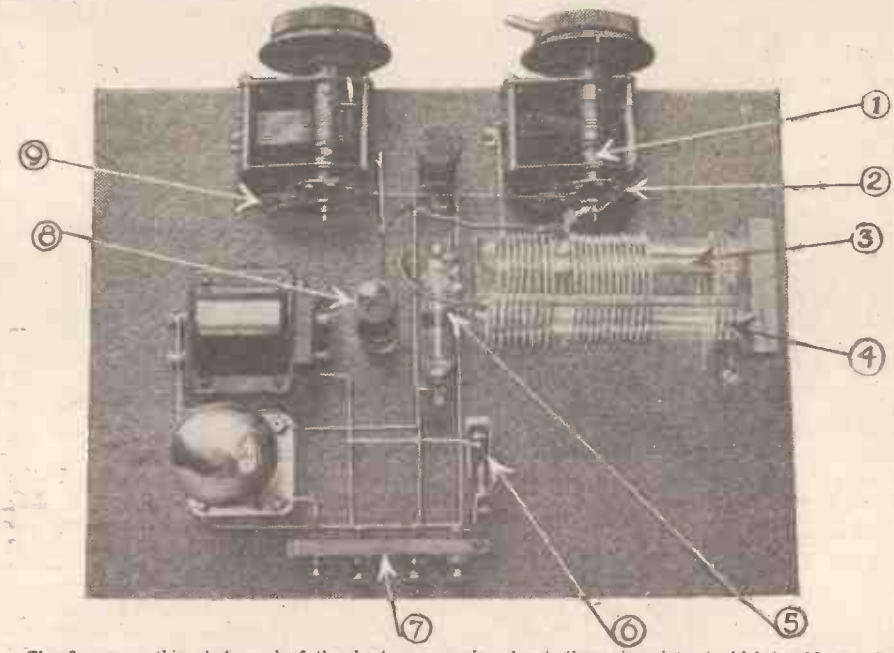
In the first place, not only should all the connections between the components and the set itself be kept short, but external leads between the batteries and the receiver should also be kept short. It is essential to insulate the batteries from earth, as this has an important bearing on the successful operation, especially below 15 metres. Should howling occur in any short-wave receiver after the L.T. leads have been shortened and both batteries insulated from earth on a glass or porcelain sheet (very often ebonite is not sufficient), a couple of small H.F. chokes placed in the external L.T. leads will usually stop the trouble.

Filament Control.

With regard to the H.T. battery, trouble may often arise if this is of the dry cell type, using rather small cells, even though a large condenser has been placed across it. I advise all short-wave enthusiasts to use accumulator H.T., or at least the new type of large dry battery recently devised for power-valve operation. Here, again, short leads are most important and the battery should be insulated from earth, while it is also of extreme importance that the H.T. condenser be of thoroughly reliable manufacture.

For the reception of weak C.W. signals, the Brown "A" type telephones of 4,000 ohms resistance are specially to be recommended. The electric construction of these receivers is quite different from other types. The receiving coils are wound on the pole pieces of a permanent magnet as usual, but the ordinary flat diaphragm is replaced by an iron reed, tuned to a suitable note, to which an aluminium cone-shaped diaphragm is attached. The resonant period of the iron reed is approximately 960 cycles per second, at which point the efficiency of the telephone is much increased. If, therefore, one can arrange the resulting beat note of the set to coincide with the resonant period of the telephones, the maximum sensitivity will be obtained for the wanted signal, and other disturbing signals will be much reduced in intensity. I have gone very fully into this detail, because much of the success in reading very weak signals through interference depends on the intelligent use of this method.

Another point in the operation of the 10-metre receiver is the control of the filament current of the DEQ valve. This requires fairly careful handling, as, if the filament is over-run, the electron emission becomes too copious, with the result that the reaction control will be too coarse and will give overlap. This must be avoided at all costs if a really sensitive condition of the set is desired, because it is impossible to pick up weak signals if the valve is oscillating violently. For best results it is essential that reaction be applied so that the valve just goes over the point of oscillation, for it is at this point the set is in its most sensitive state and also the background will be at its quietest.



The figures on this photograph of the short-wave receiver denote the main points at which trouble may be experienced. Nos. (1), (2), and (9) show the bearings of the variable condensers, and these should be well cleaned and oiled to prevent noises occurring when the vanes are moved. Loose coupling of (4), the aerial coil, is necessary for good results, the coil being arranged to slide along (3) till best results are obtained. The filament of the valve (5) must be kept at the correct temperature; while (6), the H.T. condenser, must be of reliable manufacture. No. (7) shows the terminal strip, which must be free from surface leakage; while (8) shows the choke which must be of as low a self capacity as possible.

Weak Signal Reception

It may be as well to explain, for the benefit of those who are not used to condenser reaction control, that overlap in this case means that reaction takes place at a different setting of the condenser from that at which it leaves off. For instance, suppose the set begins to oscillate when the reaction condenser dial is at 30, then, if the set is properly adjusted, reaction will leave off at 30 when the condenser is being turned in the opposite direction. If overlap exists, however, it will be found that reaction will continue until the dial has been turned back to, say, 28, or perhaps 25, having two or five divisions lag or overlap.

When listening for weak signals, it is essential that the aerial coupling be very loose, for if the aerial coil be tightly coupled to the secondary, reaction will probably become difficult or patchy, owing to the aerial absorbing a great deal of the energy in the secondary circuit. Incidentally, the use of a tight aerial coupling will make it very difficult to pick up weak signals at all, while any strong signals are likely to jam the weaker signals.

When interference is troublesome, much can be done by utilising the resonant period of the telephones as described above. But, in any case, very careful handling of the receiver will be needed, and the reading of these signals through other louder noises is an art that can only be acquired by long practice. In order to obtain this skill, I advise all amateurs to keep away from loud signals as much as possible, as these only tend to deaden the ear and make it insensi-

(*Continued on page* 814.)

PREPARING A PANEL.

Some Tips for Constructors.

(From a Correspondent.)

WHY is it that an experienced constructor can finish wiring a four- or five-valve set without soiling the panel at all, whilst the novice, tackling his first one-valve set, nearly always half-spoils his set by dirt, smears, and dust, behind the panel? There are dozens of little dodges that only come with practice, but most novices could greatly improve their efforts by bearing in mind the simple rule of "clean-up as you go."

Avoiding Bad Contact.

Trouble usually commences as soon as the panel has been drilled, for there is a certain amount of importance in the order in which the various components are mounted upon it. Generally the best plan is to mount all the terminals first, and to file their ends ready for soldering before any other components are mounted. The reason that the "old hand" generally works on this principle is that terminal-ends generally need rather a lot of filing, and a great deal of brass-dust consequently attends this operation. If the panel is perfectly clean and dry when the terminals are put in place most of this dust will not adhere to it, but the "old hand" takes no chances, and he invariably holds the panel vertically whilst filing, so that most of the brass-dust falls straight on the floor or work-bench. What little remains of the filings can then be wiped off the panel with a dry duster, and all the messy dust which would otherwise have secreted itself in inaccessible places behind the wiring is prevented from giving trouble at the later stages. The plan has another great advantage, for this dust is an enemy to variable contacts in condensers and so forth. By mounting and filing the terminals first all risk of bad contact or leakage from this source is avoided.

Another Good Dodge.

Another tip which a novice is likely to learn only by bitter experience is that of testing components before wiring them up, as far as it is possible to do so. A dry-cell combined with a pair of 'phones or a flash-lamp will detect troubles such as intermittent contact quite as easily as they are detected after the whole set is wired up—and there is no doubt as to which of these times is the more convenient to locate such a fault! After terminals are disposed of, and before large apparatus like variable condensers restrict the space on the panel, the small components such as rheostats and grid leaks can be fixed in place. Rheostats should always be mounted "in line" as far as their terminals are concerned (unless the wiring is out of the ordinary), for unless the contact to all of them can be made by one long lead touching or passing close to all of them, the filament-circuit-wiring becomes unduly complicated.

Following this method of mounting means that when the panel space becomes limited by large components, the panel itself is perfectly clean, and everything upon it is ready for wiring.

This latter operation leaves no mess whatever if every joint is wiped with a clean rag as soon as it is soldered. Whilst it is hot the flux is easily removed by a soft cloth, and it is this process of clean-up-as-you-go that accounts for the beautiful neatness of a panel wired by a constructo who knows his job.

One other little dodge which facilitates good wiring and leaves the completed set looking very neat and workmanlike is to fasten small fixed condensers in place last of all. By this method it is generally possible to support them by the wiring, instead of fixing them directly to the panel. In such a case they can be placed either where they will help to support and strengthen long leads, or else in a rather "blank" portion of the panel which looks a little bare and would tend to spoil the appearance of the set. A further advantage is that it becomes unnecessary to tap into the panel in order to insert fixing-screws for the condenser.

German transmitting apparatus that was in use as far back as 1910.

HOW TO OPERATE THE 10-METRE RECEIVER.

(Continued from page 813.)

tive to the weaker long-distance transmissions. It is only by practice that these long-distance signals can be successfully "copied," but such achievements can be reached, and some of the finest and most astounding long-distance work has been done through what appeared at first to be hopeless jamming.

The Variable Condensers.

I have several times mentioned the advantages of the G.E.C. slow motion variable condensers, but there is one little point at which they may cause trouble, and this is at the frictional drive at the back of the condenser. Occasionally, this will give rise to scratching noises, especially when the set is tuned to wave-lengths below 15 metres. These noises can be removed by wiping the brass driving cones at the back clean and oiling the whole mechanism with a good thin machine oil, taking care that no grit is present at any point on the condenser.

Then I should like to re-emphasise the need for cutting down mutual interference as much as possible when working on the short wave-lengths. The amount of energy radiated from the receiving aerial over distances of, perhaps, several miles becomes an important factor when one is searching for extremely weak signals, such as those from the Antipodes or from California, etc., and at times I have found the amount of local interference to be of such intensity that long-distance reception becomes impossible—are "mush" is responsible for much short-wave interference.

It has been found by experiment that an ordinary receiving valve, using about 60 volts H.T., and oscillating strongly with a tight aerial coupling on about 40 metres, has given readable signals over a distance of 50 miles from the set.

As such results can be obtained on a wave-length of 40 metres and we know that shorter wave-lengths have, under favourable conditions, greater penetrating power, it seems only reasonable to conclude that a strongly oscillating receiver of about 20 metres may be capable of causing serious interference over a far greater distance, and so I must urge all those who undertake work on the higher frequencies to keep their aerial coupling as loose as is practicable for good results, and never to have their reaction coupling greater than is necessary just to keep the valve over the oscillation point.

Another factor in the successful operation of a short-wave receiver is the L.F. transformer, though this would seem to be a minor consideration. It is generally found that the average L.F. transformer has an amplification peak somewhere above 256 cycles per second, and if it can be arranged so that the beat note of the receiver coincides fairly closely with this peak we shall be sure of obtaining the maximum amplification available from the L.F. stage. Accordingly a transformer capable of giving good voltage amplification should be used, and if this has a peak somewhere about the required frequency so much the better, for we are not dealing with more than a few frequencies, and distortion, as noticed in telephony reception, is non-existent.

A Suitable Transformer.

I use a C.A.V. transformer, which appears to be exceptionally suitable for C.W. reception, especially if a ·00075 mfd. condenser is connected across its input to enable the maximum clarity to be obtained. Various capacities of condenser should be tried, but I have found the value stated to be the best.

TELEPHONE: OLD SWAN 751.

TELEGRAPHIC ADDRESS: VERNCOIL, LIVERPOOL

Garnett, Whiteley & Co., Ltd.

MANUFACTURERS of WIRELESS COMPONENTS.

—

"LOTUS" CUT GEARED VERNIER COIL HOLDER.
Two-way Outside Mounting 7/-
Three-way Outside Mounting 10/6
Two-way Inside Mounting 8/-
Three-way Inside Mounting 12/6.

—

"LOTUS" ANTI-MICROPHONIC VALVE HOLDER.

—

PRESS TOOLS.

—

PRESS STAMPINGS IN ALL MATERIALS.

—

PRESS TOOLS.

—

DRILLING and MILLING JIGS and FIXTURES.

—

ASSEMBLING FIXTURES.

—

MACHINE CUT GEARS, Etc.

"LOTUS WORKS"
Broadgreen Road,
LIVERPOOL.

To the Wireless Amateur,
Great Britain.

Dear Sir, December 5th, 1925.

You will no doubt be interested to know that the Lotus Vernier Coil Holder has been declared the most popular Coil Holder on sale to-day.

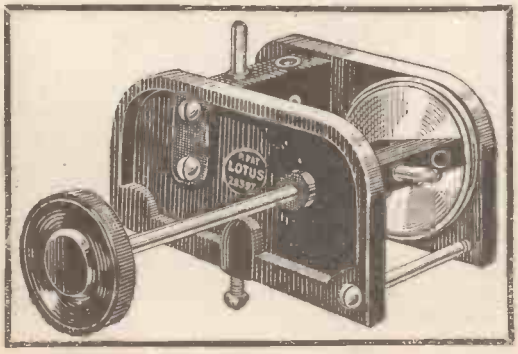
The recent Wireless Exhibition organised by the Manchester Evening Chronicle was probably the most successful wireless exhibition ever held in Great Britain.

One of the outstanding features of the exhibition was a Ballot for the most popular Wireless component, each visitor to the exhibition being handed a Ballot paper for this purpose and for which prizes to the extent of £100 were offered by Messrs. Franks, Ltd., of Manchester for the most accurate forecast.

Our Lotus Vernier Coil Holder headed the poll.

We take this opportunity of thanking those visitors to the exhibition who helped to place our Coil Holders in that proud position.

This verdict recorded in Manchester is also borne out by the Amateur users throughout the country, by the fact that the Lotus Coil Holders have to-day the largest sale of any type of Vernier Coil Holder.



Follow up the Manchester verdict by fitting a Lotus Vernier Coil Holder to your set, and you will quickly realise that you have the component that makes an ideal Xmas gift for your less fortunate wireless friend.

Yours Faithfully,

Garnett, Whiteley & Co., Ltd.

Louden VALVES

BRIGHT EMITTERS. 4/6

Type F.1 (the Plain Louden) for detection and L. F. Amplification. Type F.2 (the Blue Louden) for H.F. Amplification.

Filament Volts - - 4·5-5.
Filament Amps. - - 0·4.
Anode Volts - - - 40-80.

DULL EMITTERS. 8/- & 9/-

	4-VOLT.	6-VOLT.
Filament Amps. - -	0·1.	
Anode Volts - - -	40-80.	

N.B.—These valves consume only one seventh of the current taken by ordinary bright emitters. They will also work straight off a 4-volt or 6-volt Accumulator without alteration to Filament Resistances or Set.

Please state which type required.

POSTAGE 4d. on EACH VALVE.

"I have tried nearly every known valve, and for clearness and purity of reception, I find yours best.

"S. H., Abergavenny."

This is what one user of Louden Valves thinks and what you will think, too, if you use them. Louden Valves contain only the finest materials and workmanship, and their unique construction enables them to give the pure and distortionless reception which has been sought for so long by critical listeners.

The extraordinarily low price of Louden Valves is due solely to the new Fellows Policy by which the public can now obtain all the well-known products of the Fellows Magneto Co., *at practically Trade Prices.*

In every case, however, you must order the goods direct from us. Please enclose remittance (including 4d. postage for each valve) with order.

Write for Special Catalogue FREE.

To
THE FELLOWS MAGNETO Co., Ltd.
CUMBERLAND AVENUE, PARK ROYAL, WILLESDEN, N.W.10

Name .....

Address .....

.....

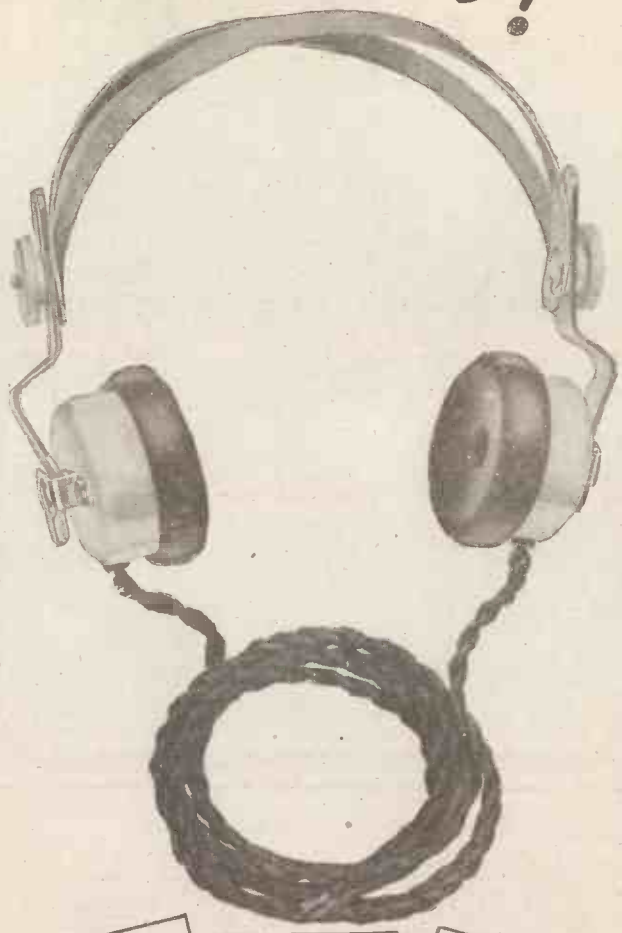
Herewith Remittance Value .....

Please forward me ..... *Louden Valve(s)*

Type .....*on conditions as per your advertisement.*

Please write clearly in BLOCK LETTERS and register Cash or Treasury Notes.
P.W. 5/12/25. E.P.S. 70.

Testimony!



Dunstan-on-Tyne. I have numerous friends who say they are the best they have ever listened through. I.L.J.

Wandsworth, S.W. I take this opportunity of congratulating you on the product of a perfect headphone. I have tried 5 other makes.

Rotherham My set has taken on a new lease of life since I changed to Ericsson's Telephones.

Catford I cannot refrain from writing to let you know what satisfaction your 'phones give me. I fixed one earpiece to a well-known make of loud speaker and results were wonderful.

Newton-le-Willows. I have had a pair of Ericsson Headphones in constant use 18 months and I greatly prize them.

I am ever so pleased with your 'phones I should have been money in pocket if I had bought them first.

Bridport. Fair weather or foul my Ericsson's get Cardiff daily on a 7/6 crystal set.

Write for Lists.

The BRITISH L.M. ERICSSON MFG. CO., LTD.
67/73, Kingsway, LONDON, W.C.2.

22/6
all resistances—there are three 120, 2,000 4,000 ohms.

Ericsson
SUPER-SENSITIVE TELEPHONES

THE "POPULAR WIRELESS" CONTINENTAL BROADCASTING TIME-TABLE.

Specially compiled by ROBERT R. PECORINI, M.Inst.R.E. ("2RI").

Transmission Starts G.M.T.	Transmission Ends G.M.T.	Station and Call Sign	Wavelength metres	Frequency kilocycles	Days of the Week	Nature of Transmission
05.40	19.15	Koenigswusterhausen (L P)	2525	119	Daily (throughout day)	Woolf's Press Service.
05.55	06.05	Hamburg*	395	759	Weekdays	Time.
05.55	06.05	Bremen	279	1075	"	Usually relay Hamburg.
05.55	06.05	Hanover	296	1013	"	"
06.00	20.00	Koenigswusterhausen (L P)	4000	75	Daily (throughout day)	News.
06.25	06.30	Hamburg*	395	759	Sunday	Time.
06.35	06.42	Lausanne (H B 2)	850	352.7	Weekdays	Weather (local).
06.40	06.46	Eiffel Tower (F L)	2650	113.1	" "	"
07.12	16.10	Amsterdam	1955	153	Daily (except M., Sat.)	News, Bourse.
07.30	08.30	Frankfurt-on-Main*	470	638	Sunday	Concert.
07.30	08.30	Cassel	273.6	1096	"	Relaying Frankfurt.
07.30	18.50	Koenigswusterhausen (L P)	2900	103.4	Daily (throughout day)	T.U. News Service.
07.30	10.30	Leipzig*	454	660	Sunday	Sacred music & Service.
07.30	10.30	Dresden	292	1027	"	Relaying Leipzig.
07.30	08.05	Eberfeldt	259	1158	"	Sacred Service.
07.30	08.05	Munster*	410 (287)	731 (1045)	"	"
07.30	08.05	Dortmund	283	1060	"	" Relaying Munster.
07.30	08.05	Helsingfors	370	810	"	Sacred Service.
07.30	08.45	Koenigsberg	463	648	"	"
07.30	11.00	Voxhaus (Berlin)	505&576	594 ; 521	"	"
07.50	08.07	Vienna	530	566	Weekdays	Markets.
08.00	08.10	Koenigsberg	403	744	"	"
08.15	08.30	Marignane	1526	196	Daily	Weather.
08.45	10.15	Copenhagen*	308	973	Sunday	Sacred Service.
08.45	10.15	Odense	950	316		Relaying Copenhagen.
08.45	10.15	Hjörring	1250	240		
09.00	09.20	Voxhaus (Berlin)	505&576	594 ; 521	Weekdays	Markets and Weather.
09.00	09.10	Oslo	382	785	Friday	Markets.
09.00	10.00	Komarov (O K B)	311	965	Sunday	News, Concert.
09.00	09.15	Leipzig	454	660	Sunday, Thursday	News.
09.05	09.30	Leipzig*	454	660	Weekdays	"
09.30	10.00	Rome (1 R O)	425	706	Sunday, Thursday	Sacred Concert.
09.40	10.30	Bloemendaal	345	869	Sunday	" "
09.40	10.30	Hilversum (H D O)	1050	285.7	"	" "
09.42	09.50	Toulouse (M R D)	1525	196	Daily	Weather.
10.00	11.00	Stockholm* (S A S A)	427	702.5	Sunday	Sacred Service.
10.00	11.00	Karlstadt (S M X C)	355	845		
10.00	11.00	Eskelstuma (S M V X) (Radio Club).	243	1234.5		
10.00	11.00	Norrkoeping (S M V V)	260	1154		
10.00	11.00	Joenkoeping (S M Z D)	265	1131		
10.00	11.00	Trollattan (S M X Q)	345	869		Mostly relay S A S A irregularly.
10.00	11.00	Fœlon (S M Z K)	370	810		
10.00	11.00	Malmœ (S A S C)	470	638		
10.00	11.00	Gothenburg (S A S B)	286	1049		
10.00	11.00	Sundsvall (S A S D)	545	550		
10.00	11.00	Linkoeping	467	642		
10.00	11.00	Boden (S A S E)	1250	240		
10.00	11.30	Barcelona (E A J 13)	460	652	Sunday	Sacred Concert.
10.00	11.00	Zurich	515	582	"	Concert.
10.00	11.00	Vienna (O T W)	400	750	Daily	Tests.
10.00	11.45	Sokolnicchi (Moscow)	1010	297	Tu., Thur., Fri., Sat.	Political Lecture.
10.00	11.50	Voxhaus (Berlin)	505&576	594 ; 521	Daily	Concert.
10.00	11.00	Leipzig*	454	660	Sunday	Educational Talk.
10.00	11.00	Oslo	382	785	"	Sacred Service.
10.00	10.10	"	382	785	Weekdays	Bourse.
10.00	10.15	Toulouse	441	680	"	Market prices.
10.00	10.15	Munich*	485	618	Wednesday	Chimes.
10.00	10.15	Nuremburg	340	882	"	Relaying Munich.
10.00	11.50	Breslau	418	717	Sunday	Sacred Service and Music.
10.00	11.50	Voxhaus (Berlin)	505&576	594 ; 521	Weekdays	Workers' Concert.
10.00	10.10	Koenigsberg	463	648	"	Weather.
10.30	11.30	Munster*	410	732	Sunday	Concert.
10.30	11.50	Eberfeldt	259	1158	"	"
10.30	11.50	Koenigswusterhausen (L P)	1300	231	"	"
10.30	11.30	Stuttgart	443	677	"	" Orchestra, Esperanto.
10.30	12.30	Koenigsberg	463	648	"	Sacred Service.
10.30	11.30	"	463	648	"	Concert.
10.45	11.00	Leipzig	454	660	Weekdays	"
11.00	11.10	Zurich	515	582	"	Weather.
11.00	11.30	Voxhaus (Berlin)	505&576	594 ; 521	"	"
11.00	11.10	Graz	404	742	Sunday	Orchestra.
11.00	12.00	Frankfurt-on-Main*	470	638	Weekdays	Bourse.
11.00	11.50	Leipzig	454	660	Sunday	Concert.
11.00	11.10	Helsingfors	370	810	Weekdays	Music.
11.30	12.25	Breslau*	418	717	"	Weather.
11.30	12.10	Munster	410	731	Weekdays	Concert (stat. orch.).
11.30	11.40	Stockholm (S A S A)*	427	702.5	"	Bourse, Markets.
11.37	11.43	Dutch Meteo (K N M L)	1100	272.6	Daily	Weather.
11.40	12.00	Hilversum (H D O)	1050	285.7	Weekdays (except Thur.)	Weather.
11.55	12.00	Leipzig	454	660	Weekdays	Police News.
11.55	12.00	Frankfurt-on-Main	470	638	"	Time.
11.55	12.15	Voxhaus (Berlin)	505&576	594 ; 521	"	"
11.55	12.15	Breslau	418	717	"	" Weather.
11.55	12.15	Zurich	515	582	Sunday	" "
11.55	12.05	Eiffel Tower (F L)	2650	113	Weekdays	" " Bourse.
11.55	12.00	Hamburg*	395	759	Daily (except Monday)	Market.
11.53	12.30	Frankfurt-on-Main	470	638	Sunday	Time.
11.55	13.00	Rome (1 R O)	425	706	Weekdays	Talk.
12.00	12.10	Munich	485	618	Sunday	Government comm'n
12.00	13.00	Ryvang*	1150	—	"	Time, Weather.
12.00	13.00	Odense	950	316	"	Divine Service.
12.00	13.00	Hjörring	1250	240	"	Relaying Ryvang.
12.10	12.20	Vienna	530	566	"	Time, Weather.
12.14	12.20	Eiffel Tower (F L)	2650	113	Daily	" "
12.15	13.30	Munster*	410	731	Weekdays	Lecture, Concert.
12.15	13.30	Eberfeldt	259	1158	Monday, Friday	Concert. Relays Munster occasionally.
12.15	12.40	Oslo	382	785	Weekdays	Markets : Exchange.
12.30	12.40	Lausanne (H B 2)	850	353	"	Weather (Zurich), Time
12.30	13.40	Radio-Paris	1750	171.3	"	Concert.
12.30	13.40	Toulouse	441	680	Daily	Music.
12.30	13.40	Zurich	515	582	Weekdays	Piano.
12.30	13.40	Moscow (R D W)	1450	207	"	News, Concert.
12.45	13.45	Radio Paris	1750	171.3	Sunday	Concert.
12.45	13.45	Hanover*	296	1013	"	Orchestra. Relays Hanover.
12.45	13.45	Hamburg	395	759	"	Weather.
13.00	14.30	Stockholm (S A S A)*	427	702.5	"	Concert.
13.00	14.00	Eberfeldt	259	1158	"	Orchestra.
13.00	14.30	"	259	1158	Weekdays	Time, News, Weather.
13.00	13.15	Toulouse	441	680	Daily	Concert.
13.00	14.30	Munster	410	731	Sunday	Children.
13.00	13.10	Brussels (B A V)	1100	272	Weekdays	Children.
13.05	14.30	Munster	410	732	Saturday	Concert ; relaying Bremen. Concert.
13.05	15.00	Hamburg	395	759	Weekdays	Orchestra.
13.05	15.00	Bremen*	279	1075	"	Bourse.
13.15	13.40	Toulouse	441	680	Daily	Lecture.
13.20	13.30	Voxhaus (Berlin)	505&576	594 ; 521	"	News, etc.
13.30	14.00	"	505&576	594 ; 521	"	News, Prices, Exchange
13.45	13.52	Radio-Paris (S F R)	1750	171.3	Sunday	Chess.
13.45	14.00	"	1750	171.3	Weekdays	Concert relay.
14.00	14.30	Voxhaus (Berlin)	505&576	594 ; 521	Sunday	
14.00	15.00	P.T.T.* (Ecole Supérieure)	458	655	"	
14.00	15.00	Lyons la Doua	479	626.3	"	
14.00	15.00	Pic-au-Midi	350	855	"	
14.00	15.00	Toulouse	315	952	"	Relaying P.T.T.
14.00	15.00	Grenoble	875	343	"	
14.00	14.30	Frankfurt-on-Main	470	638	Weekdays	Talk.
14.00	16.00	Breslau	418	717	"	"
14.00	17.00	Munich	485	856.6	Sunday	Concert.
14.00	15.00	"	485	618	Saturday	Women's talk.
14.00	14.30	Voxhaus (Berlin)	505&576	594 ; 521	Sunday	Chess.
14.10	14.30	" "	505&576	594 ; 521	Weekdays	Talk, News.
14.15	14.45	Hamburg*	395	759	Sunday	Esperanto.
14.30	15.30	Madrid (E A J 7)	373	804	Daily	Concert or Orchestra.
14.30	15.25	Voxhaus (Berlin)	505&576	594 ; 521	Sunday	Concert or Children.
14.30	15.30	Frankfurt-on-Main	470	638	Weekdays	Children.
14.45		Munich	485	618	"	Concert.
14.45	14.50	Eiffel Tower	2650	113.1	" (except Sat.)	Exchange.
14.45	16.15	Reval	350	856.6	"	Testing regularly.
15.00	17.00	Frankfurt-on-Main	470	638	"	Concert.
15.00	16.00	"	470	638	Sunday	Children.
15.00	16.30	P.T.T.* (Ecole Supérieure)	458	655	Saturday	Concert.
15.00	16.30	Grenoble	875	343	"	
15.00	16.30	Lyons la Doua	479	626.3	"	Relaying F.P.T.T.
15.00	16.30	Marseilles	350	856.6	"	
15.00	16.30	Toulouse	310	967	"	

(Continued on page 820.)

THE "POPULAR WIRELESS" CONTINENTAL BROADCASTING TIME-TABLE—(*Continued from page 819.*)

Transmission Starts G.M.T.	Ends G.M.T.	Station and Call Sign	Wave-length in metres	Frequency kilo-cycles	Days of the Week	Nature of Transmission
15.00	16.30	P.T.T.*	458	655	Sunday	Lecture.
15.00	17.30	Stuttgart	443	677	Daily	Concert.
15.00	15.30	Berlin	505&576	594 : 521	Saturday	Children's Hour.
15.00	17.00	Koenigsberg	463	648	Sunday	Concert.
15.00	15.15	Lyngby (O X E)	2400	125	,,	News.
15.15	16.00	Hamburg*	395	759	Sunday	Operatic Music.
15.15	16.00	Bremen	279	1075	,,	Relaying.
15.15	17.00	Leningrad	940	319	Weekdays	Concert.
15.30	17.15	Munster*	410	732	Saturday	Concert.
15.30	17.15	Dortmund	283	1060	,,	Relay.
15.30	16.30	Berlin	505&576	594 ; 521	Daily	Concert.
15.30	17.00	,,	505 &576	594 : 521	Sunday	,,
15 30	16.00	Eberfeldt	259	1158	Saturday	Children's Hour.
16.00		Radio-Lyon	280	1071	Sunday	Concert.
16.00	17.15	Zurich	515	582	Daily	Orchestra.
16.00	18.00	Breslau	418	717	Saturday	Light music.
16.00	17.30	,,	418	717	Wednesday	Dance.
16.00	17.00	Eberfeldt	259	1158	Saturday	Thé Dansant.
16.00	17.45	Hamburg	395	759	Sunday	Talk and Concert.
16.30	16.45	Radio-Paris	1750	171.3	Daily	Bourse, etc.
16.45	17.45	,,	1750	171.3	Wednesday	Concert.
17.00	18.30	Radio-Belgique	265	1132	Saturday	Concert.
17.00	19.30	Frankfurt-on-Main	470	638	Weekdays	Lecture Talk.
17.00	17.30	Rome (1 R O)	425	706	,,	Children.
17.05	17.40	Berlin	505&576	594 : 521	Sunday	Opera.
17.15	17.30	Zurich	815	368	,,	News.
17.15	18.00	,,	815	368	Weekdays	Children.
17.30	18.30	P.T.T.*	458	655	Saturday	Lecture.
17.30	18.00	Stuttgart	443	677	Sunday	Radio Talk.
17.30	18.00	,,	443	677	Weekdays	Lecture.
17.30	18.00	Rome (1 R O)	425	706	Sunday	Dance.
17.30	18.00	,,	425	706	Weekdays	Orchestra.
17.30	17.45	Radio-Toulouse	441	680	,,	Bourse.
17.30	18.30	Graz	404	742	Tues., Wed., Fri.	Lecture.
17.45	18.00	Radio-Paris	1750	171.3	Weekdays	Bourse, News.
17.45	19.15	Berlin	505&576	594 : 521	Sunday	Talk.
17.45	19.15	Moscow (R D W)	1450	207	Weekdays	Concert, News.
18.00	22.00	Strasnice (A D)	570	526	Daily	Concerts (with breaks).
18.00	20.00	Madrid (E A J 7)	373	804	Tues., Thurs., Sat.	Concert.
18.00	19.00	Hamburg*	395	759	Sunday	English.
18.00	19.00	Stuttgart	443	677	,,	Lecture ; Talk.
18.00	19.30	Madrid (E A J 6)	392	765	,,	Orchestra, Children,
18.00	19.00	Zurich	515	582	Weekdays	Concert.[Concert,Talk.
18.00	18.30	Stuttgart	443	677	Monday	Esperanto.
18.00	20.00	Kiel	1000	300	Tues., Wed., Fri.	Concert.
18.00	22.30	Bilbao (E A J 9)	415	729	Daily	,,
18.00	20.00	Komarov (O K B)	311	968	,,	Concert or Dance.
18.05	18.50	Barcelona (E A J 1)	325	923	Weekdays	Concert.
18.10	18.30	,,	325		Sunday	Agricultural Talk.
18.10	19.10	Vienna (O T W)	400	750	Weekdays (see Notes)	Testing.
18.15	19.10	Koenigsberg	463	648	Sunday	Talk,Lecture,Weather.
18.15	18.40	Oslo	382	785	Daily	Talk, Time, Concert,
18.15	19.10	Eiffel Tower (F L)	2650	113.1	,,	Concert, News [News.
18.30	19.00	Barcelona	325	923	Sunday	Recital.
18.30	19.25	Munster*	410	732	Saturday	Lecture, Concert.
18.30	19.15	Rome (1 R O)	425	706	Daily	Govm't Communica'ns
18.50	19.00	Barcelona	325	923	Weekdays	Press.
18.55	19.00	Eiffel Tower (F L)	2650	113.1	Sunday	News. [Dance.
19.00	21.00	Oslo	382	785	Daily	Orchestra, Concert,
19.00	21.45	Stuttgart	443	677	,,	Concert, News, Talk.
19.00	21.00	Barcelona	325	923	Sunday	Concert.
19.00	19.30	Lausanne	850	352.7	Weekdays	Lecture.
19.00	21.00	Berlin	505&576	594 : 521	,,	Music.
19.00	22.00	Hamburg*	395	759	Sunday	Theatre.
19.00	21.00	Cadiz (E A J 10)	330	908.5	,,	Organ, Concert, Talk.
19.00	22.15	,,	330	908.5	Weekdays	Music, Dance.
19.10	20.40	Koenigsberg	463	648	Sunday	Theatre.
19.10	22.15	Hilversum (H D O)	1050	285.7	,,	Music, News, Concert.
19.15	20.30	Zurich	515	582	Sunday	Concert.
19.15	Irreg	Malaga (E A J 25)	325	923	Weekdays	Concert.
19.20	20.30	Dortmund	283	1060	Saturday	Orchestra.
19.30	21.30	Eberfeldt	259	1158	,,	Lecture, Music.
19.30	22.00	Frankfurt-on-Main*	470	638	Daily	Concert.
19.30	20.00	Lausanne	850	353	Weekdays	,,
19.30	21.00	Breslau	418	717	Saturday	,,
19.30	21.30	Berlin*	505&576	594 : 521	Daily	Concert, News.
19.30	20.30	Frankfurt-on-Main*	470	638	Weekdays	Concert.
19.30	19.40	Rome (1 R O)	425	706	,,	Bourse, News,Weather.
19.30	21.30	Koenigswusterhausen	1300	231	,,	Relaying Berlin.
19.30	19.40	Oslo	382	785	Daily	Esperanto Course.
19.40	21.00	Eiffel Tower (F L)	2200	136	,,	Concert or Opera.
19.55	22.30	Graz	404	742	Tues., Wed., Fri.	,, ,, ,,
20.00	20.15	Radio-Belgique	265	1131	Weekdays	Lecture. ,, ,,
20.00	20.20	Lyngby (O X E)	2400	125	Daily	News, Time, Weather.
20.00	22.30	Copenhagen*	308	973	,,	News, Lecture, Concert
20.15	20.30	Radio-Lyon	280	1071	Daily	News.
20.15	20.45	P.T.T.*	458	655	Saturday	Talk.
20.15	21.10	Radio-Belgique	265	1131	Weekdays	Music, Lecture, News.
20.15	22.10	,,	265	1131	Saturday	,, ,, ,,
20.15	20.40	Radio-Paris	1750	171.3	Sunday	Radio Talk.
20.15	20.40	,, ,,	1750	171.3	Weekdays	Talk and Bourse.
20.30	21.00	P.T.T.*	458	655	,,	Talk.
20.30	22.00	Dortmund*	283	1060	Saturday	Opera.
20.30	22.00	Munster	410	731	,,	Relaying Dortmund.
20.30	22.00	Eberfeldt	259	1158	,,	
20.30	21.00	Frankfurt-on-Main	470	638	Weekdays	News, Talk, Sport.
20.30	21.00	Radio-Paris	1750	171.3	Saturday	Concert.
20.30	21.00	Eiffel Tower (F L)	2200	136	Sunday	,,
20.30	20.45	Radio-Toulouse	441	680	,,	Sports, News.
20.30	21.30	Radio-Lyon	280	1071	Daily	Orchestra.
20.30	21.30	Radio-Belgique	265	1131	Sunday	Concert.
20.30	20.40	Rome (1 R O)	425	706	Weekdays	Weather, News.
20.30	20.45	Radio Toulouse	441	680	,,	Press.
20.40	22.30	Rome (1 R O)	425	706	Daily	Opera or Concert.
20.45	22.00	P.T.T.*	458	655	,,	Talk.
20.45	22.30	Radio-Paris	1750	171.3	,,	Dance or Concert.
20.45	22.30	Radio-Toulouse	441	680	,,	Concert, Talk.
20.50	22.00	Koenigsberg	463	648	Sunday	News, Concert.
21.00	24.00	Madrid (E A J 6)	392	765	,,	Concert.
21.00	22.30	P.T.T*	458	655	Daily	Concert and Tests.
21.00	21.05	Rome (1 R O)	425	706	,,	Time Signals.
21.00	21.05	Lausanne	850	353	Sunday	,, ,,
21.00	22.45	Oslo	382	785	,,	Time, Dance.
21.00	22.00	Frankfurt-on-Main*	470	638	Daily	Theatre or Concert.
21.00	23.10	Barcelona (E A J 1)	325	923	Weekdays	Concert.
21.00	21.10	Radio Catalana (E A J 13)	460	652	,,	,,
21.00	21.30	Breslau*	418	717	,,	News, Sport.
21.00	21.15	Seville (E A J 5)	350	856	,,	News.
21.00	24.00	,, ,,	350	856	Sunday	News, Talk, Concert.
21.15	22.30	Petit-Parisien	345	869	Daily	Concert.
21.15	22.00	Radio-Geneva	1100	273	Sunday	Religious Concert.
21.15	22.00	,,	1100	273	Weekdays	Concert.
21.30	22.15	Eberfeldt	259	1158	Weekdays	,,
21.30	22.30	Rome (1 R O)	425	706	Daily	Dance.
21.30	22.10	Dortmund	283	1060	Sunday	,,
21.30	24.00	Radio-Toulouse	441	680	Weekdays	Concert or Play.
21.30	22.45	Berlin	505&576	594 ; 521	Saturday	Dance.
21.30	22.45	,,	505&576	594 ; 521	Weekdays and Sundays (except Saturday).	Chess and Sport.
21.40	21.50	Lyngby (O X E)	2400	125	Weekdays	Weather.
22.00	23.30	Cassel*	275	1091	,,	Concert.
22.00	23.30	Frankfurt-on-Main	470	638	,,	Relaying Cassel.
22.00	23.10	Radio-Cima (E A J 19)	402	745.8	Weekdays	Speech, Music.
22.00	23.00	Radio-Geneva	1100	272	,,	News, Concert.
22.00	23.00	Hamburg*	395	759	Sunday	Dance.
22.00	24.00	Madrid (E A J 7)	373	804	Mon., Wed., Fri.	Concert.
22.30	24.00	Madrid (E A J 6)	392	764	Weekdays	Concert, etc.
23.00	24.00	Radio-Geneva	1100	272	,,	Dance.
23.00	24.00	Vienna (O T W)	400	750	,,	Tests (see Notes).
24.00	01.00	Seville (E A J 5)	350	855	Sunday	Concert.

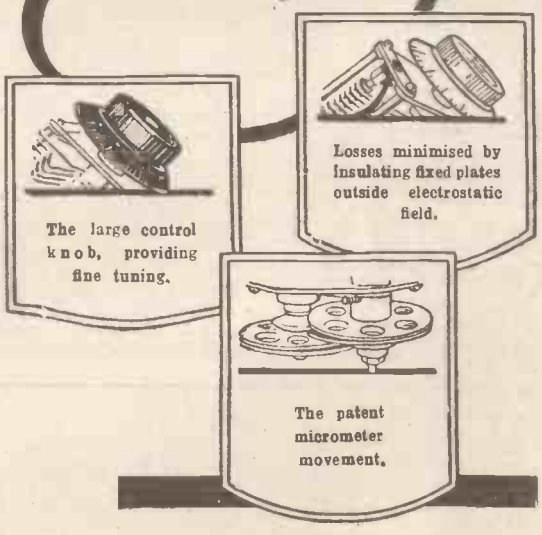
NOTES.—For the convenience of experimenters, and in anticipation of eventual general use, wave-lengths have been paralleled with corresponding frequency expressed in kilocycles.
Relay stations are mentioned under initial entry of main station. An asterisk (*) marks main station with relays working.
The following stations may be occasionally heard testing: Gleiwitz (will relay Breslau), 251 m. (1195 kc.); Kiel, 233.5 m. (1284 kc.); Reval, 350 m. (855 kc.); Milan (Sch. Teleg.); Riga, 488 m. (614 kc.); Aalesund, 515 m. (582 kc.); San Sebastian (E A J 8), 346 m. (867 kc.); Salamanca (E A J 22), 355 m. (845 kc.); Berne, 301.5 m. (995 kc.) Vienna, (O T W) 400 m. (750 kc.) 07.45–10.00, 17.00–19.00: Budapest, 565 m. (531 kc.).
PROJECTED STATIONS: Bratislava, 409 m. (733 kc.); Innsbrück (Feb., 1926); Bergen; Trondjheim; Tromsoi; Stavanger; Christiansand; Rosenbrugel; Salzburg; Klagenfurt; Muncheubuchsee, 238 m. (1260 kc.); Prague, 530 m. (566 kc.).

'You Can't Miss a Station!'

THE extraordinary tuning facilities given by the GECOPHONE Low-Loss Slow-Motion Condenser are crystallised in the spontaneous statement of a user—"You cannot miss a station with it!"

This great selectivity is a direct result of the remarkable slow-motion movement, which enables the setting to be altered to such a minute degree that the dial movement is almost imperceptible.

Minimum dielectric loss, smoothness and absence of backlash, and entire banishment of hand-capacity are other features which are the result of this entirely new condenser design.



GECOPHONE

LOW LOSS-SLOW MOTION VARIABLE CONDENSER

Full particulars of GECOPHONE Sets and Components are given in Booklets BC3772 and BC3759 respectively.

Sold by all GECOPHONE Service Depots, Wireless Dealers and Stores.

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2

EFESCA

Regenerative AERIAL TUNER

The Efesca Regenerative Aerial Tuner is the natural development of the extremely convenient series of Efesca One-Hole Fixing Tapped Coils. It is a specially designed form of Tapped Aerial Coil incorporating Aerial Reaction in a self-contained unit. Reaction is effected by means of a rotor revolving in a separately wound section of the Aerial Coil, thereby effecting maximum and uniform reaction over the whole wave band covered by the coil. Wave-length range 150 to 2,600 metres in conjunction with a ·0005 Variable condenser in parallel. Price, complete with Knob, Pointer and Scale, 32/-

Other components in the Efesca Series of One-Hole Fixing Tapped Coils are the H.F. Transformer and Anode Tuner (illustrated here), Aerial Tuner and the H.F. Reactance Coil.

Write for Catalogue No. 559/2 describing and illustrating Efesca Components and Efescaphone Sets.

Ask your wireless Dealer or Electrician to show you.

EFESCA Popularity Competition £200 IN CASH PRIZES

Ask your dealer for entry form or write direct to FALK, STADELMANN & CO. LTD. 83-93 FARRINGDON ROAD, LONDON, E.C.1

EFESCA COMPONENTS

WHOLESALE ONLY :—

FALK, STADELMANN & Co., Ltd.

83-93, FARRINGDON ROAD, LONDON, E.C.1.

Also at Glasgow, Manchester & Birmingham.

Whether it's the Nightingale or the R.A.F. band—

every cadence and every syllable is perfectly reproduced by the set on which Reflex Coils are used.

Experts are recommending them. The Public are buying them—and sending us testimonials by almost every post. You have not heard the best from your set unless you have tried Reflex Coils.

The scientific winding and the correctly proportioned air spaces of

REFLEX COILS

together with the entire absence of cardboard, ebonite, shellac, metal, etc., make them the most efficient "low-loss" coils it is possible to buy.

Patent Pending.

The NEW REFLEX Coil Plug.

For use with "Reflex" Coils. Moulded in genuine "Bakelite." Metal parts reduced to minimum, highly finished. Price 1/- each.

Ask your dealer to show you one.

Price 1/-

Prices from No. 25 at 8d. to No. 1500 at 10/-. Also 5 X X Loading Coil 1/6.

"Reflex" Coils and Coil Plugs are obtainable from all good dealers. If any difficulty, please send us name and address of dealer.

REFLEX RADIO CO., LTD.,
198, Lower Clapton Rd., London, E.5
'Phone: Clissold 4852.

REFLEX

self-supporting COILS make perfect reception certain!

AS USED IN THE HOUSEHOLD 3-VALVER

(Issue of November 21.)

THE 1926 UNIDYNE 2-VALVER AND OTHERS "FOR UTMOST EFFICIENCY."

YOUR NEW SET will have the finest possible control if it incorporates C.E. PRECISION ONE-HOLE FIXING RHEOSTATS AND POTENTIOMETERS. Efficient in action and "natty" in appearance, they are, in quality and workmanship, the equal of those selling at much higher prices. The neat, silvered dials form an accurate guide for the filament controls and are calculated to enhance any wireless receiver. The smoothness of action and stability of the resistance element are remarkable, and effectively safeguard the valves from all possible strains.

C.E. PRECISION components are **GUARANTEED** and thoroughly **TESTED** before despatch.

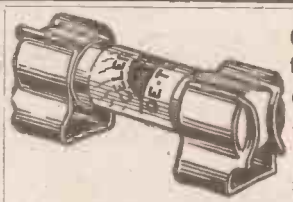
C.E. PRECISION RHEOSTATS, made in 7 and 15 ohms, price 2/9; 30 ohms, price 3/-.

C.E. PRECISION POTENTIOMETERS, essential for efficient H.F. control, price 3/9.

C.E. PRECISION products are obtainable through all reliable dealers.

C. EDE & Co., High Road, Byfleet, SURREY.

Enquiries to the London Electric Stores, Ltd., 9, St. Martin's Street, Leicester Square, W.C.2.



Crystal reception is without doubt the most ideal. Good reception depends on the Detector.

'CELERUNDUM'

is a perfect Permanent Detector.

New in principle. Scientifically constructed. Needs no adjustment. Will stand any plate voltage. Will not burn out. Eliminates all crystal and catwhisker troubles. Gives POWER, VOLUME and CLEARNESS

Retail Price **3/6** Liberal discount to the trade.

Sole representative for Europe and British Colonies :

A. VANDAM,
Caxton House, Westminster, S.W.1.

CELERUNDUM

"The Crystal With a Soul"
Reg. U. S. Patent Office

CURRENT TOPICS.

By THE EDITOR.

The Radio Association's Annual Dinner—The History of the Association and Some Candid Criticisms.

THE Annual Dinner of the Radio Association, held at the Hotel Cecil on November 19th, was an interesting affair in more ways than one. The Duke of Sutherland, President of the Association, was in the chair, and in his speech he referred to the Fellowship of the Radio Association in terms which indicate that the Association is honestly of the opinion that it provides a means of conferring something like a degree in radio engineering on candidates who pass its exams, and that the letters "F.R.A." bear the hall-mark of the "*ne plus ultra*" of learning in radio engineering. We have already expressed our complete disagreement with this belief, and have further expressed our surprise and sorrow that the Radio Association should have allowed itself to depart from its chief mission in life.

Perhaps our readers are not aware of the origin of the Radio Association, and a little light may now be shed with advantage on what is quite an interesting item of history in radio clubs and associations generally.

Forming the Association.

As far back as September in 1922, when broadcasting was very much in the teething stage, but when the ranks of amateurs were daily increased by new neophytes, a good deal of discontent was apparent, because the Radio Society of Great Britain would not take much interest in the new amateur, and membership was not easy to obtain. Further, even in those days, it was felt that some association for listeners and amateurs should exist.

At this time the Editor of POPULAR WIRELESS had several talks with Colonel L'Estrange Malone, then a member of Parliament, and several discussions were held concerning the possibilities of starting a radio association, primarily in the interests of the listener and amateur. In the long run, Colonel Malone indicated his willingness to form such an association, and several other gentlemen also expressed a willingness to form the nucleus of an executive committee. These gentlemen included Mr. S. Landeman (the present hon. secretary), Major Raymond Phillips, Professor A. M. Low, Mr. Alexander Sharman and Major Beaumont, and others.

An offer from the R.S.G.B.

POPULAR WIRELESS provided the necessary financial and editorial support, and thus made it possible for the Radio Association to start its career.

Many meetings of the committee were held in the offices of this journal, and, later, when the association began to find its feet, and the Editor of POPULAR WIRELESS found it no longer necessary to act on the committee, meetings were held in other quarters. From the first, the association showed signs of prospering and of becoming a distinct power; so much so, in fact, that the executive committee was approached by representatives of the Radio Society of Great Britain with a view to amalgamation. But the Radio Association, quite rightly, maintained its independence; and this was a direct cause of the R.S.G.B. making it possible for junior members to join its society.

But since that time our protégé, the Radio Association, has wandered rather unluckily into pastures which do not concern it. We have noted, with real regret, its tendency to over-estimate its importance, and its desire to regard itself as the source of authoritative fellowship in radio engineering degrees, while its primary function—that of assisting amateurs—has been rather neglected.

One Wireless League.

Some months ago the association was in a *cul de sac*, and its organisation extremely incoherent; so much so, in fact, that it was an easy matter for the newly-formed Wireless League to enrol a much larger membership. The constitution of the Wireless League at that time was identical with the rules and constitution of the original committee of the Radio Association, primarily founded by Colonel Malone and the Editor of POPULAR WIRELESS, but which have, of late, sunk into the background in favour of fellowship and approved signs, badges, etc., for traders—things very alien and incompatible with the early ideals of the association.

Promised Support.

There arose, some months ago, a crisis in the affairs of the association, when it was felt by certain members of the executive committee that the Radio Association should accept an offer of amalgamation with the Wireless League. To his great credit, Colonel Malone, who had consistently done his best to further the proper interests of the association, resisted this suggestion, and, later, called again on POPULAR WIRELESS and asked for support.

A meeting was held at the House of Commons, with Commander Kenworthy in the chair, and again POPULAR WIRELESS offered to help the association, if it refused the offer of amalgamation with the Wireless League, retained its independence, and got back to its primary duties, i.e. the work of helping the listener and the amateur. Support was also promised under certain conditions (not incompatible with the original ideals of the association) by two important newspapers.

For a time we hoped that the association had meant business, and that it would not fritter away its energies and the enthusiasm of its supporters by relegating its primary duties to a secondary position.

The F.R.A.

But we note, with regret, that the Radio Association is again concerning itself with affairs really outside its scope; it now wishes to assume the rôle of sole dispenser of the equivalent of degrees in radio engineering—a task which is beyond it, and which is made ridiculous by its lack of authoritative radio experts. No association can claim what the Duke of Sutherland claimed for the Radio Association unless it has a highly qualified examining board of radio engineers and physicists.

Max Darewski playing one of his own compositions at 2LO.

It might be taken more seriously if the committee could persuade men like Dr. Fleming, Dr. Eccles, Dr. Roberts, Professor Howe, and others, to form an examining board, and if they obtained and published an official letter of backing and approval from the chief radio authorities in the country. Until this happens we strongly advise the association to drop its new fangled ideas, and to get back to its real duties of helping the listener and the amateur before all other considerations.

If we could be assured of this, we should once more be glad to extend every possible support—editorial and otherwise—to the association which we were so closely identified in forming in the early days of broadcasting, but which we regret to have little sympathy with in this year of grace 1925.

In conclusion mention must be made of the very able work of Mr. R. Pecorini who organised the Annual Dinner at the Hotel Cecil. Mr. Pecorini has worked very hard to further the interests of the Association, and much credit is due to him for his unselfish efforts.

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

THE following have been found to be the winners of the "Polar" Window Dressing Competition held at the recent N.A.R.M.T. Exhibition, Albert Hall:

1st PRIZE £25.—MR. L. B. WHISSON, Glenhurst, Linden Gardens, Leatherhead.

2nd PRIZE, £15.—MR. THOMAS H. WYATT, 24, H. Block, Sutton Estate, Chelsea, S.W. 3.

3rd PRIZE, £10.—MASTER C. J. R. BUNN, 34, Barley Lane, Hastings, Sussex.

* * *

The new Brandes "Audio" Transformer, which retails at 17s. 6d., is an excellent component. That one received by us for test spent but little time on our examination bench, for it arrived at an opportune moment, and was immediately included in one of the sets which was in the course of assembly. Our preliminary tests showed it to be of a high standard of efficiency, and its compact, pleasing appearance ensured its early inclusion in a "P.W." receiver.

It has a ratio of 1 to 5, which appeared to thoroughly suit the first-stage position assigned to it. In our opinion the curve which Messrs. Brandes publish hardly does their product justice.

Anyway, the particular sample under our observation did not "drop" at 800 and 3,000. However, there must be a great temptation for a manufacturer to extend a "straight" to optimistic limits, and anything that savours of modesty in this respect is distinctly commendable. Not that many constructors worry much about curves—frequency distortion speaks for itself!

* * *

We notice that Messrs. Valco, Ltd., Tabor Grove, Wimbledon, London, S.W. 19, are now repairing practically any type of valve, including dull emitters of both normal and power types and even transmitting valves. "If you are not satisfied we will return your money," they say—and that seems fair enough!

* * *

"A Talk to Valve Users" is the title of a most interesting little handbook prepared by Messrs. Metro-Vick Supplies, Ltd., Trafford Park, Manchester. It contains a number of pages of really interesting technical matter concerning valves. We advise our readers to write for a copy—it will be sent them post free.

* * *

The advantages of glass insulators were brought forward by "P.W." some three years ago, and it is curious that such have, until recently, not been very prominent on the market. We have now the "Pyrex," however, which is made of a specially prepared glass of a nature particularly suitable for electrical insulating purposes. The samples sent us by Messrs. James A. Jobling & Co., Ltd., of Wear Flint Glass Works, were given an insulation test with satisfactory results, but it was impossible for us accurately to test their breaking-strain to the stated limit of 450 lb. We were able to judge, however, that they are capable of standing up to something well above the stresses that even in extraordinary circumstances would be encountered in amateur aerial work. The design of the "Pyrex" will have been made familiar to readers through the advertisement columns, and they will have noted the large insulative area provided.

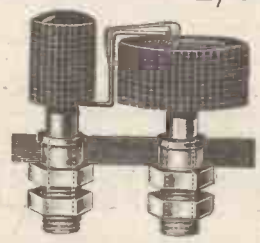
(*Continued on page* 826.)

Hear the Programme through without a break *on the new* Polar Guaranteed Crystal

There are no interruptions for re-adjustment of catswhisker, with this new trouble-free Crystal, which has a flat surface composed of a large number of very small Crystals mounted together. On this surface your catswhisker or other contact more readily remains in position—vibration does not affect it, and the great number of sensitive facets makes adjustment easy. The Polar Crystal Detector, illustrated below, consists of a silver contact and the Polar Crystal, each fitting into a socket, mounted on your panel by two nuts (template provided).

Showing Crystal partly removed from cup.

The Polar "Crystal" is sold in an ebonite cup, with mounting screw and nuts complete. From all Radio Dealers. Price **1/6**



The Crystal is interchangeable, and screws into the crystal cup—perfect contact ensured without woods-metal.

Price of complete Detector, in highly polished ebonite with sockets and nuts, all nickel-plated **3/6**

The following report on the Polar "Crystal" is reprinted from the "Manchester Evening Chronicle":—

It is significant of the numerical importance of the crystal user, that the Radio Communication Company, which has equipped some of the largest broadcasting stations in the world, should have thought it worth while to devise a crystal detector, one of which has been sent for test.

This is a beautiful little component. The Crystal and contact are separate units, and fit in the panel by means of two valve pins and sockets.

In place of the usual whisker a small plate of very thin and springy metal is used. The Crystal also is unique, it being a very fine-grained deposit on a circular metal plate.

The pressure and position can be varied all over the Crystal, and on actual tests on a low-loss crystal set, this detector gave a remarkable reading of 160 microamps on the transmission from 2ZY.

It can be recommended as a sound mechanical job and an ornament to any set.

There is one very noticeable point about a large number of present-day components. They are so beautifully made that it seems a pity to place them under the panel out of sight.

Probably after the present fashion of placing everything except the condenser dials under the panel, we shall have the usual reaction and find everything on the top. If this does occur the panel will not be disgraced, as components by recognised makers to-day have a beautiful finish and ultra efficiency.

RADIO COMMUNICATION CO., Ltd.,

E.W.B **34-35, Norfolk Street, Strand, London, W.C.2.**

"Now a word on handling RADIO CONDIT," *says CLIXIE*

"CLIXIE"

Fingers to bend CONDIT. No Pliers, please!

"If you'll always remember what RADIO CONDIT is and act accordingly, you'll never go wrong in handling it," says CLIXIE.

"CONDIT is made of copper tape curled up into the form of split tubing, equal in diameter to 16-gauge wire. The two reasons why you shouldn't twist it about like ordinary wire are obvious: first, because it amounts to wire with the middle left out; second, because it's split.

"So bend CONDIT carefully with your fingers. Avoid acute angles. With normal care you can 'persuade' it into practically any shape without opening the split. If the tubing ***does*** open at the split, no real damage is done; the effect of the split is to eliminate lateral surgings. That effect is unimpaired.

"When you ***have*** to use pliers, for terminal-loops and the like, make them round-nosed pliers, please!"

RADIO CONDIT
(P. Patd.)

THE H.F. CONDUCTOR

Per packet of six 2-ft. lengths - - - **2/-**
Per coil of 12-ft. - - - - -

Obtainable from all Wireless Dealers or direct from the Patentees:

AUTOVEYORS LTD., 84 VICTORIA ST., LONDON, S.W.1

GOOD NEWS FOR CRYSTAL SET USERS!

Send to-day for particulars of

THE MICROPHONE BAR AMPLIFIER.

Transforms your Crystal Set into a Loud Speaker Set. NO VALVES OR ACCUMULATORS, ETC.

Have you seen our New Free Wireless Lists? They will save you much time and money.

You have not heard the best until you have heard "The Littlewood" Wireless Receivers.

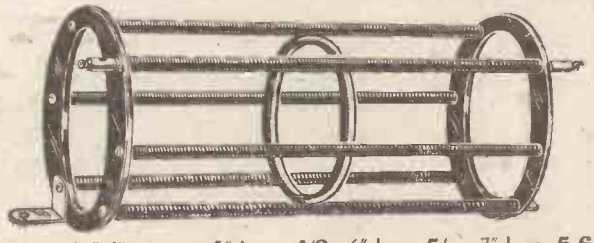
Try "The Littlewood" Super Crystal, price 1/6 post free, for louder and purer results.

FOR EVERYTHING WIRELESS AT THE RIGHT PRICE:

LITTLEWOOD'S (Dept. P.W.), Church End Radio Depot, FINCHLEY, LONDON, N.3. *Tel., Finchley 3060*

GET A "LOWFORMA"

The most convenient and efficient low-loss coil former obtainable. AN IDEAL PRESENT for anyone interested in Wireless.



Prices: 3¼" diameter × 5" long, **4/9**; 6" long, **5/-**; 7" long, **5/6.** Order from your dealer. If unobtainable, send to the Makers:

A. H. CLACKSON, LTD. (Dept. F.), 119, FLEET STREET, LONDON, E.C.4

APPARATUS TESTED.

(*Continued from page 824.*)

The Power Locking Double Coil-Holder, samples of which were recently received from Messrs. Power Wireless, Ltd., Wexham Road, Slough, Bucks, is a neat little component that will appeal to both "low-loss" enthusiasts and to constructors in general. It has many points in its favour, chief of which is the low price at which it is retailed —4s. 6d. It is a well-made little article, and its bright nickel fittings and (small supply of) polished ebonite give it a very attractive appearance. It is real ebonite, too, and not composition—this was a pleasurable discovery. Unfortunately, there are one or two points we simply must criticise, although it will be no difficult matter for the makers to put things right without re-designing the instrument. For instance, although the moving holder can be rigidly locked by merely twisting the control handle, there does not appear to be any condition between that and that of absolute looseness, unless it be a movement of a very jerky nature. This could easily be remedied. We should like to see stouter screws and nuts supplied for mounting purposes, but, of course, these can be replaced by the constructor himself. Again, inasmuch as the Power is a top of panel mounting component with which stiff wire connections can be employed, it seems a pity that the terminal holes are not quite large enough to take square section wire which is so popular. But this, too, could easily be remedied. A point worth noting is that side connections as well as underneath connections can be taken. Just that little extra attention to detail and the requirements of the constructor will make the Power component something worth buying at a shilling or two more than 4s. 6d., even although no gearing or vernier action is incorporated.

* * *

From Messrs. H. E. Ashdown (Birmingham), Ltd., Perry Bar, Birmingham, we recently received an Ashdown "B" type Square Law Variable Condenser fitted with Bakelite end plates. Of straightforward design, it is provided with a "pigtail"—a distinct point in its favour. Friction contacts are frequently sources of trouble. Its movement is good: smooth, but with that slight resistance that makes for accurate settings. It has a low minimum capacity, and a maximum reasonably close to that which is stated —.0005 in the case of the sample under review. We should like to see it provided with terminals having true threads, but doubtless Messrs. Ashdown can easily effect this slight improvement. Having done so, they will have in production a really first-class variable condenser that can be fully recommended to constructors.

Two Leyden jars compared with a Dubilier Standard Mica Condenser. The latter has a capacity equalling the two "jars," but is more efficient and more electrically robust.

* * *

From Messrs. J. J. R., 7a, Ross Parade, Wallington, Surrey, an anti-capacity tuning handle was recently to hand. Sold at 1s., it is a really useful little article. It can be slipped on to any ordinary sized control knob in a moment, and removed as quickly if desired. It grips firmly, and the greatly increased leverage thus provided is a great aid to fine tuning.

* * *

A very excellent crystal is "Apex," a sample of which was recently sent us by Mr. Clark, of 24a, Great Portland Street, London, W.1. It possesses uniform sensitivity and stability of a very commendable order. It is retailed at 1s. 6d., and the discovery of even one "weak spot" entitles the purchaser to a replacement. "Postage and a new crystal *will be refunded*" is one of the statements on the leaflet accompanying each specimen! The italics are ours.

* * *

"An A B C to Wireless Entertainment" (W. Foulsham & Co., Ltd., London, 1s.). This should prove distinctly interesting to all listeners. It includes photographs of some of the more popular of the announcers, "Aunties" and "Uncles": interesting articles about the news, time, and weather services and other B.B.C. features, together with synopses of operas, and the words of a large number of hymns and songs.

RADIOTORIAL

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

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, 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.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given to 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 wireless 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.*

TECHNICAL QUERIES.

Letters should be addressed to :
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions : (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1 - must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

NUMBER OF LAMPS IN CHARGING CIRCUITS.

E. M. P. (Worthing.)—I have direct current lighting, and wish to charge accumulators off the mains, regulating the charging rate by the insertion of lamps between the accumulators and the mains. How do I find out how many lamps I need ?

In the first place, the current required depends upon the charging rate desired, and this is regulated by the insertion of suitable lamps or "banks" of

(*Continued on page* 830.)

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page* 828.)

lamps in series with the mains, so that only the required current shall pass. In order to find out what arrangement of lamps is necessary, you must pick on the lamp you are going to use, and then work out how much current it will pass. For instance, the best lamp to use for charging is the carbon filament type, because this class of lamp passes more current than the metal filament type. You want to choose a lamp of the same voltage as your mains (say 220 volts) and rated at about 32 candle-power. The current that this lamp will pass is determined by the following formula :

VA (watts supplied) = c.p. times rating for this type of lamp. In this case the lamp will rate from 3·5 to 4 watts per c.p., so that VA = 32 × 4 = 128 watts.

Now the current that this lamp will pass is found by

$$A \text{ (amperes)} = \frac{VA}{V} \text{ where V = voltage of mains.}$$

$$\therefore A = \frac{VA}{V} = \frac{128}{220} = .56 \text{ amp.}$$

Now we find that one lamp passes ·56 amp. and for the sake of example, let us say we wish to charge at a 5 amp. rate. One lamp in series with the mains will only give us ·56, and if we place two together in series with one another, we shall have still less, so that evidently we must arrange the lamps in parallel so that though each lamp only passes ·56 amp., the whole "bank" will pass somewhere about 3 amp. Two in parallel will give ·56 × 2 = 1·12 amp.; but we need nearly 3 times that amount. Five lamps will give us ·56 × 5 = 2·80 amp. which is just below the maximum charging rate of our accumulator. It is better to be below the given rate than above it, and so if we use 5 lamps in parallel with one another, but the "bank," or collection of them in series with the accumulator and the mains, we shall be able to charge the battery at a convenient and safe rate. The formula given above holds good for any kind of carbon lamp and any voltage of D.C. main, provided that the lamp and main voltages are the same or thereabouts, and that the wattage of the lamp is 4 watts per c.p.

OHM'S LAW IN PRACTICE.

P. B. D. (Cricklewood).—I always thought that the current passing through a conductor was proportional to the pressure present at each end. If this is really the case, and across the 'phone terminals of a receiving set there exists a certain voltage. why is it that if such terminals are connected together with a short piece of wire no signals are heard in the 'phones ? Surely. according to Ohm's law, a proportion of the current should still flow through them ?

When such terminals are so "shorted" the pressure across them is reduced to an almost negligible quantity. and subsequently. the current flowing through the telephone receivers drops to practically nothing. The pressure, or, rather, potential difference, existing between any two points in an electrical circuit is directly proportional to the resistance existing between such points and the total resistance of the complete circuit. For instance, supposing a battery of negligible internal resistance had its terminals externally connected to four 10-ohm resistances in series, these forming with the battery a complete closed circuit. If 4 volts' pressure exists across the terminals of the battery on open circuit, when the circuit is closed by the resistances. measurements would prove that 1 volt potential difference exists across each of the four resistances of equal value, 2 volts across two of them, and 3 volts across three. Now, in the case of the telephone terminals, the "shorting" wire would have a very small resistance in comparison with the rest of the circuit, which, in the case of a valve set, would consist of the valve (about 10,000 ohms), H.T. battery, etc., so that the potential difference existing across the shorted terminals would not be sufficient to cause appreciable current to flow through the 'phones. Signals would therefore be nil.

LONG RANGE RECEPTION.

"Simplicitas" (Upper Norwood, S.E. 9).—I am anxious to construct a set which will enable me to listen to the French programmes and to Dublin when it is established, as well as the home stations. Could you direct me to a suitable set and to full instructions as to equipment, method of assembling, etc. ? Would either the "Unidyne" set or long-range two-valve set described in a recent issue of your paper suit my purpose, or have details of a more suitable set been described in a previous issue? Also would I be able to receive on a loud speaker ? I may say that my present knowledge of wireless is practically nil.

As you have had no previous experience of wireless construction we advise you to start with a straightforward two-valve set. For simplicity in building and for easy operation a straight-circuit H.F. and detector would be the best two-valve set for your purpose.

Such a set for long-distance reception on 'phones was described in POPULAR WIRELESS No. 113, under the title "The P.W. Continental Set."

The instructions there are very easy to follow, but if still greater detail is required you should build the "All-stations" two-valve set described in the "Best Way" Wireless Books (No. 172). Employing such a circuit as this (H.F. and detector), it should be possible to receive a great many foreign stations quite easily if an ordinarily efficient aerial is installed. It cannot be said for certain that Dublin will be tuned in with certainty when required, but we should expect very good and almost regular reception from this station, and also from several of the French stations.

UTILITY SWITCHES.

A. H. T. R (Oswestry, Salop).—What is the price of a Utility 3-pole, 2-way switch, such as was listed at 4s. 6d. in "P.W." of November 7th issue ? (I am informed that the correct price is 5s.)

The makers now inform us that the price of the Utility 3-pole 2-way switch is five shillings.

TESTING TELEPHONES.

F. R. H. (Shepperton-on-Thames).—What is the best method of testing a pair of telephones ?

The best way to tell if a pair of 'phones is in good condition is to put the 'phones on and place the end of one of the leads between the teeth. Rub a key or nail upon the other lead, and the weak galvanic currents set up in the body will cause a scraping sound in the earpieces, which will correspond with the rubbing of the key. Such a current is very weak, and is a better test for continuity than the usual dry-cell test.

(*Continued on page* 832.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 830.)

EBONITE.

J. B. C. (Chelmsford).—What is ebonite made of, and is there much difference in the various grades?

Ebonite is largely composed of rubber and sulphur, which have been mixed and vulcanised at a high temperature. As there are great variations in the quality, it is advisable to buy from a reputable source.

WAVE-TRAP CONSTRUCTION.

"INTERFERENCE" (Manchester).—What is a "wave-trap," and can it be successfully constructed at home?

A wave-trap is an additional circuit which is tuned to either "accept" or to "reject" unwanted signals. It is often very effective in this respect, especially when the interference is continuously on the same wave-length, as in the case of those who desire to receive other than their local broadcasting station, but who cannot eliminate the undesired signals.

A simple "acceptor" wave-trap can be made with a 75-turn tuning-coil and a ·0003 or ·0005 variable condenser. Join one side of the coil to the set's aerial terminal by a short external lead, and connect the other side of the coil to the condenser. The remaining connection of the condenser is then joined to the set's earth terminal, and the tuning of both set and wave-trap is varied until the best position for the elimination of interference is found.

The "rejector" wave-trap is made on very similar lines, but in this instance the coil used has 35 turns. It is connected outside the set between the A. and E. terminals, and the variable condenser is joined across it.

The method of operation is very similar, and it will be seen that the only difference in arrangement is that the coil and condenser are in parallel for a "rejector" circuit, but in series for the "acceptor."

WHY SIGNALS ALTER IN NOTE.

"HETERODYNE" (Coalville, Leicestershire).—Why is it that when tuning-in a continuous-wave signal the note alters with the adjustments made, but when tuning spark stations the note remains constant, except when it is made hoarse by oscillation?

The note or pitch of a spark station depends upon the frequency of the transmitting spark, and it is, therefore, not altered by any tuning adjustments at the receiving end.

The note of a C.W. station is not fixed at the transmitter, but depends upon a "beat" effect. The receiving set is made to oscillate at a frequency near that of the incoming oscillations, and the difference in the frequency of the two sets of oscillations produces a beat at audible frequency. If the receiver is adjusted so that the local oscillation-frequency is altered the difference between the two will alter also, and therefore the received note will alter. It is readily made to vary from a very low pitch, up to a note that is too high to be audible by altering the wave-length of the super-imposed local oscillations.

TAKING OFF THE EARTH-LEAD.

T. P. (Cardiff).—I have just built a two-valve set from diagram enclosed (it is a straight Det., L.F. with reaction—TECH. ED.) and although I can hear 5 W A quite well I can only do so with the earth connection removed. I cannot hear any other station.

There is little doubt but that your trouble is merely due to tuning. You have an aerial-tuning condenser in parallel with the aerial coil. Try a slightly larger coil, say, 50 or 75 instead of the 35 you are using, with series-condenser tuning. You could try the effect of a ·0002 mfd. fixed condenser in series with the earth terminal and earth lead, and leaving the variable condenser in parallel. In this case, however, it is probable that a No. 50 coil will be required. It is impossible to give definite values, as a great deal depends upon the inductance and capacity of your aerial, which, in the circumstances, would appear to be rather on the large side. We do not expect you will hear many other stations, as you are so close to 5 W A, and the circuit you are employing is not particularly selective. It is possible that you might bring in 5 X X or Radio-Paris, but even this is doubtful.

H.T. AND L.T. BATTERIES.

A. J. S. (Wallington).—Why are two separate batteries necessary to operate the ordinary valve?

Because two different conditions are necessary in order for the 3-electrode valve to work. In the first place, its filament must be heated in order to liberate electrons (this is done by the L.T. battery).

Secondly, this liberation has to be helped by a large difference of potential between the heated filament and the plate of the valve. This potential difference is supplied by the H.T. battery.

"RADIO SOUNDS" COMPETITION.

Consolation Prize Winners.

CONSOLATION PRIZES have been awarded to the following two hundred and ninety-one competitors, whose solutions came next in order of merit:

L. C. Aldridge, London, N.W.3; Mrs. J. Allen, Chesterfield; B. Allwright, Hoxton, N.1; G. W. Anscombe, Hurstpierpoint; H. P. Artis, London, N.W.6; F. W. Ashton, London, S.E.5; N. Atkinson, Harrow.

R. E. Badcock, London, S.E.6; M. Baird, Harlesden, N.W.; G. Ballantyne, Walton-on-Thames; Mrs. M. Barlow, Ashtead; Mrs. W. G. Barrell, New Malden; F. C. Barton, London, S.E.; H. C. Beckett, London, W.14; H. A. Beer, London, N.W.5; R. M. Bell, London, N.10; C. H. Bennett, London, W.11; A. K. Bindloss, Westminster, S.W.; Lt.-Col. R. A. Bottomley, Aston-on-Clun; F. G. Boutwood, Acton, W.3; Miss D. Bowden, New Cross, S.E.; W. G. Bowden, London, N.W.6; J. T. Bowkett, Cardiff; Mrs. G. M. Bradley, London, S.E.24; W. A. Breeze, London, S.E.20; P. R. Bridge, London, W.6; E. S. Britten, London, S.E.27; A. A. Brockwell, Warwick; C. D. Brown, Putney, S.W.; H. J. Brockman, Westcliff-on-Sea; Mrs. K. F. Browne, Bow, E.3; Mrs. C. I. Bumpstead, Twickenham; C. Bundy, New Malden; A. E. Burgess, Kingston.

Miss A. Caldwell, London, N.7; L. M. Caldwell, London, N.7; D. L. Campbell, Thornton Heath; J. L. Carden, London, S.E.; P. G. Caudwell, Oxford; E. M. Carpenter, Putney, S.W.; H. F. Carr, Tottenham, N.; L. Cawthan, Kingswear; E. G. Chalk, Westcliff; A. H. Chapman, London, S.E.23; F. W. Charles, London, N.7; F. Chilman, Hull; Miss E. Chinn, London, N.16; G. Chuter, Chiswick, W.; D. M. Clair, London, N.22; Mrs. C. N. Collins, Harrow; G. F. Comper, Brixton, S.W.; E. D. Cooke, Winchelsea; T. G. Coopey, London, N.10; Mrs. T. G. Coopey, London, N.10; E. R. Cox, Tooting, S.W.; F. L. Crompton, Streatham; F. J. Curtis, London, S.W.11.

C. E. D'Allesina, London, W.6; L. Danielli, London, N.W.; L. Danninger, Streatham; Mrs. J. L. Davidson, London, N.1; L. A. Davies, London, W.10; W. J. A. Davies, Ruislip; S. S. Davis, Fulham, S.W.; Mrs. E. Delmonte, London, W.6; Miss I. E. Doran, Clapham, S.W.; Miss M. Dovaston, Acton, W.; W. Dovaston, Ealing, W.5; E. R. Duck, Streatham; L. C. Durrant, London, W.10; H. P. Dye, Kilburn, N.W.; W. E. Dyer, Camberwell, S.E.

W. Early, Ware; A. R. Eastman, London, N.13; R. W. A. East, London, N.16; J. G. Eden, Felixstowe; Mrs. H. L. Edwards, London, E.4; R. F. Eeles, Ponders End; F. R. Elbra, E. Dulwich; L. P. Elmer, Harrow; G. R. Elsworth, Hornsey, N.

N. W. Farmer, London, W.12; N. Fenton, Watford; Mrs. M. W. Fidge, East Sheen; Mrs. N. Fleming, York; A. R. Foord, Rugby; Miss M. Forestier, W. Dulwich, S.E.; S. W. Francis, Streatham; A. A. Frost, London, S.W.20.

Mrs. E. Gannaway, London, S.W.5; E. H. Garner, Tottenham; I. F. Garnham, Holloway, N.; E. A. Garrett, Hampstead, N.W.; Mrs. F. W. Garvey, Ramsden Bellhouse; Mrs. F. M. Gatehouse, Romford; Miss A. Gayne, London, W.2; Mrs. E. H. Gill, Hounslow; Miss E. Gilmore-Ellis, Putney; T. Gilmore-Ellis, Putney; A. F. Girvan, London, S.E.27; T. H. Glasse, Harrow; E. W. Glendinning, Birmingham; R. H. Goddard, Windsor; A. M. Goodwin, Brixton, S.W.; Mrs. E. Gould, Cricklewood, N.W.; Miss M. E. Gower, London, N.11; L. Groves, Leytonstone, E.11; Mrs. E. Gray, Watford; A. Gregory, Balham, S.W.; F. Griffith, Tottenham, N.; W. C. Griscome, Wembley; W. E. Griscome, Wembley; Mrs. K. Guest, London, S.E.22; G. S. Guiroult, London, S.E.4; N. Guy, Pinner.

J. Hammond, London, W.1; E. Handscomb, London, E.11; G. M. Handscomb, Barnes, S.W. J. B. Harris, London, N.W.8; G. W. Harrison, Leeds; W. F. Hart, Barnet; Mrs. D. Hawker, London, N.1; F. Hayes, Lewisham, S.E.13; F. A. Hayward, London, S.W.17; P. F. Hearn, Cambridge; W. G. Hibbert, Cricklewood, N.W.; J. Hick, Gosforth; G. Hickman, Eastbourne; Mrs. L. Hickman, Eastbourne; J. E. Hill, Enfield; Bdr. H. Hillman, Newhaven; F. Hills, Streatham; Mrs. E. Hoare, Balham, S.W.; F. G. Hoare, Balham, S.W.17; W. F. Hollyman, Fulham, S.W.; Miss J. Home, Warlingham; Miss V. A. Horsley, Thornton Heath; Miss M. Hose, Bromley; Mrs. C. G. Hudgell, Highgate, N.6; L. D. Hughes, London, N.3; W. Hyatt, Enfield.

W. H. Inglis, Bromley; Mrs. S. J. Inkley, London, S.E.; H. C. Ives, Clapham, S.W.4.

H. L. Jackson, Coventry; H. O. Jennings, Boxmoor; Mrs. E. Jervoise, London, S.W.5; Miss B. Jones, Wrexham; Miss H. Jones, Peckham, S.E.15.

(*Continued on page* 835.)

"RADIO SOUNDS" COMPETITION.

(*Continued from page 834*).

Miss L. A. M. Kernan, Rickmansworth; C. B. Keston, London, S.W.5; W. King, Leyton, E.10; D. Kirk, Reading; J. Kitto, St. Albans; Miss N. Kitto, St. Albans; D. S. Knight, Coulsdon.

C. F. Lainson, New Cross, S.E.; E. T. Lancaster, Richmond; C. Landreth, London, N.15; G. R. Large, Dagenham; F. H. Lea, London, E.5; Mrs. A. Lewis, Lee, S.E.; A. A. Love, Ruislip; H. S. Love, Ruislip; L. B. Luget, London, E.7.

M. McEntegart, Gerrard's Cross; A. W. Macmeikan, London, S.W.17; S. H. Makepeace, London, N.W.9; R. H. Malkin, Glossop; A. H. Mann, Beckenham; A. G. Marigny, London, S.W.; Mrs. L. W. Marle, Bath; P. Martin, Streatham, S.W.; F. Masters, London, E.12; C. E. Mauger, London, N.1; F. Meredith, London, N.13; H. J. Miles, Durham; G. A. Mitchell, Fulham, S.W.; Mrs. H. A. Moncrieff, London, S.E.; J. F. Mongrardino, Luton; Miss B. Morgan, Canterbury; E. Morgan, London, S.E.8; S. A. Morris, London, N.5; D. G. Murdoch, Cricklewood.

E. H. Nelson, Balham, S.W.; H. E. Newham, London, W.14; F. G. Newman, Burgess Hill; B. Newman, Thornton Heath; Mrs. G. Newman, Thornton Heath; H. T. Nobbs, Hornsey, N.; L. B. Norman, Purley.

F. B. O'Brien, London, W.6; Mrs. M. E. Oddie, Thornton Heath; J. C. Orme, Tottenham, N.; A. Osmond, Walthamstow, E.17; C. J. Ough, London, N.19.

S. J. Page, Cricklewood; V. K. Pain, Tunbridge Wells; A. V. Palmer, Hornsey; Miss F. Parham, Lewisham, S.E.; L. Parsley, Mill Hill, N.W.; R. E. Payne, Enfield; Miss M. Pearn, Oulton Broad; F. R. Penn, London, N.10; A. Picard, London, W.9 Mrs. G. Pike, London, W.12; Miss Plaister, Seaford; W. A. Potts, Liverpool.

Mrs. F. Rafe, Clapham, S.W.; W. J. Ramsden, London, S.E.; Mrs. W. Rea-Taylor, London, S.E.23; F. H. Reeve, London, S.W.; P. L. Rice, London, N.19; A. F. Richardson, Herne Hill; R. H. Rickett, Earlswood; A. G. Ruse, London, N.19; Mrs. G. Rushen, Watford; G. E. Rushen, Watford; Mrs. B. M. Russell, Uxbridge; S. W. Russell, Uxbridge; Miss A. M. Ryder, Hornsey, N.

O. St. Martin, Brighton; A. W. Salmon, Enfield; Mrs. C. N. Salmon, London, N.10; H. A. C. Salmon, London, S.W.; Miss M. Salmon, W. Dulwich; F. S. Salter, Hampstead; S. G. Saywell, Balham; A. R. Scott, London, W.2; Mrs. D. Scott-Walker, Highgate, N.; F. B. Scull, Leytonstone; L. D. Sharland, London, N.1; V. L. Shatwell, Barnes, S.W.; C. Short, Sydenham, S.E.; Miss G. I. Short, Sydenham; L. G. T. Short, Thornton Heath; Mrs. B. Shorter, London, S.E.; D. T. Silcock, Coulsdon; N. Slater, Clapham, S.W.; Miss Smith, London, E.12; C. E. Smith, Fulham, S.W.6; C. W. Smith, Leyton, E.; G. Smith, Canterbury; G. Dean Smith, London, N.W.; J. E. Smith, London, E.12; R. A. Smith, London, S.W.1; C. J. Spencer, Northwood; F. W. Spencer, London, S.W.6; P. J. Squibb, Carshalton; A. W. Stabback, Cheltenham; Mrs. D. Stearns, Stanmore; E. G. Stevens, Wallington; J. L. Stevenson, London, E.17; Mrs. O. G. Stewart, Southall; L. Swindale, London, W.3; E. C. Syms, Deptford, S.E.

E. Taylor, Leeds; Mrs. L. Taylor, London, N.2; W. Taylor, London, W.6; C. Telford, Kew; Mrs. G. M. Thomas, Sydenham, S.E.; Mrs. M. Thompson, Norbury, S.W.16; Miss W. A. Todd, Woodford Bridge; R. S. Tonge, London, S.E.; Mrs. Townley, Highgate, N.; A. Trott, Burnham-on-Sea; Mrs. G. Trott, Wandsworth, S.W.; Mrs. M. F. Tuck, London, N.W.3; P. W. Twyman, W. Norwood; E. F. Tyler, London, S.E.12.

R. Vidler, E. Dulwich.

Mrs. Wardley, Chigwell Row; L. W. Wareham, London, N.; Miss E. Watts-Jones, Hammersmith; R. J. West, London, W.11; T. Westmacott, Catford; H. White, London, N.W.10; E. M. Whiting, Hereford; F. C. G. Wicks, London, N.2; C. J. Williams, Forest Hill, S.E.; Mrs. P. Williams, Forest Hill, S.E.; M. F. Williamson, Canterbury; H. J. Wilson, Leytonstone, E.; Mrs. R. Wilson, London, W.9; Mrs. D. M. Winter, Charlton, S.E.; R. M. Winter, Charlton; V. Wiseman, London, E.5; H. O. Wood, Ingatestone; A. G. Worth, Willesden, N.W.10; P. H. Wright, London, E.C.1.

C. P. Yapp, London, S.W.5.

(*The Correct Solution was given in last 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.

Correspondence

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

VALVE CARTONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—In a recent issue Dr. Roberts comments upon valve cartons, and states that "Little attention appears to have been given by valve makers to the important question of the boxes or cartons in which their products are sent out." With all respect to Dr. Roberts, I should like, on behalf of my clients, A. C. Cossor, Ltd., to explain that so far as they are concerned the question of valve packing has received very great attention.

I believe that the original Cossor box, which consisted of a rigid outer case with a straw-board packing insulating the valve from the box by means of four air pockets, was the first of its kind to appear. Previously valves had been packed in round tubes or circular boxes with some form of corrugated paper as a protector. The Cossor box was probably the first attempt to produce a box entirely suitable for wireless valves as apart from electric lamps.

There are many snags in this matter, however, and it would not be fair to my clients for me to disclose the reasons which lead them to supersede their rigid box by the present method of packing. It is sufficient, however, for me to state that the packing of the Cossor valve in a semi-flexible carton surrounded by an adequate layer of cotton-wool is a very great improvement. It is possible to throw a box containing a valve across the room twenty or thirty times without breaking the filament. In fact, I have seen such a test made, and although the filament was intact, the electrodes had been badly displaced by the force of the impacts. This new method of packing the Cossor valve is very expensive, but naturally my clients, after taking such exceptional care in every process of manufacture, cannot afford to neglect adequate precautions in packing, no matter how great the cost.

Yours faithfully,
ERNEST R. GILBERT.

Hazlitt House,
Southampton Buildings, W.C.1.

"CLIMATIC CONDITIONS AND DX RECEPTION."

The Editor, POPULAR WIRELESS.

Dear Sir,—I read with interest the letter of my friend, Mr. E. Tarplee, on "Climatic Conditions and DX Reception," in the latest issue of your paper, and I quite agree with him inasmuch that I, too, find it impossible to receive any American stations on the broadcast wave-band. Whereas I receive the programmes of both W G Y and K D K A every night on the low waves quite well—in fact, the latter are sometimes more than comfortable 'phone strength on O-V-1—although I have repeatedly searched on the broadcast band, I have found nothing except very occasionally an almost inaudible carrier-wave. I am greatly puzzled as to the reason for this, and it is quite possible that Mr. Tarplee has hit upon the solution, although it may interest him to hear that recently K D K A have come in very well, despite the fact that for the past few days the weather prophet has predicted easterly winds. Trusting that this may be of interest to your readers, and wishing your paper every success.

Yours faithfully,
M. WILLIAMS.

39, Tottenham Court Road, W.1.

IDENTIFICATION OF A STATION.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to Mr. A. C. Bates' article in the Correspondence columns of "P.W.," No. 182, of the 21st inst, I would mention that about a month ago, on trying out a hook-up of a short-wave receiver, two-valve Reinartz, I also heard somebody spell out "Vesser." In addition, however, I heard the word "Rohrenfabrik," being German for "valve factory." Beyond this I can give no details, but have also wondered who this transmitter might be.

Hoping this will be of interest to Mr. A. C. Bates,
Yours faithfully,
B. HAMILTON.

126, Oxford Gardens, W.10.

RE CHITOS CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—I see an inquiry in your paper re the working of the Chitos circuit as a three-valve circuit. If a 50,000 ohm anode resistance is placed across the .0003 anode tuning condenser, it will be found that the set becomes quite stable, and can be worked from a single H.T. battery in the usual way.

I have personally obtained some very excellent results with this circuit. Yours faithfully,

STANLEY W. THORPE,
M.I.E.E., M.I.F.E.
Chief Officer, B.F.B.

Fire Brigade Headquarters, Brighton.

TECHNICAL NOTES.

(Continued from page 796.)

An Efficient Transformer.

The Marconiphone "Ideal" transformer, which is already well-known for its excellent performance, has been the subject of much further work on the part of the Marconiphone research department, and certain important improvements have been made, not so much in the design as in details of the construction. The "Ideal Junior," which is described as a "detector follower" gives a straight curve for all ordinary frequencies. This instrument functions as a general-purpose first-stage transformer, as well as an amplifying unit.

These transformers are now subjected to a special impregnating process, using "Marconite," a special insulating material developed for this purpose. This impregnation is claimed to have the effect of preventing any variations in the performance of the instrument due to damp, atmospheric conditions, or the influence of surrounding materials.

It has been found by experience that a speech transformer is very susceptible to such influences and also that it suffers a gradual change with age. If these troubles have been got over, the result should certainly be an important advance in the manufacture of inter-valve transformers.

An Interesting Experiment.

An amateur sends an account of an interesting experiment in which two stages of audio-frequency amplification were applied to an ordinary telephone receiver for the purpose of working a loud speaker on music transmitted from another telephone. A modulation transformer was connected in place of the first L.F. transformer, the former having a low-resistance primary, about 25 ohms, and a high-resistance secondary, 1,000 ohms. Instead of the telephone receiver, a microphone may be used as transmitter, and this may be made up into a separate unit, or may be connected across the primary of the first L.F. transformer.

With two stages of L.F., the amplification may be great enough to cause a feed-back effect into the microphone and so set up a continuous howl. This may be prevented either by reducing the amplification and turning the microphone away from the loud speaker, or by removing the loud speaker farther away from the transmitter.

Germany's New Radio Conditions.

From the 1st of September, the regulations governing the amateur and commercial construction of wireless apparatus in Germany have been reviewed and the wave-length range extended to 3,000 metres. German transmitting stations are the property of the Imperial Post Office, but are operated by private companies. Reaction to the aerial, which had hitherto been restricted, is now free.

The importation of wireless apparatus is subject to Customs regulations, but there are no other restrictions as to particular types, except that imported goods must not infringe German patents: this, however, is an ordinary normal regulation. The sale of individual parts is free and without duty, on the assumption again that patent rights are not infringed.

(Continued on page 838.)

TECHNICAL NOTES.

(Continued from page 837.)

Rejuvenating Dull-Emitters.

Since I mentioned the "rejuvenation" of valves in these Notes a week or two back, many readers have written to me on the subject, in most cases to know the *modus operandi* of the process. I should explain that this is not accurately known, but it is believed that the "running" of the filament at its normal temperature, or higher, without the application of H.T., has the effect of bringing up to the surface—speaking, of course, of dull emitters—some further supply of the oxides, or other ingredients of higher emissive index, from within the body of the filament.

When a filament is running normally, it is calculated that the thorium—or whatever the impurity may be—diffuses steadily to the surface, and that a more or less steady state of affairs is reached, when the net emission from the filament remains fairly constant. It will be noted, however, that in any case, even if the filament is treated with every possible care, there will be a gradual reduction of its emissive powers owing to the using-up of the vital element.

But if the filament is overrun, with high-tension voltage applied, the supply of the impurity is temporarily depleted, or the filament is temporarily paralysed, and it is to overcome this effect that the "rejuvenating" process is designed. There is no doubt, whatever the explanation may be, that dull-emitter filaments may, by careful and judicious treatment, be made to give remarkable good service as compared with what they will do if abused or left more or less to their fate.

The experimenter who has been accustomed to bright-emitters—in which "you simply apply juice, and that's all there is to it"—will find that his dull-emitters have a "temperament" all their own, and a careful study of the same will well repay the user for his trouble.

Variable Grid Leaks.

A reader has sent me an interesting account of some observations which he made upon a variable grid leak of the "plunger" pattern, in which a metal plunger penetrates to different depths into a semi-fluid resistance element. He finds that the resistance, for a given setting of the plunger, varies with the angle of elevation of the grid leak. This he attributes—probably correctly—to the flow of the liquid under the action of gravity.

If the leak is in a horizontal position, the liquid will gradually flow until it lies along the lower side of the tube in which it is contained, whilst if the leak be placed in a vertical position, with the plunger uppermost, the liquid will gradually sink to the end of the tube remote from the plunger.

These observations are quite interesting from a technical point of view, but it does not matter, of course, in the least, so long as the grid leak is not going to be constantly shifted about whilst in use. If it remains in a fixed position, it has only to be adjusted until the required effect is obtained, when it will presumably remain more or less constant, and that, after all, is all that is required.

FOREIGN RADIO NEWS.

(Continued from page 812.)

Lightning Plays with Radio Installation.

A curious freak play of lightning with a radio installation is reported from Eberen, in Franconia, Germany. Lightning struck the spire of the village church, which was not provided with a lightning conductor. Part of the discharge seems to have worked its way along a series of iron nails in the roof and penetrated to the clock in the tower, which was stopped but not seriously damaged. The bulk of the discharge, however, was attracted by the three antennæ of the village priest's radio set, which he had rigged up at the side of the church tower. The aerials, of which there were three, entirely disappeared. The earth was made by means of a water cistern, and, while there were traces of burns on the window-sill of the vestry, where the lead went to the cistern, no further damage could be observed. The set itself was entirely uninjured.

Commenting on this incident, the secretary of the local radio club points to it as evidence of the necessity for all persons having receiving sets to see that they have a proper earth connection.

Famous Concerts Broadcast.

The Dutch syndicate which runs the Hilversum station has, it is announced, contracted with the "Concertgebouw" of Amsterdam, for the broadcasting of these famous concerts. They take place every Thursday during the winter season, starting at 7.55 p.m., Greenwich time.

The Hilversum station has added, furthermore, to its usual programmes a service of political and financial bulletins. These will be transmitted daily at 7.40 and 9.40 p.m., save on Sundays, when only news will be broadcast at 9.40 p.m.

On Mondays and Thursdays, at 6.45 p.m., a special talk to housewives will be given, but, as this will be in Dutch, it is hardly likely to be a popular item with foreign listeners-in. The Nederlandsch Seinstollen Fabriek is hastening work on the erection of the new powerful Amsterdam station.

Rumanian Amateurs Combine.

Under the presidency of Prince Carol, the heir to the throne, Rumanian radio amateurs have formed a club under the name of Radiophonia.

Dr. Hurmuzescu, professor of applied electricity at the University of Bucarest, will be the mainspring of the new concern, which hopes shortly to open a station besides the private ones of its members. Radio regulations were recently relaxed in Rumania.

Broadcast Athletic Meetings.

The station Radio-Belgique has started broadcasting important athletic and sporting events. This feature is proving quite popular, and it is thought that it may lead to regular broadcasting of races, football matches, etc. The roar of the crowd, and the announcement of odds and results are prominent in the programme.

Gold Finding by Wireless.

Sir Robert N. Kotze, mining engineer in the employment of the South African Government, is confident that it is possible to

(Continued on page 840.)

FOREIGN RADIO NEWS.

(*Continued from page 839.*)

discover gold and other mineral deposits by the aid of radio.

It is already possible, he states, to send radio waves through a crust of earth, and, as various kinds of minerals respond to waves in varying ways, it should be possible to devise some system of distinguishing the mineral composition of the layers encountered.

"Petit Parisien" Wave-Lengths Experiments.

The well-known "Petit Parisien" station in Paris announces that, in view of frequent interference from other stations, new wave-lengths are being tried. Listeners are requested to furnish reports.

This station has been most unlucky since its inception with regard to interference, and listeners in this country will follow with interest the new attempts to get out of the wavelength muddle.

An Interesting Radio Station.

A Gastronomic Congress and Fair is being held just now at Dijon, one of the French provincial centres best known from olden time for the excellence of its *cuisine*. A special station has been erected near Dijon for this fair, and accounts of the proceedings, varied with musical items, are being broadcast nightly at 8.30 p.m. on a 498-metre wave-length.

It is fervently hoped by radio amateurs in this part of France, that the station may outlast the fair and become a permanent feature, as hitherto they have been dependent on the Lyons stations, reception of which is subject to frequent interference.

Advantages of Radio.

A French deputy, on the reassembling of Parliament, intends raising the question of using radio to fight against the increasing tendency in the direction of depopulation, which is so grave and legitimate a source of anxiety to French statesmen. His proposal is that the French broadcasting stations should be used to send out appeals to all good Frenchmen and Frenchwomen not to sacrifice national interests to selfish convenience by refraining from having large families.

It is pointed out in this connection that radio indirectly plays a rôle in keeping the people on the land. The great objection to staying on the land in these days of hectic search after amusement is that the country-side does not offer youth chances of amusement and recreation.

The rapid extension of radio in the country districts is doing something to counteract this, as not only does listening-in brighten up the long winter evenings, but the programmes frequently supply music to which the rustic youth can dance, thus filling up a much felt gap in country life.

A Novel Periodical.

The club of Lille and district radio amateurs has started a new venture, which is believed to be unique so far. This is a bi-monthly paper which will be entirely edited, printed, and—read by the members of the club. No copy will be on sale, and members will not be allowed to give away their copies. This ought to have, incidentally, the effect of making this little paper something of a journalistic curiosity and rarity.

A Dull Filament Valve in the TRUE Sense

The Wonderful "N" Filament valve

Requires only ONE-TENTH AMPERE filament current from 3 dry cells or a 4-volt accumulator.

Gives majestic volume free from microphonic disturbance.

The heat present in the unique "N" filament is so small that *no sign of glow can be discerned.*

THE FINEST LOUD SPEAKER VALVE EVER PRODUCED

THE P.M. 4 - 22/6

Leaflet V.R. 26, free from any dealer, gives complete information.

Mullard

THE MASTER VALVE

(Patent Pending.)

LISSENOLA LOUD SPEAKING UNIT
Price 13/6 only.

The heart of a Loud Speaker is its sound reproducing base

THE LISSENOLA LOUD SPEAKING UNIT is this base. You can attach it to any horn, you can put it on to the tone arm of your gramophone, you can adapt it to take a paper pleated diaphragm by means of a simple attachment sold separately.

Buy first the LISSENOLA LOUD SPEAKING UNIT, add your own horn, experiment with different types for different kinds of music, and change over at will.

Make this test: Put on the best loud speaker you know of—or ask your dealer to—note the results with a given power input and given signals. Then take the horn off that loud speaker and attach it to the new LISSENOLA LOUD SPEAKING UNIT. With the same signals and the same power input you will get the same degree of loudness, and we venture to say even greater purity than you did before.

You will never make the LISSENOLA LOUD SPEAKING UNIT "dither" or resonate no matter what power you put through it.

ITS PRICE IS A RECORD LOW ONE, but we ask you to compare its price last. Think of this LISSENOLA unit first for what it does when compared with the finest and most expensive loud speaker, then come back to its price, and you will agree it is the best value you know of.

LISSENOLA LOUD SPEAKING UNIT

(Patent pending.)

Price only 13/6

TRAVELLERS. We have a few positions open for capable salesmen. Applicants should state fully age, connection, ground, technical knowledge, experience and salary terms. Address as below. Envelopes to be marked "Traveller."

Ask your dealer to show and demonstrate. If any difficulty, please send direct.

LISSEN LIMITED

LISSENIUM WORKS, 8-16, FRIARS LANE, RICHMOND, SURREY

Phone: RICHMOND 2285 (4 lines).

Grams: "LISSENIUM, PHONE, LONDON."

LISSEN PARTS—WELL THOUGHT OUT, THEN WELL MADE

Printed and published every Thursday by the Proprietors, the Amalgamated Press (1922), Ltd., The Fleetway House, Farringdon St., London, E.C.4. Advertisement Offices, Messrs. J. H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Registered as a newspaper, and for transmission by Canadian Magazine Post. Subscription rates: Inland and Abroad, 19/6 per annum; 9/9 for six months. Sole Agents for South Africa: Central News Agency, Ltd. Sole agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for Canada: The Imperial News Co. (Canada), Ltd. Saturday, December 5th, 1925.

R/R

An Amplion for Christmas

For what will undoubtedly be "A Wireless Christmas" the gift of an AMPLION will be appreciated more perhaps than any present the wit of man could devise.

The RADIOLUX AMPLION represents an outstanding triumph in the art of Loud Speaker design, being totally different in appearance, in construction, and in results. Louder, clearer, more sensitive and realistic in tone than any contemporary instrument, the RADIOLUX AMPLION is a *revelation* in every essential loud speaker quality.

Not only is the spoken word and the song of the vocalist true to life, but instrumental music is almost indistinguishable from the original studio performance. Outwardly resembling the English bracket clock—in itself a standard to the world—the cabinets possess that beauty of form and superlative finish which denote the *masterpiece.*

Obtainable from AMPLION STOCKISTS, Radio Dealers or Stores

Patentees and Manufacturers

ALFRED GRAHAM & CO. (E. A. Graham),
St. Andrew's Works, Crofton Park, LONDON, S.E.4

Demonstrations gladly given during business hours at 25 Savile Row, London, W.1.; 79 High Street, Clapham, S.W.4; 10 Whitworth Street West, Deansgate End, Manchester, and 101 St Vincent Street, Glasgow.

Made in two sizes and various finishes at prices from £4 15s. The illustration above depicts Model R.S.I.M. with mahogany cabinet and oxidised silver "grille." Price 8 gns.

Radiolux AMPLION

For those inclined towards a "trumpet" the House of Graham continue to offer the famous "Dragon" range at prices from 25/-.

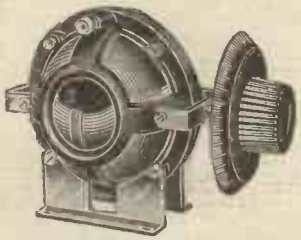
FOR · THE · FIRST · TIME · IN · LOUD · SPEAKER
HISTORY · SCIENCE · AND · ART · GO · HAND · IN · HAND

Xmas Gifts that give lasting pleasure —

RADIO **IGRANIC** DEVICES

Some Gift Suggestions

IGRANIC "E" Type Audio-Frequency Transformer
(*Patent No.* 205013).
The latest Igranic model embodying many valuable improvements. It may be relied upon to give extremely high and uniform amplification with a complete absence of distortion.
1-5 ratio for first stage 21/
1-3 ratio for second and subsequent stages and for power amplification 19/6



IGRANIC "F" Type Variometer
(*Regd. Design No.* 708773).
The radio enthusiast who *will* have none but the latest and most efficient components built into his receiver will welcome the Igranic F. Type Variometer. The great feature of this component is in the stator moulding which has been "skeletonised."
The elimination of moulded material results in a very big improvement in efficiency, due to the reduction of self-capacity and to the fact that the clearance between rotor and stator windings is very small.
It is ideal for aerial tuning in either crystal or valve sets receiving B.B.C. Stations. Supplied complete for fixing.
Price (250-600 metres), 12/6.

IGRANIC Telephone Connector
(*Pat. No.* 223469.)
A handsome and useful addition to any set. Provides connection for addition of four pairs of telephones. Automatic in action. Price 8/6

Whether your friends be mechanically or artistically inclined you could not choose for them better Xmas Gifts than IGRANIC RADIO DEVICES. To the radio enthusiast, the excellent performance and perfect workmanship of all IGRANIC RADIO DEVICES—from a grid-leak to a splendid outfit for building the Igranic Six-valve Super-Heterodyne Receiver—will be a source of lasting pleasure and satisfaction. To your friend who is keenly appreciative of good music artistically rendered, the broadcast concerts which may be so faithfully reproduced by a set built with IGRANIC RADIO DEVICES, will give sheer joy. By either of them your Xmas Gift is sure of a warm welcome and will be an enduring reminder of your friendship and goodwill.

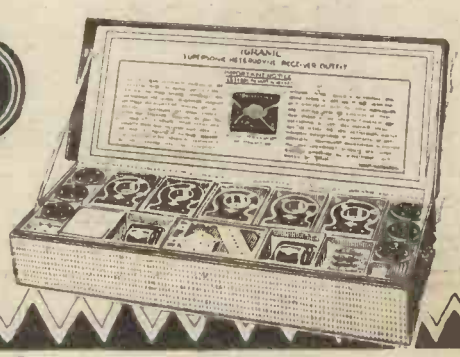
All IGRANIC RADIO DEVICES are built of the best, by the best craftsmen—to give *better* results.

IGRANIC RADIO DEVICES include :

Honeycomb Duolateral Coils, Variable Condensers, Fixed Condensers, Filament Rheostats, Intervalve Transformers, Variable Grid-Leaks, Variometers, Vario-Couplers, Coil Holders, Potentiometers, Combined Instruments, Vernier Tuning Devices, Switches, Anti-Microphonic, Valve Holders, Stand-off Insulators, etc., etc., and also the IGRANIC Supersonic-Heterodyne Receiver Outfit. *All carry the IGRANIC Guarantee.*

Write for List Z.897.

IGRANIC Super-Het Receiver Outfit.



COMPANY **IGRANIC** ELECTRIC LIMITED

149, Queen Victoria St., London.
Works: BEDFORD.

YOU WILL USE THESE

WHENEVER you want to use any components of the type illustrated here, you will find it best to specify Dubilier.

We are the largest condenser firm in the world, and practically every transmitting and receiving set contains some of the well known Dubilier products, which are universally known for their accuracy, reliability and constancy.

The four Dubilier products here illustrated are as follows:—

The Dubilier Duwatcon Variable Condenser is a special design for series-parallel working, giving a complete and uninterrupted tuning range over the whole wave-length band.

0·0007 mfd., 30/-

Type 610 and 620 Mica Condensers, for general use in receiving circuits. Capacities 0·0001-0·015 mfd.

From 3/-

The Dubilier Mansbridge Variometer. This new and convenient Variometer will cover the complete wave-length band up to 5 XX (a fixed condenser value 0·0025 mfd. is used in conjunction with it for the higher wave-lengths).

Price 12/6

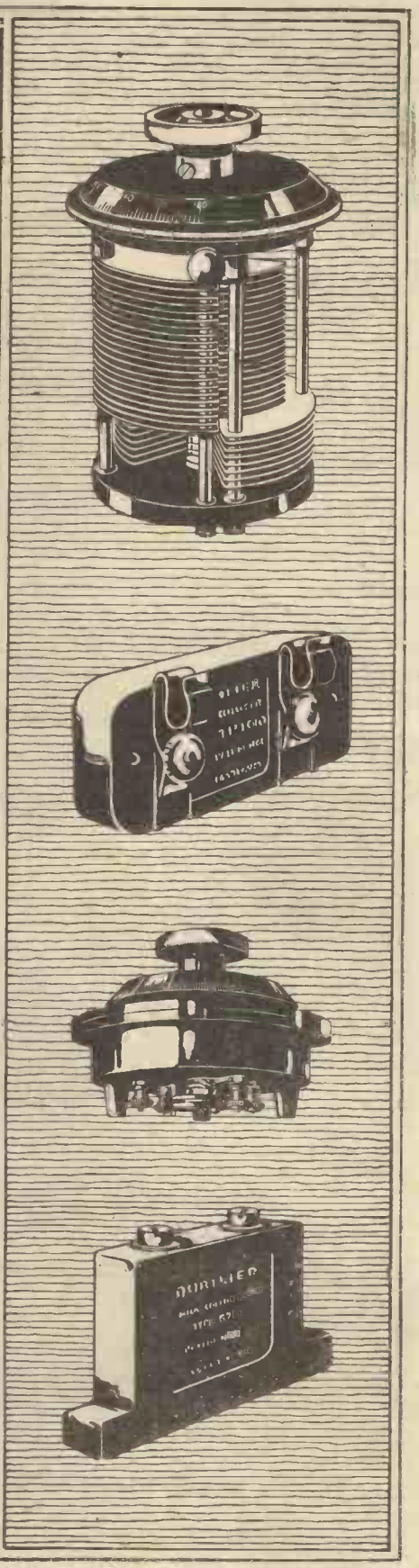
The Dubilier Condenser Company (1925) Ltd., manufacture Fixed Mica Condensers, Variable Air Condensers, Anode Resistances, Grid Leaks, the Dubrescon Valve Protector, the Ducon Aerial Adaptor, the Minicap Switch, and the Mansbridge Variometer. The Company are also sole concessionaires for the products of the Mansbridge Condenser Co. Ltd.

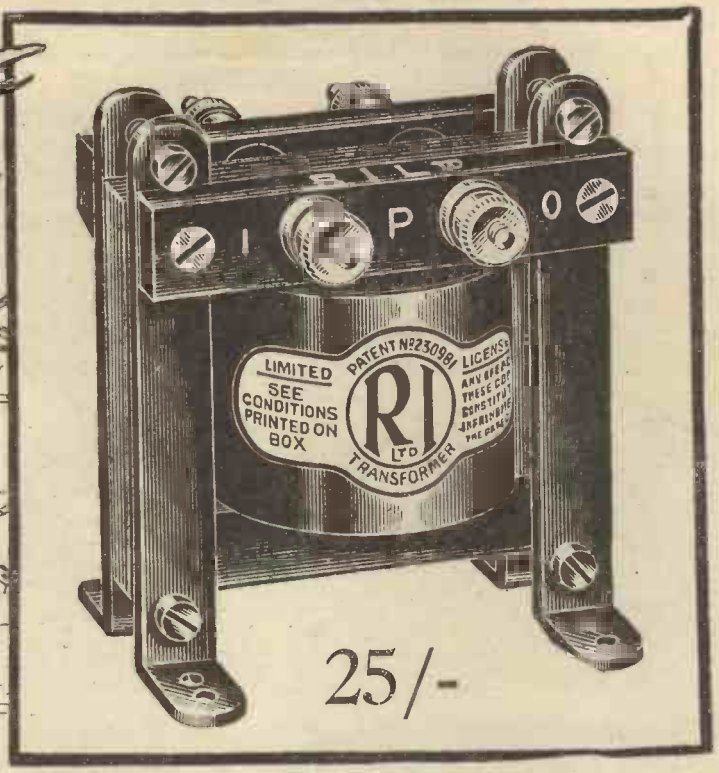
Specify Dubilier

REGISTERED DUBILIER TRADE MARK

DUBILIER
CONDENSER CO (1925) LTD

ADVERT. OF THE DUBILIER CONDENSER CO. (1925) LTD., DUCON WORKS, VICTORIA ROAD, NORTH ACTON, W.3 TELEPHONE: CHISWICK, 2241-2-3.





Purity of tone

You can't help making comparisons. The song of the nightingale—the perfect reproduction of tonal beauty by the R.I. Transformer—each in its own place whispers perfect loveliness.

This transformer still maintains the position which it has held from the first—that of being the standard form of magnetic coupling which reproduces music and speech in their most natural form

Since this transformer first appeared, it has been followed by numbers of others, some of which, as far as external appearance goes, are obvious imitations of the R.I. Transformer, while others put forward claims of superiority and efficiency which are not borne out in practice. **The only test that really counts is that of the actual user.**

Take any simple receiving circuit and couple it to an amplifier built with an R.I. Transformer, with any ordinary valve, and you get perfect and pure music or speech. Now take any other transformer on the market and make a similar test. In some cases you will get equally good results, but it will be necessary to use special valves. In other cases you will get inferior results, but in no case will you get better results, because an inspection of any other transformer will prove beyond doubt that there is nothing in any of them to give purer results unless a totally different principle is employed.

We found, after extensive research, both in our own laboratories and by making use of the results obtained by eminent investigators in the same field, that the only possible way in which the transformer could be improved was in the subdivision of the windings, thereby reducing the capacity. This innovation was hailed as a great advance in the design of the intervalve transformer, and since then nothing has been done to improve it.

One of the most severe tests of an intervalve transformer is its behaviour in reflex circuits. These latter became popular by reason of the fact that they could be used in connection with low-frequency amplifiers, without distortion, if used with an R.I. Transformer. All low-frequency intervalve transformers are not suitable for reflex circuits, neither are they suitable for all types of valves. You can use an R.I. Transformer with practically any valve and any capacity.

Over half-a-million users will confirm this. This is the best proof the public can have of the efficiency and value of a component that has obtained a classic name in the Radio Industry.

BRITISH RI

When buying R.I. Transformers see that they are contained in the R.I. standard sealed boxes.

Write for the R.I. blue and gold Catalogue, free on application.

RI LTD

THE MARK OF BETTER RADIO

Help yourself!

TAKE your choice of any part of the world. With an Ormond Condenser station after station can be tuned in quickly and sharply, no matter how closely the wave lengths approximate. Paris, Madrid, Rome, Breslau—any part of Europe, any part of America. With an Ormond Condenser nothing is simpler. But it must be an ORMOND—the result of 25 years' British manufacturing experience.

Ormond Low-Loss Condensers

SQUARE LAW (Patent applied for.)

Supplied in the following sizes:

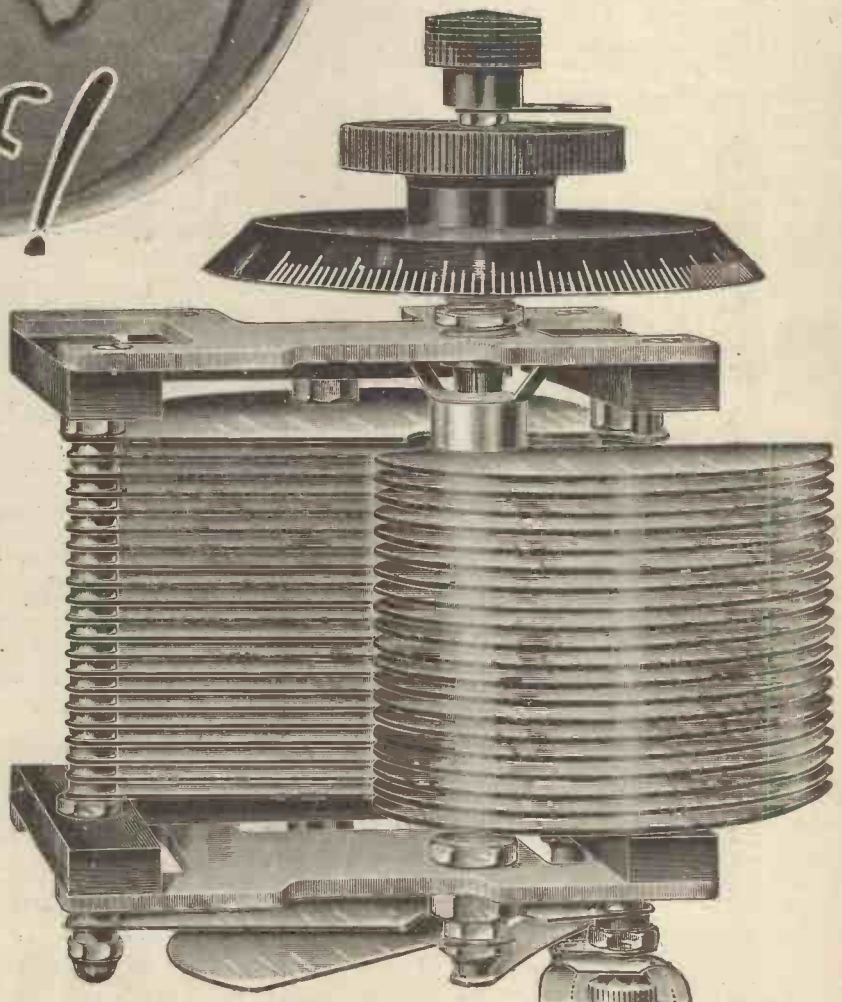
Size.	Price with Vernier.	Price without Vernier.
·00025	8/-	6/6
·0003	9/-	7/6
·0005	9/6	8/-
·001	10/6	9/-

Complete with knob and dial.

We specialise in turning Brass and Steel Screws and Machined Parts and Accessories of all descriptions.

Ask your dealer to show you these Ormond Condensers—the best dealers stock all Ormond products.

ENGINEERING ORMOND COMPANY



See the Inspection Label on every Condenser.

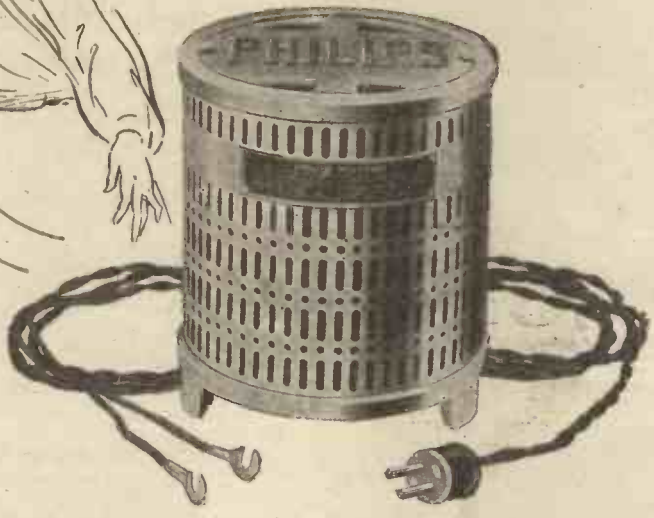
199-205, Pentonville Road, King's Cross, London, N.1.

'Phones: Clerkenwell 9344, 5, and 6.
'Grams: "Ormondengi, Kincross."

Factory :—Whiskin Street, Clerkenwell, E.C.1.

25 YEARS' BRITISH MANUFACTURING EXPERIENCE.

He never gets let down now!



A Feeling of Complete Confidence

He knows how to avoid those disappointing evenings when he had to announce to his friends in the middle of an enjoyable programme, "Sorry; the battery has run out."

He remembers, too, how that meant missing the following evening's programme as well, because he wasn't able to get his batteries charged in time.

To-day, it's all changed. A month with PHILIPS RECTIFIER has given him a feeling of complete confidence that he will never be let down now, and that there is one battery charger that always gives complete satisfaction.

Philips Rectifier works off A.C. supply, requires no supervision, works silently, and automatically regulates the current supply.

There are no objectionable chemicals, no buzzing noises, and you have, in fact, a most reliable battery feeder with an extraordinarily low running cost.

SIMPLE. CONVENIENT. EFFICIENT.

It charges while you sleep.

Write for leaflet P.W., free on application. Trade enquiries invited.

£4·15·0
COMPLETE

PHILIPS
RECTIFIER

Advt. Philips Lamps, Ltd., 60, Wilson Street, London, E.C.2.

For every Wireless Purpose

Silvertown

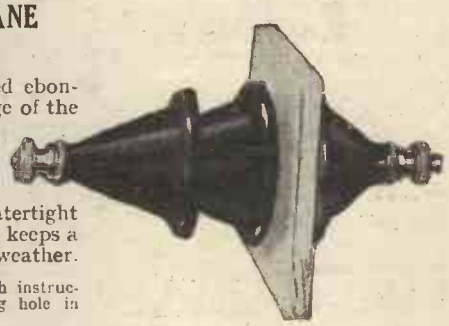
WIRELESS ACCESSORIES

Quality guaranteed by over 50 years' electrical manufacturing experience.

SILVERTOWN WINDOW-PANE INSULATORS

Regd. No.: 705625 (Patent No.: 233880)

Made of best quality enamel-coated ebonite, these insulators take advantage of the excellent insulating properties of glass, and at the same time avoid losses by keeping the lead-in well away from walls. Rubber rings form a watertight joint against the pane. The cone keeps a portion of the insulator dry in wet weather.



PRICE 4/- each. A special drill with instructions for making hole in glass supplied with each insulator.

SILVERTOWN CONE LEAD-IN INSULATORS

Regd. No.: 705625 (Patent No.: 233880)

Another effective form of insulation, using the cone insulators in conjunction with an ebonite tube passing through a window frame or wall. Electrical efficiency assured.

PRICES from 4/6 each.

The

SILVERVOX

The "Silvervox" Loud Speaker will reproduce both speech and music without the loss of its original tone and quality. Coils wound to either 120 or 2,000 ohms. The tone arm is a heavy aluminium casting. Total height 20 inches. Size of trumpet 12½ inches diameter.

Price:

£3 : 10 : 0 *each*

AN AID TO ENTHUSIASTS.

We have prepared a logging chart for recording wavelengths, condenser settings, etc., of those stations which require careful calibration to tune in. A copy of this chart, printed on stiff card, with hanger, can be obtained free of charge at any of our Branches or from any high-class dealer.

Makers:

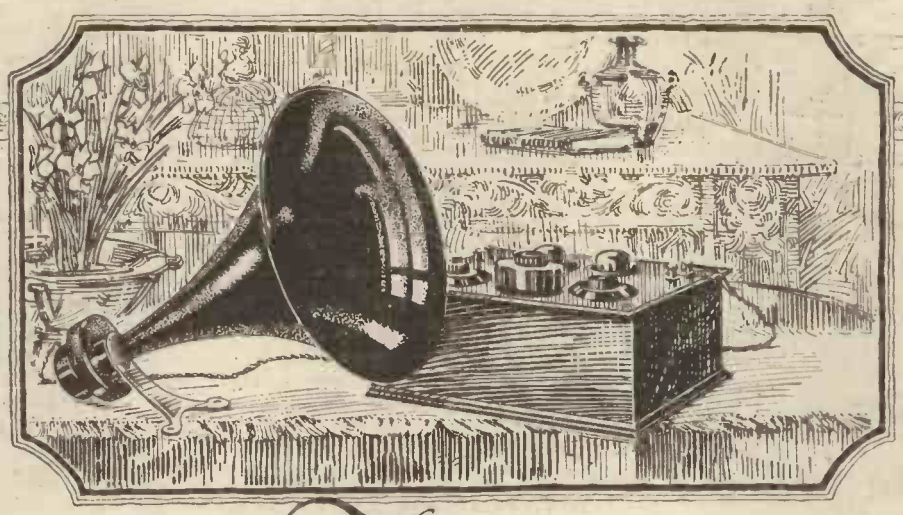
THE SILVERTOWN COMPANY,

106, Cannon Street, London, E.C.4.

Works: Silvertown, E.16.

BELFAST: 75, Ann Street.
BIRMINGHAM: 15, Martineau Street.
BRISTOL: 4, Victoria Street.
CARDIFF: Pier Head Chambers, Bute Docks.
DUBLIN: 70, Middle Abbey Street.
GLASGOW: 15, Royal Exchange Square.
LEEDS: 1, New York Road.
LIVERPOOL: 51, 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.

SILVERTOWN RADIO COMPONENTS



The Best Value in Radio

THE combination of the B.T.H. 2 Valve L.F. Receiver and B.T.H. Type C8 Loud Speaker undoubtedly represents the best value in radio. Good loud speaker results are given within 20-30 miles of a B.B.C. main station or 100 miles of Daventry.

	£	s.	d.
B.T.H. 2 Valve L.F. Receiver	6	0	0
Royalty	1	5	0
B.T.H. Type C8 Loud Speaker	1	15	0
TOTAL (less valves and batteries)	9	0	0

The B.T.H. 2 Valve L.F. Receiver

The circuit employed is a detector valve with one stage of L.F. amplification. A neat plug-in aerial and reactance unit covering a range of 300 to 500 metres is provided. A similar unit is available for 1500 to 1800 metres at an extra price of 18/-. The set is contained in a handsomely finished case.

The B.T.H. Type C8 Loud Speaker

This is an efficient but moderately priced instrument. Both body and horn are constructed of chocolate coloured non-resonant material which gives a beautifully mellow tone.

Insist on B.T.H. the Best of All

Ask your dealer for a demonstration and for copies of leaflets R.7335 and R.7430

B.T.H. RADIO

2462.

Advt. of the British Thomson-Houston Co. Ltd.

EFESCA

Regenerative AERIAL TUNER

The Efesca Regenerative Aerial Tuner is the natural development of the extremely convenient series of Efesca One-Hole Fixing Tapped Coils. It is a specially designed form of Tapped Aerial Coil incorporating Aerial Reaction in a self-contained unit. Reaction is effected by means of a rotor revolving in a separately wound section of the Aerial Coil, thereby effecting maximum reaction over the whole wave band covered by the coil. Wave-length range 150 to 2,600 metres in conjunction with a ·0005 Variable condenser in parallel. Price, complete with Knob, Pointer and Scale, 32/-

Other components in the Efesca Series of One-Hole Fixing Tapped Coils are the H.F. Transformer and Anode Tuner (illustrated here), Aerial Tuner and the H.F. Reactance Coil.

Write for Catalogue No. 559/2 describing and illustrating Efesca Components and Efescaphone Sets.

Ask your wireless Dealer or Electrician to show you.

EFESCA Popularity Competition

£200 IN CASH PRIZES

Ask your dealer for entry form or write direct to

FALK, STADELMANN & CO. LTD. 83-93 FARRINGDON ROAD, LONDON, E.C.1

EFESCA COMPONENTS

WHOLESALE ONLY :—

FALK, STADELMANN & Co., Ltd.

83-93, FARRINGDON ROAD, LONDON, E.C.1.

Also at Glasgow, Manchester & Birmingham.

20/- down

buys any of these superb Sets for Xmas

YOU buy your House by deferred payments. You purchase your furniture out of income and perhaps even your motor-car by the same up-to-date methods. Then why not choose a really good Wireless Set and pay for it as you use it. How much more satisfactory to buy out of income a worth-while Set capable of giving excellent results in preference to something considerably cheaper and less satisfactory.

The 4-Valve Family

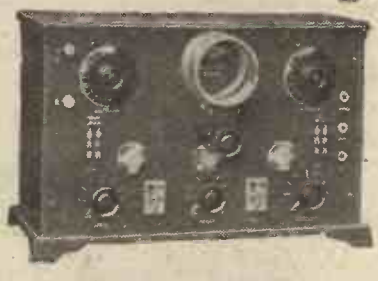
A Set which can be thoroughly recommended for home use. Splendid Loud Speaker results and ideal for long distance reception when required.

£1 down and 11 monthly payments of 24/-.

The Puriflex

£1 down and 11 monthly payments of 15/6.

A splendid Set for purity of tone. Ideal for local reception where perfect reproduction is essential.



The All Concert-de-luxe

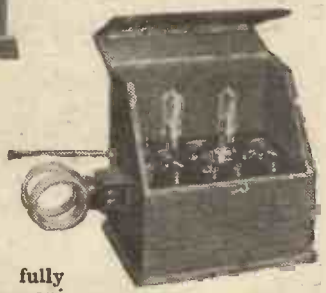
An excellent all-round Set suitable for all purposes.

£1 down and 11 monthly payments of £1.

Two-Valve Reflex

£1 down and 11 monthly payments of 15/-.

A famous 2-Valve Reflex Receiver of great power and extreme sensitivity.



All the above Receivers are fully guaranteed and prices include Marconi Royalties. These sets are also available for home assembly at a saving in cost. Send coupon for further particulars.

New Times Sales Co., Vulcan House, 56, Ludgate Hill, London, E.C.

To New Times Sales Co.,
56, Ludgate Hill, E.C.4.

Without placing me under the slightest obligation, please send me a copy of your latest Radio Book (56 pages fully illustrated)

NAME .....

ADDRESS .....

.....

P.S. 4116

Wireless Xmas Gifts

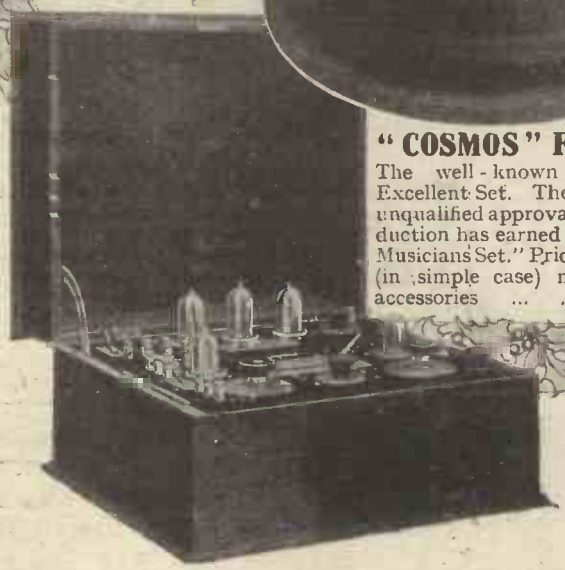
"COSMOS" CRYSTAL SET

A Crystal Set possessing many new features. Receives from High-Powered Station and ordinary B.B.C. Compact, Selective and Convenient. Price as shown 25/-

"COSMOS" THREE-VALVE SET

A handsome set giving perfect Loud Speaker reception, with extreme ease of control. Price complete with all necessary accessories and Loud Speaker.

£15:5:3



"COSMOS" FIVE-VALVE SET

The well-known "Universal" Super-Excellent Set. The set that has met with unqualified approval. Its purity of reproduction has earned for it the title "The Musicians Set." Price (in simple case) no accessories £22:5:0

ASK FOR A "COSMOS" LIST

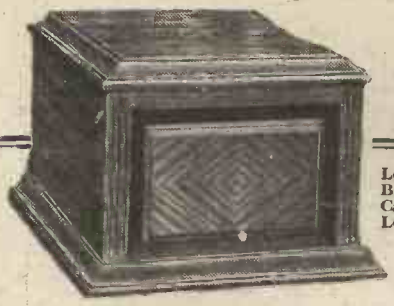
If your friend is building a set for himself, help him to produce the best results. By way of a Christmas present give him a set of "Cosmos" Strip Coils (from 3/6 each), or a "Cosmos" Square-Law Low-Loss Condenser (from 15/-), or some "Cosmos" D.E.11 Valves (at 12/6), or "Cosmos" S.P.18 Valves (12/6 each). He would appreciate nothing better.

OBTAINABLE EVERYWHERE.

METRO-VICK SUPPLIES LTD.

(Proprietors: METROPOLITAN-VICKERS ELECTRICAL CO., LTD.)

4 CENTRAL BUILDINGS, WESTMINSTER, LONDON, S.W.1



Left: Brown Cabinet Loud Speaker

Right: Brown Gramophone Adapter

The best Gift of all— a Brown

THIS Xmas choose a Radio gift which will give pleasure the whole year round. All the Brown Wireless Instruments illustrated on this page are British made and represent the highest standard of manufacture. Each one carries the fullest guarantee. Remember, the first Wireless Loud Speaker was a Brown—from that day to this, Brown superiority in design has never been challenged. Every Wireless shop carries a full range of all these instruments.

Brown H.1, 21 inches high

Brown H.3, 15 inches high

Brown New A-type 'Phones

Brown Q-type Loud Speaker

The Crystavox

The only Loud Speaker which can be worked direct from a Crystal Set without valves or other amplifiers. Requires only one 6-volt dry battery. £6 0 0

Crystavox Loud Speaker

Brown H.4, 10 inches high

Brown Featherweights

Brown H.Q. Loud Speaker, 20 inches high

Brown Loud Speakers

The H.1.—The reputation enjoyed throughout the world by the Brown Loud Speaker was built up on the H.1—the original Brown.
120 ohms £5 5 0
2000 ohms £5 8 0
4000 ohms £5 10 0

The H.2—An excellent Loud Speaker for use where the volume of the H.1 is not required.
120 ohms £2 5 0
2000 ohms £2 8 0
4000 ohms £2 10 0

The H.3.—A new medium priced Loud Speaker of exceptional volume and purity of tone.
2000 or 4000 ohms, £3

The H.4.—The smallest Brown Loud Speaker made. Fitted with standard tuned reed movement.
2000 or 4000 ohms 30/-

The H.Q.—Fitted with identical movement to that used in Brown H.1, but incorporating a handsome curved horn £6.

The Cabinet.—A "hornless" Loud Speaker capable of excellent results. In a mahogany or oak cabinet.
2000 or 4000 ohms £6 6 0

The Brown Q.—The de luxe Loud Speaker of incomparable beauty. In all resistances £15 15 0

Brown Headphones

F. type.—The most popular Headphone for Broadcast use. Weight only 6 ounces.
2000 ohms 20/-

New A. type.—The new reed-type 'phones unequalled for sensitiveness. Wonderful value at 30/- (2000 ohms).

Standard A. type.—The world's finest Headphones. As used by the Admiralty. 120, 2000 or 4000 ohms 50/-, 8000 ohms 60/-.

Gramophone Adapters

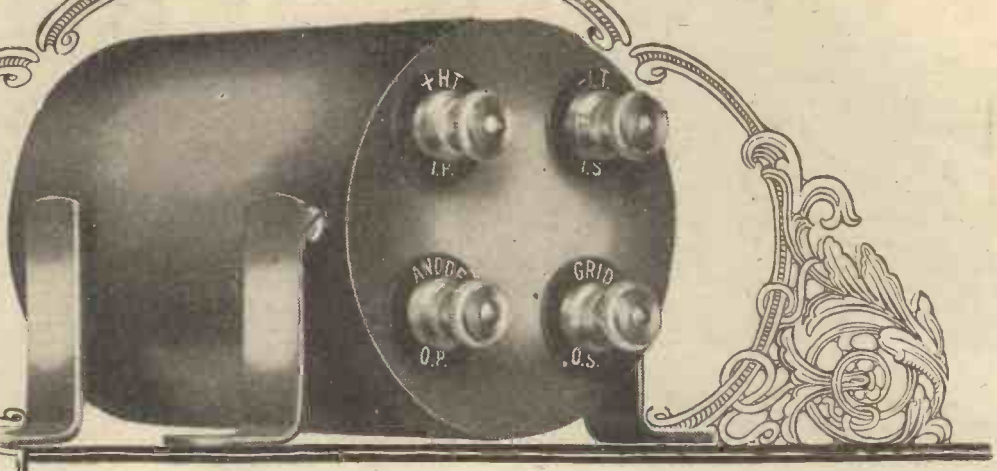
For converting your Gramophone into a first-class Loud Speaker.
H.1 (2000 ohms) £4 10 0 H.2 (2000 ohms) £2 0 0

S. G. Brown, Ltd., Western Avenue N. Acton, W.3

Retail Showrooms: 19 Mortimer Street, W. 1.
15 Moorfields, Liverpool. 67 High Street, Southampton.
Depots (Wholesale only): 13 Bushy Park, Bristol.
Cross House, Westgate Road, Newcastle.

LOUD SPEAKERS **Brown** AND HEADPHONES

Gilbert Ad. 4109



After two whole years Eureka supremacy is still unchallenged

THE Eureka Concert Grand was the first high-grade Transformer to be made with a non-laminated core. It was the first to be made with the large amount of 2¼ miles of wire. It was the first to be made with a coppered steel case which simultaneously prevented interaction, and hermetically protected its contents. And it was the first to be sold under a generous guarantee of instant replacement free of charge in the remote possibility of breakdown. Such pioneer work met with instant appreciation. Hundreds of thousands of wireless enthusiasts have realised the importance of using only the finest Transformer that money can buy or that Science can evolve—they have chosen the Eureka. Their choice has been a wise one. Your L.F. Transformer is to your Set what an engine is to a motor car. You may select the finest looking car—its appearance may be most impressive. But if its power unit is inefficient, your money will have been wasted. So with your Set. You may spend pounds on the other components—you may choose the most expensive panel, yet if your L.F. Transformer is inferior, the whole of your expenditure will be prejudiced.

Any Eureka Transformer is a veritable key to melody. Such purity of tone and volume as was never before believed possible is now within the reach of everyone. With its five distinct models there is now a Eureka to fit every need at a price within the reach of the most modest experimenter.

EUREKA REFLEX
The usual transformer is not pre-eminently suitable for reflex circuits. Special qualifications are needed, and here is the first Reflex Transformer built to measure up to true Eureka standards of quality and to conform to reflex requirements. Each .. **15/-**

BABY GRAND Nos. 1 & 2
For those whose purpose does not render the superlative Concert Grand a necessity, we can now offer the Eureka Baby Grand Nos. 1 and 2 for second stage. Incorporating all the recognised Eureka principles of design. Each **15/-**

EUREKA CONCERT GRAND
The Standard de Luxe Transformer **25/-**

Eureka No. 2. For use as a second stage amplifier **21/-**

From all Dealers

RADIO **EUREKA** PRODUCTS

Portable Utilities Co., Ltd. *Fisher St., London, W.C.1*

Gilbert Ad. 4113

POPULAR WIRELESS

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

Consultants:
Dr. J. H. T. ROBERTS, F.Inst.P.
J. F. CORRIGAN, M.Sc., A.I.C.
C. E. FIELD, B.Sc.

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

Assistant Technical Editors:
K. D. ROGERS.
P. R. BIRD.

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

RADIO NOTES AND NEWS OF THE WEEK.

Best of all the Unidynes—That 1,600-Metre Mystery—Dublin and the Pirates—Good One-Valve Results—Meal-Time Music.

A Happy Radio Xmas.

A VERY happy radio Christmas to you all. Isn't it simply wonderful how this new-fangled invention, wireless, has merged itself into the old-fashioned Christmas spirit? When the wind whistles and howls round the mast, and the lead-in taps the window-pane, could anything be more cheerful than a friendly loud-speaker, flooding the room with music? Can't you imagine how Charles Dickens and all the old-fashioned, cheery, smack-you-on-the-back, plenty-on-the-plate crowd, would have revelled in radio?

That New Unidyne.

"I'VE tried every Unidyne that's been printed except the 3-valver, but the Daddy of them all is the 1926 two-valver," says a Bishop's Auckland reader.

When I tried it, I thought it was a son-of-a-gun, for distance!

The 1,600-Metre Mystery.

WHO is the dark stranger, wandering about on 1,600 metres? Recently when tuning for 5 X X, listeners have been surprised to pick up scraps of conversation in a foreign tongue! Even when heard distinctly nobody can identify the intruder, for the language he uses is in a barbaric tongue, rather like that employed by a Croatian Serb when ticking-off a Bashi Bazouk, in the vernacular. Some say it's a new Russian station, but I fancy it's from farther south than that, near where the Tower of Babel used to be!

Dublin Again.

LISTENING-IN to the new Dublin station is decidedly diverting. At the moment the announcer there is preoccupied with the financial aspect of broadcasting. He is full of exuberant admiration for what is going on in the studio, but is haunted by a fear that the Free-Staters are picking up the concerts without paying their licences! So the poor man is torn between two fires—delighted that the concerts are going out so beautifully, but fearfully anxious that the pirates should not get them!

No Licence—No Programme.

APOLOGISING because a song is unaccompanied by a piano, this broth of a bhoy at Dublin explains that pianos cost money, and if you will only buck up and pay your licence, etc.! So if you tune in an item and hear someone say, "That was good, wasn't it? More treats are in store for you, but remember, no licence, no programme," you can be pretty sure that you have bagged 2 R N, working on 390 metres, from the McKee Barracks, Dublin.

A Gather-Round.

LET'S have a Gather-Round-Ariel—shall we?—whilst I tell you a perfectly true story. You know that everybody is supposed, nowadays, to be saving, cheese-paring, scraping and economising, to pay for that little war we all enjoyed so, don't you? Most of us have been begged and entreated to economise so often that we are afraid to put on a Players unless someone gives us a light for it, and yet there are some home-destructors, some boobs, some utter poons, who—well, listen——

Who Was That?

IN spite of all this economy talk, there are depraved listeners still living who are so bent on throwing away

(*Continued on next page.*)

To Our Readers.

ONCE more we place before our readers a special Christmas Number and take the opportunity of wishing you one and all the compliments of the season.

This is our fourth Christmas Number, and many thousands of readers who have subscribed to "P.W." since our first issue, and who have retained the back numbers, will find it interesting to scan our earliest efforts and to note the many changes and improvements made during the last three years or so.

We would particularly request our readers to give special attention to the many fine advertisements appearing in this issue. Many of them are entitled to high praise, not only because of their artistic presentation, but because of the undoubted excellence of the goods they describe.

We hope you will enjoy the contents of this issue: we think the articles and other features varied enough to appeal to all, and if we have pleased you in giving you a Christmas Number "full of good things" we are more than compensated for our labours.

The Editor.

NOTES AND NEWS.

(*Continued from page* 861.)

good boodle, that every time they hear a foreign station they rush off to the G.P.O., buy a 1½d. stamp, and waste my time, their time, the P.M.G.'s time, and sheets of paper, by writing me a blotty letter to ask me such questions as, "What station was it where the announcer last Sunday sneezed twice, and then said Ah-low?" or "Who rang a bell at 10.28 last night?"

The Announcer's Babel.

NOW I ask you, how do I know? How in the name of infra-red high-frequency blazes can I tell? Remember that there are about 100 announcers in Europe alone, all on the air at once, all saying, Hello, Hallo, Allo, Ah-lo, Al-low, and the rest of it. Every one of these announcers sneezes sometimes. Some of them—San Sebastian, for instance, where there's a *lady* announcer—sneeze twice, apparently upon the "once-a-wish" principle!

Confusion Worse Confounded.

WHAT'S more, they all revise their programmes, alter their wave-lengths, rearrange their items, and raise their frequencies—not occasionally but habitually, every time they think of it—at radio-frequency, so to speak. And then some of them thoughtfully relay the others upon different wave-lengths, and, just to complicate matters, the others give foreign talks in another language, and then there's the difference in time, and then——

The Tune He Knows.

RIGHT in the middle of all that, a man in Oxford—*Oxford*, mark you, not Borstal—has just sent me a letter saying, "What station was it *playing a tune that I know when I hear it* on 300 metres? Can you beat it? He says that right down there in Oxford (where the cars come from) he'd know that little tune again, if he heard it. What a hope!

Try Again.

I SUPPOSE you won't believe that, and you'll want to see his letter—well, you can't! For, in my despair, I tore it into ten thousand shreds and tapped off the shreds into units, and jumped upon the units, respectively and collectively, and disintegrated the atoms, and—well, what I was going to say is, if you miss the call-sign of a foreign station, the only thing to do is to make a note of the adjustments, and do what Bruce did when his spider-web coil fell apart—try, try, try again!

Found by a Photograph.

LOOKING through his copy of "P.W." dated November 14th, a Barrow-in-Furness reader saw on the "Technical Notes" page a photograph of a new American wireless set. He was interested to recognise the man operating the set as an old friend of his, John Hartley, who went out to America four or five years ago, and has since become famous out there as one of the leading radio fans. They had lost touch with each other until that photograph in "P.W." was recognised, but it's good to know that the famous John Hartley is an Englishman, who had made friends over here long before his circuit made them for him!

A DX Champion.

THE name of the American listener who claims to have tuned in 425 different broadcasting stations is Professor S. B. Kall. He certainly appears to have a Kall for this kind of thing, though DX would have suited him better than S.B.!

One-Valve Results.

ARE some of the foreign stations better than the B.B.C.'s? Radio-Toulouse, Madrid, San Sebastian, Petit-Parisien, Oslo, Hamburg, and Brussels, all come in as easily as some of the less-distant British stations, and more than one reader has reported all the foregoing foreign stations upon one valve! One Thorneywood, Nottingham, reader says: "I have logged twenty-six stations (sixteen B.B.C. and ten foreign) upon the Unidyne, which I consider to be the finest one-valve circuit offered to readers of 'P.W.'"

SHORT WAVES.

"As for America calling—there's romance for you. Two bars (reversed) of something, and then vast atmospherics. It is like watching a man swim the Atlantic."—A. G. Thornton, in the "Daily Chronicle."

* * *

"We have to arrange things so that when the double bass grunts its gruntiest it gives about the same electrical response in the microphone as when the piccolo pickles its piercingist."—Capt. Eckersley, writing in "Lloyds Sunday News."

* * *

"Over the hill to the poorhouse,
He wends his weary way;
He tried to support an 8-tube set
On a 2-tube earphone pay."—"Radio Digest."

A Radio Boycott.

"THE British station using the call G–5 D H is not an amateur station, but is being operated by the Post Office for the purpose of spying on British amateurs." This was part of a message transmitted by an amateur for the benefit of radio experimenters all over the world, according to a recent report in the "Daily Mail." Apparently the Postmaster-General complained of the boycott which resulted from the message, for experimenters all over the world refused to collaborate with G–5 D H until it had made friends again with the Radio Society of Great Britain!

Those Birthday Greetings.

TUNING-IN 2 L O's birthday greetings the other afternoon, I counted no less than 192 names and addresses! All of these had to be gabbled through at a great rate by breathless Uncles and Aunts, obviously racing to get them all finished in time. Consequently, there was only a few minutes available for the non-birthday kiddies, who, after all, outnumber the others by 364 to 1. Is the Wireless Fairy forgetting her arithmetic?

More Jamming by Morse.

ALL the way from Dover to Cornwall south-coast listeners are complaining of increased spark jamming. The offending station is said to be one with a four-letter call-sign, starting with O. For several days I have tried to sort out this station from amongst the others who interfere with broadcasting, but the French station F F B not only jams the programmes, but actually interferes with the interference—it's certainly time that something was done about F F B!

5 O Y.

LISTENING-IN recently on a Sunday morning, I heard the preliminary canter of 5 O Y, the new South London amateur station belonging to the Belvedere and District Radio Society. Modulation was quite good enough to sound O.K. when the speech was reproduced upon a loud speaker (using a four-valve set). A cheery invitation to join the society was given to residents, and the hope expressed that invalids, hospitals, and "shut-ins" would benefit by the transmission of music from 5 O Y. Well done, Belvedere!

Week-End Meal-time Music.

LOOKING back to last Christmas, it seems to me that broadcasting gets better and better. If there is a weak point at the moment I think it is at the week-ends (no pun intended). The Sunday afternoon programmes are almost ecclesiastic, and the joy of life gets too little expression between Saturday and Monday. Why not more meal-time music at the week-ends?

The Radio Revel.

IT is expected that 4,000 dancers will trip the light fantastic toe at the Olympia Dance Hall, London, on Saturday, December 19th. Simultaneously with the Radio Revel at Olympia, London will provide accommodation for another 6,000 dancers at the Palais de Danses at Wimbledon, Tottenham and Cricklewood. Popular radio artistes will attend the Revels, and it has been arranged that Jack Hylton's Band will play at Wimbledon, the Midnight Follies will go to Tottenham, and the Toronto Band, from Prince's, to Cricklewood.

Britain's Biggest.

ALL the provincial stations have arranged attractive Radio Revel programmes, at the same time, so that the affair will doubtless prove to be Britain's biggest beano! The beauty of it is that all this simultaneous fun will help the hospitals, for in all cases profits have been earmarked for the "Daily News" Hospital Fund, and similar charities.

The Up-to-Date Carol.

GOOD King Wenceslas looked up
How-to-make directions,
Still he could not find the fault
In his grid connections.
Brightly shone his valves that night,
But his grief was cruel,
For he could not get a sound
From his three-valve Dual.

A Radio Greeting.

ONCE again, a very happy Radio Xmas to you all. Enjoy yourself to your Maximum Capacity. Not like years ago, when a man used to Overload his Frame, suffer from Reaction, and then sometimes Choke. Watts the use of Wiring in, if it Hertz the Holder? With a proper Control of Input, it is possible to enjoy every Plate—even if Loaded on the Heaviside—and still have room for Currents, Nuts, and a Fig. 2. So may your table Lay-out be without Parallel, and yours the happiest Dial on Earth! **ARIEL**

A Merry Radio Xmas!

Some Cheery Xmas Messages from Famous Radio Personalities.

The new Rugby Wireless Station.

From SIR OLIVER LODGE, F.R.S.

I SEND to all wireless amateurs a friendly Christmas greeting and good wishes for the New Year.

* * *

From SENATORE G. MARCONI, G.C.V.O.

I wish the many readers and friends of POPULAR WIRELESS a Merry Christmas and a Prosperous and Happy New Year, hoping they will find ever increasing delight in the study of Wireless, the recording of messages from distant parts of the earth, the fascinating possibilities of experimenting and the striving to wrest more secrets from Nature's vast store of scientific treasures.

Dr. J. A. Fleming, originator of the thermionic valve.

* * *

From Dr. J. A. FLEMING, D.Sc., F.R.S.

I have much pleasure in offering hearty greetings for Christmas and the New Year to all readers of POPULAR WIRELESS AND WIRELESS REVIEW, and wish them all success in radio work, whether as amateur constructors or simply as listeners-in.

Broadcasting has brought a new joy and interest into thousands of lives and helped to fill with scientific knowledge minds that might otherwise have been less usefully employed. The present year is of interest to all radio amateurs, and especially to me, because it is the year of the "Coming of Age" of the Thermionic Valve, which alone renders broadcasting possible.

My British patent, No. 24850, of November 16th, 1904, was the first patent applied for in the world for utilising the electron emission from an incandescent filament in vacuo as a means of rectifying high-frequency electric currents and hence detecting electric waves as used in wireless telegraphy.

My original Thermionic Valves, which are the parents and progenitors of all others of whatever type, after being exhibited for two years running in the Royal Society's exhibit at Wembley Exhibition, have now been donated to the National Science Museum, South Kensington, and can be seen in the Electrical Hall of the new building in Exhibition Road, South Kensington, along with a fine collection of Thermionic Valves and other original wireless apparatus, showing the development of that remarkable instrument from its earliest forms (my own) up to the finest examples of modern high-power generating valves with silica or water-cooled metal bulbs.

It is amazing to note the progress made in 21 years, and that with the aid of this appliance music and speech can be transmitted over oceans and continents, bringing extreme pleasure to millions who would otherwise not be able to have it placed at their command.

* * *

From Mr. J. C. W. REITH, M.Sc. (Managing Director, B.B.C., Ltd.)

I am very glad to have the opportunity of sending to POPULAR WIRELESS and its readers a Christmas greeting from the B.B.C. We are keenly alive to the value of the support and constructive criticism which we receive from POPULAR WIRELESS, which, in common with our other friends of the press, contributes considerably to the development of our service.

This Christmas season finds broadcasting under review. Its future has yet to be decided by the Postmaster-General and presumably confirmed by Parliament. We feel sure, nevertheless, that however uncertain the prospect may be in some respects, so far as essentials are concerned there will be no interruption of the tradition of public service under unified control which it has been our privilege to inaugurate and consolidate during the past three years. May I now extend our heartiest greetings for a happy Christmas and a successful New Year to the Editor, the staff, and to all the readers of POPULAR WIRELESS.

A recent photograph of Mr. J. C. W. Reith, taken in his office at No. 2, Savoy Hill.

A Wireless Dream

I LISTENED-IN an hour or two, one night, to 2 L O,
To the Christmas Weather Forecast and a Prize Fight down at Bow ;
I heard a Low Comedian sing of his Lovely Loo,
And lions growl and monkeys howl in chorus at the Zoo.

I LISTENED to a lecturer describe the ocean deep,
Where phosphorescent fishes swim and crawly creatures creep ;
And bands of loud percussion and of saxophonic screech
Had trod with wild cacophony on Winston Baldwin's speech.

I'D been switched on to Borneo, or somewhere just as far—
It may have been to Luna or, perchance, the Polar Star—
But atmospherics, anyhow, made such a frightful din,
When Yankee-Doodle-doo was played I knew not which would win !

AND when the show was over, and I'd lain me down in bed,
I'd all these lucubrations running pell-mell through my head ;
And when the Arms of Morpheus enrapt my sleeping form,
I thought I'd struck a cyclone like the Children of the Storm !

THE atmospherics caught me up and hurled me to the moon,
Where monsters of the nether world played on the big bassoon,
On saxophones of ghastly tones, on brass of frightful bray,
Whilst sixteen lunar lions banged with ham-bones on a tray.

FROM thence the atmospherics dropt me in the deepest sea,
Where goggle-eyed galumphers chased me up a sea-weed tree,
And thereupon the tree was gone, and I was up the Pole,
And the Aurora-borealis danced a rag-time rigmarole.

I TRIED to run, I tried to walk ; I could do nought but crawl,
Whilst twenty thousand Polar cats began to caterwaul,
And an Eskimo comedian began to sing a song
Which had five thousand verses and each verse five fathoms long !

THEN, all at once, the Lovely Loo into my vision swam ;
I took her by her hand and said : " I don't know where I am ! "
And she turned her face—heaven grant me grace !—and said : " Ah spec's yo' do ! "
And her face was as blanky-blankity-black as the back of the chimney flue.

AND I woke to hear the Christmas Bells as they swelled upon the breeze,
And lo ! upon my chest there sat, purring, and quite at ease,
My dear old puss-cat, Felix, just as black as any crow ;—
And if you know a better dream, buck up and tell me so !

By " ARIEL."

Only Three Years Ago

by Captain P. P. Eckersley, M.I.E.E.

We are pleased to include in our Christmas Number this special article by the Chief Engineer of the B.B.C., whose labours for the technical perfection of British Broadcasting are so well known and so appreciated by all listeners and amateurs.

IT seems ages, and yet it is but yesterday! Only three years ago the main studio of the London broadcasting station (the second regular broadcasting station in Britain, and the only one owned by the B.B.C.) was hung with dirty mosquito netting, and from the ceiling pendulous hung ordinary carbon microphones. The room was about a 15 ft. cube.

Only three years ago I got letters from all sorts of listeners asking if London would not shut down for half an hour on Tuesdays so that people should listen to 2 M T, our little station at Writtle. That *London* should shut down, mark you!

Only three years ago I was wondering vaguely whom they would appoint as chief engineer to this new broadcasting thing; some silly idiot with more talk than sense, I thought. (Cries of: "And they did!")

Jolly Writtle Days.

It might be interesting to tell you what actually did happen in those days. You probably know that for a year before the B.B.C. was formed the station 2 M T at Writtle was once a week for a quarter of an hour (often extended to half an hour) doing a little programme of its own. It was a station designed for reception by amateurs; it was not strictly a public service. Both those who broadcast and those who listened had a great time—we were wholly irresponsible. Our programmes were of a comic-technico type—lampoons on phases of the art, little plays, appeals even then not to oscillate, gramophones, songs at the piano, and so forth. We had Melchior to sing once; he was the only "star" artiste we ever broadcast.

The coming of the B.B.C. was treated as something of a joke, and afforded us at Writtle a fund of material on which to base new burlesque. Thus the Children's Hour and "Uncle Arthur" came in for a good deal of, I hope, very light-hearted and well-meaning "ragging." The innovation of striking the chimes on the hand bells at 2 L O was carefully considered by *our* programme committee (two people with not a great deal of solemnity in their compositions), with the result that our next transmission began with the Writtle chimes.

Captain Eckersley cheerily dictating orders to his staff over the telephone.

We hung up all the old scrap iron we could find, and with an ebonite rod lashed this to make a hideous cacophany of crashes and tinkles. The clock was wrong, because the enthusiasm of the striker brought down the whole caboose on the fifth stroke of eight, and I had to announce: "Children, dears, that was eight o'clock, and now for the bedtime story." Dear dead days—but great fun!

I think my unimaginative brain was awakened from a somewhat contemptuous toleration of broadcasting as a public service to a full realisation of its potentialities when the National Opera Company sportingly allowed the B.B.C. to put a microphone in Covent Garden, and I tuned in casually one night to Humperdinck's "Hansel and Gretel." The microphone was to us something quite new. It was a Western Electric carbon developed by the Americans for their broadcasting, and was in those days a tremendous advance over anything we had in this country. The change of quality, the feeling of space in the 'phones, the applause of the audience, and wonderful singing of the artistes are commonplaces to modern listeners; to us, then, coming so suddenly on top of amateurs singing into carbon microphones, the whole transmission was a revelation.

P.P.E. Joins the B.B.C.

In February, 1923, I threw in my fortunes with the new organisation. Timid, striking out somewhat blindly in this new cold sea of problems, it was a great change from the comparative obscurity of Writtle. I was, nearly three years ago, the only engineer in the B.B.C.

The title "chief" rather reminded one of the boy who said he was top of his class, when it later transpired that the total strength of the class was one.

The whole staff of the B.B.C. in those days was concentrated in one room—secretary, Major

(*Continued on page* 866.)

A LOW-POWER RECORD.

By R. L. SANGSTER.

NEW ZEALAND to England on 2½ watts power! Such is the latest record of station Z 3 AL, a full description of which has been previously published in POPULAR WIRELESS. The following extracts from the log of this famous station "down under" need but little imagination to form a fascinating story.

When Mr. W. M. Dawson, of station 3 A L, Ashburton, N.Z., entered his wireless "shack" one fine afternoon he probably had not the slightest premonition that before leaving again he was to break all previous records for low-power wireless work. Such was the case, however.

It was a winter's afternoon in Ashburton, a small town on the Canterbury plains, and at 4.15 p.m., when the evening "séance" was decided upon, the sun was already swinging low in the heavens. After working an amateur in Turin, Italy, a few days previously on the usual input power of 14 watts, Mr. Dawson was hoping for a "G." So that when G 2 L Z was heard calling for a test, no time was lost in replying.

Signals Surprisingly Strong.

Mr. Mayer, of 2 L Z, came back right away with greetings, informing 3 A L that his signals were Q.S.A. (strong), and requesting the name and location of the owner. This information was tapped out by 3 A L, who also added that he was using 14 watts input power.

This evidently surprised 2 L Z. "Say, old man, your strength on 14 watts seems impossible," he protested. "Have just heard Z 2 A C (Mr. Ivan O'Meara, of Gisborne), and you are stronger than he is." (2 A C is believed to have been using a 250-watt tube at the time.)

Mr. Dawson assured 2 L Z that he was using a single American valve (at under normal input), and requested Mr. Mayer to take a message to forward to F 8 B V, and then to try a low-power test.

Station 2 L Z was enthusiastic.

"Well, old man, that is as good as any signals I have heard from your part of the globe," he telegraphed. "Can hear you with 'phones on the table on three valves."

Power Reduced.

After the message had been sent and received, 3 A L cut down his power to 8 watts. Mr. Mayer reported that signals were nearly as strong on 8 watts as on 14, and suggested that 3 A L could go much lower.

Mr. Dawson then took a bold step. The distance certainly was 12,000 miles, but conditions were rapidly becoming unfavourable. The power was reduced from 8 watts to 2·5 watts (160 volts, 16 milliamperes), and a reply eagerly listened for.

Straight away 2 L Z came back!

"Cannot quite get all, due to atmospherics," he remarked, "but you said power was 2·5 watts. If no interference would get all. Fine business, old man. My power is 250 watts. Say, when you reply, come up on full power, and I will note if there is any fading. Time nearly seven a.m. local." Here he reduced power and telegraphed: "3 A L Z G 2 L Z—35 watts—Q R K?"

End of the Test.

With face registering his delight, 3 A L reported that the signals on 35 watts were O.K. Feeling it was one of those afternoons when things simply could not go wrong, Mr. Dawson then cut down his power to 1·2 watts (100 volts, 12 milliamperes), sat back, and held his breath hard.

It was too late, however. "Nothing doing," reported 2 L Z sadly. "Fading now, old man. See you same time to-morrow; good-bye!" Both stations then signed off.

However, 2 L Z did not work anyone the next afternoon. Station 3 A L heard him calling "Test" time and again; but 2 L Z evidently could not hear the calls of several New Zealand amateurs who were after him.

However, when they *do* meet again——!

ONLY THREE YEARS AGO.

(*Continued from page* 865).

Anderson; the two "programmers," Mr. Burrows and Capt. Lewis; Mr. Smith, the publicity man who travelled up for an interview with a spare collar and some optimism, and never returned to his native fastnesses in Scotland any more; and last, but not least, Mr. Reith, our chief, who was allowed the superior privacy of a cupboard at one side of the room. Typewriters clicked

Mr. A. Burrows speaking into one of the early microphones.

all day, telephones clanged, visitors poured in, correspondence accumulated (I had three months' back work besides getting the whole organisation going), and there we were, the vigorous nucleus that has, with frequent thyroid injections from an eager public and an enthusiastic leader, grown with such extraordinary rapidity.

These three years have seemed like a nightmare in some ways, and even now it is so impossible to consolidate sufficiently. All day, every day, we have had to advance, rejecting the obsolete, considering the new. I was impressed in America sometimes with the beautiful spick-and-span arrangements at many stations, but I found that where bits of wire and lash-ups held sway, there it was that progress was mostly manifest.

The last three years in retrospect are "lash-up" years, where this was tried and rejected, that was lashed up and found good; but from the welter of discarded ideas something materialised, we have found some bed-rock at least. Our development staff dreams always in terms of straight lines, transformers that don't cut off, transmitters that control equally from 10,000 to 10 vibrations a second, lines that care not whether it be a bat's squeak or the pedal notes of an organ, but transmit all and each with equal facility.

"Lash Up" Transmitters.

Three years ago we had no development staff, no lines, no control-room, no central batteries—only a few lash-up experimental amplifiers, the valves pendulous on rubber strings, cotton-wool insulating shock, plasticine deadening resonance, and slowly we have crystallised this into final designs that are worthy of a maintenance system.

The most rapid advances have been made in microphones; to-day it is not unlikely we are on the eve of being able to use an arrangement responsive at all frequencies equally, that will work in a bucket of water or in a studio, that requires but a two-valve amplifier. This little cube "plunked" down inoffensively anywhere, linked to the nerve centre at Savoy Hill, can make the slightest noises around it apparent to 10,000,000 people.

Receivers More Advanced.

Transmitters, although their framework is much the same as when they were installed three years ago, have been modified to give a better response curve; lines cutting off at 2,000 are being substituted for those which are still useful with their correction at 10,000 vibrations a second.

And what of the receivers?

Three years ago one had to be an expert; one was of a brotherhood if one owned a valve set, and one's impressive jargon told of grid leaks and square laws, and reflex. To-day we are beginning to see "old men and maidens, women and children" tuning in Bournemouth, Birmingham, London, and the rest as skilfully as we used to fake our sixteen-handled reflex super! And that is the greatest advance of all, because wireless will only become ubiquitous when the loud-speaking set gives us as little trouble to operate and maintain as the crystal set of to-day.

The Future?

In three years from to-day may it not be that sets will be sold like gramophones, and that the user will bother as little about the internals as he does about a gramophone. He will ask for a demonstration, have a look at the cabinet work, his pass book, and will state the voltage and type of his electric light supply; he will have the set delivered at his door, will plug it into the mains, and, after a glance at the programmes, will choose jazz, or a talk, or a concert by the tuning of one knob!

It only means a rate of progression for the next three years similar to that which has taken place in the last three.

A Scientist's Christmas

by Sir Oliver Lodge F.R.S.

No special issue of "Popular Wireless" would be complete without an article from the pen of our great Scientific Adviser, Sir Oliver Lodge. At my special request he has contributed to this Christmas Number one of his delightful and thoughtful essays, which I am sure will be universally enjoyed by readers of "Popular Wireless."—The Editor.

YOU, Mr. Editor, have asked me to write down some reminiscences of past Christmases, so I will try to see what my recollections of the season are like.

It has often struck me that there is a time in the year when the work of the world seems to stop, when correspondence can be safely neglected, when the newspapers need not be read, when there are no engagements to keep, and when it is safe to get into a brown study and concentrate.

Opportunity for Thought.

Not exactly a slack time of year, a time indeed for extra work, but not of the usual kind. Most people associate that kind of feeling with the month of August; but that is usually given to bodily exercise and travelling and more or less complete holiday: anyhow, it is full of interruptions, and not at all suitable for concentrated work.

But the week between Christmas Day and the New Year has a totally different character: there is not much temptation to go out, nor is anything important going on. There are undoubtedly the claims of family life; but a large family is complete in itself; and it has often been possible for me to shut myself up in the study, to let letters and everything else accumulate, and to pursue some idea continuously without interruption.

In that way I have done several papers for "The Philosophical Magazine," papers of calculation involving continuous thought and concentrated effort. Not that such a paper can be completed in a week; a good deal of subsequent elaboration is needed, but the main ideas can be got in such a period, and the rest is a matter of work rather than of inspiration.

"A Spirit of Joyousness."

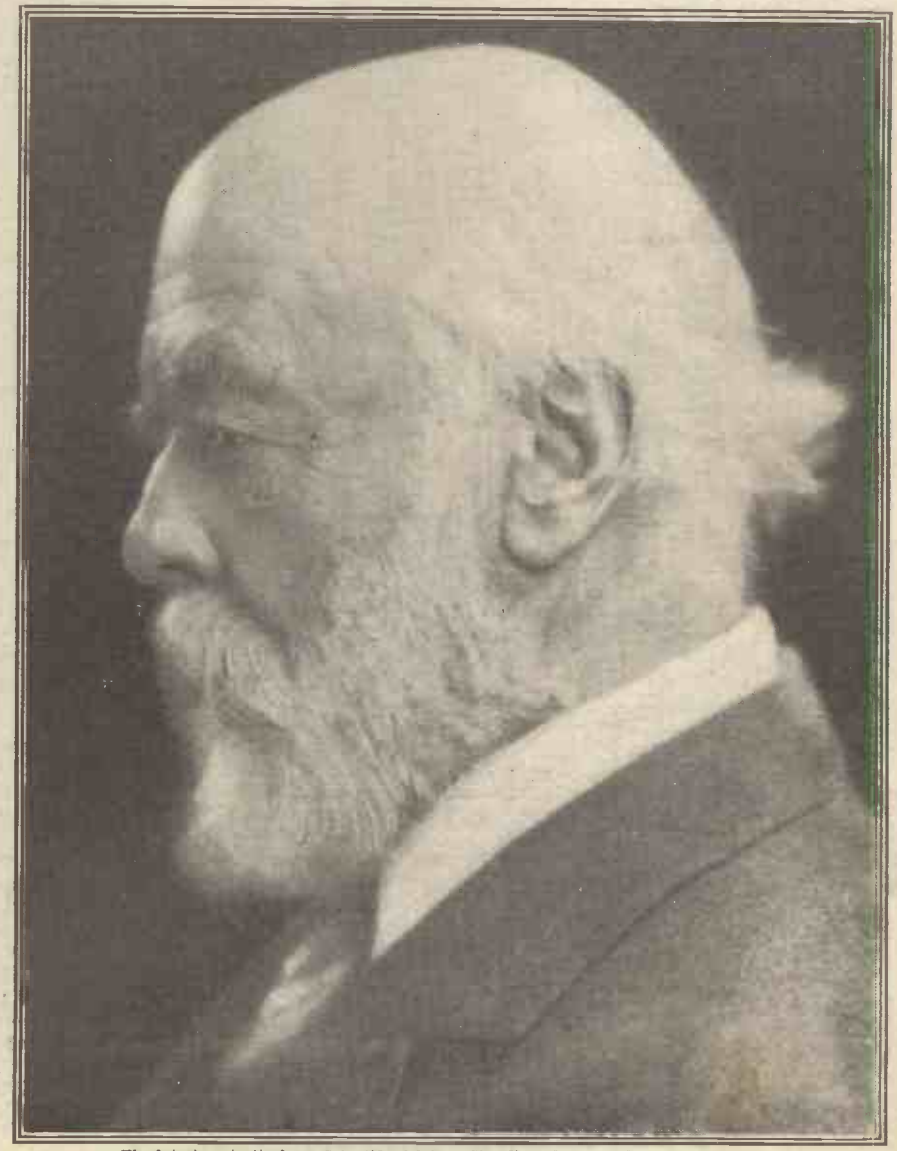
No doubt one had to come out occasionally and join in festivities, and act as Father Christmas for the youngsters, distributing the presents provided by others, and hoping that the children would be charitable enough to take Father Christmas on his merits, without inquiring too closely as to his identity. Children are very kind in that way, and allow themselves to enjoy at their face value the efforts of seniors at a little innocent deception. But these trivialities are no interruption to the work.

They do not break the thread, as college or university engagements do, and one goes back to it refreshed rather than otherwise; staying up sometimes very late at night while young people are otherwise enjoying themselves.

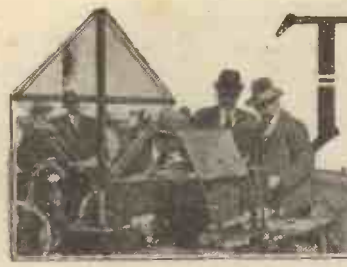
There is a spirit of joyousness and absence of care in the background, which soothes and satisfies without interrupting. Occasionally, of course, in a large family there are painful distractions at this season as at any other. A large family is always liable to illnesses or surgical operations or even death; but fortunately painful things like that are rare. For the most part it is a time of peace, and may easily be a time of concentration. Nothing is expected of one by the outside world, and the seclusion necessary to all productive work can be obtained.

It is at times like these that I wrote, for instance, such a book as "Life and Matter,"

(*Continued on page* 868.)



The latest portrait of our Scientific Adviser, Sir Oliver Lodge. (*Photo by Lafayette.*)



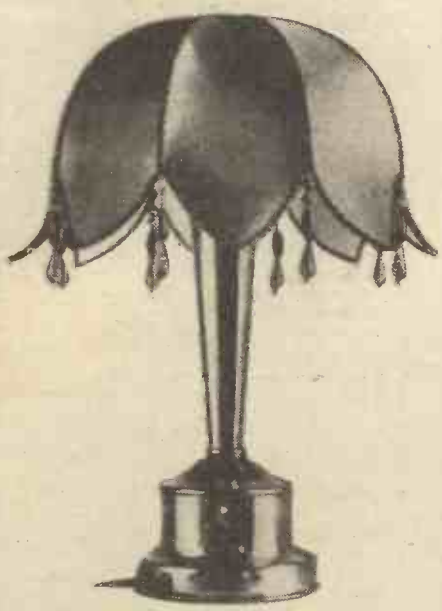
Technical Notes

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

ONE of the simplest methods of intervalve connection is the "tuned-anode," according to which the anode of the first valve is tuned to the wave-length of the incoming signal by the use of a tuning coil and variable condenser. Connection is then made, through a fixed condenser and a grid leak, to the grid of the detector valve.

The fixed condenser passes the impulse from the plate circuit of the one valve to the grid of the next, the value of the condenser generally being between ·0002 mfd., and about five times that value, that is, ·001.

Amateurs often ask questions as to the extent to which this type of H.F. amplification may be employed, and it is pointed out that if more than two stages of amplification are used, the set is apt to become very difficult to control; in fact, two



This B.T.H. combined table-lamp and loud speaker can be recommended to the attention of seekers of artistic radio Xmas presents.

stages of H.F. amplification may be regarded as the limit for ordinary working on this system by the average amateur.

In the resistance-capacity method of coupling, the plate of the first valve is similarly connected to the grid of the next, but a fixed resistance of, say, 50,000 to perhaps 100,000 ohms is introduced in the anode circuit of the first valve instead of the variable coil and condenser. This arrangement has the effect that somewhat increased impulses are passed on to the grid of the detector valve. The amplification per stage is not so great with this method as with the tuned-anode system mentioned above; but, on the other hand, two, or even three, stages may be employed with comparative convenience.

When Reaction Becomes Necessary.

Another method of intervalve coupling for the same purpose is the H.F. transformer method, the valves being connected through (air core) transformers, tuned by means of small condensers. The "semi-aperiodic" is another method, in which special transformers are used, which I cannot deal with further at the moment, however, owing to lack of space.

These various methods of H.F. amplification have their special points of advantage and different experimenters favour different methods. There will be found circumstances, however, in which it is impossible, by any of these means alone, to amplify the incoming signals sufficiently to operate the detector efficiently, and in such cases, or, in fact, in general, recourse is had to the principle of reaction.

Dull-Emitter Filaments.

A remarkable new discovery, or, rather, a development in existing methods of manufacture, was announced recently in the United States in connection with an exhibit at the Society of Chemical Industries. The interest lay in the exhibit of pure thorium metal, which has been manufactured in a variety of special forms by Drs. Rentschler and Marden, of the Westinghouse Co.

It is well known that the extra emissive properties of the dull-emitter valve filament are due in some way to the working-up to the surface of a layer of pure metallic thorium. In the case of a thoriated filament, this metal is introduced as an impurity in the tungsten of the filament, the thorium oxide being reduced to metallic thorium. In the case of the coated filament, the extra emissive material is coated upon the surface of the filament.

(*Continued on page 936.*)

A SCIENTIST'S CHRISTMAS.

(*Continued from page 867.*)

when I was absorbed in the materialistic philosophy of Haeckel, which was then widespread over the country by the translation and cheap issue of his book called "The Riddle of the Universe," to which it seemed an antidote or counterblast had to be provided.

It was then that I formed my ideas, such as they are, of the relations between life and matter—a problem still far from complete solution.

"The Faculty to Appreciate."

It was then also that I elaborated my more mathematical papers, such as the one on "Opacity," which I subsequently gave as a presidential address to the Physical Society; or one on the "Propagation of Electric Waves and the Properties of the Ether."

While on yet another Christmas I remember I was immersed in arithmetic, and was producing a book on the teaching of mathematics, which I hoped would be of service to parents and teachers; the continuity of the work making it much easier than it otherwise would have been, and making it more lively and freer from boredom than if one had to drop it and take it up again after an interval.

. . . . .

There seems but little connection in all this with the sacredness of the season and the Event which the greater part of the civilised world was commemorating. But that was in the background, too; it was that consensus of agreement that rendered the peaceful time possible. The end of the year's seasons and the returning of the sun have always been felt to be rather a sacred time, a time of rejoicing; and the instinct of the Christian world was wise in fixing on this period for celebrating the greatest event in the world's history—namely, the Incarnation of the loftiest Spirit which has appeared on the planet—whether historically it actually occurred at that season or not.

From that first Christmas Day we date our reckoning of time; and every time we write "1925" we are making an unconscious reference to that marvellous event Peace and goodwill are in the air. There was rejoicing then, and there is rejoicing now. Different individuals rejoice in different ways, and those whose motto is "Laborare est orare," may conduct their worship by losing themselves in the wonders and intricacies and extraordinarily satisfying contemplation of the deeper beauties of Nature underlying its superficial appearance and the direct apprehension of the senses.

A study of science is essentially a study of the Mind which brought all things into existence and planned their adaptation, their mutual working, and the marvellous intricacies to which the process of evolution has given rise.

No matter whether we study the problems of life, or the problems of the atoms, or the laws of space and time, or of mind and matter, or the nature of force and energy, we are studying something which the human mind has not produced, and only with difficulty understands, but which yet it has the faculty to appreciate and reverently to admire.

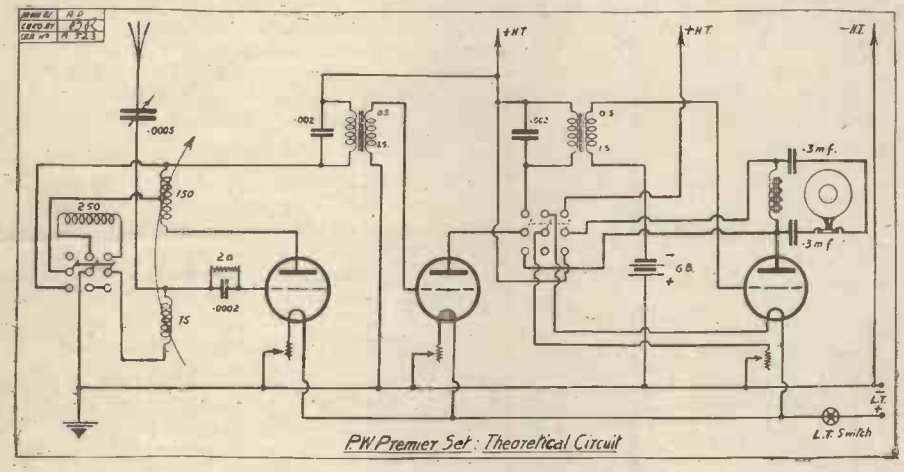
I cannot but think that the possibility upon which we are now entering, of broadcast communication with the ends of the earth, will carry the Spirit of Christmas far and wide, and help to inaugurate an era which in due time will surely come, of Peace and Goodwill among all mankind. Meanwhile, I send to all wireless amateurs a friendly Christmas greeting and good wishes for the New Year.

The "P.W." "Premier" Set

This magnificent receiving set has been specially built in the "P.W." laboratories for Mr. Ramsay MacDonald, the ex-Prime Minister. Many readers will be interested in this extremely simple but efficient model.

THIS "Premier" receiver was designed by "P.W." with two main objects in view—adaptability and simplicity. The ends were achieved without introducing undue circuit complications, and with no loss of efficiency. The result is that although plug-in coils are used and any range of wave-lengths can be covered, a certain combination of coils can be left permanently in the set, and by means of one simple switch, either a "normal" or a "5 X X" range becomes available. Tuning is accomplished in the usual way by means of a variable condenser and a moving coil reaction control.

Three valves are employed, one as a detector and two as L.F. amplifiers. A second switch brings in either the full three valves or only two, as required. The same switch adjusts the H.T., so that the H.T. plugs do not require to be altered when the last L.F. valve is "cut out." Further, this switch breaks the filament circuit of the third valve when it is not in use, so that the filament rheostat does not need to be touched during the switching operation.



PW Premier Set: Theoretical Circuit

Circuit Details.

A third switch of the "push-pull" type breaks the filament circuits of all the valves, so that having "set" the receiver on one particular station, it can be immediately switched on or off at any desired time.

A choke by-pass for the loud speaker is introduced, and a large fixed condenser is placed in series with each loud-speaker terminal, so that the loud speaker becomes completely isolated and very long extension leads can be employed, if necessary, without trouble resulting. In all other essentials, the circuit is perfectly straightforward, as a glance at the theoretical circuit diagram on this page will show.

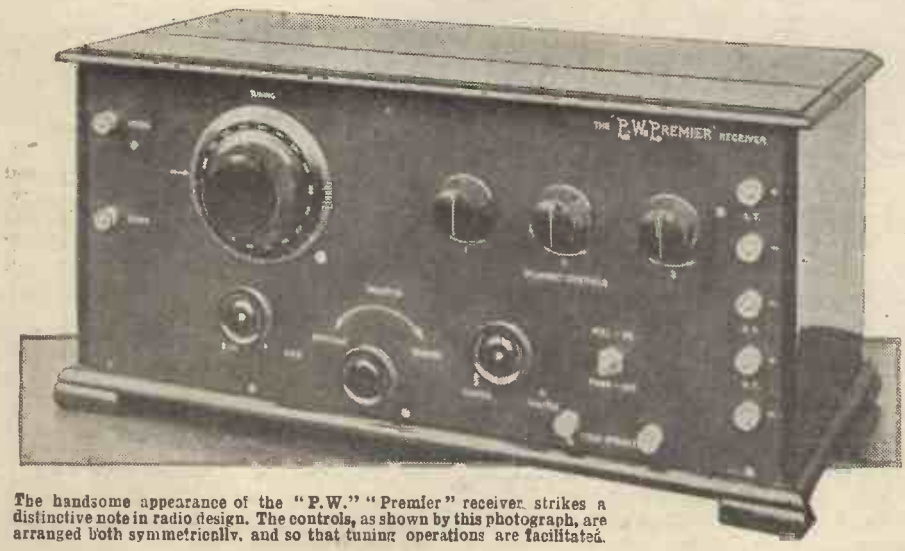
(*Continued on page* 870.)

LIST OF PARTS
for the
"P.W." PREMIER SET.

	s.	d.
One panel, 18″ × 8″ × ¼″	9	0
One mahogany case (Peto-Scott) with 5-ply wooden baseboard, 18″ × 9″ × 5/16″	30	0
Two aluminium angle-brackets (Peto-Scott)	2	6
One ·0005 variable condenser, geared, with large 360° dial (Peto-Scott)	23	6
Two 3-pole 2-way switches, Rotary Type, "Utility"	10	0
One 2-way coil holder, long handle (Lotus)	8	0
One single coil holder (Peto-Scott) (For baseboard mounting.)	1	6
One grid leak and condenser, 2 meg. and ·0002 mfd. (Dubilier)	5	0
Three valve holders for baseboard mounting (Lamplugh)	3	9
One L.F. transformer, 1st stage Concert Grand (Eureka)	30	0
One L.F. transformer, 2nd stage, Concert Grand (Eureka)	21	0
One L.F. choke (A. J. Stevens)	15	0
Three filament rheostats (Yesly)	19	6
One filament break switch, push-pull (Peto-Scott)	2	0
Two fixed condensers, ·002 mfd. (Watmel)	5	0
Two fixed condensers, ·3 mfd. (T.C.C.)	6	0
Nine terminals	1	1½
Wire, screws, 2 plugs, etc.	3	0

ACCESSORIES.

Three valves, 1 D.E.11, 1 S.P.18 (Cosmos), 1 P.V. 6 D.E. (Ediswan).
Three Igranic coils (150, 250 and 75); the 150 is tapped near the centre.
One grid bias battery, 9 volts (Siemens).
One H.T. battery, 120 volts.
One L.T. battery, 2 volts, 40 amp. actual.
Loud Speaker, Q type Brown.



The handsome appearance of the "P.W." "Premier" receiver strikes a distinctive note in radio design. The controls, as shown by this photograph, are arranged both symmetrically, and so that tuning operations are facilitated.

THE "P.W." PREMIER SET.

(*Continued from page 869.*)

Three coils are employed in the tuning arrangement adopted, two aerial coils and one tapped reaction coil. The 2 L O-5 X X switch is a three-pole two-way Utility, and operates in the following manner. The reaction coil is an ordinary plug-in coil of 150 turns, tapped at its 75th turn. This coil remains in circuit for either long or short wave-length ranges, but when the switch is over at 2 L O 75 turns are shorted, and the full 150 are free when the switch is over to 5 X X.

Operation of the Switches.

The moving coil in this set is not the reaction, that is, the fixed one in the two-way coil holder, but is the lower wave-lengths aerial coil. When the switch points to 2 L O, that is the only aerial coil in circuit, and in series with it is the ·0005 mfd. variable condenser, the larger plug-in coil being left completely disconnected. When the switch points to 5 X X, the larger fixed coil is brought into series with the other aerial coil.

Thus it will be seen that the constructor of this set can arrange his coils to suit his own purpose, and can, in fact, interchange them at any moment. At the same time a certain combination can be left in the set permanently to serve the local station and 5 X X or Radio-Paris, the set thus being pre-eminently a "household" receiver. Thus are adaptability and simplicity combined.

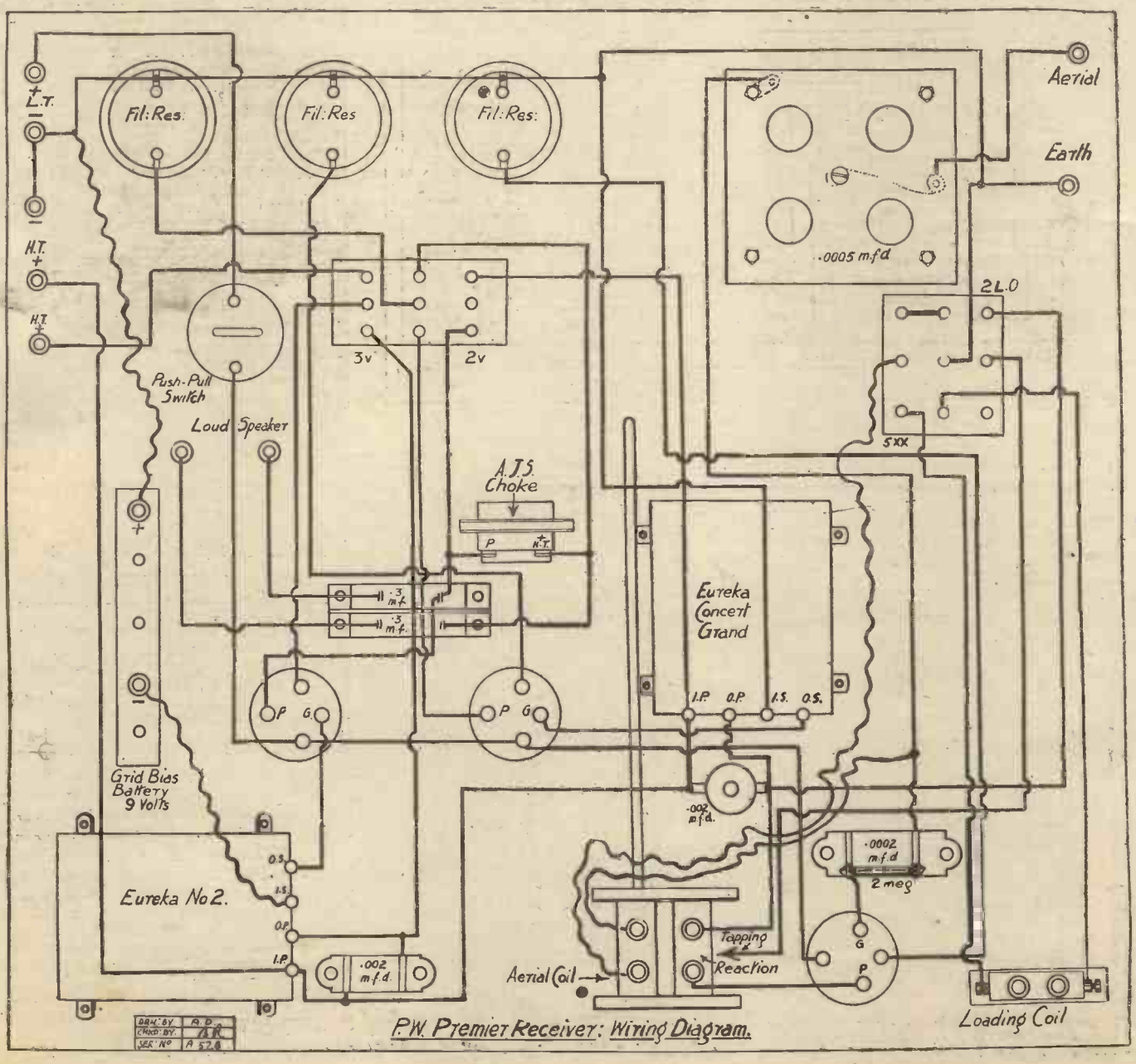
There is no necessity to discuss in detail the action of the second Utility switch which controls the number of valves used between two or three, as it does not deviate from usual "P.W." practice to any great extent. The diagrams should make it perfectly understandable and the various wiring guides which are given—and these, of course, include diagrams—should prevent the constructor from making mistakes in the connections. It is worth mentioning, however, that it is probably the first time that one switch has been made to carry out such essential combined operations in L.F. switching as cutting an L.F. valve out of circuit, rearranging H.T., and simultaneously breaking its filament circuit. Anyway, it is almost a certainty that such has not been introduced in conjunction with other "universal" arrangements such as are a particular features of the "Premier."

Magnificent Xmas Gift.

Such a receiver could form a magnificent Christmas gift, and one that is well within the scope of any constructor to build. It is merely a matter of assembly more than actual construction, as there are no special coils to wind or components to manufacture. In fact, the whole receiver can be purchased in a set of parts all ready to connect up together.

It is advised that first-class components only should be used, although, of course,

(*Continued on page 871.*)



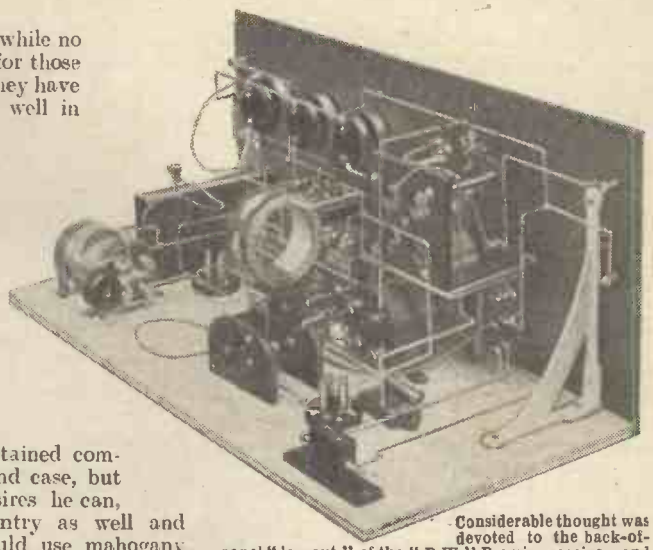
P.W. Premier Receiver: Wiring Diagram.

THE "P.W." PREMIER SET.

(*Continued from page 870.*)

there is nothing of a really critical nature in the circuit. Nevertheless, we hope readers will agree that the receiver deserves the best of everything up to the spending capacity of the individual constructor.

A list of parts and components required is as usual given, and while no particular brief is held for those components specified, they have been found to operate well in the original receiver and conform to the measurements and lay-outs given. Should alternative components be used, care should be taken either that they will fit in without trouble or that previous allowance has been made, and the lay-out correspondingly modified.

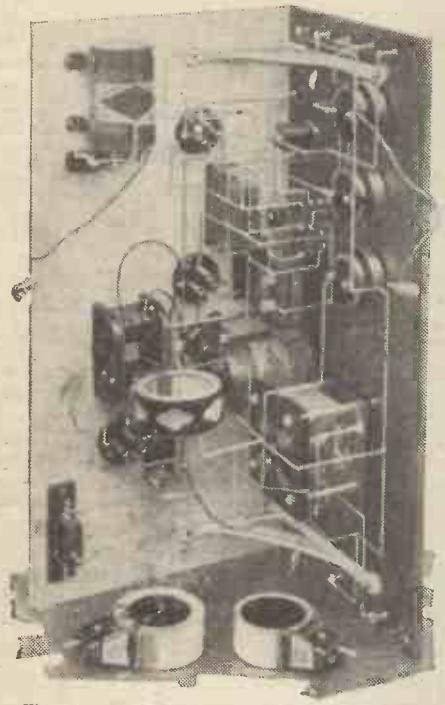


Considerable thought was devoted to the back-of-panel "lay-out" of the "P.W." Premier receiver, and careful consideration given to the conflicting claims of compactness, efficient component spacing and accessibility. The wiring, as one result of this, was greatly simplified, as the above photograph clearly indicates.

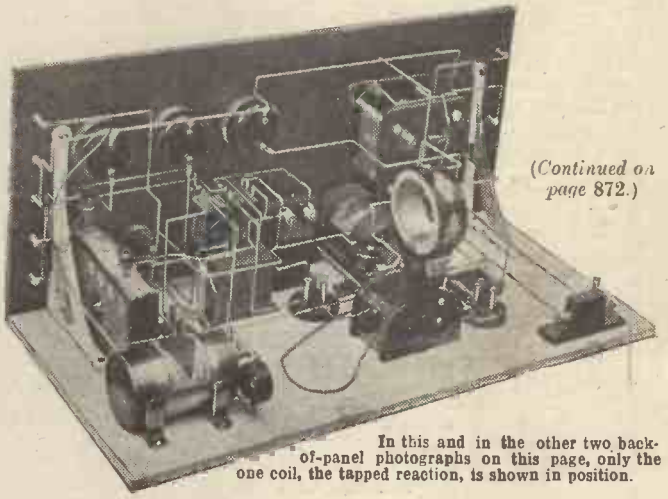
The panel can be obtained complete with baseboard and case, but if the constructor so desires he can, of course, tackle carpentry as well and make the case. He should use mahogany or oak for this purpose. The baseboard can be American whitewood. Branded ebonite should be employed, not unbranded composition of doubtful origin. The panel, it should be remembered, will have to support a considerable weight, and this many cheap compositions would fail to do without at least cracking or badly warping.

Brackets will be necessary to support the panel. Note the aluminium type used in the original model.

The panel should be carefully marked out in accordance with the measurements given below. A lead pencil should

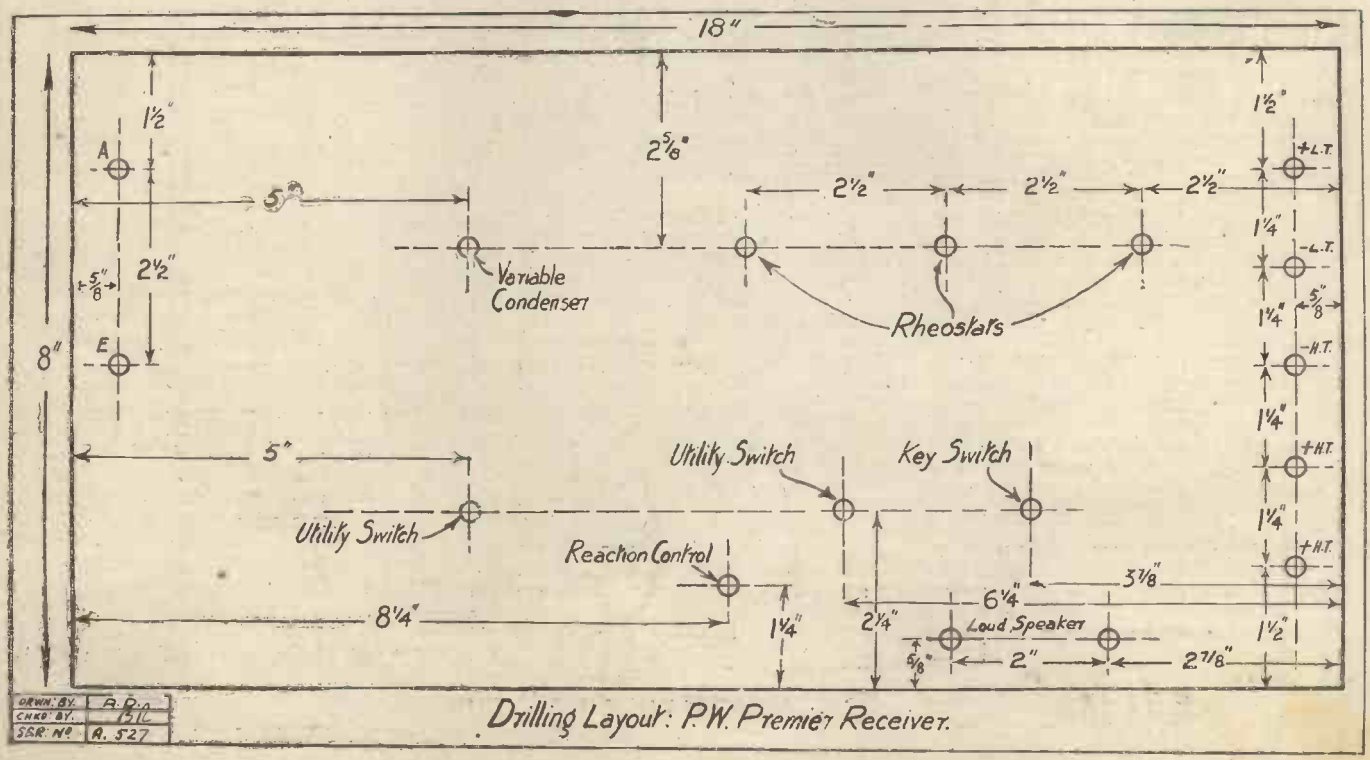


The unusual angle at which this photograph was taken enables the wiring of the second Utility notch to be clearly seen.



(*Continued on page 872.*)

In this and in the other two back-of-panel photographs on this page, only the one coil, the tapped reaction, is shown in position.



THE "P.W." PREMIER SET.

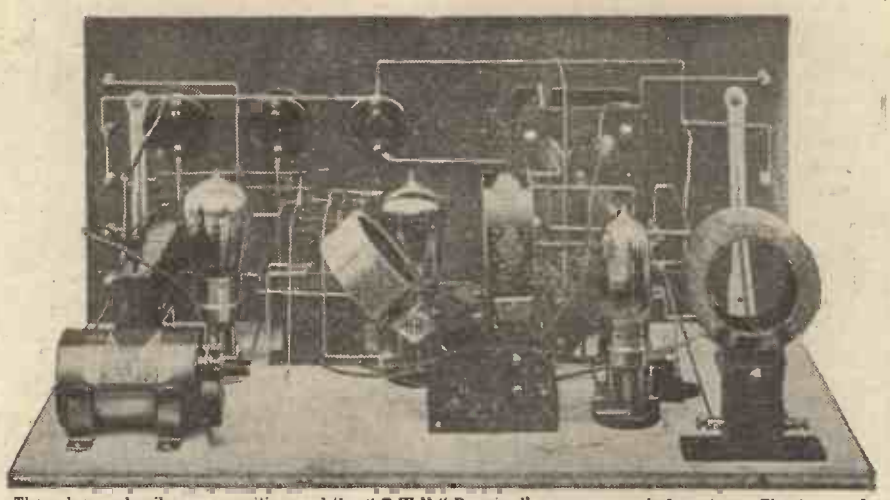
(Continued from page 871.)

not be used for this purpose, but the point of a sharp instrument. Marks need not be made in the form of extended lines—small crosses are all that is required for marking centres accurately. Great care in handling the panel is necessary if ugly scratches are to be avoided. Above all, it should be remembered to clear the bench or table before laying it down for drilling. It is a good plan to have a sheet of soft cloth always between the panel and whatever it is laid upon during the process of marking-out, and whenever it is laid aside for any reason.

Mounting the Components.

There is nothing out of the way to be encountered in drilling the panel—this can be proceeded with in the usual straightforward manner. It is strongly advised that the holes for the terminals should be tapped or threaded by drilling undersized holes, and forcing the terminals to cut their own threads. This will ensure permanency.

The relative positions of the various components on both the panel and baseboard can be clearly seen in the photographs. On the panel are mounted nine terminals, one variable condenser two Utility switches, one push-pull switch, and three filament resistances. The coil holder is mounted on the baseboard, and its control knob protrudes through to the front of the panel. The remainder of the components



The valves and coils are in position, and the "P.W." "Premier" receiver is ready for a test. The degree of reaction coupling shown is actually the one employed for 5 X X in the original model.

are fixed to the baseboard, with the exception of those fixed condensers which are supported by their own connections.

Before finally fixing the baseboard components in position a clearance check should be made. It should be noted particularly whether plenty of room has been left for a moving coil in the coil holder of reasonable size to clear everything, and whether room has been left for valves when everything else is in position.

One Utility switch should have its connecting points pointing upwards. This is the left-hand switch looking at the back of the panel, and is the one which controls the number of valves used. The other Utility switch should have its connecting points pointing outwards. The photographs will make this quite clear.

Having mounted all the components, the wiring can be proceeded with.

The Wiring Connections.

Now, instead of one 150 turn fixed coil tapped approximately in its centre, two basket or other coils, each of 75 turns, can be used. Two such coils should be joined together by one outside and one inside connection, and clamped together on a basket coil holder so that their windings are both in a similar direction. The tapping point would correspond with the two connected leads, one from each coil, while the remaining two connections are connected to the plug and socket of the holder.

The diagram, page 870, and the list of point-to-point connections should make the wiring a fairly simple task. Due regard to component clearance should again be taken and ample spacing allowed to prevent possibilities of shorts. Square section tinned copper wire should be used, and soldering is advised throughout. Readers are recommended to turn up that article, "Wiring Up Your Set" in last week's "P.W." for some invaluable advice concerning this part of the work.

It will, perhaps, be noted that one of the leads appears to go into or through the panel. This is not a connecting lead at all,

(Continued on page 935.)

POINT-TO-POINT CONNECTIONS

(Looking at the "Premier" set from back of base-board.)

Aerial terminal to moving vanes of variable condenser, fixed vanes of variable condenser to grid leak and condenser, and to aerial (moving) coil holder (flexible lead to plug side). Other side of grid leak and condenser to grid of first valve. Socket side of moving coil (by flexible lead) to inner centre contact of first Utility switch.

The middle of the centre contacts of the first Utility switch is connected to the earth terminal. The outer (nearest panel) centre contact of first Utility switch is connected to the centre tapping on the reaction (fixed) coil.

L.T. negative is joined to negative H.T., to one side of each of the rheostats and to the earth-to-switch lead. L.T. positive is connected to the break switch. The other side of the break switch is connected to one filament socket of each valve holder. The remaining filament sockets of the first two valve holders are joined to their corresponding terminals on the respective rheostats.

The lower rheostat terminal of the third valve holder is joined to the middle one of the centre contacts of the second Utility switch. The middle one of the left-hand contacts of this switch is connected to the remaining filament socket of the third valve holder.

The plate socket of the first valve is joined to the socket side of the reaction coil holder (fixed). The plug side of this coil holder is connected to O.P. of first stage L.F. transformer, and to the outer (nearest panel) of the upper contacts of the first Utility switch. The inner and centre of the upper contacts of this switch are joined together.

I.P. of the first stage L.F. transformer is connected to I.P. of the second stage L.F. transformer, and to the first H.T. positive terminal (fourth terminal down). This lead also goes to the outer (nearest panel) contact of the right-hand contacts of this second switch.

O.P. of the second stage L.F. transformer is connected to the inner left-hand contact of the second Utility switch. A ·002 fixed condenser is connected across each of the L.F. transformers between I.P. and O.P.

The grid socket of the second valve is connected to O.S. of the first L.F. transformer. I.S. of this transformer is joined to the negative L.T.-to-earth lead.

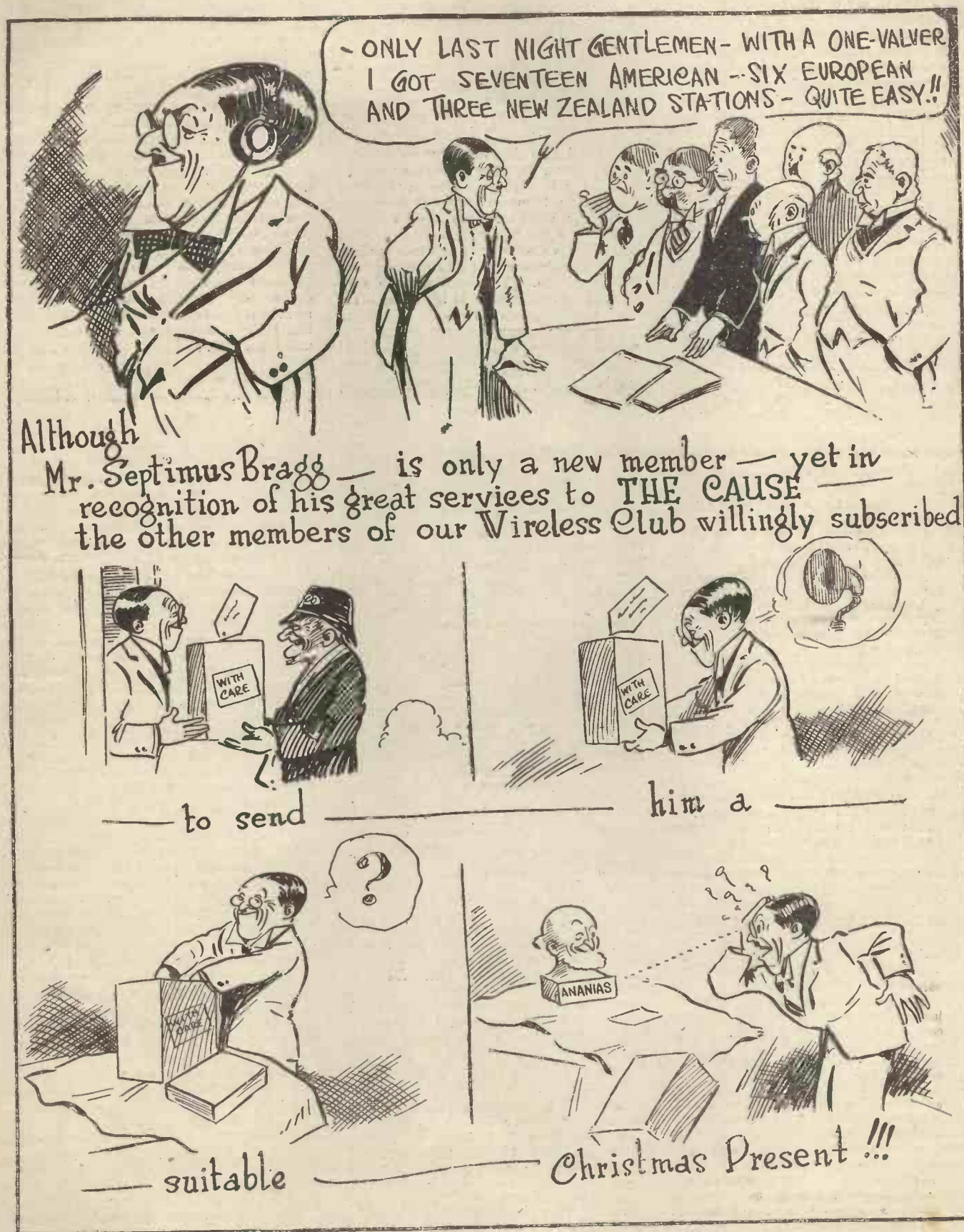
The plate socket of second valve is connected to the inner centre contact of the second Utility switch. The grid socket of the third valve is joined to O.S. of the second L.F. transformer. I.S. of this transformer is connected by a flexible lead to a black plug which is inserted at the negative end of a 9-volt grid bias battery. The positive end of the grid bias battery has a red plug inserted, which is joined by a flexible lead to the negative L.T.-to-earth lead.

The plate socket of the third valve is connected to the inner right-hand contact of the second Utility switch, to the "P" terminal of the L.F. choke, and to the right-hand contact of the outer (nearest panel) ·3 mfd. T.C.C. condenser. The other side of this condenser is joined to the right-hand loud-speaker terminal. The remaining loud-speaker terminal is joined to the left-hand contact of the inner (nearest observer) ·3 mfd. T.C.C. condenser. The remaining (right-hand) contact of this condenser is joined to the outer (nearest panel) centre contact of the second Utility switch, and also to the H.T. + terminal of the L.F. choke.

The outer (nearest panel) of the left-hand contacts of the second Utility switch is joined to the second (lower) H.T. positive terminal. (Note.—The centre of the right-hand contacts of the second Utility switch is left unconnected.)

The inner (nearest observer) of the bottom contacts of the first Utility switch is connected to the left-hand side of the single-coil holder. The remaining terminal of this coil holder is joined to the middle of the bottom contacts of this switch. (Note.—The outer bottom [nearest panel] connection of the first Utility switch is left unconnected.)

WHAT TO BUY AT XMAS: A RADIO PROBLEM SOLVED.



WHAT CHRISTMAS MEANS TO ME.

By De GROOT.

(The Famous Violinist and Broadcasting Artiste.)

CHRISTMAS!

There is magic in the very sound of it, and it is one of the few festivals left in our busy, bustling, workaday world which still means something to every one of us.

Laughter and happiness, music and song, freedom from care and sorrow, come to all of us at this time, no matter how burdened with troubles and worries we are throughout the rest of the year. To me it means all these things with just one other in addition—hard work. Working hard at Christmas-time would not appeal to many people, but to me hard work and more time spent with my beloved violin spells true happiness.

From Christmas-time right over into the New Year is quite the busiest time in my year, for now it is my duty to see that, as far as it lies in my power to do so, my patrons have a real Merry Christmas, and a happy start off in the New Year.

On the eve of 1926 I will have spent eighteen years at the Piccadilly Hotel, and during that time I have seen the gradual change in the way in which people keep the Fête de Noël. Years ago it was considered a most terrible thing to go out to dinner on Christmas Day, and in an hotel you would only find those people who had no home festivities to go to.

But all that is altered now. Year by year we get more and more people dining and merry-making in the Piccadilly Hotel on Christmas Day, and, of late, our accommodation has proved quite inadequate to cater for all those who wish to celebrate the festival in this way. Tables for the 25th and 26th have to be booked weeks in advance, and exactly the same state of things prevails for New Year's Eve.

A Busy Time.

Christmas this year will mean a busier time than ever for my orchestra and myself. We have to play at the Piccadilly Hotel in the afternoon and evening on Christmas Day. On Boxing Day we have to do the same, and, in addition, rush, between whiles, to fulfil both matinée and evening engagements at the Coliseum. On top of this we have our broadcasting engagements, endless rehearsals, while I, personally, have to put in a lot of time arranging new scores and doing some good solid practice, without which no violinist who takes a pride in his performances can hope to keep up to "tone."

But it is all worth it. When I first came to England I thought that I would never stay here for even one year. It was all so different to the country of my birth—Holland. Now I have learned to love England, my adopted country, and it would be a great sorrow for me if I ever had to go away. Every day I get shoals of letters from those who have heard me play, either at the hotel, on the stage, or over the radio, and they all testify how deeply engrained in the hearts of my hearers is the love of really good music.

In Touch with Millions.

Jazz bands are all very well in their way, but, after a time, they are bound to pall. I saw the dancing boom come in and I shall see it go out. Of that I am convinced. The French Tango has not been a great success. That is a pity, because it possesses tunefulness and melody which is so strikingly lacking in the fox trot. Broadcasting is doing much to hasten the end of the dancing craze. When people can sit in their own homes and hear first-class artistes in first-class programmes, when musicians can take their stand before an audience a thousand times larger than our largest concert hall would hold, what more can be wished?

Of the success of the radio in its present popular form I never had any doubts; of its continued success and limitless possibilities I am convinced. To wireless I owe a very great debt of gratitude. It has brought me

A recent portrait of De Groot. (*Hana Studios.*)

in touch with millions of people to whom, without its aid, I could never have hoped to have played.

My Correspondents.

Even as I write this article, I have a pile of letters from radio admirers at my elbow. One of them contains the sincerest compliment I have ever had. It comes from a man in the north of England, who starts by telling me how much he enjoys listening-in to my orchestra. He congratulates me on my conducting, and then he goes on to say: ". . . . but the real backbone of your orchestra is, undoubtedly, your first violin. In my opinion he is the soul of it."

He has never seen me. Probably he had never heard of me before he put on the headphones. He didn't know that I combine the rôle of conductor with that of first violin!

Not all my correspondents, however, are quite so clear or concise in their praise. I am fortunate in that the volume of praise far and away exceeds the little squeakings of the grumblers. But I get some letters that I really don't know *how* to take. This typical specimen for instance. It comes from a Midland town, and runs, "Dear Mr. de Groot.—I have heard your band. Yours faithfully ——" Whether to feel flattered or flattened I don't know!

Another gentleman, no doubt with the best will in the world, said that he had never enjoyed anything so much as my playing since he saw a performing monkey at a Zoo in his youth. What do you make of that?

But perhaps the greatest boon which wireless has brought me lies in an incident that happened just before Christmas last year. I received a communication from a man who, having heard my playing from the London broadcasting station, wrote to say that he was himself a great lover of the violin. He had in his possession a very valuable Stradivarius of which he was very fond. His ambition was to hear it played by a master, would I accept the loan of it indefinitely? Of course I accepted with the greatest delight, and, shortly afterwards, the instrument was in my possession. No wonder I feel flattered every time I tuck that fiddle under my chin!

A Better Violin

When I was appearing recently at Cardiff, I had a rather amusing experience in connection with that Strad. I came out of the theatre after giving my performance, and found a man waiting for me at the stage door. He was a very high-and-mighty kind of individual, and congratulated me in a condescending way on my playing.

"But," he added, thinking to show me how much he knew about the matter, "it is a pity you haven't got a better violin."

When I explained to him that the instrument in the case under my arm was worth anything from £2,000 upwards, he gently wilted away!

But at Christmas, in spite of all the extra work I have to put in, I always seem to get my full share of fun. Last year a little interlude took place which still makes me chuckle every time I think of it.

An Unintended Present.

Early in December I was approached in the Piccadilly Hotel by a lady who asked me if I would oblige her by rendering the "Chanson de Noël" on Christmas Day. It appeared that it was her favourite composition, and that she was bringing a party to the hotel specially to hear it. I told her that I should be happy to accede to her request.

Shortly afterwards I went to my music-dealer and purchased a full orchestral score of the piece. Having looked through it, I handed it to my librarian, saying:

"This is for Christmas."

He thanked me, and went off with it.

When the morning of December 25th dawned, I looked everywhere for that score but was unable to find it.

"What did you do with that score of the 'Chanson de Noël'?" I asked the librarian, at last.

He looked more than astonished.

"I took it home," he replied. "You said it was for Christmas. I thought you meant it for a present."

So that lady was disappointed after all.

This year I am looking forward to a jollier and busier time than ever. To all my friends who have been so kind to me with their applause (both heard and unheard) I make one of my very best bows and wish them the old, old wish, "A Merry Christmas and a Happy and Prosperous New Year."

RADIO WIZARDRY.

Some Amusing Xmas Experiments.

By Major RAYMOND PHILLIPS, I.O.M.

(Late Member of the Inter-Allied Commission of Control).

So many inquiries have been received from wireless enthusiasts asking me if I would furnish particulars of the instruments and apparatus used by me in connection with my lecture and demonstration at the third great POPULAR WIRELESS meeting held at the Central Hall, Westminster, on October 23rd, that I have been asked to write a special article describing some of my "lecture-room" experiments.

At the meeting in question I controlled by wireless a carillon of twelve bells, cinematograph, and an instrument arranged in a humorous form which I referred to as a "morning alarm" for rousing "light" and "heavy" sleepers.

Major Raymond Phillips, I.O.M.

For the wireless control of the various instruments and apparatus I used a spark transmitter, as shown in Fig. 1, which it will be noted consists of an ordinary motor-car ignition coil, spark gap, Morse key, and a 4-volt accumulator, all contained in a mahogany case. It will be observed that a switch and press button are provided. The latter is for use in case it is not convenient to operate the Morse key when carrying the instrument in an auditorium.

For an aerial two aluminium rods (for lightness) 48 in. long and ¼ in. diameter are fitted in the terminals on the top of the transmitter case. A licence is not required to use the transmitter provided an earth connection is not made to the instrument. A key diagram of the circuits involved is shown in Fig. 2.

A Radio Carillon.

The wireless-controlled carillon of twelve bells was originally fitted with my system of direct selection, which involved the use of a transmitter fitted with a keyboard, but owing to its complicated nature, and the fact that public audiences generally want to see apparatus brought into operation expeditiously without waiting for long preliminary technical explanations, or fine adjustments made to instruments, I came to the conclusion that for demonstration purposes selection by sequence or simple selection would be more spectacular.

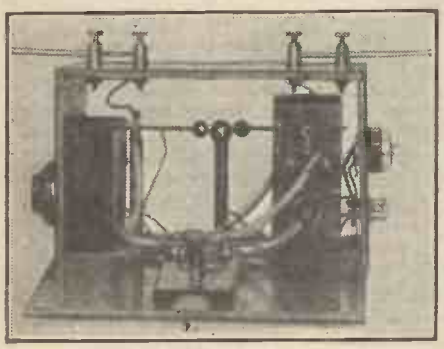


Fig. 1.

In the presentation of scientific apparatus it always seems advisable to make instruments as showy as possible, even though their operation may be comparatively simple. For that reason I arranged the carillon in question so that the bells could be sounded singly, in chords, or made to play an air or melody. A key diagram of the various circuits is shown in Fig. 3.

A "Television" Demonstration.

Only two bells are shown in the diagram, but it will be understood that by increasing the contacts fitted to a selector the number of bells can be increased accordingly. On referring to the diagram (Fig. 3) it will be observed that the carillon is fitted with a coherer which controls the whole of the mechanism. The coherer, of course, functions in an entirely different manner to a valve or crystal, as an incoming wireless wave causes filings contained in the coherer to cohere and short-circuit contacts connected with a battery and relay.

The latter opens or closes other circuits connected with an electro-magnetic device (which also functions as a dash pot) arranged to admit electric current to, and set in motion, the armature of an electric motor. The latter drives a selector, the contacts of which are arranged to open or close circuits connected with the electric bells to be controlled.

Another circuit is arranged to admit electric current to a decohering device, or tapper, which (as is well known) shakes up the filings contained within a coherer, and restores its normal resistance.

Two aluminium rods provide an aerial for the carillon, and are the same length and size as those described for the transmitter shown in Fig. 1.

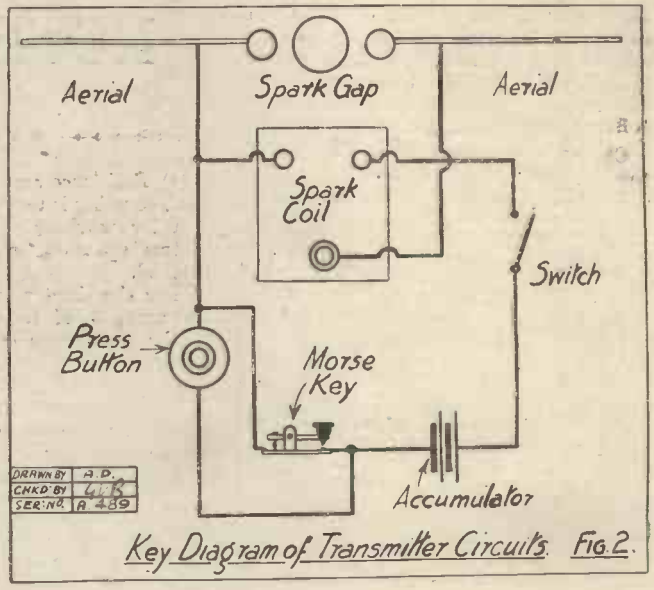
The cinematograph machine which I have arranged to control by wireless is fitted with a universal-type electric motor and miniature arc lamp. The wireless receiver which I use for controlling the machine is shown in Fig. 4. I originally designed this receiver for controlling a model train, but have since added further improvements so that the instrument is now adaptable for controlling various mechanisms as desired.

When controlling the cinematograph in question it is necessary to use (in addition to the wireless receiver) a supplementary relay. The latter has mercury contacts arranged to admit or cut off electric current from a main supply to the miniature arc lamp and motor fitted to the machine.

By carefully manipulating the Morse key fitted to the transmitter shown in Fig. 1 it is possible to transmit wireless waves in such a manner that a projected animated picture can be made still or animated as desired, thus producing an effective display which gives one some idea of what it may be like to one day have in our homes news of the day in picture form by wireless; but, of course, such an innovation will not be possible until television has been solved.

Space in this article will not permit giving a more detailed account of my wireless-controlled cinematograph, but the receiver shown in Fig. 4 possesses points which may perhaps puzzle those who have had little or no experience with coherers, as the latter sometimes have a nasty knack of functioning even when unaffected by wireless waves.

In most cases the fault (well known to experts) appears to be due to non-restoration of the normal resistance of the filings (when such are shaken up) contained within a coherer. To eliminate the defect I found that fitting a sheep gong close to a coherer, and arranging the decoherer or tapper to strike the gong simultaneously with tapping the coherer, the sound waves emitted from the gong kept the filings in a state of agitation after the decoherer or tapper had ceased to function. The arrangement will be readily noted on reference to Fig. 4.



Key Diagram of Transmitter Circuits. Fig. 2.

Preventing Accidents.

The device has proved very efficient for demonstration work, so much so that wireless experts have expressed surprise at the sensitiveness and positive action of the coherer. It will be seen that aerial terminals

(*Continued on page* 876.)

RADIO WIZARDRY.

(*Continued from page 875.*)

are mounted on the top of the receiver for securing aluminium rods the same as those previously described.

Two switches are also provided so that the coherer and relay circuit, also the selector circuits, can be opened or closed as desired.

The two press buttons shown (at one end of the receiver) are for the purpose of electrically operating the selector and decohering device should it be necessary to do so. It is generally advisable to decohere a coherer before commencing a public demonstration, so as to preclude the liability of a receiver functioning when unaffected by a wireless wave. The latter contingency might create a wrong impression in the minds of a non-technical audience. Even to-day the general public suspect trickery in any apparatus which appears to be of a mysterious nature, and instruments arranged for wireless control look very different to those for the reception of broadcast telephony. The instrument referred to in this article as a morning alarm for rousing light and heavy sleepers is fitted with a coherer, relay, large electric motor horn, and a converted ·380 revolver for firing five blank charges of black gunpowder.

A Radio Alarm.

The proposed idea is that one of these days we may be aroused from our beds by wireless, and in order to create as humorous a situation as possible I arranged the mechanism so that an electric motor horn is first put in action to rouse light sleepers, but for the heavy variety the charges of black gunpowder are exploded.

I recently fitted up a bedstead, and

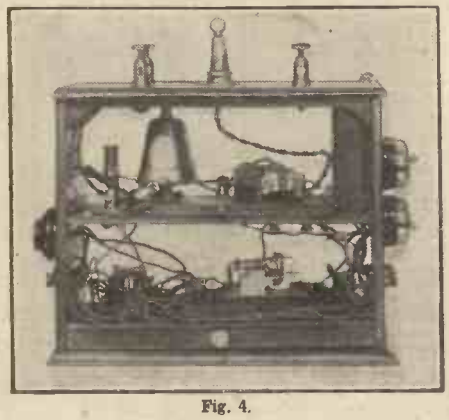


Fig. 4.

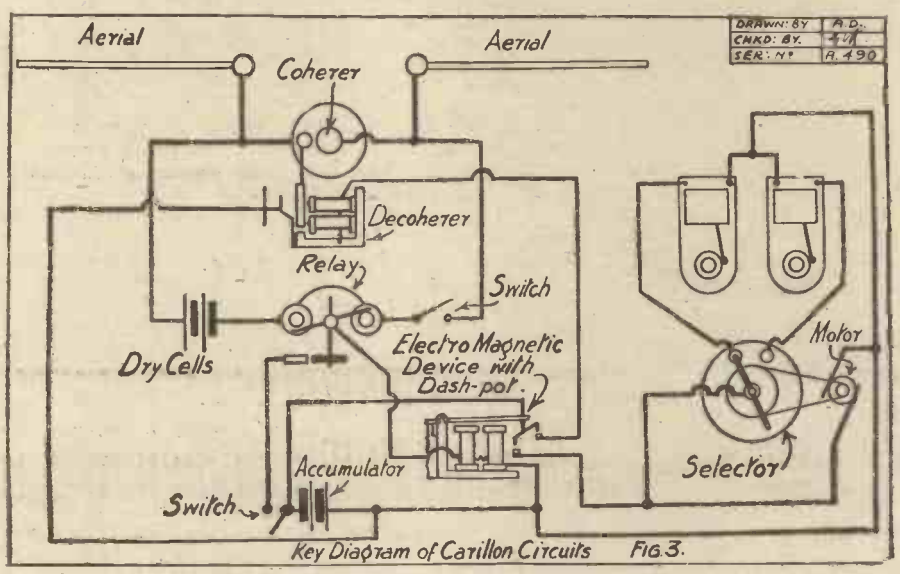
arranged that the violent explosions of the gunpowder charges caused a microphonic type of relay to operate mechanism which made the bedclothes fly into the air and throw an apparently sleeping person out of bed. Needless to say, the experiment caused roars of laughter.

The receiver of the morning alarm is fitted with a simple selector which controls circuits connected with a 4-volt accumulator and an electric motor horn, also a small "series"-wound electric motor. The latter drives reducing gear which causes a crank shaft to engage with a steel rod brazed to the trigger of the ·380 converted revolver; the operation of the various mechanisms being controlled by wireless waves according to the number and order of signals transmitted from the instrument shown in Fig. 1.

Two aluminium rods provide an aerial the same as for other instruments described.

The writer hopes at a future date to furnish particulars of further experiments. Enthusiasts will find the wireless control of mechanism a most fascinating hobby, and one which might lead to great discoveries.

The problem of jamming—i.e. interference from other transmitting stations, has not as yet been solved. Its solution would undoubtedly open up a new era in wireless with unlimited possibilities.



Key Diagram of Carillon Circuits FIG. 3.

NOTES ON H.F. COUPLING.

(From a Correspondent.)

(*a*) *Resistance capacity.*—This method of H.F. coupling is the simplest and cheapest, and for wave-lengths above about 1,500 metres is practically as efficient as any other method.

For the shorter wave-lengths, however, on account of the increased importance of the extraneous capacities in the set, its efficiency falls off considerably. With this type of coupling the anode impedance is constant for all frequencies, and therefore an H.F. valve, so coupled, does not add to the selectivity of the set.

A Selective Method.

(*b*) *H.F. Transformers.*—This method of coupling has had great popularity of recent years, and it is undoubtedly easier to handle than tuned anode coupling, although not capable of quite the same amplification. It adds a fair amount of selectivity to the set.

If you adopt this method, do not use a transformer wound with very thin wire on a moulded former. Use a turned ebonite former, sectional if finances permit; or, better still, select one of the excellent formerless transformers now on the market. Both primary and secondary windings of an H.F. transformer are high-frequency tuning coils, and should have the same care expended on their design as the aerial coil has.

The tuned type of transformer is, of course, far more efficient than the aperiodic type, and the latter type should not be used except in circuits where it is difficult to obtain stability by other methods.

If you are using interchangeable transformers of the plug-in type, make sure that they are all connected in the same way, as there is an appalling lack of standardisation in this respect.

(*c*) *Tuned Anode Coupling.*—This method of coupling is the most efficient method, particularly for the shorter wave-lengths, and the degree of selectivity attained with properly designed components is unattainable by either of the methods described above.

For best results the anode coil should be wound with wire of fairly large section, and in one of the approved low-capacity styles.

Use of Double Condensers.

Semi-aperiodic anode reactances are not nearly as efficient, since, by reason of their flatness of tuning, they involve loss of selectivity and volume. In sets with more than one H.F. valve the tuned cathode method of coupling will be found easier to handle, but it involves the additional complication of separate L.T. supply to each valve.

Double or triple condensers may with advantage be used for tuning two or three H.F. valves, but these components must be absolutely above suspicion as far as insulation is concerned, and the various systems should be well spaced apart to avoid intercapacity as far as possible. It is advisable to incorporate a small vernier condenser for each valve, so as to compensate for any slight want of balance in the tuning coils or transformers.

NO CONDENSER

of the "Mansbridge" type is a genuine product of the Mansbridge Condenser Co. Ltd.—unless the words MANSBRIDGE CONDENSER are plainly embossed on the metal case. The colour of the case is maroon. Guaranteed by the Dubilier Condenser Co. (1925) Ltd. who are the sole concessionaires.

REGISTERED DUBILIER TRADE MARK.

Specify Mansbridge

PRICE AND CAPACITY:

Capacity	Price	Capacity	Price	Capacity	Price
0·002—0·005 mfd.	2/6	0·25 mfd.	3/-	0·50 mfd.	3/6
0·10 "	2/6	0·30 "	3/-	1·00 "	4/-
0·20 "	2/8	0·40 "	3/3	2·00 "	5/-

DUBILIER
CONDENSER CO (1925) LTD

ADVERTISEMENT OF THE DUBILIER CONDENSER CO. (1925) LTD., DUCON WORKS, NORTH ACTON, LONDON, W.3. TELEPHONE: CHISWICK 2241-2-3.
E.P.S.3

Keeps any Accumulator fully charged for 3d. weekly.

—the new idea in accumulator charging described in "Popular Wireless."

THE old idea was to wait for the accumulator to be completely run down and then to put it on charge. This was expensive and inconvenient. The Rectalloy charger, on the other hand, gives a trickle charge. It is permanently plugged into the electric light socket and connected to the accumulator. When using the Set you work from the accumulator. Afterwards you switch over and your accumulator receives a gentle trickle charge from the mains to bring it up to concert pitch until the following evening. In this way your accumulator is always kept fully charged, no matter how many valves you are using. In two voltages 100/120 volts and 200/250 volts alternating current. Complete ready for use, nothing more to buy. **65/-**

Rectalloy Battery Charger

the Ideal Christmas Gift——

The Rectalloy Charger is revolutionary in its principles. No other can compare with it for efficiency or economy. Read the "Popular Wireless" articles about it. If you wish to build the Rectifier yourself according to the articles, we give you on the adjoining column the itemised list of parts.

Special Rectalloy Transformer complete with case, mounting brackets, flex and plug, etc. **37/-**

Two Rectalloy Units mounted complete, ready for immersion, the pair **17/-**

Optional Items.

One lead Unit mounted complete **2/-**

One celluloid case with taper collars **2/-**

Switch Unit **2/-** Base-board **2/-**

¶ *Illustrated Folder giving full particulars sent post free.*

RECTALLOY, LTD. *The Sole Makers of The Rectalloy Charger.*

VULCAN HOUSE, 56, LUDGATE HILL, E.C.4.

4130

"SOLDERCUPS"

(Patent applied for)

SIMPLIFY SOLDERING. NO SOLDER REQUIRED. IT IS IN THE SOLDERCUP.

Screw the Soldercup firmly to the Terminal Base. Apply a little Flux to the wire, and hold in position with a little pressure on the solder.

Heat the wire by holding the side of Hot Soldering Iron against it.

With the slight pressure applied, the heated wire will melt its way into the solder, making a perfect soldered joint.

Soldercups to fit 2, 4, 5 & 6 B.A. Terminals 1/6 per doz. post free.

Agents Wanted.

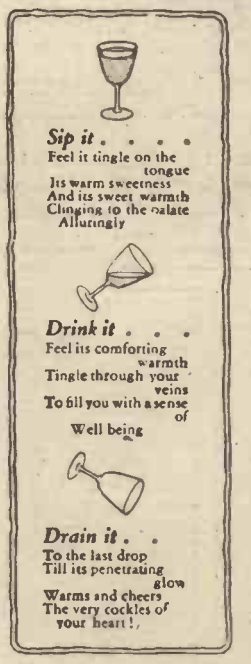
THE SOLDERCUP CO., 55, Hylton Road, SUNDERLAND.

Now then everybody — Sip it Drink it Drain it

WHAT a wealth of jollity and seasonable good cheer there is in Stone's Ginger Wine! What fun to "sip it, drink it, drain it," as the advertisement says!

There's Grandpa—*will* drain his straight off; and Uncle George—likes to linger over the sipping long after everyone's finished drinking; who is to say that Tommy is not already draining his *second* glass?

Who cares, anyway? It's all part of a very jolly Christmas, made all the jollier by Stone's Ginger Wine—so "Sip it, drink it, drain it," and warm up to the fun!



STONE'S GINGER WINE

The Original Ginger Wine—famous since 1740

SIP IT—DRINK IT—DRAIN IT—THE THREE STEPS TO REAL GINGER WINE ENJOYMENT

Nature's Wireless

By LESLIE G. MAINLAND, the famous writer on Zoo Topics in the "Daily Mail."

NO, I don't mean atmospherics, though I suppose these may be called Nature's best-known and least-appreciated demonstrations of broadcasting.

Nature has endowed some of her creatures with very strange transmitting and receiving sets. No, I don't mean the audio-frequency vibrations which are broadcast from the Zoo lion-house at feeding-time, but some much stranger and less understood forms of "wireless."

Some Zoo animals, reptiles, fish, birds, and insects, have some strange ways of signalling to each other, many of which we do not even begin to understand.

Consider the mystery of the Emperor moth. When a female emerges fresh from her cocoon, she is never worried as to whether she will "get off this season." She instantly begins to Morse her "call," demanding a husband. *How* she does it is one of Nature's unguessed riddles, but the effect of her signals is amazing.

Mr. F. Martin Duncan, F.Z.S., told me that he once placed a newly-hatched female Emperor moth in a gauze box, hid her in a pocket, and went for a walk over heathland. Suitors for the lady appeared instantly from all parts of the compass! He had eight of the handsome-winged wooers crawling over his jacket at the same time, all trying to find her—fairy princes in search of the Sleeping Beauty; only she must have been very much awake.

When the lady makes her choice, the rejected lovers fly off without a grumble, hoping for better luck next time.

How is it done?

Natural "Aerials."

Some naturalists put it down to scent of an extraordinarily penetrating character, but it cannot be perceived by human senses. It may be that some form of wireless ether vibrations may be involved in this strange courtship. Anyone would be struck by the differences between the antennæ of the male and the female. The princess has a pair of plain, straight "wires" projecting from her head. She has no signals to receive, only orders to *transmit*.

The male is astonishingly different. In touch with his "brain" are two most complicated antennæ composed of a multitude of tiny bushes and brushes. A wireless enthusiast is irresistibly reminded of an efficient "cage" aerial. Do these play a part in picking up the mating call of she-who-must-be-obeyed?

The riddle is hard to solve, because the senses of a man and a moth are so widely different that it may be very, very long before we can determine if the result is due to unsmellable scent, inaudible sounds, or undetectable ether waves. Anyone who has bred Emperor moths, however, knows that when a female hatches, males hear the tidings *somehow*, and flutter in through your open window to find their lady-love.

"Inaudible sounds," which I mentioned just now, are really quite common in Nature. The ordinary song of a grasshopper (called "stridulating") is due to rubbing a leg against the toothed edges of the wing-cases, and so causing vibrations, just as a boy runs a hoop-stick along a row of railings. There are some Indian crickets who are so small that this note vanishes; it gets too high in pitch for the human ear to detect. Yet you can *see* the little beggar making his music with his legs and wing-cases.

"L. G. M." is very popular among the denizens of the London Zoological Gardens, as this characteristic photograph indicates.

This is exactly what happens when a heterodyne whistle produced by two neighbouring broadcast stations gets higher and disappears when they move their wave-length. The whistle is still there, but we cease to detect it, and so it vanishes.

Two Extremes.

If all listeners were elephants, or had elephants' ears, we could crowd many more stations into the broadcasting wave-band, for the elephantine hearing apparatus is too coarse to perceive certain heterodynes which cause us acute annoyance.

If we all had the ears of dogs or cats, it would be the other way round, for they continue to hear noises after the sound has grown too high (*not* too faint) for the human ear.

Nearly three years ago I sent certain of these inaudible sounds through the microphone at 2 L O for the benefit of listeners' dogs and cats, with amusing results. Apart from the excitement and interest shown by the listening pets (which you may remember), a very interesting test was made behind the scenes at Marconi House, then the home of the B.B.C.

The Sound that "Vanished."

Captain Round wished to demonstrate whether these soundless notes were actually transmitted by the microphone and aerial. A dictaphone was placed at the mouth of a loud speaker. It was geared to run at about four times its usual revolutions. If I sent out a note of 20,000 vibrations a second, the dictaphone would reproduce it afterwards, when running at its normal speed, at 5,000 vibrations a second, and it would then become perfectly audible, *if it had been transmitted and recorded*: for the lowered vibrations would come within the range of "audio-frequency."

In the studio I made a noise like "Ow-ooo-oo-eee-i" (silence) "i-eee-oo-ooo-ow," using a special ear-testing whistle I had borrowed from a hospital. The "silence" represented the moment when the sound rose above the limits of the human ear, though theoretically the noise was still going on. The vibrations, as recorded on the phonograph of the dictaphone, were then reproduced at the lowered speed, and the wax cylinder told the truth.

The sound never *really* vanished, and the dictaphone rendered it as an unceasing whistle which rose and fell *without* a break at its highest point.

This illustration of "soundless noises" is just to show you the possible explanations of some mysterious things in the animal world.

During the air raids of the Great War it was noticed that pheasants perceived

(*Continued on page* 882.)

BROADCAST NOTES.

By O. H. M.

The Radio Festival Week—Sir Harry Lauder to Broadcast—The Latest Wireless Scare—Extending Broadcasting Hours—The Revolt against S.B.

THIS promises to be a right royal wireless Christmas. With the prospect of severe weather, and with the promise of another festival week of British Broadcasting, the vast majority of those who are fortunate enough to have wireless receivers will be glad to spend Christmas at home.

Sir Harry Lauder will make his broadcasting debut during Christmas week, probably on December 23rd.

The Festival Week will begin on Sunday, December 20th. In the afternoon there will be a ballad concert of radio stars, including the Squire Octet, Miss Peggy Cochrane and Miss Edith Penville. Some of Crook's "Peter Pan" music will be played by the Octet. In the evening the band of the Grenadier Guards will play in the London studio. Mr. Harold Williams and Mr. Maurice Cole will also be heard.

In the early part of Monday's programme Sir Gerald du Maurier will broadcast a special talk. Corelli's Concerto for Christmas Night will be appropriately included in the pieces to be played by the London Chamber Orchestra, conducted by Mr. Anthony Bernard. Tailleferre, the eminent French poetess, will recite one of her own compositions. A novelty of Monday's programme will be the broadcasting of the End-of-Term Concert from Marlborough College.

On Tuesday, December 21st, the Christmas opera, "Hansel and Gretel," will be conducted by Mr. Percy Pitt.

On Christmas Eve, about 9.30, carols and waits will be relayed from Whitechapel. On Christmas morning the chimes of Bow Bells will be broadcast from all stations. Mr. A. J. Alan, the ever-popular raconteur, will tell a new story to listeners.

John Henry will be very much to the fore on Boxing Day, when the B.B.C. will make an effort to put on the lightest programme of its history.

The Latest Wireless Scare.

The latest wireless scare is related to cancer. Curiously enough, complaints have emerged simultaneously from different parts of the country, accusing wireless waves of communicating cancer germs. This is yet another serious charge to an already considerable accumulation. Wireless has been made responsible for bad weather and for the encouragement of thunderstorms. Wireless has been presumed in some quarters to be a disturbing influence on the movements of several planets whose habits have been sedulously regular for the past 20,000 years.

But this cancer charge is undoubtedly grave, and I trust that the B.B.C. will be able to issue a fully fortified official denial at an early date!

Extending Broadcasting Hours.

I understand that the suggestion I made in these columns some weeks ago about the necessity of extending the present hours of broadcasting is to be acted upon early in the New Year, and the gaps will be filled in the programmes of 5 X X and the main stations. There will be nominally a broadcasting day of thirteen hours, starting at eleven in the morning. This will mean, of course, a considerable increase in expenditure, and an added strain on staff, but it is certainly what the public wants.

Mr. Donald Calthrop, the well-known actor-manager, who recently joined the staff of the B.B.C.

Need for Better Land Lines.

Despite the improvements made by the new repeater stations on the land lines borrowed from the Post Office by the B.B.C., there is still a growing need for improvement in the land-line service in this country. In this respect we are a long way behind the United States, where land-line links have reached a high degree of perfection.

Unfortunately, the present broadcasting committee appears to be precluded from discussing technical subjects, but my impression is that not the least important of its recommendations will transgress its terms of reference and will bear upon the land lines available for British broadcasting.

In any reorganised system that will mark a definite step forward, British broadcasting must have its own land lines, quite apart from the trunk system of the Post Office.

The Revolt Against S.B.

The revolt against simultaneous broadcasting appears to grow in strength and in area. The development of this revolt is yet another chapter in the story of the swings of the pendulum of public opinion.

It is quite six months ago since I was recording an equally violent outburst against local programmes, and demands

(*Continued on page* 932).

NATURE'S WIRELESS.

(*Continued from page* 881.)

the approach of air-craft long before any of our listening devices gave notice. Disturbances in the coverts showed that *something* was worrying the birds, and then the raiders appeared to confirm their fears.

So well was this recognised that many anti-aircraft stations had a cageful of pheasants, "borne on the strength" with official rations, as part of their equipment. Hearing of a most exquisite acuteness seems to be the only explanation.

Another bird-riddle—how do vultures pass on the news of a find, and why does a flock invariably find its way to an animal's body a few minutes after life has left it?—is rather simpler. It is a matter of sight.

Through Ocean Depths.

A vulture, hovering on his mile-high beat in the heavens, sees a meal and sinks to the ground. A second hovering bird, miles away, notices the act and goes to investigate. The second bird's movements are spotted by a third and fourth from equally long distances, and the original discoverer soon finds himself surrounded with competitors.

A very fair sample of Nature's wireless.

Matters are not quite so simple when we look into the cases of sea-animals and fishes. Even out of the water, after capture, a conger-eel will bark. What use does he make of his voice under water?

Water is the finest medium for conducting vibrations and sounds. The death-flurry of a wounded whale is detected by other whales on the other side of the sky-line. The shock of a single exploding anti-submarine depth-charge near the Tuskar Rock (S.E. Ireland) knocked a diver off his feet in Rosslare Harbour, eight miles away.

Do fish make any use of such natural opportunities for broadcasting their fears and wishes?

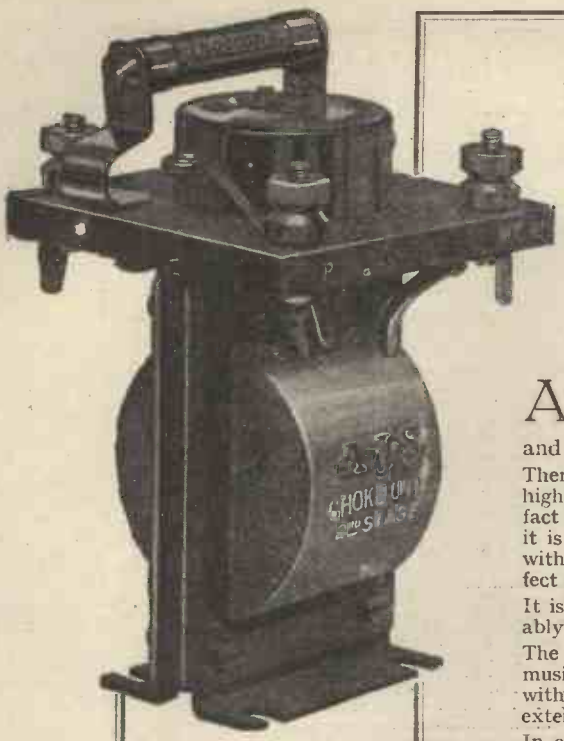
Maritime Mystery Noises.

Captain West, of the B.B.C., spent a strange hour with me at the aquarium of the London Zoo. Hydrophones were dropped into some of the tanks, and the sounds were amplified while we eavesdropped on headphones.

This great secret was not one which Nature was disposed to give up in such a casual way. We heard the wrasse devouring crabs, but that gruesome crunching was the only sound we could understand.

There were plenty of other mystery noises, but their meaning and origin could not be guessed at with our improvised apparatus and limited time.

Still, the sounds were there.



CHOKES AND WHY——

A GOOD choke can be produced to sell at a cheaper figure than a good transformer, and there are very few transformers on the British or any other market that are capable of reproducing speech and music with such fidelity as a well designed choke.

There is no foundation for the rumour that it is impossible to obtain such high amplification with choke as when ordinary coupling is employed. The fact is that few people use the correct valves. If pure reproduction is desired it is not possible to use a high amplification valve with a transformer, but with choke coupling a valve with a high " M " Factor may be used with perfect safety, and is in fact essential if it is desired to obtain the best results.

It is interesting to note that valves with a high " M " Factor take considerably less H.T. supply than those whose " M " Factor is of a low order.

The A.J.S. Choke gives a practically constant amplification over the whole musical scale, thus the quality of reproduction is equal to resistance coupling without the disadvantage of having to increase H.T. supply to the same extent.

In addition to customary use of Chokes, they can be used with advantage for transmitter modulation, or for output units in place of a telephone or loud-speaker transformer.

A.J.S. Chokes should be used in any Receiver when it is desired to obtain the most faithful reproduction of speech and music (all A.J.S. Receivers and Amplifiers are so equipped), but we cannot emphasise too strongly the fact that no Choke will work efficiently unless the correct valves are used in conjunction with it.

Three types of Chokes are supplied :—

(1) The Choke Unit only. (2) A Choke Unit for the first stage of intervalve coupling. This Unit comprises the Choke, by-pass and coupling condensers, and grid leak. (3) A Choke Unit for the second and subsequent stages of intervalve coupling, with coupling condenser and grid leak.

These units only require the addition of a Valve-holder, Resistor, and the necessary connections to complete a low-frequency amplifier.

CHOKE ONLY - - - 15/-

CHOKE UNIT (both stages) 20/-

..... FREE .....

Publication No. 115 is a booklet containing much useful information concerning Chokes, Condensers, Variable and Fixed, Coils, and many other components. A number of charts and diagrams make this a most useful reference book for all interested in the constructional side of Radio. On receipt of the coupon below we will despatch a copy to you post free.

FIXED CONDENSERS.

A.J.S. Fixed Condensers have best selected ruby mica dielectric, and have very low losses. Soldering tags are provided, but terminals may be fitted in the eyelets securing the condenser tags. Can be secured to panel or baseboard with a single screw.

CAPACITIES :

·0001, ·0002, ·0003, ·0005 .. each 1/9

·001, ·002, ·00C „ 2/-

A·J·S

A. J. STEVENS & CO. (1914), LTD.
RADIO BRANCH - WOLVERHAMPTON.
Telephone: 1748 (7 lines). Telegrams: " Reception, Wolverhampton."

LONDON SHOWROOMS: 122-124, Charing Cross Road, London, W.C.2.
Telephone: Regent 7161-2. Telegrams: " Ajayessco, Westcent, London."

GLASGOW OFFICES: 240-250, Great Western Road, Glasgow.
Telephone: Douglas 3449. Telegrams: " Reception, Glasgow."

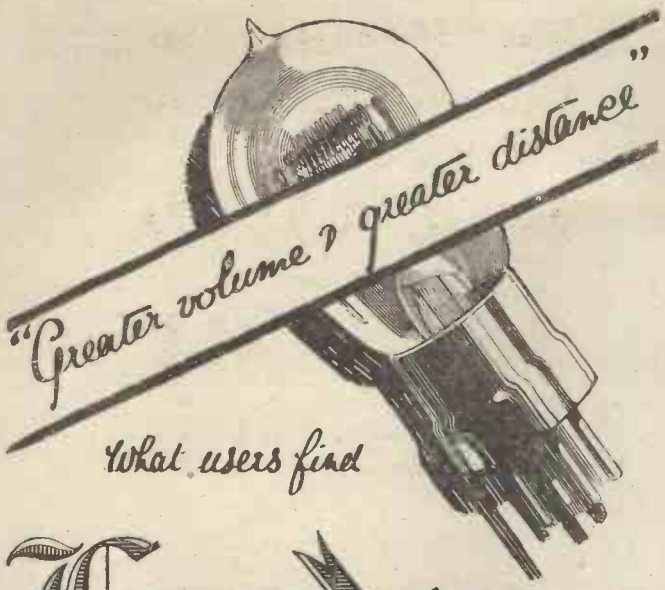
A. J. STEVENS & CO. (1914), LTD.

Please send publication No. 115.

NAME .....

ADDRESS .....

P.W.12/12/25. .....



Louden VALVES

BRIGHT EMITTERS. 4/6

Type F.1 (the Plain Louden) for detection and L.F. Amplification. Type F.2 (the Blue Louden) for H.F. Amplification.

Filament Volts - - 4·5-5.
Filament Amps. - - 0·4.
Anode Volts - - - 40-80.

DULL EMITTERS. 8/- & 9/-

4-VOLT. 6-VOLT.
Filament Amps. - - 0·1.
Anode Volts - - - 40-80.

N.B.—These valves consume only one seventh of the current taken by ordinary bright emitters. They will also work straight off a 4-volt or 6-volt Accumulator without alteration to Filament Resistances or Set.

Please state which type required.

POSTAGE 4d. on EACH VALVE.

AN APOLOGY.

We apologise to those who may in the past have been obliged to wait for their Louden Valves. Upon dealing direct with the public we experienced a demand for these valves far in excess of the output. Adequate steps were at once taken, and we can now assure all users that their orders can be despatched by return—write to-day.

To THE FELLOWS MAGNETO CO., LTD.
CUMBERLAND AVENUE, PARK ROYAL, WILLESDEN, N.W.10

Name.....

Address.....

.....

Herewith Remittance Value.....

Please forward me.....*Louden Valve(s)*

Type.....*on conditions as per your advertisement.*

Please write clearly in BLOCK LETTERS and register Cash or Treasury Notes
P.W. 12/12/25. E.P.S. 71

More especially this Christmas—

EVEN the enthusiast who usually prefers experimenting to "listening-in" gives way to family pressure at Christmas.

At Christmas the set must be *perfect*. Adjusted to a nicety—clear-toned and trouble-free.

This result the Harlie-Detector gives you—*always*.

It is the most sensitive crystal-detector yet produced, and the easiest to adjust. It can be adjusted in the dark by a turn of the ebonite knob, and it is always at the exact delicate tension required for perfect reception.

Simple as A.B.C.—anyone can fix it to a crystal or crystal-valve set in a few moments, and yet it is so efficient that it has been officially adopted for use on Lifeboats and in the Mercantile Marine.

Don't tickle the crystal—fix a

Harlie SUPER-SENSITIVE **DETECTOR**

There is no substitute. *If your usual dealer cannot supply you, fill in this coupon and post to us with P.O. for 5/6.*

HARLIE BROS., 36, WILTON RD., LONDON, E.8

Dear Sirs,

I enclose herewith **5/6** *for one HARLIE-DETECTOR to be sent to me post free on the understanding that my money will be refunded, without question, if I return the Detector undamaged within ten days.*

NAME.....

ADDRESS.....

P.W.

Merritt Service

Choosing Your Radio Xmas Presents

By. G. V. DOWDING, Grad.I.E.E.
(*Technical Editor.*)

WELL, the Christmas season is once again upon us. "Carolling" has commenced, the quarterly bills have started to stream in, and that present problem has loomed up again demanding a complete new set of solutions. These latter must be provided very quickly now; "shop early" is the slogan, and quick decisions will be necessary if it is to be observed. No doubt quite a number of people have already prepared tentative "lists"; if they have it is to be hoped that they haven't forgotten the claims of radio.

The primary object of this article is to show how broadcasting has opened up an entirely new field in which present seekers can wander and search in order to fill some of those perplexing gaps. Its further purpose

This Be-Co loud speaker makes a very attractive Radio present.

is to indicate how they can, at the same time, purchase really worth-while wireless gifts for their relatives and friends.

An excellent idea of what radio has to offer in this direction is given in the "Suitable Radio Gifts" supplement, which appears in this issue and also in the advertising columns, and it is hoped that the following few general remarks will help readers to make their choice.

A Happy Gift.

First of all, it must be pointed out that radio presents are not necessarily expensive presents. Certainly, beautiful radio gifts costing many guineas each are available, but at the same time, there are as many more again which, costing but a few shillings each, can prove extremely acceptable to anybody with a wireless set. And this brings forward another important point. Practically every house in the country boasts of a wireless installation these broadcast days, and radio presents need not be confined to components and other bits of "innards" that appeal only to constructors and amateurs. To choose a radio gift for anybody who hasn't got a wireless set is a simple matter; give him or her a set! No gift is capable of giving such pleasure; pleasure? It is possible that happiness is the right word to use. Even the little crystal receiver, costing but a pound or two complete, is an "open-sesame" to endless hours of song and music, and everything else that is pleasing to the human ear. And there are some excellent crystal sets obtainable these days; excellent in both appearance and in operation.

Presents must always be chosen carefully, especially radio presents. "So-and-so" may have a crystal set, and it might appear on first thoughts that nothing could be more kindly and thoughtful and nothing more likely to give him delight than to buy him a loud speaker. But it is probable that "So-and-so" would receive such an offering with decidedly mixed feelings. In the first place, to give him a loud speaker only would mean, failing the arrival of other appropriate gifts, that he would have to buy an amplifier and all its necessary batteries, etc., before he could use it. It is on the cards that he would not be able to indulge himself to that extent. Then again, it is quite probable that he hates the very sight of loud speakers and would not use one in preference to 'phones even if he were supplied with a complete loud-speaker outfit. Tact is certainly a factor that is necessary to the successful bestower of Christmas radio gifts!

Buy Reputable Goods.

Discreet inquiries *should*, of course, be made, but that is often quite impossible, more especially if it is desired that one's presents should form surprises—delightful surprises.

Youngsters are not generally difficult to deal with—it is seldom that they trouble to conceal the nature of *their* outstanding requirements! A splendid present for a boy who is interested in wireless is a complete set of parts for a receiver and instructions for assembling it. But here, again, it should be remembered that it would be sheer cruelty to give him a complete kit for a valve set without supplying him with the necessary accessories to place it into commission when built, or, at least, without finding out whether some other kindly person will come along with the necessary missing links in due course.

No trouble will be experienced in the case of the enthusiastic wireless amateur. Anything of a wireless nature will please him. He cannot have too many valves, transformers, and the like. Don't make the mistake of giving him cheap stuff, however, for your enthusiastic amateur is terribly discriminating. It would be far better to give him a really first-class crystal detector than a second-class rather shaky variable condenser. Yes, discrimination is most emphatically necessary in quality with your keen radio "fan," relative or friend.

And tread carefully all you who have never been into a wireless store before. It is the business of salesmen to sell, and unfortunately there are salesmen who have no consciences. Radio salesmen are not excepted, and wireless gear is tricky stuff to buy at the best of times. Here, of course, our supplement comes in. Nothing is included in *that* which we wouldn't mind buying ourselves, and that is saying something! Let those whose wireless knowledge is limited remember that there are, for instance, loud speakers *and* "loud screechers." The advice of a friend who knows something about matters radio—not one who thinks he does!—should be followed if it can be obtained. If it cannot, a real safeguard is to limit purchases to branded goods; branded, that is, with the names of reputable firms. "P.W." advertisers can be trusted.

Useful Components.

"Made in England" makes a patriotic appeal, and it can be honestly stated that it is also something of a hallmark. In any case, should the receiver of a present discover at some future date a tiny little inscription indicative of "NOT made in England" on his present, even should it be passably good in operation, it is possible that he will tend to think less of it subsequent to the discovery if he doesn't think less of the donor.

There are many things radio that can prove acceptable to people who already possess complete wireless outfits. These will suggest themselves; for instance, it is obvious that telephone receivers would be received with sincere gratitude by anyone who has hitherto been limited to but one pair. A cheaper present, but one that might please a crystal set owner, is a new piece of really good crystal, anyway it would be a change from that ubiquitous almanac!

(*Continued on page* 888.)

The new B.T.-H. loud speaker is sure to be found in many homes this Xmas.

PROLONGING THE LIFE OF YOUR TELEPHONES.

FROM A CORRESPONDENT.

THERE are many ways in which telephones can be badly treated by a careless owner, but nearly all telephone troubles could be avoided quite easily by attention to the following points.

If the telephones are not left permanently connected to the set but are stowed away after use, make sure that they are kept in a dry airy place, as dampness will in time adversely affect them.

If you are using a valve set, be careful that the 'phones are connected in circuit the right way round. Most 'phones are marked with red cord or a plus sign to denote which side of the 'phones should be connected nearest to H.T. plus. Should they be connected to the set so that current flows in the reverse direction, it is only a question of time before the telephones become de-magnetised.

Determining Polarity.!

When telephones have no indication which is the plus lead, the polarity can be determined as follows:

Carefully unscrew one of the earcaps, and remove the diaphragm, leaving the magnets exposed. Hang the 'phones up rigidly, and then "load" one of the magnets with small pins, gramophone needles, or similar objects, until its magnetism is supporting all the load it will hold. Then send a small current from a dry-cell through the 'phone-cords, first in one direction and then in the other. If the loading of the magnet has been very carefully done, it is possible to tell when the current from the cell is flowing through the 'phones in the right direction, because it then assists to hold the load of pins. When the cell is reversed, however, and the current opposes the magnetism of the 'phones, the load will fall off as soon as the current starts to flow. The leads can then be marked plus and minus to correspond with the cell connections.

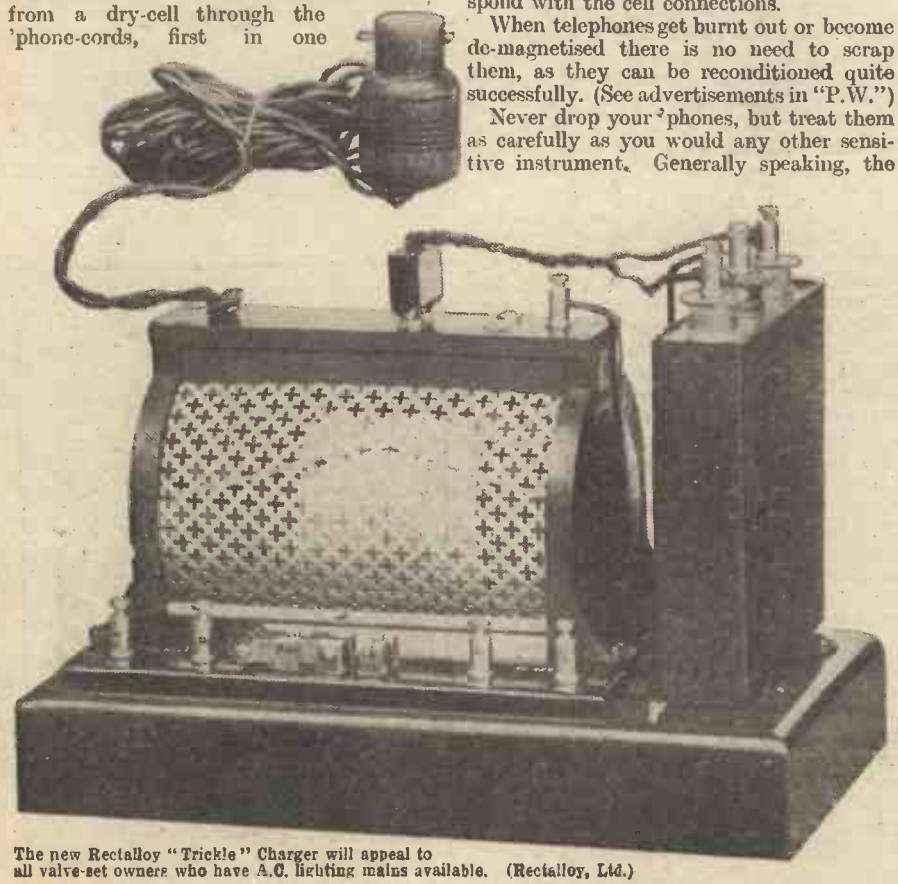
A handsome American receiver—the Ultradyne, a product of the Phœnix Radio Corporation.

When telephones get burnt out or become de-magnetised there is no need to scrap them, as they can be reconditioned quite successfully. (See advertisements in "P.W.")

Never drop your 'phones, but treat them as carefully as you would any other sensitive instrument. Generally speaking, the diaphragms should not be removed, as this is a tricky operation, especially with 'phones of the Brown reed-type. Should an ordinary flat diaphragm become rusty through long use, it can be carefully cleaned and lightly smeared with vaseline, but great care must be taken not to bend or dent the diaphragm in any way.

It is perhaps as well to say that there is no right-way-round or wrong-way-round to connect 'phones in a crystal set, as in this instance the currents flowing are not strong enough to adversely affect the permanent magnets of the telephones.

Whilst on the subject of 'phones for crystal sets, one other little point is worthy of mention. If your 'phones are not the ordinary 2,000 or 4,000 ohms kind, but are wound to a higher or lower resistance (say, 120 or 6,000 ohms), it is generally well worth while trying as many kinds of crystal in the detector as possible. The resistance of the various types of crystal used for detectors varies enormously, and if you can get a piece exactly suitable for the telephones in use, the result is an appreciable increase in volume or sensitivity.



The new Rectalloy "Trickle" Charger will appeal to all valve-set owners who have A.C. lighting mains available. (Rectalloy, Ltd.)

RADIO CHRISTMAS PRESENTS

(*Continued from page* 887.)

Valve set people would not be very pleased with 6-volt valves if they were in the habit of using 2-volters; suitable valves are difficult to choose unless a hint is forthcoming from the intended recipient as to what sort he likes and what he wants—if any.

Speaks for Itself

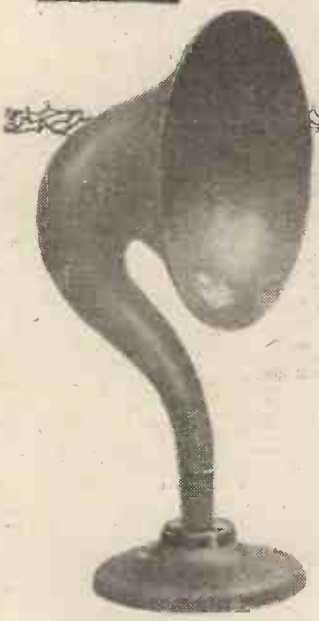
Loud-speaker set owners can always do with two loud speakers, more especially if the additional one provided in the way of a Christmas present is a really modern, up-to-date instrument. It is well worth mentioning in passing, that a radio gift is not a silent menace, as is a pair of red slippers, an art ornament, or a tie or pair of socks of vivid hue; it is liable to lift up its voice whenever its donor is present and speak for itself in no uncertain tone! Opportunities for taking such a terrible revenge must not be allowed to occur! One more argument in favour of quality.

This must not lead would-be radio present seekers to believe that purchasing wireless apparatus is a hazardous business fraught with danger; once again, if branded goods, strongly for preference "Made in England," are chosen, the strong chances are that all will be well.

Novel permanent and automatic crystal detectors; crystal sets; valve sets; telephone receivers and loud speakers; accumulators, valves and component parts; patent aerial insulators and earth pins; gadgets—there is limitless choice. Turn to the "Radio Gifts Supplement" to commence with; you may find something there that will solve at least one or two of those present problems right away.

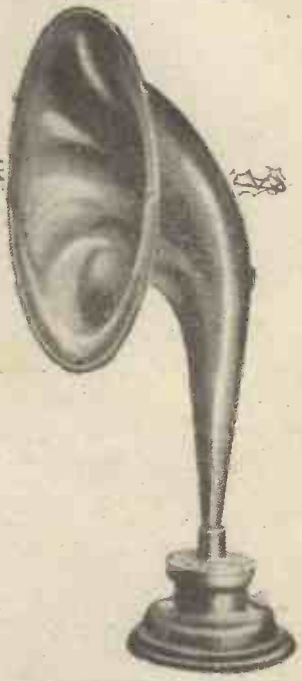
Suitable Radio Gifts

What some of our Advertisers are offering in the way of Christmas Wireless Presents.

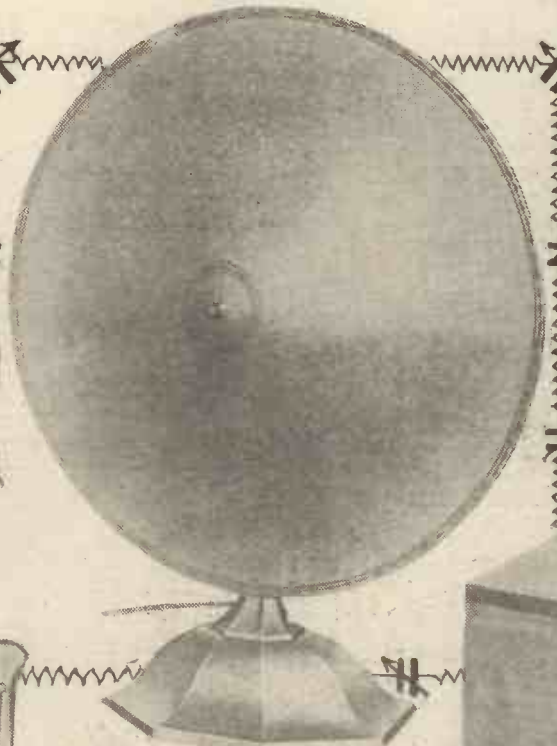


A popular "Brandes" Loud-speaker model

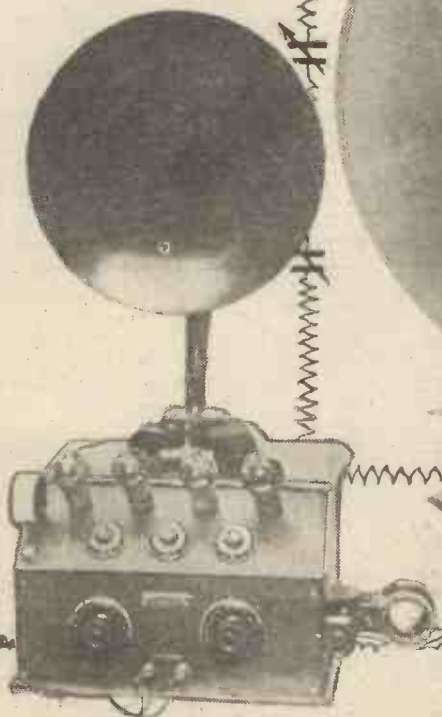
The Climax Junior De Luxe Crystal Set Price **£1 : 1 : 0**



The T.M.C. Concert Grand. Price **£6 : 10 : 0**



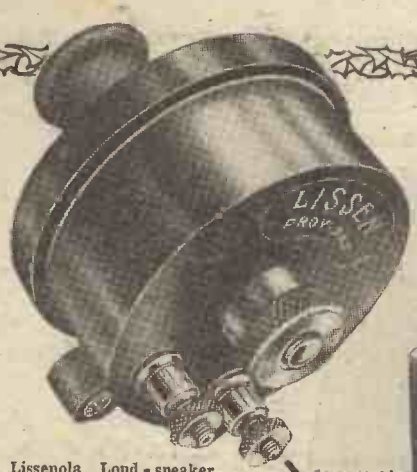
The Kone Loud Speaker (Standard Telephones & Cables, Ltd.). Price **£6 : 6 : 0**



4-Valve Set (Type B). (Messrs. Ward & Goldstone.) Price **£18 : 18 : 0**

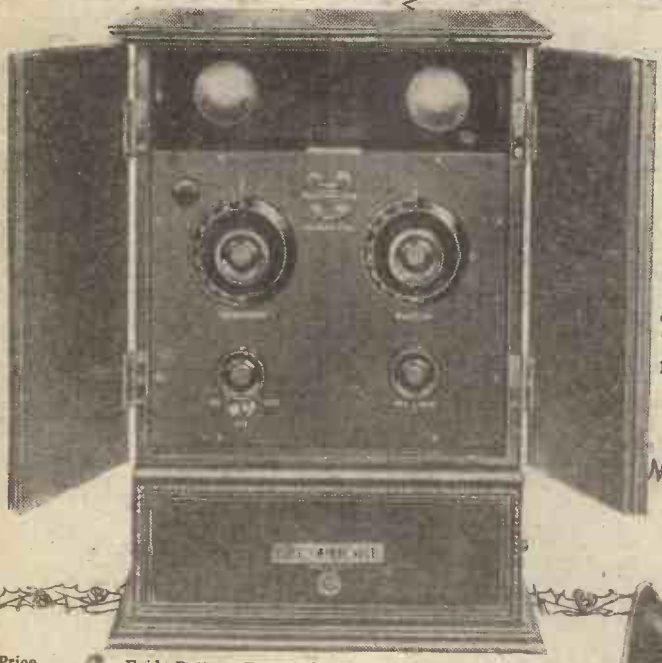
The Dubilier Buzzer Wave-meter. Price **£5 : 5 : 0**

For wave-lengths from 100 to 3,000 metres.



The Lissenola Loud-speaker Unit. (Messrs. Lissen, Ltd.) Price **13/6**

The Revophone Crystal Set. Price **£2:10:0**



The General Electric Co.'s "Gecophone" Receiver. Price **£10:10:0**

The Silvervox Loud Speaker. (The Silvertown Co.) Price **£3:10:0**

Price **35/-**

Exide Battery, Type W.H. (24 volts).

One of Messrs. Brown's Popular Loud Speakers.

The Harlie Crystal Detector.

The Burndept Ethophone III. Receiver.

The A. J. Stevens Cabinet Loud Speaker Price **£4:15:0**

The Two-Valve "Seymour" Efescaphone Set (Falk, Stadelmann & Co.)

The Cossor "Wuncell" Dull Emitter Valve. Price **14/-**

The Ediswan A R D E (Dull Emitter Valve). Price **14/-**

The Metropolitan Vickers "Cosmos" Crystal Set. Price **£1:5:0**

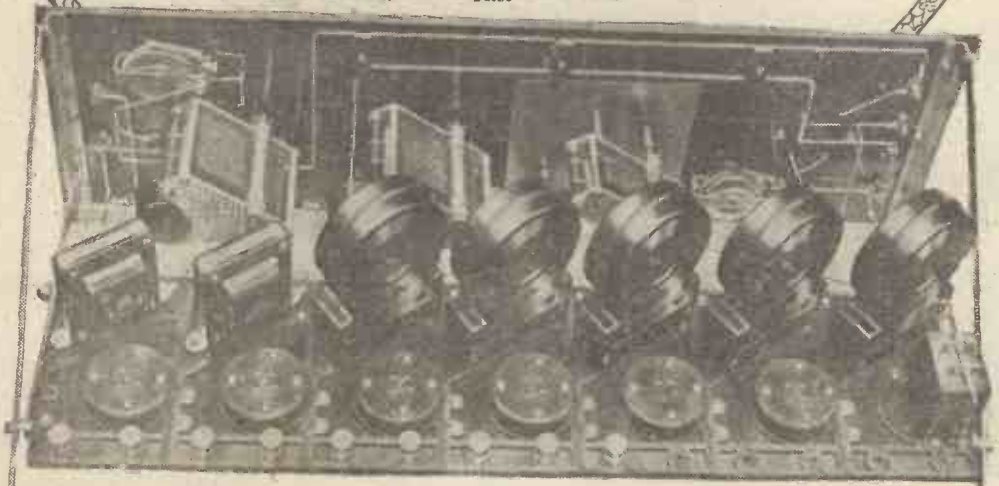
The Vanicon Double Condenser.

"Radio Lux." One of the latest Amplion Loud Speakers (in lacquer). (Messrs Alfred Graham & Co., Ltd.) Price £13:13:0

The P.M. 4 Dull Emitter for L.F. Amplification. (Messrs. Mullard.) Price 22s. 6d.

The Ormond Engineering Co's. L.F. Transformer.

One of Messrs. Oldham's 2-volt Accumulators for Dull-Emitter Valves.



The Igranic Supersonic Heterodyne Receiver Outfit. Price £15:15:0

A RADIO ROCKET TO THE MOON.

Wireless Photographs of Other Worlds.

By G. H. DALY.

MAN is ever finding new uses for wireless, and his latest idea is to use wireless as a substitute for himself.

It so happens that a gigantic man-carrying rocket has been designed which the inventor claims will easily reach the moon, but, quite naturally, no human being is anxious to make the journey (although at least one scientist has offered to go—under certain conditions). So it has been decided that a special wireless transmitting set will go instead.

It is hoped that by means of this set we shall be able to follow the journey of the rocket through space, for, if everything goes well, the set will automatically send out wireless messages at certain intervals on the way.

In addition to this, the very idea of sending a wireless rocket to the moon is likely to open up other possibilities, hitherto unimagined even in the minds of H. G. Wells or Jules Verne. These possibilities will be outlined later. In the meantime we will dwell upon the manner in which it is proposed to equip the rocket with wireless, and the way in which the set will send these automatic messages from space.

The moon is roughly about 300,000 miles from the earth, yet the farthest distance which we have been able to send wireless messages is 24,000 miles—i.e. the circumference of the earth. This transmission was carried out by one of America's most powerful transmitters, and if the reader will pause a moment he will see that the only place on earth which could be 24,000 miles away from that particular transmitting station, is the station itself.

Radiating Space Waves.

In fact what happened was that a certain wireless signal was radiated from this station and picked up at the same station after it had travelled right round the earth—i.e. 24,000 miles.

This experiment, as mentioned before, was carried out from one of the largest wireless stations in America with its attendant huge aerial system, and obviously to fit a rocket with apparatus of a hundredth of the power is out of the question. As a matter of fact, the rocket set will be in the vicinity of 500 watts, which on earth has a normal range of about 500 miles for continuous wave telegraphy.

However, the power of a wireless transmitter is no criterion for the distance it will transmit. Take for instance the tiny amateur sets which get over to New Zealand on about the same horse power as is required to run a sewing-machine.

A 500-watt continuous wave set in the rocket with its very limited aerial system may be heard by us on earth long after it has covered a considerable portion of its 300,000 mile journey to the moon.

A fact also to be considered is that wireless waves radiated from the rocket will not be exactly the same kind of waves as those radiated from an earthed transmitter such as we generally use.

To put it briefly, in the case of an earthed transmitter, it is said that only half the waves are radiated through the air, the other half of the waves being propagated underneath the surface of the earth, and this latter half tending to drag back the other half which is passing through the air; thus to a certain extent the earth hinders the wave by damping it out.

In the case of the rocket wireless set the waves radiated will be pure space waves or complete loops instead of half loops as radiated by the earth transmitter. It is therefore reasonable to suppose that the complete waves from the rocket will be propagated for a much greater distance than the half waves used by us with earthed transmitters. It should be added that it is practically impossible to radiate complete waves from earthed transmitters even if they have a balance capacity instead of earth, and indeed it is necessary for any aircraft to be at least 10,000 feet high before anything resembling a pure space wave can be radiated. The rocket, of course, will radiate complete space waves almost instantly on leaving the earth owing to its great velocity.

Through the Heaviside Layer.

Scientists have recently shown that the presence of matter even in the form of a very thin gas tends to hinder or damp out wireless waves.

Now the air or gas surrounding the earth is approximately 300 miles deep, so that once the rocket has passed out of the earth's atmosphere there will be no matter to hinder the wireless waves until they reach the edge of the earth's atmosphere, and so the distance which a comparatively small set in the rocket can transmit is greatly in excess of that which the same transmitter could send on earth—how great we cannot as yet tell.

Some there are, of course, who will say that the Heaviside layer will prevent wireless waves from the rocket reaching the earth, but this is hardly likely, for we have now every reason to suppose that the only waves which will be stopped by the Heaviside layer are those which strike the latter at a reflecting angle, which is for electromagnetic waves generally about 45 degrees.

But how is the rocket to be fitted with wireless and how is the set to be made to radiate automatic wireless messages?

In the first place a special chamber is to be constructed in the rocket—a padded cell, as it were. The wireless set itself will consist of a standard continuous wave wireless set. The filament of the valves are to be lit by non-spillable accumulators, and the high tension current is being supplied from a large number of dry cells.

Amazing Possibilities.

The rocket will be equipped with a strong trailing aerial wire which will be released automatically as the rocket is shot off from the earth.

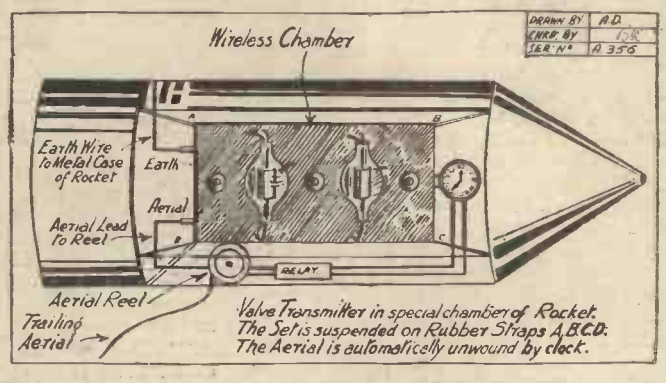
The transmitter will be operated by a special clock which will be set going shortly before the rocket leaves the ground.

The natural sequence of shooting a rocket to the moon is shooting one to Venus or Mars—the planets in the solar system which are nearest the earth and which are possibly capable of supporting life.

If certain germs were stored in the rocket we might even populate these planets in this way, but this is beyond the scope of wireless.

Some day, however, when wireless photography and television are perfected, it may be possible to equip a wireless controlled rocket with automatic wireless photographic or televista mechanism which will send or bring back to we earth folk photographs and pictures of these other worlds. This is undoubtedly quite within the bounds of possibility.

Meanwhile we can listen in for the moon rocket and endeavour to pick up the messages as it travels on its lonely way through the darkness of space.



GEARY'S AMAZING XMAS NIGHT.

By HIGHAM BURLAC.

How an old friend established Two-Way communication with the Shining Lights of History.

"NO, Aloysius," I said, "I don't want you to talk about Christmas. Christmas is the season of goodwill, but if there were many more like you it would develop into a *pogrom*. Take your hand off that chunk of galena, and hand back that little condenser you've just slipped into your vest pocket. Thanks! You cheap Raffles, you're a human tax-collector—always robbing poor citizens, friend and foe alike."

"You Really Must Listen—"

This monologue occurred in my laboratory, where Geary had strayed, evidently to see, as usual, what he could attract in the way of small parts. His aim in life seems to be to construct an eight-valve set out of parts collected from other men, wood stolen from a baby's toy, and ebonite wrenched from a blind woman's piano.

"But, Higham," protested Geary, "you really must listen to this one—there's your crystal; I was only looking at it—this is absolutely a winner. It's unique in the annals of indigestion. It's got all the ghost yarns and nightmares knocked base over apex, and only fit for the Children's Hour. B-r-r! It makes me shiver to think of it—'In Two-way Communication with the Tomb.'"

"Well, I suppose you have been reading some of Dr. Cohn Andoil's yarns," I said. "Fire away—and then go away!"

Johan of Spitzbergen.

This is what Geary told me.

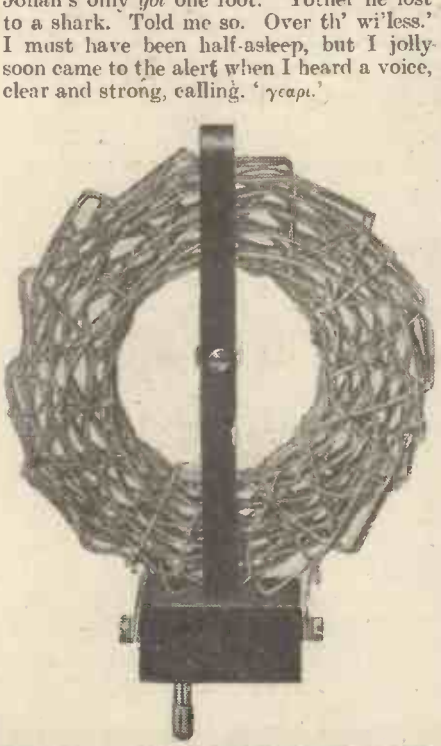
"Being Christmas, we had a bit of a party last night. Boys and girls and engaged couples, just to keep the kissing games lively, and save the gas in the back parlour. Both the grannies, with their dear old caps and their well-known stories of birth, marriage, illness, and death in the days of dear Prince Albert. Also several of those unmarried ladies of unwhispered age, who get so frightfully bucked over half a glass of cheap port. It was all quite good fun, but I was somewhat preoccupied and impatient because I had an appointment at ten-thirty with Johan Oliessen, 3 P Z, of Spitzbergen. I always have half an hour with Johan at Christmas. He's the son of Johan Oliessen, a blubber-boiler in a large way of business. He once chipped in and saved me from bumping off my transmitting valves in an attempt to log the Brownsonian Expedition at the North Magnetic Pole. He relayed my messages in Morse *au Esquimaux*, and sent me a baby seal as a memento. We called it Johan. Johan is now dead, and his overcoat is used as a radiator muff for my Ford.

"But, as I was saying, I had my mind occupied with Johan and the clock and a new microphone, and did not notice particularly what I ate and drank. Usually my Christmas fare is dry toast and cocoa, but I must have eaten a number of amateur mincepies of my daughter's manufacture, and some cold Christmas pudding, besides drinking whisky, port, sherry, ginger wine, raspberry cordial, olive oil, vinegar and coffee.

"I am Socrates."

"With that cargo stowed below, I stole out of the room during Granny Geary's famous story of the parson's ulcerated leg, and sneaked up to the wireless room. I fixed things all ready, though I must say that the plugs and sockets seemed uncommonly awkward, and it took me seven minutes to find H.T.+ However, I got the juice into the aerial, and howled for Johan good and loud, thinking how lucky I was to feel so snug while he, poor chap, was kicking Polar bears off with one foot, and knocking the icicles off the generator with the other.

"'No, that's all wrong,' I said. 'Jo-Johan's only *got* one foot. 'Tother he lost to a shark. Told me so. Over th' wi'less.' I must have been half-asleep, but I jolly soon came to the alert when I heard a voice, clear and strong, calling. 'γεαρι.'



Coils make acceptable Xmas gifts for wireless amateurs. Here is the "Mars," unorthodox in appearance but efficient in operation.

"That made me sit up, I can tell you. Nothing greasy or Polar or Esquimaux about *that*. The voice made me feel like I did when I visited the giant refrigerator at Smithfield. Thinking to infuse a little warmth into the proceedings, it being Christmas and what-not, I tapped the mike and said:

"'Hello, me jolly old top! How is my mod? Six F H *over!*'

"The voice—by Jove, that fellow *could* modulate!—came as clear as a Klaxon.

"'γεαρι, I am Socrates!'

"'What of it,' I replied, thinking, 'Anyway, this bloke died long before Queen Anne, if I know anything about history—which I don't.'

"We Are Cæsar."

"'γεαρι, we are both liars,' came the reply, but before I could switch over to tell him what *he* was, another voice broke in and said:

"'*Geario, quo vadis?*'

"'This is awful,' I thought. 'I've struck some blooming school of Esperanto or else the Tower of Babel.'

"'Six F H calling,' I replied. 'Geary owner, and who the deuce are you? Berlitz or Hugo or what?'

"The reply was:

"'We are Cæsar! Julius calling!'

"'B'gosh, are you!' I called back. 'I've read all about you in Shakespeare. How's Brutus and the gang?'

"'When I sloshed the Belgæ at—I forget where—this wireless would have enabled me to do it in half the time and without the loss of that Fourth Legion. I've Napoleon here. Would you like a word with him?'

"'Sure!' I replied. 'Shove on the First Consul.'

Real DX.

"'Attend!' The voice had a sergeant-major's flavour about it that I didn't like. 'Attendez! You are ordered to take note that had my admiral possessed the instrument *sans fil* in 1805, your Nelson would have saved his *sopig* life and my *bateaux* their hulls. Marconi was born too late to alter my destiny.'

"'Bee-enn,' I said, in fluent French, 'but it's no good your trying to dicker with the history books. How's my modulation?'

"Another voice butted in:

"'Baron Munchausen *hier*. Keary, who der vireless invented?'

"'I did!' I yelled.

"'Take my diploma.' said the baron. 'I thought I meinselluf der cratest inventor vos. But I vos hrong. Take also mein medals and reputation. Dot Socrates vos right. Ve all liars are.'

"Just as I was about to reply fittingly—for I had got my goat out properly—a gentle voice broke in:

"'Say, Geary, what about this child?'

"'Oh, let 'em all come!' I growled. 'I suppose you are either King Tut or the Missing Link. I don't know what DX is coming to.'

"'Nay, friend, I am Benjamin Franklin.'

"'Good!' I answered. 'Did you invent wireless, or do you want to excuse yourself something because you had no wireless, or do you want to call me a liar? This is getting monotonous.'

Back to Earth.

"'Nay, friend,' came the voice, a nasal voice, 'I am a one hundred per cent American. We do not invent. Except stories. But say, stranger, didst ever hear the story of how I held a conversation with Jupiter. Now, mark you, I had nothing but the electric fluid and a jack-knife. Cost me two dollars, less two and a-quarter for cash. Well, I ups and I——'

"'*Bang!*'

"Well, Higham, I must have gone to sleep, for I found myself on the floor, still holding the plug with which I had been hunting H.T. plus. And the amateur pies must have done the rest."

"Geary," I said, "my vote goes to old Socrates. And if you will replace the ammeter you have just hidden in your muffler, you may go in peace. It being Christmas and what-not, as you would say."

What we think about them

Members of the N. Thusiast family give their views concerning "Britain's Most Dependable Valves."

Old Mr. N. Thusiast passes an opinion

"—of course, a grand-dad can hardly be expected to hear as well as youngsters. But when he *does* hear, he's a jolly sight more critical, eh? At one time I didn't at all fancy music being served up with buzzing and booming and crackling. But, bless your hearts, since Tom fitted those Ediswan Valves . . such music. Those dance bands might be in the room—not a note's spoiled. Talk about rejuvenation treatments. You should see me dancing round with Elsie!

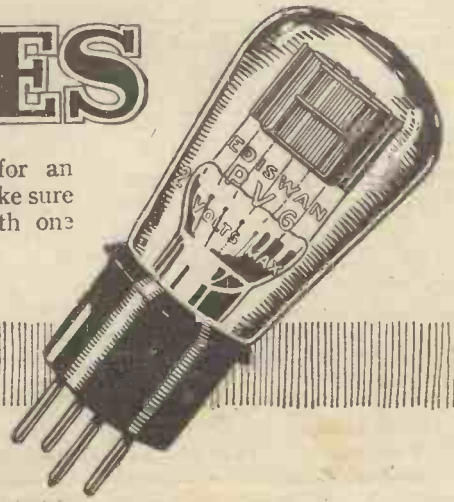
Every member of the family appreciates the fact that

EDISWAN VALVES

WILL IMPROVE ANY SET

THE VALVES TO USE		
Rec.	Acc. or Batt Volts	Power
A.R.	4	P.V. 5
A.R.D.E.	2	P.V. 6
A.R. 06	3	P.V. 8

will secure faithful reproduction for an unusually lengthy period. Only, make sure of using them in conjunction with one another—as shown here.

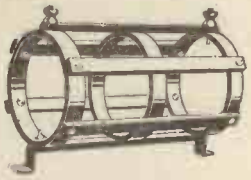


ANTIPONG VALVE HOLDERS

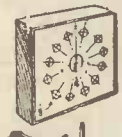
Low Loss, Shock Absorbing, non-microphonic, universal fitting. They protect your valves and improve the quality of reception. Use them for Dull and Bright Emitters. Price Each **3/-**

LOW LOSS COIL FORMERS

Skeleton Formers should always be used to ensure efficiency, especially on short wave-lengths. The Bowyer-Lowe series covers most amateur needs. Prices from **5/-**



STUD AND SERIES PARALLEL SWITCH PARTS



Complete sets of parts to construct Stud Switches with ¾ in. radius arms. Boxes containing complete Switch Arm with real Ebonite Knob, Bush, Contact Plate, 10 Studs with 2 Nuts to each and 2 Stops, lacquered finish; Drilling Template, enabling purchaser to construct any size switch from 2 to 10 way **2/3**

Series Parallel Switch Parts Complete .. **4/-**

EVERY ONE GUARANTEED FOR A YEAR

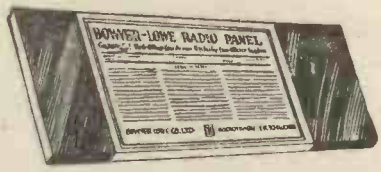
Buy Bowyer-Lowe Components because they never let you down. Every one is guaranteed for a year. If within that time it shows any defect in construction or performance it will be exchanged free. Bowyer-Lowe Low Loss Parts are built by expert radio engineers to give results of the highest efficiency. Use them in all your sets.

Complete Catalogue free on application to

The Bowyer-Lowe Co. Ltd. Letchworth.

MATCHED H.F. TRANSFORMERS

The very fact that every Bowyer-Lowe Transformer can be guaranteed to match every other in its range without special selection is itself good evidence of the great skill and care with which these Transformers are made. Every condenser is individually tested against standards. All ranges from 550 to 2,000 metres and up are supplied; and a special Neutrodyne Unit covering 300 to 600 metres. All ranges. Each **7/-**



BOWYER-LOWE PANEL SERVICE.

Beautifully polished, drilled and engraved Panels of Tested Grade A Ebonite are supplied by the Bowyer-Lowe Company for any set of which full size drawings or blueprints are available. Perfectly accurate workmanship and quality of finish are features of this service. The uniform price for panels of any size is 1½d. per square inch. Ask us to make your next panel.

Bowyer-Lowe Tested Components

ALADDIN UP-TO-DATE

Not New Lamps for old—— but NEW VALVES FOR OLD!

Send your useless Valve to us and we will give you

An Aladdin Amplifier or General Purpose Valve for .. **2/11**
An Aladdin Dull Emitter Type A. 2 volt ·06 Amp. Valve for **6/6**
An Aladdin „ „ „ B. 4 volt ·06 „ „ „ **6/6**
An Aladdin „ „ „ C. 2 volt ·15 „ „ „ **4/9**

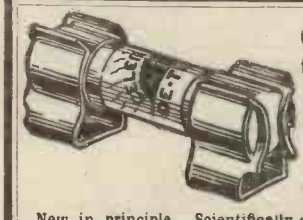
We take any type of imperfect or broken valve in exchange.

TAKE ADVANTAGE OF THIS OFFER IMMEDIATELY.

3d. extra per Valve must be included for postage, etc.

Don't omit to send for our latest Price List of nearly 1,000 priced articles. Post Free.

PAYNE & HORNSBY Limited,
GALLOWGATE, NEWCASTLE-ON-TYNE.
Leeds, Belfast, Notts, Sunderland, North and South Shields.



Crystal reception is without doubt the most ideal. Good reception depends on the Detector.

'CELERUNDUM'

is a perfect Permanent Detector.

New in principle. Scientifically constructed. Needs no adjustment. Will stand any plate voltage. Will not burn out. Eliminates all crystal and catwhisker troubles. Gives POWER VOLUME and CLEARNESS

Retail Price **3/6** Liberal discount to the trade.

Sole representative for Europe and British Colonies

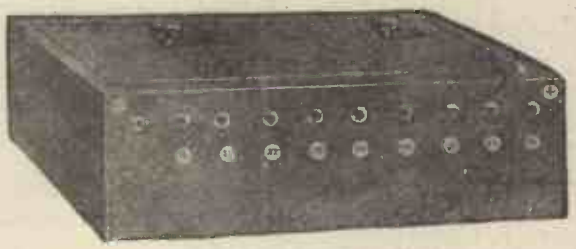
A. VANDAM,
Caxton House, Westminster, S.W.1

Reg. U. S. Patent Office

it's here

RECO

The Rechargeable H.T. BATTERY



60 VOLT BATTERY, 40/-

For particulars write to:

Radio Equipment Co., Ltd.
5, Dyer's Buildings
HOLBORN, LONDON, E.C.1

try it!

Barclays Ad.

Marconi Valves

a "Sound" product

MARCONI Valves are sound in construction, principle and performance, and in their unfailing power to give absolute satisfaction; consequently they are the most popular and widely used valves in the radio world to-day.

Each type of Marconi Valve is constructed for a specific purpose on straightforward scientific lines and is dependable in every way, economical in operation and guaranteed by the name *Marconi*, famous for 30 years in radio.

Broadcasting Stations throughout the world use them, and leading experimenters and amateurs everywhere prefer them. The reasons are obvious. Marconi Valves will satisfy your every radio need.

Get the Valve in the Purple Box.

AT ALL RADIO DEALERS.

Brief particulars of six popular types:

TYPE R. Filament Volts 4. Filament Amps. 0·7. Anode Volts 30-100. Impedance (ohms) 40,000. Amplification Factor 9. Price **8/-**

TYPE R.5v. Filament Volts 5. Filament Amps 0·70. Anode Volts 30-120. Impedance (ohms) 30,000. Amplification Factor 9. Price **8/-**

TYPE D.E.R. Filament Volts 1·8. Filament Amps. 0·35. Anode Volts 30-80. Impedance (ohms) 32,000 Amplification Factor 9. Price **14/-**

TYPE D.E.3. Filament Volts. 2·8. Filament Amps. 0·06. Anode Volts 20-80. Impedance (ohms) 22,000. Amplification Factor 7. Price **16/6**

TYPE D.E.6. Filament Volts. 1·8/2. Filament Amps. 0·5. Anode Volts 60-120. Impedance (ohms) 10,000. Amplification Factor 5·5. Price **18/6**

TYPE L.S.5. For power amplification. Filament Volts 4·5. Filament Amps. 0·8. Anode Volts 60-400. Impedance (ohms) 6,000. Amplification Factor 5. Price **40/-**

Full descriptive list of Marconi Valves, No. P.W. 435, giving particulars of each type, sent on request.

THE MARCONIPHONE COMPANY LIMITED. Registered Office: Marconi House, Strand, London, W.C.2.
And 210-212, Tottenham Court Road, London, W.1.
Branches:—Aberdeen, Bristol, Birmingham, Belfast, Cardiff, Cheltenham, Dublin, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Nottingham, Southampton, Swansea.

Marconiphone

"The Triumph of the Master Mind"

MARCONIPHONE TYPE 21 RECEIVER fitted with coils for broadcasting wave-lengths, complete with accessories and royalty, including a Sterling "Dinkie" Loud Speaker PRICE **£14 - 14**

Extra if fitted with Daventry coil instead of broadcasting coil - 5/-

TYPE 21, receiver only, **£7·10**

TYPE 31 (three valves), receiver only, **£14-0**

At all Radio Dealers.

An Ideal Christmas Gift

Marconiphone Type 21 Receiver *and* Sterling "Dinkie" Loud Speaker

The Marconiphone Type 21 Two-Valve Receiving Set is simple to operate. Designed to cover a wave range from 200-3,200 metres, it is admitted by users everywhere to be the best for quality of reception and value. It is the ideal receiver for Daventry on a loud speaker.

The circuit embodies a unique form of reaction which does not effect tuning or necessitate movement of reaction coil during tuning adjustment. There is no hand capacity effect. The set gives perfect loud-speaker reception within a range of 50 miles from a main broadcasting station, and 100 miles from Daventry, whilst telephonic reception of most B.B.C stations is guaranteed. Additional high frequency or low frequency amplification may be added if required, without alteraton to the set.

The Marconiphone "Ideal Junior" Transformer is incorporated in this instrument, the windings of which are impregnated with "Marconite" the most perfect insulating material known, and non-corrosive. All wiring is easily accessible. Anti-microphonic valve-holders are included, and a special switching device prevents battery "creeping."

The Sterling "Dinkie" Loud-Speaker included with this set is known to thousands of listeners as "The little fellow with the loud voice"; its tonal quality is remarkable for so small an instrument, and it is undoubtedly an ideal combination with Marconiphone Type 21.

Descriptive Leaflet No. P.W. 437 sent on request

THE MARCONIPHONE COMPANY LIMITED
Registered Office: MARCONI HOUSE, STRAND, LONDON, W.C.2
And 210-212, Tottenham Court Road, London, W.1
Sole Agents for STERLING TELEPHONE AND ELECTRIC COMPANY, LTD.

A Three Valve Unidyne Set

The Set Invented and Described by G. V. DOWDING and K. D. ROGERS. (*Technical and Assistant Technical Editors "Popular Wireless."*)

MOST of the readers of "P.W." will need no introduction to the Unidyne circuit, which was first introduced to readers of "Popular Wireless" in the summer of 1924 through the columns of that journal.

For the benefit of new readers the principle of the receiver can be stated in a few words by remarking that whilst the circuit design conforms more or less to standard arrangements, the Unidyne circuits work efficiently and reliably *without any H.T. battery.* This result is obtained using ordinary apparatus such as can be found on any H.T. set, the sole exception being the type of valve employed.

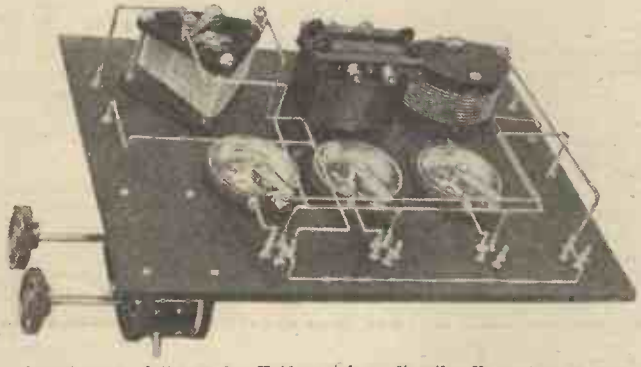
All the Unidyne circuits employ a valve having *two* grids. The outer or main grid corresponds more or less in its action with the grid of an ordinary three-electrode valve. The extra grid (which is sometimes called the inner or auxiliary grid) is the electrode which is connected in such a way to the rest of the circuit that the H.T. battery becomes unnecessary.

The success of the one-valve and two-valve Unidyne circuits has been so great that there has been an insistent demand for a three-valve set on similar lines. To meet this demand the receiver now to be described was constructed.

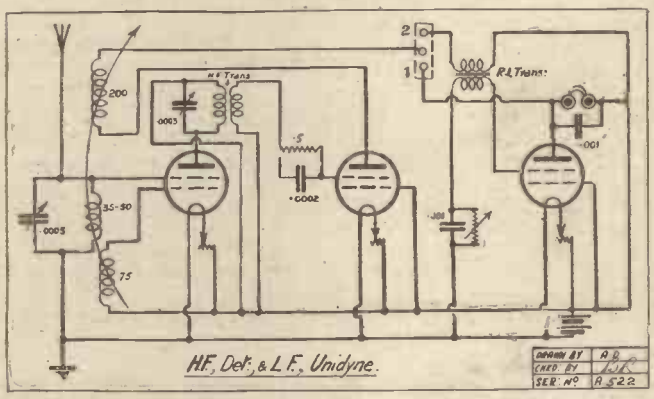
A glance at the theoretical diagram (Fig. 1) shows that the first valve acts as an H.F. amplifier, and is coupled to the secondary valve by means of an H.F. transformer. The second or detector valve has a large reaction coil in its plate circuit which is coupled to the aerial coil. The third valve is a Unidyne L.F. amplifier which can be switched in or out of circuit at will, making the set an H.F. and Detector, or an H.F., Detector and L.F. circuit.

The method of attaining reaction in the first valve's circuit will be seen to consist of a grid coil, which is connected between the inner grid and positive. This form of reaction is in addition to the normal reaction coil connected to the plate of the

(*Continued on page 900.*)

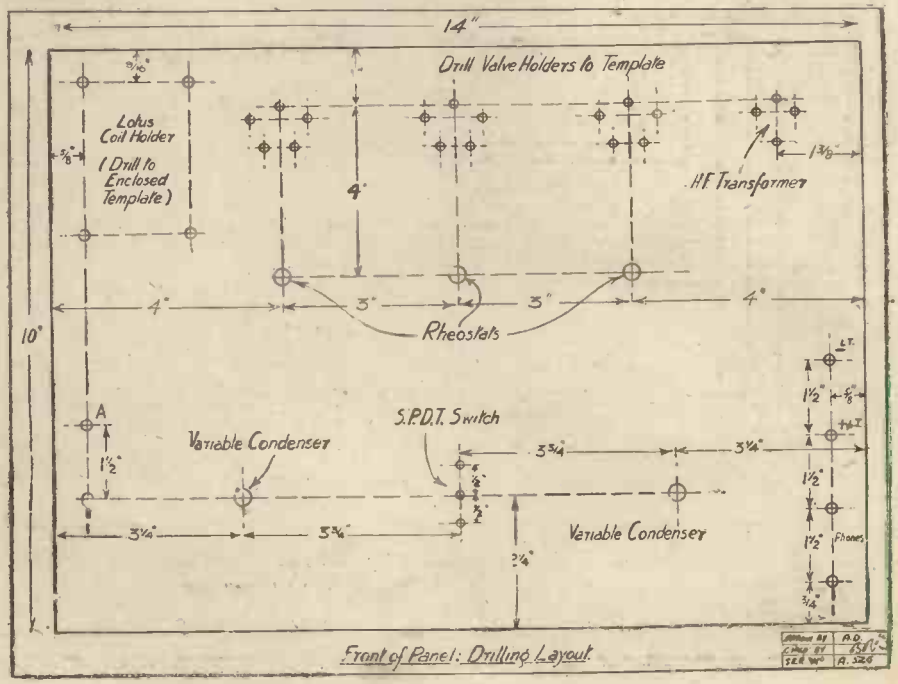


A photograph of the 3-valve Unidyne taken after the filament and aerial and earth connections had been completed.



LIST OF COMPONENTS.

	s.	d.
One panel, 14" × 10" × ¼" (Peto-Scott)	19	8
With cabinet to fit 5" deep.		
One R.I. L.F. transformer	25	0
Three Burndept rheostats (15 ohms)	15	0
One Bretwood variable grid leak	3	0
One Lamplugh ·0005 variable condenser	12	0
One Wates K type ·0003 variable condenser	7	9
One Watmel fixed condenser, ·002	2	6
Do. do. do. ·001	2	6
One Dubilier do. do. ·0002	2	6
One Dubilier grid leak, ·5 megohm	2	6
One Lotus 3-way coil holder	10	6
Nineteen brass valve sockets	1	7
Six terminals	0	9
One Nesthill S.P.D.T. switch	1	6
Wire screws, transfers, etc.	1	6
Two 4" condenser dials (Radion)	5	0



A THREE-VALVE UNIDYNE SET

(Continued from page 899.)

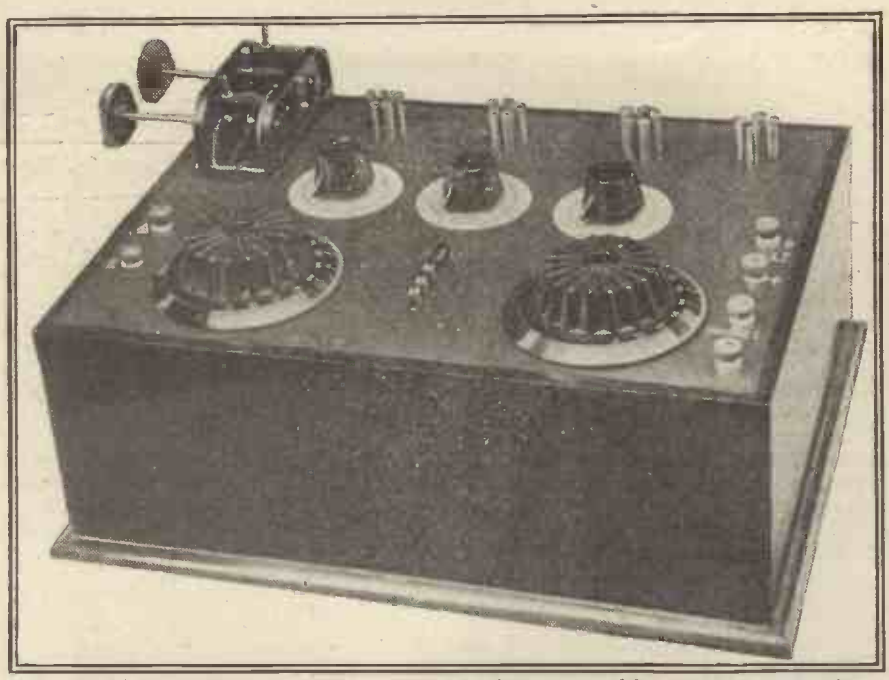
detector valve, and is a refinement in reaction control which gives singularly good results when tuning long-distance stations.

The operation of the set is quite straightforward, and, for ordinary broadcast listening, the position of the grid coil can be roughly adjusted and left alone whilst tuning is carried out in the ordinary way. When searching for long-distance stations or resolving a weak carrier wave, the effect of the grid coil becomes very apparent, and it will be found to afford a critical and valuable aid to fine tuning.

Concerning the Components.

The construction of the set is commenced by a careful overhaul of the components, as in a set of this type where there is no H.T. battery it is essential that all the parts should work smoothly together. In the list of components on page 899 is shown the actual apparatus used on the original set, and constructors are advised to conform with this if possible. This is especially true of the L.F. transformer, the grid leaks, and the value of the fixed condensers.

The drilling of the panel is carried out in accordance with the drilling diagram on page 899. It will be noted that in the five-pin valve of the type used, the valve sockets for the filament connections are placed very close together, and great care must be taken to drill these accurately. With each of the valves a template is supplied by which accurate drilling can be carried out, and great care should be taken over this part of the construction.



The complete receiver has its appearance greatly enhanced by the use of large condenser dials which also greatly assist in the easy control of the tuning. All controls are placed where they are most accessible to the operator.

Four valve legs, placed to correspond with those of an ordinary valve, are used to hold the H.F. transformer, but an ordinary three-electrode valve holder (of the four-pin type) can be used instead, if desired. When the panel has been drilled the best method of mounting is to screw in and tin the ends of the terminals. Then mount the valve legs, taking great care that the panel is perfectly clean between the filament legs and that no shorting takes place at this point. The S.P.D.T. switch and terminals are then mounted, then the rheostats, and then the remainder of the components in the most convenient order.

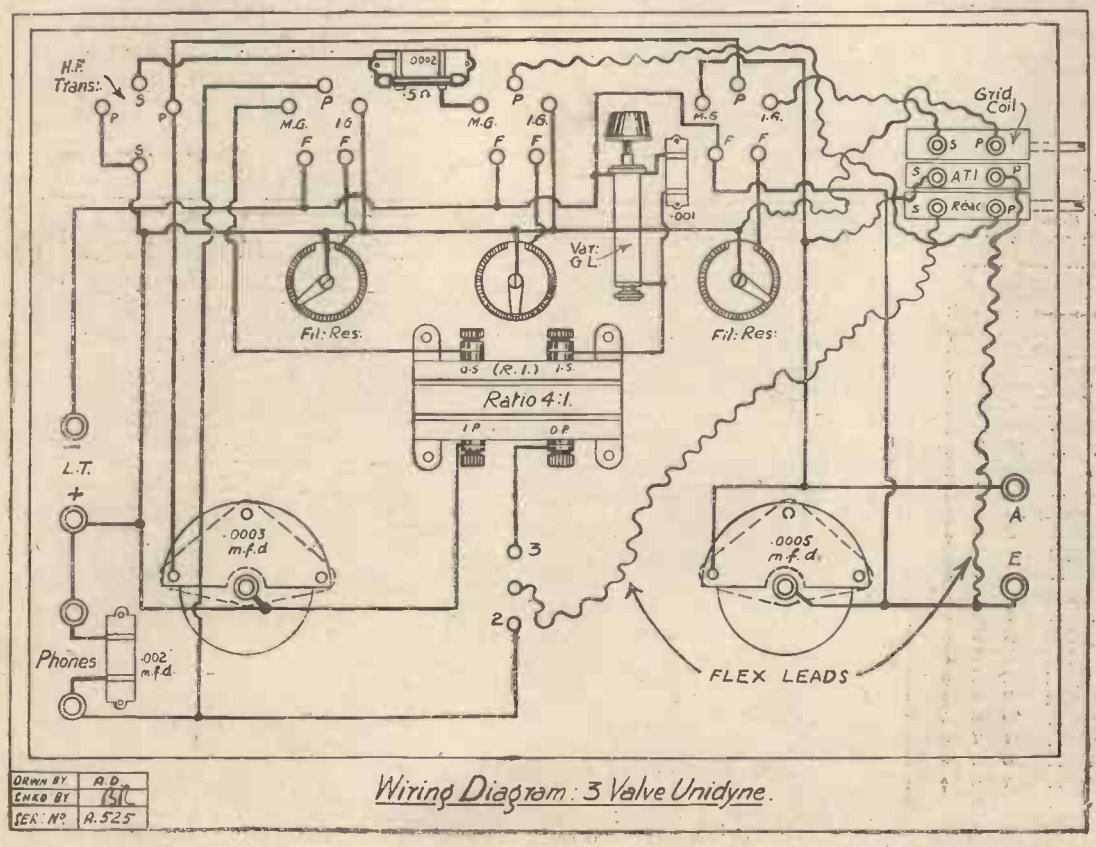
There is no need to secure the fixed grid-leak and condenser to the panel, as the soldered wires to this component are quite sufficient to hold it securely in place. Similarly, the fixed condensers across the telephones and the resistance in the L.F. grid circuit are secured in place by their connections.

Smooth Control.

One feature of the original set which is worthy of remark was the smooth control afforded by the use of extra large dials on the tuning condensers. This would appear to be a small point, but in practice it afforded just that little extra fineness of variation which makes all the difference to long-distance listening.

The R.I. transformer was fixed in position on the panel by means of 4-B.A. screws tapped into it. If desired, the holes can be drilled right through the panel and the bolts secured by screws

(Continued on page 901.)



DRWN BY	A.D.
CHKD BY	
DER. Nº	A.525

Wiring Diagram: 3 Valve Unidyne.

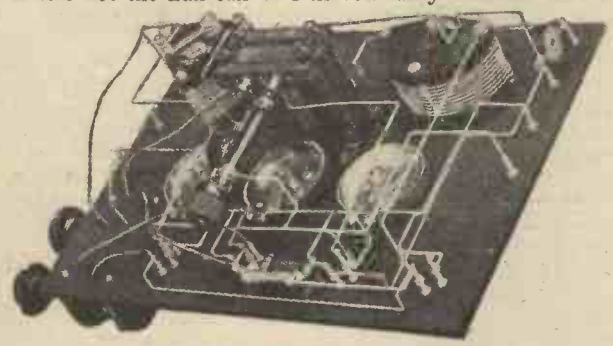
A THREE-VALVE UNIDYNE SET

(*Continued from page* 900.)

on the face of the panel. The only disadvantage of this is that it certainly impairs the appearance of the completed set.

Wiring-up the Set.

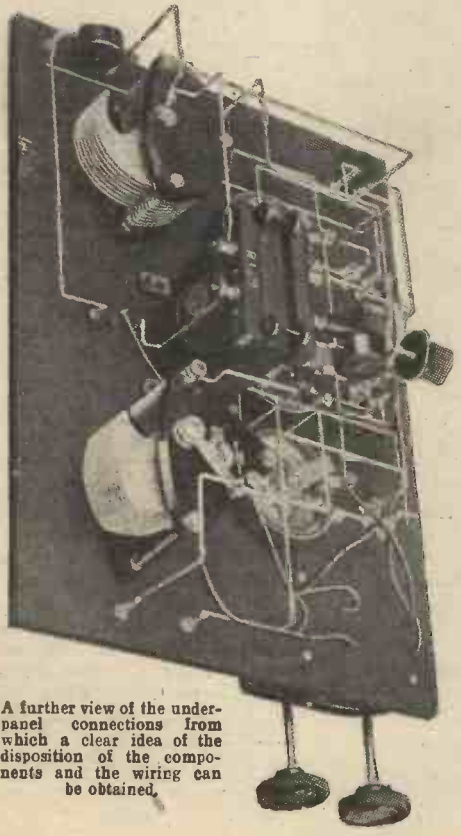
As the set is perfectly straightforward the wiring should present no difficulties if the wiring diagram on page 900 is carefully followed whilst the work is being carried out. When the wiring is completed it should be checked over by the list of connections which is given on this page. The panel should be given a final overhaul and dust, and it need hardly be said that no traces of flux should appear upon it. This can be quite easily prevented in the first instance if the constructor makes a point of wiping over each joint with a clean rag as soon as it is soldered. Whilst the metal is still hot the flux can be removed easily and effectively, but if this operation is left until the flux has cooled, it will be extremely difficult to remove it.



This photograph shows how well spaced are the connections between the various components—a feature that makes for easy control and efficient operation.

When finished, the set can be connected up to a 6-volt accumulator and tried out. It is interesting to note that, unlike most of the Unidyne sets, this particular instrument did not appear to be unduly critical as to the coils employed. Almost invariably in Unidyne sets the best results are obtained with home-made basket coils of the single-layer type, or Lissenagon coils. In this set it was found that other coils could be used, and excellent results were obtained using the Tangent coils shown in the photograph.

The handling of the set is very similar in principle to an H.T. set of the same type, but it will be found to be exceptionally responsive to the various controls.

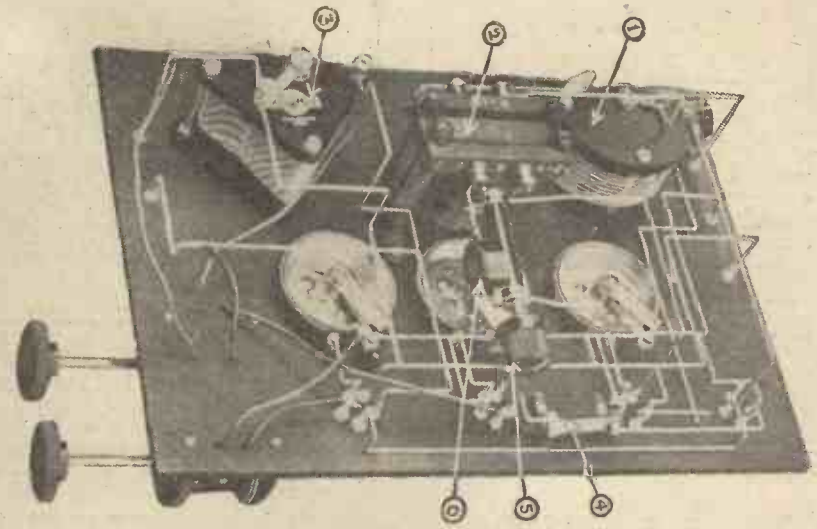


A further view of the underpanel connections from which a clear idea of the disposition of the components and the wiring can be obtained.

The H.F. Transformer.

In addition to the Bowyer-Lowe transformer which is recommended, other makes were tried, and good results were obtained with a Discol and a McMichael. It should be noted, however, that in the case of the former (Discol) the primary connections do not correspond with the "filament" connections of the valve holder, but are placed instead across the plate and grid pins. If, therefore, the Discol transformer is to be used, the connections which at present go to "grid" and "plate" sockets should be taken to the right and left "filament" sockets respectively, and the remaining connections should be made to the "grid" and "plate" sockets instead of to the "filaments."

A brief consideration of the results obtainable with this set will leave the constructor impressed especially by its long-distance abilities and by the perfect clarity of its tonal reproduction. The volume obtainable from the L.F. side is perhaps hardly equal to that produced by an H.T. set using a specially designed L.F. valve with "plenty on the plate," but there is no doubt of the superiority of Unidyne quality. This, with its absence of scraping and hissing due to the H.T. battery, will be a revelation of what broadcasting is capable of when reproduced unaccompanied by a noisy background.



A view of the wiring of the finished receiver. The numbers denote the following components: (1) ·0003 v. condenser, (2) R.I. transformer, (3) ·0005 v. condenser, (4) grid leak and condenser, (5) variable grid leak for L.F. valve, (6) ·001 fixed condenser.

POINT-TO-POINT CONNECTIONS.

(Looking at back of panel—valves at top.)

Aerial terminal to fixed plates of ·0005 variable condenser, socket of fixed coil holder, and main grid of first valve.

Earth terminal to moving plates of ·0005 variable condenser, to Negative, and plug of fixed coil holder.

Negative is connected to the left-hand filament socket of each valve holder, the right-hand socket of each is taken to one side of its rheostat, the other side of the three rheostats being connected together and to Positive. Plate of first valve to O.P. of H.F. transformer, and to fixed vanes of ·0003 variable condenser. I.P. of H.F. transformer and moving vanes of condenser to Positive. O.S. of H.F. transformer is connected to one side of the grid leak and condenser, other side of grid leak and condenser to main grid of second valve.

I.S. (H.F.) is connected to positive lead, plate of second valve to plug of reaction coil holder, socket of reaction coil holder to centre contact of switch.

Top contact of switch to O.P. of L.F. transformer, I.P. of which goes to positive lead, O.S. of L.F. transformer to main grid of third valve, I.S. to one side of the variable grid leak, the other side of which goes to Negative. A ·001 fixed condenser is connected across the variable leak.

Plate of third valve to one side of 'phones, also to bottom contact of switch.

The other 'phone terminal is connected to Positive. A .002 fixed is connected across the 'phone terminals.

The inner grid of the first valve is connected to the socket of the top moving coil holder, the plug of same being connected to positive lead, as are the inner grids of the second and third valves.

(Flex leads are used for all connections to the coil holder.)

SOME USEFUL EXPERIMENTAL PANELS.

By OSWALD J. RANKIN.

Being a short supplement to the series of articles entitled "An Experimental System," in which is described some additional panel-units of great utility.

READERS who have adopted the panel-and-frame experimental system recently described by the writer, and who may desire to introduce a few further refinements in order to facilitate operations

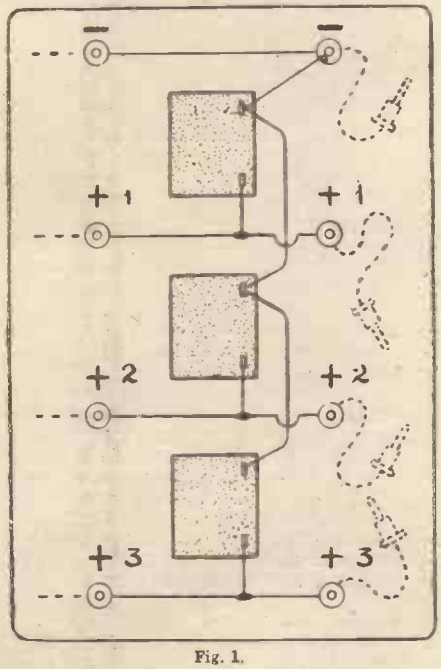


Fig. 1.

covering a still wider range, will find in the following examples some simple and really useful additions which by no means constitute added complications.

Figs. 1 to 3 show a simple shunting panel for the H.T. battery, a very desirable unit which every valve experimenter requires at some time or other. The circuit arrangement is shown in Fig. 1, the top and under-panel views of the made-up unit being shown in the photographs Figs. 2 and 3. The unit comprises a 6 in. by 3 in. ebonite panel, the thickness of which will of course be identical with that of all other panels, three Mansbridge fixed condensers of 2 mfd. capacity, and eight terminals. Fig. 1 may be taken as a guide for wiring-up the panel, all connections being

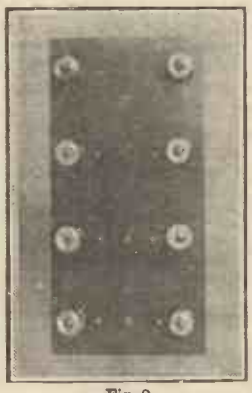


Fig. 2.

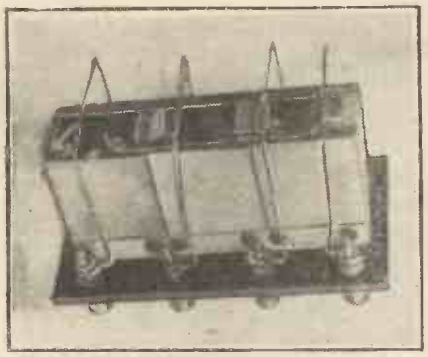


Fig. 3.

made exactly as shown, and the terminals marked correspondingly.

The idea is to provide a separate shunting condenser for each battery tapping, a practice which is now becoming very common, and rightly so, since a single condenser can only effectively shunt one section of the battery. The diagram (Fig. 1) is self-explanatory.

In use, the unit is extremely convenient; the H.T. positive leads from the H.F., detector, and L.F. circuits are simply connected to the left-hand row of terminals, the flexible wander-plug leads being fitted with spade terminals and connected to the right-hand row of terminals, so that, in effect, the panel is simply connected in series with the various circuit leads to the H.T. battery, the wander-plugs (shown dotted), which

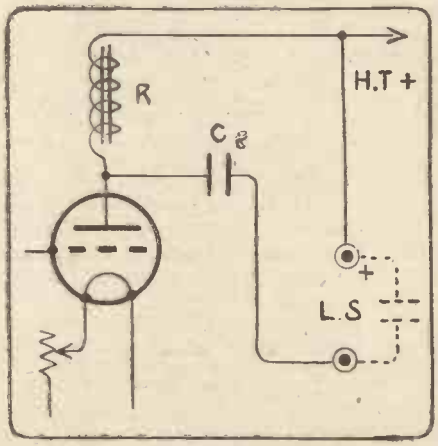


Fig. 4.

would otherwise be connected direct to their respective circuit leads, being now connected to the extension terminals on the right of the panel, and the necessary shunting capacity between each positive tapping and the common negative (or otherwise each section of the battery) being provided by means of the condensers connected as shown. The condensers are firmly attached to one longitudinal edge of a strip of hardwood which is afterwards screwed to the panel.

Fig. 4 shows a simple filter circuit for use in conjunction with high-resistance headphones or loud speaker, when using a fairly high plate voltage on the last L.F. amplifying valve. The idea here is, of course, to protect the delicate windings of the H.R. 'phones or loud speaker. The steady plate current is quite unnecessary for the working of same, and it is well to block this by means of a 2 mfd. Mansbridge fixed condenser, C, and to provide a resistance path (a standard L.F. choke coil, R) for passing this current direct to the plate of the valve.

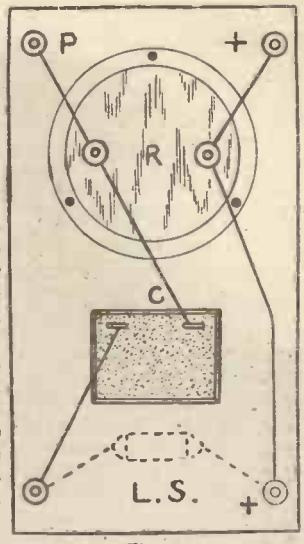


Fig. 5.

The fluctuating currents pass through the condenser and operate the magnets of the H.R. headphones or loud speaker, providing the H.T. voltage to the last L.F. valve is suitably increased.

Fig. 5 shows the method of mounting and wiring the choke coil and the condenser to the under side of the 6 in. by 3 in. panel. A pair of clips to take the Wates "K" type fixed condensers should be fitted to the two loud-speaker terminals, the clips being arranged as described in a previous article dealing with the L.F. transformer units. It is most important that the positive terminal of the loud speaker (or headphones) should be connected to the terminal which is common to the H.T. positive.

Figs. 6 shows the circuit arrangement of a telephone distributing panel, this being a modification of an excellent little device described by Mr. W. S. Sholl in a recent

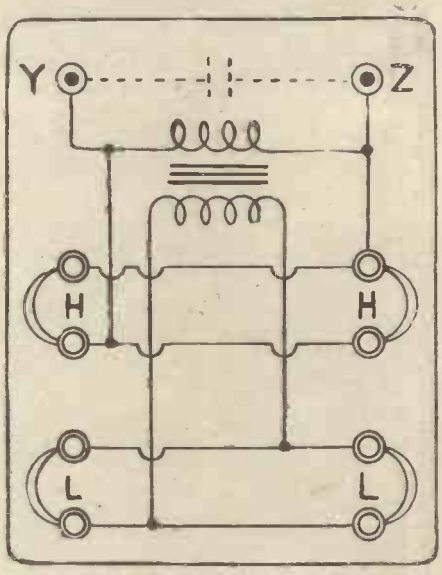
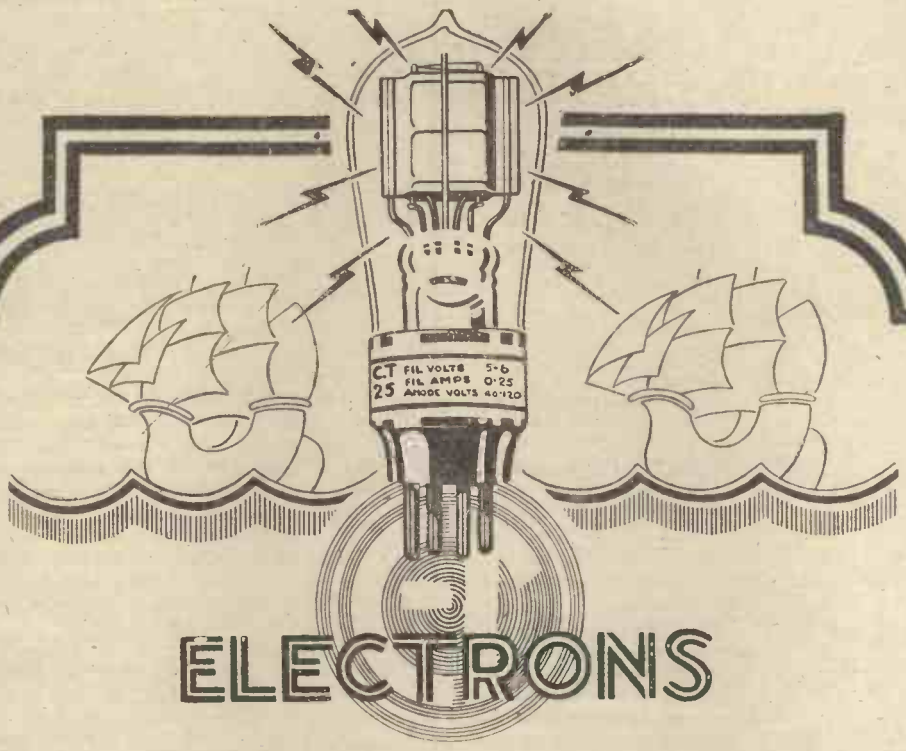


Fig. 6.

issue of "P.W." The unit comprises a 6 in. by 3 in. panel, a telephone or "step-down" transformer, and ten terminals. It will be seen that both H.R. and L.R. 'phones may be used, and since both diagrams are self-explanatory, it is only necessary to add that the terminals marked Y and Z (input) should be connected to the plate of the last L.F. valve and the H.T. positive in the usual way, and preferably fitted with clips to take the "K" type fixed condensers.



ELECTRONS

THE LIFE OF THE VALVE

Electronic emission from the heated filament of this valve is responsible for its life and utility. But to give you perfect control over distance, the electron flow must be thoroughly efficient.

Not only is the CLEARTRON-built anode efficient, but it brings a 40 to 60% increase in electronic emission. A unique theory—protected by patents pending—develops a specially constructed path which yields greater and more even electron output. That is why CLEARTRON valves bring greater distance and increased volume.

C.T.08 and C.T.15

12/6

Also makers of American type C.T. 199 at 12/6. Full technical data on request.
ALL CLEARTRON VALVES ARE DULL EMITTERS.

the Ironclad Guarantee

invites the full confidence of the purchaser. He is definitely assured of more than ordinary satisfaction or instant replacement. There is rarely need for replacement, but the assurance that your interests are secure is there. CLEARTRON guarantees greater distance, volume and purity, and keener selectivity. Send for technical data.

Write for particulars and specification of the CLEARTRON Console Master Speaker.

CLEARTRON RADIO LIMITED
1 CHARING CROSS, LONDON
AND BIRMINGHAM

'Phone: Regent 2231/2. 'Grams: Cleartron, Westrand, London.

C.T.25 and C.T.25B

15/-

Also makers of American type C.T. 201A at 15/-. Full technical data on request.
ALL CLEARTRON VALVES ARE DULL EMITTERS.

CLEARTRON

BRITISH MADE

America's foremost valve made in Britain's newest factory with British bases for British sockets.

TELEPHONE: OLD SWAN 751.

TELEGRAPHIC ADDRESS: VERNCOIL, LIVERPOOL

Garnett, Whiteley & Co., Ltd.

MANUFACTURERS of WIRELESS COMPONENTS.

"LOTUS" CUT GEARED VERNIER COIL HOLDER.

Two-way Outside Mounting 7/-
Three-way Outside Mounting 10/6
Two-way Inside Mounting 8/-
Three-way Inside Mounting 12/6

"LOTUS" ANTI-MICROPHONIC VALVE HOLDER.

PRESS TOOLS.

PRESS STAMPINGS IN ALL MATERIALS.

PRESS TOOLS.

DRILLING and MILLING JIGS and FIXTURES.

ASSEMBLING FIXTURES

MACHINE CUT GEARS, Etc.

"LOTUS WORKS"
Broadgreen Road,
LIVERPOOL.

To the Wireless Amateur,
Great Britain.

Dear Sir, December 5th, 1925.

You will no doubt be interested to know that the Lotus Vernier Coil Holder has been declared the most popular Coil Holder on sale to-day.

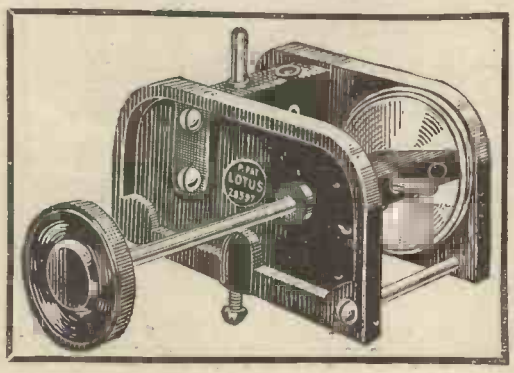
The recent Wireless Exhibition organised by the Manchester Evening Chronicle was probably the most successful wireless exhibition ever held in Great Britain.

One of the outstanding features of the exhibition was a Ballot for the most popular Wireless component, each visitor to the exhibition being handed a Ballot paper for this purpose and for which prizes to the extent of £100 were offered by Messrs. Franks, Ltd., of Manchester, for the most accurate forecast.

Our Lotus Vernier Coil Holder headed the poll.

We take this opportunity of thanking those visitors to the exhibition who helped to place our Coil Holders in that proud position.

This verdict recorded in Manchester is also borne out by the Amateur users throughout the country, by the fact that the Lotus Coil Holders have to-day the largest sale of any type of Vernier Coil Holder.



Follow up the Manchester verdict by fitting a Lotus Vernier Coil Holder to your set, and you will quickly realise that you have the component that makes an ideal Xmas gift for your less fortunate wireless friend.

Yours Faithfully,

Garnett, Whiteley & Co., Ltd.

Geo Whiteley

A FAMILY CRYSTAL SET

Built, Photographed and Described by E. M. KNIGHT

BROADCASTING has been the means of bringing inestimable joy and pleasure to the aged, the infirm, and invalids by placing within their hearing concerts, popular talks, theatre and other transmissions. To them the difficulties associated with the adjustment and tuning of the receiver are often very trying, and in the receiver here illustrated (Fig. 1) and described an effort has been made to produce a crystal set that will give loud results without any of the difficulties associated with tuning suitable for presentation to an invalid or the "old folks."

Once it has been adjusted there are no control knobs to worry about, and it remains permanently tuned ready for broadcast reception. A detector of the permanent type is employed and, when required for use, all that is necessary is to plug into sockets the aerial, earth, and telephone leads, a simple operation in which no one can go wrong.

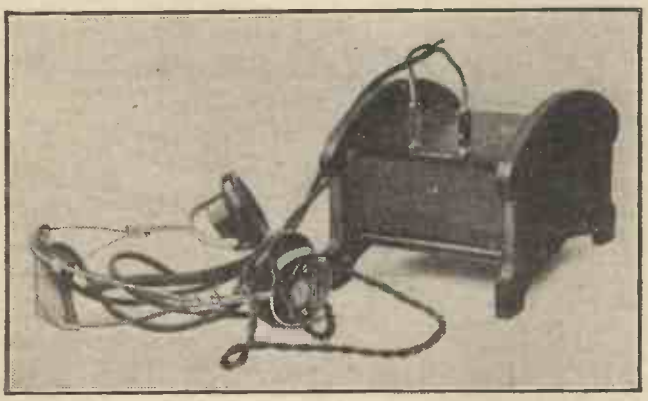


Fig. 1. The compactness and neat artistic appearance of this receiver makes it an ideal Xmas present.

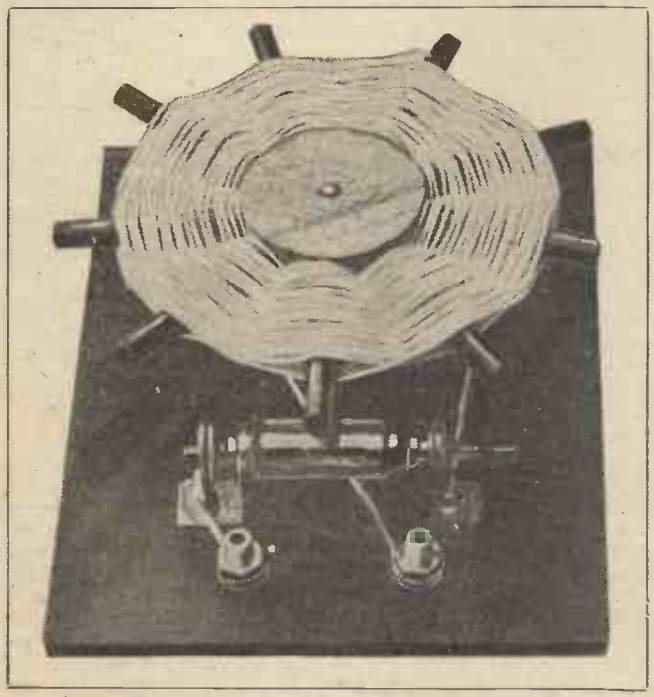
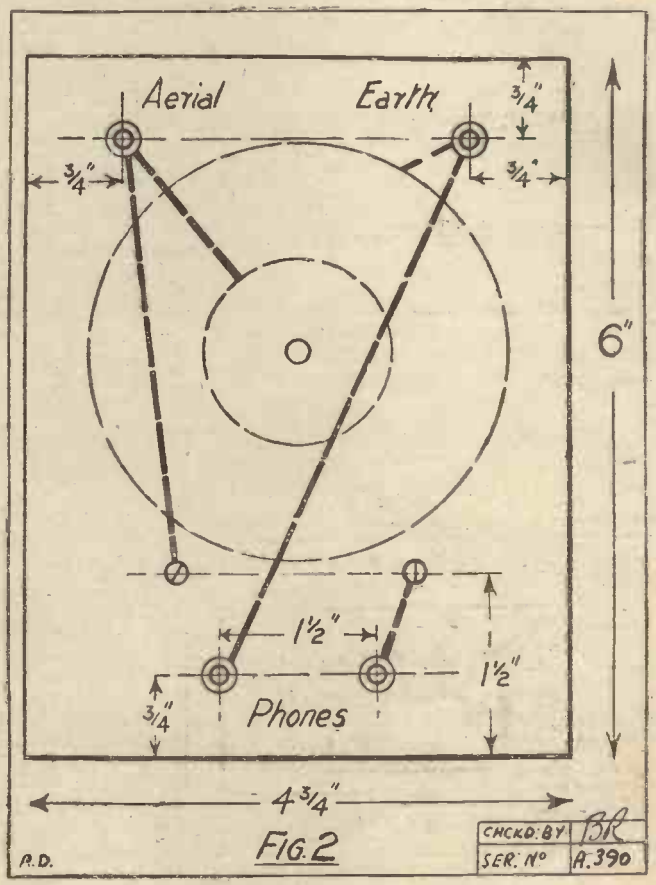


Fig. 3. There are no under-panel complications as this photograph clearly shows.

First Steps.

The wave-length to which a wireless receiver will tune is dependent on two factors, the amounts of capacity and inductance in the aerial-earth circuit. If one is increased, the other must be decreased for a given wave-length, and vice versa. When capacity is at a minimum, inductance is increased to a maximum, with a resultant increase of signal strength; and if the inductance coil itself is made with thick wire, high-frequency resistance

(Continued on page 908.)

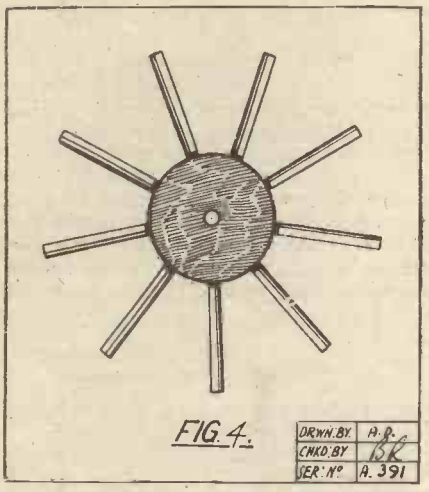


A FAMILY CRYSTAL SET.

(*Continued from page 907.*)

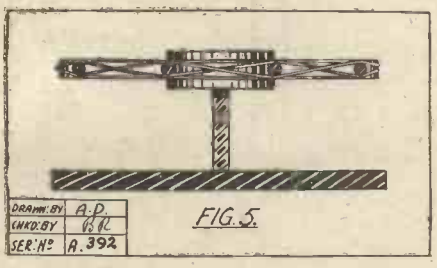
is reduced to a minimum and still louder results are obtained.

This is applied to the present receiver. A basket coil with a minimum self-capacity is wound with a fairly thick wire by experiment to the exact wave-length of the B.B.C.



station to be received, and no further tuning is then necessary while it remains in the same aerial-earth receiving system.

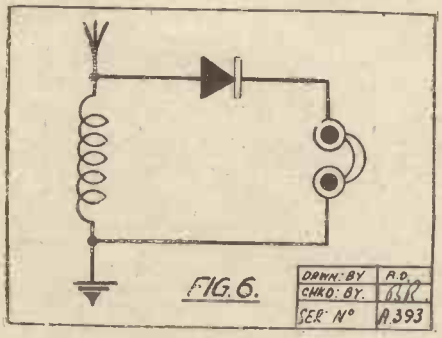
As a preliminary to construction, the aerial should be erected and the earthing system arranged so that the receiver may be tested during construction under the



conditions in which it is to be permanently used.

The Detector.

Making the receiver itself is quite simple. Everything is mounted on the back of a $\frac{3}{16}$-inch ebonite panel 6 in. by $4\frac{3}{4}$ in. Fig. 2



shows dimensions, and Fig. 3 is a photograph showing the panel back. Instead of terminals, plugs and sockets are used for simplicity in making connections. The position of the holes for mounting the detector will be decided by the type used. This may be one of the permanent types now fashionable, such as the R.I., which is very efficient.

As an example of the permanence of this detector, a receiver accidently fell from a shelf to the floor, about four feet, with telephones attached. It was still in perfect working order when picked up.

Winding the Coil.

The basket coil is wound with No. 22 D.C.C. wire on a former consisting of a hardwood centre $1\frac{1}{2}$ in. in diameter and $\frac{1}{2}$ in. thick, into which nine 2-in. lengths of $\frac{1}{4}$-in. ebonite rod are fixed at equal distances round the edge (Fig. 4). Six inches of the wire is left at the start for connections, and it is then wound in and out between the spokes in the usual way until the required number of turns are put on.

The end of the wire is secured by passing through a small hole drilled through one of the ebonite spokes. No shellac is required on the coil. The correct number of turns is found by experiment, the constructor judging by local conditions of aerial, wavelength, and previous constructional experience, etc., the approximate number of turns required. The writer used 38 turns for 2 L O. Extra turns are taken off one at a time till the best result is obtained.

When correct the coil is permanently mounted in position by means of a short length of 2 B.A. rod, screwed into holes in the hardwood centre and ebonite panel (Fig. 5).

Very Simple Wiring.

Wiring connections are quite simple, and are better if done with stout wire and well-soldered. One end of the coil winding goes to the aerial socket, and the other end to the earth. The aerial socket is also joined to one side of the detector, the other side of the detector to one 'phone socket, the second 'phone socket to earth.

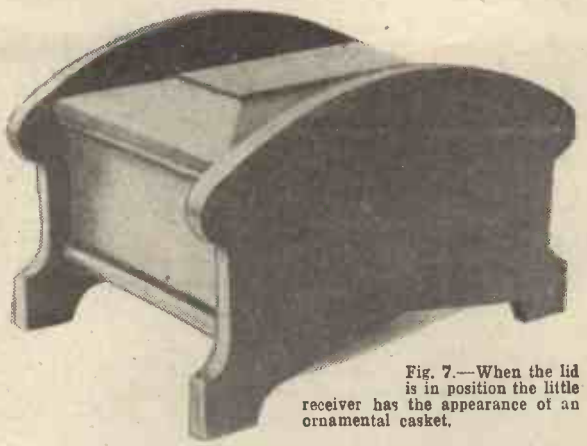


Fig. 7.—When the lid is in position the little receiver has the appearance of an ornamental casket.

These are shown with dotted lines in Fig. 2, and in the theoretical circuit, Fig. 6.

Describing the Case.

The completely enclosed receiver (Fig. 7) is quite attractive. With the lid in position it forms an ornamental little casket,

occupying but little space. The case can be made in oak, walnut, or mahogany, and nicely polished. An idea of its construction is given by Figs. 8 and 9. The ends are grooved into the sides; the bottom fits between them. The ebonite panel is fixed to the ends with small screws. Two small shaped strips of wood, fixed at the ends of the lid, prevent it from slipping off.

The receiver photographed was constructed for an aerial 35 ft. long in S.W. London, $4\frac{1}{2}$ miles from 2 L O. Results are very loud in the telephones. Bands from 2 L O can be heard quite clearly in an average-sized, quiet room when a General Radio loud speaker is joined direct to the receiver.

HARD CIRCUITS MADE EASY

In this useful article Mr. C. E. Field, B.Sc., Staff Consultant to "P.W.," describes and clearly explains the intricacies of the famous Neutrodyne Circuit.

THE neutrodyne circuit, introduced recently in America by Professor Hazeltine, is rapidly gaining popularity, because it possesses the many advantages of conventional H.F. amplifying circuits, without their drawbacks and limitations.

Let us see, then, what are the troubles encountered in connection with H.F. amplification, and how they are overcome by the neutrodyne principle. In Fig. 1 is shown a two-valve H.F. amplifier and detector, employing tuned anode coupling.

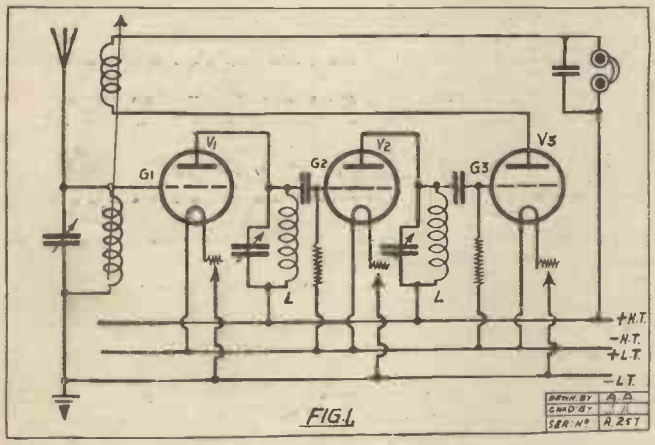


FIG. 1.

Readers who have experimented with such a circuit will know that it is very unstable and difficult to operate, and that if reaction is employed to increase the range and selectivity it becomes almost impossible to keep the circuit from howling.

When reaction is introduced, the cause of the oscillation is easy to see if we understand the nature of the signals being received. Telephony signals are rather complex, but they may be regarded as consisting of groups of waves, or electrical impulses, the frequency with which the groups follow one another being dependent upon the note being transmitted.

What Reaction Does.

The strength of the signals depends very largely upon the number of waves in each group, and if we want to obtain strong signals from a valve, much will depend upon the extent to which we can prevent the individual groups of waves from dying away. A wave-train dwindles very rapidly if it has to encounter high resistance, and for that reason we make our aerials, tuning coils, etc., of thick wire when practicable. This is not sufficient in all cases, however, and so we use reaction, which actually *lengthens* the groups of waves.

Referring to Fig. 1, this is what takes place. Signals in the aerial produce voltage impulses on the grid, G_1 of the first valve. Amplified variations of current are passed out from the plate, causing voltage impulses to be applied to G_2. Similarly, by the action of V_2, still greater impulses are handed on to G_3, resulting in an output varying from V_3 very much in excess of the original current in the aerial. The reaction coil now comes into operation, for currents flowing out from V_3, through this coil, produce similar currents in the aerial coil to which it is coupled.

"Howling."

If the reaction coil is correctly connected, the additional currents produced in the aerial will add to those already there, the result being that each group of waves is given an additional supply of energy, which enables it to exist for a longer time before dying away. This additional energy is passed through the valves, and causes still more current to flow in the reaction coil, which in turn still further lengthens the life of each wave-train in the aerial.

At length a point is reached at which one train is still in existence when the next one commences, so that an unbroken stream of waves is produced, giving rise, generally, to a howl in the telephones.

A reaction coil is not necessary, however, to make a set oscillate, and the circuit shown in Fig. 1 could easily be made to howl without any reaction coupling, whilst if three or four valves were similarly coupled, oscillation would be practically unavoidable. This is brought about as follows.

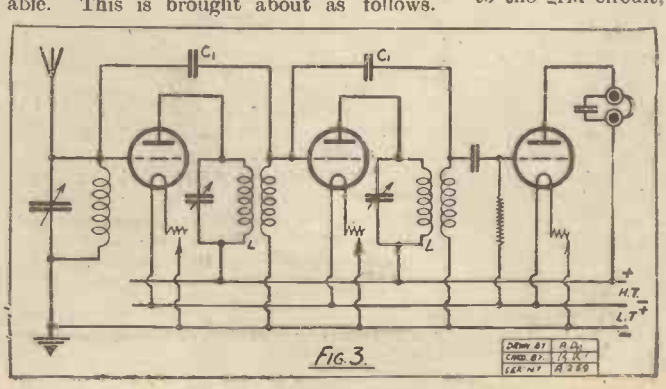


FIG. 3.

Inside each valve is a plate and a grid—i.e., two pieces of metal insulated from one another. This, we know, constitutes a condenser, so that in each valve there is a means by which H.F. currents can pass between the plate and grid, independently of the electrons from the filament. It is rather difficult to obtain a mental picture of electricity flowing from the filament, through the grid, to the plate of a valve, and at the same time passing by condenser

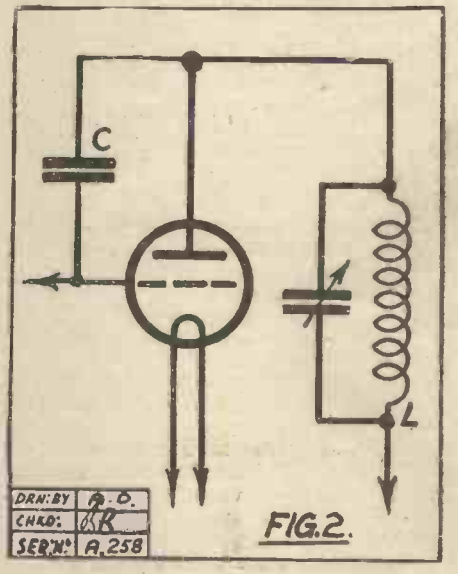


FIG. 2.

action from the plate to the grid. The action would be just the same, however, if the capacity were outside the valve, instead of being inside, so that we could represent a single valve, as in Fig. 2, the condenser connected between the grid and plate leads representing the valve capacity.

A Counteracting Effect.

We have now just the same action taking place as when we used a reaction coil, for we are transferring energy from the plate to the grid circuit, and so lengthening the life of the trains of impulses falling on to the grid. When two or three valves are employed, the self-capacity of each adds a little more to the length of the wave-trains, until eventually the conditions previously outlined are obtained, and continuous oscillations are set up.

How can this be prevented?

(*Continued on page* 910).

HARD CIRCUITS MADE EASY.

(Continued from page 909.)

Since the oscillations are set up by the transference of energy from plate to grid, the most direct way of counteracting the effect would evidently be to transfer just as much energy at the same time, from grid to plate.

A "Balancing Capacity."

We require some means, therefore, by which the fluctuating current flowing through the coil L in the plate circuit, can produce exactly the opposite effect to that which it normally produces, as far as its influence upon the valve grid is concerned. This can very easily be brought about, for if L is made the primary winding of an intervalve transformer, it will induce in the secondary winding currents which at any instant flow in the opposite direction. Hence if we connect the top of the *secondary* winding to the grid of the valve through a condenser C_1, of about the same capacity as that between the valve electrodes (C in Fig. 2), the two capacities will tend to transfer equal amounts of energy in opposite directions at the same moment. This is shown carried out in Fig. 3, which represents a three-valve neutrodyne receiver, the capacities of both H.F. valves being balanced.

The neutrodyne principle has been applied by a well-known radio scientest to single-circuit, or tuned-anode, coupling, as shown in Fig. 4.

Here it will be seen that a coil L is introduced for the sole purpose of carrying the reversed currents which pass through the neutralising condenser. As it is necessary to have this and the anode coil fairly closely coupled, the two may comprise the windings of an H.F. transformer. All that is necessary, therefore, to convert the Fig. 3 circuit into that in Fig. 4, is to transfer the leads to the second and third valve grids from the secondary to the primary transformer winding, and insert the usual grid leak and condenser which are necessary for tuned-anode coupling.

Reaction Seldom Necessary.

It is, of course, possible to employ reaction in the usual way with a neutrodyne receiver, but when several H.F. valves are employed its use will seldom be found to be necessary. The capacity of the neutralising condensers is naturally very small, and must be variable so that it may be adjusted to balance exactly the capacity of the valve to which it is connected.

By tuning in a station with the filament of, say, the first valve turned out, the neutralising condenser for that valve can be adjusted till signals disappear. This will indicate that the capacity of the valve has been balanced, and the process can then be repeated with each of the other valves in turn.

Many firms now manufacture special condensers for neutrodyne sets, but a variable condenser on variable lines, consisting of one moving and one fixed plate will be found quite satisfactory. A very neat little condenser can be made in this way by using semi-circular plates about one inch in diameter, separated by an air space of $\frac{1}{8}$ in.

The actual capacity required will be something approximating ·000001 mfd., but it will vary with individual valves. When a valve is changed the balancing process generally requires to be repeated. It is, however, by no means a difficult operation.

A neutrodyne receiver is extremely selective, and for purity of reproduction is to be preferred to the super-heterodyne, although, of course, the natures of the two systems are by no means similar. In fact, it is not impossible to neutrodyne a super-heterodyne receiver!

Finally, it should be remarked that the neutrodyne is neither a "super" nor a "stunt" circuit, but bids fair to become the conventional H.F. amplifying system of the future.

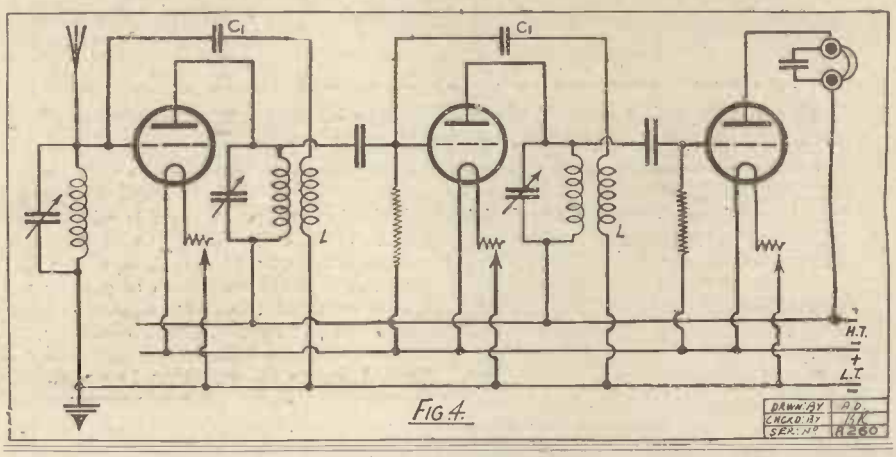


FIG 4.

WHAT ACCUMULATOR SHALL I USE?

FROM A CORRESPONDENT.

THIS is a question that a good many prospective set-owners are considering, and much depends upon getting a correct answer. To purchase an accumulator without knowing how long it will last upon your set before requiring recharging is obviously unwise; but if the following simple rules are borne in mind, there is no need to rely upon other people's opinion, for you can work out accurately what type of accumulator is required, and how long it will last.

The current which a valve takes out of an accumulator is reckoned in amperes. Some of the bright-emitter valves take half an ampere or more to light them. Other valves of the semi-dull emitter type take about a quarter of an ampere, whilst the most economical type of all are the "·06's," which, as their title implies, take only six-one-hundredths of an ampere—i.e. three-fiftieths.

A Simple Calculation.

When several valves are used at once, their respective current consumptions must be added together, to find out how much current the set will need. For instance, three of the ·06 type will take a total of ·18 ampere, whilst two valves, each taking ·25 ampere, followed by a power-valve taking, say, ·5 ampere, would take a total of one ampere (more than five times as much).

As every valve-maker indicates the valve's current-consumption upon the valve-box, it is a very easy matter to determine the current required by any given number or type of valves. Then simply multiply this figure by the number of hours which the accumulator must run without recharging, and you have arrived at the class of accumulator which is required. To make this perfectly clear, let us take the case of a four-valve set, which is to be worked from, say, Cossor Wuncells. We will assume the owner lives in the country, and can only charge his accumulator once a fortnight, and that he will use the set for an average period of four hours per day.

Determining Required Capacities.

Consulting the valve-maker's specification, we find that each valve is rated at ·25 ampere, so that four valves will consume a total current of one ampere. We have to multiply this by the number of hours which the accumulator must run without recharging, in this instance $14 \times 4 = 56$. The required accumulator, then, must deliver one ampere for 56 hours—i.e. it must have a capacity of at least 56 ampere-hours. The nearest obtainable figure would be 60 actual-ampere-hours, which would just give a little necessary margin.

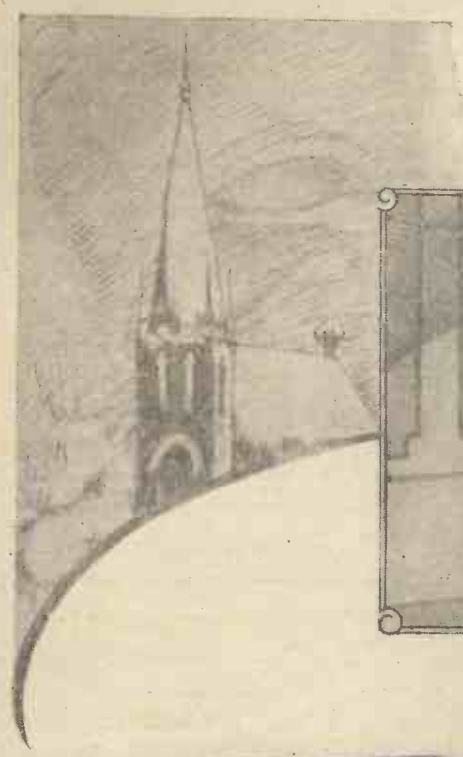
If the set had been only a two-valve set, the figures would have been halved, the figures in this instance being $·25 \times 2 (= ·5)$, multiplied by 56, = 28 actual ampere-hours.

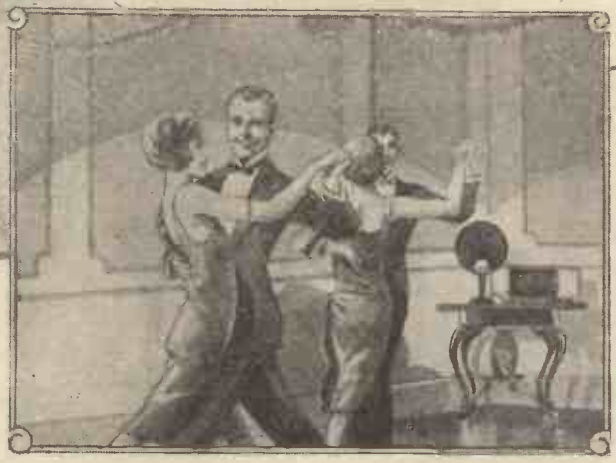
Our final example, worked in the reverse direction, will make the principle perfectly clear. How long would a 20-actual-ampere-hour accumulator last without recharging, if used upon a set employing two bright-emitter valves, each rated at ·7 ampere?

The total current required by the set would be 1·4 amperes, and this number must be divided into the 20-actual-ampere-hours of the accumulator, as follows:

$$\frac{20}{1{\cdot}4} = 14{\cdot}28$$

This shows that the accumulator would only last about fourteen hours without re-charging so an accumulator with a greater capacity would be necessary, or, better still, dull-emitter valves should be employed instead.





Hook up an Ericsson Super-Tone Loud Speaker to anyone of these Sets and you'll hear radio at its very best. Beautifully mellow and pure. Dull black enamel finish on wood base. 18" high, 2,400 ohms resistance - **63/-**

To meet the demand for a loud-speaker of equal purity to the Senior, we produced the Junior Super-Tone of wonderful volume for a loud speaker 15½" high.
32/6
complete with lead.

for a perfect Radio Xmas choose perfect radio apparatus.

"The last word in high-class construction" is the description aptly applied to the Ericsson 4-Valve Receiver. A really beautifully made set. Gets *all* the B.B.C. stations and many of the Continentals at full loud-speaker strength of wonderful purity. In beautiful mahogany case. Switching keys for 2, 3, or 4 valves and "phones" to "loud speaker." Incorporated wave-trap cutsout "locals." Price (Royalties included) **£30**

A 5-valve set, giving splendid loud-speaker results of remarkable volume from the locals and 5 XX. Switching keys for 2 and 3 valves and low tension. Very smooth reaction. In highly-polished mahogany case with nickel and steel-bronze fittings. (including Royalties)
£20

The family Loud-speaker Set at £8 15 0 (royalties included) was built to meet popular demand. A splendid full volume 4 valve set for the local and 5 XX. Housed in a neat oak case—all fittings totally enclosed against dust. Valve and coils changed by lifting the lid. Price
£7 10 0
plus 25/- royal

FOR sheer simplicity, purity and reproduction and length of range you simply cannot surpass Ericsson apparatus. It is built by experts, not merely factory assembled. From a grid-leak to a cabinet 4-valve receiver every piece of Ericsson apparatus has quality stamped on it.

These are some of the Ericsson lines which will make admirable Christmas gifts, and will help to make 1925 a really Jolly Radio Yuletide.

Two, three and four-valve receivers, Super-Tone Senior and Junior Loud Speakers, Crystal Sets, Condensers, Transformers, Rheostats, etc., etc.

Write to-day for our fully illustrated and comprehensive Circuits and Components Catalogue. Ericsson Apparatus is sold by good dealers everywhere. Agents in all big towns.

The BRITISH L.M. ERICSSON Mfg. Co., Ltd.
67/73, KINGSWAY, LONDON, W.C.2.

Ericsson
WIRELESS APPARATUS

The completed instrument has a very artistic appearance.

HOW TO MAKE A PAPER DIAPHRAGM LOUD SPEAKER.

By R. J. GRIFFEN.

HAVING received so many letters asking for further particulars of the construction of my paper diaphragm loud speaker, a photo of which, together with a letter, appeared in "P.W.," No. 164, of July 18th, from all over the country as well as over seas, I intend to give in the following article as clear details as possible, together with sizes and sketches of various parts, so that anyone may follow them. This is apparently what a good many people have been looking for for some months past.

The first part to make is the pleated paper diaphragm. This appears to have given most of the trouble; some people have even tried to cut a circle out the required size and then to pleat it. A moment's consideration will show this is impossible. The diameter of the finished diaphragm must first be determined—in this case 15 in.—the radius, viz., 7½ in., is then the width of the paper. The circumference may be found by the usual formula: πd.—i.e. $3{\cdot}14 \times 15 = 47{\cdot}1$ in., which is the length of the paper, allowing a bit to spare and for lap, which can be cut off if necessary after pleating. Allow 48 in.

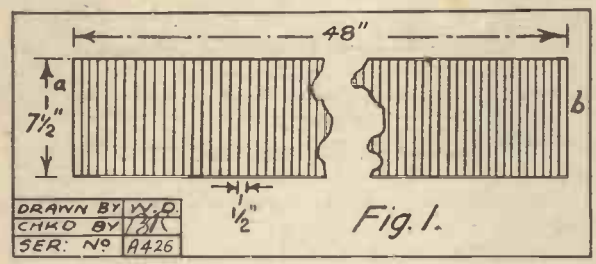


Fig. 1.

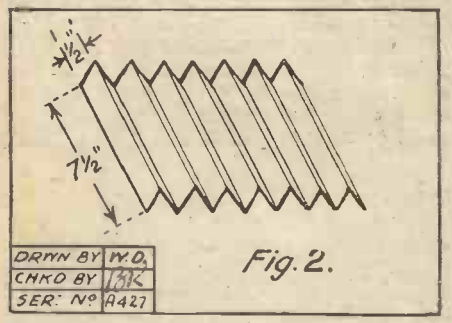


Fig. 2.

Therefore a strip of paper 48 in. × 7½ in. is required—Fig. 1. I am using good quality drawing paper, but parchment may be used. It will perhaps be found impossible to obtain paper this length, but two strips may be neatly glued end on end, overlapping about $\frac{3}{16}$ in.

Both edges of the 48 in. sides should then be accurately divided into ½ in. sections starting from the same end for each edge, so that if one of these points were joined up by a line to the corresponding point on the opposite edge this line would be exactly at right-angles to either of these edges and parallel to the ends, as shown in Fig. 1. As a matter of fact, these points are all joined up in this manner, but not with a pencil, but with some blunt pointed instrument such as a very blunt compass point, just to bruise the surface of the paper along these lines.

Pleating the Paper.

The paper is now ready for pleating, which is done by folding the first ½ in. strip one way and the next one the opposite way, as in making a fan. When finished it should look like Fig. 2. Care must be taken to press each crease well.

The ends *a* and *b*, Fig. 1, are now brought together while the diaphragm is held quite flat. It should now look like Fig. 3, a circle 15 in. diameter. The ends *a* and *b*, Fig. 1, are shown joined at *a*. If the paper is about the right length the outer edge should be almost flat without the pleats showing, the pleats of course gradually getting more expanded from the centre, which of course should be ½ in. thick, as shown in Fig. 3. If it is found that the outer edge is too "crinkled," a piece of paper across the whole width may be cut off one end until this edge is flat, allowing, of course, about $\frac{1}{16}$ in. lap to glue the two ends together, *a*, Fig. 3.

It will be found that a hole about $\frac{1}{16}$ in. diameter is left in the centre, the use of which will be seen later.

Any design which is painted on the diaphragm to relieve the plainness must of course be done before pleating. My own, as shown by the photo, has two brown and two green dragons.

Mounting the Diaphragm.

The diaphragm is now ready for mounting as soon as the frame is made, which can be made from any well-seasoned hard-wood. The actual design, of course, can be left to the maker's own choice; the one in question has an over-all height of 18½ in. Fig. 4. The base is a flat oak board 16 in. × 6 in. × ¾ in., into which the three legs of the front part of the frame are morticed and glued. The shape of the front frame can be seen in the photo, while the back part is just a plain wooden ring which is screwed and glued to the front part with the diaphragm between, as shown at *a*, Fig. 4.

The inside diameter of the frame is 14 in. and the outside 16 in., so the width of the frame is 1 in., the thickness of the wood ⅜ in., allowing the paper diaphragm to be held all round by ½ in. between the frames. The back ring fits exactly over the front frame, excepting the legs. Of course it should be arranged so that the grain of the back ring is across that of the front. The diaphragm should be stretched out and kept quite flat while the frames are screwed and glued up tightly; at least 8 screws should be used round the frame so that the paper has not the least play at any point between the frames, otherwise undesirable vibrations will be heard at certain frequencies of the music or speech being received; this vibration or "rattle" will always occur at the same frequency in the same loud speaker once it shows itself.

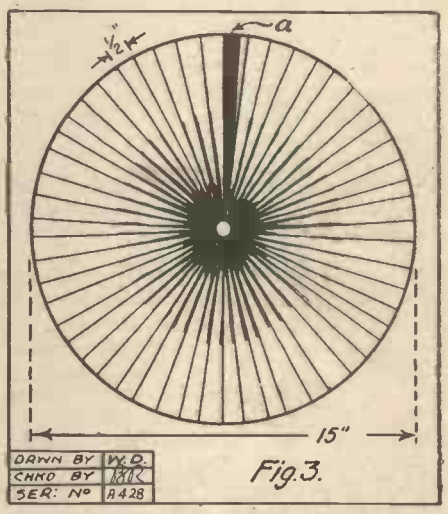


Fig. 3.

The Telephone Unit.

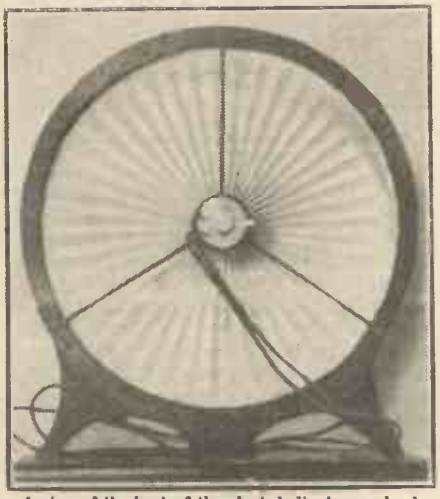
The next part to be made is the supporting collar, etc., for the 'phone, but just here I had better describe the type of 'phone used. It is not a gramophone attachment, as is generally supposed, but one of the well known "A" type headphones made by S. G. Brown, Ltd., Acton, who now sell these single earpieces of any ordinary resistance for this purpose.

These 'phones differ from the ordinary ones in that the diaphragm is cone shaped and has a very small screw at its centre to screw it to the "reed" which forms the armature of the 'phone, and therefore is the part which vibrates; the screw and diaphragm are removed, they not being required. The hole in the reed (the one in which the transmitting post is fixed and which will be referred to later) will be found to be exactly in the centre of the

(*Continued on page* 916.)

A PAPER DIAPHRAGM LOUD SPEAKER.

(Continued from page 915.)



A view of the back of the pleated diaphragm loud speaker.

'phone. A milled knob, *e*, Fig. 4, on the back of the 'phone adjusts the distance between the magnets and the reed. Printed directions for the use of the adjusting knob are supplied by the makers with each 'phone.

Fixing the 'Phone Unit.

The chief point to be remembered when mounting the 'phone is to keep it parallel with the paper diaphragm with the screw hole in the reed exactly behind the centre of the hole in the paper diaphragm. A brass collar, *b*, Fig. 4, is turned up, so the ebonite cap on the 'phone fits tightly in it. The inside diameter for this purpose should be about $2\frac{1}{8}$ in., and the thickness anything from $\frac{1}{8}$ in. to $\frac{5}{32}$ in., and $\frac{5}{8}$ in. wide.

Three holes are then drilled at equidistances round the collar. A No. 23 or $\frac{5}{32}$ in. drill should be used so that the holes may be tapped 2 B.A. It is found advisable to drill these holes near the edge towards the diaphragm, as shown at *b*, Fig. 4. These tapped holes, of course, take the radial arms; their positions are seen in the photo of the back of the loud speaker and at *c*, Fig. 4, which may consist of three ordinary 2 B.A. screwed rods, although a plain rod with one end screwed looks rather better. These rods must be long enough to reach from the edge of the wooden frame and to screw into the brass collar when in position. In this case they should be about $6\frac{1}{2}$ in. long, according to the angle at which they are bent after leaving the collar, *c*, Fig. 4, to allow the 'phone to stand away from the diaphragm, Fig. 4. The outer ends of these arms are flattened and drilled with a No. 25 or $\frac{5}{32}$ in. drill to allow a 4 B.A. screw to pass through.

The "Transmitting Post."

The ebonite cap must have its central hole enlarged to $\frac{1}{4}$ in. to allow the transmitting post free access. It is then pressed tightly into the collar, when a drill through each of the three holes just "dots" or dents the ebonite so the cap is held lightly in position by the radial arms screwing right into it; if a nut is put on the arms before they are screwed into the collar it will lock them in position.

The radial arms, when each are bent equally, are now bolted to the wooden frame by 4 B.A. screws passing right through the frame and the arms, the nuts showing at *d*, Fig. 4.

The transmitting post, Fig. 5, is now made and on this depends very largely the tone of the loud speaker. I found the best material to use was a piece of straight-grained oak which, in my case, is several hundred years old, having been taken from the beams of an old house we recently pulled down; it is therefore very dry and well seasoned. It is about 2 in. long and $\frac{3}{16}$ in. diameter at the largest end, *a*, and tapering to a fine point. This post is now glued in the hole in the centre of the diaphragm, with the flat end, *a*, flush with the front of the diaphragm. This will allow the point to pass through the hole in the ebonite cap, and be practically flush with the back edge of the cap. It is rather a good idea to screw the 'phone into the cap one or two turns, so the point of the post rests in the hole of the reed, which, by the way, is its permanent position later, until the glue sets and fixes the post in this position. The 'phone is then removed, and it should be seen that the post does not touch the ebonite cap when passing through it. A small spot of glue is then put on the point, and the 'phone is screwed in gently, making sure the point goes in the screwed hole of the reed, as it should do if great care has been taken throughout. As the 'phone is screwed into place the diaphragm will be pushed out at its centre by the transmitting post, and will stand out as shown at *f*, Fig. 4. This should not be very far, but just so the pressure between the diaphragm and the reed would keep the post if it were loose in position. The central button, *f*, which is of the same wood as the frame, i.e. oak, is about $\frac{3}{4}$ in. diameter, and is glued to the end of the post and surrounding pleats, its chief function being to finish off the centre.

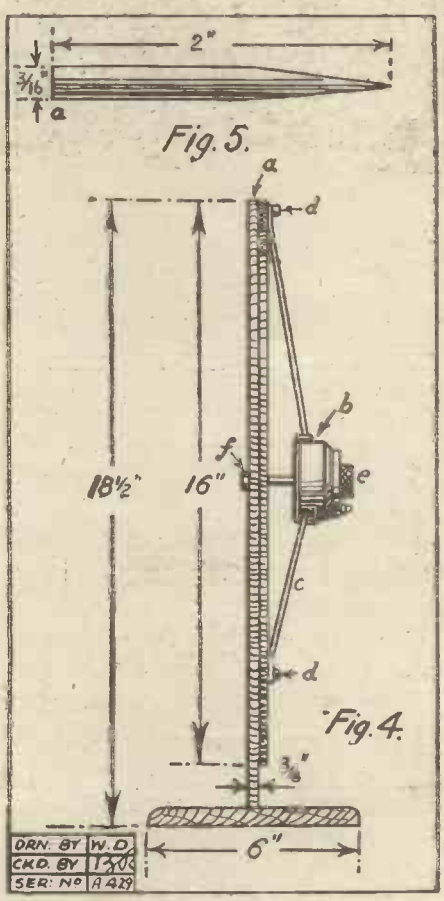
"Perfect Results."

The loud speaker is now finished and ready for testing, and is connected in the usual way to the receiver, the milled knob being adjusted for best results as before described, and if the foregoing instructions are carried out carefully there is no reason why the reader should not obtain the perfect results which are enjoyed every evening from the one described, provided, of course, the receiver is properly designed, and is being handled by someone who can get the best out of it. I don't altogether mean volume or "quantity," but quality, as, personally, I think the reason why so many people run down loud speakers, of any sort, for that matter, is that they have either heard one on a receiver which is not designed for loud-speaker work, or on a good set, the operator of which does not know his job.

I have been asked, does the diaphragm vibrate? Of course it does, and it can be felt when working. The amount of vibration and therefore the volume of sound reproduced depends, apart from the variations of the incoming signals, on the size of the diaphragm, so the larger the diaphragm within reason the more noise.

The resistance of the 'phone used should be 2,000 ohms, although one of 60 ohms could be used in conjunction with a telephone transformer, which some people prefer to protect the windings. I may say here that mine is 4,000 ohms, and although it is in direct series with 120 volts H.T., it is still going strong after several months' constant work.

I have tried this against the standard



disc type; the difference is hardly appreciable in comparison with the ordinary hard type of loud speaker. It is quite as loud in an ordinary room, because it spreads the sound all round, and so is better for that, but does not throw it so far.

EARTH CONNECTIONS.

ONE'S attention is often drawn to the external aerial connections, but rarely to those of the earth system. Parasitic noises in the telephones or a falling off in signal strength can often be traced to the earth connection, especially where it is made just above ground and open to the atmosphere.

Clean Contacts.

It is advisable to clean the wire occasionally, and to wrap it with insulation tape to protect it from the damp air. Especially is this necessary when water is often poured over the connection.

Where connection is made to a water-pipe it can be very effectively cleaned with emery paper.

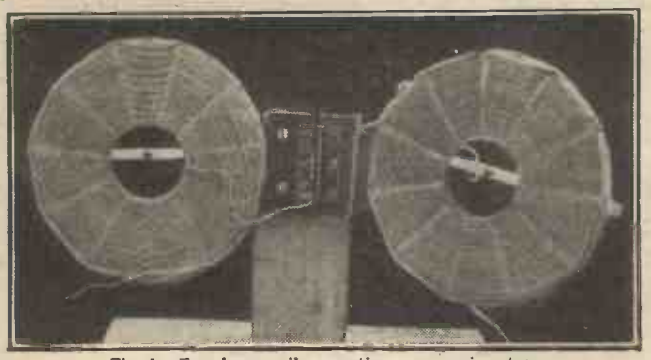


Fig. 4. Two large coils operating as a variometer.

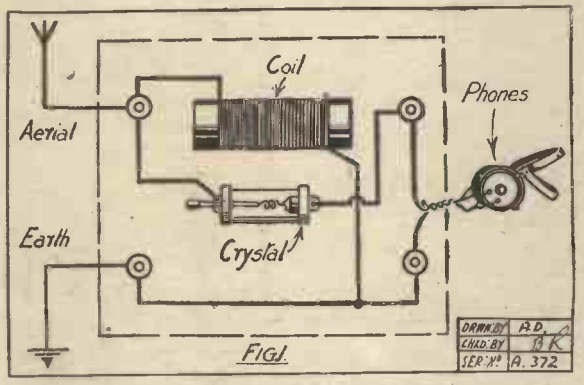
HOME-MADE COILS FOR DAVENTRY.

By S. N. SEDGWICK.

Listeners to 5 X X will find the practical tips given in this short article of considerable value.

NOW that Daventry opens the door for thousands of new crystal-set users, an account of three quite different sorts of coils which can be made or built up at home by a novice may be useful.

The three coils (strictly four, it is true, since the third consists of two joined in series to make a variometer) have been



used in home-made crystal sets at a distance of 90 miles from 5 X X with complete success, the circuit employed being of the simplest possible character. (Fig. 1.)

No. 1 is a coil that when once complete requires no tuning, but is always adjusted to receive 5 X X. (Fig. 2.) It is built on a low-loss former of a unique description. Four threepenny combs, 7 in. long, made of ivorine or some similar non-conducting substance, were purchased, and mounted on a rectangular strip of wood. Twelve ounces of No. 22 D.C.C. wire were used. A hole was drilled in the wood at one end, through which about six inches of the wire was passed for connecting purposes, and then the rest of the wire was wound,

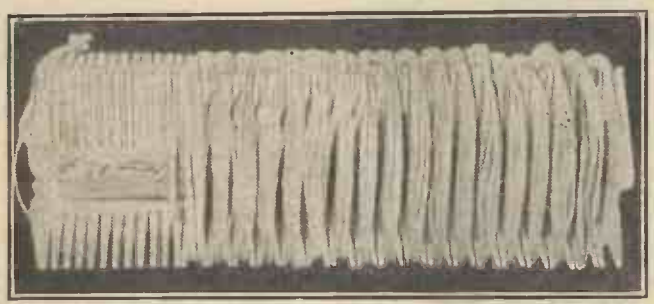


Fig. 2. The "low-loss" coil wound on a former consisting of four combs.

as the photograph shows, between successive pairs of teeth, about 15 to 18 turns in each set of slots. Nineteen slots were thus brought into use. It was discovered that 12 ounces of wire was sufficient to bring in 5 X X at full crystal strength on a good aerial. The coil on its former can easily be mounted in a box, or on two wooden supports, one end of the wire being brought to the aerial terminal, and the other to the earth terminal.

"Tapping" Experiments.

If, for any reason, the signals should be faint, and the coil should need tuning to the particular aerial to which it is to be connected, the tuning is accomplished by baring a little of the outer wire on the 17th and 18th sections, and then leaving the end of the wire unconnected to the terminal, a small piece of wire is fixed on the terminal, using the other end to touch one or other of the bared places on the coil, so completing the circuit. By experimenting in this way, it is easy to find the spot at which signals come in strongest, and the wire should be cut at that place, the portion not required being removed from the former, and the new end of the coil being brought down to the terminal.

If care is taken that there are only ten turns in the first five slots, and then the rest of the slots are wound full, the wire may be scraped from the 10th, 20th, 30th, 40th and 50th turns, which will be the outer turn on each of the first five slots, and there will be no difficulty in finding the exact place where the coil gives the strongest signals.

The second coil, Fig. 3, was wound on an ordinary commercial brass former. It consists of 3½ ounces of No. 28 D.C.C. wire, wound in the following way.

The brass former, obtainable at any wireless shop for about 1s. 6d., has two rows of 23 spokes, set on a brass barrel 2 in. in diameter, about ⅜ in. between the rows. The first thing is to have the barrel cut in two, and to mount the two halves on a round wooden rod, such as the end of a curtain pole. This enables coils of different widths to be wound, and also the spokes to be "staggered," or set parallel to one another, as required. (Fig. 5.)

"Spade" Tuning.

The coil in question was wound in the following way. A ring of thin cardboard ¾ in. wide was placed on the former in such a way as to be held firmly by the spokes, the two rows of which were "staggered"—i.e. the spokes in one row came opposite the spaces between the spokes in the other row. The wire, started on one row, was passed round the 5th spoke in the opposite row, then round the 9th in the first row, and so on, four spokes being missed each time, until the former was full. Then the coil was prevented from unravelling by sewing black thread round the edges, as shown in the photograph. The spokes being removed from the former, the coil slipped off easily, and was ready for mounting.

This coil can be tuned by means of a shield or spade. An aluminium disc 4 in.

Fig. 3. A coil which can be used for 5 X X, tuning being carried out with a "spade."

in diameter, moved slowly in front of the coil, brings in Daventry when about three parts of the way across.

Two Commercial Coils.

A piece of copper is equally good; and if no such thing is available, a threepenny ring of ordinary bare copper wire, such as is used for hanging pictures, can be used instead. This should be mounted just as it is, on a thin slab of wood.

Fig. 4 shows how two ordinary commercial coils can be used to tune in Daventry. The coils are mounted on two ebonite or fibre strips which are hinged together; the hinge serving as a connector. The inner end of the wire on Coil No. 1, and the outer end of the wire on Coil No. 2, being fastened to the hinge. (The other two ends going to the aerial and earth terminals of the set.)

(*Continued on page* 918.)

USES FOR FIXED CONDENSERS.

From a Correspondent.

FIXED condensers are used in such a variety of ways in a receiving set, and there are such a variety of receiving circuits employing fixed condensers in ways peculiar to themselves, that it is almost impossible, in a short note, to deal with all the uses of fixed condensers. There are, however, certain uses to which they are put which may be said to be more or less common to all circuits.

"Low-loss" Requirements.

In the first place, a fixed condenser is used in the aerial circuit frequently, for the purpose of shortening the natural wave-length of the aerial: for this purpose, it should be placed in series with the aerial. As this condenser is in a tuned circuit, or approximately a tuned circuit, it is very desirable that it should be a low loss condenser, that is, that the dielectric should be of a good grade—air or mica.

The condenser will be used in series with the aerial when the inductance of the tuning coil, or the self capacity of the aerial, is too great for the reception of the desired wave-lengths. Consequently, the capacity of this fixed condenser depends upon the self-capacity, or natural capacity, of the aerial, upon the minimum value of the inductance of the coil, and upon the wave-lengths which it is desired to receive.

The grid condenser, which usually has a value somewhere about 0·0002 mfd., serves the purpose of blocking the grid current in the detector. The value assigned to this condenser is largely a matter of habit. The best value depends upon the type of valve and upon the way in which it is operating, upon the value of the grid leak, and upon the strength of incoming signals.

Concerning Grid Condensers.

If a comparatively low-resistance grid leak is used, the value of the grid condenser should be correspondingly less. If a high-resistance grid leak is used, or if the incoming signals are strong, it may be better to use a larger grid condenser. It is common to employ a fixed grid condenser, although a variable grid leak is popular. It is quite a good plan, however, to use a variable condenser for the grid, as well as a variable grid leak, at any rate until the best value of grid condenser has been found, and even then, as the foregoing remarks will show, the value of the grid condenser, for best results, should be adjusted according to requirements. The smaller the value of the grid condenser, other things being equal, the more sensitive the detector. The limit is when the grid blocks.

The by-pass condenser, of the fixed kind, is well-known for use across the headphones for the purpose of providing a low impedance path for the H.F. currents. The same kind of condenser is generally used across the primary of the first L.F. transformer, for the same reason. Generally it may be taken that the fixed by-pass condenser is for the purpose of providing an easy path for H.F. currents across a piece of apparatus which is primarily designed for L.F. currents. It is important to remember that a by-pass condenser should not be larger than the value required for the purpose in view.

By-pass Condensers.

For example, if a by-pass condenser is used in the plate circuit of the detector, to pass the H.F. current across the primary of the first transformer, it should generally not be of greater value than ·001 mfd. If the circuit will not oscillate with this condenser, it is probable that the trouble will be found with the valve or with the tuner. If the circuit will oscillate over the entire range required, without the use of any by-pass condenser, then it is better to do without the latter condenser.

For condensers across H.T. batteries the larger the value the better, and moreover these condensers need not be of the low-loss kind, although they must be free from any danger of actual breakdown. Paper insulation condensers of 1 or 2 mfd. are often used for this purpose. They overcome the coupling effects due to the development of resistance in the H.T. battery with advancing age, and generally improve the performance of the battery.

The Savoy Orpheans both "on" and "in the air" during recent aeroplane broadcasting experiments.

HOME-MADE COILS FOR DAVENTRY.

(*Continued from page* 917.)

By swinging one coil towards the other, the tuning is effected without difficulty, and if the hinge is not too easy, the coil will

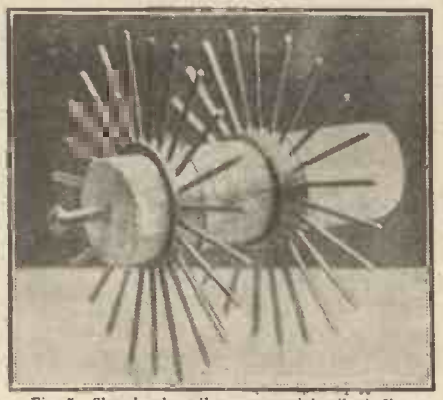


Fig. 5. Showing how the commercial coil winding former is divided and mounted.

remain where it is placed in relation to its neighbour.

In the photograph, the coils depicted are two Ledion 5 X X coils; but any of the 5 X X basket coils, obtainable for 1s. 6d. each, will suit admirably.

Mounting the Coils.

Note how they are mounted. Each one lies on a strip of ebonite, and a piece of a bone or vulcanite knitting kneedle is passed through two of the sections. Where it shows in the centre, a hole is drilled, and a screw passes through to the back of the ebonite, where it is held in place by a nut. In this way the coils are held quite solidly, but can be dismounted immediately by removing the centre screw. The photograph shows the twin coils mounted on a block of wood: but if a neat cabinet is made, they can be placed either within or at the back, according to taste.

TO BE PUBLISHED SHORTLY

A Special Article of Interest to all Unidyne :: Constructors ::

By CAPTAIN H. J. ROUND

(Chief Research Engineer. The Marconi Co.)

He knows they will please

The gifts that please are the gifts we all wish to give our friends. What more acceptable gift could there be than the latest and most up-to-date horn-less loud speaker that is made—

"The BECO DeLuxe"

HORNLESS LOUD SPEAKER

It will please the most discriminating and make a valuable addition to the furniture of any home. In tone and volume it has no equal.

Mahogany £5 5 0 Oak £5 0 0

The smaller model, the well-known "BECO," although only 6 inches high, gives remarkable good volume and clear reception. The price brings it within reach of everyone.

52/6 & 55/-

These models can be obtained at Harrods, J. Barker & Co., Whiteleys, Gamages, Lewis' Ltd., Manchester and Liverpool, etc

BRITISH ELECTRICAL SALES ORGANISATION, 623, AUSTRALIA HOUSE, STRAND, LONDON, W.C.2

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

A LOW-CAPACITY valve holder of interest is the F.A.V., a product of Messrs. F. Brown, Ltd., Langley Works, Long Acre, London, W.C. 2. A minimum of metal is employed, but nevertheless such is its design that smooth yet perfect contacts are possible even if, as is often the case, a valve's pins are slightly out of truth. The "self-cleaning" spring contacts are well sunk in order to prevent "H.T.-filament" tragedies, and it can be mounted either beneath or above a panel by means of one countersinking central screw. The F.A.V. sells at 2s., and can be thoroughly recommended.

* * *

The new Ferranti L.F. transformer, the A.F.3, is really excellent, and we congratulate Messrs. Ferranti, Ltd.; they have produced something that will set a standard that many other manufacturers will have great difficulty in following. We were all the more impressed by the operation of the new Ferranti because it was tested under abnormal conditions. Subsequently to ordinary laboratory tests which amply corroborated the statements set forth in a leaflet accompanying the component, it was introduced into a certain receiver. Now, this receiver had not been giving the results expected of it, and naturally all its components were under a very black cloud of suspicion. The Ferranti, as a matter of interest, was substituted for one of the L.F. transformers in use, and the effect was surprising. Weak distorted signals were transformed into healthy, pure reproduction. Seldom have we experienced such a definite demonstration of efficiency. The high primary impedance and the low self-capacity of the Ferranti in a circuit in which those factors are an important requirement, no doubt contributed in no small degree to the excellent results obtained. The A.F.3 has a ratio of 1 to 3·5, and is suitable for either first or second stages. It is retailed at 25s. and, in our opinion, is well worth the money.

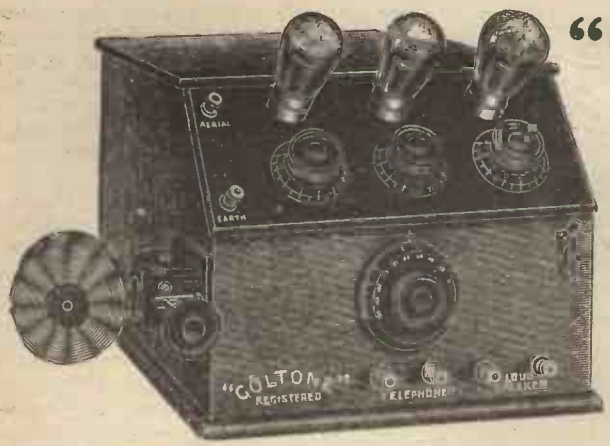
* * *

Fixed condensers of useful shapes are "Paragon" one piece mica condensers. Standing on their edges, as it were, they occupy very little room on either baseboards or behind panels. They are provided with moulded casings so that they are absolutely protected from damp or the effects of normal changes of temperature. The makers, Messrs. The Paragon Rubber Manufacturing Co., Ltd., Sculcoates, Hull, recently sent us a number of samples of various values. These on test all proved to be very efficient. They held their charges well and showed but inappreciable errors from stated capacities. With every Paragon sold a guarantee is given, and this is so comprehensive that the purchaser is completely protected for an indefinite period against anything except faults arising from misuse.

* * *

There are but few crystals as sensitive as natural galena, and crystal enthusiasts will no doubt be interested to learn that selected specimens of a useful size are now being marketed under the name of "Sylverex" Radio Crystal Test size at 1s., complete with suitable cat's-whisker. Messrs. Sylvex, Ltd., of 41, High Holborn, W.C.1, inform us that they intend to carry out a vigorous advertising campaign in connection with

(*Continued on page* 922.)



"GOLTONE" (REGD) RADIO XMAS GIFTS

BRITISH MADE

The Set illustrated shows our Type "B" Receiver. Polished Oak Cabinet, highly finished. Ample space is provided inside the cabinet for the High and Low Tension Batteries and the only wires on view are those connecting to the Aerial, Earth and Loud Speaker.

Space is provided at the top of the cabinet for the Loud Speaker.

Complete with ALL Accessories including "Goltone" Junior Loud Speaker, "Sampson" Accumulator, "Volex" Battery, Valves, Aerial Set, Plug-in Coils, Marconi Royalties. No extras required.

TWO-VALVE "B" SET. Gives Loud Speaker Reception within 40 miles of the main B.B.C. Stations and 150 miles from Daventry High Wave Station.

£12:2:6

THREE-VALVE "B" SET. Gives greater volume over a much wider radius.

£15:17:6

FOUR-VALVE "B" SET. Receives the majority of British and Continental Stations with extraordinary volume on Loud Speaker.

£18:8:0

For full details of other types of Valve Sets, send for Catalogue R/113.

OUTSTANDING MERIT

CHARACTERISES THE "GOLTONE" PRODUCTS.

The utmost efficiency is obtained where "Goltone" Wireless components are used.

Send for large 40 pp. Catalogue, R/113, illustrating most complete range of Radio Sets and Components, free on request.

DEALERS should enclose Business Card for Trade Terms.

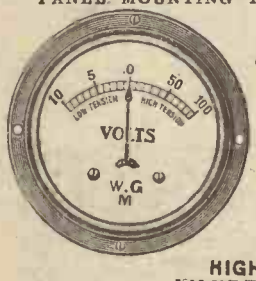
"Goltone" Specialities are stocked by the Leading Radio Stores. Write direct if unobtainable.

"GOLTONE" MULTIPLE TELEPHONE BLOCK

A handy Gift to every Crystal Set Owner. Enables 4 additional pairs of Telephones to be connected up simultaneously. Moulded insulated base, ebony finish, nickelled terminals. Price 3/-.

"GOLTONE" CENTRE ZERO PANEL MOUNTING RADIOMETER

Patent Applied.



Records the voltages of the high and low-tension batteries. Reading 10 Volts and 100 Volts. Price 12/9.

Panel Mounting Push Buttons 1/6 pair.

Pocket Type Radio Meter. Price 10/6.

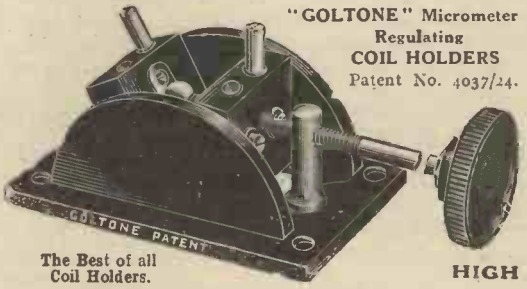
HIGH TENSION WANDER PLUGS

4-way, providing 2 High-Tension and 2 Low-Tension Conductors. Price 3/- each. 5-way, providing 3 High-Tension and 2 Low-Tension Conductors. Price 4/- each. 6-way, providing 2 High-Tension, 2 Low-Tension and 2 Grid Bias Conductors. Price 5/6 each. 7-way, providing 3 High-Tension, 2 Low-Tension and 2 Grid Bias Conductors. Price 6/6 each.

Firmly refuse substitutes and see the Trade Mark on the box

"GOLTONE" Micrometer Regulating COIL HOLDERS

Patent No. 4037/24.



The Best of all Coil Holders.

Adds considerably to the Selectivity and Efficiency of the Receiving Set.

Two-Coil Type	7/-
Three-Coil Type	10/6
Two-Coil Type for Panel Mounting	6/-

Refuse Inferior Substitutes.

"GOLTONE" MICROMETER FILAMENT RHEOSTAT

One-hole panel fixing. Sweet action. Ball contact. Complete as illustrated.

6 ohms	2/6 each.
12 ohms	2/9 "
30 ohms	3/6 "

"GOLTONE" HIGH-FREQUENCY PLUG-IN TRANSFORMERS

High-grade instruments wound on solid Ebonite Formers.

No.	Metres.	
R12/60..	80-150	7/- each.
R12/61..	150-300	
R12/62..	300-600	
R12/63..	600-1200	
R12/64..	1200-3000	

Specially wound Neutrodyne Model, 350-550 Metres. 7/- each.

"GOLTONE" NEUTRODYNE CONDENSER

Fine adjustment Condenser, permitting extremely critical tuning. Price 2/6.

HIGH-FREQUENCY TRANSFORMER FOR NEUTRODYNE RECEIVER (Hazeltine Circuit)

Skilfully wound and assembled. Fitted with rotary reaction for last stage of amplification.

No. 13B/52 .. 10/6 complete.

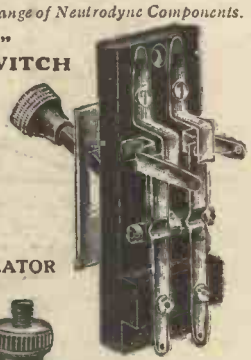
See Catalogue R/113, for wide range of Neutrodyne Components.

"GOLTONE" NO-CAPACITY SWITCH

Fitted with screwed front plate for panel mounting. Its outstanding features are low price, compactness, easy fitting and reliable action.

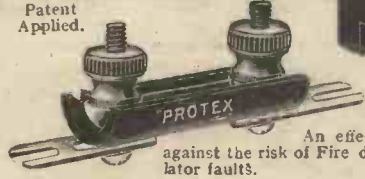
Each:

2-way Double Pole ..	3/6
4-way Double Pole ..	5/6



"PROTEX" ACCUMULATOR SAFETY DEVICE

Patent Applied.



Should be attached to every valve set. An effective safeguard against the risk of Fire due to Accumulator faults. Price 1/- each.

Ward & Goldstone PENDLETON. MANCHESTER LTD.

Also at LONDON & GLASGOW.

APPARATUS TESTED.

(Continued from page 920.)

this crystal. We have carefully tested the several samples sent us, and there is no doubt that it is of very high quality and retailers need have no hesitation in bringing it to the notice of their customers.

* * *

Messrs. The Ludgate Radio Co., 56, Ludgate Hill, London, E.C.4, have sent us a number of their Thorpe K.4 valves for test. These valves were, of course, specially designed for Unidyne receivers and have been adopted the world over as standard for these sets. The samples sent us were carefully tested on aerial and gave extremely satisfactory results. The price of the Thorpe K.4 has for some time been reduced from 17/6 to 12/6, and at the latter price is obtainable from most dealers, or post free from the above concern.

It would appear from our tests that this considerable reduction in price has in no way reflected upon the workmanship or efficiency of the valve.

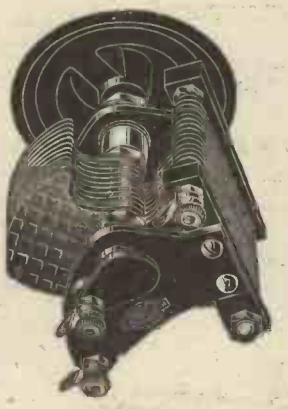
In these circumstances we have no hesitation in recommending it to the attention of Unidyne enthusiasts.

* * *

A little component that should become very popular is the new Ediswan grid leak. It comprises a resistance element contained within a small vacuum tube. Its overall size is no greater than that of any ordinary grid leak. The result of this method of construction is, of course, that the leak remains constant in value whatever are the atmospheric conditions and, within limits, whatever the applied voltage. Silent working is, therefore, guaranteed when one of these Ediswan leaks is in use, or, at least, should noises develop then one component can be ruled out as the cause. Even when we held a spirit lamp under the leak for a few moments while it was under test not the slightest resistance variation was recorded. Five sizes are available—0·5, 1·0, 2·0, 3·0 and 6·0 megohms at the standard price of 2s. 6d. each.

* * *

Ball bearings cannot be used indiscriminately in variable condensers, for the last thing we want is a dial that will swing round with the case of a bicycle wheel. Nevertheless, carefully employed, the result is excellent—instance the ball-bearing Lamplugh variable condenser. Quite recently, it will be remembered, we reported upon the Lamplugh square law ebonite-end plate model; now we have before us the higher-priced low-loss Lamplugh straight line variable. It is provided with metal end plates, shorted through a "pigtail" to the moving vanes, the fixed vanes being isolated by a minimum of ebonite. All this is most sensible practice, and we can only wonder why it is not more widely adopted. By means of the above-mentioned ball bearings a smooth, silky movement is obtained. Our report on the cheaper Lamplugh was to the effect that it was a good job, mechanically and electrically. The one at present under review is the same—de luxe.



* * *

Messrs. Autoveyors have sent us samples of their "Clix" Twin Plugs. Here we see one further adaptation of those popular little connectors, Clix. Two Clix are coupled neatly together to form one double plugging unit for H.T. and L.T. battery connections, or for telephone receivers, etc. The plug, complete with adapters (sockets for panel mounting), is retailed at 1s. With justification, Messrs. Autoveyors can claim that Clix are universal. There isn't much they cannot do in the way of connecting.

* * *

The new Lissen loud speaker unit, details of which have already appeared on our back cover, is truly excellent value for money. Its low price is startling in comparison with the price of other makes of loud-speaker gramophone attachments. That it is a Lissen, which is a guarantee of its quality, makes it all the more surprising. We have tested the sample sent us, and very good were the results that we obtained. Truly a quality loud speaker is now within the reach of all amateurs; the main item is the unit, which, as per Messrs. Lissens Lissenola, costs but 13s. 6d.

CURRENT TOPICS.

By THE EDITOR.

A Radio Christmas—Sir Arthur Stanley and the Future of Broadcasting—Post Office Control?

ONCE more we have the opportunity of wishing our readers a happy Radio Christmas and a prosperous New Year. It is pleasant to think that radio will undoubtedly bring real joy to many thousands of people this Christmas. We have but to think of the hospitals to realise how great a boon a wireless set must be to those unfortunate patients who, by sickness or injury, are prevented from enjoying the spirit of Christmas by the family fireside. Think again of the countless children to whom the festivities of Christmas are but a legend and to whom a pantomime is an unattainable fantastic joy. Yet broadcasting will carry its message of pleasure and comradeship to many a child this year who, in other circumstances, would have passed but a cheerless Christmas.

Sir Arthur Stanley and Broadcasting.

We seldom indulge in newspaper sentiments, but in this issue we feel readers will join us in a sincere appreciation of the benefits broadcasting can bestow this Christmas. And should you feel urged to help, why, any hospital will thankfully receive that which you give to help along the fund for Wireless in the Hospitals.

* * *

Sir Arthur Stanley, president of the Wireless League, recently gave his views on the future of broadcasting.

Sir Arthur thinks the present broadcast service has been well built up, the programmes being good and including items to suit all tastes; whilst on the technical side transmission has been brought to a high standard.

Sir Arthur, however, still regards the B.B.C. as a monopoly, and he says, "A monopoly is apt to create public prejudice, and there will probably have to be some change in administration.

The Word "Monopoly."

"A central control is essential. A system of competitive programmes would not be to the advantage of the listener. Money from licences would have to be divided, and it would not be possible for anyone concerned to be able to afford the high fees necessary for the best artistes.

"It is probable that the future system of broadcasting will be run on the lines of the B.B.C., but as a Government monopoly instead of a private monopoly, functioning so that it will be answerable to public opinion."

It is too late in the day to reiterate the arguments that the B.B.C., as at present constituted, is not a real monopoly. Critics of the B.B.C. have used the word monopoly with but little discrimination; the word has been distorted in order to fit in with the arguments of those who dislike the constitution of the B.B.C.

In our opinion, and, let it be said, in the opinion of many expert financial, political and economic critics of the B.B.C.—that company is not monopolistic. We invite Sir Arthur to again closely examine the constitution of the B.B.C., and then to compare it with a Government monopolised concern.

A Possible Disaster.

It is Sir Arthur's forecast of the future of the B.B.C. that we dislike, yet, at the same time, feel instinctively that some such system as he mentions will be brought into force when the B.B.C.'s licence expires.

As a Government monopoly Sir Arthur says that the B.B.C. will be "answerable to public opinion." Theoretically it will—in practice we doubt if it will. We have a first-class example of Government monopoly in the telephone, and if there is any monopoly which answers so slowly—both in the actual work carried out by its 'phone operators and by its organisers and chiefs when public disapproval is expressed—we should be glad to hear of one.

Frankly, the greatest disaster which could overtake British broadcasting is that of Government control. If any of our readers belong to the Wireless League, and are invited to ballot on this question, we urge them to consider the proposition very carefully before they vote. Review the B.B.C. impartially and ask yourself, "Could any Post Office or other Government department equal it for efficient service?" The answer is an emphatic "No!"

RADIOTORIAL

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

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

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

Assistant Technical Editors:
K. D. ROGERS. P. R. BIRD.

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

Staff Consultants:
Dr. J. H. T. ROBERTS, F.Inst.P.; J. F. CORRIGAN, M.Sc., A.I.C.; C. E. FIELD, B.Sc.

Foreign Correspondents:
F. M. DELANO, Paris; Dr. ALFRED GRADENWITZ, Berlin; L. W. CORBETT, New York; P. F. MARTIN, Italy; W. PEETERS, Holland.

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, 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.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given to 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 wireless 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.*

TECHNICAL QUERIES.

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

GRID LEAK.

A. H. C. (Bolton).—Could you please give me full particulars of a wire-wound grid leak having a resistance of approximately ·1 megohm (10,000 ohms)?

A suitable grid leak would be constructed as follows: A piece of ebonite rod 1½ in. in diameter should have eight grooves ½ in. deep and ⅛ in. wide. Each should contain 1,000 turns of No. 38 "Eureka" wire, preferably D.S.C. It is not necessary to take any pains to ensure that the grid leak windings shall be non-inductive, as no great advantage is

(*Continued on page* 928.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 926.)

brought about through the use of a non-inductive grid leak. It is very convenient to provide tappings on the grid leak, and in between the slots the wire may be brought to studs which can be tapped by a small switch arm to give lower values when required.

INTERFERENCE FROM POWER LINES.

G. C. N. (Wickford).—My aerial is situated about 350 ft. from a power line. Is this likely to affect my reception?

No, we do not think that this will give you any trouble at this distance. It is advisable, however, to erect your aerial at right angles to the power line.

ADDING L.F. TO ARMSTRONG SUPER.

C. R. A. (Kendal).—Can low-frequency amplifying stages be added to Armstrong "super" circuits with good results?

Yes, although a very careful arrangement of components is necessary in order to prevent the very violent "howling" which is liable to arise.

CRITICAL TUNING.

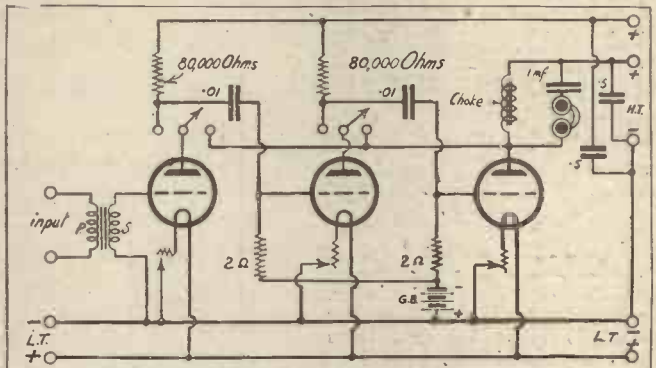
W. W. (Chadwell Heath).—What is meant by critical tuning, and does it differ from "sharp" tuning?

"Critical" tuning is understood to be the condition prevailing when small movements of a vernier condenser will bring in or tune out signals, and when without a vernier condenser it is almost impossible to tune finely enough. "Sharp" tuning is when very small movements of an ordinary condenser are sufficient to bring in or to cut out the different stations.

CONNECTIONS OF AERIAL CONDENSER.

R. F. A. (Watford).—When adding a condenser in series with the aerial in order to reduce the wave-length, does it matter whether the condenser is connected above the coil next to the aerial or below the coil next to earth? also, is there any difference in the way in which the actual condenser connections are made—i.e. moving plates to earth side or fixed plates to earth side?

Generally a difference is noticeable on a valve-set when the condenser position is reversed, and sometimes one position is decidedly better than the other. In certain cases, and especially on the longer wave-lengths, there is a noticeable difference in the signals of a crystal set when the condenser position is altered.



Theoretical Circuit of 3 Valve L.F. Amplifier

With a valve set it should be noticed that when the series condenser is in the earth-lead the set is insulated from earth, and hand capacity effects are consequently more marked.

The actual condenser connections are also found to affect body capacity, and where fixed metal end-plates are used, it is generally preferable to connect these to earth. If ebonite fixed end-plates are used the best connection for reducing unwanted capacity effects is when the moving plates are on the "earth" side, and the condenser itself between aerial and coil.

A DISTORTIONLESS AMPLIFIER.

M. J. N. (Southport).—I am thinking of constructing a 3-valve distortionless amplifier. Will you give me a theoretical diagram, showing values of components employed.

The circuit is given below. The first stage should be coupled by means of an L.F. transformer. If the preceding valve is an L.F. amplifier this transformer should be of a lower ratio—i.e. 2-1 or 1-1; if not, a first stage transformer, having a ratio of 4 or 5 to 1, should be employed.

Complete units for coupling the valves can be obtained, and are usually found to be very satisfactory, the Polar R.C.C. unit being a good example of this type of coupling unit. Separate components can, however, be used if desired; it is advisable, however, to use wire-wound anode resistances, as these tend to reduce to a minimum the variation of resistance.

The use of an L.F. choke in the plate circuit of the last valve, in conjunction with the 1 mfd. fixed condenser prevents the H.T. from passing through the winding of the loud speaker. Suitable valves for this amplifier are: First two valves, D.E. 5b (or if ·06 valves are employed D.E.3b.) The last valve should be a power valve of a suitable rating to work in conjunction with the previous valves employed. It will be found that the value of the grid bias battery will be slightly higher than usual, owing to the potential drop across the 2 meg. grid leaks. The H.T. to the first two valves is common and the H.T. applied should be approximately 160 volts.

For the last valve the H.T. applied need only be from 100–120 volts, according to the type of power valve employed.

IMPROVING OSCILLATION CONTROL.

E. B. W. (Weston-super-Mare).—Having built a two-valve Unidyno, I am having

(Continued on page 930.)

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 928.)

trouble in making the valve oscillate when the L.F. valve is switched in. With the detector only, everything is quite O.K., but on switching the L.F. in I find very tight reaction coupling is necessary before the set will oscillate. Amplification seems to be O.K., and changing the connections of I.P. and O.P. and O.S. and I S. of the transformer only decrease the amplification without assisting in the oscillation problem.

In all probability you would find that a ·002 mfd. fixed condenser across the I.P. and O.P. connections of the transformer would assist matters, while the reversal of the transformer itself may be beneficial. This means leaving the *connections* to the transformer as they are at present, but moving the whole instrument so that the secondary side faces where the primary used to face, and vice-versa. It has been found that occasionally the field of a transformer will oppose reaction, and until the transformer has been reversed all efforts at obtaining satisfactory reaction have been fruitless.

THE N. CIRCUIT.

"JOLFER" (Belgium).—When will Sir Oliver Lodge's new circuit appear ?

The circuit is, we believe, still the subject of experiment.

LEAKAGE FROM ACCUMULATOR.

A. H. L. (Montreuil).—The acid from my accumulator is leaking from the bottom edge of the celluloid. How can this be prevented ?

Amyl-acetate may be used for cementing together celluloid. Some shredded celluloid should be dissolved in the amyl-acetate to a consistency of thin cream, and this cement then applied to the parts that require uniting. Note that this material is highly inflammable and should therefore not be used near a naked light.

WORKING OUT INDUCTANCES.

E. F. (Woodford Green).—How is the inductance of a coil calculated ? Give example.

The following formula is an approximate method of calculating the inductance of a coil :

$$L = 4\pi \frac{A \times N^2}{l} \times 10^{-9} \text{ henries}$$

A = sectional area of the coil in sq. cm.
N = number of turns.
l = length of coil in cm.

For instance, with a coil of 10 cm. diameter, 100 cm. long, with 2,000 turns, the sectional area will be πr_2, so that

$$A = \frac{22}{7} \times 5 \times 5 = \text{sq. cm.}$$

$$\therefore \quad A = \frac{550}{7} \text{ sq. cm.}$$

Substituting the formula given above :

$$L = \frac{4 \times \frac{22}{7} \times \frac{550}{7} \times 2000^2}{100} \times 10^{-9} \text{ henries}$$

$$\therefore \quad L = \frac{1936000000}{4^9} \times \frac{1}{10^9} \text{ henries}$$

$$\text{and } L = \frac{1,936}{49,000} \text{ henries}$$

$$= \cdot 039511 \text{ henries}$$

or 39,511 microhenries approximately, ignoring for simplicity the correction factor.

SAFETY FIRST.

"NERVOUS" (Partington, near Manchester).—Is an aerial dangerous to erect because it also acts like a lightning conductor ? Would a separate lightning conductor on the mast be a safeguard ?

The aerial itself forms an efficient lightning conductor, and is therefore actually a safeguard if it is directly earthed. The down lead should go to earth in a straight line without entering the house, and this can easily be arranged with an outdoor switch (which connects up the instruments when desired but is normally "shorting" between aerial and earth leads). In the circumstances a lightning conductor on the mast is hardly necessary, but, of course, it can be erected if desired.

EARTHING ARRANGEMENTS.

F. S. E. (Bootle, Liverpool).—I am not satisfied as to the best way to make an earth connection. Should the earth-wire be insulated, and is a water-pipe earth really a good and satisfactory method ?

The earth wire does not require insulation, but should be as short and as stout as possible. A water-pipe makes a really first-class earth connection, although a large plate of metal or a long metal rod buried in fairly moist earth is to be preferred, if it can be arranged. The earth wire should be soldered to its earthing point, if possible.

REFLEX RECEIVERS.

A. R. I. M. (Leytonstone).—What is a reflex circuit arrangement, and how does it work ?

The simplest form of reflex circuit makes use of one valve and a crystal. The incoming oscillations are passed through the valve and are amplified in the usual way, and then they are rectified by a crystal. After rectification they are passed, via an L.F. transformer, back to the grid circuit of the valve. This means that the L.F. impulses are passed through the valve and the valve now acts as an L.F. amplifier. Finally, the L.F. currents are passed through the telephones.

The result of this arrangement is that the one valve is made to do the work of two, that of an H.F. amplifier and also that of an L.F. magnifier. As a matter of fact the results obtained are a little less than those achieved by a three-valve set, because the valve, though acting as a dual amplifier, does not perform both the amplifications to such a degree as would two valves.

A valve can only pass a certain amount of current, and therefore the amplification of either the H.F. or L.F. currents has to suffer slightly. The set, however, is very efficient, and forms one of the most economical one-valve receivers yet devised.

With a well constructed and handled single-valve reflex circuit—they are very easily constructed and operated—loud-speaker signals strong enough to be heard all over a small room should be obtained at distances up to 15 miles from a broadcasting station. Reaction upon reflex circuits does not seem to have its usual effect, and it is only useful for fairly long-range reception. At close range or on loud signals reaction appears to paralyse the circuit and cause a loss of signal strength; at any rate, it does not give an appreciable *increase* in the loudness of the received signals.

BROADCAST NOTES.

(Continued from page 882.)

in widely differently situated parts of the country for more of the London programmes to be relayed.

When Daventry started an endeavour was made to put out a proportion of programmes alternative to London. Thereupon the agitation against the innovation at once took form, and has now reached considerable proportions.

It is only right that our broadcasting authorities should be responsive to the movement of public opinion, but sometimes I think that the B.B.C. is perhaps too sensitive, and is inclined to "spoil" its listening public. But, anyway, it is a failure on the right side, and I hope never to have to accuse our broadcasters of rigidity or Napoleonic policies. In this connection, I shudder to think what might be our fate if broadcasting were incorporated in the telephone system.

End of the B.B.C.?

Having accepted the formula of the British Broadcasting Commission to replace the British Broadcasting Company, the Government Committee is in a state of considerable perplexity on the subject of recommending how the Commission is to be appointed from the so many conflicting interests. There is a possibility of so much trouble in the event of any set of opinions prevailing, that there is now a tendency on the part of the Committee to fall back on a formula which will give the B.B.C. a further tenure of some years while the difficult problem of the future is being thrashed out.

It is just as well that this possibility is being kept in mind. Listeners, no doubt, have reason to criticise the B.B.C. not infrequently, but there would be a general alarm and tremendous dissatisfaction if the B.B.C. were brought to an end without a satisfactory substitute.

Moreover, the much abused wireless manufacturers are following a very wise policy by remaining in the background and threatening nothing. Those who have been engaged in abusing them will perhaps have to come to them on bended knees to continue to exercise the stewardship of British broadcasting. When everybody else quarrels, the manufacturers will have to step into the breach. Anyway, they are not going to be excluded.

SCHOOL STORIES AND ADVENTURE.

ANY of our readers who enjoy a rattling good school story or a stirring tale of adventure will find the new issues of THE HOLIDAY ANNUAL (6s.) and CHAMPION ANNUAL (6s.) packed with entertaining fare from beginning to end. The Boys of St. Jim's, Greyfriars and Rookwood Schools figure in the HOLIDAY ANNUAL. Their exploits are exciting and amusing to a degree. Thrilling adventures on land and sea—at home and abroad—will be found in the CHAMPION ANNUAL. There is not a dull moment in either book. Both Annuals are strongly bound, have superb coloured covers and are fully illustrated throughout. They are now on sale at all booksellers and newsagents.

Correspondence

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

FILAMENT TEMPERATURE.

The Editor, POPULAR WIRELESS.

Dear Sir,—A point which I believe would be of great interest to your readers, and which I have failed to find commented upon in any wireless journal which I have read, is that of filament temperature, especially in its relation to range and reaction.

I use a crystal and one-valve reflex receiver which I made myself—I will not trouble you with the circuit—and I find that when I have tuned to a distant station (Radio-Toulouse, Munster, Hamburg, etc.), I can increase the signal strength by increasing the filament temperature without causing any howls if the reaction coil is not too tightly coupled to the grid coil. Conversely, if the coils are coupled too tightly and a howl be produced, loosening the coupling will cause signals to fade right away, whereas decreasing the filament temperature will eliminate the howl while maintaining signal strength at audible volume.

If this use of filament temperature is bad practice, I should be glad to be told about it, and I dare say that many of your readers would also be glad of the warning. On the other hand, if it is a useful and proper method of control, I am sure there must be thousands of listeners who would appreciate the hint.

I would like to add that since I discovered POPULAR WIRELESS some months ago my weekly expenditure on wireless papers has dropped from several shillings per month to threepence per week.

Yours faithfully, C. J. JACOBS.

Swithland, Thornbury Road,
Osterley Park.

Filament Control should be used on all receivers as long as the valves are not over-run.—TECH. EDITOR.

THE B.B.C. "TALKS."

The Editor, POPULAR WIRELESS.

Dear Sir,—In reading your editorial notes in a recent issue of POPULAR WIRELESS I should like to add my humble endorsement of the criticism of "The New Statesman." He hits the nail right on the head re "the potted science and history." Of course the majority shut down when these talks by indifferent speakers, who more often than not splutter, hesitate, and speak with a plum in their mouth, come on.

The primary object of the B.B.C. is to entertain. Why do they not give us more music of a light and tuneful character? I should like to know.

Take the programmes as obtaining at present. Why should we have to wait till 10.30 p.m. for a bit of dance music, and then sit up till 2 a.m. listening to it?

No, the whole of the present programmes want at least 30 per cent more tuneful music. Why is De Groot so popular? The answer is not far to seek. I know this much—that the one hour's transmission from Radiola, Paris, on Sunday dinner-time is worth all the programme the B.B.C. put out on any Sunday.

Another thing, I take strong exception to your remarks about the B.B.C. being a success. Of course they are a success. If I opened a little general shop next to the Home and Colonial or Lipton's, and the Government forced people to purchase in my shop under the threat of imprisonment, I should be a success. I could not help it.

No, sir, these confounded talks and twaddle have got to be cut out.

I know several who have not paid their licence yet for this reason and it is *not* because they cannot afford it.

I have taken out three consecutive licences, viz. 1922, 1923, 1924, but *not* for 1925.

This is not because I cannot afford it or wish to shirk my obligations, but to show my resentment of the B.B.C. programmes.

I have offered the P.M.G. 2s. 6d. as his share of my dues to the State. The matter is in abeyance at the moment, as I only wrote about two months ago. I may have some interesting news for you in another two or three months!

Trusting you will at least see some of my logic.

I am, dear sir, Yours faithfully,
R. S. RUDLAND.

36, Gipsy Road, Welling, Kent.

FOREIGN RADIO NEWS.

From Our Own Correspondent.

Wireless in "Rhineland."

GREAT satisfaction has been caused in German radio circles by the announcement by the Allied authorities that the ban on the use of radio and the Rhineland and occupied districts of Germany has been lifted.

It is expected that one powerful station, at least will be installed, possibly at Cologne or Mannheim, and that thousands of persons will avail themselves of this opportunity to become listeners.

The announcement is taken to be part of the new policy of conciliation consequent upon the Locarno Treaty.

Dairymaid Radio.

Dr. von Stetten, a noted German physiologist, as the result of experiments among the cattle in the high feeding grounds of the Alps this summer, announces that cows give more milk if, while they are being milked, music is played.

The music employed was that broadcast by Swiss radio stations, by means of a loud speaker in the neighbourhood of the cows while the milking process was going on.

A Swiss cartoonist takes the opportunity for drawing a cartoon showing "the latest style of headphone for radio for cows."

Important Radio Appointment.

It is announced that Professor Zickendraht, of the University of Basle, has been nominated for the position of technical adviser to the International Radio Bureau, the seat of which is in Geneva. The bureau is at present still busy on an entire reorganisation of European wave-lengths.

New German Coastal Station.

The German postal authorities announce the opening of a new coastal radio station designed to serve shipping entering and leaving the mouth of the Weser.

The station is in two parts—the receiving station being at the head post-office, Bremerhaven, and the transmitting one at Wuhlsdorf. It will be known as Bremerhaven station, and its call number is K B H.

These letters have been used hitherto by the North German-Lloyd station in the Lloydhalle, Bremerhaven, but the latter will henceforth use the letters K A B.

Belgrade Station Developments.

In view of the rapidly increasing interest taken in radio in Serbia, the Belgrade station announces that it has engaged the well-known Todo Jazz Band, which gives daily concerts in the Palace Hotel, Belgrade. This band, which is well known in Paris, London and Berlin, will play daily for broadcasting at 5 p.m., Greenwich Time.

(*Continued on page* 935.)

FOREIGN RADIO NEWS.

(Continued from page 934.)

Every Tuesday and Thursday there will also be, at the same hour, a violin recital of chamber music.

There will be no other afternoon broadcasting by this station as hitherto, the hours being changed from 6 to 7 p.m. to 12.30 to 1.30 p.m.

Switzerland and Bavaria to Relay.

An international relay has been inaugurated, an arrangement having been made whereby Zurich and Munich will relay each other's broadcasting programmes.

New Madrid Station.

The Valencia station, known as E A J 24, which has been carrying on a series of wavelength tests of late, has ceased broadcasting.

The new Madrid station, Prado del Rey, which is under the control of the Government, and uses 150 kilowatts, has started broadcasting on a wave-length of 3,800 metres, and reports have been received of clear reception both by day and by night from as far as Buenos Ayres.

THE "P.W." PREMIER RECEIVER.

(Continued from page 872.)

it is merely an extended branch which rests on the panel and prevents the lead to which it is attached touching another lead, even when pressure is applied. This little scheme is well worthy of applying at all such doubtful points. It does not take long to carry out, and may be the cause of saving the "life" of a valve.

A very careful check, especially of the connections to the Utility switches, should follow the completion of the wiring. All traces of flux, dust and filings should be removed. Coils and valves of the largest sizes available should be inserted, and note taken whether ample clearance is available all round. The grid bias battery should be placed in position, and the necessary leads of flexible wire cut to correct length, and wander plugs fixed on them. The grid bias battery should be one of nine volts tapped at every 1½ volts. It should fit in comfortably in the position indicated in the photographs.

The original model has an engraved panel but, of course, transfers will look quite well and give the receiver a finished appearance.

For 2 L O and most other main stations a 75-turn aerial coil will be required. This is the moving coil in the two-way coil holder. The isolated wire need not be in position for the "2 L O" range. For 5 X X a 250 coil is required.

The 75 and 250 coils can be left in position, and the two ranges on them are available by switching.

Other coil combinations will suggest themselves to constructors. It should be remembered that on the 2 L O range only the one coil is in circuit with 75 turns reaction, while on the 5 X X range 150 turns of reaction is "open" and both aerial coil plugs are in series. Reference to the diagrams will make this clear.

Valves, etc., as specified, will be found quite suitable, although there are others that will operate in the circuit quite well.

TECHNICAL NOTES.

(*Continued from page 868.*)

It is stated that it will now be possible, thanks to the discoveries referred to above, to produce filaments actually of thorium, or, at any rate, containing a very much higher percentage of thorium than hitherto. The advantage of such filaments for the purpose of wireless valves will be evident, and it is claimed that filaments giving from 25 to 50 per cent. greater emission than the highest at present in use may thus be made.

Available in Commercial form.

Another important application of the new discovery is in connection with X-rays for medical purposes. The "target" in an X-ray tube, which corresponds to the anode of a wireless valve, is subject to electronic bombardment, and the character of the resulting X-rays emitted from the tube depends upon the nature of the target, or anticathode, as it is sometimes called.

The characteristic X-radiations from thorium are found to be much more useful for therapeutic purposes than those from other metals commonly used, and consequently an important field should be opened up in this connection.

Metallic thorium, produced by Drs. Rentschler and Marden, has been manufactured on the commercial scale in the form of rods, cold-wrought wire, filament, ribbon, bars, discs, and powder.

Question of Interaction.

Although much attention has been devoted to the question of the interaction of L.F. and H.F. transformers, little seems to have been given to the question of a similar effect with variable and fixed condensers. The shrouding or shielding of L.F. transformers is now a matter of common commercial practice. H.F. transformers are designed specially for the limiting of the external field, so as to avoid interaction.

The electrostatic field external to a fixed mica condenser is likely to be small, owing to the extreme smallness of the dielectric thickness between the plates, and consequently we need not seriously consider the effect in the case of a fixed condenser.

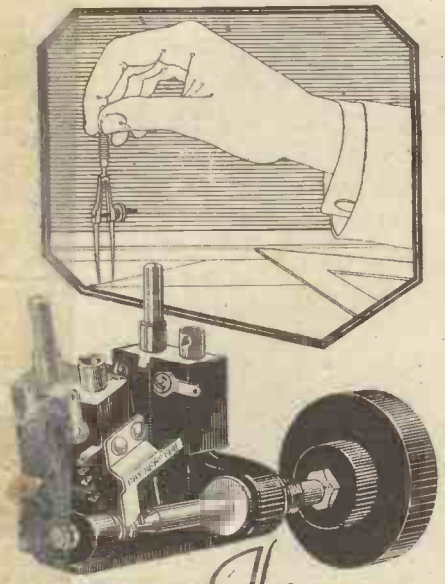
But in the case of a variable air condenser, there may be, and usually is, quite a large amount of stray electrostatic field which, apart from the question of interaction, may represent considerable energy loss when the condenser is subject to H.F. potentials.

An Interesting Experiment.

A writer in "Q.S.T.," the official organ of the American Radio Relay League, Mr. L. W. Hatry, a well-known writer on radio subjects, has dealt with this matter in a very interesting way, and points out a number of factors which have hitherto escaped general notice.

In the first place, he remarks that although the metal end-plates of some variable condensers are blamed for losses, this is hardly likely to be seriously comparable with the other losses; the condenser already contains a large number of metal plates, and the addition of two extra ones, which in effect are connected with the rotor, is not likely to make much difference. The distribution of the lines of

(*Continued on page 940.*)



The Newey Vernier Coil Holder

The last word in accuracy and precision in coil-holders. Designed so that it can be fixed in any position, including back of panel, one-hole fixing.

The moulding is Bakelite throughout, ensuring perfect insulation together with high finish. The adoption of worm gearing having a ratio of 8 to 1, gives a vernier movement which is absolutely free from backlash and so necessary for fine critical tuning. Worm gearing further enables the heaviest coil to be used without any fear of its position being altered by a jar or through its own weight.

A special stop is fixed on the spindle which prevents the coils from being overwound, thereby affording complete protection to the teeth of the Bakelite sector. For accuracy, precision and beautiful finish, this coil holder has no equal.

Price 6/6

Newey's

Ask your nearest dealer. If you have any difficulty write direct.

Wholesale Distributors:—
Pettigrew & Merriman (1925) Ltd.,
122-124 Tooley St., London, S.E.1.
and Branches] *Tel. Hop* 134.

You will not hear a more mellow and natural reproduction of broadcast music and speech than that given by a "TrueMusiC" Loud Speaker.

Mellow in note, sensitive to weak signals and handsome in appearance, the "TrueMusiC" Loud Speaker will be your pride and the envy of your friends.

The secret of this successful reproduction lies chiefly in the horn. The "TrueMusiC" horn is built up of copper by a patented electrical process, without straining the metal in any way. Therefore there is none of the distortion and jarring on certain notes so often associated with metal horns, and yet none of the flatness complained of with composite horns. The "TrueMusiC" Loud Speaker is straight in shape to avoid deflecting or "bending" the sound waves —the cause of "re-echo."

Concert Grand	**£6:10:0**
Standard - -	**5: 0:0**
Junior - - -	**2:10:0**
T.M.C. Minor -	**1: 1:0**

TrueMusiC

True to every Tone and Semi-Tone

Demonstrations at the following agents:
Autoveyors Ltd., 84, Victoria St., S.W.1; L. A. Gardener & Co., Church Lane, Charlton, S.E.7; Harrods Ltd., Wireless Dept., Brompton Rd., S.W.1; Izzard Bros., 13, Upper Clapton Rd., E.5; Kingsway Radio, 7, Railway Approach, Cannon St., E.C.4; Marshall & Snelgrove, Wireless Dept., Oxford St., W.1; Ray's Wireless Service, Norwood Rd., Herne Hill, S.E.24; Saville Pianos, Ltd., 63, Church St., Enfield; 22, High St., Stoke Newington; 527, High Rd., Tottenham; 240, Hoe St., Walthamstow; 142, High Road, Wood Green; Sports & Radio Stores, 30b, Queen's Parade, New Southgate; or authorised T.M.C. agents everywhere

Write for Catalogue.

The Telephone Manufacturing Co., Ltd.,
Hollingsworth Works, West Dulwich, S.E.21

Putting His Foot Down

When the mammoth puts down his foot, it stays put.

Don't you wish you could set the catwhisker on your crystal set with the same ease and assurance?

Unfortunately your catwhisker needs a touch as delicate as a butterfly alighting; you may almost hold your breath for fear of disturbing it.

If only it were possible to combine in one simple device these two extremes of pressure, the whole difficulty of adjusting a crystal would be completely overcome.

Put **your** foot down. Break that wasteful habit of buying spare crystals every month.

The **Climax Popular Plug-in Detector** is fitted with the Climax Auto-micrometer catwhisker. This famous catwhisker succeeds in automatically combining that essential delicate micrometer pressure with a separate independent hold-on pressure. **The setting is easy, permanent and of maximum possible efficiency.**

For crystal set constructors the Climax Popular Plug-in Detector is supplied fitted with CLIMAX Auto-micrometer catwhisker and CLIMAX Crystal. **PRICE 3/6** *complete with Sockets.*

Climax Auto-micrometer Catwhisker (Prov. Pat. No. 21001/25). **PRICE 1/-**

Climax Superb Crystal. Guaranteed *natural* galena. An ideal combination with the Climax Catwhisker. **PRICE 1/-** *per box*

Climax Popular Crystal Set is fitted with the Climax Popular Plug-in Detector, complete with Climax Auto-micrometer Catwhisker and Superb Crystal. **PRICE 12/6**

Daventry Adjustable loading coil. **PRICE 3/6** *extra.*

MAKE SURE IT'S CLIMAX

If you have difficulty in obtaining genuine CLIMAX productions, and are asked to accept inferior imitations, kindly send your order direct to us, enclosing P.O. or cheque to the correct amount, when immediate attention will be given to your instructions.

CLIMAX RADIO ELECTRIC Ltd.

Head Office and Works: *Tel.:* Putney 2599
Quill Works, Putney, London, S.W.15
(All communications to the above address)

Showrooms: 257, **HIGH HOLBORN, LONDON, W.C.1**
Tel. Holborn 2538

CLIMAX RADIO

TECHNICAL NOTES.

(Continued from page 936.)

electric force has been mapped out by the writer referred to, as a result of actual experiment, and he has found that there is, in fact, a very considerable spreading out of the electric field owing, to some extent, to the comparatively large distances between the plates.

The capacity of the condenser for a given setting—particularly for settings of low capacity—is largely influenced by the proximity of surrounding objects. As a practical proof of this, he took a well-seasoned wood slab, of sufficient size to keep the hand well away from the condenser, and gradually brought the wood nearer to the end plate of a variable condenser which was tuned for a given signal. When the wood was directly against the end-plate of the condenser, and about an eighth of an inch from the rotor plates, it required a condenser-capacity reduction of about one microfarad to retune the signal.

What it Proves.

To make certain that the condenser was being affected and not the coil, a second test was made. The wood was fixed in a vertical position, behind the rear end-plate of the condenser. The coil was to the rear and right of the condenser, and the board test was made on the left of the condenser. This did not affect the carrier note to any appreciable extent (the coil was of the toroid type). In this second test, although the wood was much nearer to the coil than in the first test, the effect was negligible, showing that it is the condenser which must be approached and not the coil. The capacity of the condenser, when these tests were being made, was set at about half maximum.

The writer of the article remarked that this shows that tests on condensers ought, in order to be reliable, to be made with the condenser well isolated from neighbouring objects. And, furthermore, that ample clearance should be given to the condenser in the assembly of the components of the receiving set—a point which is not sufficiently brought out as a rule. It possibly explains, too, high resistance at minimum capacity adjustments.

A Shrouded Variable Condenser.

Finally, these results would seem to indicate the desirability of enclosing the condenser completely, and of constructing it with a shaft of non-metallic material, end-plates of insulation, and so on; in short, to take any reasonable steps to ensure the field being confined as far as possible to the fixed and movable vanes. As a matter of fact, a commercial condenser has just appeared on the American market which is provided with a complete metal shroud, exactly after the fashion of a L.F. transformer. The case is made from thin sheet brass, and a mica "window" is provided for the lead-in of the terminals.

Printed and published every Thursday by the Proprietors, the Amalgamated Press (1922), Ltd., The Fleetway House, Farringdon St., London, E.C.4. Advertisement Offices, Messrs. J. H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Registered as a newspaper, and for transmission by Canadian Magazine Post. Subscription rates: Inland and Abroad, 19/6 per annum, 9/9 for six months. Sole agents for South Africa: Central News Agency, Ltd. Sole agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for Canada: The Imperial News Co. (Canada), Ltd.
Saturday, December 12th, 1925.

POPULAR WIRELESS AND WIRELESS REVIEW, December 19th, 1925. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

MAKING A TWO-VALVE TRINADYNE RECEIVER.

Popular Wireless

and Wireless Review

Every Thursday PRICE 3d.

No. 186. Vol. VIII. December 19th, 1925.

Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.

CONTENTS.

Crystals are now used in many large transmitting stations for stabilising wavelength. Our cover photograph shows the comparitive sizes of a tiny piece of crystal and one of the several huge valves it, in a sense, controls.

Exide

THE LONG-LIFE BATTERY

TYPE WH. BATTERY

Exide Battery, Type WH, with Strap Carrier. Strap carrier 2/6 extra.

Exide Battery, Type WH, with Wire Carrier. Wire carrier 1/6 extra.

THE IDEAL XMAS GIFT

New H.T. Battery

This new WH type High Tension Battery incorporates the most advanced features of battery design, giving absolute freedom from the voltage fluctuations and consequent noises associated with dry batteries, with a total absence of the ripple of "smoothed out" alternating current supplies.

The special features of this battery are:—

It need be *recharged* only once *every six months* when used for wireless or similar work.

It is supplied *in a dry-charged condition* and can be put into operation immediately after filling with acid, but a freshening charge should be given during the first month.

All *materials* used are *absolutely pure*. The container is of moulded glass. No separators are required. No brass or other corrodible material is employed.

Every plate can be *readily inspected*. The acid level is plainly marked. The mud space is clearly visible.

Tappings can be taken at every 12 volts.

Suitable *connecting clips* are included with each battery.

PRICE 24-Volt WH. Battery (including 2 connecting clips but excluding acid) **35/-**

48 volts, 72 volts, 96 volts, 120 volts, 144 volts pro rata.

Obtainable from all Exide Service Agents or from your usual dealer.

BIRMINGHAM:
58, Dale End.
'Phones: Central 7629/30.

BRISTOL:
22, Victoria Street.
'Phone: 6460.

The Chloride ELECTRICAL STORAGE COMPANY LIMITED.
Clifton Junction, Near Manchester.
London: 219-229, Shaftesbury Avenue, W.C.2
'Phone: Regent 8070.

MANCHESTER:
1, Bridge Street.
'Phone: Central 2075.

GLASGOW:
40-44, Tureen Street.
'Phone: 985 Bridgeton.

Made at the largest battery works in the British Empire.

What we think about them

Members of the N. Thusiast family give their views concerning "Britain's Most Dependable Valves."

Old Mr. N. Thusiast passes an opinion

"—of course, a grand-dad can hardly be expected to hear as well as youngsters. But when he *does* hear, he's a jolly sight more critical, eh? At one time I didn't at all fancy music being served up with buzzing and booming and crackling. But, bless your hearts, since Tom fitted those Ediswan Valves . . such music. Those dance bands might be in the room—not a note's spoiled. Talk about rejuvenation treatments. You should see me dancing round with Elsie!

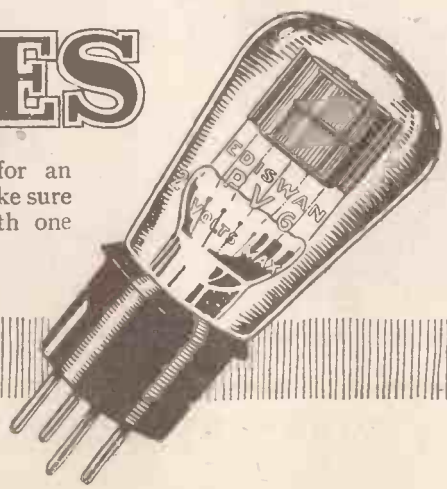
Every member of the family appreciates the fact that

EDISWAN VALVES

WILL IMPROVE ANY SET

THE VALVES TO USE		
Rec.	Acc. or Batt Volts	Power
A.R.	4	P.V. 5
A.R.D.E.	2	P.V. 6
A.R. 06	3	P.V. 8

will secure faithful reproduction for an unusually lengthy period. Only, make sure of using them in conjunction with one another—as shown here.



RADIO IGRANIC DEVICES

Of vital importance to all radio enthusiasts

The Igranic Electric Company have realised the advantages which will accrue from co-operation between British and American manufacturers of high-grade Radio Accessories, and after a very careful investigation of the American market, the Igranic Electric Company have decided that the products of the Pacent Electric Company represent the highest standard produced in America.

Arrangements have now been concluded under which the Igranic Electric Company, in addition to their present range of components, become exclusive manufacturing licensees of the Pacent Radio Essentials.

Pacent Radio Essentials are the result of eighteen years' practical radio engineering experience. They are manufactured from the finest materials and are designed with a thoroughness which makes each one an engineering achievement. They are only placed on the market after the Pacent engineers have exhaustively studied existing conditions and the requirements of the public, and have fully satisfied themselves that the accessories offered are the best possible for the purpose. Forty prominent manufacturers of receiving sets have adopted Pacent Radio Essentials as standard equipment.

In subsequent advertisements we shall have pleasure in announcing details of individual Igranic-Pacent Radio Essentials; in the meantime, we invite those who wish for advance information to read over our special Igranic-Pacent Booklet P.3, which will be sent post free. Write for it to-day—a postcard will do.

Among the range of Igranic-Pacent Radio Essentials are the Superaudioformer, the audio-frequency transformer with a "curve" that is to all intents and purposes *straight* and giving uniform amplification down to 100 cycles and up to 8000 cycles—the True Straight Line Frequency Condenser, which absolutely ensures perfect straight line frequency operation with wide, accurate spacing of stations—the Microvern, the most elegant and efficient vernier tuning dial yet invented—Porcelain Rheostats and Potentiometers giving perfect valve control at a very low cost—the most complete line of Jacks and Plugs in the world—and many other equally efficient components.

RADIO IGRANIC-Pacent ESSENTIALS

Particulars of these interesting Igranic-Pacent Radio Essentials are described in our new booklet P.3, for which you are invited to send, so that you may read of the parts with which you may improve your present receiver or assure your next set being the finest you have ever built.

IGRANIC ELECTRIC CO., LTD.,

Exclusive Manufacturing Licensees of Pacent Radio Essentials

149, QUEEN VICTORIA STREET, LONDON. Works: BEDFORD

Branches: **BIRMINGHAM. BRISTOL. CARDIFF. GLASGOW. LEEDS. MANCHESTER. NEWCASTLE**

Pacent
RADIO ESSENTIALS
PACENT

Popular Wireless

Scientific Adviser
Sir OLIVER LODGE
F.R.S.
Consultants:
Dr. J. H. T. ROBERTS
F.Inst.P.
J. F. CORRIGAN, M.Sc.
A.I.C.
C. E. FIELD, B.Sc.

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

Technical Editor:
G. V. DOWDING,
Grad.I.E.E.
Assistant Technical
Editors:
K. D. ROGERS.
P. R. BIRD.

RADIO NOTES AND NEWS OF THE WEEK.

A Wireless Rescue—That Morse Jamming—A Broadcast Novel—More Low-Power Feats—The Big Smash—New Vienna Station.

Reducing the Number of Stations.

NOBODY seems to have noticed the interesting fact, yet probably never again after this year will there be so many stations to tune-in as at present. "Fewer stations and higher power" is the cry nowadays, and by next winter the European ether may be combed out, and half the stations shut down. Then there will be more broadcasting, less howls, and peace, perfect peace, for Captain Eckersley!

Then and now—Senatore Marconi as a young man with his first radio transmitter—

A Wireless Rescue.

THE good ship "Geraldine Mary," which brings the paper for "P.W." all the way from Newfoundland, has to find her way through some very dirty weather sometimes. Nevertheless she manages to do a good turn for others occasionally, as the following incident goes to prove:

The Lame Duck.

ON a recent voyage she received a wireless message from the s.s. "Striklestad," who had broken her propeller shaft, and was getting anxious to be towed to St. John's, Newfoundland. The "Geraldine Mary" used her direction-finder to locate the other vessel, and went to her assistance. For four days she was standing-by the "Striklestad," in weather too bad to get a towing-line across to her! Twice they were blown apart by hurricanes, but the direction-finder brought them together again, and eventually the crews succeeded in passing the line from the lame duck to the "P.W." paper ship.

That Morse Jamming.

MY remarks upon the jamming by Morse in the south of England have brought me a shoal of letters, and the burden of them all is the same: "It ought to be stopped." Some of my correspondents are despondent about it, others are vitriolic, one I am sorry to say said a naughty word; and the best one of all asked, "Why not an ether-Locarno?" There's a lot of sense Pact in that little question!

Long Distance on One Valve.

"SCOOPING in the States" on the one-valve Chitos seems a pretty easy proposition when conditions are good. Quite a number of readers have reported the feat within the last few weeks, and one of these, writing from Waterloo (Liverpool), says, "Listening in on my home-made Chitos one-valve I heard K D K A. The reception was clear and distinct, with absence of mush, but fading every two minutes, though always audible." Not so bad for one valve, is it?

A Broadcast Novel.

THESE readings from "Tom Brown's Schooldays," which 2 L O has been giving us lately, in the afternoons, seem to have been widely appreciated. They are supposed to be for the children, but I know several youngsters of twenty or more who dash home eagerly from their afternoon walks, and almost cut their friends—"Mustn't-stay-a-moment-Dearie" sort of thing—because they are so anxious to know what's going to happen to Tom next.

Why not broadcast a short novel in this way—a real love-story, for the romantic hour when the fire is flickering and it's too dark to read, just before it's time to think about tea?

2 O Z.

MR. J. W. NORTON tells me that he has re-opened his station G 2 O Z. The address is now 20, Perryn Road, Acton, London, W.3.

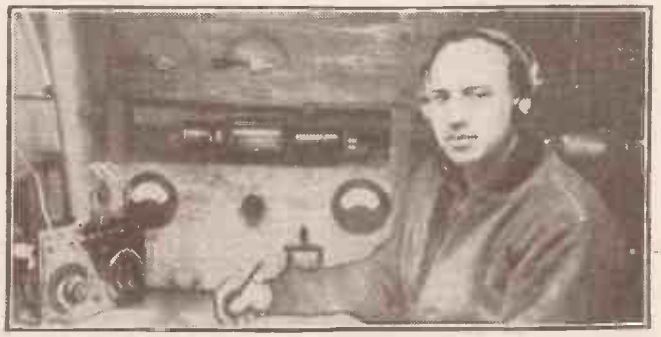
More Low-Power Feats.

VERY-low-power long-distance work is going strong, now that receiving conditions are good. One Leicester experimenter (Mr. J. W. Pallett, 2 W M) has succeeded in getting through to Italy upon the incredibly low power of 10 watts. He was picked up in Venice, where signals were reported at "very good strength." Mr. Pallett has also been heard in Stuttgart (Germany), and by several amateurs in France.

Empire Broadcasting.

BROADCASTING to our kin in the Dominions is not half such an impracticable proposition now as it was considered a mere six months ago. When Mr. F. A. Mayer, of Wickford, Essex, put a 5 X X programme on the short waves for

(*Continued on page* 948.)



—and John Reinartz, as he is to-day, with his special apparatus on the s.s. Bowdoin.

NOTES AND NEWS.

(Continued from page 947.)

the benefit of a Mosul listener, it was picked up not only in Mesopotamia, but in Tasmania also. And if an amateur transmitter can do it occasionally, why not a pukka short-wave B.B.C. station, doing it regularly ?

No Hope Yet for Europe.

THE B.B.C. has officially washed its hands of the European ether this year. Up till recently there was a hope that before the coming spring it would be possible to work out a scheme to reduce heterodyning and limit interference ; but now there is no hope that it can be done in the time. As a matter of fact, the new stations keep on jumping up so fast that I wonder the B.B.C. didn't admit it before now ; and next summer will be none too long in which to settle all the details.

A Loud-Speaker Test.

THERE was an amusing evening round at the Hackney Radio Society recently, when members had a loud-speaker contest. All the different loud-speakers were placed out of sight behind a curtain. Then a powerful set was switched on to each loud-speaker in turn, and the audience, unaware of which one was in circuit, voted by numbers. When the curtain went up the winner had a great ovation, and all the others looked very down-in-the-horn.

Super Spanish Station.

YOU know how well the Spanish stations have been coming in lately ? They say now that Madrid is getting jealous of San Sebastian, and is planning a super broadcasting station which will make even 5 X X look like a crystal set. Everything is to be on the gigantic side—wave-length 3,800 metres, and power 150 kilowatts, which is about ten times as much as Daventry ! Sacramento, senors ! Mind yo ir eardrums !

Cold Work at Daventry.

THE Daventry engineers had a cold and unenviable job during that sharp frost of December 5th, when they attempted to re-erect the aerial which had been brought down by the weight of frost and snow. In a bitterly cold wind they climbed the 500-ft. mast, working their way hand over hand up an iron ladder, and erected a temporary aerial. This consisted of a steel wire a quarter of an inch thick, but it saved the situation that night.

The Big Smash.

ONE of the B.B.C. engineers told a " Daily Mail " reporter that the aerial—600 feet long, and consisting of ten strands of wire—parted right in the centre. The heavy " cage," with about 450 ft. of lead-in wire, crashed to the ground, causing considerable damage to guy-ropes, halyards and other supports.

More Aerial Trouble.

DAVENTRY is not the only unlucky station, for three 500-ft. masts were blown down at the new wireless station at Norddeich (Germany) during the recent storms which swept the Continent.

" No lives were lost," says the report, which is all the more remarkable considering that not only were the masts blown down, but immediately afterwards all the engineers were " blown up " by the authorities !

News by an Eye-witness.

ONE of the most interesting points raised at the inquiry by the Broadcasting Committee was that given in the evidence of Mr. J. W. C. Reith, Managing Director of the B.B.C. Pleading for the removal of restrictions over the broadcasting of news, he suggested the introduction of a new type of announcer—the " narrator." The duty of this " oral correspondent " would be to give an eye-witness account of events as they happened, and there's no doubt that a good man could give listeners some thrills in this way—at the Derby, for instance.

SHORT WAVES.

" If the Government take over the B.B.C. every listener will regret it."—" Liverpool Evening Express."

* * *

" It is my firm conviction that the office of director of the London radio station is second in importance to no other office in the United Kingdom. His power . . . is incalculable. That exercised by the Prime Minister of his Majesty's Government is almost a little thing in comparison."—Mr. Corbett Smith, in the " Fortnightly Review."

* * *

" Some people are not satisfied with getting their ration of wireless from the common or garden stations. The best music available now is that broadcasted from an aeroplane ; a joke acquires exquisite point if someone cracks it in a diving suit ; lectures or literature attain loud-speaker honours only if they come from the deck of a canal barge."—A writer in the " Daily News."

The Vienna Station.

I AM indebted to a correspondent for up-to-date details of the new Vienna broadcasting station, which is reported to be testing upon a wave-length of 400 metres. He has a friend living only a few miles from Vienna who says that the station is still quite a long way from completion, and is not likely to be testing upon 400 metres, in any case. Another Austrian station—Graz, to be exact—uses 404 metres, and probably this accounts for the reports already received.

An Original Call-Up.

MY informant gives some interesting details of Graz, which transmits a concert every night from 7 p.m. till 9 p.m. The station is easily recognisable, he says, owing to the fact that they invariably call up in Morse before every item of the programme. This is done with a deep-toned instrument, sounding something like a motor-horn, and the announcer then gives the station's name and wave-length.

Radio's Responsibilities.

I SEE that Mr. A. Corbett Smith has been saying that, in his opinion, the director of the London Radio Station holds the most important post in the United Kingdom.

It may be so, of course, but, thank goodness, the aforesaid director himself never talks to us as though he thought he was anyone special. Perhaps that's the reason of his popularity !

Wireless in a Will.

BY bequeathing his wireless set to a friend, the late Mr. E. F. Gordon, of New York, created a radio record. According to the official files, everything, from fountain pens to filthy lucre, is mentioned in wills at some time or another, but this was the first wireless set.

I don't think I should care about operating a set which had come to me in a similar way, would you ? Somehow, it doesn't seem quite the thing to me; but some people I know would play marbles with the glass eye of a dear departed and think nothing of it !

A Message from Dr. Eccles.

HERE is a cheery Christmas message to readers from Dr. W. H. Eccles, F.R.S., the eminent scientist whose work upon radio problems is well known the world over. It arrived just too late for inclusion in the Christmas number of " P.W." ; but, fortunately, it is still in time for Christmas. Dr. Eccles, in his letter to the Editor, says :

New Opportunities in 1926.

" THE year just ending has been immensely successful for wireless amateurs, and the use of wireless has spread everywhere. From being the hobby of a few, wireless has become of interest to thousands ; and now that a few shillings buys components that used to take the amateur weeks to make, it is not too much to hope that amateurs will originate more wireless discoveries and inventions in the coming year than even in this year now closing.

" I wish all amateurs a very happy Christmas and a busy and successful New Year."

That Two-Valve Trinadyne.

NOT long ago a non-technical but very critical friend of mine—whom you all know by repute—asked me to recommend him a good circuit for loud-speaker work 11 miles from London. He was dissatisfied with his three-valver, and somewhat sceptical of the alternative I recommended—a Trinadyne, followed by one L.F. ! It was a stiff proposition for two valves—for both volume and perfect clarity were essential—but, somehow, I trusted that Trinadyne, because everyone speaks so well of it, and the event proved I was right !

The Noiseless Background.

" IT'S a wonderful set," he told me when I saw him the other day.

" Loud and clear as a bell. But sometimes it *frightens* me ! "

" How's that ? " I asked.

" Well, it's like this," he said. " Sometimes, after I've been enjoying it, there's a halt in the programme, or an interval, and then it's so deathly quiet that I go over and listen to the loud speaker ; and there's no sound whatever—no rushing, no scratching, nothing ! And I think to myself (his voice sank), ' It's bust.' Then, all of a sudden, there is a stentorian statement, ' THIS is the London station,' and I sigh with relief and think to myself, ' Yes, and *this* is the set for me ! ' "

ARIEL.

HOW TO MAKE A 2 VALVE TRINADYNE RECEIVER

The Set Designed, Built and Described by J. ENGLISH.

The Trinadyne Circuit, described by our contributor in "P.W." No. 145, March 14th, 1925, aroused considerable interest, and the full constructional details of a Trinadyne Set made by Mr. English are now available for "P.W." readers.

IN this article I propose to describe the construction of a two-valve receiver embodying the Trinadyne circuit which was outlined by me in "P.W." No. 145 of March 14th, 1925.

I have been informed by amateurs who have tried out the one-valve circuit that they have obtained excellent results with it, and also with the two-valve circuit, which is reproduced in Fig. 1. This circuit is used in this receiver, the first valve acting as the Trinadyne valve, while the second functions as an L.F. amplifier. A 250-turn choke coil has been added between input secondary of first transformer and grid of first valve.

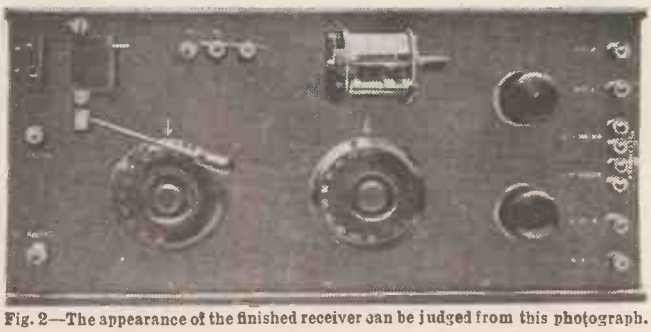


Fig. 2—The appearance of the finished receiver can be judged from this photograph.

For the benefit of those who have not read the article referred to above, it may be briefly mentioned here that the first valve operates primarily as an amplifier of the L.F. currents passed by the crystal K, but, by virtue of the coupling of aerial to grid by the condenser C, and the connection of filament to earth, the valve also acts as an H.F. amplifier. By coupling the anode coil L_2 to the aerial coil L_1, it is possible to feed back into the grid circuit the amplified H.F. currents, thus giving a greater rectified current from the crystal to be amplified by the valve. Moreover, the coupling of L_1 and L_2 reduces damping, making tuning sharper.

Results Obtained.

The receiver described herein, when finally completed, reproduced almost exactly the characteristics of the original circuit as developed on my experimental unit system. Thus experimenters who construct this set may be confident of reproducing a receiver capable of giving the results obtained with the original.

On the same evening that construction was finished, the receiver was tested on a moderately good aerial-earth system. 2 L O, distant six miles, naturally came in exceedingly strong on the loud speaker, on which several other B.B.C. stations were also tuned in at good strength. Several French and German stations could be heard quite comfortably on the loud speaker, and, between 11.30 and 12 p.m., 2 L O having closed down, two American Stations, W F I Phila. and another, the call sign of which was not identified, came in quite strongly on the 'phones.

Reception in every case was very clear and pure, while the receiver fulfilled all expectations in respect of stability and control, hand capacity effects being negligible.

Three Circuits.

As shown in Fig. 2, the receiver is built on the American system now so popular among constructors, all apparatus except variable controls being mounted inside the cabinet out of harm's way. The coil holder, however, has been brought to the front of the panel on the extreme left. Besides making changing and coupling of coils easier, there is another reason for this which will be apparent later.

Provision has been made by means of appropriate terminals for the set to be used as (*a*) a crystal receiver, (*b*) a Trinadyne receiver, (*c*) a two-valve receiver, Trinadyne and L.F. amplifier.

The position of components on the front of the panel is shown in Fig. 2, the dial and knob on the left belonging to the aerial tuning condenser, while the dial and knob next to it operate the anode tuning condenser. The two-coil holder is mounted above the A.T.C., while in the top centre is the crystal detector. The two filament rheostats mounted on the right, are of the dual type, so that dull or bright emitter valves can be used.

The relative positions of components mounted on the panel and baseboard are clearly shown in the rear views, Figs. 3 and 4. The only point to notice here is the method of mounting the grid bias battery for the last valve. This is shown diagrammatically in Fig. 5.

Fixed condensers are not mounted on the baseboard, but soldered direct to their respective connections, which are sufficiently stiff to retain them in place.

The receiver has been designed so that a one-valve H.F. amplifier, contained in a small separate cabinet, can be coupled to the receiver without altering the existing wiring, connection being made by two wires only. For this reason the coil holder is mounted on the extreme left of the panel, in order that the crystal coil of this receiver

(*Continued on page* 950.)

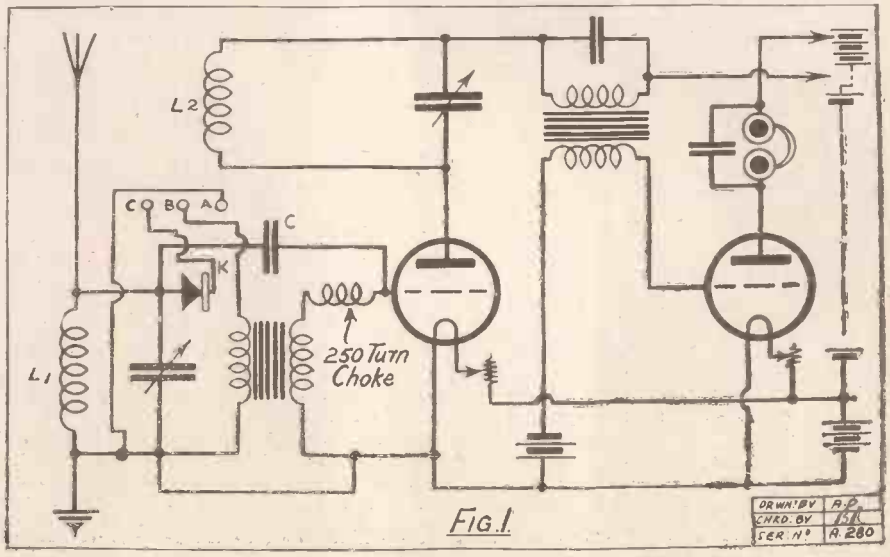


FIG. 1.

A 2-VALVE TRINADYNE RECEIVER.

(*Continued from page 949.*)

may be coupled to the aerial coil of the H.F. unit when added. I hope to describe shortly the construction of this unit, which also possesses the valuable property of being used in the three circuits available with the two-valve receiver, as a wave-trap, a piece of apparatus almost essential to DX workers in the London district, now that 2 L O is using increased power.

Preparing the Panel.

The cabinet may be purchased or made up to the specification of Fig. 6 with ⅜-in. wood, and the given dimensions should be adhered to as closely as possible.

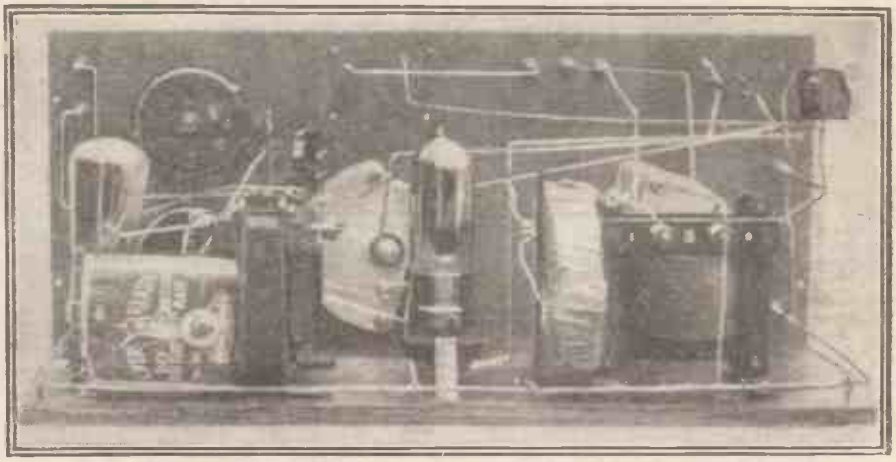


Fig. 4. The back of panel wiring and lay-out can be clearly seen from the above photograph.

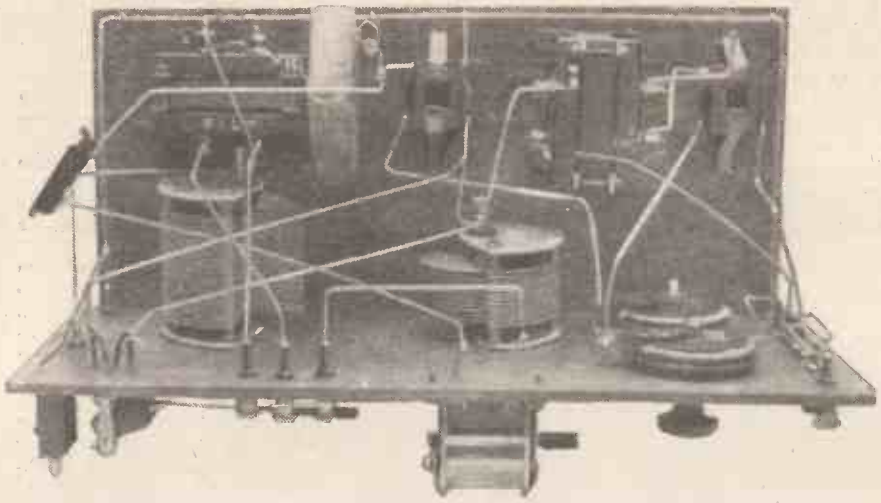


Fig. 3. This photograph, in conjunction with fig. 4, will enable the constructor to arrange his components so that the lay-out corresponds to that obtaining in the author's receiver.

Before the panel is drilled, it is advisable to gather together all components, of which a list is appended, and, as a guide, the brand of component used in the original receiver is indicated. Equally reliable articles may be substituted if desired, but where any radical departure is made from this list care should be taken to make any necessary alteration in the drilling plan.

The ebonite should be of guaranteed quality, preferably with a matt surface. If it has a high polish, rub it down with emery paper, wipe with an oily rag, and polish with a clean cloth. This will remove the surface skin, the insulation resistance of which may be of doubtful value. After the panel has been properly finished off and made to fit correctly in the cabinet, holes can be drilled in accordance with the plan of Fig. 7, and the panel afterwards suitably engraved if desired.

The baseboard, measuring 15 in. by 7 in. by ⅜ in., already stained or polished as desired, is then screwed to the panel with three ¾-in. brass screws. This will hold the panel and baseboard together sufficiently rigidly to enable further constructional work to be carried out. Care should be taken that the panel is at right angles to the baseboard when screwed up.

On the panel itself are mounted the two variable condensers, coil holder, crystal detector, two rheostats, and the necessary terminals, while the valve holders are attached to the baseboard in the manner indicated in Fig. 8 (A and B). This provides a holder in which the dielectric between the valve-pins is air only, and unwanted capacity is thus reduced to a minimum. The pieces of ebonite can be marked out with the template supplied with any holder. The choke coil is also mounted on the baseboard, next to the first intervalve transformer.

Before placing the transformers in position, it will facilitate construction if most of the wiring up is done. The transformers can then be screwed down and wiring completed.

Wiring the Receiver.

Fig. 9 is the wiring plan, which should be carefully followed in conjunction with Figs. 3 and 4, when wiring up with square tinned wire should be quite a simple matter.

A few points to note in wiring the receiver are, that the aerial terminal is connected to the fixed vanes of the A.T.C., and to the pin of the aerial coil-plug. The aerial terminal is also connected through the ·0003 mfd. fixed condenser to the grid of the first valve, from which a lead runs to one end of the 250-turn coil, the other end of which is connected to input secondary of the first transformer. A wire is run right round the edge of the baseboard from L.T. negative to earth terminal, and to this wire are connected wires to one filament connection of each valve holder and to output secondary of first transformer.

The anode first valve is joined to the

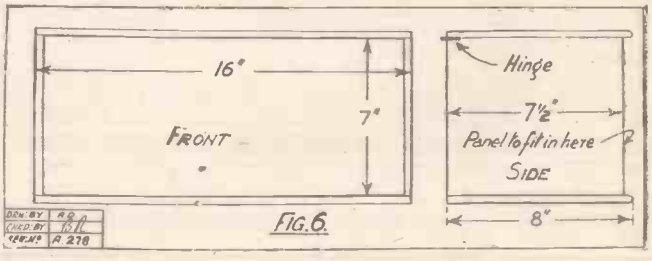


FIG. 6.

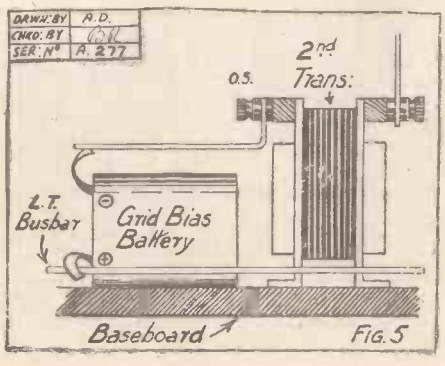


FIG. 5

fixed vanes of the second variable condenser, then to the socket of the anode coil plug, the pin of which is connected to the moving vanes and to the I.P. of the second transformer. The moving vanes of the A.T.C. are connected to the terminal A, and the O.P. of first transformer, thence to O.S. of same and to L.T. — lead. Also the wire from aerial to the detector goes to the crystal side, the cat's-whisker being connected to terminal C.

The connections to the coil plugs are made by short lengths of flex passing through

(*Continued on page 951.*)

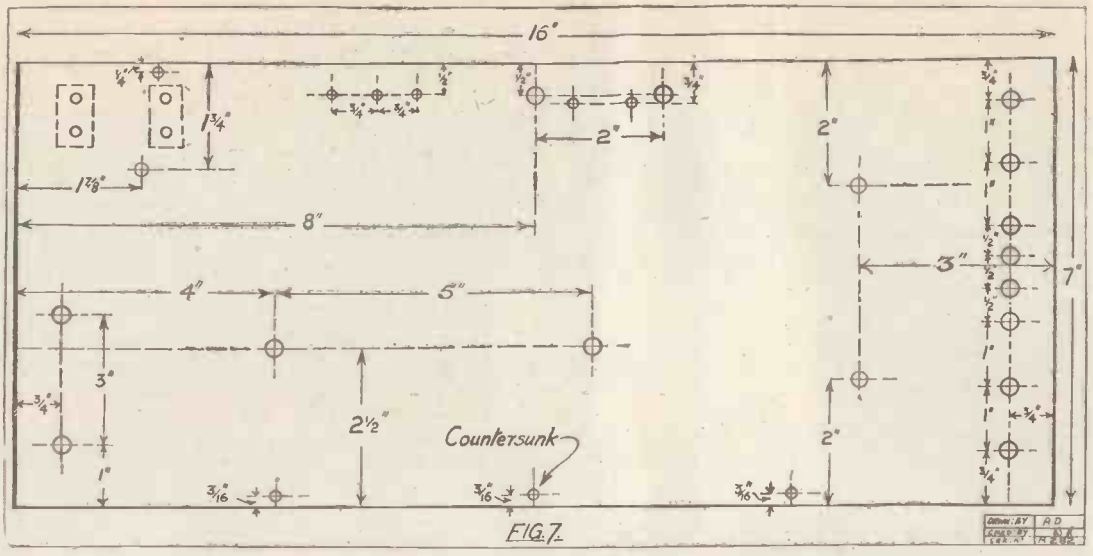
A 2-VALVE TRINADYNE RECEIVER.

(*Contined from page* 950.)

holes in the panel and soldered to their respective connections behind.

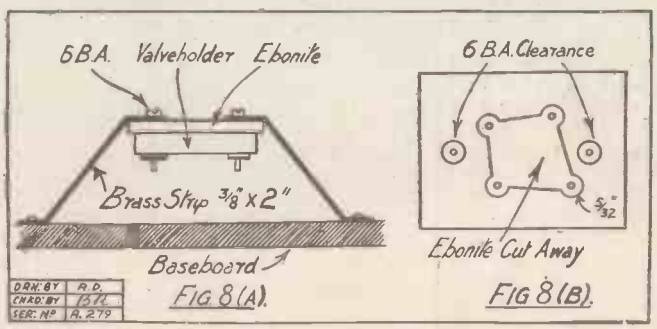
Before fixing the panel and baseboard in the cabinet, the receiver must be tested. When the constructor has satisfied himself that all connections are sound and correctly made, and that no wires are accidentally touching, then testing can be commenced.

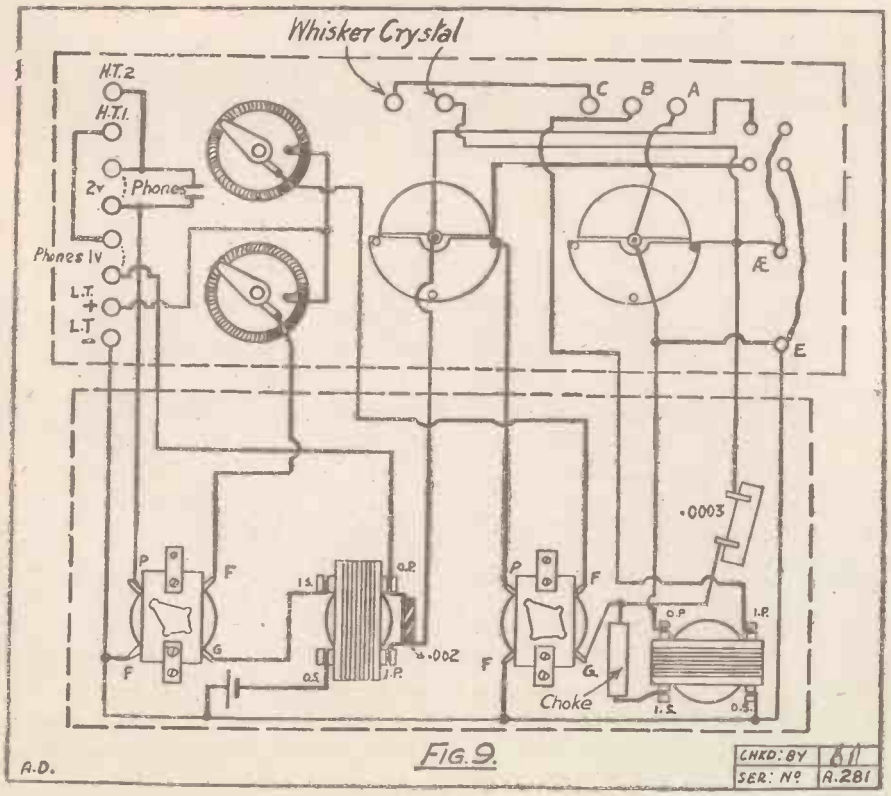
I would recommend the constructor to work through the three circuits available with this set, as it will test each part of the apparatus at the same time. Moreover, besides giving an idea of the relationship of each circuit, it will save much time looking for faults should anything be wrongly connected or any component be faulty. Also the experience in manipulation gained at each stage will make the operation of the complete set much easier than if this had been attempted at first.



Testing Out the Circuits.

The first circuit is the crystal receiver, for which connect up aerial and earth leads and insert a suitable coil, say No. 35 or 50, in the aerial coil socket and connect the 'phones to the terminals A and C. The only tuning control is the A.T.C., and this circuit is so simple that if the local station is not received properly, the fault should be readily traceable.





We now turn to the second circuit, the Trinadyne, for which disconnect the 'phones and connect B and C with a piece of wire. Place a valve in the first holder and insert a suitable coil, say No. 50 or 75, in the second (moving) socket. The high and low tension batteries are connected to their respective terminals L.T. —, L.T. + and H.T. + No. 1. The connection between L.T. + and H.T. — is made externally, while the 'phones are connected to the bottom pair of the four 'phone terminals.

A suitable anode voltage for L.F. amplification is plugged in for the first valve according to the type used, and the set tested for reaction effects. The anode coil is swung up a little distance from the aerial coil, and the anode tuning condenser rotated until the valve oscillates. It is unnecessary to tune this last condenser exactly, an approximate setting being all that is required to obtain ample reaction. The correct adjustment will be found by experiment, but it is best to tune the anode coil slightly below the wave-length being received. If the valve does not oscillate, try reversing the connections to the anode coil.

Easy to Handle.

When reaction is working properly, a station may be tuned in and the effect of varying the detector adjustment noted, remembering that removing the cat's-whisker from the crystal will allow the valve to oscillate if it was near the point of oscillation previously.

A little practice should be sufficient to master the operation of the receiver, which is, after all, quite simple to handle.

We now turn to the full two-valve circuit, for which disconnect the 'phones and short the terminals to which they were connected, placing the 'phone tags in the pair of terminals immediately above. Place a valve in the second holder and connect a lead

(*Continued on page* 999.)

Technical Notes

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

THE remarks which I made in these Notes a few weeks ago regarding the popularity of the variometer have brought quite a number of letters from readers, mostly in favour of the variometer. One of my correspondents, Mr. P. Harrap, of Wakefield, describes the "humble variometer" as "one of the few low-loss tuning devices."

He goes on to give an account of experiments with the POPULAR WIRELESS "Ultra-audion" circuit, in which he made certain modifications with improved results.

In the absence of a diagram I may describe the circuit as follows. The aerial is tuned by a variometer in series with a fixed condenser of ·0002 mfd. The aerial terminal of the variometer goes to the plate of the single valve and also on to the 'phones and H.T. battery in the usual way. The other terminal of the variometer that is between the variometer and the fixed aerial condenser goes through a fixed condenser (·0003) to the grid of the valve, and the grid leak (variable) connects the grid to the filament-earth. Plate voltage of 40 volts was used, and the tuning was found to be quite sufficiently sharp.

Many other correspondents state that they do not agree with the objection, so often urged against the variometer, that it gives too flat tuning.

Concerning Loud Speakers.

A new addition to my already enormous monthly budget of wireless journals has lately made its appearance in the shape of the "Irish Radio Review." This excellent journal is published at 179, Gt. Brunswick St., Dublin, and the price is 4d. per month.

All readers in Ireland would no doubt find it interesting to obtain a copy of this journal, which naturally deals especially with the interests of Irish Radio listeners.

One of the staff at work in the new broadcasting station W R N Y (N.Y.)

Visitors to the recent Exhibition will no doubt have heard the new Amplion Radiolux, but for the interest of those who have not, I may mention that I have lately had this instrument specially demonstrated to me by Messrs. Alfred Graham & Co., and I formed a very favourable opinion both of its design and of its performance. In outward appearance it resembles a "hornless" model, but in fact it is not hornless at all. The reproducer unit is of the well-known Amplion type, and this delivers the sound into a tapered tone-arm, after which it is reflected from special reflecting surfaces of hyperbolic and parabolic forms. Theories of sound reflection, especially from surfaces which are comparable in dimensions with the wave-length of the sound, are always difficult to apply and interpret. But the result is the thing; and the result from the Radiolux is very good.

I may say that I hold no brief for the Amplion or any other loud speaker, and am always pleased to praise a loud speaker if it is worthy. But the number of loud speakers on the market to which praise can be unstintingly given is unfortunately very small.

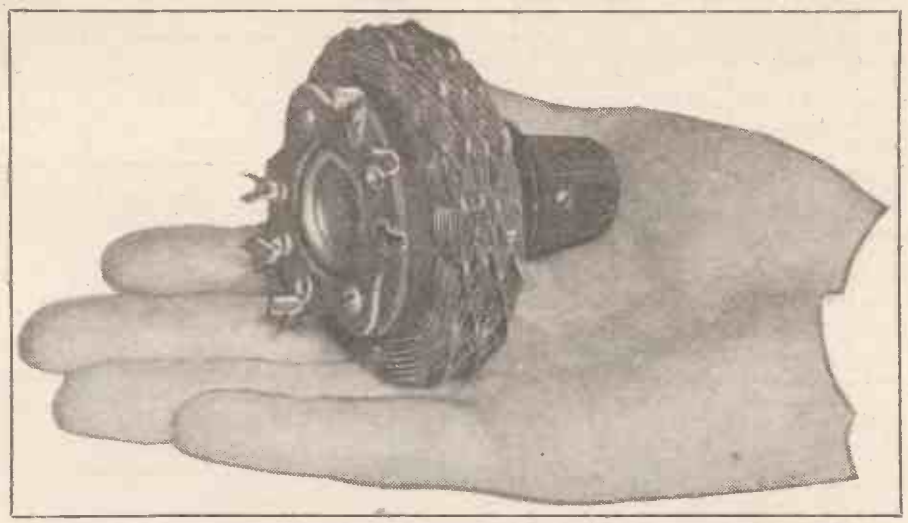
The Correct Connections.

Talking of loud speakers, it is very important to connect the terminals of the loud speaker (or of the headphones for that matter) the right way round. In the absence of a telephone transformer, there may be quite an appreciable steady current passing through the loud speaker windings, and if this is in the "right" direction, it helps to preserve the permanent magnetism of the magnets (which, unfortunately, is often far from permanent).

If the current flows in the "wrong" direction, it tends to accelerate the natural decay of the "permanent" magnetism, and so increase the rate of deterioration of the loud speaker. In most good instruments, the polarity of the terminals is indicated but, if not, a simple test is to adjust the diaphragm until it just "clicks" against the magnet, then just release it by reversing the adjusting screw. If now the speaker be connected up, the diaphragm should be pulled against the magnets when the current is in the right direction, but not if the current is in the wrong direction.

Effects of a "Free" Diaphragm.

The "cone" type of loud speaker has acquired a good deal of popularity and in some cases the cone is, in fact, merely a conical diaphragm.



The desire for compact radio components has resulted in this complete three-circuit tuner recently introduced in America.

I notice in the "Radio World" (New York) a description of a new type of loud speaker in which the principal claim made is that the cone, or rather the cones (for there are two of them, facing opposite ways), are supported only at the centres, the edges being entirely free.

It is claimed that, owing to this construction, the reproduction is uniform for practically the whole band of audio frequencies, whereas when the edges are clamped, the cone vibrates as an elastic diaphragm, with, of course, a definite natural frequency. According to the curves given by way of illustration, it appears that whereas the ordinary speaker gives a resonance region somewhere about the middle of the scale, the new-type gives a straight line parallel to the X-axis.

Principle Not Novel.

As I have not heard this instrument, I cannot speak as to the claims, whether they are substantiated or not. But as to the principle, I find it difficult to believe that this is in any way novel. The original Brown reed telephone had, in effect, a free cone, although the edges carried a very slight tissue membrane; this was found to be an advantage from the point of view of volume reproduction, since it prevented eddy escapes of air around the edges.

(*Continued on page* 1000.)

THE RADIO SOUNDS COMPETITION.

ANALYSIS OF LISTENERS' SOLUTIONS.

By THE EDITOR.

Below we publish a brief analysis of the Radio Sounds Competition recently broadcast by "P.W." and which attracted over fifty thousand competitors.

THE task of adjudicating the Radio Sounds Competition proved tremendous. A special staff was kept busy for several weeks dealing with the 50,000 odd entries for the competition. But now that the task has been completed, it has been possible to compile an analysis of the competition, which we undertook to provide for the B.B.C.

What Listeners Missed.

The first sound was meant to represent a "HORSE AND CARRIAGE." A large majority of the competitors mentioned the horse as starting, trotting, etc., but ignored any reference to the horse drawing a vehicle. It would seem that the sounds broadcast by the B.B.C. as representing the clatter of the horse's hoofs "got over" very well indeed, and quite a small percentage of the competitors failed to recognise this part of the sound. But the rumble of the carriage (although this sound was reported to have "got over" very clearly) was not diagnosed at all correctly.

Mr. A. Whitman, of the B.B.C. Dramatic Staff, who was responsible for the production of the actual "Sounds."

Sound No. 2 was "SQUIRTING SYPHON," and this apparently "got over" very well indeed. A few competitors mistook it for the sound of a tap being turned on and the water rushing out, but the number of listeners who made this mistake was negligible.

Sound No. 3 was a "TUBE LIFT." A study had been made of the sounds made by various types of lifts, and it was found that the tube lift made the most distinctive noise. Most competitors gave the answer "lift," others "lift starting" or "lift working," failing to specify "tube lift." This may seem a subtle point, but we warned competitors before the competition that these sounds were being arranged with the specific idea of assisting the B.B.C. to solve just such subtle problems, which they make use of in the broadcasting of plays, etc.

We suggest to those competitors who failed to distinguish the noise as specifically with that made by a tube lift, to listen to the noise of a tube lift the next time they travel underground. They will find that the "note" given out by a tube lift, whether descending or ascending, is peculiarly different from, say, a goods lift or a passenger lift in an office building.

Sound No. 4—"SOLDIERS FIXING BAYONETS." On the whole this sound seems to have been well understood, although many replies gave "soldiers drilling," "squads being drilled," etc., as answers. We may say here that two soldiers were specially engaged to broadcast the sound of fixing bayonets. In order to eliminate the noise of the grounding of the rifles on the floor, the men were made to stand on mats, so that the sound of their boots as they sprang to attention and the thud of the rifles on the floor were eliminated. Every effort was made to concentrate on the "click" of the bayonets being withdrawn from the sheaths and fixed with a military precision to the rifles. This was not an easy sound, and rhythm played a large part in its correct solution. But there is no doubt that a very large majority of competitors obtained a clear idea as to the meaning of the sound.

Sound No. 5 was a "TURNSTILE." One or two readers took this to be an anvil, but more than 85 per cent. of the competitors gave correct, or nearly correct, answers.

A "Tricky" One.

Sound No. 6 was a sound apparently easy, but it required close attention. The answer to it was "GUN FIRING AND FLYING SHELL." A very clever representation of the gun being fired was given, then the sound of the flying shell, while, in the distance, the dull explosion as it fell. In this case the majority of the replies ran as follows: "shell firing," "shells firing" and "shells exploding."

Although the general trend of the sound was understood, it is rather surprising (seeing how many ex-Service men listened in) that there were not a great number of correct solutions. It may be mentioned here that the advice of a gunnery officer was taken on this sound, and at one of the rehearsals he gave it as his opinion that the sound was as perfect as it could be, and that its meaning could hardly be mistaken.

Sound No. 7 was decidedly a tricky one, and was included in the list of sounds as a test of the powers of concentration and observation of listeners. The majority of competitors had no trouble in recognising the sound of crockery, but it appears that directly they had recognised the clatter of cups and saucers, etc., they failed to concentrate until the sound was finished. The correct answer to No. 7 was "LAYING A TABLE FOR SEVEN," and it will be remembered that in the spoken clue, counting up to seven was clearly emphasised by the lady who performed the necessary work in creating this sound with a number of pieces of crockery. Very few competitors indeed counted the sounds.

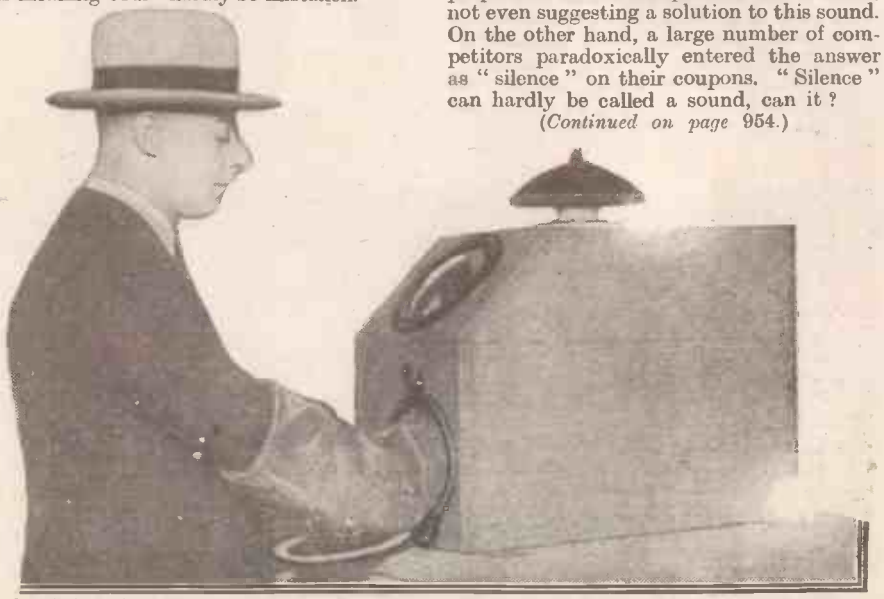
No. 8 was a "TELEPHONE CALL BOX," and this sound was missed by only a very few listeners indeed. The B.B.C. seem to have put it over with exceptional clarity, although one or two listeners complained that they did not hear the click of the pennies. But the vast majority had no trouble in recognising No. 8.

No. 9 was not an easy one. The answer was "CRACKLING OF WOOD FIRE," and yet, curiously enough, practically all the replies were O.K., although expressed in various ways. The various critics who heard the rehearsal of these sounds, prior to their actual broadcast, were almost unanimous in their opinion that very few competitors indeed would recognise this sound. It was a sound exceedingly difficult to express in the studio, and several experiments and rehearsals were carried out before the advisory board of critics were satisfied that it was a legitimate sound to include in the competition. The B.B.C. will doubtless be interested to know that the methods they adopted to reproduce this sound appear to have been very successful.

The "Silent" Sound.

Sound No. 10 was a "KISS." This would appear to have "got over" badly, at any rate at the first time. A large proportion of the competitors left a blank, not even suggesting a solution to this sound. On the other hand, a large number of competitors paradoxically entered the answer as "silence" on their coupons. "Silence" can hardly be called a sound, can it?

(*Continued on page* 954.)



A watertight lifeboat wireless set for transmission or reception on view at a recent exhibition in London.

THE RADIO SOUNDS COMPETITION.

(*Continued from page 953.*)

Sound No. 11 was "TEARING CLOTH OR CALICO." This sound "got over" excellently, most of the lady competitors recognising the distinctive sound of calico being torn, while a good many other competitors were slightly off the mark in mentioning other materials, such as silk, linen, etc. Calico was chosen after many tests, because it gave a distinct ripping sound.

Sound No. 12 was a "CASH REGISTER," and we have no comments to make on this. It would appear that out of the 50,000 odd competitors who went in for the competition, very few failed to give the correct solution to this sound.

Sound No. 13 was "LIGHTING A CIGARETTE," and since the publication of this answer we have had one or two letters from competitors stating that cigarettes do not make sounds! Sound No. 13 was very carefully rehearsed, and, if you will remember, a very significant spoken clue was also given with it.

How it Was Done.

The actual sound was caused this way: Two gentlemen stood in front of the microphone, and, while speaking the clue, one took out a cigarette case, handed a cigarette to his companion, took one himself, tapped it in the usual manner on the case—the rhythm of this sound alone was very significant—snapped the case and put it back in his pocket, took out a box of matches, rattled them as he extracted one match, struck it very close to the microphone, handed it over to his companion (who made distinct puffing sounds as he drew at his cigarette), lit his own cigarette, puffed, and then extinguished the match.

Special critics listening to this sound reported that, although the puffing was rather indistinct, the other part of the procedure was very clearly broadcast, and it would appear, from analysis of the answers to this sound, that very nearly 40,000 listeners gave correct solutions. We think this will interest the B.B.C. in view of the fact that they themselves were somewhat dubious as to the possibility of the sound being recognised.

Sound No. 14 was "WALKING ON SHINGLE BEACH." A very curious thing happened when this sound was being broadcast. The whole clue to the sound was the word "shingle," and the gentleman in charge of the production of the sounds had to speak a clue.

An Amusing Slip.

No doubt in the rush of the excitement of broadcasting the sounds his memory failed him, and he distinctly mentioned the word "shingle" by saying, "By jove, this shingle is hard!"

This caused a good deal of amusement in the studio, and everybody there was resigned to the fact that that sound would be identified by nearly every listener. But, strange to say, the correct answers were very few. Some confusion was apparently caused by the secondary sound of the sea waves receding on the shingle, causing many competitors to state "boat being hauled up the beach," etc. On the whole, this sound was not a great success, and if the B.B.C. are going to use it in the future, a good deal of experiment will be necessary before it can be legitimately included in their repertoire of sounds.

Sound No. 15, "HAMMERING IN A NAIL TO HANG PICTURE," "got over" very well indeed, and we can say without qualification that, judging by the number of correct solutions, the sound was very good indeed and its purpose quite clearly comprehended by the majority.

The Hardest of All?

Sound No. 16 was, in the opinion of many critics, the hardest of the lot. The correct answer was "MOUSE CAUGHT IN A TRAP." This sound was rehearsed at least a dozen times before it was broadcast.

The majority of the replies suggested "cruelty to animals," but there were a limited number of absolutely correct solutions.

Sound No. 17 was "WHITEWASHING (OR DISTEMPERING)," and on the whole, we can report that this difficult sound "got over" very well; but, if it is to be used in connection with broadcast plays, etc., the clue will have to be more direct than we could permit when broadcasting the sound for competition purposes.

Sound No. 18 was "RAILWAY STATION AND MILK CANS." Some people have written stating that railway stations do not make noises, but that is rather splitting hairs. Nobody will deny that there are certain sounds distinctly peculiar to railway stations. Some secondary sounds led to confusion or oversight in a good many replies. Practically everyone of the 50,000 odd competitors mentioned the words "railway station" or "train entering station," etc., but the milk-cans seem to have been overlooked.

Sound No. 19, "STROPPING A RAZOR," was clearly understood by the great majority of the competitors.

Sound No. 20, a "SEWING-MACHINE," also "got over" very well indeed, although replies such as "a model engine at work," "testing motor-car," etc., were fairly plentiful.

On the whole the B.B.C. technicians and those responsible for the effects, etc., are to be congratulated on the faithfulness with which they reproduced these sounds in the studio. There is no doubt that this particular branch of broadcasting is one which offers a very large field for experiment. It must be remembered that, when we broadcast the twenty sounds in the form of a competition, it was not possible (otherwise there would have been no competition to speak of) to give very direct clues. But we feel that, from a close perusal of the results sent in by competitors, practically all the above sounds could be used successfully in the ordinary course of events by the B.B.C. For every-day use, of course, the B.B.C. could give far more direct clues than was possible in the competition.

The above information has been sent to the B.B.C., and we wish to take this opportunity of thanking them very much indeed for their courtesy in allowing us to arrange and organise what has undoubtedly proved to be an interesting experiment.

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENT.

Difficult to Identify.

IN most continental countries loud complaints are being made that announcers do not make it sufficiently clear from what station they are speaking.

The rule appears to be to announce the name of the station at the commencement of the programme, and then to make no subsequent reference to it. The only exceptions are Toulouse, Oslo, Rome, and Munster, where the announcers state the station's name with every single announcement throughout the programme.

Eiffel Tower Wave Length Changes.

The Eiffel Tower station, as from the beginning of this month, made a change in its wave-length for certain transmissions.

The concerts that take take place daily from 7.30 to 9 p.m. are now broadcast on a wave-length of 2,740 metres, to avoid certain interferences reported by listeners.

The announcements and news items broadcast at 6 p.m. continue on the old wave-length of 2,650 metres.

An Icelandic Station.

Iceland's first radio station will soon be in operation, and will be situated on a hill near Reykjavik. It will employ a power of 1 kilowatt.

It will not transmit many programmes of its own, but will relay those of several European stations. It is probable that various announcements, news items, etc., will be made in Icelandic.

It is calculated that the station will be of very great service to the international fleets of fishing vessels cruising in Icelandic waters, by warning them of the approach of fog, storms, drift ice and shoals of fish.

Another Radio Danger!

It will be recollected that a few weeks ago the King of Siam deposed and divorced his queen as being "unfitted for her royal duties," and took onto himself a new queen from whom, with eminently satisfactory speed, he has received the present of an heir to the throne.

The story goes that the poor deposed queen sought to enliven the dullness of court life by means of radio. She had an excellent receiver, which enabled her to pick up quite a number of stations.

The Siamese, however, notwithstanding the fact that their monarch is enlightened, having been educated in Europe, looked upon this practice of listening to mysterious sounds from the skies with deep suspicion, and attributed her failure to provide her royal husband with an heir to her nightly consorting with these invisible spirits from the ether.

The new queen-consort, it is stated, has been enjoined on no account to have anything to do with radio, and the only set in the palace has been packed up and taken away by the deposed queen.

A NEW 'DX' 2 VALVER

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

THE "Ultra-audion" circuit is widely popular, both here and in America, as perhaps the simplest, cheapest and most effective one-valver hitherto evolved. One of its greatest charms is that it combines great sensitivity with a degree of selectivity usually unobtainable with the ordinary direct-coupled magnetic reaction circuit. But the "Ultra-audion" is a powerful oscillator, and requires a certain amount of care in handling if one is to avoid becoming an "ether hog."

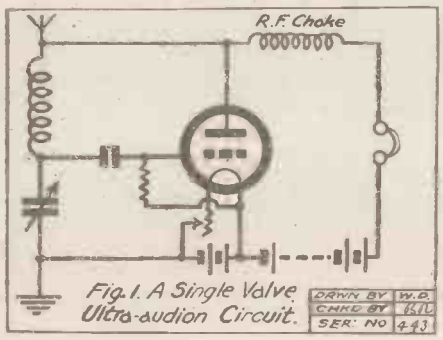


Fig. 1. A Single Valve Ultra-audion Circuit.

Efficient Reaction Control.

The present writer, who has made a special study of this circuit, has already discussed various methods of stabilising it in the pages of POPULAR WIRELESS (see "Controlling the Ultra-audion," POPULAR WIRELESS No. 140). The simplest, and that most generally relied on in America, is the correct adjustment of filament temperature by means of a vernier rheostat. Fine adjustment of the H.T. voltage is another good method, though not so easy of attainment with the ordinary type of H.T. battery. In the set about to be described these two methods are combined, and an excellent DX two-valver results.

In the single-valve circuit of Fig. 1, using a Marconi - Osram D.E.R. valve, the writer found that best results were obtained with a fairly bright filament and about 18 volts on the anode. This low anode voltage enables one to add a stage of resistance coupled L.F. without the necessity of an unduly large H.T. battery. A total of 60 volts has been found amply sufficient for a two-valver, both valves being of the type named. The original circuit of this set is shown in Fig. 2. As the impedance of the valve is about 35,000 ohms the necessary voltage on the first anode, when a 50,000 ohm (Dubilier) anode resistance is used, will be about 43 volts, to correspond with the 18 volts previously mentioned.

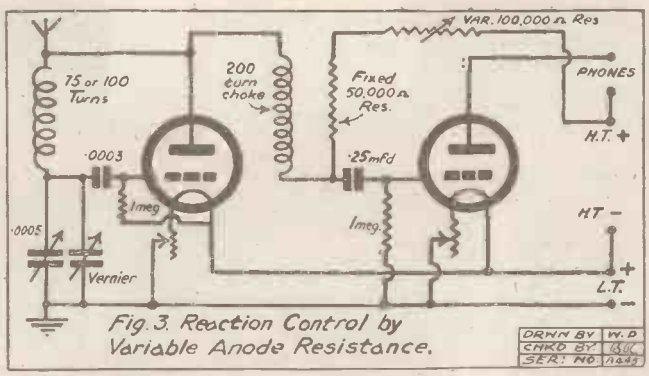


Fig. 3. Reaction Control by Variable Anode Resistance.

The H.T. battery in use having taps at 42 and 48 volts, one or other of these was used with good results, but the large jump of 6 volts did not allow of fine adjustment here, practically all control being on the filament rheostat. By adopting the circuit of Fig. 3, however, the necessity for a tapped battery was overcome and a very efficient control of reaction obtained. This is one of the simplest and most effective DX two-valvers the writer has ever used. And, while not primarily designed as a "volume-producer," it is capable, on a fairly good *indoor* aerial, of working a small loud speaker at 40 miles from 2 L O.

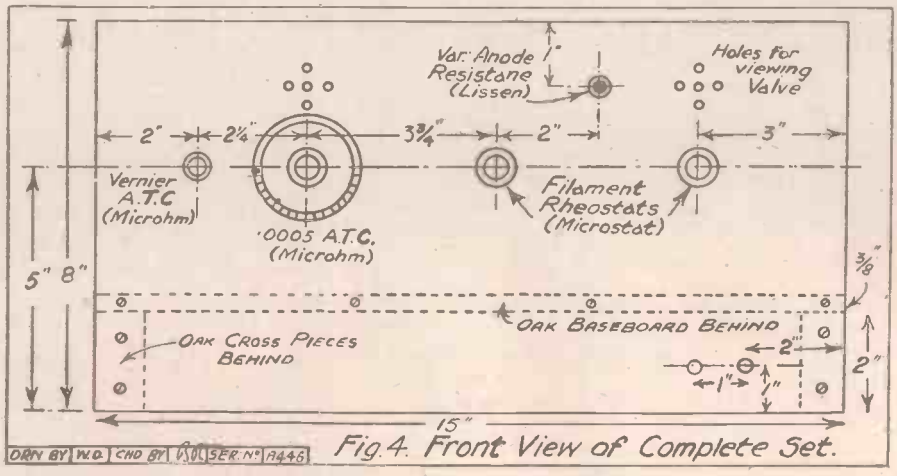


Fig. 4. Front View of Complete Set.

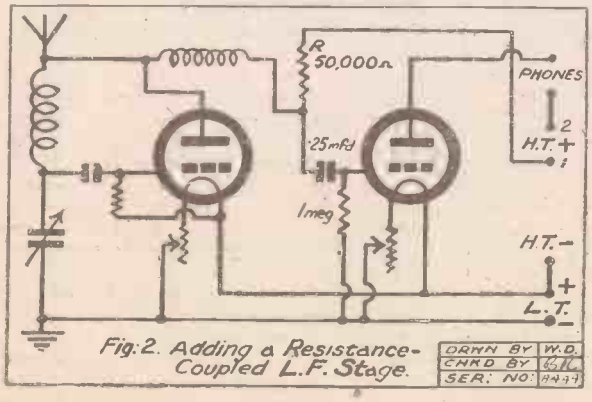


Fig. 2. Adding a Resistance-Coupled L.F. Stage.

Constructional Details.

These are shown in Figs. 4 and 5. The set is assembled on a modified "American" plan, with vertical front panel and on an oak baseboard, supported by cross pieces at either end. The writer's own set, being an experimental one, is quite open, but, of course, the whole could easily be slid, drawer-fashion, into a suitable cabinet, and a totally enclosed receiver of

(*Continued on page* 956.)

A NEW DX 2-VALVER.

(*Continued from page 955.*)

good appearance would then result. If the baseboard is of sufficiently seasoned hardwood the terminals may be mounted directly on it (as in the writer's set), but otherwise ebonite bushes or strips should be used. The components specified are those used by the writer, but other makes could doubtless be substituted.

Operating the Circuit.

The principle of the variable anode resistance to control reaction can be supplied to a single-valver if desired. A method of doing this is shown in Fig. 6. The ·25 Mansbridge condenser is necessary here to prevent shorting of the D.C. through the 'phones, while by-passing the L.F. impulses. This arrangement has the further merit of obviating the passage of any D.C. through the 'phones, with consequent increased safety to their windings.

The method of operation of either the one or the two-valver is the same.

With the detector filament fairly bright (but not at full brilliancy) and the variable anode resistance about half-way, search carefully on the A.T.C. The tuning being very sharp it is easy to miss even a near-by station. So rotate the condenser very slowly.

If telephony is heard, adjust the vernier A.T.C. to get loudest signals. Then, very carefully, decrease the value of anode resistance, till the set is just short of the oscillating point. If a carrier wave is picked up, dull the filament at once. If this leads to a "plop" and the sudden cessation of oscillation, the H.T. is probably too high. Increase anode resistance and try again. When speech comes in on the filament adjustment, tune in with the vernier A.T.C., keeping off the oscillating point by adjusting the filament rheostat. If there is difficulty in doing this, increase the anode resistance.

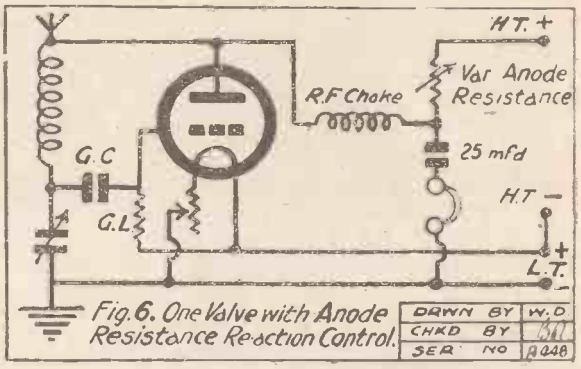
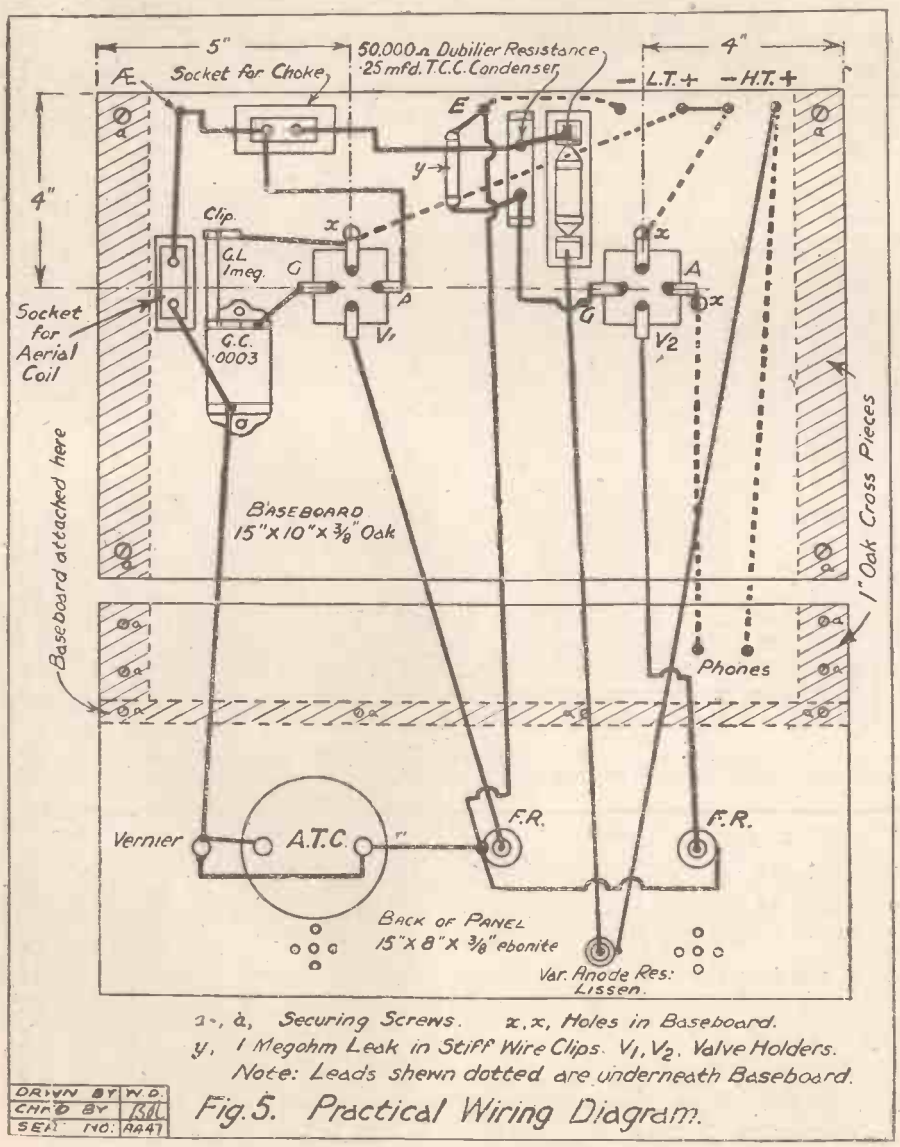


Fig. 6. One Valve with Anode Resistance Reaction Control.

Finally, when best results have been obtained with the other controls, bring signals up to maximum as before, by a careful *decrease* of this resistance, the general principle being always to use this adjustment as the final one, since it has little or no effect on the aerial tuning.

Final Hints.

If neither speech nor a carrier wave can be picked up at the first attempt, decrease the anode resistance and try again. If results are not satisfactory with minimum anode resistance, it means that you have too low a total H.T. voltage or too small a coil in circuit; most probably the latter. It must always be remembered that, with the series condenser of the "Ultra-audion," a considerably larger coil will be required than in parallel tuned circuits. On the other hand, too large a coil (as well as too much H.T.) will keep the set in constant oscillation and make it impossible to resolve the carrier waves.



a, a, Securing Screws. x, x, Holes in Baseboard.
y, 1 Megohm Leak in Stiff Wire Clips. V1, V2, Valve Holders.
Note: Leads shewn dotted are underneath Baseboard.

DRWN BY W.D. CHKD BY SER NO. AA47

Fig. 5. Practical Wiring Diagram.

A NOVEL DETECTOR.

THIS simple fixed detector, which can easily be constructed from a few odds and ends at a small cost, will appeal to those who like making their own components.

The container can either be a glass tube, such as used for ordinary detectors, or a piece of ebonite tube, ½ in. internal diameter by 1½ in. long, into which first wedge a good piece of crystal with tin foil.

Next secure two small corks, such as used in medicine bottles, and these should be cut down to ⅜ in. in length, and drill a hole in the centre of each to take a 6 B.A. screw, which is best done with a hot knitting needle.

Inserting the Corks.

After inserting the 6 B.A. screws, secure with nut and washer, and solder a piece of flex to each end, and, having first removed the insulation, and spreading out the flex in the form of a brush, the corks should now be inserted in each end of the container.

Now cut two spring clips from a piece of spring brass, and drill two holes in each to take the heads of the 6 B.A. screws and the two terminals for securing the detector to the 3 x 1 x ¼ in. ebonite panel.

The detector may now be sprung into position between the clips, and adjusted by rotating one of the cork end pieces, which, once adjusted, should remain so for some time.

Dance to it this Christmas!

ARE you in a position to take full advantage of the lighter Broadcast Programmes this Christmas? Can you get sufficient volume from your Receiver to enable you and your friends to dance to the Radio Music? If not, an A.J.S. Amplifier will make all the difference, and will bring to your home the atmosphere and the thrill from the crowded ball-rooms of the country's finest hotels.

An A.J.S. One- or Two-Valve Amplifier may be added to any Crystal or Valve Receiver that normally gives loud head-phone reception.

One-Valve Amplifier -	£5 2 6
Two-Valve Amplifier -	£8 2 6
Concert Amplifier -	£15 19 0

Our publication No. 119 fully describes these Amplifiers. Shall we send you a copy? Ask also for particulars of the A.J.S. Loud Speakers.

STANDARD LOUD SPEAKERS.
Height 24 inches.
In Wood—
Mahogany or Oak Flares £4 15 0
In Metal—
Black Matt or Stove Finish £4 0 0
Grained, various wood finishes £4 5 0

JUNIOR LOUD SPEAKERS.
In metal, Height 19-in.
Black Horn £1 15 0
Grained wood finish £1 17 6
Cabinet Model in Mahogany £4 15 0
Pedestal Model in Mahogany or Rosewood £22 10 0

Hear these Amplifiers and Loud Speakers in our Showrooms in Glasgow and London.

A·J·S

A. J. STEVENS & CO. (1914), LTD.,
RADIO BRANCH, WOLVERHAMPTON.
Telephone: 1748 (7 lines). *Telegrams: "Reception, Wolverhampton."*

London Showrooms: 122/24, Charing Cross Rd. London, W.C.2
Telephone: Regent 7161–2. *Telegrams: "Ajayessco, Westcent, London."*

Glasgow Showrooms: 240-250, Great Western Rd., Glasgow.
Telephone: Douglas 3449. *Telegrams: "Reception, Glasgow."*

A. J. STEVENS & CO. (1914), LTD.,
RADIO BRANCH, WOLVERHAMPTON.

Please send publications Nos. 119 and 118.

Name.....

Address.....

P.W. 19/12/25. .....

Issued by the Publicity Dept., A.J.S.

Loud Speaking Equipment

Standard

FORMERLY

Western Electric

WE are offering a complete Western Electric 5 valve Receiving Set complete with Loud Speaker for **£27 17 0.**

This set will meet the most critical demands and gives excellent loud-speaker results from both home and foreign stations. Units may be purchased separately if desired.

Write for our booklet No. W 546 for details of Western Electric Valves, Reeiving Sets, Amplifiers, Loud Speakers, and Igranic accessories.

Standard Telephones and Cables Limited

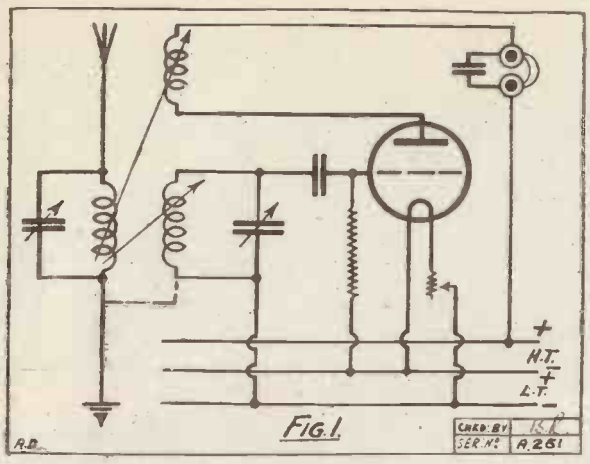
Connaught House, Aldwych, London, W.C.2

'Phone : Central 7345 (10 *lines*).

Works : NORTH WOOLWICH, NEW SOUTHGATE and HENDON.

Branches: Glasgow, Leeds, Birmingham, Manchester, Newcastle, Cardiff, Southampton, Liverpool & Dublin.

Complete for £27-17-0.



HARD CIRCUITS MADE EASY.

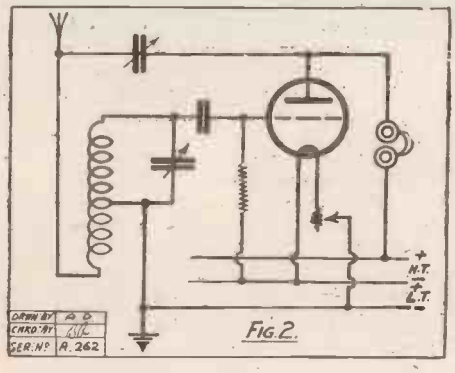
By C. E. FIELD, B.Sc.
(*Staff Consultant*).

No. II. REINARTZ CIRCUITS.

THE Reinartz circuit was introduced in America in 1921 by John L. Reinartz.

Although it has not achieved a great degree of popularity in this country, it nevertheless possesses many distinct advantages over conventional circuits for the reception of short-wave broadcasting, chief among which is its remarkable selectivity.

There are many selective circuits available for the amateur, but most of these depend for their success upon a multiplicity of tuned circuits and variable couplings, and are consequently extremely difficult to control and critical in operation. The



various Reinartz circuits are very easily handled, especially with regard to the control of reaction.

At first sight, a diagram of a Reinartz circuit looks all wrong. The aerial and grid of the first valve are connected to *opposite* ends of a coil, and the reaction coil seems to be in the wrong place. The arrangement becomes quite simple, however, if we develop it from an ordinary loose-coupled tuning circuit.

Capacity Reaction.

In Fig. 1 is shown a one-valve circuit in which a loose-coupled aerial tuning system is employed. Since the bottom end of the aerial coil is earthed, and that of the secondary is taken to the low-tension battery, which is not deliberately insulated from earth, it is common practice to join the ends of the two coils, as shown.

It will be seen that a reaction coil, connected in series with the telephones, is coupled to the aerial coil, in order to reinforce the aerial oscillations by transferring some of the amplified output from the valve back into the grid circuit.

Now, there is another method by which energy can be poured out of one circuit into another, and that is by means of a condenser. Thus if, in Fig. 1, we connected a small condenser between the plate of the valve and the aerial, the latter would receive additional impulses through the condenser from the valve output. Obviously, the condenser could not be connected in series with the headphones in the same way as the reaction coil, but would have to be joined so that the output from the valve divided, part going to the 'phones and part back to the aerial.

An H.F. Choke Necessary.

This is shown carried out in Fig. 2, which otherwise is identical with the Fig. 1 circuit except that the coils are shown end to end instead of side by side, and there is no tuning condenser in parallel with the aerial coil. It will be noticed, also, that the telephone bypass condenser has been omitted, for otherwise very little current would pass through the reaction condenser to the aerial, when there was a much easier path for it straight to the high-tension battery.

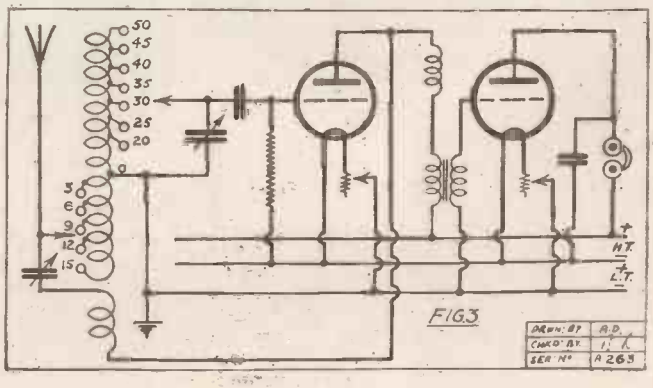
The circuit shown in Fig. 2 is a Reinartz circuit in its fundamental form, and its action may be briefly summarised as follows. Impulses in the aerial produce currents in the bottom portion of the coil, which is aperiodic and consists of a few turns only. Oscillations are induced in the upper portion, which is the tuned grid coil, and applied to the grid of the detecting valve in the usual way. Part of the output from the valve is fed back into the aerial through a variable condenser, by which the degree of regeneration may be regulated.

We can elaborate this circuit in many ways.

It may be found that sufficient reaction cannot be obtained by the condenser alone, and so a reaction coil can be included in addition. This is inserted between the valve plate and the reaction condenser, and coupled to the aerial portion of the main coil.

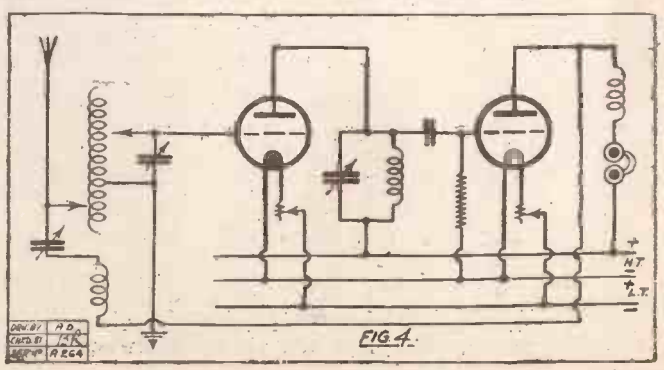
Another factor which may affect the amount of regeneration obtainable is the self-capacity of the telephone windings. If this is high, very little high-frequency energy will pass through to the aerial, especially when a reaction coil is employed. It is then advisable to connect a radio-frequency choke-coil between the valve plate and the telephones. By substituting the primary winding of a low-frequency transformer for the telephones, a note-magnifier can be added.

In Fig. 3 is shown a Reinartz circuit incorporating a reaction coil and condenser, a high-frequency choke, and a note-magnifier. The following values will be found suitable for use in this circuit.



Closed circuit tuning condenser and reaction condenser, each ·0005 mfd.; grid coil, 50 turns with tappings every 5 turns from 20 to 50; aerial coil, 15 turns with 5 tappings; reaction coil, 2 layers of 20 turns. The grid and aerial coils are one continuous winding, the reaction coil being wound in the same direction on the same former. The latter should be a 3-in. diameter tube, and the wire employed may be No. 22 S.W.G.

Continued on page 962.)



TRACING HAND-CAPACITY TROUBLES.

FROM A CORRESPONDENT.

NOTHING is more annoying than when trying to adjust a set accurately, every movement of the hand from the dials causes the set to howl, or to detune and lose the desired distant station. Hand-capacity gets its name from the fact that it is generally most noticeable when the hands are placed upon the tuning controls, but in extreme cases not only the hands but any part of the body will cause the trouble. Every movement of the person wearing the 'phones seems to cause the set to misbehave, and the difficulty of tuning such a set has to be experienced to be believed.

What is the cause of the trouble? Obviously it is a tuning-trouble, pure and simple, for signals are not impaired in any way, apart from the fact that the set appears to be fitted with invisible verniers. Such vagaries are excusable in an Armstrong-super, but the ordinary straight set should be free from faults of this kind if the wiring of the tuned circuits is watched carefully during construction.

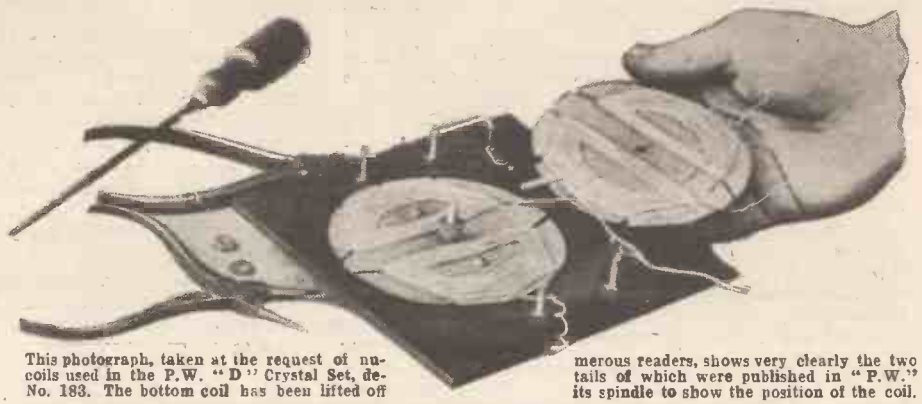
Two Distinct Halves.

The secret of avoiding hand-capacity is to keep all the metal, near which the hands must move, *at earth potential*. A simple experiment will make this clear. Try closing your hand slowly round first the earth-wire and then the aerial-wire. The latter will cause the tuning to alter, whilst the former will not affect it. The fact of the matter is that whilst standing upon the ground your body is earthed, just like one side of a parallel-tuning condenser. In effect your hand is an extra plate of the condenser, and if you move it towards anything directly connected to the opposite plates (even with the air between), you will alter tuning just as effectively as a vernier-plate upon that condenser would alter it.

Once this is realised you can look at your set (or at a circuit diagram), and divide it mentally into two distinct halves. On the one hand is the earth-potential side, which includes all the wires which are joined directly to earth without passing through a tuned circuit. Normally this will consist of the earth-lead itself and half the plates in the aerial tuning condenser, and all the filament wiring. The L.T. battery is not always connected direct to earth, but it generally stands upon the floor, and in any case there is no tuned circuit between it and earth, so it, too, can safely be considered as being at earth potential. Similarly all the tuned H.F. circuits which are connected to H.T. may be regarded as "safe" upon the H.T. – side, and therefore that half of the tuning-condenser which is connected direct to H.T. + should be reckoned as being at earth potential.

All the danger lies upon the opposite side of the tuned circuits. This is the grid-potential half of the set, and all the wiring there should be mentally marked as dangerous. In the first-valve circuit, all the aerial wiring and the grid lead itself are full of possible trouble. If it is an H.F. valve you can take the other path through the batteries, and remain quite safe until you start to cross the tuned H.F. circuit. Here the trouble begins, for only one side of the tuned circuit (that towards H.T. +) is safe. The other side, carrying the connections to the plate of the first valve and to the grid of the second, should all be kept as far away from the hands as possible. Capacity-effects will easily penetrate through insulating materials, so keep the plate-to-grid wiring right away from the front (or in the case of a flat-panel set, from the top) of the receiver.

Generally the unwanted capacity is more troublesome at the condenser itself than in the wiring, owing to the larger surface. The remedy is reversal of the connections, which is often sufficient to cure all tendency to de-tune. A large fixed condenser across the H.T. will often assist matters, and extension-leads which enable the hands to remain a long way from the set whilst adjusting are a great asset. There is one other cure which is absolutely effective, and that is to place an earthed metal screen or "shield" round the whole set, or the parts affected, so that no movement outside the receiver can vary the capacity of the wiring to earth.



This photograph, taken at the request of numerous readers, shows very clearly the two coils used in the P.W. "D" Crystal Set, details of which were published in "P.W." No. 183. The bottom coil has been lifted off its spindle to show the position of the coil.

HARD CIRCUITS MADE EASY.

(*Continued from page* 961.)

The high-frequency choke may be a three or four hundred turn duolateral coil, wound as openly as possible. The Reinartz tuning system can be employed with a stage of high-frequency amplification quite satisfactorily.

In this case, no grid leak and condenser are required for the first valve, which is the high-frequency amplifier. This valve can be coupled to the detector by tuned-anode coupling in the usual way, and a plug-in coil can be used if desired. The reaction coil and condenser are joined between the plate of the detecting valve and the aerial, a high-frequency choke being inserted before the telephones.

This circuit, which gives very good results on broadcast wave-lengths, is shown in Fig. 4.

Aerial and Grid Coils.

Although the introduction of a reaction coil in the circuits described gives an improvement upon the results obtained with a condenser alone, it can be rendered unnecessary by reducing the resistance of the aerial tuning circuit to a minimum. The effect of reaction is to prolong the trains of waves in the grid circuit into which it is introduced. Now, what causes wave-trains to die away more than anything else is the presence of resistance, so that the introduction of reaction may be regarded as a reduction of resistance. Hence, by keeping the resistance of the aerial circuit down, we can reduce the amount of reaction required.

In order to do this, the aerial and grid coils should be wound with No. 18 or even No. 16 S.W.G. wire, in which case it will be found that a sufficient degree of regeneration will be obtainable by the use of the condenser alone, although it may be necessary to introduce more tappings to the coils in order to obtain a finer adjustment of the aerial tuning.

Suitable for Telephony.

A further improvement consists in winding the two coils on one basket-coil former. In order to carry this out, a former should be cut out of a round piece of cardboard six inches in diameter, in which nine slots are cut radially, the inner ends lying on a $1\frac{1}{4}$-in. diameter circle. (Nine equal divisions can be obtained by setting a pair of compasses or dividers at $3\frac{1}{16}$ in., and stepping that length round the circumference.) Two windings of No. 20 S.W.G. wire are then put on together until fifteen turns have been wound. The end of one is then brought out, and the other winding continued to a total of fifty turns.

Connections are then made as follows. The inner end of the fifteen turns, and the outer end of the fifty turns, go to aerial and grid respectively, the other two ends being joined to the earthed low-tension terminal.

Such a coil gives tight coupling between the aerial and grid sections, and is very efficient. No reaction coil will be found necessary, and a circuit utilising one of these coils, with the addition of a note-magnifier, is probably the simplest and most efficient of the Reinartz circuits.

Finally, it has frequently been stated that Reinartz receivers are more suitable for C.W. than for telephony reception. Certainly they require moderately expert handling, but given this they are capable of efficiently performing both duties.

A VISION OF "P.O.B."

By HIGHAM BURLAC.

The cryptic letters "P.O.B." stand for "Post Office Broadcasting." We say no more—but leave you to read our contributor's visionary forecast.

FIRST a vision of the dictionary. Looking under P, we find: POB. (*pŏbb*); Italian, *pobo*; Ger., *pobit*. *V.t.* To make a restrained noise. See *As You Like It*. "Pob me no pob, thou shingled parrot," Also *The Way of a Seagull* (Dell). "The unmistakable pob of the sheiks fell upon her startled ear."

Colloquial: Used to express Post Office Broadcasting.

Whilst walking along the Embankment, the sight of Somerset House reminded me that I wanted a sixpenny postal order with which to pay my income tax. (*Yes, I said it was a Vision*). So, naturally, I stepped into the nearest Post Office, which was at 2, Savoy Hill, where broadcasting used to be done by the B.B.C.

"I Was Not Ever Thus!"

Except for seven Highlanders filling fountain-pens, no soul was to be seen. I observed a push-button marked "Supt," and this I pushed. After five minutes, there came to the counter a civil servant who had an unusual air of respectability, a touch of "I was not ever thus," about him. He inquired my business.

"Good Heavens!" I exclaimed. "Why! If it isn't old Freddy. What in the name of——"

He stopped me with a gesture. "Don't," he said. "Don't say it. I *am* he who was Chief Unk. of all Uncles. They gave me this job when broadcasting was abolished by the Committee. When I say *broadcasting*—you know what I mean. Say! Do you ever listen in?"

"Not guilty," I replied.

"Hush," said Freddy. "Don't speak so loudly; it's a crime! Not listening, I mean. Well, you ought to hear the Male Learners' Voice Choir. And the Sorters' String Quartette. It's a bad dream."

"Is that kind of thing done here?" I asked. "Oh, I want a postal order, please!"

A "Second Division Uncle."

He seized a telephone. "Official? Yes, Blank speaking. Stop the 'noise of horses' hoofs' and send her down. Yes! A customer. You see," he said, turning to me, "the lady clerk has to take a hand at Noises Off. She'll be down in a jiffy. We are doing 'Dick Turpin' to-night, hence, I expect, you'll find the lady fractious. She has to clash the coconut shells on the slate all the way to York."

I secured my P.O., and the lady flew upstairs. "Would you like to look over the old place?" said Freddy. "It's a revelation of the official bacillus." Just then, a perspiring biped arrived on a red-painted bicycle. "What on earth——" I began.

"You may well ask," said Freddy. "It's a Second Division Uncle coming on duty. He passed an exam. in Elem. Geog.; Eng. Gram.; Precis and Cross Tots. He comes from Shadwell. His name is Lubbs. My friend, I am unwell."

Presently, he recovered his composure and led me upstairs, past rows of red-painted fire-buckets and notice-boards. Decrepit postmen tottered about, and here and there I observed a comatose comptroller.

A Sample Programme.

"Here's a sample programme," said Freddy. "Sanctioned by a Standing Committee; drafted by the Clerk who used to write the preface to the P.O. Guide; passed by the Censor; sold by the Stationery Office. It's a scream."

It was. I reproduce it here.

P
XQ 14/60/HF. O.H.M.S. Dept. C.9
(P.O.) W/T. Schedule. Oct. 9th.

(*Evening Service*)

6.0 to 7.0 p.m.—(See below).*

7.0 to 7.15 p.m.—No service. (See Regn. CXII. *Repairs.*)

7.15 to 7.30 p.m.—Rugby Tests. (N.B. Any member of the public who tunes Rugby out should fill up Form E.)

7.30 to 8.0 p.m.—Discourse. (Comptroller of P.O.B.) Subject: Stamp Machine, Automatic, Evolution of.

8.0 to 9.0 p.m.—The (P.O.) Mark III (P.O. pattern) Band. (*Second-class, temporary, auxiliary.*) (For schedule of items, see Form H, obtainable weekly from H.M. Stationery Office.)

9.0 to 9.10 p.m. (sharp)—Selected Item, by Henry, Jno. (To be selected by Chief Auditor (P.O.)

9.10 to 9.30 p.m.—"Stories of the Post Office," No. 374. "The meaning of Form Z."

9.30 to 10.0 p.m.—Discussion between the (P.O.) Comptroller and the Controller (P.O.) of (P.O.) Pillarboxes. Subject: "Standardised Slits or Local Option?"

G.M.T.

DOXOLOGY.

*Juveniles only. For Schedule, see P.O. Guide, p. 9937.

By the time I had regained my senses, we had arrived at the Salon or "Instrument Room," as the P.O. called it. The band was playing "In a P.O. Workshop." All the instruments were painted Pillar-box red, and the bandsmen were clad like postmen. Just as they began to render that feeling passage descriptive of the noises which accompany the manufacture of a (P.O. pattern) Mark 3 star violin (P.O.B. Dept.), a man stopped them with upraised hand.

The Chief "Pobber."

"What's up?" I asked.

"You'll see," said Freddy. "Hold on tight."

The interrupter was speaking into the scarlet (P.O. solid back pattern) microphone. He said.

"I am instructed by the Comptroller of P.O.B., to state that Temside Branch will close down for ten minutes. Ends. O/C., P.O.B., Temside."

"Why must he shut down in the middle of an item?" I asked.

"Boy 'as put a bit of slate pencil in key 'ole of letterbox," said a voice like a "blast."

I turned. "Who the——"

"Allow me to introduce the Chief Pobber," said Freddy. "High official. *He* passed in Adv. Geog.; Copying Manuscript; Eng. Comp.; and Alg. (Stage 2.)."

"Er—did *these* have to pass in—er—anything?" I asked, indicating the band.

"Absolutely," replied the Chief Pobber. "Acoustics, Cosmetics, French (Elem.) and 'Istory. Very stiff, too."

"Er—does *everybody* have to pass something?" I queried.

"Certainly! At least, everybody on the ESTABLISHMENT."

"I see. And are all pobbers on the—er—what you said just then?" I asked.

"All except the trombone-cleaners and ukulele-players. And the man who pronounces the foreign names for us. Of course——"

Not Covered by the Act!

Here my informant stopped and stiffened in the official manner. An entertainer had finished his advertised item five minutes early and was saying.

"As I have a few more minutes at your disposal, I will give a little item entitled. 'Why Molly got——'"

He had reached this point, when the Chief Pobber switched off the microphone and said sternly.

"'Ere! What's all this? 'Taint covered by the Act. If you want to give a *nextra* fill up Form M. If it's a *noncore* you must apply to Mount Pleasant on Form W."

"Freddy," I said, "let's go and jump in the river—or have one. I am distraught. How smoothly the machinery of Empire runs. *Civis* (*P.O.*) *Britannicus sum.* Land of hope and story (of the P.O.). I am going back to Timbuctoo, soon, sooner. But tell me, Freddy! Do they still fine you for not having a licence?"

"Ne-ow! They quod you nowadays if you don't have a—receiver."

Some visions are called nightmares.

Winding Coils

SOONER or later nearly every home constructor makes his own coils, for there is no doubt that the coil which is constructed at home possesses many advantages over its factory-made rival.

The cost of manufacturing coils at home is very low, so several of them can be made and compared, the number of turns, etc., being varied until results are all that can be desired. In the tables given in the following pages are details of the most popular types of coil, showing the wave-lengths which are covered with the various combinations of coil and condenser. All the values given are average ones, obtained under practical working conditions with standard equipment such as possessed by every listener.

The first table on page 965 shows the values for spider-web and basket coils. A completed coil of the spider-web type is shown by the photograph on this page (Fig. 3), and the method of winding is depicted below. These coils are simplest to make of all, being wound upon a cardboard former of the type shown, which can be made at home quite easily or procured from any dealer for a few pence.

Fixing the Wire to the Former.

The wire generally used for coils to cover up to 500 metres is 24 or 26 gauge, double cotton-covered, but silk or enamel insulation can be employed instead. To commence winding the wire is first fastened securely to the former by pushing the end through one or two small holes made for the purpose near the centre of the former. Pull the wire tight and commence winding it in and out of alternate slots, as shown by the photograph at the foot of this column. Every time that the wire passes the starting-point (whether it passes at the front or back of the former) one complete turn has been laid on. When the desired number of turns has been reached the wire is finished off by threading through holes made in the former, in the same way in which it was fixed to start.

Basket coils are wound in exactly the same way as the spider-web type, but in this instance the former itself is made of wooden spokes instead of cardboard, and these spokes are withdrawn after the coil is completed. Consequently the basket-coil former can be used over and over again. The familiar honeycomb-type coil is made upon a former carrying a double row of spokes, but its construction is too complicated to be described here.

Fig. 1. How the winding of a spider-web coil is commenced.

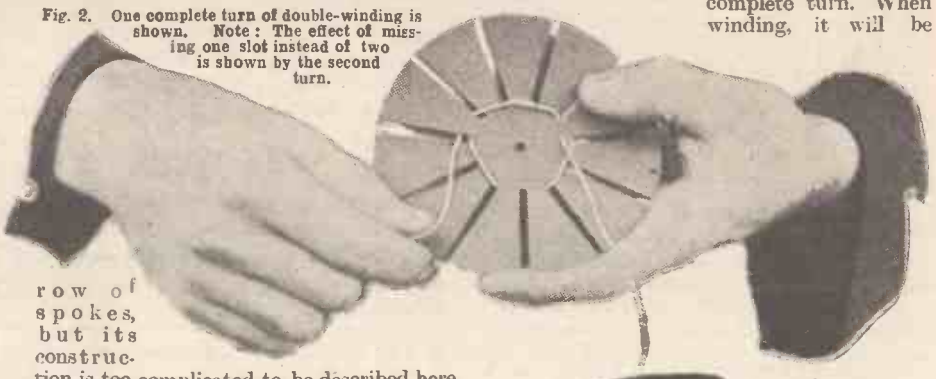


Fig. 2. One complete turn of double-winding is shown. Note: The effect of missing one slot instead of two is shown by the second turn.

Before the spokes of a basket coil can be withdrawn the coil must be made self-supporting. One method of doing this is by dipping the coil and former into molten paraffin wax, draining it, and withdrawing the spokes after the wax has cooled and fixed the turns in place. A better plan is to fasten the turns together with thread, cotton or silk. When the first spoke has been withdrawn it is replaced by stitches holding this section together before the next spoke is removed, and so on.

Double Winding.

One disadvantage of both basket and spider-web coils is the fact that being flat they are rather wide across. A method of double winding is often adopted, which greatly reduces the width of the coil without impairing its efficiency to any great extent (see Fig. 2).

The wire is fixed and started in the usual way, but the method of passing round the coil is different. Instead of being threaded in and out of *every* slot, the wire is made to pass from front to back of the former and vice versa at every adjoining *pair* of slots. Commencing near the thumb on the right of Fig. 2, the first turn emerges from the slot under the thumb-nail, and crosses over two of the partitions before it goes through the back of the former. Here it again passes two partitions before emerging at the front of the former, and so on round and round the coil.

As before, each time the wire passes the starting point is one complete turn. When winding, it will be noticed that the slots which were left vacant by the first turn are filled up by the second, and so on. If a mistake is made and the wire is carried down the wrong slot, it is easily detected by the fact that turns will start to lie parallel instead of interlacing as before. (Such a false start is shown by the last slot threaded in Fig. 2, which indicates what would happen and how the turns would start to lie side by side if only one slot is missed instead of two slots every time.)

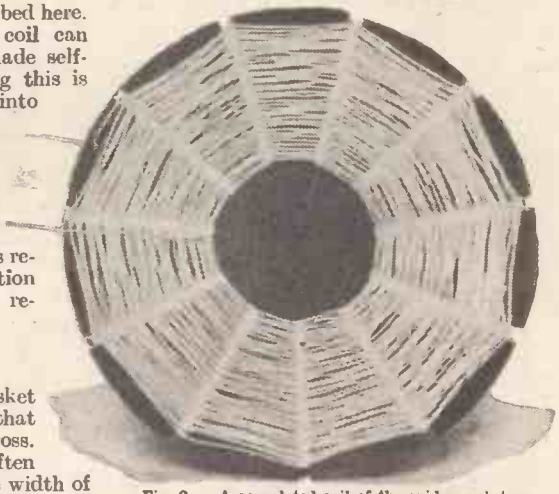


Fig. 3. A completed coil of the spider-web type.

One other type of coil which is efficient and easy to make has now gone out of favour owing to the excessive room it required behind the panel; this is the "solenoid," or cardboard-tube coil (shown in the photograph at the head of this article).

(*Continued on page* 997.)

THE WAVELENGTHS OF COILS.

Compiled by C. E. FIELD, B.Sc.
(Staff Consultant).

BASKET OR SPIDER-WEB COILS.

(1.) Aerial coils with parallel tuning condenser.

No. of Turns	Gauge of Wire S.W.G.	Capacity of parallel condenser in microfarads.														Suitable no. of turns in reaction coil.
		·0001		·0002		·0003		·0004		·0005		·00075		·001		
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
20	24	225	185	255	190	285	190	310	195	335	195	390	200	435	205	20–40
30	24	300	250	340	250	380	255	420	260	450	260	520	265	585	275	20–40
40	24	395	330	450	335	500	335	550	340	590	345	685	350	770	360	30–60
50	26	485	405	560	410	620	415	680	420	735	425	850	435	955	445	30–60
60	26	590	490	675	500	750	500	820	510	885	515	1025	525	1155	540	60–80
70	26	700	580	805	590	895	595	975	600	1050	610	1220	625	1370	640	60–80
80	28	805	670	925	680	1025	685	1125	695	1210	700	1400	715	1575	735	60–100
90	28	915	765	1050	775	1170	780	1280	790	1380	800	1600	820	1795	840	60–100
100	28	1035	865	1190	875	1320	885	1445	895	1560	905	1810	925	2030	950	60–100
125	30	1310	1090	1510	1110	1675	1125	1830	1035	1975	1145	2290	1170	2570	1200	60–100
150	30	1640	1370	1890	1390	2100	1405	2290	1415	2470	1430	2860	1460	3220	1510	60–100

(2.) Aerial coils with series tuning condenser.

No. of Turns	Gauge of Wire S.W.G.	Capacity of series condenser in microfarads.														Suitable no. of turns in reaction coil.
		·0001		·0002		·0003		·0004		·0005		·00075		·001		
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
20	24	125	95	140	95	150	95	155	100	160	100	165	110	170	110	20–40
30	24	165	125	185	130	200	130	210	135	215	135	220	145	230	150	20–40
40	24	220	165	245	170	260	170	270	175	280	180	290	190	300	195	20–40
50	26	270	200	305	210	325	210	335	215	345	220	360	240	370	245	25–50
60	26	325	240	365	250	390	255	405	260	415	265	435	285	450	295	30–60
70	26	385	290	435	300	465	305	480	310	495	315	515	340	530	350	40–80
80	28	450	335	500	345	535	350	555	355	570	365	595	390	610	400	40–80
90	28	500	380	570	390	610	395	630	405	650	415	675	445	695	460	40–80
100	28	575	430	650	440	690	450	715	460	735	470	765	505	790	520	40–80
125	30	720	545	820	560	875	570	905	585	930	595	970	640	1000	660	40–80
150	30	910	680	1020	700	1100	710	1130	725	1160	740	1210	800	1250	820	40–80

(3.) Anode coils with parallel tuning condenser.

No. of Turns	Gauge of Wire S.W.G.	Capacity of parallel condenser in microfarads.														Suitable no. of turns in reaction coil
		·0001		·0002		·0003		·0004		·0005		·00075		·001		
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
20	24	115	55	155	60	185	65	210	70	235	75	280	80	325	90	20–40
30	24	170	85	225	90	275	95	310	100	350	110	420	120	485	130	20–40
40	24	230	115	310	125	375	130	430	140	475	145	575	165	665	180	20–40
50	26	295	145	395	155	470	170	540	180	600	190	730	205	840	225	20–50
60	26	360	175	480	190	580	205	660	215	735	230	895	260	1030	280	30–60
70	26	430	210	570	225	690	245	790	255	880	270	1070	305	1230	335	40–80
80	28	500	245	670	260	805	280	920	295	1020	315	1240	355	1425	385	40–80
90	28	570	280	760	300	915	320	1050	340	1160	360	1415	400	1625	440	40–80
100	28	645	316	865	340	1035	365	1190	385	1320	405	1600	455	1840	500	40–80
125	30	820	405	1100	435	1320	465	1510	495	1680	520	2040	585	2350	640	40–80
150	30	1030	505	1380	545	1660	585	1900	620	2110	650	2560	730	2950	800	40–80

Wind coils on a former having eleven spokes or slots, with an inside diameter of 1½ inches.
The tables assume the use of a normal P.M.G. aerial, general-purpose valves, and conventional moving-plate variable condensers. The values would be considerably modified by the use of special anti-capacity valves and valve-holders, or condensers with specially low minimum capacity.

HONEYCOMB-TYPE COILS

(1.) Aerial coils with parallel tuning condenser.

No. of Turns	Gauge of Wire S.W.G.	Capacity of parallel condenser in microfarads.														Suitable no. of turns in reaction coil.
		·0001		·0002		·0003		·0004		·0005		·00075		·001		
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
20	24	220	185	255	190	280	190	310	195	330	195	385	200	430	205	20–40
40	24	365	305	405	310	465	315	505	320	545	325	630	330	710	335	40–60
60	24	510	425	585	435	650	440	710	445	765	450	885	460	990	470	60–80
80	24	660	555	760	565	840	570	920	575	996	580	1150	595	1290	610	60–100

(Continued on page 966.)

THE WAVELENGTH OF COILS.—(*Continued from page 965.*)

HONEYCOMB-TYPE COILS.—*continued.*

(1.) *Aerial coils with parallel tuning condenser*—continued.

No. of Turns	Gauge of Wire S.W.G.	Capacity of parallel condenser in microfarads. ·0001 Max.	·0001 Min.	·0002 Max.	·0002 Min.	·0003 Max.	·0003 Min.	·0004 Max.	·0004 Min.	·0005 Max.	·0005 Min.	·00075 Max.	·00075 Min.	·001 Max.	·001 Min.	Suitable no. of turns in reaction coil.
100	24	820	690	940	700	1040	705	1140	710	1225	720	1420	740	1590	755	60–100
125	26	1020	865	1170	870	1295	880	1415	890	1525	900	1770	920	1980	940	60–100
150	26	1220	1025	1395	1040	1550	1050	1695	1060	1820	1070	2115	1100	2370	1130	60–100
175	26	1425	1200	1630	1215	1810	1225	1980	1240	2130	1250	2470	1280	2770	1310	60–100
200	26	1650	1385	1890	1400	2100	1420	2290	1435	2465	1450	2860	1485	3210	1520	60–100
250	28	2100	1760	2405	1790	2670	1810	2920	1830	3140	1845	3640	1890	4080	1940	100–150
300	28	2520	2120	2880	2150	3200	2165	3500	2185	3770	2210	4360	2260	4900	2320	100–150
350	28	2880	2420	3300	2450	3660	2480	4000	2505	4310	2525	5000	2600	5600	2660	100–200
400	28	3260	2740	3735	2780	4150	2810	4525	2830	4870	2860	5650	2930	6350	3000	100–200
450	30	3640	3050	4170	3100	4630	3140	5060	3165	5440	3200	6310	3270	7080	3360	100–200
500	30	4160	3490	4760	3540	5300	3590	5770	3615	6220	3650	7220	3750	8100	3840	100–200
600	30	5030	4220	5760	4280	6400	4330	6990	4380	7530	4430	8720	4530	9800	4650	100–200
700	32	5980	5000	6850	5100	7610	5150	8300	5200	8940	5250	10380	5400	11620	5520	100–200
800	32	6850	5750	7850	5850	8720	5900	9510	5950	10240	6020	11880	6170	13300	6300	100–200
900	32	7760	6500	8880	6600	9870	6670	10780	6750	11600	6820	13450	7000	15100	7160	100–200
1000	36	8630	7250	9880	7350	10970	7430	12000	7510	12900	7590	14950	7770	16800	7960	100–250
1250	36	10700	9000	12250	9120	13600	9210	14850	9300	16000	9400	18550	9630	20800	9860	100–250
1500	36	13000	10900	14890	11100	16550	11200	18050	11300	19400	11400	22550	11650	25300	12000	100–300

(2.) *Aerial coils with series tuning condenser.*

No. of Turns	Gauge of Wire S.W.G.	Capacity of series condenser in microfarads. ·0001 Max.	·0001 Min.	·0002 Max.	·0002 Min.	·0003 Max.	·0003 Min.	·0004 Max.	·0004 Min.	·0005 Max.	·0005 Min.	·00075 Max.	·00075 Min.	·001 Max.	·001 Min.	Suitable no. of turns in reaction coil.
20	24	130	100	145	100	155	100	160	105	165	105	170	110	175	115	20–40
40	24	210	150	235	160	250	165	260	170	270	170	280	180	285	185	20–40
60	24	295	215	330	230	350	230	365	235	375	240	390	255	405	262	20–60
80	24	380	280	425	290	455	295	470	300	485	310	505	325	520	340	20–60
100	24	475	350	530	360	565	370	590	380	605	390	630	405	650	420	40–80
125	26	590	435	660	450	700	460	730	470	755	480	785	500	805	525	40–80
150	26	700	520	790	530	840	550	875	560	900	575	940	600	965	630	40–80
175	26	820	610	925	630	980	640	1020	650	1050	670	1100	700	1130	735	40–80
200	26	945	700	1060	730	1130	740	1175	750	1210	775	1260	805	1300	845	40–80
250	28	1200	890	1350	930	1440	940	1500	960	1540	985	1600	1030	1650	1070	40–80
300	28	1450	1070	1630	1120	1740	1140	1800	1160	1860	1190	1930	1240	1990	1300	60–100
350	28	1650	1220	1860	1280	1980	1300	2060	1320	2120	1350	2210	1410	2270	1480	60–100
400	28	1870	1380	2100	1450	2240	1470	2330	1500	2400	1530	2500	1600	2570	1670	60–100
450	30	2100	1550	2360	1620	2510	1640	2600	1670	2680	1710	2800	1790	2870	1870	60–100
500	30	2390	1770	2680	1850	2860	1880	2970	1910	3070	1960	3190	2040	3280	2140	60–100
600	30	2890	2140	3250	2230	3480	2270	3600	2310	3720	2360	3860	2470	3970	2580	100–150
700	32	3440	2540	3860	2660	4120	2700	4270	2750	4410	2810	4580	2940	4720	3080	100–150
800	32	3940	2910	4430	3040	4720	3090	4900	3150	5050	3220	5250	3360	5400	3520	100–150
900	32	4450	3300	5020	3440	5350	3500	5550	3570	5730	3650	5950	3820	6110	4000	100–150
1000	36	4950	3660	5650	3820	5950	3890	6150	3960	6350	4050	6600	4230	6800	4430	100–150
1250	36	6150	4550	6900	4750	7360	4830	7650	4920	7880	5030	8200	5250	8440	5500	100–200
1500	36	7500	5550	8950	5800	9000	5880	9320	6000	9600	6150	10000	6400	10300	6700	100–200

(3.) *Anode coils with parallel tuning condenser.*

No. of Turns	Gauge of Wire S.W.G.	Capacity of parallel condenser in microfarads. ·0001 Max.	·0001 Min.	·0002 Max.	·0002 Min.	·0003 Max.	·0003 Min.	·0004 Max.	·0004 Min.	·0005 Max.	·0005 Min.	·00075 Max.	·00075 Min.	·001 Max.	·001 Min.	Suitable no. of turns in reaction coil.
20	24	115	65	155	65	185	70	210	75	230	75	280	85	320	95	20–40
40	24	200	105	265	115	315	125	360	130	400	135	480	145	550	160	20–40
60	24	320	175	430	185	500	195	570	200	635	210	765	230	880	250	20–60
80	24	415	225	550	240	660	255	750	265	835	280	1010	310	1160	330	20–60
100	24	525	285	690	300	825	315	940	335	1050	350	1260	385	1450	415	40–80
125	26	655	360	865	380	1030	400	1170	420	1305	440	1580	480	1810	520	40–80
150	26	780	430	1030	455	1230	480	1400	500	1560	525	1890	575	2170	620	40–80
175	26	915	500	1210	530	1445	560	1650	590	1830	615	2210	675	2540	730	40–80
200	26	1060	580	1400	615	1675	650	1910	680	2125	710	2560	780	2940	845	40–80
250	28	1350	735	1780	780	2130	825	2430	865	2700	905	3260	990	3740	1070	40–80
300	28	1625	885	2145	940	2560	990	2920	1040	3250	1090	3920	1200	4500	1290	60–100
350	28	1855	1010	2450	1070	2925	1130	3335	1190	3710	1240	4480	1360	5140	1470	60–100
400	28	2100	1145	2775	1210	3310	1280	3780	1340	4200	1410	5070	1540	5820	1670	60–100
450	30	2345	1280	3100	1360	3700	1450	4220	1500	4690	1570	5660	1720	6500	1860	60–100
500	30	2680	1460	3540	1550	4230	1640	4820	1710	5360	1800	6460	1970	7430	2130	60–100
600	30	3245	1770	4280	1880	5120	1980	5830	2070	6490	2180	7840	2380	9000	2580	100–150
700	32	3855	2100	5090	2230	6080	2350	6930	2460	7710	2580	9300	2830	10700	3070	100–150
800	32	4420	2410	5830	2550	6970	2690	7940	2820	8640	2960	10650	3240	12250	3520	100–150
900	32	5005	2730	6610	2980	7900	3050	9000	3200	10010	3350	12100	3670	13900	3980	100–150
1000	36	5550	3020	7330	3210	8760	3380	9980	3550	11100	3720	13400	4080	15400	4420	100–150
1250	36	6880	3750	9100	3980	10860	4190	12370	4370	13760	4600	16600	5050	19100	5480	100–200
1500	36	8400	4580	11100	4860	13250	5120	15100	5360	16800	5630	20250	6150	23300	6680	100–200

Wind coils on a former having two rows of 23 spokes, separated by 1 inch, with an inside diameter of 2 inches.
The tables assume the use of a normal P.M.G. aerial, general-purpose valves, and conventional moving-plate variable condensers. The values would be considerably modified by the use of special anti-capacity valves and valve-holders, or condensers with specially low minimum capacity.

THE RECTALLOY TRICKLE CHARGER.

Making the Step-Down Transformer.

By GEORGE HARLAND.

In response to numerous inquiries our contributor describes the construction of the Trickle Charger Transformer. Further Constructional articles will appear shortly, owing to the great interest aroused by Mr. Harland's account of his experiments with Rectalloy rectifiers.

IN this article, instructions are given for the making of the step-down transformer, and further details in connection with this charger, which has aroused great interest amongst our readers.

In previous articles I have described my experiments with the electrolytic rectifier, using rectalloy electrodes, and sulphuric battery acid as the electrolyte.

The system of "trickle charging" differs only from the ordinary system of charging in that a small or "trickle" current is passed into the battery for a long period, instead of a comparatively large current for a short period. For example, it is usual, about once a fortnight, to charge up your filament battery by means of a charger

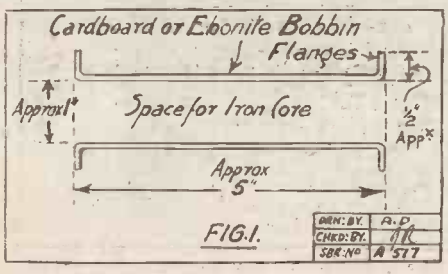


FIG. 1.

giving from 2 to 5 amps. for a period of anything from 10 to 20 hours. This means that you require a large charger, capable of giving this heavy charging current, and a large battery, capable of lasting a fortnight or longer on one charge.

An Ideal System.

It is, however, unnecessary to use either a large charger or a large battery: both of these components may be quite small, if you adopt the system of "trickle charging"; this means that whenever the battery is not in use on the set, you simply throw over a switch and it is put on a very small charge, which feeds back into it, between one night and the next, the amount of electricity which has been taken out of it during an evening's working.

This system is, in short, the ideal one, both for the health and life of the battery and for the convenience of the operator. If a permanent connection is made to the alternating current electric mains and a throw-over switch introduced, so that the battery can be thrown over to "to set" or "to charge," the system becomes equivalent to working direct off the mains, and the battery and charger may be forgotten (except for the usual occasional filling up with distilled water).

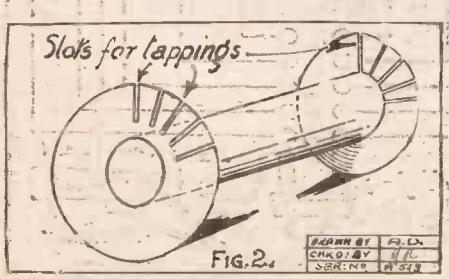


FIG. 2.

Practically No Waste.

Since the charger is practically always on the mains, it becomes necessary to use a form of rectifier which does not consume energy for its working. A valve rectifier would not be suitable, as it requires current for heating the filament, quite apart from the rectified current which passes in the plate circuit and which goes to the battery on charge. A valve rectifier would need to have the filament properly alight just the same if a small charging current were being passed through it as it would if passing a heavy charging current. If a valve rectifier were used for trickle-charging, the total amount of energy used for maintaining the filament alight would probably far exceed the energy passed through it to the battery which was being charged.

For reasons of this kind, as was explained in previous articles, it is necessary to employ a rectifier which uses practically no energy in the process of its functioning, and it is here that the rectalloy rectifier is so eminently suited for the purpose. Owing to the use of the sulphuric acid electrolyte, which has a high electrical conductivity, the resistance losses in the rectifier are very small, and, furthermore, owing to the fact that the rectification is of an electrolytic nature, there is nothing corresponding to filament heating current.

In other words, practically all the energy used is that which is passed into the battery for charging, and consequently one is just as well off in using the charger for 100 hours at a current of 0·1 amp., as one would be if one used it for 20 hours at a current of 0·5 amp.

A "Wattless" Transformer.

Another important item in this connection is the design and construction of the step-down transformer, for, as this is practically always on the mains, it must be so designed that it consumes a "wattless" current, that is to say, so that, when not delivering current from the secondary, or low-tension side, it is taking only an infinitesimal current on the primary or mains side.

The design of a wattless transformer is principally a matter of the number of turns on the primary, the gauge of the wire, the cross-sectional area of the iron used for the magnetic core, and the method of winding the primary.

Without going into details of the calculations, I may as well give you the actual dimensions and details of the transformers which I have used, and which I have found excellently suited for the purpose.

The different alternating current mains in this country may generally be divided into two main classes—those between 100 and 120 volts and those between 200 and 250 volts.

For the first class, a total number of turns on the primary of 2,500 must be used, and for the second class, a total number of turns of 5,000 must be used.

The iron core, for really efficient working, must be of generous dimensions; if it is not, you will have some heating of the transformer when working, and you will

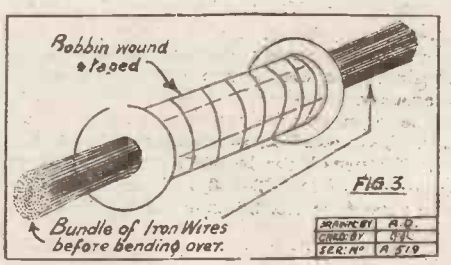


FIG. 3.

have a certain amount of energy consumed over and above that which is required for the charging of the battery.

The Iron Core.

I have found that it is best to have an iron core of about one square inch cross

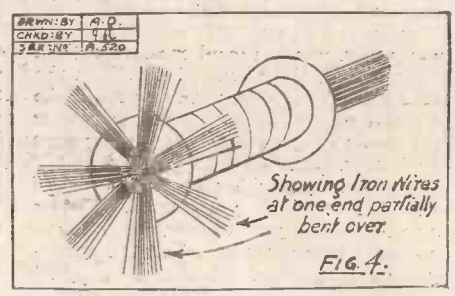


FIG. 4.

section, although in some of my experimental transformers which work perfectly well, I have used a bobbin—a cylindrical bobbin—the inside diameter of the core

(*Continued from page* 970.)

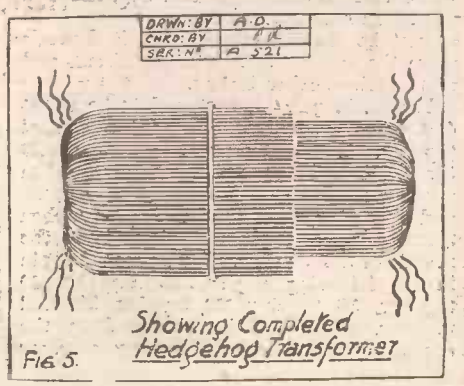


FIG. 5.

THE RECTALLOY TRICKLE CHARGER.

(*Continued from page 969.*)

or iron space, being ⅞ in. An inside diameter of about one inch will be found quite suitable, and a little more or less will not make much difference.

The bobbin may be made of paper, ebonite, cardboard, or any other similar substance, and should have two end-flanges fitted in the usual way. The thickness of the cylindrical wall should not be much greater than ¼ in., otherwise you get an "air space" between the windings and the iron, with consequent loss of energy.

Winding the Transformer.

In the winding of a power transformer (as distinct from an intervalve transformer) you do not need to trouble so much about self-capacity effects. In fact, provided you adopt a reasonably efficient method of winding, you can ignore capacity effects altogether.

The primary winding should be put on first. This consists, as already mentioned, of 2,500 turns if for 100–120 volt mains, or 5,000 turns if for 200–250 volt mains. The wire should be No. 36 enamelled, although No. 38 will do.

Instead of winding the wire to and fro, in indiscriminate fashion, it is better to divide the bobbin into, say, eight or ten equal parts, by marking rings at equal intervals with a lead pencil. Then wind approximately one-eighth of the total number (if you have divided into eight parts) in the first space, then proceed to the second space and wind the next eighth, and so on.

In this way you start at one end of the bobbin and finish up at the other end. Or, if you prefer, you can wind one-sixteenth in the first space, the second sixteenth in the second space and so on, until you reach the other end of the bobbin, then lay two or three sheets of good dry tissue paper over the winding, and begin to proceed in the other direction, finishing up at the end of the bobbin at which you started. But as you will be dealing with fairly high voltages you should take great care that the insulation is properly done.

Tapping the Secondary.

When the primary winding is completed, it should be bound over with Empire tape or ordinary insulating tape, and the secondary, or low-tension, winding may then be put on. This consists of No. 26 enamelled wire. The number of turns to be put on cannot be stated accurately, as it depends upon the amount of iron in the circuit and upon various other factors.

It will, in general, be found to be about 400 turns on either side of the central tapping. The best way is to wind on 20 turns, then bring out a tapping, then another 20 turns, then a tapping, then 50 and a tapping, then 50 and a tapping, then 300 and tapping. This tapping will be the middle of the winding. Then proceed again in the following way: 300 tapping, 50 tapping, 50 tapping, 20 tapping, 20 final tapping. This will be clearer from the accompanying drawing. In any case, as the secondary winding is on the outside, you can always add a few more turns, or take a few turns off, if you find you do not get just the charging current you want.

When the transformer is finished, bind over carefully with Empire tape or insulating tape and prepare to introduce the iron core. The tappings may be brought out through small holes drilled in the flanges of the bobbin, or, what is more convenient, through slots made in the flanges. The wires which lead out for the tappings should have short lengths of sistoflex slipped over them to prevent the abrasion of the enamel.

The Next Step.

When the wound bobbin is complete, the iron core, consisting of a bundle of iron wires, should be introduced. If the bobbin is 5 inches in length, the iron wires should be about 14 inches long, although the exact length is not important. These iron wires may be bought from electrical stores or wireless shops.

You will require somewhere about a couple of pounds of iron wire; it is sold all ready cut to lengths, in bundles. When the core has been thoroughly stuffed with the iron wire, the bobbin being in the middle, the ends of the wires should be bent over, taking a small bundle of perhaps twenty wires at a time, and bending outwards more or less evenly all round.

They should then be finally bent right over, those from one end overlapping those from the other end, and bound tightly with a piece of the same iron wire, or two or three pieces. The gauge of the iron wires for the core should be anything from 20 to 26 gauge; the exact gauge of the wires is immaterial, and the ordinary wires sold for the making of transformer cores will do perfectly well.

It is a good plan to bring the tappings from the secondary (the low-tension side) to terminals on a baseboard so that different charging currents may be obtained. A convenient system, which I have used, is to bring the tappings to two parallel rows of valve sockets, as shown in illustration. In this case, a push-in plug, composed of two valve legs inserted into a piece of wood or ebonite, may be made up, and may be plugged into any desired position.

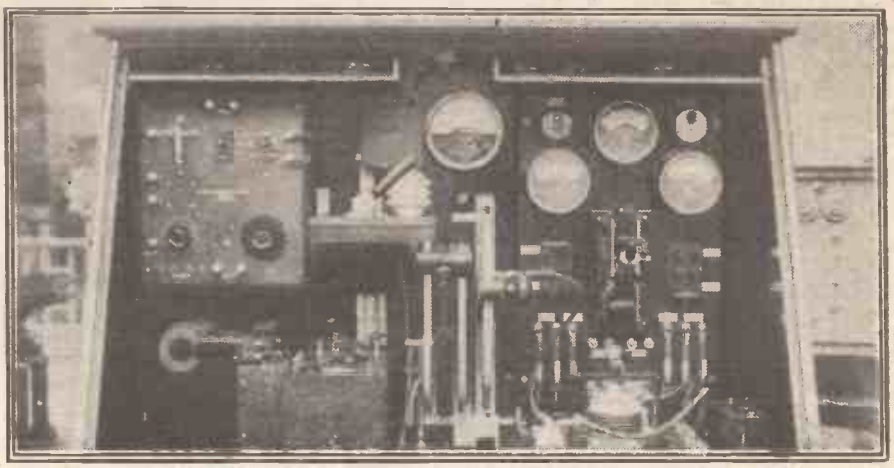
Controlling the Output.

The rectifier described in previous articles should not be made to pass more than about 0·5 or 0·6 amp., otherwise minute sparks will occur at the rectalloy electrodes (too small to be seen), which will have the effect of disintegrating the electrodes and causing them to waste away.

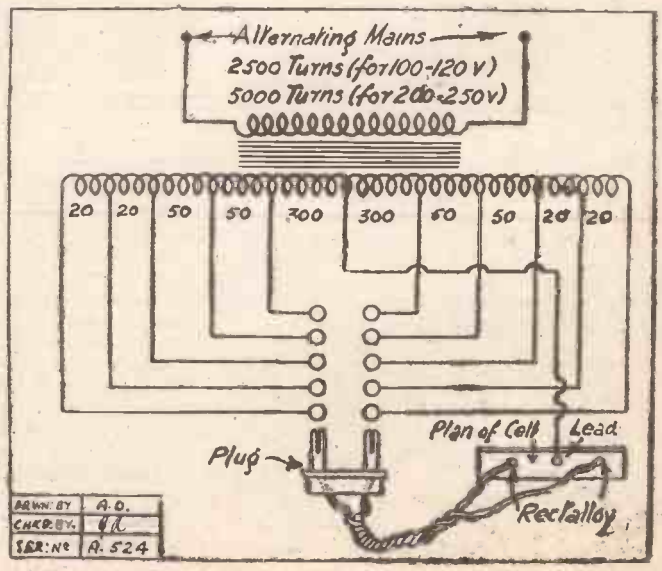
The way to estimate the charging current required is as follows: Suppose I use three Cossor valves, taking 0·25 to 0·3 amps. each: total current, say, 0·8 amp. If this is used on the average for four hours a night, total number of ampere hours is 3·2.

To put this back during the next 20 hours requires a current of 0·16 amp., or say 0·2, that is, a fifth of an amp. If for any reason I get a bit behind-hand at the end of a week or two, I have only to change over to the 0·4 tapping for two or three days and then go back to the 0·2.

Thus no difficulty in the control of the charging rate should be experienced.



A typical ship's cabinet ½ kw. set made by Messrs. Siemens Bros.



Some idea of the size of the portable one-valver is given by this photograph.

HOW TO MAKE THE "P.W." ONE-VALVE PORTABLE RECEIVER.

Designed and Described by G. V. DOWDING, Grad. I.E.E.
(*Technical Editor*).
Constructional Work by G. V. COLLE
(*Technical Staff*).

THE small, completely self-contained portable receiver described in this article has a range of reception of something between 30 to 50 miles. It only weighs a few pounds, and the case measures but 11½ in. by 7¾ in. by 3½ in.

A portable set of this nature has many uses both during winter and summer—uses that vary with individual circumstances. It is not, however, a "listener's" set—it requires rather skilful handling.

The above figures refer to the inside measurements of the small attaché case which holds the set, its batteries and its frame aerial. It is not essential that these figures be adhered to exactly, but if our panel drilling diagram is to be of any value to the constructor the case should be *about* 11½ in. long and *at least* 3½ in. deep.

Quite Straightforward.

Actually the panel holds the complete set, including the valve and coils, but not the frame aerial or batteries, and it can be lifted out of the case in this condition. Therefore the set can be constructed and fitted to any fairly suitable case afterwards.

The circuit employed is a very much simplified Armstrong super-regenerative. The simplification is affected in respect of the L.F. oscillator system. Only one large

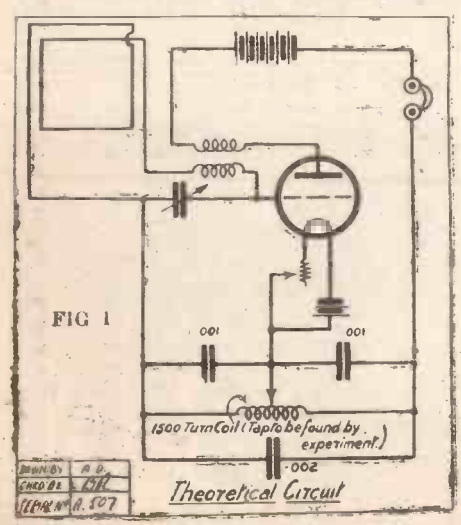


FIG 1

PARTS REQUIRED FOR ONE-VALVE PORTABLE SET.

	s.	d.
1 1,500-turn Igranic coil	17	6
1 Filament rheostat (Precision)	3	0
1 Valve holder for base mounting (Goswell Engineering Co.)	1	6
2 ·001mfd. fixed condensers (Dubilier)	6	0
1 ·002 mfd. fixed condenser (Dubilier)	3	0
1 Ebonite panel, 10½ x 4½ x ¼ in.	2	0
1 ·0005 Dial-o-denser	15	3
2 terminals (small W.O. type)	0	3
1 Coil of Glazite	1	2
1 Coil, 35 (Goswell Engineering Co.)	1	9
2 yards of 2 m/m flexible wire	0	3
1 Coil plug	0	9
1 Ebonite knob (tapped 2 B.A.) and 2 in. of 2 B.A. spindle	0	3
1 Attaché case, 11½ x 8 x 3½ in. deep	2	6
1 66-volt Siemens' H.T. battery	13	6
1 B.T.H. B5 valve	16	6
2 4½-volt pocket lamp batteries	0	9
1 75-turn basket coil	2	0
¼ lb. 26 D.C.C. wire (for frame aerial)	1	3

Igranic coil is employed instead of the conventional two. This coil is tapped approximately at its 750th turn. Further details concerning this will be given in due course. It must be pointed out, however, that the words in the theoretical diagram, Fig. 1, "Tap to be found by experiment" do not mean that a tedious, tricky task has to be performed. The necessary operation is quite simple; but of this more anon. It cannot be given exactly, as certain factors will alter its point slightly in individual cases.

Except for the coil, and perhaps the frame aerial, there is nothing in the receiver of an abnormal nature. A Dial-o-denser is employed because of its compactness—it is a variable condenser contained within the dimensions of an ordinary tuning dial. The filament resistance must be of an efficient nature—one of 30 ohms value at least is necessary, if of the wire type.

The Coil Holder.

Having drilled the 10½ in. by 4½ in. panel for the 'phone terminals, Dial-o-denser and filament resistance, in accordance with the details given in Fig. 2, the drills should be laid aside and further holes tackled as the components are prepared for mounting.

The shelf which holds the valve holder and two of the fixed condensers should consist of good hard ⅜-in. wood, and measure 3 in. by 2½ in. Three countersinking screws passing through holes shown in the panel drilling diagram will hold it in position.

The coil holder is fashioned from one switch or control knob, a 35-turn mounted "Quality" coil, a single coil holder, and a block of wood 2 in. by 1¼ in. by ⅜ in. The block of wood should be mounted similarly to the wooden shelf, except that only the one screw will be necessary, as indicated in the diagram. Two holes should be drilled through the side of the single coil holder, which should be screwed to the block of wood, as shown in the photographs and wiring diagram.

The 35-turn coil should have its socket sawn off, and a 2 B.A. tapped hole drilled through the side of its mounting in the centre, ¼ in. from the bottom. A hole large enough to clear a 2 B.A. threaded rod should be drilled in the panel at the point marked "Reaction Control" in the diagram. A short length of 2 B.A. threaded rod should be tightly screwed into the control knob, which should, of course, be provided with a 2 B.A. screw. Over this rod should be slipped first a washer, then a spring washer, and then another ordinary washer.

Further Constructional Details.

The rod should be passed through the panel and screwed into the tapped hole in the 35-turn coil's base. It can pass right through and be held by a nut, but if the thread is true and close, this may not be necessary. It should be screwed sufficiently far to cause the spring washer to compress. It should then be possible to swing the coil easily from side to side, although it lies flat up against the panel. A 75-turn "Quality" coil plugged into the single coil holder will just clear the moving coil.

Metal thread screws can be run in from the front of the panel to act as stops and limit the movement of the moving coil to such an extent that it cannot project over either side of the panel.

The valve holder can then be mounted on the one side of the shelf.

Next the 1,500-turn Igranic coil can be attended to. First of all it must be carefully removed from its base. It will be necessary to tie some thin twine around it at one or two points to prevent it unwinding.

It should be mounted by means of a long countersinking screw and nut and a strip of ebonite 3½ in. long by an inch or so in width. The head of this screw will be behind the Dial-o-denser. A 1½ in. length of 2 B.A. rod could be used, this passing into a threaded hole in the panel and being secured by means of a nut above the holding strip. There would be no room for a nut at the other end as the Dial-o-denser lies very flat to the panel.

The .002 fixed condenser is then secured (one screw will suffice) to the side of the

(*Continued on page 972.*)

THE "P.W." ONE-VALVE PORTABLE RECEIVER.

(Continued from page 971.)

block on which the single coil holder is mounted. The two ·001 fixed condensers are situated on the shelf on the other side to the valve holder.

POINT-TO-POINT CONNECTIONS OF THE ONE-VALVE PORTABLE SET.

One filament socket of the valve holder to one side of the filament rheostat. Other side of rheostat to the positive L.T.

Remaining filament socket of the valve holder to negative L.T.

Plate socket of valve holder to plug side of reaction coil (fixed).

Socket side of reaction coil to positive H.T. plug.

One 'phone terminal to the negative H.T. plug.

One tag of each ·001 mfd. fixed condenser connected to positive L.T. and to the tapping on the 1,500-turn coil.

Remaining tags of the two ·001 mfd. fixed condensers joined to the ends of the 1,500-turn coil.

A ·002 mfd. fixed condenser is also connected across the two ends of the 1,500-turn coil.

Inside of the coil is also joined to the remaining 'phone terminal.

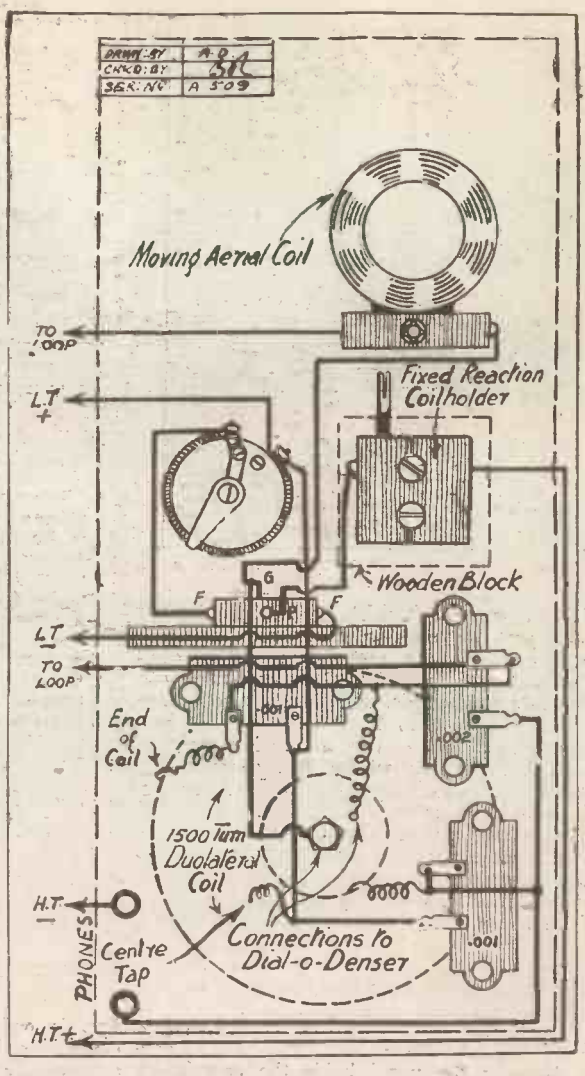
The other end of the 1,500-turn coil is then connected to one side of the frame aerial and to one side of the Dial-o-denser.

Remaining side of frame aerial to one side of aerial coil. Other side of aerial coil to grid socket of valve holder and to the remaining side of the Dial-o-denser.

Wiring can now be started as per the wiring diagram. Glazite should be used throughout, except for the leads to batteries and frame aerial, which should consist of single rubber-covered flexible wire, and sufficient length allowed in each case, remembering that it is better to have too much length, and subsequently snip off pieces, than too little.

The connection from the centre of the Igranic coil to the two ·001 fixed condensers should be left until everything else has been finished.

The frame aerial can then be wound on a flat piece of cardboard cut to fit in the lid of the case and clear it by ¼ in. all round. This is rather a tricky job, and a few feet of "passe-partout" ribbon will help a great deal. This costs but a few pence, and can be purchased at any shop dealing in photographic supplies. It is a form of adhesive tape. 22 turns of 24 S.W.G. cotton-covered wire are required for the frame. These turns should be wound on in this manner. Around the edge of one side of the cardboard, ¼ in. or so in. should be wound two turns. These two turns should be held in position temporarily with small pieces of "passe-partout," and then secured with stitches of thread sewn through the cardboard with a stout needle. Going inwards ⅜ in. all round from the first pair of turns another two turns should be wound and secured, and so on until 22 turns of wire have been wound on—11 bunches of 2, separated each by ⅜ in., all on the one side of the cardboard.



This completes the frame aerial which, when connected to its flexible leads, can be secured in the lid, turns of wire inwards, by means of two paper fasteners through the lid. Of course, these turns could be left secured with "passe partout," and not stitched, but stitching makes for greater permanency.

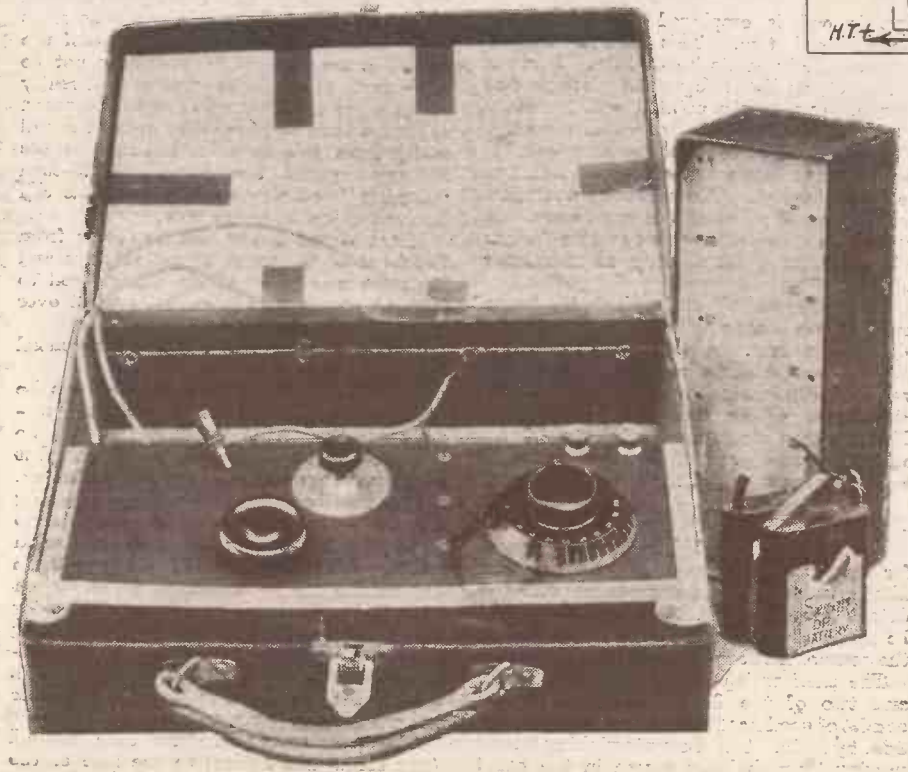
Tapping the "Quenching" Coil.

Two wooden end supports can be screwed into the case, and to these can be screwed the panel when the last connection has been made.

A 66-volt H.T. battery will be required, also a B5 valve, and either two 4½-volt flashlamp batteries connected in parallel, or a small unspillable accumulator of two volts and a B3 valve. Although the latter combination will give longer hours of working, and the accumulator is obtainable from most electricians, the acid fumes are liable to cause trouble if it is left in the set.

Now everything should be connected up and a temporary connection made in about the centre of the large Igranic coil. This tapping is very easy to make if one of the turns has a penknife blade gently inserted

(Continued on page 975.)



A photograph of the complete receiver, showing the batteries removed. In this case two 4½-volt dry batteries, wired in parallel, were used with a B5 valve.

Help yourself!

TAKE your choice of any part of the world. With an Ormond Condenser station after station can be tuned in quickly and sharply, no matter how closely the wave lengths approximate. Paris, Madrid, Rome, Breslau—any part of Europe, any part of America. With an Ormond Condenser nothing is simpler. But it must be an ORMOND—the result of 25 years' British manufacturing experience.

Ormond Low-Loss Condensers

SQUARE LAW (Patent applied for.)

Supplied in the following sizes:

Size.	Price with Vernier	Price without Vernier.
·00025	8/-	6/-
·0003	9/-	7/6
·0005	9/6	8/-
·001	10/6	9/-

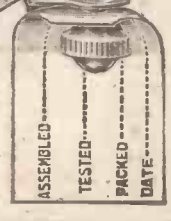
Complete with knob and dial.

We specialise in turning Brass and Steel Screws and Machined Parts and Accessories of all descriptions.

Ask your dealer to show you these Ormond Condensers—the best dealers stock all Ormond products.

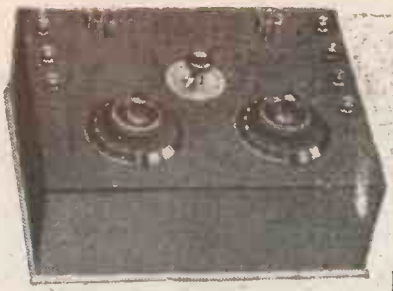
ENGINEERING ORMOND COMPANY Reg. App. for

199-205, Pentonville Road, King's Cross, London, N.1.
'Phones: Clerkenwell 9344, 5, and 6.
'Grams: "Ormondengi, Kincross."
Factory:—Whiskin Street, Clerkenwell, E.C.1.



See the Inspection Label on every Condenser.

25 YEARS' BRITISH MANUFACTURING EXPERIENCE.



The new improved Unidyne 1-Valve

HERE'S an entirely new one-valve Set which is more sensitive even than the first Unidyne Set introduced twelve months ago. A Set which is cheap to build, economical to run and safe to use. Check up the list of parts you can buy for £2. And then remember, above all, that because it uses no high-tension battery you cannot possibly have a mishap and burn out your valve. For quality of reproduction the new Unidyne stands supreme. And for extraordinary value for money this kit of Components cannot be equalled.

Complete Unidyne Kits of Components

Includes the following: One Square Law Variable Condenser, ·0005 mfds., and one ditto, ·0003 mfds. Each with vernier and spiral contact. One 30-ohm Rheostat; one 2-megohm Grid Leak; one ·0003 Fixed Condenser; one Unidyne Efficiency Choke; 10 nickel-plated Valve Sockets; 7 Mark III plated Terminals; one plated Shorting-bar. All components tested by us and fully guaranteed. **41/-**

Extra if required:

"Red Triangle" Ebonite Panel, 10 x 8 x 5/16th, drilled and tapped.....5/-
Engraving extra.....1/6
Polished Cabinet to fit.....8/6
Coil Unit for B.B.C. wave-lengths (comprising aerial and reaction coils mounted on duplex plug-in base).....4/6
Interchangeable Daventry Coils, similar to above.....5/6

NOTE.—When all parts are purchased together with panel a Marconi Royalty of 12/6 must be remitted with order.

Finished Instrument:—

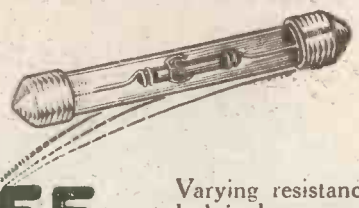
Aerial tested and fully guaranteed. Inclusive of Broadcast Coils and Marconi Royalty. Exclusive of valves, £5-5-0

PETO-SCOTT Co., Ltd. (Sole Unidyne Licensees)

Head Office, Mail Order & Showrooms:
77, CITY ROAD, LONDON, E.C.1.

Branches: 62, High Holborn, London, W.C.1. Walthamstow: 230, Wood Street. Plymouth: 4, Bank of England Place. Liverpool: 4, Manchester Street.

P.S. 4156



SAFE in a VACUUM

Varying resistance in a grid leak is the cause of much of the crackling and parasitic noise in Loud Speakers and headphones. The Ediswan Vacuum Grid Leak, the resistance element of which is manufactured by a secret process, is safely enclosed in a frosted glass tube, in a vacuum. No chemical action due to either atmosphere or light rays can take place. Result—a constant resistance under all working conditions.

EDISWAN VACUUM GRID LEAK

Made in six sizes, 0·5, 1·0, 2·0, 3·0, 4·0, and 5·0 megohms.

2/6 each.

ASK YOUR DEALER ABOUT THEM.

The EDISON SWAN ELECTRIC Co. Ltd., 123/5, Queen Victoria Street, E.C.4.

"TANGENT" *The Better Coil!*

You've never seen a coil like it; it is doubtful if you ever will. The very quality of the work stands high above anything else.

Over fifty years' experience in the manufacture of delicate electrical apparatus is the secret, and that secret gives you a design that is different, and workmanship that is unsurpassed.

The use of a larger gauge wire than is usual, giving minimum resistance to H.F. currents.

Ample air spacing, giving self capacity.

No interlacing.

Finally, a substantially built job, giving a solid and compact unit.

Most good houses sell Tangent Fitments.

RADIO TANGENT FITMENTS

GENT & C° LTD

Established 1872

Write for leaflet P.W. free on request.

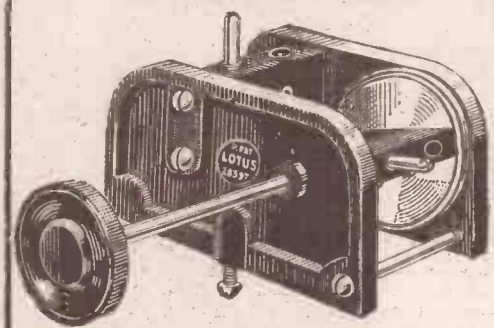
GENT & CO., LTD., Faraday Works, Leicester.

You want THE BEST!

When buying coil holders, Ask for "Lotus" and you will get the best.

LOTUS Coil Holders

are made from Bakelite mouldings with nickel plated fittings; they are an ornament to any set and they give the best results.
MOVING BLOCK CANNOT FALL.



RETAIL SELLING PRICES:

Two Way, 7/-
Extended handles, 8/-

Three Way, 10/6
Extended handles 12/6

The Vernier Movement is actuated by three sets of enclosed Precision Cut Gears, representing a reduction of 8 to 1.

TESTIMONIAL

"I should like to take this opportunity of saying how glad I am that I fitted your coil holder. I can now, without any other alteration to my set (Det. L.F.), receive 6 stations with comparative ease, where before, tuning in of three was an achievement."

GARNETT WHITELEY & CO., Ltd., Lotus Works, Broadgreen Road, LIVERPOOL

THE "P.W." ONE VALVE PORTABLE RECEIVER

(*Continued from page 972.*)

underneath, and the wire scraped and a light lead soldered to it.

The first tapping might prove O.K., if not, one on either side a few turns away should be made.

Careful Handling Essential.

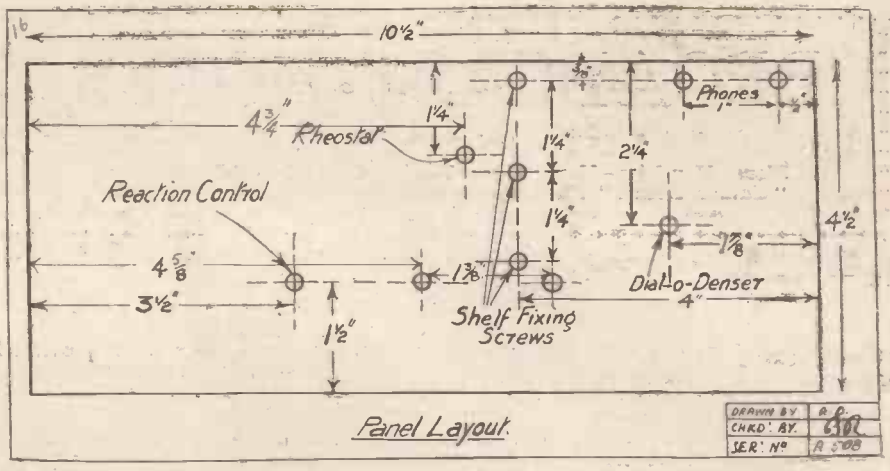
Remember this is an Armstrong "super," and requires careful and rather expert handling. It is not a "new man's first valver" by any means.

The tapping point made permanent, the panel can be secured and the batteries placed in position in the case. They will be found to fit in snugly and tightly if a case of the size recommended is used.

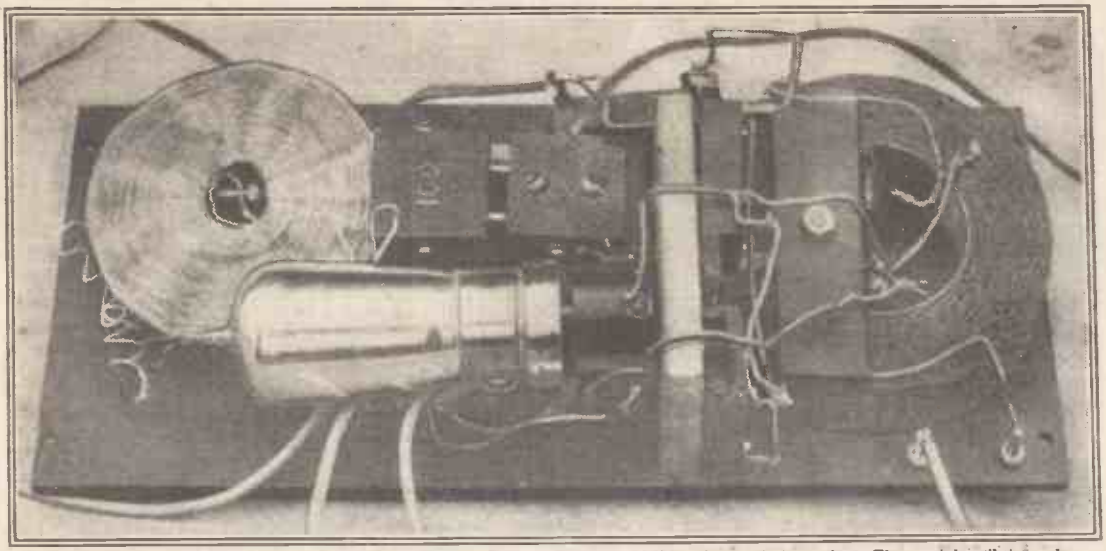
The whole 66 volts H.T. will be required. This little set is suitable only for normal wave-length ranges, and will not bring in 5 X.X. It is, of course, extremely directional, and the lid should stand up and be placed in line with the broadcasting station when the set is in use.

The circuit can be employed to advantage in an ordinary set, but not with anything but a frame aerial.

In operation the set is not very difficult to control, providing tuning is carried out slowly and carefully. For best results the reaction should be set so that the valve is just oscillating, when a high-pitched whistle should be heard. Tuning should then bring in the local station and final reaction *and filament* control should enable the signals to be tuned in at surprising strength. If the whistle is still troublesome, variation of the tapping point on the large coil should be tried until the pitch of the whistle is *raised* to inaudibility. If the tapping is moved too much and the whistle is *never* audible even when the set is not tuned in properly, loss of signal strength will occur, and the happy medium must be found for best results.



Panel Layout.



A clear idea of arrangement of the "works" of this set can be obtained from the above photograph. The aerial coil is underneath the 100-turn reaction coil.

A TIP IN DESIGN.

From a Correspondent.

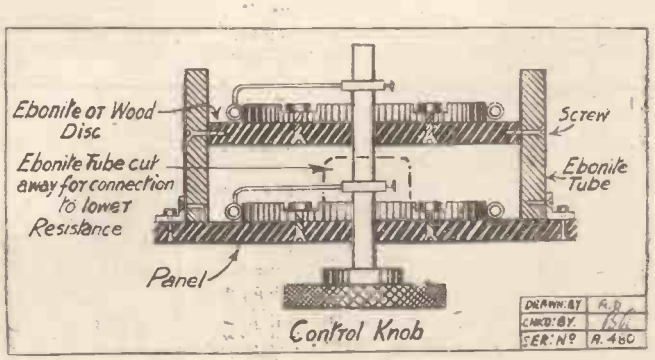
ONE step in the direction of simplifying design, which is also a means of saving space on the panel, is to mount two or more filament rheostats on one spindle. Obviously, this method is only practicable when the rheostats are intended to control currents the values of which are not strictly critical, such as in connection with R.5V. or D.E.5 valves or other valves of this type.

Thus for use in the case of L.F. amplifiers a very simple control can be incorporated while no loss of efficiency will take place. The idea is not to be recommended where H.F. circuits are present as very often successful radio frequency amplification depends largely upon critical filament control.

The diagram shows the arrangement for the commonest type of rheostat. First lengthen the spindle of one rheostat by replacing the original spindle with a suitable brass rod, and mount the instrument in the usual way. Next, obtain a piece of ebonite tube of slightly larger *internal* diameter than the *outside* diameter of the rheostat, and fix it to the panel by means of three angle pieces, as shown. Next, mount a disc of ebonite or wood inside the tube, just clear of the rheostat, fixing it in place by three screws through the tube. Then mount the second rheostat on this disc.

Saving of Space.

A hole or slot should be cut in the tube to allow connection to be made to the first rheostat. If the rheostats are of the type in which the base is "proud" of the winding and is not made of porcelain, the inside disc is not necessary, and the fixing screws can be put through the tube into the base of the second rheostat. This arrangement is practicable and handy for three rheostats and obviously saves much panel space.



BROADCAST NOTES.

By O. H. M.

More Novelties—New Year Fare—Round the Stations—The "Gather Round" Idea—Broadcast Talks—What Listeners Want.

APPARENTLY we have not yet reached the end of broadcasting novelties. The latest of which I have heard include a studio representation of a boxing match, under the conditions that apply at the National Sporting Club. This, I understand, will be given early in the New Year. Another novelty in the process of development is a special series of talks which have as their purpose the encouragement of weight reduction, particularly among women listeners.

There are now several very sound methods of reducing weight without incurring any harmful effects. The best of these combine physical exercises with psychological training. It will be interesting to see whether or not the communication of this method by radio will be followed by any marked disappearance of superfluous flesh.

Dame Henrietta Barnet and Sir Oliver Lodge before the microphone at 2 L O on the occasion of their recent broadcast talk.

New Year's Fare.

I hear that the New Year broadcasting arrangements are likely to provide a better entertainment than will be available even during the Christmas season. We are to have a new version of Mr. Stobart's "Good-night," and on this occasion the whole world will be included in his dispensation of good wishes.

There is also to be a sort of musical retrospective survey of the most successful broadcasting items of the past year. Then, on New Year's Day will be given a musical "Old Moore" by way of representing forthcoming events.

Mr. Percy Pitt, the eminent conductor, and head of the B.B.C.'s musical department, is putting on a special programme of his own music on January 4th, which is appropriately his birthday.

Round the Stations.

Up to now the "Round the Stations" programmes of the B.B.C. have been generally popular, but experience goes to prove that too many stations are covered, and the items taken are too brief, so a change is being made in the New Year. For instance, on January 8th, the "Round the Stations" programme between 8 p.m. and 10 p.m. will consist of four half-hour periods from the four best provincial programmes of that evening.

The "Gather Round."

Now that Donald Calthrop has started his "gather round" Saturday night features with such success, it is to be hoped that the B.B.C. will retain and consolidate this kind of programme item. The professional touch which Mr. Calthrop imparts will be much appreciated. It should be remembered, however, that theatre and music-hall companies do not always apply to broadcast procedure.

For instance, there has been a good deal of ill-considered criticism of the confidential and chatty manner which some announcers have been developing. It is true that this may have been overdone, but there is certainly room for some of it.

The microphone is a much more intimate instrument than any other means of communicating entertainment. To revert to formalism, and to leave out the personal touch would be to take away what is one of the distinctive claims of broadcasting to the vast majority of listeners.

The "Talk" Trouble.

As I have mentioned before on this page, there seems to be considerable delay in the process of making the broadcast talks accommodate themselves to more ideal programme conditions. I was told some time ago that the B.B.C. had decided to apply the doctrine that all talks, however serious, should have an entertainment value, and should be so disposed in the programmes that there should be easy transition. The application of this doctrine then somewhat overdue was made all the more urgent because of the continued delays in the provision of alternative services.

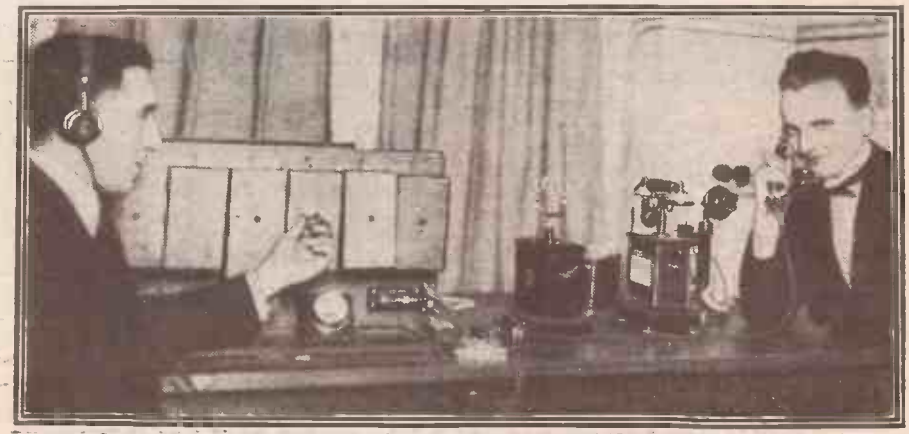
But still I see no sign of the effective application of this idea, and I am not surprised, therefore, that some readers of the "Daily Mail" are expressing their dislike of the serious features in the programmes. I can find no explanation of the reason for delaying a change which seems irresistible. I would have thought that such a change would commend itself not only to entertainment experts but also to those whose duty it is to provide the educational part of the programmes.

The duty of programme builders of any kind does not finish with the provision of what they consider to be sound material. It is equally important that this material be so prepared and disposed that listeners will receive it. For instance, no amount of sound educational matter is of the slightest use if every listener in the country, except a small minority, disregards it.

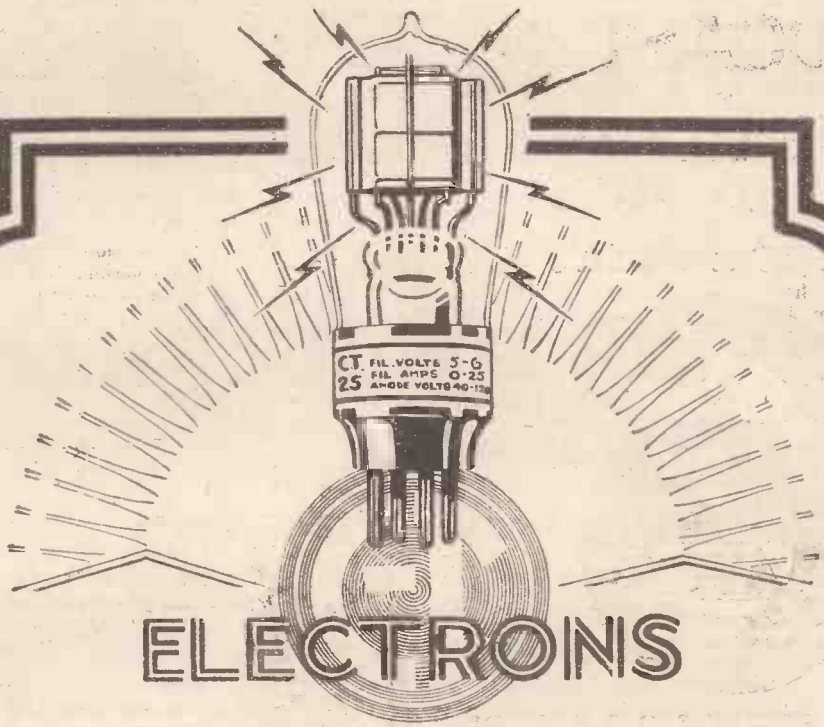
The B.B.C.'s Critics.

The search for a new means of accurately gauging the opinions and wishes of listeners appears to be no nearer a satisfactory conclusion. The evidence of the early public sessions of the Broadcasting Committee was particularly interesting in this respect. As was to be expected, the members of the committee were extremely anxious to find an answer to this problem. It looks as if the B.B.C. must continue to judge public opinion from the letters it receives and from the advice of the newspaper press.

In view of the undoubted fact that 95 per cent of the 8,000 letters received weekly by the B.B.C. are favourable to the present composition of the programmes, it would appear that the B.B.C. is not very far from accurately gauging the trend of public opinion.



Carrying out tests in the control room of the new B.B.C. studio recently opened at Oxford.



ELECTRONS

the life of the valve

The utility of this or any thermionic valve depends entirely upon its treatment of the electronic flow. Positive efficiency in electronic emission is necessary for perfect control of sound values over long distance.

The CLEARTRON-built anode—protected by patents pending—develops a specially constructed path which promotes and sustains greater and more uniform electronic flow. Actually, CLEARTRON valves afford a forty to sixty per cent. increase in electron output and consequently a definite superiority in distance and volume.

C.T.08 and C.T.15

12/6

Also makers of American type C.T. 199 at 12/6. Full technical data on request. All CLEARTRON valves are Dull Emitter.

the Ironclad Guarantee

invites the full confidence of the purchaser. He is definitely assured of more than ordinary satisfaction or instant replacement. CLEARTRON guarantees greater distance, volume and purity, and keener selectivity.

Write for particulars and specifications of the CLEARTRON Console Master Speaker.

CLEARTRON RADIO LIMITED
1 CHARING CROSS, LONDON
AND BIRMINGHAM

'Phone: Regent 2231/2.

'Grams: Cleartron, Westrand, London.

C.T.25 and C.T25B

15/-

Also makers of American type C.T. 201A at 15/-. Full technical data on request. All CLEARTRON valves are Dull Emitter.

CLEARTRON

BRITISH MADE

America's Foremost Valve made in Britain's Newest Factory.

21,249

Service Advertising

THE REDUCTION OF INTERFERENCE BY DIRECTIONAL RECEPTION.

By H. C. RYLATT.

The author of this article deals with a subject of perennial interest to amateurs—the reduction and possible elimination of interfering signals. The methods described in the following article, will, we think, attract wide attention.

THE question of directional reception appears to have received but very little attention from amateurs, and having regard to the useful manner in which one or another of the various methods of directional reception may be employed to reduce interference from stations operating on a frequency very close to that to which the receiver is tuned, it is proposed to give an outline of the main requirements of an installation employing directional reception, together with a consideration of the principles involved.

There are two methods of obtaining directional reception in wide use. Both systems employ a closed loop or loops as aerials, the systems varying only in the manner in which these loops are employed.

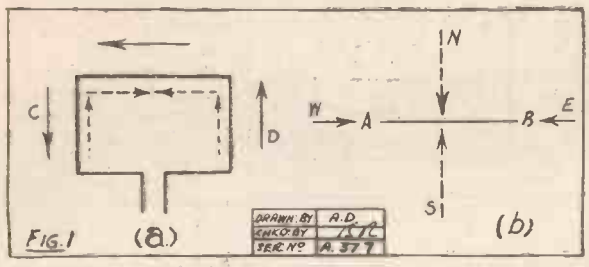


FIG. 1

In Fig. 1, a closed rectangular loop is shown in elevation at (a) and in plan at (b). The shape of this loop is not of vast importance, though it is most essential that it should be symmetrical. An aerial of this type is chiefly influenced by the magnetic component of an etheric wave, and, as will be presently shown, the E.M.F. generated in the loop will be constant, no matter from what direction the etheric wave is proceeding. On referring to Fig. 1 (b) we see the loop, as represented by a straight line, lying in the plane A B.

Theoretical Considerations.

The four arrows N, E, S, W, indicate the direction of propagation of four etheric waves of equal intensity. The instantaneous direction of the flow of current due to the E.M.F. induced in the loop by the magnetic component of an etheric wave coming from E is shown by the thick line arrows.

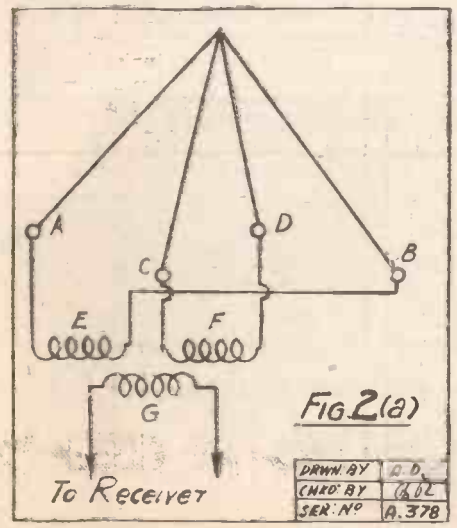


FIG. 2 (a)

A wave from direction W would result in a flow of current similar in every respect to that resulting from a wave from direction E, but of opposite phase. It must be noted that it is only the vertical sides of the loop in which E.M.F.'s are generated, consequently a wave proceeding from either N or S as shown by the dotted arrows will induce an E.M.F. in each vertical part of the loop. These E.M.F.'s will, of course, be equal in phase and value, and consequently will balance one another out, as indicated by the dotted arrows in Fig. 1 (a).

We thus see that the maximum energy is induced in the loop when lying in the plane of the etheric wave it is desired to receive, while the energy available for useful work is nil when the plane of the loop is at right angles to the plane of wave propagation. Therefore, given a loop of appropriate dimensions we can rotate it about its own axis so as to bring the effect of an undesired wave to a minimum without unduly reducing the effect due to the desired wave. Where the direction of propagation of two waves is approximately the same, even the use of a loop will not greatly assist in the elimination of one or the other.

Such a loop as we have been considering is known as a frame aerial. There are many kinds in use, differing from one another in appearance and constructional details only.

The current flowing in a frame aerial is of a very small order, far less energy being transferred to an aerial of this type than to an outdoor aerial; nevertheless there is no reason why such aerials should not be more widely used than at present. The popular idea seems to be that a frame aerial is only suitable for use with a super-heterodyne. True, it is the only aerial suitable for use with this type of receiver, but only because this type of aerial is an exceedingly bad radiator of electro-magnetic waves, which this kind of receiver generates in a violent manner.

The second system referred to at the beginning of this article is known as the Bellini-Tosi system, the principle employed being shown in Fig. 2 (a) and (b) in which the loops are shown in elevation and plan.

The E.M.F.'s induced in these two loops, which are rigidly fixed, vary in magnitude according to the angle between the plane of each loop and the direction of the magnetic field of the incoming etheric wave, and cause currents to flow in two small coils shown in Fig. 2 (a) as E F. These two coils are fixed at right angles, and the circuit formed by each loop and its corresponding coil may be tuned by condensers, or left untuned as desired.

A magnetic field is set up within these coils due to the currents flowing in them, and this magnetic field has a direction relative to the coils coinciding with the direction of the magnetic wave relative to the loops.

The absolute direction of this secondary field may be determined by rotating the small search coil G, which will give zero signal strength in the telephones of the receiver to which it is connected when the plane of the coil coincides with the direction of the secondary magnetic field. These coils are combined in practice in an instrument termed a Radio-Goniometer, in which the search coil is rotated within the fixed coils, the position of the search coil being indicated by a pointer moving over a divided scale on the top of the instrument.

Obtaining Actual Bearings.

It will be seen therefore that such an arrangement can be made to serve two purposes. It can be employed to obtain the bearing or direction of an incoming wave, and this system is used in most stations employed in giving bearings and positions to shipping and aircraft. Again, by setting the pointer of the goniometer on the point where an interfering signal is at zero intensity, it is possible to read signals from

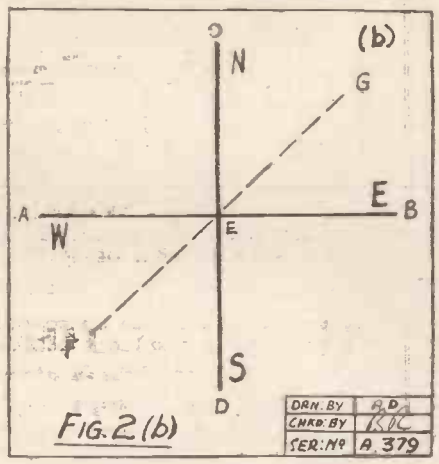


FIG. 2 (b)

other sources which would otherwise have been unreadable owing to the strong interference.

Both the systems we have considered so far suffer from the same drawback, and that is the absence of differentiating between the direction of an incoming wave and its reciprocal. For example, a wave whose direction of propagation is indicated in Fig. 2 (b) by the line E F would produce a magnetic field in the fixed coils similar to the field produced by a wave the direction of which is indicated by the line E G, so that it would be impossible to reduce signal E F to zero to enable signal E G to be read, for in doing so signal E G would also drop to zero.

It is possible, however, by a modification of the Bellini-Tosi system, to determine the actual bearing of a station by eliminating the reciprocal bearing; this is achieved by making use of the "aerial effect" of the loops. There is, of course, a capacity

(*Continued on page* 980.)

Reduction of Interference by Directional Reception.

(Continued from page 979.)

effect between the loops and earth, and due to this effect a D.P. is set up between A and B, Fig. 3, the amplitude of which is determined by the value of the resistance D, the phase of the current due to this D.P. being controlled by the adjustable inductance C.

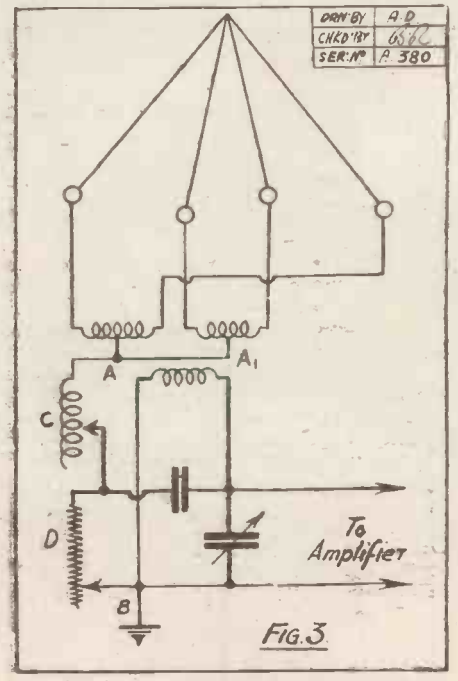


FIG. 3.

The action is as follows. The E.M.F.'s induced in search coil are applied to the detector or amplifier as shown. Disregarding the effect of C and D, when the search coil is placed in a position to give maximum strength, the E.M.F.'s in the search coil will be in opposite phase to those E.M.F.'s which would be induced in it were the search coil rotated 180° to the other position of maximum strength.

D. F. in Practice.

On considering the phase and amplitude of that portion of the circuit AB, we find that no matter what the position of the search coil, the phase of the E.M.F. due to antenna effect will remain constant. Applying the E.M.F.'s due to both parts of the circuit, we find that at one position of maximum strength we shall get E.M.F.'s due to search coil and antenna effect supplied to the amplifier in phase, whilst on rotating the search coil 180° the two E.M.F.'s will be in opposite phase. Since by adjusting D we can make the amplitude of the E.M.F.'s due to aerial effect equal to the amplitude of the E.M.F.'s induced in the search coil, we shall obtain zero signal intensity in the second position.

From theory to practice is sometimes a tortuous journey, but the theoretical considerations of directional reception are quite straightforward, and the practical application is not a difficult matter.

Cutting Out the Local Station.

With each of the systems dealt with there is an inherent drawback: the frame is comparatively insensitive—i.e. the E.M.F.'s induced by an etheric wave are very minute—while with the Bellini-Tosi system it is most essential that the loops should be symmetrically erected in an open position free from immediate screening. These essentials practically rule this system out of court from the amateur's point of view, unless he is very favourably situated; therefore we will confine our constructive suggestions to the successful use of the frame aerial.

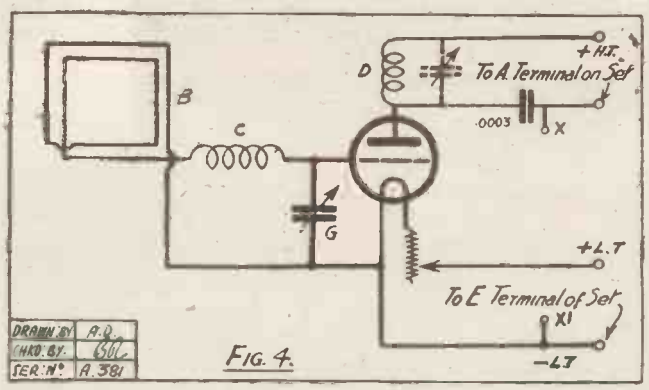


FIG. 4.

There appears to be a large body of listeners who, living near a main station, are desirous of taking the programme from a distant station, and from this body arises a plaint that they are unable to do this successfully, though they may have expensive valve sets. The coast dweller, too, has some grounds for complaint, for he cannot listen in comfort because he is badly jammed by flatly tuned spark transmitters of ship stations. The remedy, we are told, lies in the existing set being made more selective, or else being scrapped in favour of a super-het. As is well known, a receiver must not be too sharply tuned if undistorted reception is desired, and it is not everyone who can afford to scrap a three- or four-valve set and purchase a super-heterodyne.

Consequently, it behoves us to find a cheap and efficient method of obtaining a greater selectivity than that obtained by ordinary tuning methods. In the course of much experimental work the writer has come to the conclusion that, generally speaking, the use of a frame reduces the effective range of a receiver to an extent equal to the reduction suffered by the cutting out of at least one H.F. stage, and that a range approaching the normal for a given receiver can still be obtained with a frame provided an extra stage of H.F. amplification is added.

As most constructors wishing to try out this method of reception will wish to do so without alteration to their existing receiver, it is suggested that a simple unit should be built up to match the receiver with which it is to be used. For this reason actual details of construction are left to the individual.

The circuit shown in Fig. 4 is suitable for use with most circuits, and will be found highly efficient. The frame B may be of any suitable type; data regarding size, etc., are given in an appended table. C is a loading coil, to which the choke D may be loosely coupled by means of a two-coil holder to provide a certain amount of reaction. A variable condenser, as shown in dotted lines, is not advised, as, besides increasing the number of controls, the fact of having so many circuits tuned to resonance will make the set hopelessly unstable. The value of G can be ·0005 or ·001 maximum; the former is recommended. Wiring in this unit should be as short and well spaced as possible, with a view to reducing all stray capacity and resistance losses.

Some Useful Details.

Care should be taken to ascertain whether — H.T. and — L.T. or — H.T. and + L.T. are common, and whether + or — L.T. are earthed on the existing receiver; the battery terminals on the unit described should coincide with those on the receiver.

A suggested lay-out of panel is given in Fig. 5, and it is suggested that the frame should be mounted on top of the cabinet.

If series aerial tuning is used in the receiver it will be found necessary to insert a grid leak between X and X1. A Bretwood is recommended in this position, as the resistance will need to be kept higher than is usual.

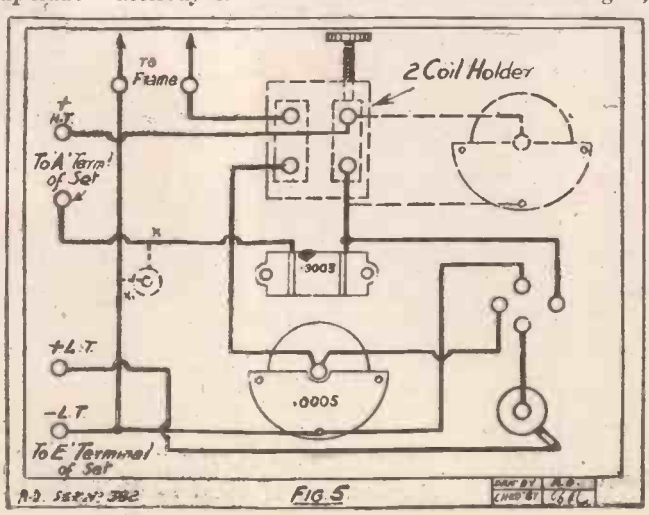


FIG. 5.

Wave-Length Metres	Length of Side of Frame	No. of Turns	Spacing in Inches
300	4 ft.	8	⅜
600	4 ft.	12	⅜
1000	4 ft.	25	⅜
1500	4 ft.	35	⅜
2600	4 ft.	55	⅜
300	6 ft.	5	¼
600	6 ft.	11	¼
1000	6 ft.	20	¼
1500	6 ft.	30	¼
2600	6 ft.	50	¼

Osram Valves
for Broadcasting

Type D.E.3
(Dull-Emitter)

Dry batteries will run the D.E.3—a great consideration to those who have not ready means available for re-charging accumulators.

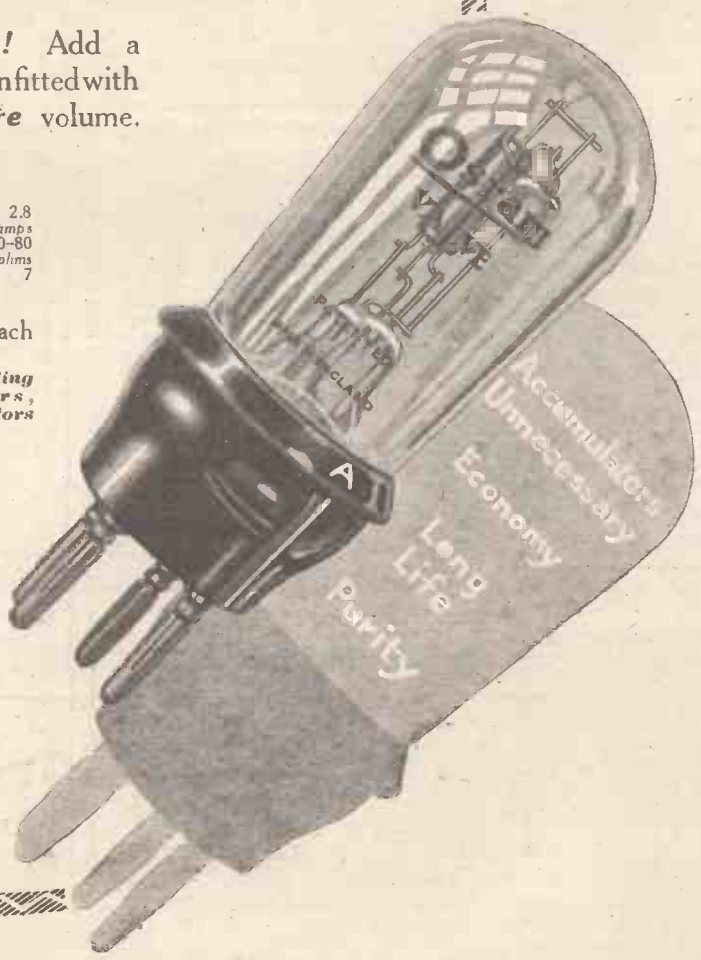
CRYSTAL USERS! Add a stage of L.F. amplification fitted with a D.E.3 Valve for ***more*** volume.

Characteristics :

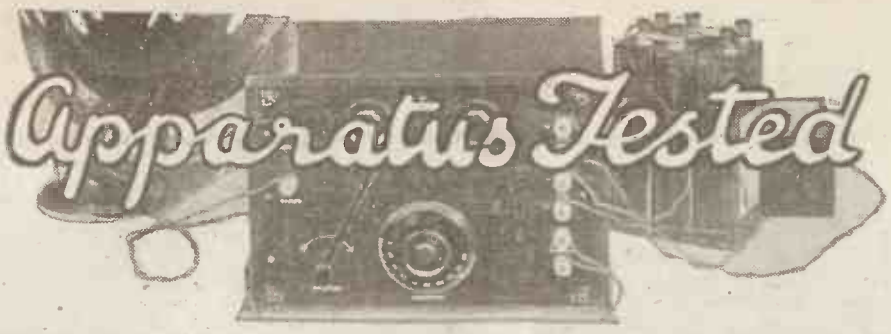
Filament Volts	2.8
Filament Current ..	·06 amps
Anode Volts	20–80
Impedance ..	22,000 ohms
Amplification Factor ..	7

Price **16/6** each

Sold by all leading Wireless Dealers, Electrical Contractors and Stores.



Advt. of
The General Electric Co., Ltd.
Magnet House, Kingsway,
London, W.C.2.



Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

ONE of the best commercial valve sets we have examined during the last year is the Ericsson enclosed pattern three-valver. It is not only well made and handsome in appearance, but it is very efficient in operation. It was evidently designed by experts who not only paid very close attention to the "tout ensemble," but to detail—to those little points that make all the difference between instruments capable of doing certain things and the painfully small percentage that do such things comfortably and in a manner conducive to easy listening.

For instance, aerial and earth, battery and loud-speaker terminals are situated at the back of the artistic cabinet in which the receiver is contained, but on the front of the panel are two telephone receiver terminals. A telephones-loudspeaker switch is provided, so that the 'phones can be connected up and the receiver adjusted without referring to the loud speaker or its connections at all. Again, a master switch is provided so that once the receiver is "set" on any one particular station it can be switched off or on by members of a household who would be unable to do so if they had to tackle rheostats and the like.

A third switch gives a choice of two or three valves. The panel lay-out is symmetrical, and the more important controls are placed in such a way that tuning becomes a pleasure and not an awkward operation. It is the reaction control, however, that demands special mention. It is a horizontal sliding movement, and is a mechanical triumph. Its smoothness is reminiscent of ball bearings, and how it is obtained without the lavish use of oil is hard to imagine.

The circuit employed in this Ericsson three-valver is H.F., det., L.F., the tuned anode method of H.F. coupling being used. Separate H.T.'s, grid bias and all other such refinements are introduced. Plug-in interchangeable coils of Ericsson design are used, those sent us with the receiver covering 280 to 530 metres on our aerial. Both coils and valves are readily accessible and windows for inspecting the latter are provided in the front panel.

On test, results were very good indeed. Commercial receivers rarely arouse our enthusiasm, as they so seldom deliver results equal to the modern constructor's assemblies. But the Ericsson was well worth handling. Due to a careful balancing of components it delivered everything expected of a first-class three-valver. London came in very loudly—as, of course, it should do and, due in no small measure to the excellent reaction control, it was very selective, and it was not difficult to bring others of the B.B.C. stations. Reproduction was distinctly healthy, and there was a complete absence of distortion. The variable condensers and filament resistances possessing true, velvety mechanical movements, no difficulty was experienced in obtaining real DX adjustments.

It is certainly a receiver that will deliver the goods to the listener and intrigue his amateur friends. And that is about as high a compliment as could be paid to any set, and justifies the rather extensive space we have allotted to its description. The Ericsson three-valver costs £20, but that, in our opinion, is by no means a high price for a high-class instrument.

(*Continued on page* 988.)

APPARATUS TESTED.

(Continued from page 986

We predict great popularity for Messrs. Bowyer-Lowe's new "Popular" variable condenser; it is a component that satisfies most "low loss," "square law," and other requirements at the low price of 10/-, ·0003 mfd., and 10/6, ·0005 mfd. capacity. It is of novel construction, and instead of metal endplates of normal shape it is provided with aluminium "girders." A minimum of metal having a maximum of strength is thus employed. The moving vanes are "earthed" to the frame and stout ebonite brackets support the fixed vanes. A ball bearing is fitted—no spring washers or other obsolete makeshifts—and the movement is smooth without being too free. The nicely turned dial is fixed by means of a substantial screw on to an unthreaded spindle. It is "one hole mounting" and two comfortably sized and conveniently placed terminals are provided for connecting purposes. On test it showed a lower minimum capacity than is usual with a maximum substantially as stated. Altogether, it is a clean, bright little component that does one good to examine and should give the amateur pleasure to handle—more especially as it is guaranteed for a minimum period of twelve months.

* * *

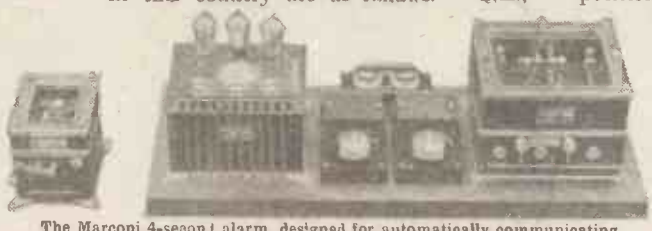
"The Wireless Annual for Amateurs and Experimenters." (Iliffe & Sons, Ltd., London; 2/6.) Containing nearly two hundred pages of invaluable information, this 1926 annual should be on every amateur's bookshelf. A unique feature is a list of amateur transmitting stations in all parts of the world.

* * *

A very ingenious outfit for simplifying soldering in the wiring of radio sets has been placed on the market by Messrs. Cooke & Whitfield, of St. Paul's Square, Birmingham. It is known as "Solclips"—at least, that is the name of the neat little devices that are the important feature of the system. Solclips are small sleeve arrangements and are made to two designs: one for terminals and the other for wiring. They are sold complete with a sufficient supply of "Fluxite" and solder in the shape of pellets of the exactly required size, at 1/- per box of 18, either pattern.

* * *

A range of interesting valves recently reached us from the land of dykes and cheese. Known as the "Teltas," they are all dull emitters. There are four distinct types, and their main characteristics and the prices at which they are to be retailed in this country are as follows. "T.E.," 3–4 volts, ·06 amp., H.T. 40–80, 12s. "L.T.," 2½–3 volts, ·18–·25 amp., H.T. 20–100, 11s. 6d. "A.S.," 3–4 volts, ·06 amp., H.T. 40–120, 12s. "A.V.," 2–3·5 volts, ·06–·1 amp., H.T. 5–30, 12s. The "Teltas" are very small valves, being only about half the size of ordinary English valves. As will be seen from the above figures, they will operate from dry batteries, and this, together with their small sizes, makes them particularly suitable for use with portable sets or completely enclosed receivers. On test they give very good results, the type "A.S." operating well as an H.F. amplifier, for which purpose it was particularly designed. The "T.E." and "L.T." functioned very effectively as Dets. and first L.F.'s. The "A.V." is an interesting little valve. It is very soft and develops blue glow at about 30 volts H.T. Naturally it makes a very sensitive detector. There is undoubtedly a demand for a valve such as this, and we can only regret that there is nothing like it on the English market emanating from an English manufacturer. Of course "softness" is a disadvantage in any valve left or right of the "middle" position, and also it tends to shorten a valve's life, but nevertheless there is, or at least has been, a brisk demand for "soft" foreign valves, so until a British manufacturer comes forward and says, "Here is a nice cheap "soft" valve guaranteed to blue up at 25 H.T., but we warn you that it has only a few hundred hours of life," DX and "super" one-valver people will doubtless continue to purchase "soft" foreigners—when they can get them.



The Marconi 4-second alarm, designed for automatically communicating signals with ships equipped with 4-second alarm receivers. It transmits regular dashes of the above duration.

Hear the Programme through without a break

on the new

Polar Guaranteed Crystal

There are no interruptions for re-adjustment of catswhisker, with this new trouble-free Crystal, which has a flat surface composed of a large number of very small Crystals mounted together. On this surface your catswhisker or other contact more readily remains in position—vibration does not affect it, and the great number of sensitive facets makes adjustment easy. The Polar Crystal Detector, illustrated below, consists of a silver contact and the Polar Crystal, each fitting into a socket, mounted on your panel by two nuts (template provided).

Showing Crystal partly removed from cup.

The Polar "Crystal" is sold in an ebonite cup, with mounting screw and nuts complete. From all Radio Dealers. Price **1/6**

The Crystal is interchangeable, and screws into the crystal cup—perfect contact ensured without Wood's metal.

Price of complete Detector, in highly polished ebonite with sockets and nuts, all nickel-plated **3/6**

The following report on the Polar "Crystal" is reprinted from the "Manchester Evening Chronicle":—

It is significant of the numerical importance of the crystal user, that the Radio Communication Company, which has equipped some of the largest broadcasting stations in the world, should have thought it worth while to devise a crystal detector, one of which has been sent for test.

This is a beautiful little component. The Crystal and contact are separate units, and fit in the panel by means of two valve pins and sockets.

In place of the usual whisker a small plate of very thin and springy metal is used. The Crystal also is unique, it being a very fine-grained deposit on a circular metal plate.

The pressure and position can be varied all over the Crystal, and on actual tests on a low-loss crystal set, this detector gave a remarkable reading of 160 microamps. on the transmission from 2ZY.

It can be recommended as a sound mechanical job and an ornament to any set.

There is one very noticeable point about a large number of present-day components. They are so beautifully made that it seems a pity to place them under the panel out of sight.

Probably after the present fashion of placing everything except the condenser dials under the panel, we shall have the usual reaction and find everything on the top. If this does occur the panel will not be disgraced, as components by recognised makers to-day have a beautiful finish and ultra efficiency.

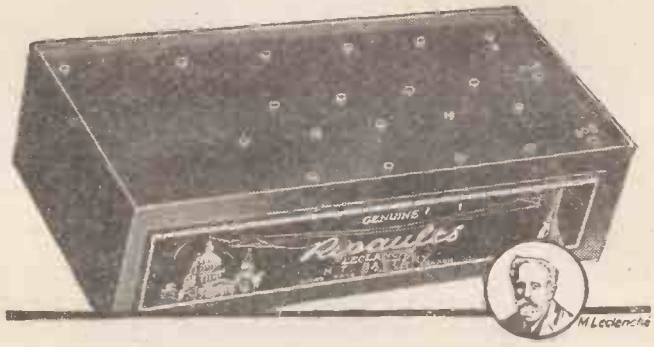
RADIO COMMUNICATION CO., Ltd.,

34-35, Norfolk Street, Strand, London, W.C.2.

Xmas Gifts

Give Presents to last throughout the year—

Ripaults



The experimenter will appreciate a Ripaults Battery because of its dead silent working and regular current supply —the Broadcast Listener because of its absolute reliability and long life.

RIPAULTS DRY BATTERIES

PRODUCT OF

LECLANCHÉ LABORATORIES

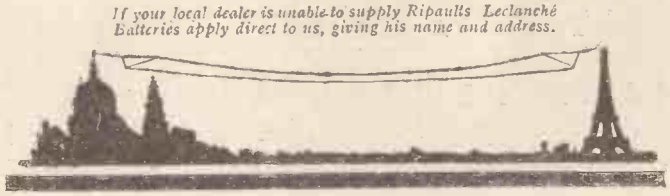
20 Volts	Price each	4/6
36 „	„ „	7/6
60 „	„ „	12/6
108 „	„ „	21/-

RIPAULTS LIMITED,

1, KING'S ROAD, LONDON, N.W.

Telephone - - - - - - North 4374 (4 lines).

If your local dealer is unable to supply Ripaults Leclanché Batteries apply direct to us, giving his name and address.



RADIOTORIAL

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

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, 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.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given to 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 wireless 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.*

TECHNICAL QUERIES.

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

ONE VALVE CIRCUIT.

"NEWCOMER" (Atherstone, Warwickshire).—I have got some wireless parts and hope to make up a one-valve set this Christmas, for long or short waves. I want to use a 2-coil holder and plug-in coils, and a ·0005 variable condenser. Can you give a simple diagram that a novice can understand showing how the connections should be made?

The accompanying pictorial diagram shows the connections for the standard one-valve circuit, arranged for long or short waves, by means of series-parallel tuning. The connections to the various components are clearly shown, and the only point which needs elucidation is the use of the three terminals on the left, which are marked A.P., A.S. and E.

The E terminal is for the earth connection, but either A (series) or A (parallel) can be used, according

(*Continued on page* 994.)

Make your set perfect for Christmas

IF you have a crystal or a crystal-valve set you can easily make it better than you have ever had it before by fitting a Harlie crystal detector.

The improvement will surprise you.

The Harlie-Detector has the most sensitive crystal yet produced.

It can be adjusted in the dark by simply turning a knob.

Contact is always at the exact delicate tension required for perfect reception.

Vibration, and even hard knocks, cannot disturb it.

Anyone can fix it in a few moments. It just screws on to your set.

It has been officially adopted for use on Lifeboats and in the Mercantile Marine.

Don't tickle the crystal—fix a

Harlie
SUPER-SENSITIVE
DETECTOR

There is no substitute: *If your usual dealer cannot supply you, fill in this coupon and post to us with P.O. for 5/6. Do this at once if you want one for Xmas.*

HARLIE BROS., 36, WILTON RD., LONDON, E.8

Dear Sirs,

I enclose herewith **5/6** *for one HARLIE-DETECTOR to be sent to me post free on the understanding that my money will be refunded, without question, if I return the Detector undamaged within ten days.*

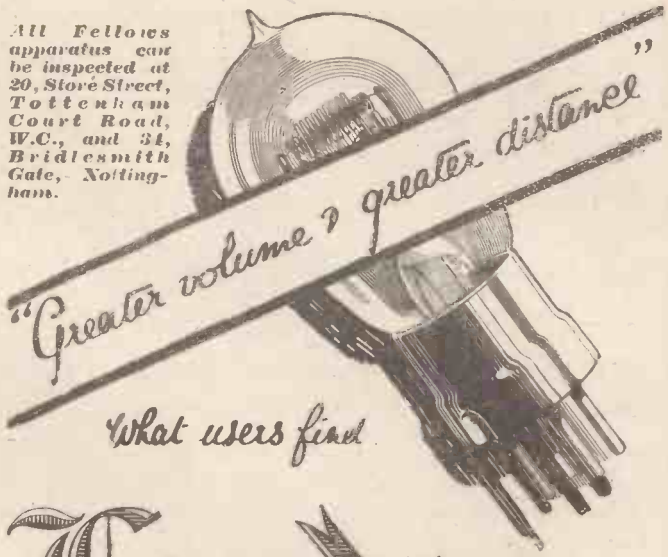
NAME.....

ADDRESS.....

P.W.

Merritt Service

All Fellows apparatus can be inspected at 20, Stove Street, Tottenham Court Road, W.C., and 31, Bridlesmith Gate, Nottingham.



Louden VALVES

BRIGHT EMITTERS. 4/6

Type F1. (the Plain Louden) for Detection and L.F. Amplification. Type F.2 (the Blue Louden) for H.F. Amplification.

Filament Volts - - -	4·5-5
Filament Amps. - -	0·4
Anode Volts. - - -	40-80

DULL EMITTERS. 8/- & 9/-

	4-VOLT.	6-VOLT.
Filament Amps. - - -	0·1	
Anode Volts. - - -	40-80.	

N.B.—These valves consume only one-seventh of the current taken by ordinary bright emitters. They will also work straight off a 4-Volt or 6-Volt Accumulator without alteration to filament resistances or set. When ordering please state which type is required.

POSTAGE ON EACH VALVE 4d. This must be enclosed with remittance.

I am using the two valves (Type FER 1) as L.F. Amplifiers, *and I get both greater volume and greater distance.* If you add to this the fact that I am using *one-seventh of the current* previously used, it goes without saying that I am highly delighted with their performance. Louden Valves for me in future, whatever the price. What a happy name is "Silver Clear."

H. H. (Halifax).

The experience of this user will be yours, too, if you instal Louden Valves in your set. Greater Volume and Greater distance are qualities common to all Loudens. The Dull Emitters (the types FER 1 and FER 2) have, in addition, the valuable property of reducing accumulator bills to one-seventh. Their cost, also, is practically no more than is paid for bright emitters of other makes, and you can substitute them for bright emitters *without having to make any alterations at all to filament resistances or set.*

Their wonderfully low cost is due entirely to the new Direct to Public Policy which eliminates the middleman's profit and enables the wireless public to satisfy their radio requirements at a substantial reduction in price.

To obtain Louden Valves please fill in order form below and post direct to us with Remittance, which must include Postage. All valves are fully guaranteed.

Write for Special Illustrated Catalogue FREE

Please use this Order Form.

Order early to be sure of delivery in time for Christmas. Our works will be closed from Wednesday evening (Dec. 23) to Monday (Dec. 28).

To THE FELLOWS MAGNETO CO., LTD.
CUMBERLAND AVENUE, PARK ROYAL, WILLESDEN, N.W.10

Name.....

Address .....

.....

Please forward me.....*Louden Valve(s) Type*..... *on conditions as per your advertisement. I enclose Remittance Value*.....

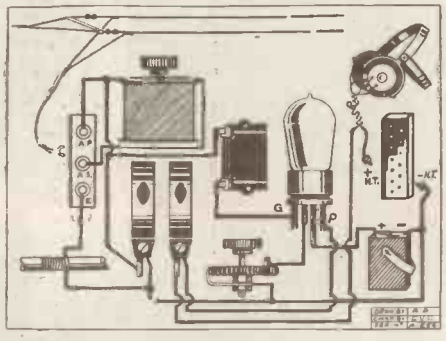
Please write clearly in Block Letters, enclose 4d. for postage of each valve, and register Cash or Treasury Notes.

P.W. 19/12/25. E.P.S. 72.

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 990.)

to whether short waves or long waves are being received. For short waves, connect up "in series" by placing the aerial lead on the terminal marked A.S., leaving the A.P. parallel terminal disconnected.



For long waves connect the aerial lead to the A.P. terminal and join a short strip of brass or bare wire between the earth terminal and the "series" terminal. The aerial-coil and condenser will then be "in parallel."

ADDING A VALVE TO CRYSTAL SET.

S. J. A. (Brentwood, Essex).—I am thinking of adding a valve to my crystal set, but do not know the difference between an H.F. valve and an L.F. valve. What distinguishes them, and which is the better method?

You should consider carefully whether it is range or loudness of signals that is required, for there are two distinctly different methods of amplification.

The received signals can be amplified *before* they are passed to the crystal set for detecting purposes, or they can be amplified *after* they have been detected by the crystal set. The former is known as H.F. amplification and the latter as L.F. amplification (or magnification).

L.F. amplification will not appreciably increase range of reception. That is, should it be desired to receive signals from a station which is entirely inaudible on the crystal set alone, then L.F. amplification would be useless.

On the other hand, should it be desired to work a loud speaker by amplifying the signals of a near-by broadcasting station whose signals are comfortably audible on a crystal set, then H.F. amplification would be useless, and L.F. magnification or amplification (either word can be used) is the method to adopt.

H.F. for range and L.F. for loudness is therefore the two alternatives in the use of valves. Both, of course, can be employed if necessary.

FADING.

"FADEAWAY" (Solihull, Birmingham).—Why do the signals fade away very often? Sometimes when I am receiving well the sounds slowly die away, and at other times they will fade away fairly quickly but come back again. Is this all due to what is known as fading? And, if so, what causes it?

There is a scientific phenomena known as "fading" which affects long-distance signals, but all "fading-away" effects are not due to this cause. An effect like fading is often produced by a run-down battery. This is particularly the case when a large dry battery is used for lighting dull-emitter valves. When the battery is nearly exhausted it will sometimes become irregular in its action, the voltage falling away almost entirely and then picking up spasmodically nearly to its full value.

It is possible for a fading effect to be produced by the intermittent energising of a nearby aerial. Somebody living not very far away may own a valve set, and may have his first H.F. valve on the point of oscillating, so that when he adjusts any of his tuning condensers the aerial may be energised. Sometimes interference received in this way will produce a drop in signal strength and clarity of tone without any howling or whistling being audible.

When very weak signals are being received, movements of the aerial may be sufficient to cause fading. A slack aerial running in close proximity to a wall or the branches of a tree may be blown sufficiently by each gust of wind to produce an appreciable weakening of signals.

There are other causes which produce a similar effect, but the foregoing are those most likely to be found in everyday conditions.

(Continued on page 995.)

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 994.)

ULTRA COILS.

P. K. (Colchester).—I have made several ultra coils, and have used them with very good results. They certainly increase both signal strength and selectivity, but can an ultra coil be used as a wave-trap additionally to another coil—ultra or ordinary—for tuning ?

Yes. an ultra coil can be used in several ways purely as a wave-trap and additionally to an existing circuit. It can be placed in both series and shunt positions, and it is both interesting and instructive to experiment with it in this manner. (See P.W. 180).

POOR RESULTS.

F. S. (Edgware Road, London, W.) encloses a diagram of his 3-valve receiver, with a letter complaining of very bad results.

The set is the usual H.F. (tuned anode) Detector and L.F. with reaction and variometer tuning. The reaction may be wrongly connected ; try reversing its connections. Also see that the anode coil is of the correct size to receive the required signals. A further point is that, although in every other respect the circuit is quite correct, it contains no grid-leak. This is necessary, and should be connected between the grid of the second (detector) valve and the L.T. minus terminal, (or any point going to L.T. minus, such as one of the filament connections.)

The resistance of the leak should be about 2 megohms. but as this value depends upon the type of valve used it is preferable to use a variable leak of the compression type. A fixed condenser (·001 mfd.) across the primary of the L.F. transformer may be useful, and also one across the 'phones and H.T. battery.

See that you are not using unsuitable valves. If, by any chance, you are using a soft detector and hard amplifiers. it is probable that the H.T. voltage on the detector is not enough to operate the amplifiers, or, if the voltage is enough for the amplifiers, it is probably too much for the detector. Separate H.T. control will be necessary for each valve, so the H.T supply for each valve should be tapped off separately by means of wander plugs, inserted in the H.T. battery.

Finally, make sure that every connection is O.K. and is clean, especially such connections as aerial, earth, tuning coils, and valve legs. Also make sure that there is no chance of capacity or other leakage on the H.F. side of the receiver. H.F. currents are very tricky to deal with, and they will leak away at the most surprising places unless great care is taken with cleanliness and spacing.

INCREASING CONDENSER CAPACITY.

R. S. (Croydon).—How can the capacity of a variable condenser be increased ?

The capacity of variable condensers of the moving vane air dielectric type can be increased by inserting thin mica between the vanes, (sticking them by means of shellac), or the whole condenser can be immersed in a hard mineral oil. The easiest method, however, is to place fixed condensers or a fixed condenser of suitable capacity in parallel. A switch can be provided so that the additional condenser can be disconnected when required. This is an arrangement that provides a very comprehensive range of capacity adjustments. For instance, if a ·0005 mfd. fixed condenser is so connected to a ·0005 mfd. variable condenser, a range of values of anything up to ·001 mfd. results.

WIRELESS INSULATORS.

"CURIOUS" (Colchester, Essex).—Why is it that such great care in insulation is recommended for aerial currents, when wires carrying much stronger currents are habitually used with a very much inferior covering of insulation ?

Just because the received current in a wireless aerial cannot light lamps or ring bells, people are apt to consider that it cannot penetrate the insulation of bell wire, etc., and such material is frequently employed for the lead-in, and is run through a small hole in the window-frame and fastened to the wall with metal staples.

This is quite a mistake ; it is not an ordinary small current that is being dealt with. It is what is known as an H.F. current, and has the power of escaping through paths to earth that would present unsurpassable barriers to much larger currents of an ordinary nature.

Therefore, if it is desired to make the most of a wireless outfit, a lead-in tube of glass or ebonite should be employed.

(Continued on page 996.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page 995.*)

HOW TO SEND IN YOUR QUERIES.

J. F. W. (Abergavenny) and others have written for advice or diagrams, promising to send a remittance if the charge for diagrams, etc., is stated.

For the benefit of new readers it may not be out of place to draw attention to the rules of the Query Department, as set out under heading "Radiotorial." The observance of these rules will facilitate the work of the technical staff and assist in getting the replies as quickly as possible. If a long, rambling letter is sent in there is a difficulty in sorting out the important from unimportant points, but this can be avoided by numbering the questions.

Delay and the possibility of mistakes in names of places, etc., are avoided by the inclusion of a stamped addressed envelope. Where a specific diagram is asked for (such as "Detector with 2 L.F. Transformer/Resistance coupling"), only the fee for the diagram need be enclosed.

When it is uncertain what type of set will be required it is better to decide this before sending money for the diagram. If the circumstances are outlined, together with a statement of maximum number of valves, or results required, this advice can be given in the form of a single question and answer.

Remember that the best circuit for your requirements is not necessarily the one that uses up *all* your old components; a great many readers limit the usefulness of their receivers by insisting that a certain variometer or similar component *must* be used. It is better to state the desired results and give the list of components on hand, saying they are to be incorporated in the new set if possible, and consistent with good results.

THE CHITOS 3-VALVE SET.

J. T. P. (Richmond Hill).—What is the best way of preventing howling and distortion when adding a third L.F. amplifying valve to the Chitos, with L.F. receiver? Is it necessary to use a separate H.T. battery.

It may not be necessary to employ a separate H.T. battery if a little experimenting with the existing connections is tried. The effect of reversing the leads to the primary (and/or to the secondary) of the first L.T. transformer should be tried. If slight distortion persists this may be cured by connecting a suitable resistance across the secondary of the last transformer (generally of the order of 100,000 ohms, but various values should be tried). This should prevent the trouble, and the addition of a carefully chosen fixed condenser across the "phone" terminals will make the reception very clear and pleasing.

OVER-RUNNING DULL-EMITTER FILAMENTS.

"DULL EMITTER" (London).—In order to obtain good volume on my two-valve set I find I have to keep the filaments as bright as those of bright emitters, and after a time they burn out. Is this because dull emitters are not yet perfected?

You do not state what dull-emitter valves you are employing and, in full detail, under what conditions. It is necessary to know this before definite advice can be given. Dull emitters, generally speaking, are perfectly satisfactory; in fact, it is our opinion that they are from every point of view preferable to bright emitters. If you are endeavouring to obtain considerable loud-speaker volume from a two-valve set you will naturally tend to run the filaments of the valves at an unduly high temperature, and this in most cases will cause dull emitters to lose their low-temperature emitting properties. No valve set should be "pushed" to its uttermost limits, for, apart from the above, it will have a bad effect on the reproduced signals. Probably your requirements necessitate a further stage of L.F. amplification. If this is added, we would advise the employment of a dull emitter power valve, such as a D.E. 6 (2 volts), or B. 4 (6 volts), you should then have ample volume at your disposal without the necessity of over-running the filament of the valves.

DRILLING EBONITE.

S. Y. W. (S.E.).—I have had no experience whatever of cutting and drilling ebonite, but should like to prepare my own panel. Is it advisable for a novice to attempt this?

Get a few pieces of scrap ebonite and practise drilling upon these until you are confident of being able to do the panel correctly. The sawing is easy, but to keep a straight line clamp a thin piece of wood to the panel and guide the saw by its edge.

Correspondence

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

THE CHITOS CIRCUIT.

(The following extracts from readers' letters concerning the Chitos one-and two-valve circuits may be of interest.—Ed.)

" . . . In August last you gave the one-valve circuit, which I made up, and the results I obtained were simply wonderful. Since then I have added a stage of L.F. and the results I have got from this are more than wonderful. My aerial is not of the best, about 35 ft. Electron wire, but I have had on the loud speaker nearly all French stations, and a lot of other Continental ones. On London, it is far too loud for my room. . . .

" C. HAWKSWORTH, Brixton."

" . . . This circuit is undoubtedly one of the best for volume and selectivity when using two valves only, and is, in my opinion, superior to the Reinartz, which takes a lot of beating.

" E. DENYER, Staines."

" . . . With 80 volts on the L.F. valve and 45 on detector, the volume is sufficient to work a loud speaker from 2 Z Y (2 miles distant) very satisfactorily, whilst not impairing the long-range capabilities of the set. The detector valve is a B.T.H. B.5. whilst I find that almost any valve (including some foreigners) is O.K. for the L.F. Filament control is very critical. . . .

" E. C. BOWMAN, Manchester."

(Continued on page 998.)

WINDING COILS.

(Continued from page 964.)

Referring now to the tables on pages 965–6, it will be seen that in all cases the first column gives the number of turns of wire. For the basket or spider-web types the maximum number of turns shown is 150, as this is about the limit to which such coils can be wound with safety. Honeycomb-type coils, on the contrary, are listed up to 1,500 turns, and from these figures all the coils necessary in the ordinary way can be constructed. Attention should be paid to the footnotes underneath the table marked 3 in both basket or spider-web and honeycomb-type classes of coil.

In all the tables the size of the wire (Standard Wire Gauge) is given in the second column. Fourteen of the remaining fifteen columns show the wave-length in metres of the various coils. Columns 3 and 4, for instance, show respectively the maximum and minimum wave-lengths when the coil of the stated number of turns is used in conjunction with a ·0001 condenser. Six other condenser capacities are shown in the same way, each with its maximum and minimum values indicated.

The last column indicates a suitable number of turns for the reaction coil to be used in conjunction with the other coils shown upon the same line. It will be seen that a certain latitude has to be allowed in the case of the size of the reaction coil, because a good many other factors have to be considered in this instance besides the number of turns of which the coil is composed. Where the constructor has no previous experience to guide him in a choice of the best number of turns for reaction, he is recommended to start by constructing a coil having an intermediate number. For instance, in the case of a coil where the figures in column 17 are given as 20–40, a 30-turn coil would be sure to give satisfaction.

CORRESPONDENCE.

(*Continued from page 997.*)

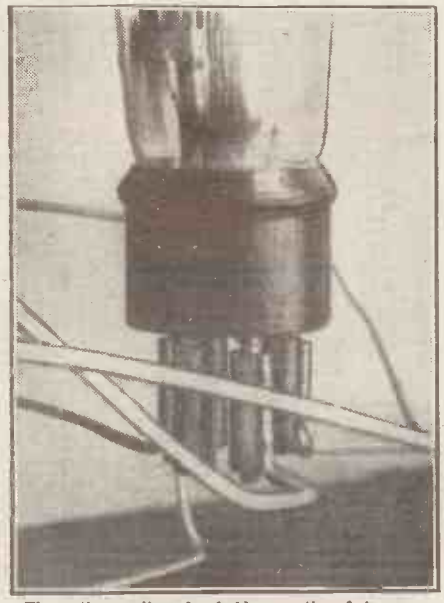
ANTI-CAPACITY VALVE HOLDER.

The Editor, POPULAR WIRELESS.

Dear Sir,—Please find enclosed a photo of valve holder which I have constructed and which I think will be both useful and interesting to readers of "P.W."

It embodies two important features, first its low capacity (which will be readily appreciated by a glance at the illustrations), secondly it is extremely non-microphonic, being solely supported by the connecting wires.

The first glance at the photo gives one the impression of its being weak and unsafe, but the reverse is the case, it being quite secure and strong. When the



The anti-capacity valve-holder mentioned by our correspondent.

idea first occurred to me I tested for strength by soldering a piece of square wire to a socket and found that this one socket alone had sufficient strength to support the valve with no signs of weakness.

These valve holders are quite easy to make, as they are simply pieces of square wire soldered to sockets, then bent and cut to the required shape and length. As to cost, I don't think one can complain of fourpence for such an efficient component.

Yours faithfully,

9, Bolsover Road, Hove, Sussex. S. ANDREWS.

A HINTS PAGE?

The Editor, POPULAR WIRELESS.

Dear Sir,—As an ardent reader of your paper, "P.W.," I and my local fellow-readers, of whom I know many, wish to thank you for your very useful articles and circuits, which you give us, not occasionally, but every issue, and ask if it is not possible to include a "hints" page, and if possible give a valve per hint, or your usual remuneration, or even merely thanks, which would mean not only yours, but also the readers to whom the hints were of use. No doubt you are well aware many gadgets made by wireless-ites never get into print, and it may interest you to know the first page read in your "P.W." every week by the majority of readers is the information (Free Replies to Readers' Questions) page. Trusting you will consider this and find it possible.

Yours faithfully,

37, Johnston Street, Wakefield, Yorks. A. V. THOMPSON.

[We should welcome opinions from other readers—Editor].

A 2-VALVE TRINADYNE RECEIVER.

(*Continued from page 951.*)

from terminal H.T. 2 to the H.T. battery putting a higher voltage on the second valve. The operation of the receiver is then identical with that described for the one-valve circuit.

If loud signals are to be received or a high anode voltage is used, a 4½-volt flash-lamp battery is placed in position, as shown in Fig. 5. If, on the other hand, weak signals are to be received and only a moderate anode voltage is used, this battery may be removed and replaced by a length of wire or brass strip, so that the O.S. of the second transformer is connected to the L.T. negative lead.

Similar to Reflex Set.

When working with this set, the experimenter should think of the one-valve circuit as a simple crystal receiver followed by an L.F. amplifying valve, and also as a one-valve set with reaction.

In general the receiver is operated in a similar way to a reflex set, except that the anode circuit is not exactly tuned, while reaction needs slightly more careful adjustment.

With regard to the crystal, one of the new types of permanent detector may be substituted with advantage, thus eliminating one variable control.

It will be noticed that no fixed condensers are provided, either across the 'phone terminals or H.T. batteries, as, in my opinion, it is better for several reasons to connect these condensers externally.

When the constructor has obtained by practice some facility in tuning, there is no reason why several British and Continental stations should not be received at loud-speaker strength given a good aerial, while under good conditions reception of American signals is quite possible.

LIST OF COMPONENTS AND COST.

	£	s.	d.
Two intervalve transformers (R.I. Ltd.)	2	10	0
·001 variable condenser (H. B. Rival)	0	8	6
·0005 variable condenser (H. B. Rival)	0	7	0
Two dual rheostats (Burndept)	0	15	0
Two valve holders (H.T.C.)	0	3	0
Two-way coil holder	0	5	0
Crystal detector (Marconi-phone)	0	7	6
·0003 fixed condenser (Dubi-lier)	0	2	6
·002 fixed condenser (Dubi-lier)	0	3	0
One dozen terminals	0	1	6
Panel, ebonite, 16 in. by 7 in.	0	5	0
Cabinet (purchased)	1	1	0
Wire and sundries	0	3	0
250-turn coil	0	9	0

On page 940 (Technical Notes) of our issue of December 12th, 1925, a statement regarding tests with variable condensers was made giving the variation of capacity due to an adjacent body as "one microfarad." This is obviously a misprint and should read "one micro-microfarad."

TECHNICAL NOTES.

(Continued from page 952.)

A New Valve.

A remarkable new valve has been developed by one of the experts of the Westinghouse Co. in America, which is, in effect, a combination of an ordinary wireless receiving valve and a selenium, or other light-sensitive cell. Briefly, the construction of the valve is as follows.

There are the usual three electrodes and there is also an additional grid: the inside of the glass envelope of the valve is coated with some alkali metal, such as sodium, care being taken that this does not deposit on the electrodes.

This coating is sensitive to light, and under the influence of light it emits fairly copious quantities of electrons (not, of course, comparable with the emission from a heated filament, but sufficient to permit of operating a sensitive valve, when applied to its grid). The coating on the glass is connected to the "extra" grid. In the ordinary way, this extra grid plays little or no part in the working of the valve. But if light falls upon the valve, the extra grid acquires a potential, depending upon the intensity of the light, and it then influences the functioning of the valve.

If the light is fluctuating or intermittent, the operation of the valve is affected correspondingly. There are many other refinements and important points, which I cannot go into, but briefly, the foregoing gives an idea of the *modus operandi*.

Aid to Television.

This whole arrangement is extremely sensitive. For example, when a beam of light is falling on the valve, and everything is steadily adjusted, the blowing of a stream of cigarette smoke through the beam of light will be sufficient to upset the adjustment of the valve and to cause it to actuate a relay and set an electric bell ringing. Many other interesting tests of a similar character have been made.

The purpose of the valve, of course, is in connection with a new system for the wireless transmission of moving pictures.

Coated Valve Filaments.

Since writing last week of the production of pure or practically pure thorium filaments, I have had brought to my notice the results of some new recent experiments upon thoriated or rather thorium-coated molybdenum filaments. It is claimed by the discoverers that the coating of thorium compound may be made much thicker, and that it remains coherent and uniform in its electronic output, whereas (according to the information supplied to me) the ordinary thoriated filament develops minute beads of thorium upon its surface, these beads being only visible under a powerful microscope, and being entirely isolated from one another.

Supposing those observations to be correct, it does not necessarily follow that the electronic emission would be affected by the form taken up by the thorium on the surface of the filament. However, it is claimed that the molybdenum filaments give a much greater emission, and as this is a matter which is easily tested, I presume that the statement may fairly well be accepted.

What is not clear, however, is whether there are any difficulties in the manufacture of these filaments, and whether their performance is up to expectations throughout the whole of their life. No doubt information on these points will be forthcoming in due course.

The "Shot" Effect.

In this connection, some interesting results have lately been published in the "Physical Review" (U.S.A.) by Dr. A. W. Hull and Mr. N. H. Williams on the irregularities in the electronic emission from valve-filaments. This effect was first observed by Schottky, and is sometimes known as the "Shot effect." The electrons emitted from a hot filament do not all leave the filament with the same velocity.

Furthermore, owing to chemical changes in the filament, continual irregularities are created which, although small in themselves, become appreciable when several stages of amplification are employed. Special circuits have been used in which shock excitation, due to these irregularities, has considerable effect.

The net result of this "Shot effect" is that, even with perfect batteries and with the aerial and earth disconnected from the set, there would still be a certain amount of noise or hiss, especially, as already mentioned, when there was much amplification employed.

Printed and published every Thursday by the Proprietors, The Amalgamated Press (1922), Ltd., The Fleetway House, Farringdon St., London E.C.4. Advertisement Offices, Messrs. J. H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Registered as a newspaper and for transmission by Canadian Magazine Post. Subscription rates, Inland and Abroad, 19/6 per annum, 9/9 for six months. Sole agents for South Africa: Central News Agency, Ltd.; Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for Canada: The Imperial News Co. (Canada), Ltd. Saturday, December 19th, 1925. R/R

POPULAR WIRELESS AND WIRELESS REVIEW, December 26th, 1925

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

HOW TO MAKE THE SIMMONDS WAVE-METER.

Popular Wireless

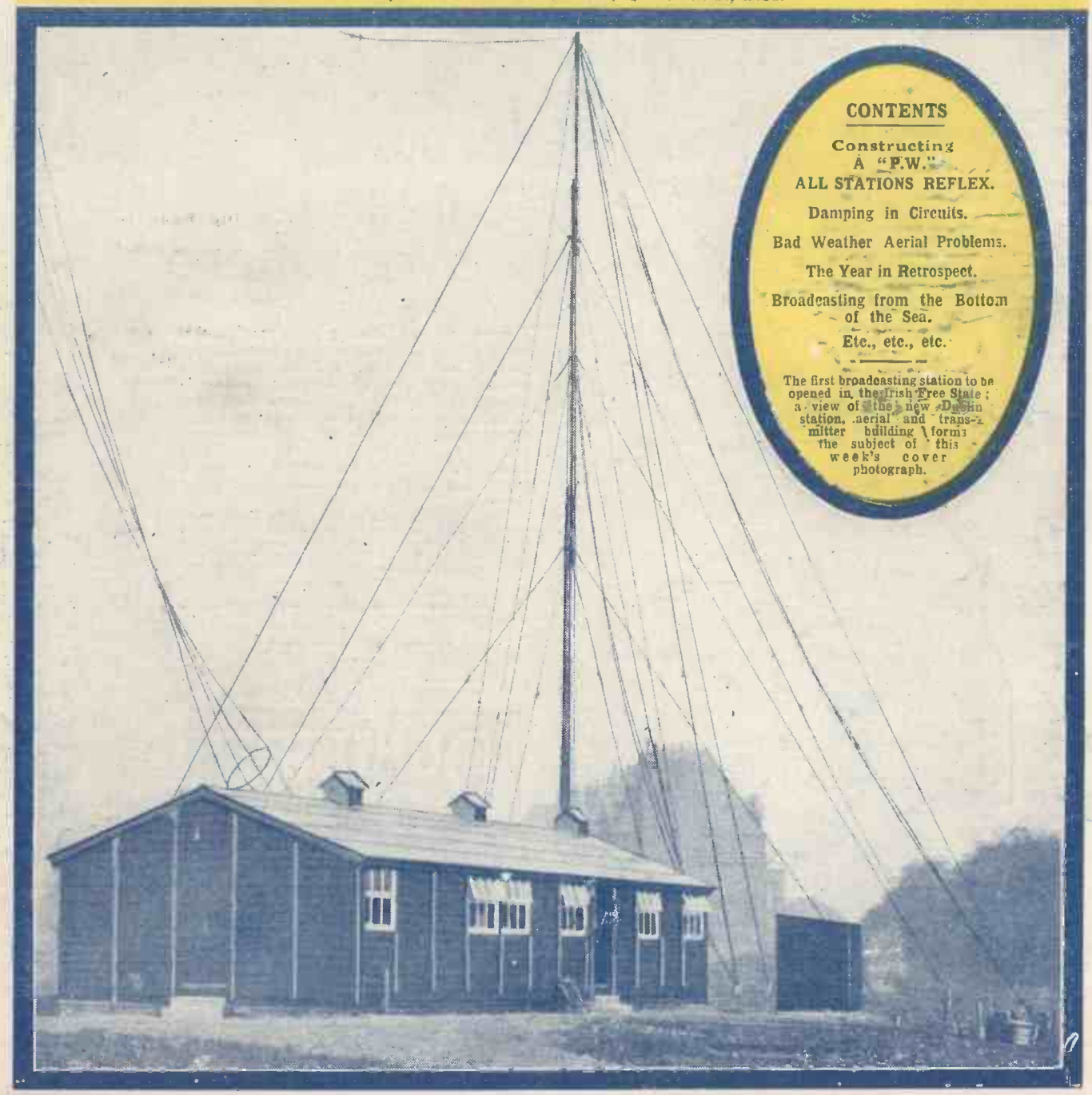
Every Thursday PRICE 3d.

No. 187. Vol. VIII.

and Wireless Review

December 26th, 1925.

Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.



CONTENTS

The first broadcasting station to be opened in the Irish Free State ; a view of the new Dublin station, aerial and transmitter building forms the subject of this week's cover photograph.

Dubilier everywhere

—in Arctic Seas.

Every year many Whaling Vessels such as this spend all the long summer months amid the ice and black waters of the Polar Seas, entirely alone save for the slender contact with the outside world that wireless gives them. Reliability is therefore essential in their wireless equipment; and that is why in all wireless gear that is installed to go far North or South you will find Dubilier Products of Standard Type—ample proof that they are good enough for every purpose.

Dubilier Products include: Fixed Mica Condensers, Variable Air Condensers, Anode Resistances, Grid Leaks, the Dubrescon Valve Protector, the Ducon Aerial Adaptor, the Mansbridge Variometer, and the Minicap Switch. The Company are also sole concessionaires for the products of the Mansbridge Condenser Co., Ltd.

Whenever any of these products are required, it is always safest to—

Specify Dubilier

REGISTERED DUBILIER TRADE MARK

DUBILIER
CONDENSER CO (1925) LTD

The Dubilier Mansbridge Variometer. All wave-lengths to 1,800 metres, **12/6**

The Dubilier Dubrescon Permanent Valve Protector. Insert in H.T. lead, **6/-**

"The secret consciousness
Of duty well performed, the public voice
Of praise that honours virtue, and rewards it.
All these are yours."

FRANCIS

Of Duty well performed . . .

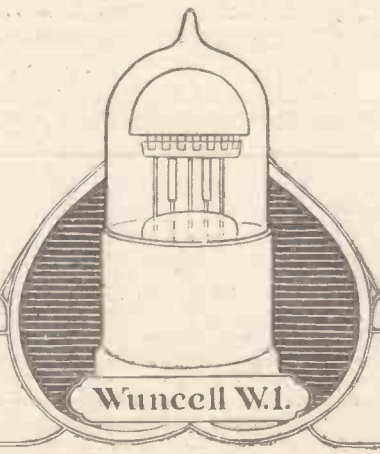
THE monk in his cell—the worker at the bench. Between these two a great gulf, yet by one common bond they are united. The bond of Duty. No monk ever possessed more enthusiasm for his tasks in life than those loyal workers—men and women alike—engaged in the business of making Cossor Valves. Without their co-operation—so cheerfully and willingly given—the nation-wide reputation for long service and dependability enjoyed by Cossor Valves must inevitably suffer.

Whether you buy your Wuncell Dull Emitter in Eastbourne or Edinburgh, in Canterbury or Carlisle, its unique standard of performance will be worthily and creditably maintained.

Long life—exquisite purity of tone—unequalled sensitiveness—supreme economy of operation—all these features are ensured in the Wuncell by reason of its patented design and construction. Only the arched filament in combination with a hood-shaped Grid and Anode—by utilising almost the whole of the electron stream—can achieve such magnificent and unparalleled results.

For 2-volt Accumulators.

W.1. For Detector and L.F. use - 14/-
Consumption: .3 amp.
W.2. (With red top) For H.F. use 14/-
Consumption: .3 amp.
W 3. The Loud Speaker Valve 18/6
Consumption: .5 amp.



For 2, 4 or 6 Volts.

W.R.1. Similar to W.1 but with special resistance which can be short-circuited when not required - - 16/-
W.R.2. Similar to W.2 but with resistance as above - 16/-

A. C. Cossor, Ltd. Highbury Grove, N.5

Cossor Wuncell W.1. Valves

Gilbert A.I. 4225

Popular Wireless

Scientific Adviser
Sir OLIVER LODGE, F.R.S.
Consultants:
Dr. J. H. T. ROBERTS, F.Inst.P.
J. F. CORRIGAN, M.Sc. A.I.C.
C. E. FIELD, B.Sc.

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

Technical Editor:
G. V. DOWDING, Grad.I.E.E.
Assistant Technical Editors:
K. D. ROGERS.
P. R. BIRD.

RADIO NOTES AND NEWS.

Is H.F. Worth While?—A 13-Year-Long Programme—Crossing the Years—The Right to Radio—Admiralty and British Amateurs—A Radio Ambassador.

The Season's Greetings.

I SHOULD like to take this opportunity of thanking every reader who so kindly sent congratulations upon the POPULAR WIRELESS Christmas Number. Such a shoal of good wishes and greetings poured into the offices that it was impossible to reply to the senders individually, but we shall toast all our unknown friends to-morrow. Once again: A very Happy Radio Christmas to you all!

Starting the New Year Well.

THE Southern Railway has already made its New Year resolution, and a very good resolution it is! Because the wireless apparatus upon the Southern's cross-Channel steamers was jamming listeners upon the south coast, the company is changing over to a wave-length of 800 metres. Twenty-five ships and the Newhaven and Dieppe land stations are involved, and listeners over a thirty-mile-wide belt of the coast will benefit. I call that very sporty! Well done, Southern!

Is H.F. Worth While?

AFTER being in disgrace for quite a long time, I notice that high-frequency amplification is gradually attaining popularity again. An instance of the change of opinion is afforded by the recent debate by the Dulwich Radio Club, where it was decided that "some form of high-frequency amplification was both advantageous and desirable for purity of output and reliability."

A Test at Sea.

THAT good long-distance results can be obtained without an H.F. stage is well shown by the following extracts from a letter which was sent to me by a reader upon the s.s. "Carina":

"I finished the set (the 'two-valver' in 'P.W.' of October 24th) soon after passing Gibraltar, and tested it out off Algiers. The first station I picked up was Bournemouth, coming in good and strong; then a German station, Daventry, and several French stations, also one Italian.

"At 1,200 miles (air-line) 6 B M was still coming in strong enough to get all the news, and with music at a pleasing volume; also with a German station coming in very strong. At 1,500 miles I could still hear Bournemouth faintly, but Daventry had disappeared."

The famous composer Sir Edward Elgar, who conducted at 2 L O recently.

Police Economy.

WHEN the Chief Constable of Suffolk put forward a proposal for a police wireless set, a critic suggested that he really wanted the set to listen to the dance-music, etc. The wily C.C., however, pointed out that the post-office charge £7 per annum for telegraphing Greenwich time once a day, whilst the B.B.C. give it to their patrons more frequently, at a lower cost! Everyone agrees that Greenwich time is necessary to the police, and nobody could withstand the official arithmetic as regards economy—so the county of Suffolk is going to have a set!

Long-Distance Results.

CONDITIONS are now ideal for long-distance listening, and there are several new stations in Europe which can be picked up on the "P.W." "Continental," the "Unidyne," or any other good long-distance receiver. The latest of these transmitters is the new station at Milan, which is now sending upon 320 metres.

Radio-Berne.

I HATE to keep referring to long-distance work, especially that done upon one or two valves, because it makes some people so mad! The old idea still lingers that the more valves you have, the greater distances you get—whereas the truth is that skill in handling can do far more than an extra valve or two. One sixteen-year-old reader living at Purbrook, near Portsmouth, tells me that he has scooped in signals from Radio-Berne, the receiver used being a one-valver. Following this, half a dozen two-valve readers have reported the same station, so apparently Berne will be an easily received station when it settles down to regular programmes.

5 Z G.

THE call sign 5 Z G has been allotted to Mr. R. P. Hawkey, of Tregenna, Grange Avenue, Woodford Green, Essex. Transmissions will be upon 45 and 150 metres, and reports will be welcomed.

A 13-Year-Long Programme.

IN an official statement it is announced that the B.B.C. had organised and transmitted more than 120,000 hours of programmes during the past three years. That means to say that if all the programmes were combined into one huge programme, it would take *nearly fourteen years* to give it all out again from one station! Even dear old "Disgusted," who writes to the papers so often, must realise that the job of the Director of Programmes is no sinecure!

(*Continued on page* 1006.)

NOTES AND NEWS.

(*Continued from page 1005.*)

A Long-Lived Valve.

WHICH is the oldest valve now "living"? I have just learned of the "death" of a dear old bright emitter, who had been on duty for an average of three hours a day ever since 1919. He belonged to one of the best families—Ediswan A.R.—and to the end he enjoyed his four volts regularly! After his lamented decease it was calculated that he had worked hard at putting electrons on a plate for 6,500 hours! Dear old fellow! His owner misses him sadly, for he was a shining example; and we could do with more like him, couldn't we?

Unlucky Listeners.

LISTENERS have been a trifle unlucky of late. About half of the B.B.C. stations have been troubled by heterodynes or hoarseness, and in addition there has been an epidemic of breakdowns (or "technical difficulties," as the announcers called them). Not content with throwing its aerial down on the ground, Daventry was no sooner mended than it started sulking, and on one occasion would not say a word to anyone for twenty-five minutes or so. The engineers had to be very firm with Daventry before she consented to oscillate properly, but once she was on the air again, she forgot her tantrums, and now she talks just like her old self once more!

Those Programmes.

WHAT do you think of all this anti-B.B.C. talk that's going round? I suppose it does everything good to have a grumble sometimes, but it remains true that if the B.B.C. stopped broadcasting things that are objected to, there would be nothing left at all for the programmes. Personally, I don't think we have much to complain of, for you can always switch off if you don't want to listen—and it's very rarely I am so bored that I am forced to close down

Another Radio Mystery?

PROBABLY we become more critical as time goes on, but I have to admit that most of the programmes suit me all right. It isn't the talkee talkee that I mind when I do break out, but *that* announcer! Do you know which one I mean? He puts years on me every time I hear him, and I'm afraid to speak to strangers at Savoy Hill, in case they say: "Oh, rahlly! Populah Wahless?"

I've hundreds of radio friends, but he is my first radio enemy! So, if one day you hear him yell "Moor-dah" into the microphone at the top of his voice, you will know that I've wandered into the studio to slay him!

Crossing the Years.

THEY say that listeners are in for a novel pleasure during the opening moments of the New Year. The idea is that as soon as we are fairly into 1926 we should pick up an American programme. Owing to the difference in time it will still be 1925 in the U.S.A., and as the New Year sweeps across the Atlantic, we shall hear the New Yorkers getting ready to welcome the hour that has passed us.

Even if we don't get the right atmosphere, we shall doubtless get the atmospherics.

Wireless in Council Houses.

A PORTSLADE correspondent tells me that the old trouble about installing wireless in the Portslade council houses has broken out again. I have not been able to confirm the details at the time of writing, but apparently people were informed that they must obtain permission of the town clerk before installing sets, and three months ago some of them wrote for this permission.

The Right to Radio.

WHEN no reply was forthcoming, some of the bolder spirits hardily installed their sets, and listened-in without permission. Now, apparently, they are being asked for an explanation, just as though there was no right to radio in Portslade! Further developments will be awaited with interest.

SHORT WAVES.

"We can hardly desire to have the B.B.C. replaced by cold-blooded and heartless State officials. Think of the take-it-or-leave-it of the postal service; is not that sufficient warning?"—"Electrical Times and Lighting."

* * *

"When a man pays ten shillings a year and is provided with an excellent variety of entertainment for about nine solid hours of every day if he cares to listen, and then writes to the papers complaining either that on one particular evening at one particular hour the item did not please him (*him*, out of some millions of listeners!) the only thing to do is to let him rave."—"Electrical Industries."

* * *

"During the fifty and more years I have been on the earth, I have known many wonderful things, the invention of the telephone, the coming of electric power and light, kinemas, motoring, and aeroplaning. But the greatest of all has been wireless."—Sir John Foster Fraser, writing in the "Sunday Herald."

5 X X in Belgium.

SINCE I remarked upon the fact that 5 X X is the most popular station in Europe, I have had plenty of confirmation from Continental readers. Writing from Mortsel, one enthusiast says he picked up the very first experimental transmission from 5 X X, "and the excellent reception was quite a revelation to me. Since that time I have been listening every night, and I am sure thousands of other Belgians are now doing the same. I am only too pleased to profit from this opportunity to congratulate the B.B.C. for its fine performance."

A Radio Ambassador.

THIS reader raises an interesting point when he says that the traders of Great Britain owe their success in Belgium not only to the quality of their goods, but undoubtedly to 5 X X, which he calls "the biggest advertising medium in existence." The fact that our Daventry Ambassador speaks up successfully in Belgium can be gathered from the statement that "My present 3-valve set has allowed me to put aside the headphones, because the reception from 5 X X is of such a strength that it is easily heard in every room of the house!"

Giant British Station.

THE new Post Office station at Rugby, the largest and most powerful wireless station in the world, will soon be sending messages commercially to every continent. The station has recently been carrying out tests at 1 a.m. and 1 p.m., and "powerful signals" have been reported from Sydney, Australia. Although listeners in the Midlands have not yet grumbled to me about the interference from Rugby, a complaint of jamming has been forwarded from Java!

An American Precedent.

SOME months ago I suggested that our Admiralty might well take a leaf out of the book of the U.S. Navy Department. Perhaps you remember how that go-ahead body created a precedent and considerable astonishment by one day forgetting all about red tape! They chanced their dignity and sent a cordial invitation round to the headquarters of the American radio amateurs to ask if the "hams," "ether-shakers," "brass-pounders," or any other kind of amateur transmitter, would like to co-operate with naval experts in short-wave wireless tests. And the "hams," etc., replied in the affirmative, doubtless with many a "Yes, bo," "Kid, you seddit," and "Atta baby."

Honour for Radio Amateur.

THE sequel was that one of America's foremost amateurs, Mr. F. H. Schnell, was granted the rank of lieutenant, and cruised the Pacific in the American battleship "Seattle," keeping in wireless touch with his wireless friends en route. As Mr. Marcuse has told "P.W." readers in "2 N M Calling," some very valuable experiments were carried out, including constant communication with Britain.

And then the British First High Admiral of the Low Wave-lengths (or some equally eminent nautical dignitary) suddenly got busy.

Admiralty and British Amateurs.

I DON'T pretend to know exactly what happened, but apparently his investigations showed that British amateur transmitters were not a whit behind their American colleagues in their willingness to co-operate with the authorities. There was a general hoisting of slacks amongst transmitting members of the Radio Society of Great Britain, and then the Admiralty disclosed their plans. Briefly, the scheme is this:

Co-operation on the Short Waves.

THE good ship "Yarmouth" is to sail to the Far East (Hong Kong is her precise destination, I believe), and on the way she is to keep in touch with British wireless amateurs by means of short-wave radio. There will doubtless be regular schedules, as in the case of the "Seattle," and the gain in gathering valuable data about short-wave work may well be incalculable.

That's not the only gain, either; for, besides the added prestige for amateur experimenters, there is the confidence that we are not lagging behind in the international race for radio laurels. And if the radio baby can get right through red tape like this, who can say what barriers it shall not overcome eventually?

A Wireless Menu.

BARNSLEY and District Wireless Association recently held their second Annual Dinner, and amongst other tenis on the menu were the following:

EXIDE SOUP.
WIRELESS COD AND 2 L O SAUCE.
(Yes, I think so)
HIGH-TENSION CHICKEN
(10,000 volts on the plate)
and
LOUD SPEAKER CHEESE!

ARIEL.

The Year in Retrospect

A Timely and Informative Critique of Radio Progress made during the Year.

By SEXTON O'CONNOR.

DURING the last twelve months the demand for receiving sets of greater selectivity has become more insistent than ever. Although some progress has been made in this direction it must not be forgotten that each year sees more and more new stations coming on to the ether, and this, in turn, means a corresponding increase in the difficulty of preventing mutual interference.

For those with unlimited purses the problem of "reaching out" and selecting different programmes at will has been solved, in large measure, by the latest type of superheterodyne circuit, as well as by the Neutrodyne principle of stabilising several stages of H.F. amplification in series. Both systems enable extraordinary ranges of reception to be obtained—whilst the use of frame aerials, combined with projector or filter couplings, impart a high degree of selectivity.

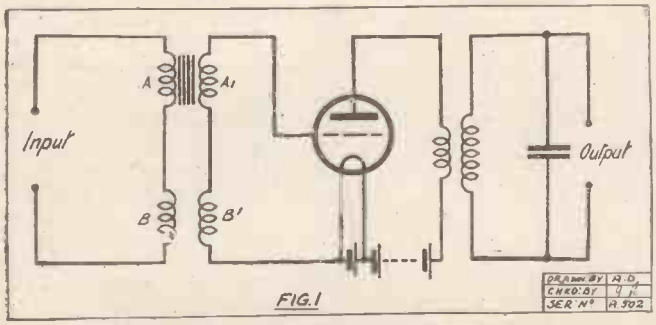


FIG. 1

Selectivity and Atmospherics.

Unfortunately, the market price of built-up sets of this kind is at present beyond the reach of most purses. There is nothing prohibitive, however, in the cost of constructing a Neutrodyne circuit from component parts, except the number of valves required and their upkeep. In the case of the superheterodyne the initial expense can be kept down to a fairly reasonable figure by building up from the special "Superhet. Kits" now on the market. So far as the ordinary listener is concerned the use of an aperiodic aerial coupled to a tuned secondary is a recent contribution towards selectivity that has proved very popular. The tapped form of plug-in coil is another useful innovation for the same purpose. By coupling a crystal or detector valve across a portion only instead of the whole of the aerial inductance, the effect of detector "damping" is reduced and the natural selectivity of the aerial is preserved.

Apart from these devices, many listeners depend upon the use of rejector circuits or wave-traps to shut out undesired signals. Or a series acceptor circuit tuned to the interfering frequency can be inserted in parallel with the aerial to act as an "H.F." drain or by-pass for the unwanted energy. Another plan is to closely couple an absorber trap to the aerial coil which tends to draw out and dissipate interfering waves.

However efficient these circuits may be in theory, they are by no means easy to manipulate in practice. With a little skill and practice one can undoubtedly cut out the local station, but usually the desired "distant" energy goes as well—or at least a very large proportion of it.

The elimination of atmospherics is a problem closely allied to that of selectivity—though it is of greater importance in commercial signalling than to the broadcast public. One ingenious method of tackling this form of nuisance, due to a French inventor, M. Bellescize, is shown diagrammatically in Fig. 1. The input coil feeds both signals and atmospherics alike to a valve amplifier through two parallel coils, A, A^1 and B B^1. The coils B B^1 being air-cored will pass both kinds of energy. Owing to the hysteresis of the iron core of the coils A A^1, the small signal impulses produce practically no effect on the coil A^1, although the large impulses due to atmospherics are transferred in full.

The coil B^1 therefore carries the effect of both signals and atmospherics, whilst the coil A^1 responds to atmospherics alone. By winding the coils in opposite directions, these components can be balanced out, so that the atmospherics disappear, and the signal voltages alone appear on the grid of the valve.

Some Ingenious Crystal Detectors.

A great deal of ingenuity has been devoted to the improvement of crystal holders, particularly with the object of minimising the trouble of searching for fresh sensitive spots. Fig. 2 shows one very simple, yet ingenious, device protected by the British Thomson Houston Co. As will be seen, the cat's-whisker is made in the form of a spiral wire, which is caused to rotate over the face of the crystal by turning the knob K. The actual point of contact between the two is thus automatically and continually varied.

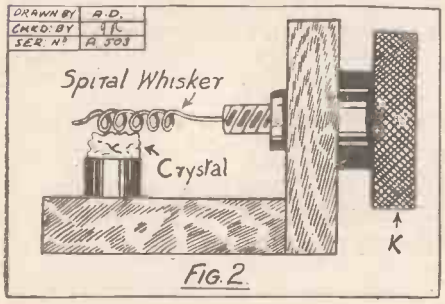
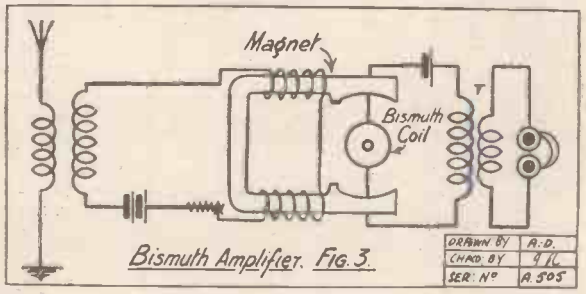


FIG. 2.



Bismuth Amplifier. FIG. 3.

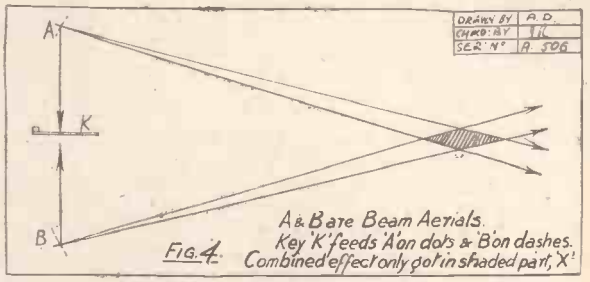


FIG. 4. A & B are Beam Aerials. Key K feeds A on dots & B on dashes. Combined effect only got in shaded part, X.

A curious form of crystal detector has been suggested, in which magnetic attraction is used to bring the metal contact into touch with the sensitive surface. Filings or small

(*Continued on page* 1008.)

THE YEAR IN RETROSPECT.

(Continued from page 1007.)

particles of iron are housed in a metal cup in an insulated casing located immediately below the face of the crystal.

A magnet is placed above the crystal and draws some of the particles up into a series of minute chains extending between the base and the crystal. If an electro-magnet is used, "searching" is effected by switching the magnetising current on and off so that fresh chains are continually formed and collapse.

A Novel Detecting Device.

In another unusual construction, the crystal is floated in a small trough of mercury in the lower end of a glass tube. The cat's-whisker is in the form of a fine screw threaded through the upper end of the tube, and pressing the crystal with its pointed end into the mercury. These particular arrangements are merely typical examples of a great variety of models all designed with the object either of searching for sensitive spots automatically, or of securing a more effective and more easily controlled contact between the crystal and cat's-whisker.

Fig. 3 shows a novel type of detecting device which has been suggested as a

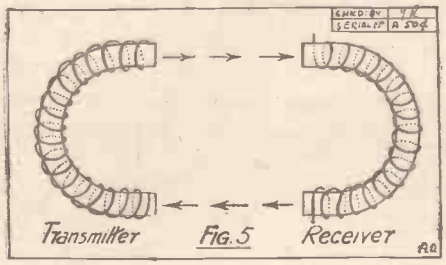


Fig. 5

substitute for the crystal or valve. The principle depends upon the fact that the resistance of certain conductors, such as bismuth, alters with the density of the magnetic field to which they are exposed.

A Secret Signalling System.

Incoming oscillations are passed through the coil windings surrounding a highly-laminated magnet. The corresponding increase in the magnetic flux across the magnet poles changes the resistance of the bismuth coil, and the resultant current fluctuations are fed across a transformer T to the 'phones. By replacing the telephones by a second magnet and bismuth coil, the detected currents can be amplified.

The importance of short-wave working has been further demonstrated, not only by the extraordinary achievements of our leading amateurs, but also in commercial working. Only a few weeks ago Senatore Marconi announced at the third POPULAR WIRELESS meeting that he had succeeded in maintaining reliable daylight communication between this country and the Argentine on a wave-length of only 15 metres, and using a power of less than one-quarter of a kilowatt.

Fig. 4 shows an ingenious plan invented by Mr. R. D. Bangay for utilising short-wave beam transmission for the purpose of

(Continued on page 1043.)

SEARCHING FOR DISTANT STATIONS.

FROM A CORRESPONDENT.

IN spite of all that has been said against long-distance listening upon one or two valves, there is a tremendous fascination in reaching out for foreign stations. Probably every set owner goes through the desire-for-distance-phase, but a good many are deterred by the fear of spoiling other people's pleasure.

There is no fear of doing this if you have a "straight" set and know how to control oscillation. This gentle art should be learnt outside broadcasting hours, when the ether is quiet, for not only does this give other people a chance to enjoy the programmes, but the reaction-rush and other phenomena of oscillation are best recognised when there is no strong carrier-wave on to conceal them.

The Time to Practice.

Here is the best way to learn the art of long-distance searching. For simplicity's sake we will assume that the set is a straight detector-valve, with one knob to control tuning, and a variable coil holder. Everybody knows that for DX (long-distance) work it is necessary to use reaction, but not everyone has realised that such reception can only be carried out with *very weak* reaction. Strong reaction is worse than none at all, for it is impossible to hear very weak signals through it, and it distorts speech, so that even if it could be heard it would be impossible to hear what the announcer was saying.

First of all, you must make sure that you can control the reaction, so that you know exactly when the set commences to oscillate. To do this, choose a time when there is no broadcasting on, open the reaction-control right out, put on the 'phones, and listen to the effect of reaction upon the receiver. When the coil is right away from the aerial coil, the reaction control apparently makes no difference, but move the coils *slowly* towards one another and note the effect. At a certain point, as the reaction is increased, there is a very faint hiss or breathing sound in the 'phones, and this denotes that the set is just starting to oscillate. This is when the receiver is in its most sensitive condition, but if you advance the reaction coil still further, the gentle hiss or breathing becomes a rushing sound and the set may whistle or squeal.

All Around the Dial.

Strong reaction of this kind is no earthly use for long-distance work, so loosen reaction and go back to the point where the set is nearly but not quite oscillating. Now adjust the tuning control, and you will find that the tuning alters reaction, and very often shortening the wave-length will cause the set to howl, whilst tuning up to long wave-length stations will take the set right away from oscillation point.

A good set should be capable of oscillation all round the dial, so set the pointer at 10, open out the coils, and notice where it is necessary to place them to start oscillation. Then move the pointer up to 20, 30, 40, and so on, noticing in each case where the coil has to be placed to keep the set only just oscillating.

The Expert Touch.

It may seem rather tedious to practice like this when there are no signals, but if ever you hear anyone say admiringly, "He knows how to handle his set," it will be because the person of whom the remark was made had learned this relationship between the position of reaction control and tuning. Soon you will be able


A German crystal set of novel design.

to tell instantly when the set is near oscillation point, and you will be able to control this oscillation and make it start just when you want it to, irrespective of whether the condenser dial is set at 25 or 125.

The Most Sensitive Point.

When you are able to bring your set right up to the point without going over into self-oscillation, you are in a position to start long-distance work with confidence, for you will be no danger to your neighbours' enjoyment and you will get results that seemed phenomenal before you gained the knack of the controls. After you are really expert, you will find it is not always necessary to move the reaction coil to compensate for a change in wave-lengths, as often this is more easily done by a few volts more or less of the H.T. battery-adjustment. Whilst, for very fine control, in the region that lies between insensitivity and the very first sign of oscillation, the filament control affords a wonderfully precise adjustment.

It is not necessary to study the theory of wireless to gain operating skill. It helps of course, but it is mostly a question of practical experience.

IMPROVEMENTS AND MODIFICATIONS IN THE ONE-VALVE LOUD-SPEAKER CIRCUIT

By F. GAILLARD.

Further Notes on the popular One-Valve L.S. Set described in "P.W.," No. 154.

SINCE the publication of my circuit in POPULAR WIRELESS, No. 154, I have had so many inquiries and criticisms that I venture to think a short article on the circuit will be welcome.

Quite 70 per cent of my inquirers commence with "I am a novice," "I cannot understand the diagram," etc.

I would like, therefore, to repeat and emphasise the words of Mr. Phillip Mason in POPULAR WIRELESS, July 4th, viz.: "Super-circuits are not for the 'man in the street,' but only for the advanced amateur."

I will further take the liberty of quoting Mr. Mason's explanation of his circuit and apply it to mine.

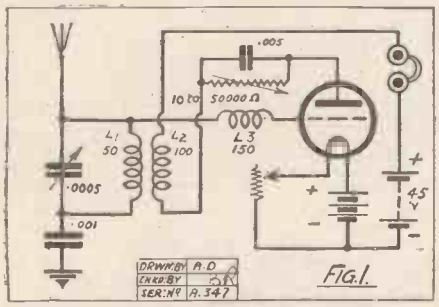


FIG.1.

"This circuit appears to function, as regards rectification, on the Homodyne principle, whereby synchronisation is effected between the oscillations generated by the valve and the incoming signal impulses.

"The dual trains of oscillations appear to 'come to grips' with one another when

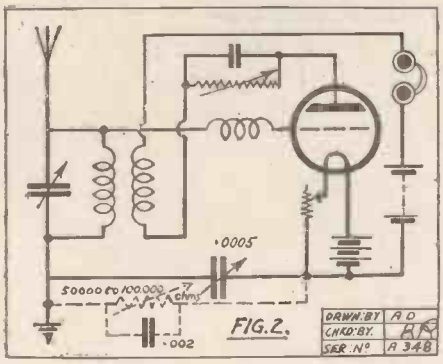


FIG.2.

the receiver is dead in tune, and the arrangement then (not otherwise) becomes very stable."

Now, although rectification is brought about by the correct adjustment of the reaction coil, an almost vernier control of

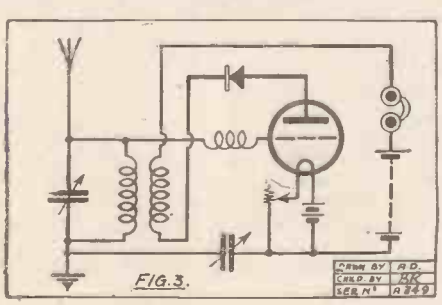


FIG.3.

the reaction is obtained by the correct adjustment of the filament and variable resistance. A further stabilising device may be added by inserting a .0005 variable condenser between the L.T. + and the earth.

It will be seen, therefore, that as there are four extremely sensitive variable controls of the reaction, it is not a circuit with which a beginner could hope for any degree of success.

I will now describe a few variations of my original circuit.

Increasing Stability.

Fig. 1 is my original circuit. The best results are obtained with low self-capacity pancake coils. I use "Quality Coils" by the Goswell Engineering Co., with reversible reaction switches.

The numbers shown for L1, L2, and L3 are for 2 L O, 6 B M, etc.

With regard to the choke coil L3, the value varies slightly with the wave-length, and it is an advantage to use a solenoid coil with slider if this can be conveniently done.

Fig. 2 shows a variation which increases stability but slightly reduces signal strength. If, instead of the variable condenser, a variable resistance and fixed condenser (as shown by the dotted lines) is added, the signal strength is louder but the set is not so stable.

Dual-Amplication.

Fig. 3 shows a crystal in the plate circuit in place of the resistance and condenser. This crystal is not used as a rectifier, but as a high resistance whose value varies according to the pressure of the cat's-whisker and the particular spot it touches.

Fig. 4 shows the circuit with one stage of L.F. amplification added. It will be seen that no complications of any description are introduced.

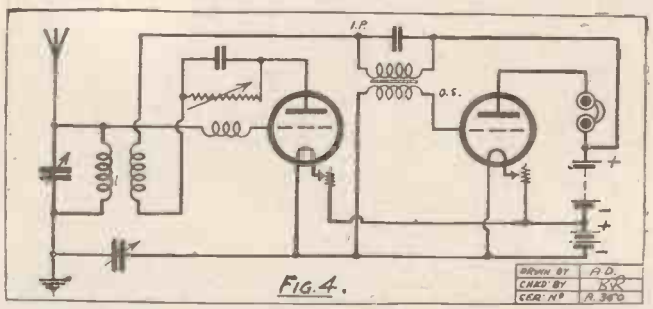


FIG.4.

Separate H.T. and grid bias on the L.F. valve are refinements well worth consideration as in standard practice, but are not essential to the operation of the circuit.

Fig. 5 and Fig. 6 show methods of introducing dual amplification, and are circuits which have given very good results indeed. Especially in Fig. 6, which embodies a system of L.F. "feed back" evolved by a famous radio engineer, is volume, stability, and purity combined in a really noteworthy manner. The variable condenser, whose connections are shown in dotted lines, is quite optional. In certain cases it will be found to improve results considerably, but not invariably. It is, however, well worth trying.

(*Continued on page* 1010.)

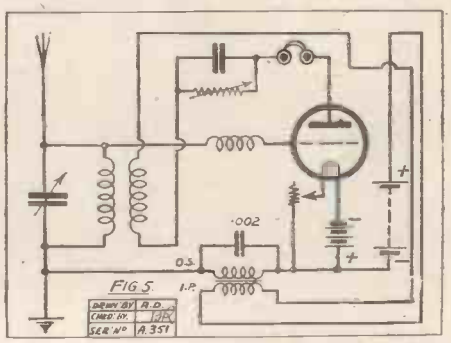


FIG.5.

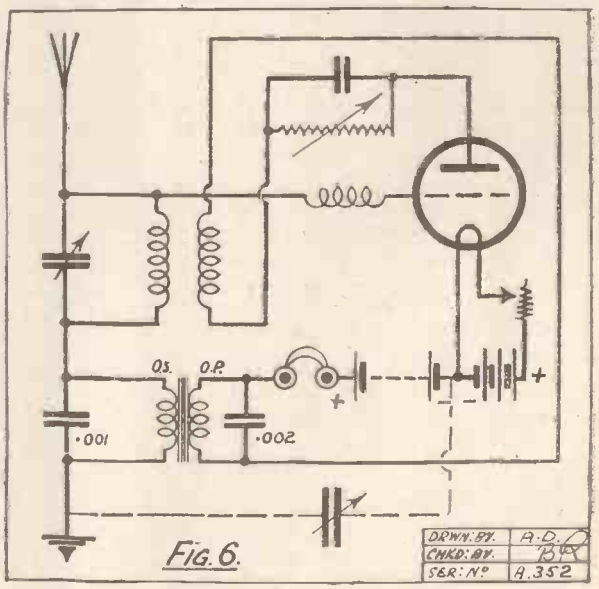
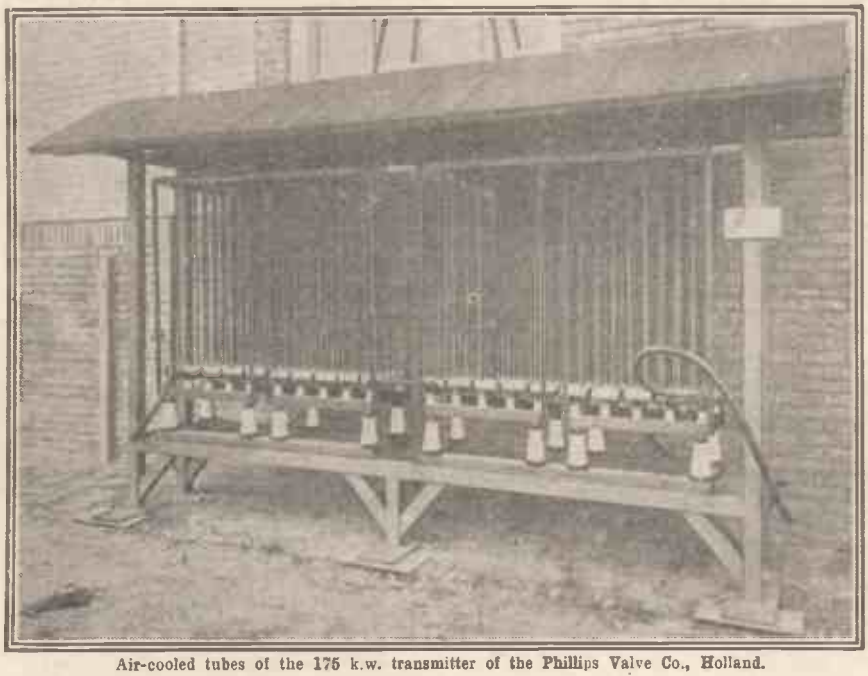


FIG.6.

EBONITE AND PANEL MATERIALS.

FROM A CORRESPONDENT.

MANY inferior materials are offered under the name of ebonite to the unsuspecting amateur, and it is high time that this most important material should be sold under a guarantee, say as conforming to the specification of the British Engineering Standards Committee. In the absence of such guarantee, the amateur is left to decide for himself without the assistance of the electrical tests available to the manufacturer. The best course, under the circumstances, is to insist on a guarantee of the manufacturer's name, and to watch the advertisement columns of the wireless press for copies of certificates of test from the National Physical Laboratory.



Air-cooled tubes of the 175 k.w. transmitter of the Phillips Valve Co., Holland.

Suspicious Surfaces.

The amateur is generally safer in purchasing bright finish ebonite than in buying the matted kinds, as the grade of the ebonite can be judged to a certain extent from the nature of the surface, which should bear a high gloss and be of a jet-black colour. The surface should also be perfectly flat. Unless a guarantee of low surface leakage is given with the material, the gloss should be removed with emery paper on both sides before mounting the components. The outer surface can be finished to a smooth matt by rubbing with a circular motion, using a paste of oil and pumice powder.

Another test the amateur can apply is to scrape the edge with a sharp knife. The material should cut in shavings and not break up into powder. The shavings should be of a dark brown colour. Examine the edge after scraping, and reject the material if light-coloured specks appear, since these show the existence of loading material which detracts from the insulating properties of the material.

Matt surface ebonite requires very careful examination, since there are many methods of producing this surface without accomplishing the object really aimed at, namely, the reduction of surface leakage. In really good quality ebonite this surface is produced by sandblasting, and this will be indicated by a definite uniform grain and a velvety appearance. Other methods usually result in a semi-matt appearance only, without absolute uniformity of grain. Broadly speaking, the surface should be similar to that obtained on the fine ground glass employed for photographic focusing screens. In case of doubt it is as well to remove the surfaces in the same way as for the polished varieties.

Artistic Materials.

Amateurs with an artistic turn of mind will welcome the introduction of grained ebonite, usually sold as "mahoganite," in which an artistic representation of wood grain is produced by the introduction of red vulcanite. This also possesses the advantage that several makes can be obtained with guaranteed low surface leakage, but insist on this guarantee, as many inferior imitations are made. Galalith or erinoid can also be obtained in many excellent colours, including horn, tortoise-shell and amber imitations, and its electrical properties are excellent. Its one disadvantage is its tendency to warp under atmospheric conditions, which necessitates that it should be firmly supported all round.

This article would not be complete without a brief reference to the many excellent bakelised materials on the market. This type of material, which possesses ideal qualities for radio work, especially in regard to strength, has not received much attention in this country, possibly on account of its price, but is in very great vogue amongst our American confrères.

THE ONE-VALVE LOUD-SPEAKER CIRCUIT.

(*Continued from page* 1009.)

Combined with the "Hopwood."

Fig. 7 shows the principle applied to the "Hopwood" circuit. This latter has of late lost much of its original popularity, but nevertheless, used in the manner indicated, it is deserving of the amateur's attention.

The variometer should be of sufficient size to cover the wave-length range to which the circuit is tuned, not forgetting that the aerial and earth inductance and capacity must be included. A Bretwood anode resistance will be quite O.K. for the reaction circuit.

Without making extravagant claims, I can add in conclusion that Bournemouth, 90 miles away, London 60 miles, and 5 X X 100 miles, can generally be brought in on the loud speaker with the single valve, and that with one L.F. added volume is equal to anything possible on normal three-valve sets.

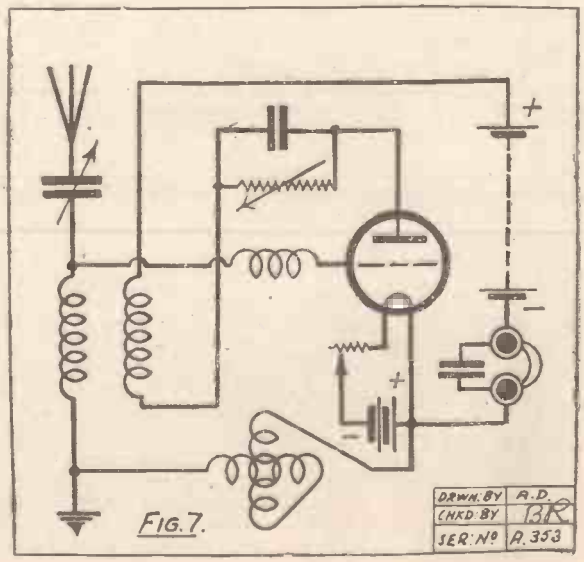


FIG. 7.

A "P.W." ALL STATIONS REFLEX

This extremely efficient receiver has been Designed and Described by

G. V. Dowding, Grad. I.E.E.

(Technical Editor.)

The Constructional Work carried out by

G. V. COLLE and C. A. MEADOWS.

(Technical Staff, "P.W.")

IT is well known to every reader interested in valve sets that the idea of the reflex circuit is to make one valve do the work of two. Unfortunately, this ideal is never attained, but in a well-designed receiver it is possible to so arrange the circuit that one or more of the valves will do a little bit more than the amount of work usually required in a straight circuit. The result of this in practice is a greatly increased signal strength, especially in the case of a local station over that usually associated with a receiver containing the same number of valves. For those who are not clear upon the action of the reflex receivers, it may be as well to run briefly over the system. It consists, first, in using a valve as an H.F. amplifier in the usual way and then passing the amplified signals on to a detector, which may take the form of either a crystal or a valve. After this, the rectified impulses are passed back again on to the grid of the H.F. valve, which then has the task of still further amplifying them, thereby acting as an L.F. or note magnifier.

A photograph of the complete receiver. Note the accessible positions of the tuning and reaction controls.

Body Capacity Eliminated.

In the actual set under consideration a valve detector has been employed in order to give the maximum stability possible with reflex sets (they are always a little more difficult to handle than straight circuits), the circuit used being one which has long been well known in this country, but in which a very important improvement has been made.

A study of Fig. 1 will show how the first valve is made to act as an H.F. amplifier, detection carried out by a second valve which is provided with a reaction coil, and then the L.F. components are amplified by the first valve. In the usual course of events this process would mean that the telephones or loud speaker would have to be placed directly in the plate circuit of the first valve, or, in other words, in one of the most sensitive spots in the set and one which is dealing with H.F. currents. The result, if this procedure is adopted, is that any slight movement of the operator or the loud speaker leads is accompanied either by a squeal from the set or a cessation of signals, due to variation of tuning, being made by alteration of capacity in the anode circuit of the valve. Such happenings make it very difficult for anybody but an expert to operate the receiver satisfactorily, and so, when this set was designed, it was decided that some means of removing this trouble would have to be adopted.

L.F. Choke.

Accordingly, what is now well known, L.F. practice was modified to meet the needs of the moment, and an L.F. choke was inserted in the position usually occupied by the telephones—i.e. in the plate circuit of the first valve. Across this choke the telephones could be connected if a suitable blocking condenser, which would pass the L.F. impulses but not the H.F. or the direct H.T. current, were used. But this procedure would appear to have the effect of damping, if not absolutely choking, the H.F. impulses flowing in the circuit, and so at first, when the receiver was built up, a ·0003 condenser was connected across the L.F. choke, in order to provide an uninterrupted path for the H.F. impulses.

In the diagram Fig. 1 and in the photographs of the set itself, it will be seen that this condenser is omitted, and this is because it was found on test that the self-capacity of the choke was sufficient to allow the H.F impulses to pass. This may not be the case if a different choke is employed, so that should constructors break away from the actual components given in the list on this page, they are advised to try the effect of a ·0003 condenser before deciding to omit it.

LIST OF COMPONENTS.

	s.	d.
1 Panel, 10 x 8 x ¼ in., with cabinet 5½ in. deep (Peto-Scott)	13	6
1 ·0005 variable condenser (Peto-Scott)	10	6
1 ·0003 variable condenser (Peto-Scott)	9	3
1 "Maxamp" L.F. Transformer	19	6
1 Lissen L.F. choke	10	6
2 Lissenstat major rheostats	15	0
1 Yesly 2-way coil holder	7	6
1 ·002 fixed condenser (Sangamo)	2	6
1 ·0002 fixed condenser (Sangamo)	2	6
1 2-megohm grid leak (Dubilier)	2	6
1 Lissen fixed condenser ·0003	2	0
1 panel mounting single coil holder (Peto-Scott)	1	2
9 terminals (W.O. type)	1	1½
Wire, screws, transfers, etc.	1	6

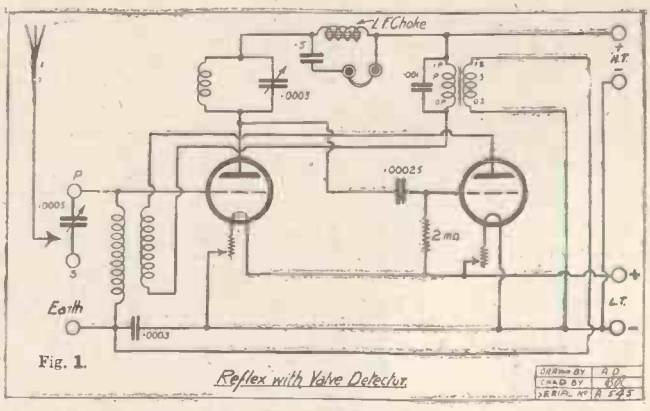


Fig. 1. Reflex with Valve Detector.

In the construction of the set the

(*Continued on page* 1012.)

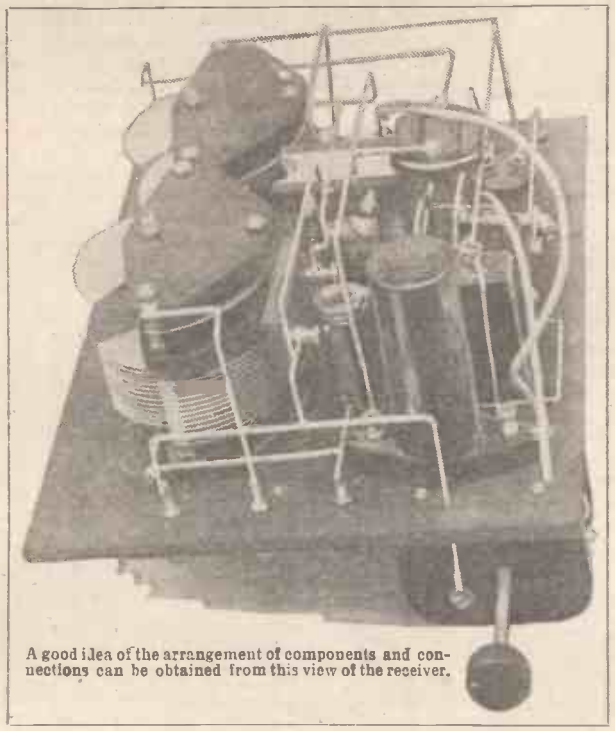
ALL STATIONS REFLEX.

(*Continued from page* 1011.)

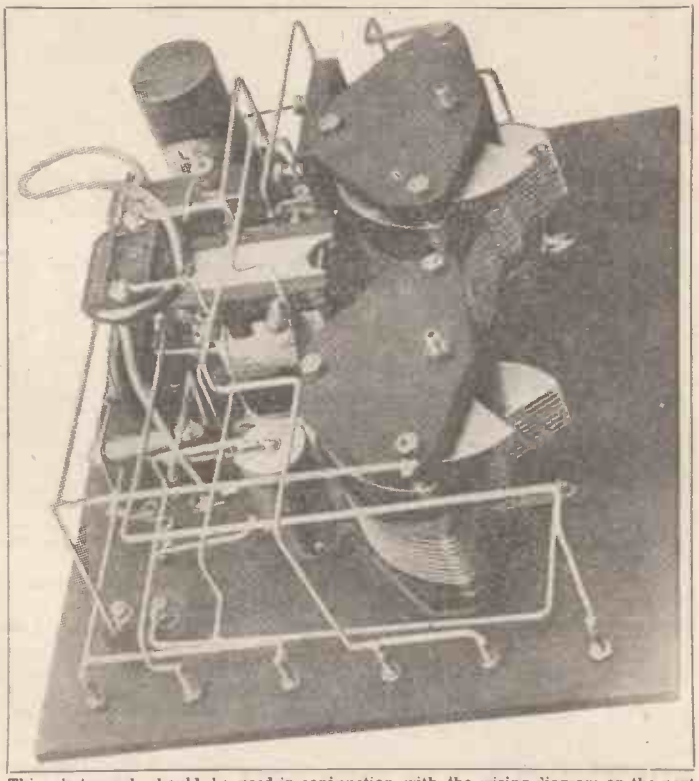
components in the list mentioned on page 1011 will be required. It is advised that constructors keep it as nearly as possible to the actual types mentioned, because, as will be seen from the photographs, there is no waste space on the panel, and any variance from the list given may make it difficult for the constructor to space his panel out efficiently, especially if such things as large rheostats, L.F chokes, and very large variable condensers are used.

The Panel.

Assuming that the same types of components as have been mentioned are used, the constructor can go right ahead with the drilling of his panel by using the dimensions provided in Fig. 2, care being taken in the cases of the coil holder and the valve socket that the drilling centres are made quite accurate. If they are "out" in any way, he will find it extremely difficult to mount the holder and probably impossible to insert the valves.



A good idea of the arrangement of components and connections can be obtained from this view of the receiver.



This photograph should be used in conjunction with the wiring diagram on the next page, in order to assist the constructor in connecting up the components.

The drilling of the panel is, however, the more easy side of the construction of the set; it is in the actual wiring of the receiver that special care should be taken. As has been remarked before, there is no waste space available upon the panel; and this means that not only the components, but the connections between them, must be fairly close together, and anybody who has built a reflex receiver will know that in such case careful wiring up must be done if results are to be satisfactory.

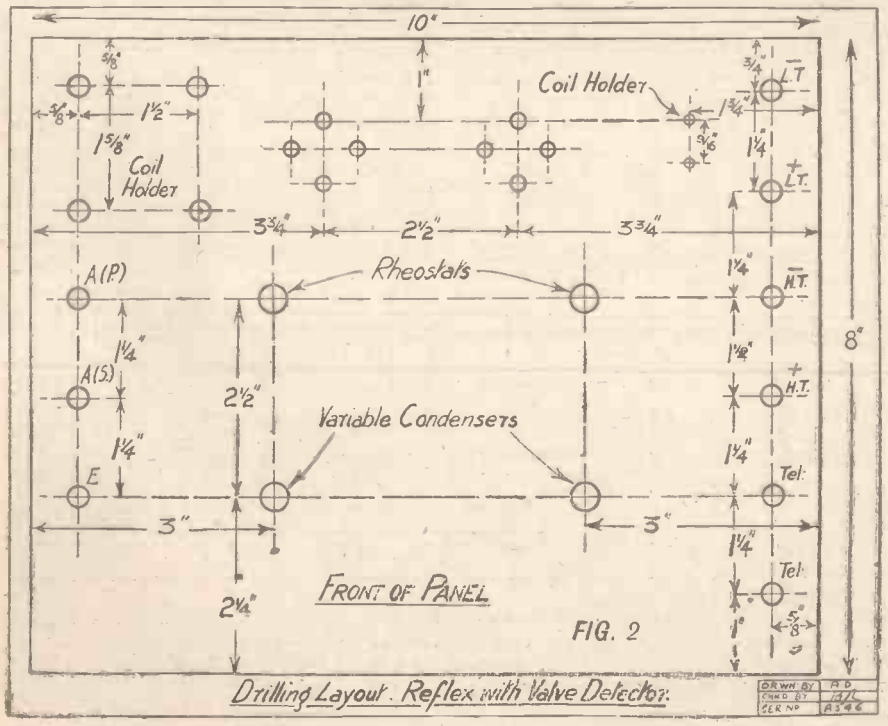
Good Connections Important.

Accordingly, we advise everybody to use stout wire, either square or round section, and to solder all connections, so that the shortest leads possible may be employed. It is extremely important that no such safety devices as insulated wire or systoflex be used, as these might add to the inter-wiring capacity of the set and might possibly cause howling or instability.

The wiring diagram Fig. 3 gives the actual connections made on the set, the photographs of which appear in this article, and this diagram should be used in conjunction with the photographs and the point-to-point list (on page 1014), in order to obviate any mistakes that may cause trouble when the set is tested out. Good, strong, and, above all, clean soldered joints should be employed, as dirty connections, loose contacts, or dry joints are fatal in a receiver of this nature, where many of the wires have to carry two absolutely distinct types of electrical impulses.

It will be seen that very often, in the case of a bad connection, not only will the H.F. impulses be impeded, but also the L.F. currents will have their progress stopped altogether or else seriously hindered. The total result of such happenings is usually

(*Continued on page* 1013.)



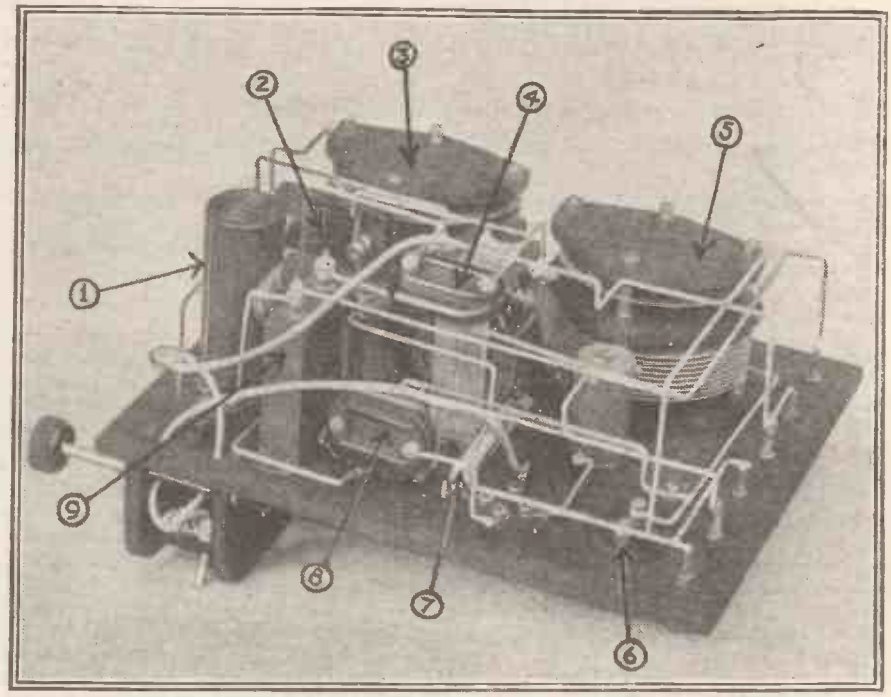
ALL STATIONS REFLEX.

(*Continued from page* 1012.)

announced to the operator by noisy reception, constant howling, instability, or, possibly in bad cases, a complete failure to receive anything at all.

When the set has been wired up to the satisfaction of the constructor, he should run over the connections in order to make sure that they are all clean and that no traces of flux or loose solder remain, and then the set is ready for test.

The choice of valves must be made to suit the type of accumulator it is desired to use; but whatever type of valve is decided upon, whether bright or dull emitter, it should be picked out from the many available on the market with a view to the function it has to perform. In other words, it is advisable to use a valve capable of carrying on H.F. and L.F. amplification satisfactorily (especially the latter) in the first position, while a good detector should be placed in the second valve sockets. The H.T. will have to be varied while the set is in operation until the best results are obtained.

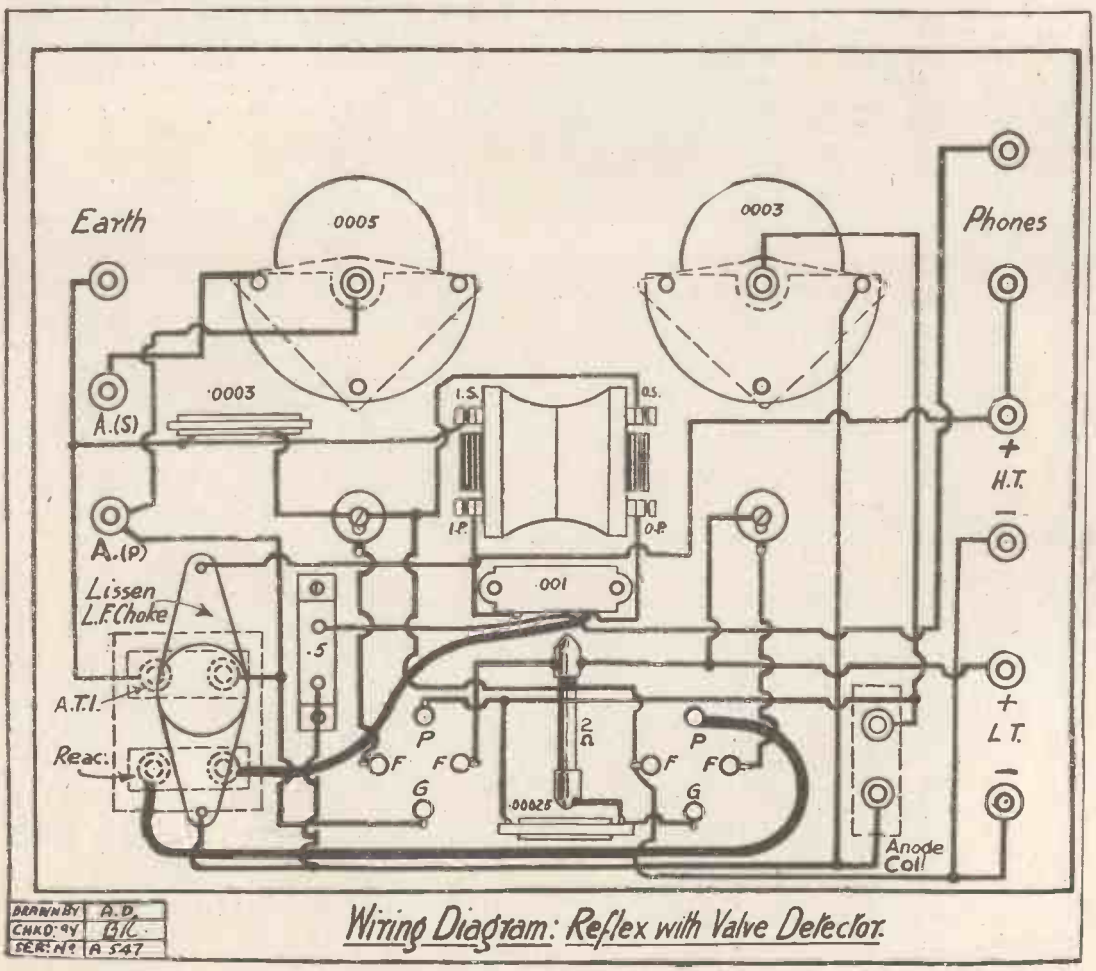


In this photograph the numbers indicate the following components: (1), L.F. choke; (2), ·0003 fixed condenser; (3), ·0005 var. condenser; (4), ·001 fixed condenser; (5), ·0003 var. condenser; (6), anode coil holder; (7), grid leak; (8), grid condenser; (9), ·5 mfd. fixed condenser.

The Coils to Use.

As regards coils, any good make should be found suitable, or home-made spider coils can be used if desired, the sizes most applicable for ordinary broadcast wavelengths being a 50 or a 75 in the aerial and in the reaction positions, and a 75 for the anode coil.

For 5 XX 150 aerial, 250 anode and 100 or 150 reaction should be suitable, the aerial in this case being connected so that parallel tuning is obtained.



Wiring Diagram: Reflex with Valve Detector.

For the sake of those unacquainted with the "three-terminal" system of obtaining either series or parallel tuning, the following will be useful:

For series connect aerial to centre (series) terminal and earth to earth terminal, parallel terminal being left unconnected. To obtain parallel tuning the aerial should be connected to the parallel terminal (top), and the series and earth terminals should be connected together and taken to earth.

As regards actual handling no difficulties should be encountered as the receiver operates in a similar way to the ordinary H.F. and Det. set. Reaction is, of course, a little more critical and should be handled carefully while tuning will be found to be rather flat on the aerial side and moderately sharp on the anode.

When operating properly the set should be capable of operating a small loud speaker up to about 12 miles from a main B.B.C. station and about 5–6 miles from a relay.

(*Continued on page* 1014.)

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENT.

New Danish Relay Station Opens.

THE new Hammeren relay station has commenced operations with considerable success, on a wave-length of 1,900 metres. This is, however, not definitely fixed, and may be subject to modification as the result of experience gleaned during the first few weeks of service.

Free Radio Instruction.

Free radio instruction is now provided for French youths, having attained the age for military service, by the army and navy authorities.

Posters put up at street corners last week appealed for young men, due for army or navy service, to qualify for wireless work in the services by attending a free course of radio instruction, starting on January 4th at the headquarters of the various French army and navy commands.

Radio a Colonising Power.

The rapid progress of radio opens up all sorts of possibilities regarding its use in future warfare, and an enterprising Paris journalist attempted to secure the views on this subject of Marshal Foch and Marshal Lyautey.

He found both chiefs adamant, however. The late Allied commander-in-chief replied: "My personal interest in radio is, of course, well known, but I have made it a rule, which admits of no exception, never to grant any interviews, and never to say anything for publication on any subject whatsoever."

Marshal Layutey, who has just completed a long period of activity as coloniser of Morocco, took the view that the circumstances of his recent retirement were such as would make it exceedingly inadvisable for him to make any public statement, even on so innocuous and purely scientific a subject as radio. He agreed, however, that radio was one of the most powerful agencies, properly employed, by a colonising power in an uncivilised or half-civilised community.

Northernmost Radio Station.

The most northern radio station in the world at present, it is stated, is that at Longyear City on the island of Spitzbergen. The station is situated on the shore of Advent Bay, on the west coast of the island, its geographical position being 78 degrees 20 minutes north.

A New Metal.

Professor Bohr, a well-known German scientist, claims to have invented a new metal called Hafnium. The element is produced in the form of a dark-grey powder, and, according to its discoverer, is specially suitable for use in wireless sets.

Brazilian Station Flourishes.

Such has been the success of the Montegrande station near Buenos Ayres, that it has been found necessary to increase the station's power.

The Legal Side of Radio.

At a meeting of German lawyers interested in radio, it was stated by the chairman that "the ignorance of radio matters displayed at times by judges is appalling," and it was resolved to form a Radio Legal Association for the purpose of studying the legal aspect of radio and of helping with proper advice contestants before the courts and the courts themselves.

The presidency of the association was assumed by Germany's leading judge, Dr Simons. He is president of the German Supreme Court in Leipzig, and in the interval between the death of President Ebert and the election of President von Hindenburg, he acted as interim president of the German republic.

Opportunities for Inventors.

The German radio paper, "Radio Umschau," published by Bechhold in Frankfort, is offering a prize of two hundred gold marks for the best solution of the following problems:

1. An apparatus for making audible sounds not usually perceptible, such as pulse and heart beats, cell growth in plants, etc.

2. A practical and simple way of directly measuring capacities and inductances.

3. An appliance for measuring infinitesimal lengths, breadths, and weights, down to the thousandth parts of millimetres and milligrams.

Solutions, which should be accompanied by illustrative drawings or photographs, should reach the editor before February 15th. There are no restrictions placed on competitors.

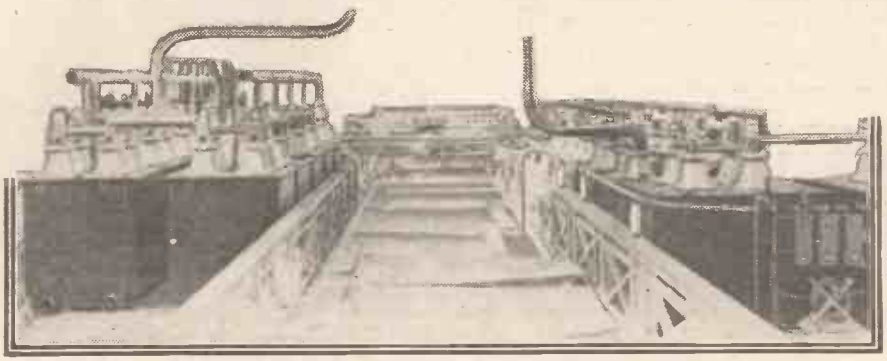
An Important Agreement.

An agreement has been signed between the station Radio-Paris and three of the "Big Four" among Paris morning newspapers, for co-operation in the diffusion of news. This means practically a pooling of the news-gathering resources of these three papers for the benefit of listeners to the Radio-Paris station, and is considered in press circles as the first step towards the realisation of a "spoken" radio newspaper.

Milan Asks for Reports.

Radio-Milan station is making tests from 9.30 p.m. to midnight on a 337 metres wave-length, using 1,200 watts.

(Continued on page 1042.)



A few of the giant condensers installed in the inductance room of the new Rugby Station.

ALL STATIONS REFLEX.

(Continued from page 1013.)

POINT-TO-POINT.

Aerial parallel terminal to moving plates of ·0005 variable condenser, plug of fixed coil holder and grid of first valve.

Aerial series terminal to fixed plates of ·0005 variable condenser.

Earth terminal to socket of fixed coil holder, one side of ·0003 fixed condenser, and to I.S. of L.F. transformer. The other side of the ·0003 fixed condenser is connected to O.S. of L.F. transformer and to L.T. negative, which is connected to the rheostat of the first valve, direct to one filament socket of the second valve, and to H.T. negative. One filament socket of the first valve is connected to the remaining connection on the first rheostat, the other filament socket of the first valve holder going direct to L.T. positive.

L.T. positive is connected to one side of the second rheostat, the other side is connected to the remaining filament socket of the second valve. Plate of first valve to one side of grid condenser, socket of anode coil holder, and to moving vanes of ·0002 variable condenser.

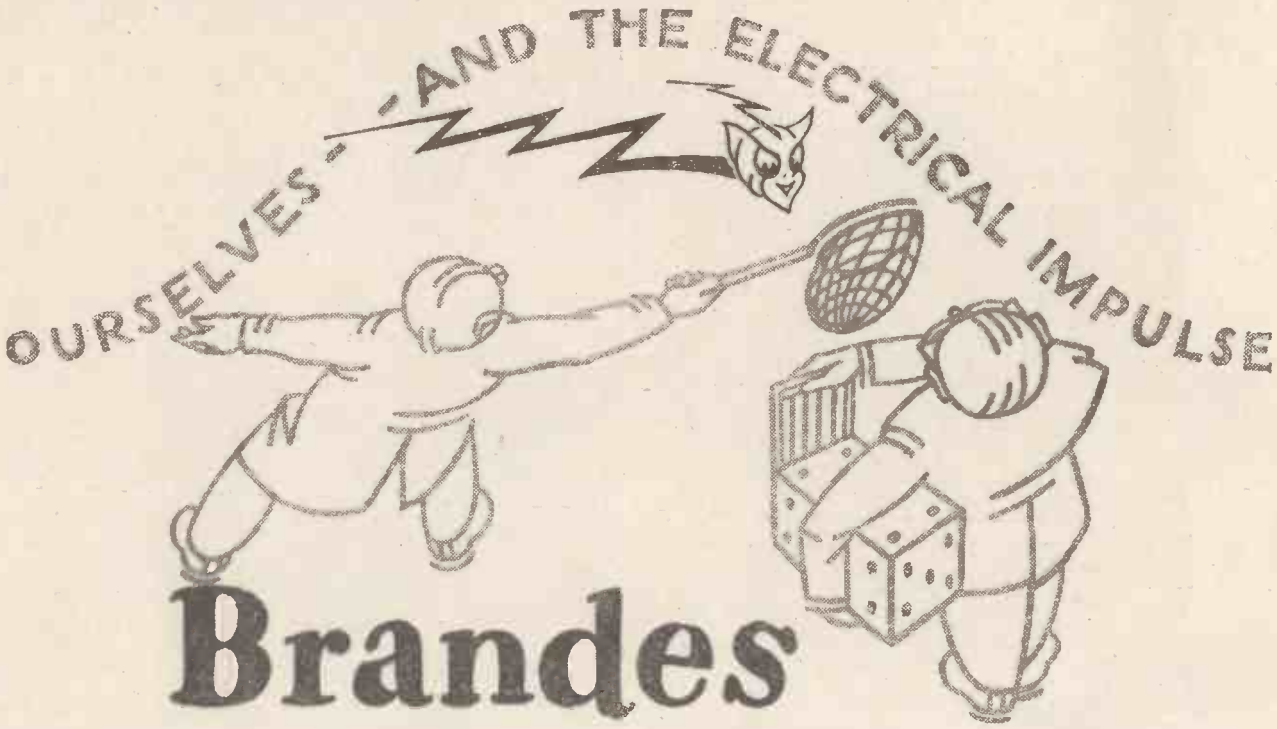
Fixed plates of variable condenser to plug of anode coil holder, one side of ·5 T.C.C. fixed condenser, and one side of choke. Other side of ·5 condenser to one 'phone terminal, other 'phone terminal to H.T. positive.

Other side of choke to I.P. of transformer and to H.T. positive.

Grid of second valve is connected to the other side of grid condenser and one side of grid leak. Other side of grid leak to L.T. positive.

Plate of second valve is connected by a flex lead to socket of reaction coil holder, plug of reaction coil holder to O.P. of transformer.

A ·001 fixed condenser is connected across the primary of the transformer.



Brandes

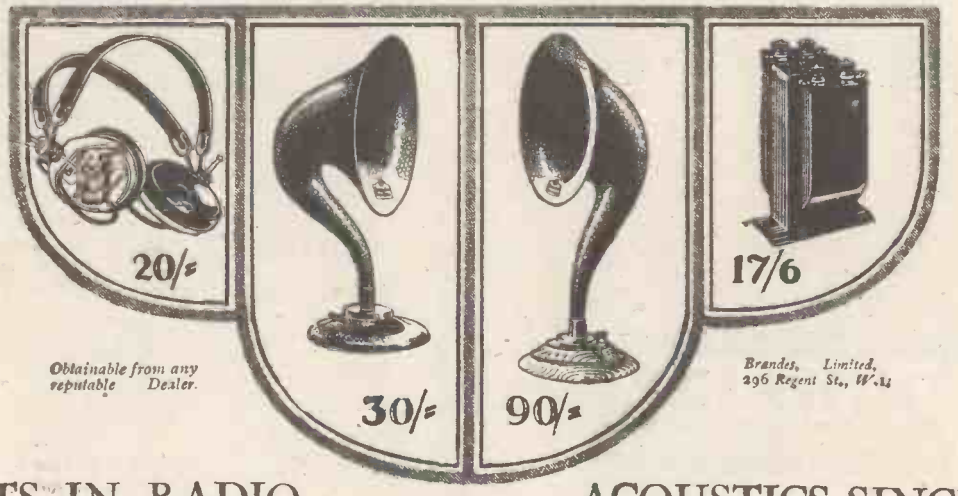
"HULLO! What do you fellows want me for now?"
"Come along, you young imp. Our laboratory experts want a word with you?"
"Shades of Geneva! They want my advice again. Still, take the net and cage away, and I'm with you. You Brandes people have a little more understanding than most; you consult me with due humility. Others, without any knowledge of what I demand, force me to speak. I become refractory; their instruments reproducing radio sound talk less naturally in consequence. You know, they really ought to study me a little more. Here I am, at the beck and call of every soul interested in radio, from a high power station to myriads of embryo Senatore Marconis. I recommend a study of radio acoustics, which means the study of transforming myself, the electrical impulse, into audible sound. I, being the electrical energy, walk right into the receiver of Tom, Dick or Harry, carrying the voice from the studio. To be able to talk just as naturally as the people in that studio I must have the correct scientific elements built into the instrument which reproduces the sound. You chaps have been the only radio builders to consult me to that end. I know you've worried me for seventeen years, but I appreciate the tactful consideration which went with it. I hope you have benefited by my advice; by what I hear of Brandes instruments, you have. Well, lead on to the laboratory, gentlemen; I have an appointment at 2 LO after lunch."

MATCHED TONE HEADPHONES.
The synchronised effort of both receivers discovers greater sensitivity and volume and truer tone. Light, comfortable & sturdy.

THE TABLE-TALKER.
Material used in the construction of goose-neck horn eliminates metallic harshness. Adjustable. Height 18 ins., neutral brown finish, padded base.

THE BRANDOLA.
Greater volume with minimum current input. Large diaphragm gives fulness to upper and lower registers. Walnut plinth, electro-plated fittings.

THE AUDIO TRANSFORMER.
Ratio 1 to 5. High amplification of applied voltage, together with straight line amplification frequency curve.



Obtainable from any reputable Dealer.

Brandes, Limited, 296 Regent St., W.1

EXPERTS IN RADIO ACOUSTICS SINCE 1908

26/23²

Service Advertising

Across your H·T·BATTERY

CRACKLING noises are frequently experienced in the Loud Speaker or telephones of a valve receiver. Such noises, although sounding like "atmospherics" are often due to the sudden changes of voltage which occur in H.T. Batteries.

The trouble can be overcome by fitting across the terminals of your H.T. battery a condenser whose capacity is sufficient to "smooth out" all inequalities in the voltage.

The Mansbridge Condenser (manufactured by the Mansbridge Condenser Co., Ltd.) is admirably suited to such a purpose; it is made in capacities from 0·02 microfarad to 2 microfarads at prices from 2/6 to 5/-. Your dealer will advise you as to suitable capacities, but you should be sure to look for the name "Mansbridge Condenser" embossed on the maroon-coloured case *as illustrated above*. It is your only assurance that the condenser really is made by the

MANSBRIDGE CONDENSER CO. LTD.

and guaranteed and sold by The Dubilier Condenser Co. (1925) Ltd.

REGISTERED DUBILIER TRADE MARK

DUBILIER CONDENSER CO (1925) LTD

ADVERTISEMENT OF THE DUBILIER CONDENSER CO. (1925) LTD., DUCON WORKS, VICTORIA ROAD, NORTH ACTON, W.3. TELEPHONE: CHISWICK 2241-2-3.

E.P.S. 4

"Why didn't I use GLAZITE!!"

The more complicated the circuit, the more important it is to use

BRITISH MADE

GLAZITE

REGD.

COLOURED CONNECTING WIRE; RED, YELLOW, BLUE, BLACK.

10 ft. Coils Per **1/2** Coil

2 ft. lengths, one of each colour, Per **1/-** Pkt.

Of all Radio Dealers.

Genuine Glazite bears this seal which guarantees quality.

Makers of Electric Wire for over forty years.

THE LONDON ELECTRIC WIRE CO. AND SMITHS LTD.

Playhouse Yard, Golden Lane, London, E.C.1

Telegrams: Electric, London. Telephone: Clerkenwell 1388, 1389, 1390, 1391.

JUDD.

BROADCAST NOTES.

By O. H. M.

Programme Criticisms—Radio Radiance—Murder Mysteries—Good Fare Coming.

I THINK the B.B.C. deserves great credit for the sensible way it takes the Press criticisms that have been poured out recently. I was speaking to a prominent B.B.C. official the other day about these criticisms. While, of course, he did not agree with them, and felt perhaps a little hurt about the headlines, he took the very sensible view that the criticism was that of the candid friend trying to help the general cause of broadcasting.

He even went so far to admit that there was an element of truth in it, but not in the way diagnosed by the newspapers in question. He made the interesting observation that the real trouble is not too much "talk," but rather a deficiency in absorbing the talk appropriately in the programmes. Of course, there can be no real solution of this vexed problem until the B.B.C. gets its new scheme of high-power regional transmitters in operation.

The New Scheme.

When every listener has more than one programme, then there will be much less dissatisfaction. But in the year which must elapse before this desirable change is established, it will be up to the programme builders at Savoy Hill to do a little more gilding of the pill of education. Incidentally the fact has emerged that there is actually 20 per cent less talk in the programmes now than there was a year ago—the Eldorado period to which the bitterest critics now hark back.

* * *

I hear that on January 27th Radio Radiance will be heard for the last time. This Radio Revue has had a remarkable run, and has been enormously popular among the low-brows and middle-brows. Besides numerous repeats all over the country there have been no less than seven editions of Radio Radiance. But although this first Radio Revue has been so successful, it must now give way to other revues. Programme standards are lifted literally from month to month.

Echoes of the Birthday Festival Week are still heard. Competent opinion seems unanimous that the specially commissioned radio drama, "The White Château," was the outstanding event of the Big Week. Captain Reginald Berkeley has done nothing so well as this since his famous "French Leave." Assisted by Mr. Norman O'Neill's music and Mr. R. E. Jeffrey's production, "The White Château" really marked an epoch in broadcasting. We shall want this play again next year.

* * *

The versatile Donald Calthrop has a number of light novelties in hand for the New Year. He is preparing a special version of "Kate," with music by Gerrard Williams, for January 7th. Mr. Calthrop has caught the "radio bug"; he is mad keen on the new art and its possibilities.

The first radio serial mystery has turned out to be a great success. "Who Killed Robertson?" was the subject of discussion in homes, trains, buses and offices all over the country for a fortnight. Incidentally, that altogether admirable organisation, The Winter Distress League, which provides work, not doles, has benefited considerably. I hope it will not be long before we have another serial mystery, and I would like to see the B.B.C. make a strenuous endeavour to induce Sir Arthur Conan Doyle to revive Sherlock Holmes for the wireless public. But whatever the next serial is, it should run closer up than did the first. An intermission of a week is too long. One other criticism. There is really no need for long introductions.

* * *

I hear that the programme on Sunday afternoon, January 17th, will be entitled "Towards the Unknown Region." Here is a real opportunity for the artistic blending of talk and music, but I hope that the lugubrious is avoided. Speaking of the lugubrious I am really looking forward to a feast of ghastly thrills in the Edgar Allan Poe anniversary programme of January 17th.

* * *

It is admittedly difficult to glean the truth from the numerous conflicting rumours in circulation about the proceedings of the Broadcasting Committee. There have already been some big surprises, and there are others in store. The B.B.C. disregarded itself in its evidence, thereby nonplussing those who were ready to leap upon it.

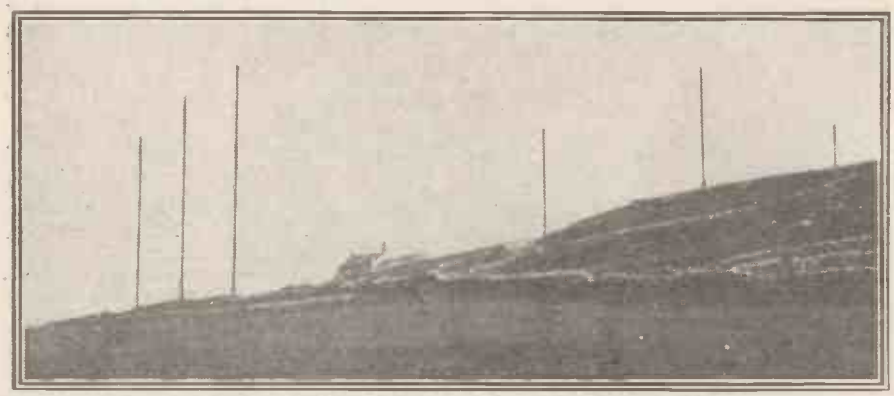
More Committee Evidence.

The Wireless League supported the B.B.C. in essentials, but pleaded for the already familiar Commission idea after 1926. The newspapers have had their say, friendly on the whole to the B.B.C., but jealous of ambitions for more broadcast news, and a little nervous about broadcast advertisements.

Other witnesses to come are the representatives of the N.A.R.M.A.T., the music industry, the theatres, the music halls, the Radio Association, and the R.S.G.B. The last two will be generally favourable to the B.B.C. The "Narmat's" attitude is uncertain; but it is bound to have a good deal to say about programmes, because both manufacturers and traders are ascribing their disappointment with present business to the high-brow character of programmes. The music people will have a smack at the whole idea of broadcasting, and will endeavour to impose crushing restrictions on the new regime.

New Year Programmes.

Other witnesses will include a few selected artistic authorities who can be counted upon to agree only on one thing, and that is their ability to do broadcasting better than the B.B.C. What the Post Office said at the preliminary private session no one knows except the Post Office and the Committee. But I am still of the opinion that the Committee will recommend an extension of a modified licence to the B.B.C. for three or five years, after which the permanent regime will be introduced.



The masts of the Marconi Co.'s giant station at Carnarvon, Wales.

But the Committee's report is a recommendation to the P.M.G. The latter may modify it before it reaches Bill stage in the House. And still the whole thing will be on the knees of the gods. The political exigencies of the moment may well exercise a determining influence.

There is known to be a section of opinion already concentrating on poisoning the minds of Members of Parliament against the probable recommendations of the Committee and the P.M.G. But the exponents of this school of thought can spare themselves the trouble. Other political considerations may intervene, but no amount of artificial and interested propaganda will invalidate the essential provisions of the Report.

* * *

The special New Year's programme to be broadcast simultaneously from the London Studio is being arranged by R. E. Jeffrey. For the first time in the history of broadcasting four studios and five microphones will be in use. Timing is planned to a fraction of a second. The programme itself will consist of a selection of the outstanding successes of the first year, including in particular "Aeroflashes of The White Château," "Radio Radiance," Crowland Abbey Bells, Military Tattoo, the String Quartette, "Winners," Ruby Helder, Rex Palmer, John Henry and De Groot.

BROADCASTING FROM THE BOTTOM OF THE SEA.

By Dr. ALFRED GRADENWITZ.
(Our Correspondent in Berlin.)

A REMARKABLE experiment was tried by the Hamburg Broadcasting Company, popularly known as the Norag, when, a few days ago, a party of newspaper men on the Hapag steamer, "Kehrwieder," was taken to the rocky island of Heligoland, and there treated to a radio lecture delivered by a diver, vividly describing his impressions and experiences from the bottom of the sea. That unique lecture was at the same time listened to by wireless amateurs not only in Germany, but in Denmark, Holland, Sweden, and elsewhere.

The party arriving at the ship prior to the experiment.

In performing his difficult task far down at the bottom of the sea a diver generally communicates by a rather primitive arrangement with the crew operating the air pump on board the accompanying vessel.

Complicated Details.

In the present case, far more comprehensive arrangements were required, for one of the most experienced divers of Hamburg, Mr. Harmstorf, was to speak from the bottom of the sea through a broadcasting transmitter to hundreds of thousands of listeners. For this his helmet had to be fitted with a microphone, enabling him to communicate with the outside world. Transmission from the bottom of the sea was then carried out as follows:

The diver would speak into the microphone fitted into his helmet close to his mouth, the telephone currents generated in the microphone being supplied by wires embedded in indiarubber hosing to an amplifier installed aboard the ship. The intensity of telephone currents would thus be increased sufficiently for them to be led to Cuxhaven through the Heligoland-Cuxhaven telephone cable.

That cable had a specially added overhead extension leading from the Heligoland Post Office to the Heligoland landing stage, whence a lead tube cable, 1,000 metres in length, afforded a connection with the diver's vessel.

Microphone Difficulty.

Any telephone currents arriving at Cuxhaven through the Heligoland - Cuxhaven cable were supplied to an amplifier in connection with the wireless telephone shore station, in order to be still further amplified so that they would have sufficient power to traverse the overhead telephone line from Cuxhaven to the Hamburg long-distance telephone station, whence the line was continued as far as the broadcasting transmitter.

One of the microphones fitted on the ship used for the experiment described in the above article.

At the Hamburg long-distance telephone station, the telephone line was connected up with the local broadcasting transmitter, telephone currents at the same time passing through cables on to the Bremen and Hanover transmitters. The three broadcasting transmitters eventually converted any telephone currents thus received into high-frequency vibrations radiated from the aerials, to be picked up by listeners all over the country.

The main difficulty to be solved in designing the diver's broadcasting outfit was the proper arrangement of the microphone in his helmet. Extraordinary acoustic conditions were, in fact, to be accounted for within this metallic ball, which, moreover, were complicated by secondary noises due to the breathing air introduced and discharged.

Surprising Success Achieved.

While a lining of wadding and felt in connection with experiments on shore did not lead to very satisfactory results, a felt cushion, when tested under water, proved quite efficient, while the noises due to the discharge of air were disposed of by an attachment designed by the diver himself, by which the discharging valves were located close to his arms. A point near the diver's mouth was found to be the most satisfactory position in the helmet for installing the microphone.

Two additional microphones, serving for communication with the diver while below the surface and for the speech input of the local transmitter respectively, were installed aboard the ship, so that any questions the diver was being asked by those present, as well as any noises produced on board the ship, could be distinctly heard.

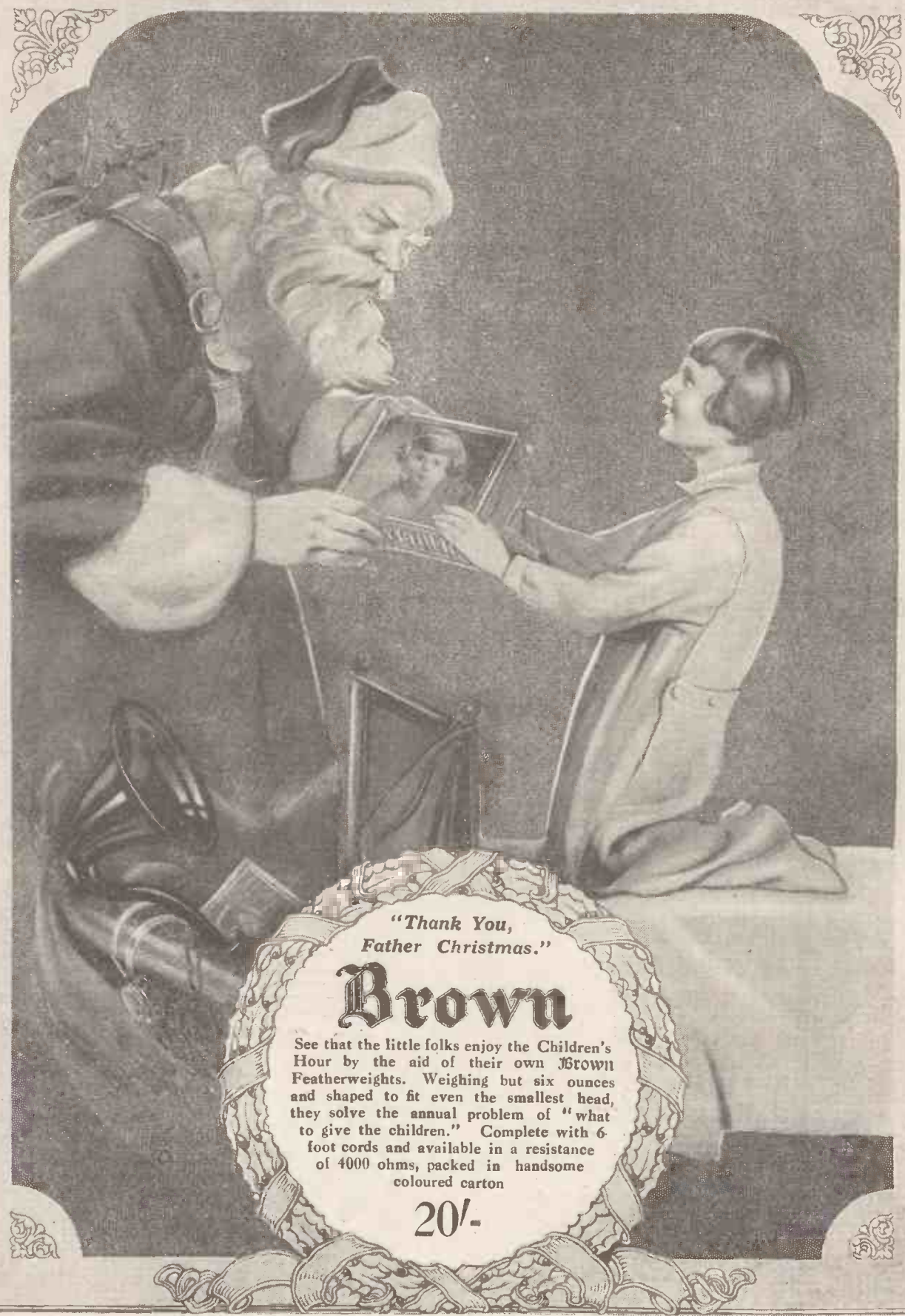
The diver carried about him a 2,000 c.p. electric lamp of special construction, in the brilliant light of which he could be watched continually on his tour around the ship.

The diver gave a most enthusiastic and picturesque description of his first impressions at the bottom of the sea. The scenery, he said, was of fabulous beauty, the sea bottom being, so it seemed, studded with diamonds, and even the bottom of the ship giving out a strange luminescence due, in his opinion, to reflexes from an infinity of minute air bubbles.

The diver commencing his descent to the bottom of the sea.

An empty bottle containing a cheque for 100 marks was dropped into the sea, this sum being made payable to the lucky finder. This bottle was eventually found by a Heligoland fisherman.

Reception in connection with this experiment was found to be excellent and of perfect clearness, far surpassing all expectations.



"Thank You, Father Christmas."

Brown

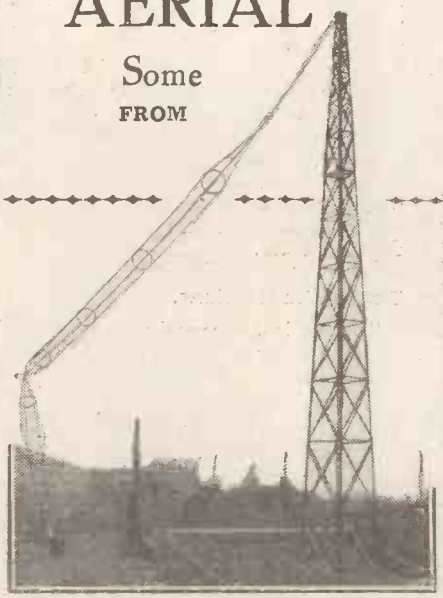
See that the little folks enjoy the Children's Hour by the aid of their own Brown Featherweights. Weighing but six ounces and shaped to fit even the smallest head, they solve the annual problem of "what to give the children." Complete with 6-foot cords and available in a resistance of 4000 ohms, packed in handsome coloured carton

20/-

BAD WEATHER AERIAL PROBLEMS.

Some Interesting Facts.

FROM A CORRESPONDENT.



The Cape Town broadcasting station's aerial.

THE collapse of the Daventry aerial in the midst of our first touch of real wintry weather is a striking illustration of the tremendous load that can be thrown upon an extended wire network by the mere deposition of a layer of ice and snow. It must be remembered that the aerial consists of ten strands of wire each 600 ft. long, and that the combined weight of ice and snow deposited upon the wires was probably two or three times that of the metal itself.

A Hazardous Task.

In the first place the height of the wire—five hundred feet above the ground—naturally favoured the formation of a heavy layer of hoar frost. To this was added a top loading of snow—also held at a chilly height and kept well below melting-point, until finally the total weight exceeded the designer's safety factor and brought the aerial, together with 450 ft. of lead-in wire, crashing to the earth.

Luckily it was found possible to erect a temporary aerial of ¼-in. wire in time to serve for the 8 o'clock transmission the same evening, a feat which speaks wonders for the ingenuity and hardihood of the B.B.C. engineers on the spot, particularly as the repairs were carried out in bitterly cold weather and in the teeth of a gale. The climbing of a narrow iron ladder to the top of a 500 ft. mast, and the subsequent operations aloft, were events calling for a stout heart and cool head.

A Curious Effect.

The same problem presents even greater difficulties at the larger commercial transmitting stations, such as that at Sainte Assise, outside Paris. Here, there is a network of twenty parallel wires, over two miles in length, and supported at a height of 800 ft. by two rows of eight masts. The total extra weight thrown upon the supports during a snow storm is estimated at over 400,000 kilos, or roughly 400 tons.

Even during a hailstorm an extra load of 100 tons has been thrown upon the supports from this cause in less than five minutes. Incidentally the snow or ice loading has the curious effect of increasing the transmitted wave-length (9,200 metres) by several hundred metres, and a special compensating circuit has to be switched into the aerial system to keep the transmitted frequency constant.

The increase in wave-length is chiefly due to the ice, snow, or sleet bridge formed across the aerial insulators, constituting in effect a high-resistance shunt. The exact wave-length formula for any oscillatory system includes a resistance factor as well as inductance and capacity, an addition to the resistance having the effect of increasing the wave-length.

Moreover, the deposit of snow, etc., adds to some extent to the natural capacity of the aerial system as a whole, and for this reason also tends to increase the length of the transmitted wave.

Serious Danger.

In this connection, it is interesting to note that the aerial insulation of a ship's wireless set is sometimes reduced by salt water or spray to such an extent that the aerial is practically short-circuited. Under these conditions aerial oscillations will not build up, and it is impossible to start up the transmitting set without serious danger of destroying the generator valves, particularly when working with wave-lengths over 600 metres on a direct coupled aerial.

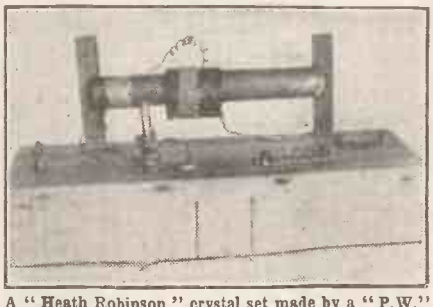
In such an emergency the valve transmitters are switched over to a special steadying circuit, magnetically coupled to the aerial, and in this way sufficient current is induced in the aerial to dry it out and restore the efficiency of the insulation.

A similar steadying circuit is also sometimes used in naval practice to prevent frequency-variations arising from the swaying of the aerial system under the action of the wind.

CRYSTAL DETECTORS FOR REFLEX SETS.

FROM A CORRESPONDENT.

MUCH of the success of the ordinary reflex set depends upon the crystal which is used as a detector, and a great deal of the set's ease of operation will depend upon the stability of the crystal contact. Whilst it is always advisable to get the best possible detector that funds will allow, the necessity for a well-designed instrument—capable of easily finding and *keeping* a sensitive spot—is greater in the case of a valve-crystal set than in the straight crystal set.



A "Heath Robinson" crystal set made by a "P.W." reader thirteen years ago. It is still in daily use.

One reason for this is the fact that the current available at the detector terminals is much greater in the case of the former type than in an ordinary crystal set. Consequently the mechanism of the detector must be really good, and it is surprising to find that the rather tricky cat's-whisker-type of detector is generally used for reflex work, instead of the more robust carborundum-and-steel contact.

Apart from the greater current handled by a crystal in a valve-crystal set, it is the case with reflex circuits that the signals are amplified after detection; and, therefore, fidgeting with the crystal does not mean a scratching in the 'phones, but loud, amplified noises which are far more objectionable. The only safeguard is to procure a really good detector, which needs but little re-adjustment.

Something to be Avoided.

The permanent or semi-permanent crystal detectors generally give good results in reflex circuits, but their disadvantage is that the changing of the crystal for another is not easy (though this is often necessary in such circuits). For this reason a *well-designed* cat's-whisker type of detector is probably rather better in most cases than the use of a permanent detector.

In cases where the latter type fail to give good results it is worth while to try reversing the leads to the detector itself, and the effect of using an anode coil of 80 or 85 turns instead of 75 should be tried. Very often attention to the foregoing points and careful adjustment of the H.T. will completely cure an unsatisfactory crystal; but there is no cure for a badly-designed detector, so this should be avoided at all costs.

Technical Notes

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

A GERMAN scientist, Dr. Carl Mueller, of Berlin, has developed what he calls "transparent gold." This can be made in a thickness of only about one five-millionth of an inch, and is used for the reproduction of sounds, in place of the usual loud-speaker diaphragm. Exact details of the material, or of its method of employment, are not to hand, but it is stated that demonstrations have been given, at which the audience were greatly astounded by the results obtained.

Selectivity.

With the increase in broadcast stations, not only in this country but in other parts of the Continent, manufacturers no longer make such a great point of the fact that a set will operate without aerial or earth. Selectivity is the thing in these days—broad tuning is to be avoided like the plague.

The virtue of a coil is that it will not pick up anything that is not brought to it in a legitimate manner by the aerial. What was a virtue yesterday may be a fault to-day, but this means progress.

Stereoscopic Broadcasting.

The stereoscopic broadcasting which was described recently in these notes, and which has since been tried out in this country, has also been tried in Germany with considerable success. The British tests so far made must be regarded as being in the nature of preliminary trials, two microphones being used, placed at different positions with respect to the orchestra, for example, so as to produce a composite effect similar to what one would get if seated in the front row of the stalls.

In the German experiment the "Fuller" system was tried, the transmission from the two microphones being broadcast on different wave-lengths, so that they could be received by separate receivers and brought to the two ears separately. It is understood to be the intention of the B.B.C. to transmit from two microphones placed at a suitable distance apart, on two different wave-lengths, perhaps from London and Daventry, for example.

It should be noted that reproduction on two loud speakers is useless for the purposes of this stereoscopic broadcasting: the essence of the system is that the two ears of the listener receive separate and different impressions, and for this purpose it is necessary to use headphones, the two 'phones being connected respectively to two receivers.

Liquid Rectifiers.

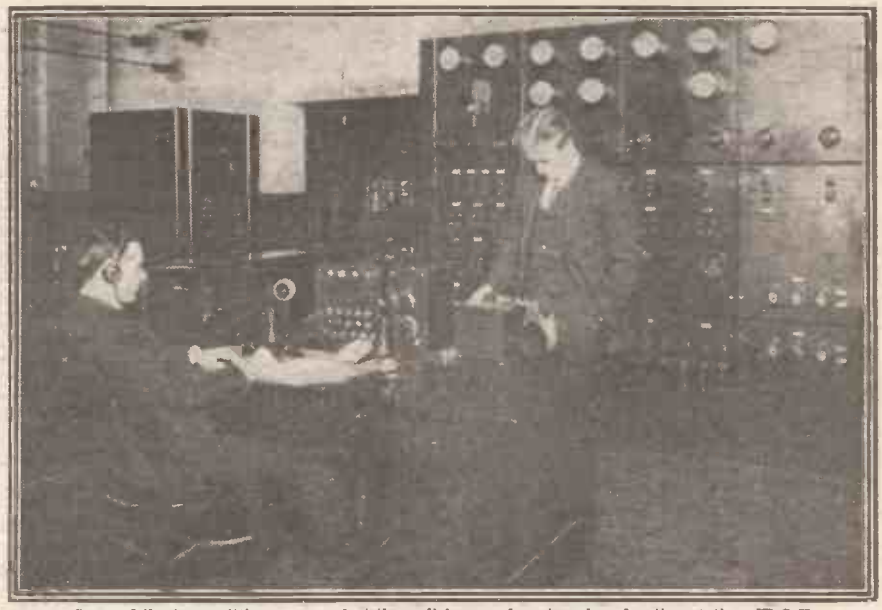
An interesting development in connection with liquid rectifiers was announced recently to the French Academy of Sciences by General Ferrié, the well-known French radio authority. These experiments were initiated as a result of an observation on the behaviour of silver electrodes in a sulphuric-acid solution. It was found that the resistance of the electrolyte gradually diminished when current was passed, and on further investigation this was found to be due to the production of colloidal silver in the acid. Colloidal solutions—or "suspensions," as they should more properly be called—may be described roughly as collections of large numbers of very small particles suspended in a liquid. Although the particles may be exceedingly small, they are not, of course, so small as individual molecules, and hence the "particles" which take part in the conduction of electricity through an electrolyte would be smaller than those taking part in the similar action in the case of a colloidal suspension.

Large Charging Currents Available.

It would seem that the action of the current, in the circumstances of Ferrié's experiment, was to dislodge small particles of silver from the electrodes, these particles being then subject to the well-known "Brownian movement" and assisting in carrying the current across from one electrode to the other. In the rectifier based on this principle, one electrode is of readily oxidisable metal. In one direction, the current passes through the colloidal silver on to the surface of the metal cathode, whilst in the other direction, the metal electrode becomes covered with a skin of oxide, which blocks the current. On reversal, this electrode again becomes the cathode, the hydrogen evolved against the layer of oxide reducing the same and allowing the passage of the current. The dependence of rectification in liquids upon the alternate formation and destruction of an oxide film is, of course, well-known, and in the present case this principle is employed, whilst use is also made of the peculiar properties of the colloid suspension, as mentioned above. Commercial rectifiers based on this principle have been made and are capable of carrying a current sufficiently large in amount to be useful for the purpose of charging electrical storage batteries from alternating current mains, a step-down transformer being, of course, employed to reduce the mains voltage to the required value.

Transmission of Pictures.

The Bartlane process for the transmission of pictures by telegraph lines or cable is coming much to the fore, and a remarkable demonstration of this process was lately given, when pictures, taken in Italy and brought by aeroplane to London, were cabled to New York. The picture is recorded by special means on to an ordinary telegraph or cable tape and is then transmitted in the usual way: at the receiving end, the tape is run through a light projector, producing on a film an accurate reproduction of the original photograph or picture. The results obtained by this method appear to be remarkably good.



Some of the transmitting gear used at the well-known American broadcasting station, W G Y.

A New Ten-Valver.

The H. M. Kipp Co., of Canada, have lately put on the market the "Mercury Super Ten," a ten-valve receiving set with four stages of high-frequency amplification. This set is built on a special circuit designed for long distance reception (to meet Canadian conditions), and especially to be easily manageable by the average user, and to give good selectivity. As regards sensitivity, it is claimed to receive from 2,500 miles distance on a loop aerial, and as regards selectivity, the claim in this respect is to "hair line," or "knife edged" selectivity.

(*Continued on page* 1044.)

A Short Wave Absorption Wave Meter

A photograph of the wave-meter in use at 2 O D.

2 O D CALLING.

In this article "2 O D" deals with the construction of a special wave-meter, the value of which every practical amateur will appreciate.

By E. J. SIMMONDS, F.R.S.A., M.I.R.E.
(who writes exclusively for "P. W.")

IN my last chat I discussed some of the difficulties that may be encountered when one is operating a short-wave receiver, but, so far, I have not mentioned anything about the greatest difficulty of all—finding a station the wave-length of which is approximately known.

When dealing with the very high frequencies used in short-wave transmission the slightest touch on the tuning condenser will shift the frequency a surprising amount, so that unless the operator exercises great caution he is likely to miss a weak station altogether. This is not the end of the matter, however, because until one gets very used to the operation of a particular short-wave receiver and a particular set and coupling of coils, one finds great gaps, so to speak, in the wave-length bands used by amateurs, and one is inclined to wander hopelessly up and down the tuning scale without any idea of the wave-length at a given moment.

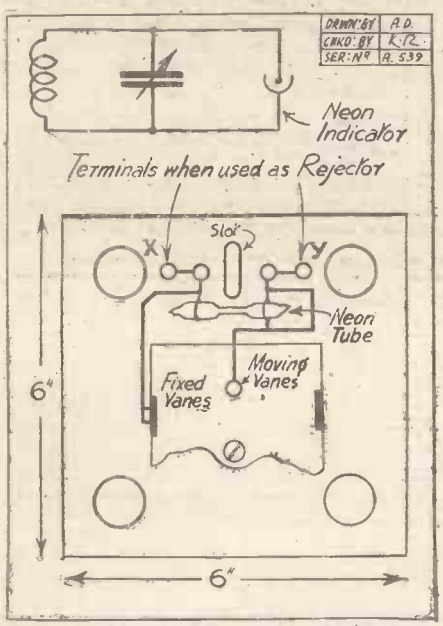


Fig. 1.—The theoretical and practical wiring diagrams.

To get over this annoying state of affairs, the only thing to do is to construct a wave-meter to cover the wave-length upon which the receiver is to be operated.

There are three main types of wave-meters, the buzzer type, the heterodyne type, and, finally, the absorption wave-meter which we are to discuss here.

The first two mentioned types are, of course, designed to act as small transmitters emitting a wave, the frequency of which is governed by the tuning arrangements of the wave-meter.

When using the buzzer type the tuning of the receiver is adjusted until the maximum signal strength is heard in the telephones. This maximum value is difficult to judge exactly owing to the flatness of the wave emitted by this type of wave-meter.

The Absorption Method.

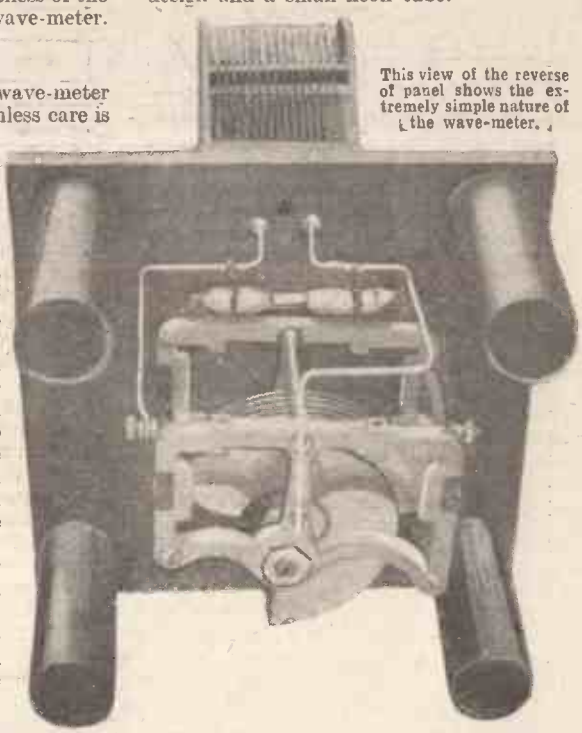
A well-designed heterodyne wave-meter gives very exact readings, but unless care is exercised when using this type on the high frequencies, much confusion may result owing to the clashing of the harmonics of the wave-meter and receiver.

The absorption wave-meter, however, acts on quite a different method, for it contains neither buzzer nor valve and does not emit any wireless waves. Briefly, it simply consists in a closed resonant circuit which can be tuned, placed near the grid circuit of the receiving set, so that when these two circuits are synchronised as regards tuning, part of the energy in the grid circuit of the receiver will be absorbed by the wave-meter. This absorption has a very definite effect upon the receiver, for, if this latter is just oscillating and then its grid circuit suddenly becomes exactly in tune with the circuit of the wave-meter, the energy absorbed by the latter will cause the valve suddenly to cease oscillating.

This condition will be noted by a sharp click in the telephones the moment the two circuits come into resonance, and this resonance has to be exact before the absorption will be great enough to cause the set to stop oscillating. It will be seen, therefore, that this type of wave-meter is particularly valuable for use where the very high frequencies are being dealt with. Moreover, it is extremely cheap to construct and possesses a reliability far in excess of that possessed by the other two wave-meters.

In the construction of an absorption wave-meter very few components are required, as will be seen in the photographs of the one in use at my station. This one has been designed for use either with a receiver or for tuning the transmitter. Hence the inclusion of the small neon tube underneath the panel.

This latter should be of ¼ in. ebonite about 6 in. square, and should be mounted on ebonite or wooden pillars about 4½ to 5 in. long and ¾ in. thick. The components mounted on the panel consist of two terminals (these are not shown on my wave-meter), but can be included, so that the instrument may be used as a rejector or wave-trap, which will be explained later, two coil sockets or a coil holder, the centre of which has been cut out to reduce capacity, a variable condenser of efficient design and a small neon tube.



This view of the reverse of panel shows the extremely simple nature of the wave-meter.

If the wave-meter is not to be used with a transmitter this neon tube can be omitted, as it is useless when the instrument is employed tuning the receiver. The circuit used is shown in Fig. 1, the wiring being carried out by 16 S.W.G. copper wire, and all joints being well soldered.

Well-designed Condenser Essential.

I should like to say a few words about the variable condenser before discussing any further details for the construction of the wave-meter. The condenser in use on my wave-meter and shown in the photographs is one of a new type recently introduced by the Francis Manufacturing Company of London, and is exceptionally

(Continued on page 1024.)

A SHORT-WAVE ABSORPTION WAVE-METER.

(Continued from page 1023.)

suitable because of its strong and efficient design. In the case of such a condenser mechanical as well as electrical efficiency must be considered, for the slightest variation in spacing of the vanes, due to weak supports, will throw the calibration of the wave-meter right out.

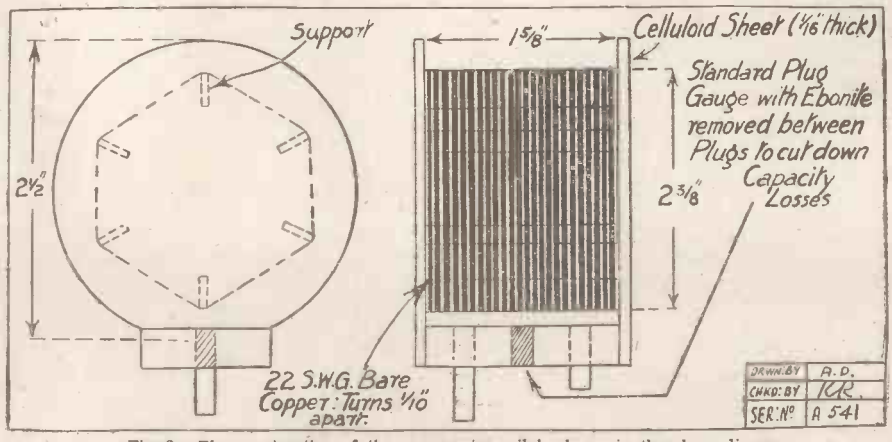


Fig. 2.—The construction of the wave-meter coil is shown in the above diagram.

The condenser under consideration has its fixed plates as well as the moving plates moulded in a solid block in order to avoid losses which might occur owing to the oxidisation of the surfaces of the spacing washers more usually used in variable condensers. This condenser is designed in accordance with best modern practice, metal end plates being used and the fixed vanes being insulated from the body of the condenser. As a further precaution against inefficient electrical contact between the moving vanes and the metal end plates, pigtail connections have been employed.

Constructing the Coil.

With regard to the construction of the coil, it is absolutely necessary that this be of extreme mechanical robustness and of low self-capacity. The average low-loss coil, as used in the 10-metre receiver which I described recently, is much too weak mechanically and would be unable to hold calibrations with any degree of accuracy. The slightest variation between the spacing of the turns or in the diameter of any one turn would be sufficient to throw the whole of the calibration out and render it useless.

Therefore, the type of coil shown in the photographs and in Fig. 2, was designed, and this has been found to be extremely strong. The former consists of six celluloid strips mounted between two celluloid discs, the whole being supported upon a small strip of ebonite, provided with a plug and socket of the usual type and dimensions. Between the plug and socket the ebonite is removed as far as possible, in order to cut down capacity losses, while the coil itself is wound with 22-gauge bare copper wire, the celluloid strips being slotted so that the turns are fixed $\frac{1}{10}$th in. apart.

In order to make these slots a small three-cornered file should be used, and the strips should be prepared before they are fixed to the two celluloid side pieces. These latter are made in the form of discs 2½ in. in diameter and about $\frac{1}{16}$th in. thick, the strips being fixed in position equidistantly round the circumference of the discs, so that they form a hexagon having a diameter of $2\frac{3}{8}$ in. In other words, the strips are mounted $\frac{1}{8}$ in. in from the outside of the discs.

Use of the Neon Tube.

The six strips are fixed in position to the discs by means of a thick solution of celluloid dissolved in acetone. The acetone can be obtained from any chemist, and the solution or cement should be made by dissolving small pieces of scrap celluloid in it. This makes a very strong jointing material, but should be kept well corked up, otherwise the acetone will rapidly evaporate, leaving the celluloid. Care should be taken while winding on the wire for the coil that equidistantly spaced turns are obtained, the whole coil being fixed to the end of the ebonite holder by a couple of small wood screws, the ends of the wire being soldered to the socket and plug in the holder. Fifteen turns are sufficient.

For the benefit of those who wish to use this wave-meter in conjunction with a transmitter, I may say that the neon tube consists of an ordinary tube from a sparking-plug tester, such as the Brolt or Mitchell. This neon tube is placed in the circuit, as shown in Fig. 1, and denotes resonance of the transmitter with the wave-meter by giving a purple glow. In the case of the instrument used at 2 O D, I find that the neon lamp lights up at a distance of about 6 to 8 ft. away from the transmitter when operating on 45 metres with an input of 100 watts.

Calibration !

The calibration of the wave-meter is a process which should be done extremely carefully, and will have to be undertaken by every constructor who makes the instrument. As a guide, however, the calibration chart worked out for my own wave-meter is reproduced with this article, and, if the wiring scheme shown in the photographs is carefully followed, will act as a check on the calibration obtained by the constructor. The wave-meter will give a range of wave-lengths of from 20 to 100 metres, and should a smaller wave-length be required, another coil having a less number of turns can be wound and the instrument recalibrated with this coil.

Calibration is a comparatively simple undertaking, and it can be readily obtained by tuning in various commercial stations which operate on fixed wave-lengths between 20 and 100 metres; the wave-lengths and the readings on the dial are plotted against each other. (See Fig. 3.) It is desirable to obtain as many plotting points as possible in order to obtain reasonable accuracy. A list of stations working on a fixed wave-length is given at the end of this article.

I have already explained the action of the wave-meter, but I should like to emphasise the fact that the receiver should be oscillating as weakly as possible and the wave-meter as far away from the receiver as practicable. Otherwise, the absorption may be too great and the non-oscillating point is spread over one or two degrees of the condenser reading. This point should be absolutely sharp and well defined.

Frequency and Wave-length.

The need of the wave-meter for short-wave reception has already been pointed out, but it may be better realised by thinking, not in terms of wave-lengths, but of frequency. For instance, in comparing different wave-lengths one is apt, especially when dealing with short wave-lengths, to consider the difference between 25 and 50 metres as being only 25 metres. It is, of course, but it is not quite the same as a 25-metre difference taken on wave-lengths of the order of, say, 4,000 metres; for, if one works out the frequency change—and it is frequency which is of importance—one finds that it varies between 12,000 kilocycles

(Continued on page 1027.)

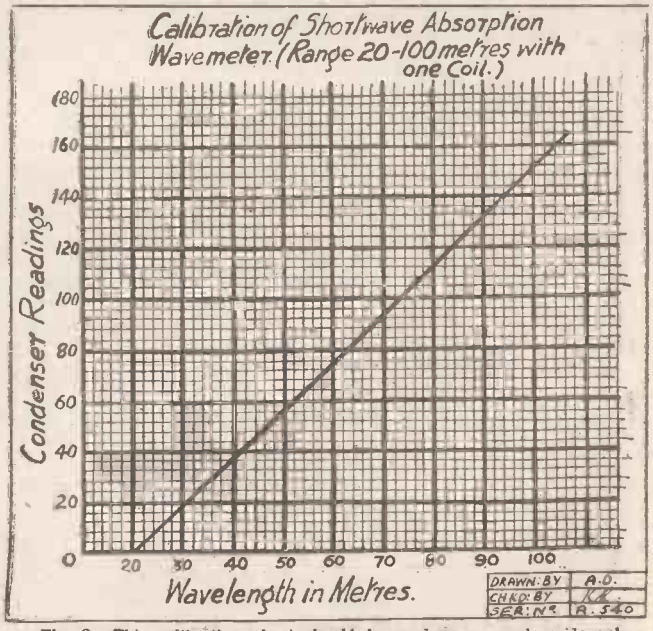
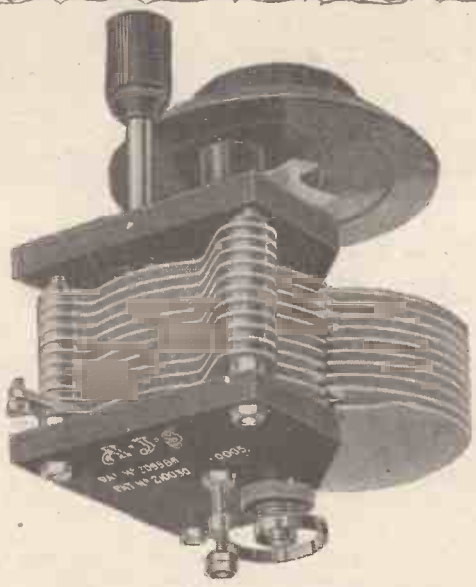


Fig. 3.—This calibration chart should be used as a rough guide only. It will not be accurate for instruments other than the original one from which it was taken.



FREE

Publication No. 115 contains useful information concerning Chokes, Condensers, Coils and other components. Charts and diagrams make this a most useful reference book for all interested in the constructional side of Radio. May we despatch a copy to you post free?

The Condenser for the Experimenter, and Why?

ONE of the chief reasons for the general production of Condensers with metal end plates has been the fact that an instrument of this design may be more cheaply produced in large quantities, but it should be borne in mind that metal end plates fitted in a Condenser do not necessarily mean efficiency and it is to be regretted that the term "low loss" has been applied indiscriminately to many Condensers, whose efficiency has been of a very low order. The best quality of ebonite used for end plates, in conjunction with good design, will result in a Condenser having an efficiency equal to, and in many cases greater than, any other design.

Visit our Showrooms in London and Glasgow.

The best circuit in the world will not give you good reception unless your Condensers are beyond reproach. A.J.S. Variable Low-Loss Condensers have stout end plates of best quality ebonite, and are of the straight-line wave-length type, which means that a more open scale reading is obtained on low wave-lengths than is usual in an ordinary Condenser. The high-frequency resistance is very low, and losses almost negligible. The minimum capacity has been reduced to 7 micro-microfarads for the ·0005 mfd. model, as compared with the usual 20 or 30, the minimum capacity of the remaining A.J.S. models being in proportion.

The bearings are large and rigid, ensuring freedom from wear. A special friction washer prevents any tendency to slip.

·0002 mfd. -	**10/6**	·0005 mfd. -	**12/6**
·0003 mfd. -	**11/6**	·001 mfd. -	**17/6**

A.J.S. COILS

If first cost only is considered, these coils are not the cheapest on the market; but if quality of workmanship and materials, together with efficiency is required, then better value will be hard to find. Prices: 20-60, 4/3; 75, 4/6; 100, 6/-; 150, 6/9; 200, 7/6; 250, 7/9; 300, 8/-; 400, 9/6. Prices of larger coils on application.

A·J·S

A. J. STEVENS & CO. (1914), LTD.,
RADIO BRANCH, WOLVERHAMPTON.
Telephone: 1748 (7 lines). *Telegrams: "Reception, Wolverhampton."*

London Showrooms: 122/24, Charing Cross Rd. London, W.C.2
Telephone: Regent 7161-2. *Telegrams: "Ajayessco, Westcent, London."*

Glasgow Showrooms: 240-250, Great Western Rd., Glasgow.
Telephone: Douglas 2449. *Telegrams: "Reception, Glasgow."*

A. J. STEVENS & CO. (1914), LTD.,
RADIO BRANCH, WOLVERHAMPTON.

Please send publication No. 115.

Name .....

Address .....

P.W. 26/12/25. .....

Issued by the Publicity Dept., A.J.S.

GUN-METAL TERMINALS.

By J. F. CORRIGAN, M.Sc.
(*Staff Consultant, "Popular Wireless."*)

QUITE a novel and agreeable finish can easily be given to terminals and other metal fittings of the set by plating them with a mixture of metals similar in composition to the well-known gun metal.

This plating must be carried out electrolytically, but as the process is a straightforward one, it is described below for the benefit of readers who care to try their hands at it.

First of all, prepare, separately, saturated solutions of copper sulphate and zinc sulphate. The solutions of these salts are

A German cabinet receiver, recently designed to cover all wave-lengths between 200 and 3,000 metres.

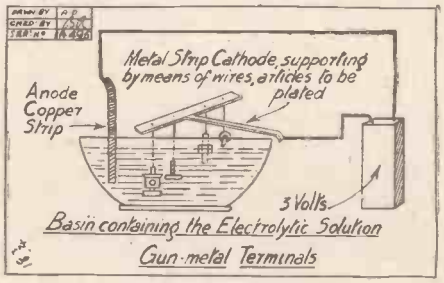
said to be "saturated" when no more of the salt can be dissolved in the liquid. Having prepared the saturated solutions, mix each solution with approximately a third of its bulk of water.

The Plating Process.

The gun-metalling solution is then prepared by mixing eight parts (by volume) of the diluted copper sulphate with two parts of the diluted zinc sulphate solution.

The mixed solutions are then placed in a clean electrolysing bath, which, as will be seen from the illustration, can suitably consist of an ordinary pot or porcelain basin.

A current of about 3 volts will be sufficient to carry out the plating with. The anode of the electrolysing bath should consist of a strip of copper, whilst the articles to be plated form the negative element of the bath.



Care must be taken that the articles to be plated are rendered scrupulously clean and free from grease, otherwise the deposited metals will not stick on their surfaces, and they will peel off after the articles have been removed from the bath. This preliminary cleaning is best effected by washing the articles in a hot, strong solution of common washing soda.

After the articles to be plated have been suspended in the liquid, the current should be turned on and allowed to flow for about five to ten minutes. The solution works better when it is used at a temperature of about 130° F.

After plating, the articles are removed from the bath, well washed in hot water, and then rubbed down with a little very fine emery paper in order to obtain a smooth polish. They can be subsequently lacquered or varnished, if desired.

Variations in Tone.

Finally, it should be remembered that the colour of the plating can be varied to quite a considerable extent by altering the proportions of the constituents of the bath, the copper salt tending to give the plated articles a brown or reddish tone, and the zinc salt increasing the blackness of the plating. It should also be borne in mind that while the bath is being used, copper is being dissolved off the anode strip, and therefore the solution will become more and more concentrated in its copper content. This should be allowed for by subsequently adding a further quantity of the concentrated zinc sulphate solution to the bath.

Of course, anodes of metals other than copper can be employed for the purpose, but in practice it is found that a copper anode gives the most satisfactory and the most easily obtained results.

A SHORT-WAVE ABSORPTION WAVE-METER.

(*Continued from page 1024.*)

and 6,000 kilocycles, a kilocycle being 1,000 cycles. In other words, it varies between six and twelve million cycles per second. A change of this amount in frequency is of enormous importance when the design of transmitters or receivers is being considered. So that all amateurs who wish to take up short-wave work from a scientific point of view, and as a serious application, should get into the habit of regarding all measurements of wave-length in terms of frequency.

The Meter as a Wave-trap.

There is one final point about the wave-meter which I should like to mention for the benefit of those who are taking up short-wave reception merely as an interesting side line. This point concerns its use as a rejector circuit or wave-trap available for the B.B.C. or higher wave-lengths.

With the short-wave coil removed and an ordinary plug-in coil inserted the wave-meter can, by the use of the two terminals included on its panel, be so coupled to an ordinary broadcast receiver that it will very materially assist in cutting out interference, without any serious reduction in signal strength of the station it is required to receive. It can be used in many ways, either in the aerial lead or in the receiving circuit, or merely magnetically coupled to the aerial or closed circuit coil of the set, the unwanted signals being eliminated by absorption.

LIST OF STATIONS.

POF	18	metres
AGA	26	,,
POW	28	,,
WQO	35	,,
J1AA	36	,,
A2CM	35	,,
WIZ	43	,,
NKF	54.4	,,
KDKA	64	,,
WIR	74	,,

A NEW TYPE OF INDOOR AERIAL.

AN indoor aerial of rather novel design, which gives splendid results, consists of four cylindrical coils of 22-gauge D.C.C. wire pulled out to the same length and suspended on string between the corners and centre of the room, a few inches below the ceiling.

The coils should be wound on a smooth stick, one inch in diameter, for a length of three and a half feet; four of these coils should be wound, and then stretched out until they are of the same length, which will vary with the size of the room where they are to be suspended.

The string is threaded through the coils and tied to insulated hooks, the wire being arranged so that the four ends meet near the centre of the ceiling, where, together with a length of flex to act as lead-in, they should be soldered together.

When tested, this type of aerial gave much better results than when the wires were suspended in the same position but not coiled, which makes them much shorter.

CURRENT TOPICS.

By THE EDITOR.

A Wireless Club—Helping Amateurs "Get Together"—Readers' Views Invited—Where Licence Fees Go—The B.B.C. and the Programme Controversy—The Elusive Formula—A Suggestion.

WE have had in mind for some time past the formation of a "Popular Wireless" Club, with headquarters in London. The idea of the Club would be to provide a comfortable accommodation for amateurs to meet and discuss their work, for lectures and demonstrations, workshop facilities, a library, etc. etc.

This club would in no way clash with existing radio societies: its chief *raison d'être* would be to encourage social relations among amateurs, and also to encourage the exchange of ideas. From time to time lectures and debates would be given, but the chief value of the club would lie in the facilities it would offer to amateurs to meet and discuss their hobby.

Some such club, if patronised by a large number of amateurs, might easily grow to large dimensions, with branches in the provinces, and, in each case, suitable club premises for members.

We would like to see such a club in every large town. And by "premises" we do not mean a single hired hall: we have in mind a club in every sense of the word, with every facility, including dining-rooms, smoking-room, library, workshop, billiard-room, etc.

What Do Readers Think?

This may sound ambitious, but when one considers the fact that there are at least half a million amateurs, there is no real reason why such a club should not prove a success.

At present amateurs can only "get together" through the medium of their local radio societies, or through the medium of the R.S.G.B. And, although these meetings are often interesting from the technical point of view, they do not do much to promote social intercourse among amateurs, nor do they take place in surroundings which encourage amateurs to prolong their talks with other amateurs. A comfortably furnished club room would be a greater incentive than a draughty hired hall, minus the usual comforts associated with the life of a clubman.

Such a club as we have in mind would require substantial backing before actually brought into existence. It would require a whole-time manager and staff; it would have to be located in a central part of the metropolis; the entrance fee and subscription would have to be small, but the membership large. We have outlined above the idea of a Radio Club for amateurs which, we feel, would attract more visitors than the majority of Radio Club meetings held in this country; but no steps can be taken to create such a club until there is ample evidence that it would receive adequate support. Frankly, we feel that such a club is badly needed and, further, that attempts should have been made long ago by the R.S.G.B. to found one. We expected that the Wireless League would have gone into the matter, but nothing has as yet transpired.

In the meanwhile, we cordially invite our readers to send us their ideas on the matter. The possibility of such a club coming into existence depends on the degree of enthusiasm shown by amateurs. We would also like to have readers' estimates as to the amount to be charged as entrance fee and yearly subscription.

It is generally understood that when a new convert to broadcasting goes to the Post Office and spends ten shillings on a broadcasting licence, two and six is retained by the Post Office, while the odd seven and six is handed to the B.B.C.

According to the "Daily Mail" this doesn't happen at all: at present the P.M.G. keeps the full ten shillings! If a million extra licences were taken out this week, nothing, according to the present arrangement, would be handed to the B.B.C.

It appears that some time ago—just before the number of licence-holders reached 1,500,000—the Post Office informed the B.B.C. that a certain clause in their agreement was about to become operative. This clause stipulated that the B.B.C.'s income should not exceed £500,000. And a little mental effort shows that seven and sixpence multiplied by 1,500,000, gives a total of £562,000.

So the Post Office—never an institution to let money slip by—has stopped paying the B.B.C.!

The question is, what is the Post Office doing with the money now being paid in by new licence holders? The amount is increasing daily. The answer would appear to hang on the nature of the report of the Broadcasting Committee.

At the moment we have no definite reason to believe that this money will be entirely diverted from broadcasting, although, as the "Daily Mail" points out, some sinister questions asked at the committee suggest that the Treasury "has its eye on the money with a view to a raid, the line being that broadcasting is a luxury, not a necessity, and, therefore, just as fair game as the Road Fund."

This idea is a disturbing one. What do listeners think about it? If the Treasury suggest a raid on the licence money paid in by listeners exceeding the 1,500,000 mark, we can see lively times ahead!

The B.B.C.'s Programmes.

Just recently there has been quite a lot of limelight thrown on the B.B.C.'s programmes. And yet when we consider the number of listeners in this country, we wonder whether any number of criticisms under half a million would be of any *real* value in determining "what the average listener wants."

A few hundred critical letters from critically-minded listeners do not, in our opinion, give a clear indication as to what the majority of listeners think of the programmes.

And, whatever the future of the B.B.C., this same argument as to what should constitute a good, all-round broadcast programme, will periodically crop up and will, just as periodically, die an unsolved death—until its next ressurrection.

A programme formula has been searched for ever since the B.B.C. began its duties—and it has not been found. We doubt if it ever will be found.

Mr. Seymour Hicks broadcasting in 2 L O's studio.

The B.B.C. can't please everybody: they have to try and please as many listeners as they can—to please, in fact, a really big majority. We feel quite impartial about the question, because the psychology of programmes is not our business; but we suggest that the B.B.C. might make one last big attempt to obtain a really reliable plebiscite on this vexed question of programmes. What might succeed—if they put up good prizes and went in for a course of intensive advertising propaganda—would be a ballot on a colossal scale.

It would cost money, a lot of money; but if the entries exceeded half a million, sufficient material would be obtained to give the adjudicators a good idea as to the solution of that old problem "What the Public Wants."

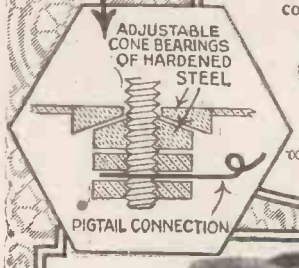
The
"COSMOS"
SLOW MOTION
CONDENSER

COMPENSATED SQUARE LAW EFFECT

LOW LOSS

NO BACK LASH

with its ratio of 10 to 1 makes it possible to dispense entirely with the customary vernier and its attendant losses. Particular stations can be logged. Backlash is avoided not temporarily but permanently and movement is smooth, permitting fine adjustment. This model can also be arranged for remote control, as shown in the illustration below. Also supplied without slow motion feature when the condenser is one-hole fixed. Both models are constructed to eliminate hand capacity, for low loss and to give a compensated square law effect. Cone bearings of hardened steel ensure constant calibration and a pigtail connection gives permanent positive contact.



Metro-Vick Supplies Ltd.
4, Central Buildings, S.W.1

Prices:	Ordinary.		Slow Motion.	
	.00025 mfd.	.0005 mfd.	.00025 mfd.	.0005 mfd.
	15/-	17/6	19/-	21/6

COSMOS

MICRO FINE TUNING

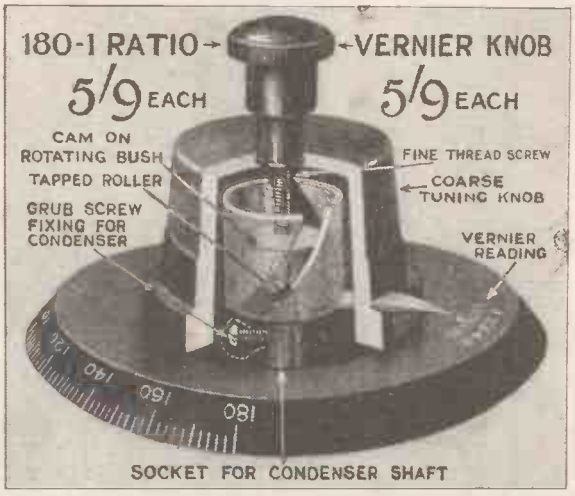
COMBINE

VERNIER DIAL

"By Test the Best."

(PROTECTED BY PATENTS.)

JOIN the ARMY
OF DISCERNING ENTHUSIASTS TO-DAY.



12 SOUND REASONS
FOR FITTING

1. No Panels to Drill for Fixing.
2. Does Away with Vernier Condensers.
3. Gets Those Elusive DX Stations.
4. Provides a Remarkably Fine Adjustment.
5. Is the Simplest to Fit.
6. Is Made Without Gears and
7. Has No Backlash.
8. Is Wonderfully Smooth to Work.
9. Adds 100% Efficiency.
10. Enhances the Appearance of Your Set.
11. Can be Made for Any Special Size Shaft.
12. Is Universal for ¼", $\frac{3}{16}$" and 2 B.A. Shafts, Plain or Threaded.

ASK YOUR DEALER FOR IT.

Send for Leaflet to Manufacturers and Patentees

SOMCO LTD.,
1-11, LARCH ROAD, BALHAM, LONDON, S.W.12

Damping in Circuits

A Useful Article Clearly Indicating where Low-Loss Coils Fail.

By F. E. COX, B.Sc. (Lond.)

THERE are probably many amateurs who, having read of the advantages of the low-loss coils, are led to wonder why such coils have not been adopted wholesale by wireless enthusiasts. Others who have tried low-loss coils may have noticed but little increase of signal strength in comparison with the more popular plug-in type

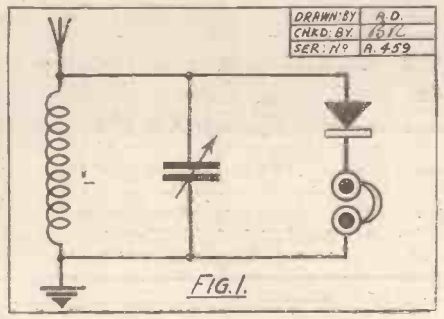


FIG. 1.

of commercial coil with its crowded wire of thinner gauge. It is the object of this article to explain that damping is responsible for reducing the undoubted superiority of low-loss coils.

Crystal Circuits.

Damping can be best understood by the aid of Fig. 1, which is an ordinary crystal circuit. Here the crystal-'phone circuit is shunted across the coil and condenser. Now, although the crystal-'phone circuit has a resistance of some 14,000 ohms, yet a small current flows in it. This affects the coil, and the result is exactly the same as if an appreciable resistance had been added to the coil L itself. In addition, the aerial has a considerable resistance, and its effect is also the same as adding another extra resistance to L. This effect is called damping. In a previous article the writer has shown that to design a coil giving the best possible results, the inductance L should be as large as possible, whilst its resistance R should be kept low. This is done by using thick wire, spaced if possible, and wound on a cardboard cylinder or a skeleton former. Thus in a good coil the ratio $\frac{L}{R}$ is high.

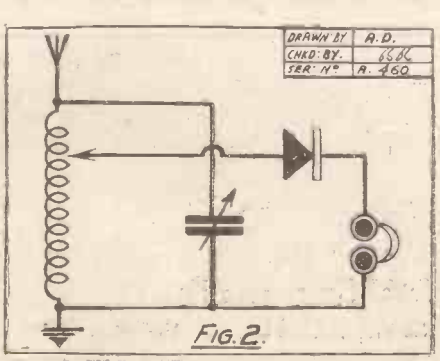


FIG. 2.

We can see that the damping effect defeats the object of a low-resistance coil, for it adds to R a resistance much in excess of R itself. $\frac{L}{R}$ becomes $\frac{L}{R + R_1}$ where R_1 is the damping effect expressed as resistance. A high resistance in the tuning circuit also flattens the tuning, but by tapping off the crystal-'phone circuit as in Fig. 2, so as to include less than the whole of the turns used, the flat tuning disappears and tuning becomes surprisingly sharp. With strong signals and a low-resistance aerial and earth an increase of strength is usually obtained by the circuit of Fig. 2. The capacity should be reduced to an absolute minimum and the number of turns increased. Suppose by doing this both L and R are doubled (actually this is unlikely), the above ratio becomes $\frac{2L}{2R + R_1}$.

Now, the increase of resistance due to the extra turns is only a fraction of the whole resistance whilst the inductance is now double; thus greater signal strength is obtained.

The writer has found this theory borne out in practice, for with a low-loss coil of spaced wire 18 S.W.G., five-plate condenser, and R.I. permanent crystal detector, in spite of a poor aerial (25 ft. high, 60 ft. long, of 16 S.W.G. wire), and earth wire merely twisted round a water-pipe, three broadcasting stations are received—Birmingham, at 30 miles, quite well; whilst Nottingham relay station, at 40 miles, and 2 L O, at 84 miles, come in quite faintly. The important point is that in the case of the two latter, decreasing capacity and increasing inductance makes a very noticeable difference. By moving the crystal-'phone tapping so as to include more turns than those used for tuning (see Fig. 3), signals much louder than given by circuits 1 and 2 were obtained.

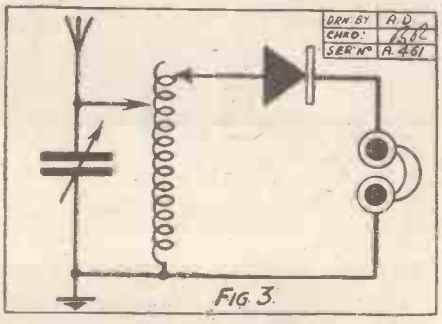


FIG. 3.

These results were obtained almost daily for weeks during morning and afternoon transmissions in such a consistent manner as to discountenance any possibility of assistance from re-radiation. Circuit 2 gave extremely sharp tuning but weaker signals. It is difficult to compare the usefulness of the three circuits when receiving signals which are not faint, as in the case of Birmingham, unless a micro-ammeter is used to measure the rectified current.

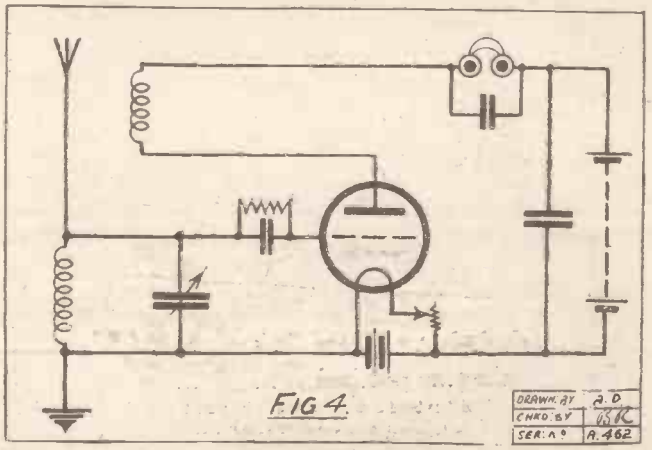


FIG. 4.

(*Continued on page* 1033.)

DAMPING IN CIRCUITS.

(*Continued from page* 1031.)

Now, there is much difference of opinion as to whether the best crystal circuit is that of Fig. 2 or Fig. 3. In the writer's experiments there was no doubt as to the superiority of circuit 3 for these weak signals.

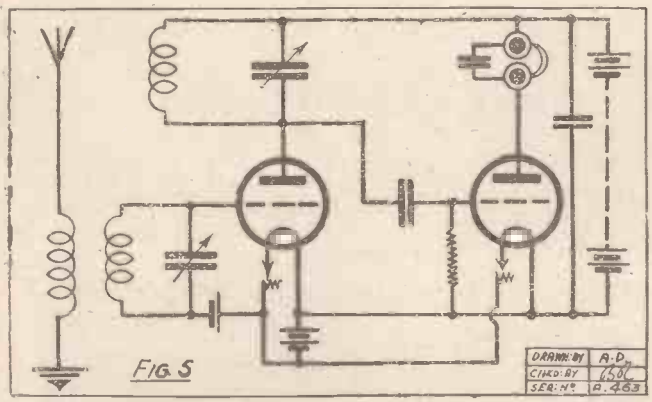


FIG. 5

Perhaps a better aerial-earth system would have given better results with circuit 2; then again the crystal-damping effect may vary for strong and weak signals. Also every crystal differs from another in its damping effect. Since in all crystal circuits damping is great, it is doubtful whether the heavy gauge wire and the spacing (twelve turns to the inch) were of much advantage, so that wire, a number of gauges smaller, on the same former unspaced, would probably have given almost identical results, for any increase of resistance is but a small fraction of the total.

Using Reaction.

In a set using a valve detector in place of the crystal (Fig. 4) the damping is not so severe. However, with the valve working on the leaky grid principle, the grid current which causes rectification also produces a considerable damping effect; moreover, the aerial damping is still present. A low-loss coil will show up better here. When reaction is used the signals are much amplified. This is due to energy passing from the plate circuit to the aerial circuit, the effect being to reduce the resistance of the coil.

When a circuit, tuned to resonance, is on the verge of oscillation the resistance, including damping resistances, is reduced to zero. This happens whether the tuning coil is low-loss or quite a poor one, so that one type of coil becomes as good as another as far as resistance is concerned. For maximum signal strength it only remains to use as large an inductance as possible, since its resistance is cancelled out when reaction is pushed to the limit. If the variable condenser be put in series with the coil, the latter of necessity will be larger.

H.F. Amplification.

There are circuits which have only light damping. In Fig. 5 is shown an H.F. amplification stage using a tuned anode, preceding a valve detector. The aerial is coupled loosely magnetically to L, which is a low-loss coil. The damping due to the aerial is now much less than in previous circuits; moreover, the damping due to the first valve nearly disappears if negative grid-bias is used, for then no grid current can flow owing to a change in the working point on the valve curve. It will be noticed that there is no reaction deliberately introduced in circuit 6 to remove what small damping effect exists there. L should therefore be a low-loss coil of the best design, when results are decidedly better than with other coils. Here the resistance of the coil is important, for damping is reduced to a minimum in this type of circuit. The aim should be to make

$$\frac{L}{R}$$

— as large as possible.

At the same time, this circuit gives improved selectivity again owing to reduced resistance. This arrangement will, with some valves, oscillate unless properly neutrodyned.

If reaction should be deliberately introduced the effect previously discussed will again result, and one coil is as good as another. Again the aim will simply be to use as many turns as possible for maximum strength.

Using Positive Grid-Bias.

Where a potentiometer is used to stabilise as in Fig. 6, the intention is to cause deliberately a big grid current by shifting the working point on the curve in the opposite direction to that in circuit 5, and therefore to damp the closed circuit. Here a low-loss coil is not being used to the best advantage neither in the direction of signal strength nor selectivity.

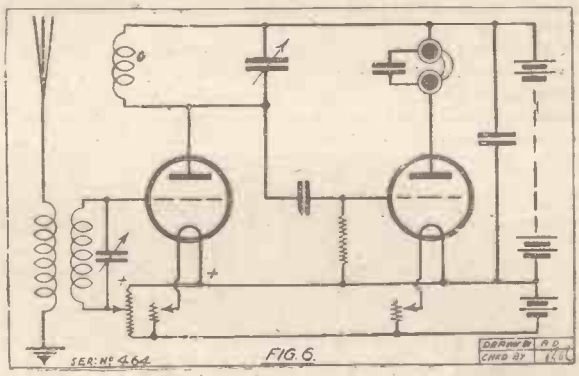


FIG. 6.

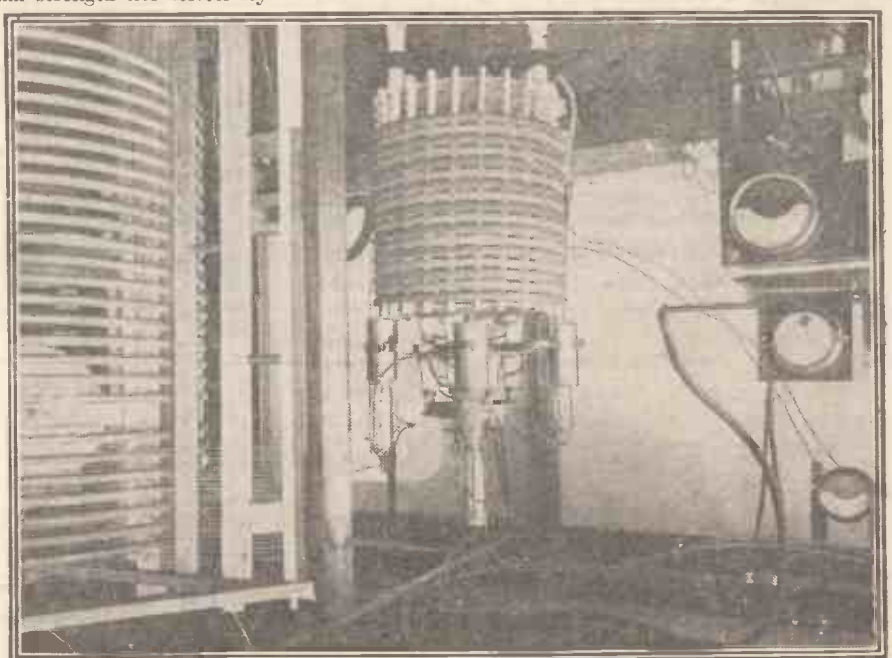
It should be noticed that in circuits 5 and 6 the tuned anode is damped by the detecting valve, so that here careful design is not quite so important. This would still be true for any other system of H.F. amplification.

Modern Practice.

These are not the only reasons why better coils have not been favoured universally. We must not look to the manufacturers to lead. Good coils are cumbersome, more expensive to make, and cannot be readily interchanged, whilst many people are averse from tappings. However, a set using good coils in an intelligent way can give superior results.

It must be remembered that manufacturers are concerned primarily in making their sets to work satisfactorily and in a fool-proof manner. Hence we find them using such inferior designs as H.F. transformers wound with resistance wire. Getting the maximum power from a given number of valves is of little importance to them. Finally, it must not be thought that the best way to defeat damping is necessarily to use reaction, for although reaction accomplishes so much, yet it fails in one vital respect—that is in the distortion it produces.

To obtain volume or even selectivity at the expense of purity is a measure that all amateurs and constructors will wish to avoid.



This transmitter, using four water-cooled valves, belongs to Messrs. Phillips, of Holland, and is installed at their Eindhoven works.

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

IT is interesting to note that Sir Edward Marshall Hall, K.C., has joined the board of directors of Messrs. Cleartron Radio, Ltd., makers of Cleartron valves and other products. It will be remembered that Sir Edward is a Unidyne enthusiast. He spoke at the famous Unidyne banquet given by the Institute of Patentees at the Savoy Hotel some twelve months ago, and was one of the first to instal a Unidyne receiver for broadcast reception.

* * *

A valve-holder that is of original design aud has many novel features is the "Tonex" File-grip, a sample of which was recently sent us by Messrs. The Tonex Co., of Back High Street, Blackpool. Supplied either for baseboard or panel mounting at the reasonable price of 2s. 9d., it is a really thoughtfully produced component. It can with reason claim to be both "anti-microphonic" and low-capacity. A special grip ensures an efficient contact with every valve-pin, even should it not be accurately centred. This grip is fashioned out of the one piece of metal that also serves as a soldering tag and to hold a terminal screw, so that the connection is quite continuous. We can certainly recommend this Tonex article; apparently nothing has been overlooked.

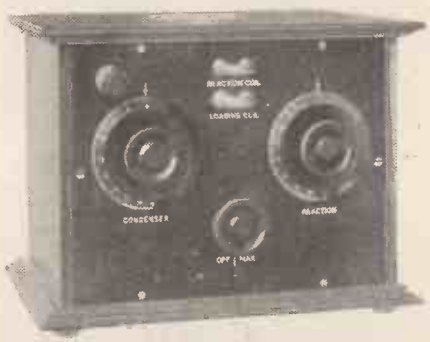
* * *

Amateurs and constructors alike will welcome the introduction of the "E. & R." Patent Panel Holder, which is due to Messrs. Gregory & Sutcliffe, Viaduct Street, Huddersfield. It consists of two solid cast-iron standard brackets, each fitted with a movable grip. Any size of panel can be supported and held at a height of some eight or so inches—high enough to clear the largest of variable condensers, or other components. The holder can be screwed to the bench, if necessary, or can be moved about with the panel. For experimental panels it should prove invaluable, and at 5s. 9d., post free, a ready sale for it should be assured.

* * *

Low-loss enthusiasts are catered for by Messrs. A. H. Clackson, Ltd., 119, Fleet Street, London, E.C.4, who have produced the "Lowforma," a "low-loss" former which, when assembled, measures 6 inches in length and 3½ inches in diameter. It consists of two ebonite rings, held together by means of six grooved ebonite rods, a central ring preventing sag when winding. Two brass "feet" are supplied for mounting purposes and two brass terminals for connecting. Sold unassembled, the former can very quickly be screwed together,

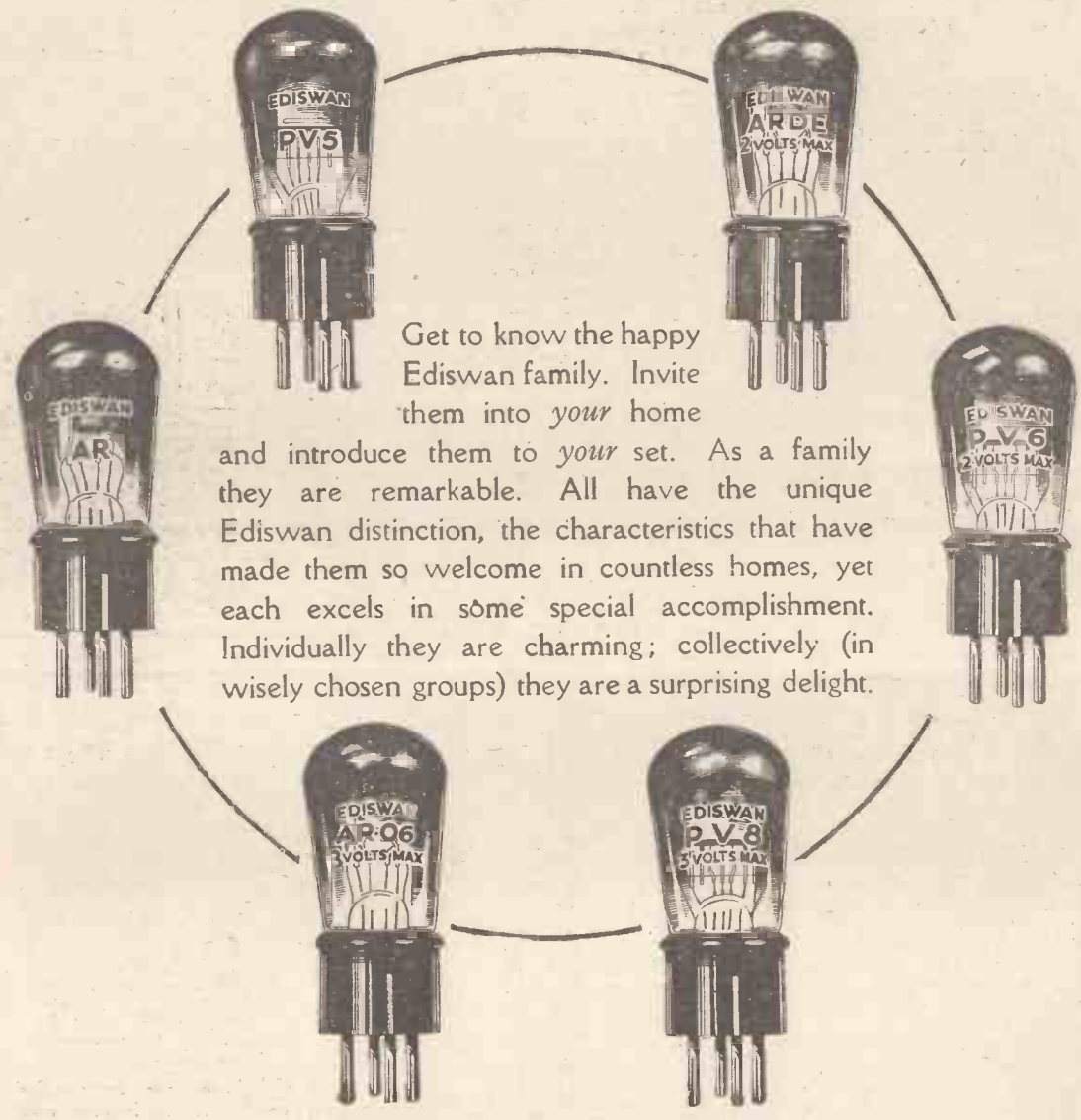
(*Continued on page* 1036.)



A neat little receiver—The Gecophone One-Valve Set.

THE HAPPY FAMILY

"The Family Circle"



Get to know the happy Ediswan family. Invite them into *your* home and introduce them to *your* set. As a family they are remarkable. All have the unique Ediswan distinction, the characteristics that have made them so welcome in countless homes, yet each excels in some special accomplishment. Individually they are charming; collectively (in wisely chosen groups) they are a surprising delight.

There is a decided affinity, a quite definite link between each Ediswan Receiving valve and Ediswan Power valve. The Receiving valves are supplied either H.F. or L.F. and the best Power valve to use is shown in the table opposite.

Ediswan Valves are entirely British Made.

EDISWAN VALVES

Will Improve ANY Set

THE EDISON SWAN ELECTRIC CO. LTD.,
123-5, QUEEN VICTORIA STREET, LONDON, E.C.4.

The Valves to Use.

Receiving.	*Accumulator or Battery Volts.*	*Power.*
A.R. -	4	P.V.5
A.R.D.E.	2	P.V.6
A.R.·06	3	P.V.8

With these groups and Ediswan H.T. and L.T. Accumulators the ideal is attained.

162-92.

APPARATUS TESTED.

(Continued from page 1034.)

as all holes are tapped and only a screwdriver is necessary to tighten up the screws and make the article as rigid as a one-piece former. It is a handy size and well-made, so that at the price of 5s. it should sell readily.

* * *

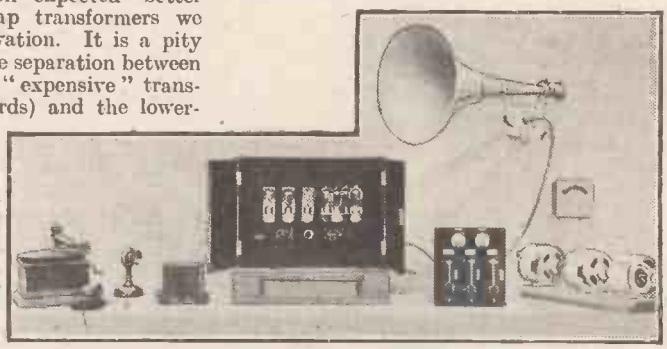
We have had a "Puremax" loud speaker on test for the past week or so. It was sent us for this purpose by Messrs. Lee & Churchill, Ltd., 76, Fore Street, London, E.C.2. It gives very clear reproduction with good projection. Notwithstanding its comparatively thin metal horn, it is by no means "tinny"; its tone is, in fact, most surprisingly mellow. It is a large, handsome instrument, sensitive and yet capable of handling large volume without developing harshness. Readers are recommended to place the Puremax on their list of "possibles." Many of the new disc types of loud speakers are sympathetic to atmospheric variations, and until this is entirely overcome we shall have a very warm spot in our hearts for the horn type, of which the Puremax is a very good example.

* * *

Messrs. Contractors' Supplies Co., 5, Finsbury Square, London, E.C.2, have sent us two small L.F. transformers for test, one of 3-1 and the other of 5-1 ratio. Known as the "O.K.", they retail at 12s. The labels on these transformers state them to be hand wound. This, we must point out, is nothing much to "shout about." Subsequent to a series of tests, we held a "post mortem" on one of them, and discovered nothing to cause a winding machine to blush with shame. However, the method of winding adopted, although insulated sections are not employed, is perfectly efficient, as far as it goes, and preferable to "cotton reel" machine winding. Although the O.K. has not the low self-capacity of some of the more expensive transformers, it has a lower self-capacity than most of the cheaper types, and this is a distinct point in its favour, in view of the many popular circuits in which many transformers fail. Again, few of the cheaper types have primaries of an impedance as high as the O.K., but that does not say that the O.K. is perfect in this respect; it isn't. However, on test the O.K.'s gave better results than would have been expected—better than most other cheap transformers we have had under observation. It is a pity that there is such a wide separation between what we can term the "expensive" transformer (17s. 6d. upwards) and the lower-priced transformer, for which there is, doubtless, an enormous sale. Actually, if the constructor can afford the price, the former is by no means "expensive"; but then, again, many cannot, and to them the O.K. can be recommended as being well ahead of many low-priced transformers.

* * *

Messrs. H. Clarke & Co. (M/c.), Ltd., Atlas Works, Eastnor Street, Old Trafford, Manchester, have sent us one of their new "Verniaknobs." It consists of a graduated bakelite dial fitted with two knobs. It is provided with a novel bush which allows it to be fitted to ordinary variable condensers having $\frac{3}{16}$ in., $\frac{1}{4}$ in., or 2 B.A. spindles. Either an ordinary dial adjustment is then available or a "vernier" adjustment of a 50–1 or so ratio. This latter fine tuning movement is continuous throughout the whole scale and operates quite independently. The "Verniaknob" is an excellent piece of mechanism and has a positive smooth action which would transform the shakiest variable into a real DX capacity unit. It is by no means cheap—the retail price being 10s. 9d.—but it is undoubtedly a quality production.



A Marconi Band repeater as used on ships for amplifying gramophone music.

Over-hauling Your Set for Xmas?

If you are overhauling your set for the Christmas festivities, make sure your Fixed Condensers are fully efficient. *Fit Watmel and make certain.* Built from the finest materials obtainable, and designed to eliminate edge losses, Watmel Fixed Condensers will give you lasting and trouble-free efficiency. Mica sheets securely clamped between the plates render it impossible for the capacity to vary, whilst the bakelite case ensures perfect insulation. No wax whatever is used in their construction. Fixing is the easiest matter—one central screw only being necessary.

Standard capacities. Any other size can be supplied at short notice.

Grid Condenser.

·00005, ·0001, ·0002, ·0003, ·0004, ·00025, ·0005 — **2/6** each

Standard Fixed Condenser:

·002, ·001 — **2/6** each

·0025, ·006 — **3/6** each

Combined Grid Leak and Condenser.

3/-

WatMel

FIXED CONDENSERS

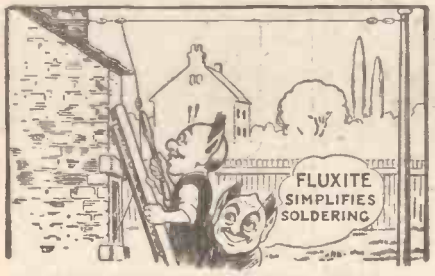
Guaranteed Correct within 5%

THE WATMEL WIRELESS Co. Ltd., 332a, Goswell Road, London, E.C.1.

Tel. CLERKENWELL 7990.

Lancashire and Cheshire representative: Mr. J. B. LEVEE, 23, Hartley St., Levenshulme, Manchester.

FAULTY INSULATION!



Solder those joins with FLUXITE, and they become one unbroken piece of metal. You will be surprised at the improvement in the quality of your reception.

FLUXITE SIMPLIFIES SOLDERING

and makes it easy for every wireless enthusiast to ensure maximum results from his set.

Ask your Ironmonger or Hardware Dealer to show you the neat little

FLUXITE SOLDERING SET

It is perfectly simple to use, and will last for years in constant use. It contains a special "small space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, FLUXITE, solder, etc., and full instructions. Price **7/6**. Write to us should you be unable to obtain it.

Price **7/6**

FLUXITE SIMPLIFIES SOLDERING

All Hardware and Ironmongery Stores sell FLUXITE in tins, price 8d., 1/4 & 2/8.

Buy a Tin To-day.

FLUXITE LTD. (Dept. 324), West Lane Works, Rotherhithe, S.E.16.

ANOTHER USE FOR FLUXITE
Hardening Tools & Case Hardening
ASK FOR LEAFLET on improved methods.

Hear the Programme through without a break on the new Polar Guaranteed Crystal

There are no interruptions for re-adjustment of catswhisker, with this new trouble free Crystal, which has a flat surface composed of a large number of very small Crystals mounted together. On this surface your catswhisker or other contact more readily remains in position—vibration does not affect it, and the great number of sensitive facets makes adjustment easy. The Polar Crystal Detector, illustrated below, consists of a silver contact and the Polar Crystal, each fitting into a socket, mounted on your panel by two nuts (template provided).

Showing Crystal partly removed from cup.

The Polar "Crystal" is sold in an ebonite cup, with mounting screw and nuts complete. From all Radio Dealers. Price **1/6**

The Crystal is interchangeable, and screws into the crystal cup—perfect contact ensured without Wood's metal.

Price of complete Detector, in highly polished ebonite with sockets and nuts, all nickel-plated **3/6**

The following report on the Polar "Crystal" is reprinted from the "Manchester Evening Chronicle":—

It is significant of the numerical importance of the crystal user, that the Radio Communication Company, which has equipped some of the largest broadcasting stations in the world, should have thought it worth while to devise a crystal detector, one of which has been sent for test.

This is a beautiful little component. The Crystal and contact are separate units, and fit in the panel by means of two valve pins and sockets.

In place of the usual whisker a small plate of very thin and springy metal is used. The Crystal also is unique, it being a very fine-grained deposit on a circular metal plate.

The pressure and position can be varied all over the Crystal, and on actual tests on a low-loss crystal set, this detector gave a remarkable reading of 160 microamps. on the transmission from 2ZY.

It can be recommended as a sound mechanical job and an ornament to any set.

There is one very noticeable point about a large number of present-day components. They are so beautifully made that it seems a pity to place them under the panel out of sight.

Probably after the present fashion of placing everything except the condenser dials under the panel, we shall have the usual reaction and find everything on the top. If this does occur the panel will not be disgraced, as components by recognised makers to-day have a beautiful finish and ultra efficiency.

RADIO COMMUNICATION CO., Ltd.,

S.W.8 34-35, Norfolk Street, Strand, London, W.C.2.

RADIOTORIAL

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

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, 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.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given to 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 wireless 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.*

TECHNICAL QUERIES.

Letters should be addressed to :
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions : (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

A SET FOR LOUD-SPEAKER WORK.

G. C. G. (Jesmond, Newcastle-on-Tyne).—What is the best circuit to get good results on the loud speaker from the local station (5 N O). At present I am using two dull-emitter valves, and basket-coils for tuning. Also an L.F. transformer, and I should like to take in all the above components if possible.

You do not say in what way the present set is unsatisfactory, but if the volume is just a little insufficient for good results we should add one valve of the resistance-coupled type. This would give a fair increase in strength without any distortion.

If considerably more volume is required the second L.F. valve may be transformer coupled, but the ratio of the L.F. transformer employed must not be higher than 2 to 1. In either case, grid bias on the last valve may prove to be essential. For the resistance coupling you will probably have to

(*Continued on page* 1040.)

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page* 1038.)

increase the maximum value of your H.T. supply, as valves coupled in this way generally require 120 volts or more for good results.

ONE-VALVE RESULTS.

B. P. S. (Warrington).—I have constructed a one-valve set. I can hear 6 L V and 2 Z Y quite well, but am unable to hear any other stations. Can you tell me what the trouble is?

You are already getting normal one-valve results. A straightforward one-valve set (Unidyne or H.T.) cannot be credited with possessing a guaranteed range under all conditions, greater than something between 40 and 100 miles (we would rather not fix this figure). Anything above this is either due to abnormal location or other natural causes, or to operating skill. The latter can be acquired with experience, but the former is just pure circumstance. Possibly, as you get to know your set, you may begin to record DX results, but you should regard such as pure gain, and not *expect* to accomplish "all B.B.C., etc."

ACCUMULATOR TROUBLES.

A. H. B. (Glasgow).—My accumulator does not seem to be lasting as long as it should after each charge now, although it looks quite all right. What is likely to be the fault?

This may be due to careless charging. Take the battery to another electrician explaining the circumstances, and asking him to give it a long, slow charge. Sulphation may have commenced although yet barely noticeable, but the above will put matters right. Also ask him to test the acid solution.

THE UNIDYNE QUERIES.

SPECIAL NOTICE.

Owing to the very heavy demands upon the Technical Staff, it is regretted that the recent offer of free replies to Unidyne Queries has now been withdrawn. Commencing forthwith all such queries must be forwarded in accordance with the Rules of the Technical Queries Dept., as set out under the heading "Radiotorial."

CRYSTAL RANGE.

A. G. (Harrow).—What is the maximum range of a crystal receiver for telephony?

Generally speaking, the maximum range of a crystal receiver with a good aerial, is 25 miles for telephony but, of course, signals are not loud at this range. About ten miles is a fair range for satisfactory results. The maximum range of 25 miles may, of course, be exceeded, and often reception of telephony is accomplished regularly at a range of about 40 miles.

A WATER-PIPE EARTH.

E. N. R. (Church End, Finchley. London, N.)—What is the best way to fix the earth connection to a water-pipe?

Good contact is essential here, and may be obtained by soldering, or by one of the special clips sold, which can be tightened by screws. If a soldered connection is made, and the wire is splayed out and well soldered in several places, there will be no resistance losses due to corrosion.

GRID LEAKS AND CONDENSERS.

A. J. M. (Slough).—Is there any rule whereby I can work out the correct values of grid leak and condenser to use in any circuit?

It has been proved by experiment that quality of speech received is impaired if the product of the capacity of the grid condenser is micro-microfarads and the resistance of the grid leak in millions of ohms exceeds 200. Generally speaking, the higher resistance and less capacity factor is advisable. Owing to the different qualities of apparatus it is always advisable to experiment in the values of these two items if optimum efficiency is required. For instance, the grid "leg" or wiring insulation or the grid condenser may be "leaky," in which cases it may be advantageous to dispense with the leak altogether.

WIRING-UP TRANSFORMERS.

F. S. (Shepperton-on-Thames).—I am building a loud-speaker (Det. and 2 L.F.) set, but am not certain about the wiring-up of the L.F. transformers. As no particular makes seemed to be advised I decided to write and ask whether it was an important feature, or whether any type of transformer would do.

The exact make, so long as it is a good one, is not important, but for best results the transformers should be chosen for the task they have to perform. For instance, the second transformer should be properly designed for second stage amplification, or distortion may occur. You should stipulate a second stage transformer when ordering, or else buy one of about 2·7 or 3 to one ratio. If distortion occurs a ·002 mfd. fixed condenser across the primary of the second transformer may help, while a power valve should be used for the last valve if good reproduction is to be obtained.

RINGING NOISES.

J. N. A. (Dumbarton).—What are the "microphonic noises" which are so often referred to in wireless articles describing valve sets?

It will sometimes be found, when operating a valve set, that any vibration causes a ringing, metallic sound in the 'phones. A coin dropped on to the table on which the set is placed may sound like a hammer blow, and when adjusting the valves the rheostat arm can be heard passing over each turn of wire in the resistance spiral.

The trouble here lies in the valves, which are said to be "microphonic," and is caused by a relative movement of the plate grid and filament of the valve, set up by the slightest shock or vibration. The early types of dull-emitter valve were the worst offenders in this respect, but modern valves are not often very microphonic. The effect is most pronounced in a set employing L.F. or dual amplification.

The only remedy is to mount the set on something soft, as a piece of felt. If possible, arrange the valves with the filaments in a vertical position. For use with delicate valves of the ·06 amp. type some special pliable indiarubber valve holders are on the market, and if these can be obtained they will serve to prevent the occurrence of microphonic noises.

RELATIVE SIZES OF COILS.

F. J. S. (Solihull, Birmingham).—Is there any definite relation between the sizes of primary, secondary, reaction, and anode coils?

Not that could be expressed in definite figures; it is more or less a question that must be settled by individual experiment, although in the case of one specific range of wave-lengths, such as those covered by the B.B.C. stations, the values have become almost standardised. The secondary coil must always be larger than the primary, because it has not in addition to its own inductance the inductance of the aerial and earth system, as has the primary. This applies also to the anode coil, while the reaction can be something approximately the value of the primary coil or the A.T.I. (aerial tuning inductance) as it is called.

FRAME AERIAL.

S. L. F. (Walsall).—Can you give me some details on how to construct a frame aerial for listening to broadcasting on 360 metres? What kind of wire shall I use? Can it be placed on the second floor or the first floor of an ordinary dwelling, or must it be on the roof? How will the results compare with my one wire 100 feet long and 25 feet high outside?

A frame suitable for use on 360 metres may be made by winding 12 turns of No. 22 copper wire on cross-arms of 3½ feet. The turns should be spaced one quarter of an inch. The two ends of the wire are attached to the receiver. The aerial may be placed anywhere in the house close to the receiver. Using two stages of radio-frequency amplification you should get the same results as you would with a detector alone on a first class aerial. With two stages of radio-frequency amplification and two stages of audio-frequency amplification you should be able to hear the broadcasting from 5 I T all over the house, using a loud speaker.

ACCUMULATOR PLATES.

P. D. P. (Tottenham).—How are accumulator plates made? Could I make my own battery?

Possibly you *could* make your own accumulator, but it would not be worth the time, trouble, and expense, for unless you are skilled in that kind of work the result is not likely to be successful. The plates consist of lead screens which are filled either with a paste of litharge and dilute sulphuric acid in the case of the negative plate, or with red lead and dilute sulphuric acid in the case of the positive plates. The positive paste is usually mixed with ammonium sulphate, or some similar substance, to act as a binder.

After the plates have been made they have to be "formed" by repeated charging and discharging at a slow rate.

Correspondence

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

SEPARATE PLATE POTENTIALS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I should like to take this opportunity of thanking Mr. O. J. Rankin for his article in "P.W." No. 154, entitled "Providing Separate Plate Potentials."

I assembled the 3-valve receiver, H.F., det., and L.F., Fig. 2, given with this article on September 4th, and thought you would be interested to know what results have been obtained up to date. Stations heard are Daventry, Zurich and Birmingham loud-speaker strength, and Dortmund, Brussels and Elberfeld at good 'phone strength, Nottingham, London, Manchester, Toulouse and San Sebastian, Glasgow, Belfast, Berlin, Aberdeen, Bournemouth, Cardiff, Newcastle, Madrid R.I. and Madrid Union Radio, Leeds, Bradford, Hull, Radio-Paris, Swansea, Barcelona E A J 13, Barcelona E A J 1, Hamburg, Plymouth, Stoke-on-Trent and Hilversum. I attribute my success not to the circuit alone but to the article "Providing Separate Plate Potentials."

Wishing your paper every success.

Yours faithfully,
L. H. GRIFFIN.

20, St. Peter's Street, Old Radford,
Nottingham.

THE "AUTO WAVE-TRAP."

The Editor, POPULAR WIRELESS.

Dear Sir,—You may be interested to hear my results with your "Auto Wave-trap." I wound 75 and 25 turns of 24 D.C.C. wire on a 2-in. former, ½-in. space between the two coils, and fixed two home-made fixed condensers as instructed by you. These consisted of four pennies and three waxed papers, and five pennies and four waxed papers. I am afraid it is rather a Heath Robinson edition of your "auto-trap," but the results were very good. I tried it on a 2-valve "P.W." set first, with 50 and 50 coils instead of 50 and 75. I cut 6 B M out at four miles on five degrees of the variable condenser and got other stations easily.

I then tried it on a "Midget" straight 1-valve set with home-made coils 44 and 64 in place of 50 and 75. 6 B M went out on eight degrees and Madrid came in very good. Four German stations (one very loud indeed), three French stations, San Sebastian faint but clear. I next tried it on a S.T. 100 with 50 and 35 in place of 50 and 50, and got splendid results. I tried it on a 3-valve set with 35 and 50 in place of 50 and 75, with the same excellent results.

I then went back to my "Midget" set and found the above-mentioned German and French stations with ease and clearness, and no fiddling about.

I got Rome in faint and bad fading. The strange thing was 2 L O was the only B.B.C. station beside the local one I could get in. I found, if anything, increased volume of sound and, of course, good selectivity.

None of these sets will cut 6 B M out without a wave-trap. My aerial is very good—40 ft. high, 150 ft. single wire directional for 6 B M. Earth wire 15 ft. long going down below water level. I congratulate you on your "auto-trap." I don't think the correct values of condensers, as given in your paper, could improve the set unless I happen to have hit on them with the pennies. I don't find the trap is liable to "howl" unless badly used.

Yours truly,
J. M. BELLAIRS.

The Moorings,
Christchurch.

A "SUPER" CRYSTAL SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having had many concerts spoiled by commutator sparking, caused by passing motor-cars, I decided to build a crystal set capable of reducing the interference. After many attempts, I have, I think, succeeded.

This set receives 5 N O (14 miles range) at fair strength *without the assistance of an aerial.* After a three weeks' trial, I have not heard the faintest sound of sparking, oscillation, or atmospheric discharges.

5 X X comes in fairly well on an indoor aerial.

It may interest you to know that the set is a modified "P.W." Ultra, connected up in rather an interesting manner. When used with a good aerial and no earth, signals are still perfectly clear. Anyone residing in this district is heartily invited to hear this set.

Yours faithfully,
T. GIBBON.

18, Sherburn Road,
Durham.

FOREIGN RADIO NEWS.

(*Continued from page* 1014.)

The request is made that listeners picking up these messages should communicate the fact, with observations on clearness, etc., by postcard addressed to Radio-Milan, 23, Corso Italia, Milan, Italy.

A New Belgian Station.

The province of Liège, which complained of not hearing the Radio-Belgique transmissions from Brussels, now has no less than three stations of its own. The opening of Radio-Wallonie was reported in these notes two weeks ago. Its wave-length has been definitely fixed at 285 metres.

The newcomers are Radio-Central, which broadcasts concert programmes on Mondays, Thursdays, and Saturdays, on a 205 metres wave-length, and Seraing-Radio, which will, starting this week, broadcast band music every Thursday on a 195 metres length.

Seraing is a small town near Liège, famous for the Cockerill works, and it is reported that the workmen in these big works are showing an increasing interest in radio.

The Geneva Station.

The station recently opened at Geneva has met with so little support locally that it can no longer afford to spend large sums on securing first-class programmes of its own. An arrangement has, therefore, been come to with Zurich to use the Geneva station as a relay for the excellent Zurich programmes.

The installation at present in Zurich will, it is reported, be moved shortly to Saint Gall, and will be replaced by a more powerful sender.

Sweden Makes Definite Arrangements.

Save in special cases, which will be duly announced beforehand, broadcasting from all Swedish stations will take place on weekdays from 6 p.m. to 11 p.m., and on Sundays from 11 a.m. to 1 p.m., and from 5 p.m to 11 p.m.

The Swedish stations, with their wave-lengths, are as follows:

	metres
Stockholm	427
Gothenburg	290
Malmoe	270
Sundswall	545
Falun	370
Joenkoeping	265
Boden	1350
Trollhaettan	345
Norrpoeping	260
Karlstad	355
Gaevle	325
Linpoeping	467
Eskilstuna	243

Radio Boom in Canada.

Canada is enjoying a radio boom, and the heads of the large wireless firms state that sets are simply selling themselves.

During the fiscal year ending 1925 the production of radio sets in Canada amounted in value to 3,000,000 dollars.

The number of radio licences issued by the Canadian Government totalled 91,996 in twelve months, and at the end of the year there were 51 licensed broadcasting stations in the Dominion.

THE YEAR IN RETROSPECT.

(*Continued from page* 1008.)

secret signalling. Two reflecting aerials are located at A and B respectively, each sending out a narrow beam of signal energy in the direction shown by the arrows. The actual signals are superposed on the transmitted waves by means of a key K which, as shown, is connected alternately to the aerials A and B, so that "dot" impulses are sent to A, whilst "dash" impulses go to B, or vice-versa.

"Polarised" Waves.

In the case of telephony, part of the modulating currents would feed one aerial, and part the other. The result is that full reception is only possible within the narrow area shaded at X. Any receiver located outside this area would receive only fragmentary and unintelligible portions of the transmitted message. By controlling the direction of the beams radiated from A and B, the message can be confined to any given district to the exclusion of all others.

In order to investigate the peculiar liability of short-wave energy to "fading" losses, experiments have been carried out by Dr. E. F. Alexanderson and others in the use of plane-polarised waves, and interesting developments may reasonably be expected to follow from this line of research, particularly with regard to the effect of the Heaviside layer on short-wave transmission. In one way or the other the future of wireless communication appears more than ever to be largely bound up with the question of short-wave working.

A Novel System.

The almost unlimited extent of the field yet open to wireless investigators is illustrated by the novel transmitting and receiving system shown in Fig. 5. Here the ordinary type of aerial is replaced by two horseshoe-shaped open-core solenoid windings. The transmitting coil is energised by currents of sufficiently high frequency to create a moving magnetic field which travels through the solenoid at approximately the speed of light.

At this speed (but not before) each magnetic field "breaks away" at the end of the solenoid and continues its path in a straight line through the ether, forming a concentrated pulse of radiant energy. At the distant end it is received upon a similar solenoid and can be detected by suitable means. The radiated energy apparently returns to the transmitter as indicated by the arrows, thus forming a closed path for the magnetic fields through the ether.

A MAIN STATIONS AND 5XX ULTRA.

The article describing the construction of this interesting crystal set has, we regret to say, been unavoidably left over, but will appear in next week's issue of "P.W." It is an easy-to-make receiver employing the now famous "Ultra" tuning system in a novel manner and is certain to attract considerable attention.

TECHNICAL NOTES.

(*Continued from page* 1022.)

One of the first criticisms of such a set would naturally be that of current consumption for the valve filaments. This, however, has been kept within very economical limits by the use of special Northern Electric Peanut "tubes," which only consume altogether about 1½ times the current of an ordinary single dull emitter—the power for filament lighting is rated, in fact, at ½ an amp. at 6 volts for the whole ten valves. The panel is about 6 in. by 18 in., and the set is about 7 in. deep. On the L.F. side, push-pull type transformers are used in a balanced power amplifier.

A New H.T. Unit.

The Radio Corporation of America announce the "Duo Rectron," a new power unit, embodying a Radiotron receiving valve, and the Rectron power or rectifying valve. This unit supplies correct voltage for any size receiving set up to ten valves. A special type of valve—known as a voltage regulator—was developed for the purpose, and it is claimed that with this unit it is impossible to get too much H.T. current on a small set or too little on a multi-valve set. The current output, in fact, at any ordinary H.T. voltage, is up to 50 milliamps. The rectifying valve is designed specially for long life, and a filter system is introduced which is claimed to be so efficient that all trace of A.C. hum is removed. The H.T. voltage reaches up to 130 volts, and the unit is designed for 110 volt 60 cycles.

The "Panatrope."

Another interesting development for which the R.C.A. is partly responsible is a new system for the recording and reproduction of sounds, the device being known as the "Panatrope." This has been evolved jointly by the R.C.A., the Westinghouse Co., the General Electric Co., and one of the big gramophone manufacturing concerns. The Panatrope employs a special type of radio amplifier for the reproduction of gramophone records, and in a public demonstration of the instrument, Dr. Alfred Goldsmith, the well-known radio authority, made a speech in Washington, over the broadcast, describing the invention, the speech being reproduced from a wireless receiver and amplified through the Panatrope. The proper purpose of the Panatrope, however, as mentioned above, is in conjunction with a special type of disc gramophone. When used in this way, the volume of the reproduction may be adjusted so that it is sufficiently large to fill a huge hall, or sufficiently small to be suitable for an ordinary reception room. The records are electrically cut, and the reproduction is by a new system which discards the sound box and horn. The vibrations of the needle lying in the groove of the record do not directly produce the sound, as in the ordinary gramophone, but the vibrations are translated into electrical variations and these are then stepped-up by means of valves in the usual way.

An All-Wavelength Coil.

I recently examined a model of the "Multidyne" coil, which, I believe, is of French origin, at any rate, which I have noticed advertised in the French radio journals. This is a combination of six coils, with a selector switch, so that a range of wave-lengths from 180 to 5,300 metres is available. The usual objections to tapped coils—dead-end effects, and so on—are claimed to be overcome by the special system of switching, the coils not in use being entirely disconnected from those in use. It is difficult to give in a few words a description of the switch employed, but this is quite simple in action, and is well made. Whether capacity effects would have any serious influence on the functioning of the coils I am not able to say, as I have not tried the coil, but the coils themselves are also wound in a special way. The case is marked on the outside, and a lever to the switch indicates, by means of numbers on the case, which coils are in circuit.

Controlling Oscillation.

Many amateurs who are quite at home with note magnification, or low-frequency amplification, and who contemplate building a receiver employing stages of H.F. amplification, are deterred from doing so owing to the extra tendency for the set to oscillate, this in spite of the extra selectivity obtained. The control of oscillation in a radio-frequency receiver is, of course, of great importance, as the nearer we approach the point of oscillation, the greater the sensitivity and usually also the selectivity. One well-known method of controlling oscillation is by the potentiometer, another by the non-inductive variable resistance, and a third by using a variable condenser in conjunction with a third winding on the H.F. transformers. The potentiometer method and the resistance method have their own peculiar disadvantages, which we need not discuss for the moment, whereas the capacity method, apart from the need for the specially-wound H.F. transformers, is easy to control.

A well-known commercial set, with two H.F. valves, detector, and two L.F. amplifiers, employs this method of H.F. control. Three H.F. coils are employed, the first being the usual two coil coupling between the aerial and the set. The second and third transformers each have a third coil, and a three-plate control condenser is placed in series with these third coils: this condenser permits the control of the reaction, and so helps in building up signal strength smoothly and without danger of oscillation.

An Interesting Tone Control.

An interesting innovation by the well-known Grebe Company of New York, is the "Colortone," an adjustment by means of which the quality of the reproduction from a receiving set may be controlled at will. The quality may be changed, for example, from a high thin pitch to a deep sonorous tone, embracing all the intervening qualities in the course of the adjustment. The purpose of this adjustment is to make the receiver adaptable to particular types of reception. For example, suppose a violin solo is being received: the set would then be adjusted so that it suited that particular type of reception—no doubt, the fairly thin pitch would be appropriate in this case. For a 'cello, or a bass voice, or again for the bass instruments in an orchestra, the deeper tones would be required. The Colortone, moreover, it is claimed, makes it possible to suppress considerably the high-pitch frequencies caused by heterodyne interference of one station with another, and also to reduce, to a great degree, disturbances due to static—which are, of course, much more troublesome in the States than here.

R/R

Mellow as an old fiddle

PLAYER'S wealth of experience in all that pertains to the maturing of tobacco enables them to place their cigarettes on the market as they reach prime condition, while the extraordinary demand forbids staleness. The maturing and blending is so skilfully done that the natural fragrance of the Tobacco remains unimpaired.

20 for 11½d.

10 for 6d.

PLAYER'S NAVY CUT.
REG° N° 154011

P.1213

It must be Players

Printed and published every Thursday by the Proprietors, The Amalgamated Press (1922), Ltd., The Fleetway House, Farringdon St., London E.C.4. Advertisement Offices, Messrs. J. H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Registered as a newspaper and for transmission by Canadian Magazine Post. Subscription rates, Inland and Abroad, 10/6 per annum, 5/9 for six months. Sole agents for South Africa: Central News Agency, Ltd., Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for Canada: The Imperial News Co. (Canada), Ltd. Saturday, December 26th, 1925. R/R