POPULAR WIRELESS, October 15th, 1927. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

A MAGNIFICENT GIFT ISSUE

Popular Wireless

Every Thursday PRICE 3d.

No. 280. Vol. XII. INCORPORATING "WIRELESS" October 15th, 1927.

FOUR 6d BLUE PRINTS Free!

FOUR MORE BLUE PRINTS NEXT WEEK!

FRUITS OF RESEARCH

The B.T.H. Co. have always made good valves but the new 2-volt series are the "best yet."

They are not valves made in a hurry, much time and money having been expended in the search for the perfect 2-volt valve—and at last it has been discovered. The B.T.H. Co. are now able to offer a complete 2-volt series comparable in performance with the best 6-volt valves.

Every point is a "strong point" in the new valves. The filament has no superior in strength, endurance or emission, whilst the grid and anode, by their perfect placing in relation to each other and the filament, further ensure the complete working efficiency of the valve. In short, the new B.T.H. 2-volt valves are *perfect in every part*, and are a marked improvement on anything hitherto achieved in the science of valve making. Whatever valves you may be using now, it will pay you to investigate these claims, which the B.T.H. 2-volt valves will fully support under actual broadcast conditions. They are unusually good valves offered at the usual prices.

Type	Purpose	Fil. Volts	Fil. Amps	H. T. Batt. Volts	Ampl. Factor	Impedance	Price s.	Price d.
B21	H.F.	2	0.1	40 to 150	16.0	32,000 ohms.	10	6
B22	G.P.	2	0.1	40 to 100	7.5	14,000 ohms.	10	6
B23	Power Amp.	2	0.2	40 to 100	6.0	8,000 ohms.	12	6
B8	Res. Coupl.	2	0.1	100 to 150	50.0	180,000 ohms.	10	6

The above prices are applicable in Great Britain and Northern Ireland only

B T-H

A COMPLETE RANGE OF VALVES—

2 VOLT VALVES

FOR ALL SETS AND CIRCUITS

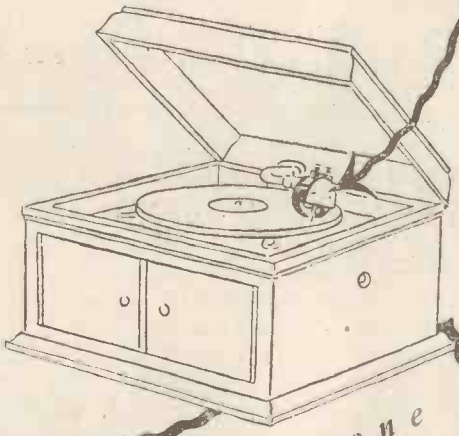
B21 (H.F. & DET)
B22 (General Purpose)
B23 (Loud Speaker)
B8 (R.C.)

2806

If you are interested in R. C. Coupling, write for a copy of the "RESISTOR" Booklet to Publication Department, The British Thomson-Houston Co. Ltd., Rugby

Let Electricity improve your Gramophone

BE your Gramophone old or new, electricity can improve it. The Brown Electrical Pick-up, when fitted in place of the ordinary sound box and connected to an amplifier and loud speaker, will give you four much-sought gramophone improvements. It will give purer, more mellow, more life-like tone. It will give far greater, more majestic volume. It will give that much-needed effective control of volume. It will almost completely eliminate the bugbear of needle scratch. In short, the Brown Electrical Pick-up brings gramophone performance streets nearer the ideal. Ask your Dealer to prove this to you by showing you how the Pick-up can improve *your* gramophone. Price £4



Purify its tone
Increase its volume
Reduce its needle scratch
Control its volume

The Brown

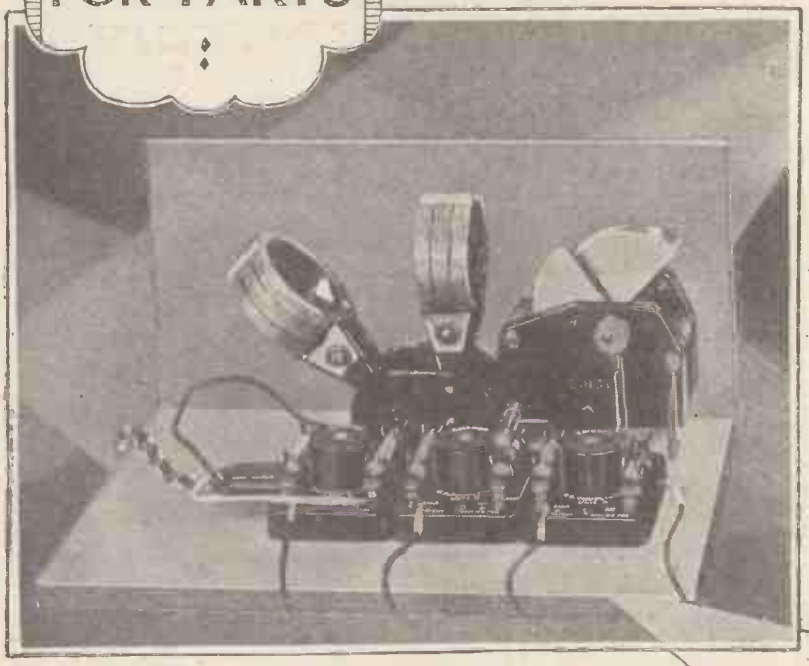
ELECTRICAL PICK-UP will

9661.

It really is wonderful
The *New & Improved*
R.C. THREESOME

EASIER TO BUILD THAN EVER MADE IN AN HOUR OR TWO ONLY 50/- FOR PARTS

The ingenious design of the New and Improved R. C. THREESOME makes its construction easier than ever. The incorporation of plug-in units have considerably reduced the number of parts for assembly. So simple is the New R. C. Threesome that you can make it in an hour or two. No Soldering! Wiring connections have been reduced from 24 to 5. Think of it! Only 5 connections to make and you can be sure of wireless reception of amazing purity. Once you have heard the New and Improved R.C. Threesome you will never again go back to ordinary wireless.



It's simple to make—simple to operate—and costs only 50/- for parts.

Complete Instructions with Blue Print—FREE! Merely fill in Coupon below and post TO-DAY!

INSTRUCTION BOOK & BLUE PRINT—FREE

No need to wait. The coupon below will bring you the Instruction Book and Blue Print. Fill it up now and Post QUICK!

EDISWAN

To THE EDISON SWAN ELECTRIC CO., LTD.,
(Publicity), 123/5, Queen Victoria St., London, E.C.4.

P.W. 15/10/27

Please send, post free, presentation copies of the R.C. Threesome Instruction Book and Blue-print.

Name.....

Address.....

V59 .....

KINGS OF THE AIR

AFTER four years Cossor still stands pre-eminent among valves. The famous Cossor Kalenised filament—the first ever to operate without visible glow—is still acknowledged to be without equal for strength, long life and economy.

Even if you know nothing about Radio you'll sense Cossor superiority the moment you start using Cossor Valves. Such wonderful tone—such majestic volume—such freedom from irritating background noises that every Cossor user quickly becomes a staunch enthusiast.

Remember this when you buy your next valves—demand Cossor Valves and be satisfied that you'll get valves which will serve you well, which will cost little to run and which will give you the most perfect broadcast music. A full range of types available from 10/6 each.

Cossor
the melody maker

Popular Wireless

Scientific Adviser :
Sir OLIVER LODGE, F.R.S.
Editor :
NORMAN EDWARDS, M.Inst.R.E., M.R.S.L., F.R.G.S.
Technical Editor : G. V. DOWDING, Grad.I.E.E.
Assistant Technical Editors : K. D. ROGERS, P. R. BIRD,
G. P. KENDALL, B.Sc., A. JOHNSON RANDALL.

RADIO NOTES AND NEWS.

Weather Notes—Dawson's Debut—Jingle in the Jungle—New Musical Instrument—Australia Received Direct—Home of the Free.

Weather Notes.

THE days—as dear old ladies love to remark—are now drawing in. Rain is not expected to stop in most localities and a deep depression is centred all round the circumferences of sporting circles. Therefore, let us gather round the gadgets and seek the elusive broadcasting station, bearing in mind the old saying, "Trust in 'P.W.' and keep your panel dry." But after the revelations which appear in this week's Notes one is bound to have a doubt as to whether the earth is really big enough to make DX worth while.

"Morse."

SUFFERERS from Morse interference will probably learn without a pang that the old house at the corner of Washington Square South, Greenwich Village, New York City, in which in 1836 Samuel Morse perfected his telegraph instrument, is shortly to be pulled down. The world's first telegraph message is said to have passed over a wire between this house and a building on the site of which New York University now stands.

Television.

WE have heard many reports of wonderful television receivers to be placed on the market "in a few months" for a long time past. Not long ago Mr. Baird was preparing to test his system across the Atlantic. Last month news came from Vienna that a new system of television had been evolved by an Englishman; a report also came from Berlin that the A.E.G. were about to spring a similar marvel on the public. So far as I know, no receiver has yet been placed on the market. Has television proved too hard a nut to crack, after all? Now, Mr. Baird, we are looking to you.

The First and the Last.

THE lucky young man who was the first person to pass through the turnstile at Olympia to see the Radio Exhibition was presented with a fine valve receiver, which one supposes will inspire him. The total attendance at the exhibition was 78,886. The busiest day was on the Wednesday when 15,195 enthusiasts paid for admittance.

P C J J's Short-Wave Programmes.

THE following times of transmissions have been arranged for P C J J this month:—

Thursday, Oct. 13th—17·00 to 21·00 G.M.T.
Tuesday, Oct. 18th—19·00 to 22·00 „
Thursday, Oct. 20th— „ „ „ „
Tuesday, Oct. 25th— „ „ „ „
Thursday, Oct. 27th— „ „ „ „

Dawson's Debut.

IF you keep a listening-in diary to remind you of special items, you might make a note under October 29th, on which date the newcomers to the microphone, Wally Dawson and Billy Wallis, will give a short but snappy turn from 5 G B. Billy and Wally are, however, no strangers to the art of entertaining—but ye shall be the judges Hist! If the great Robey did not copy his famous eyebrows from Wally's—he might well have done. *That*, however, you cannot judge until Mr. Baird perfects television. Got the date?

To Report Progress.

WHETHER it is by reason of the activities of the U.S.A. Federal Radio Commission or not, no less than seventeen radio stations have recently disappeared from the U.S. Government's list. There are now only 680 stations broadcasting over there. Only 680! Shades of super-super-vernier.

(*Continued on next page.*)

OUR AMATEUR BROADCASTER'S STUDIO.

This is the studio which is connected by land-line to 2 N M, the amateur transmitting station operated by Mr. Marcuse. The studio is situated in the house of Mr. Valentine, who acts as Mr. Marcuse's assistant in his Empire broadcasts and other experimental transmissions. The microphone will be seen in the above photograph suspended from a bracket on the wall at the extreme right.

NOTES AND NEWS.

(*Continued from previous page.*)

Radio versus Cable.

LATEST statistics show that whereas the ocean cable mileage is about 325,000, that of wireless circuits is only 150,000. But this is encouraging for radio considering the start the cables had. Besides, radio can add thousands of miles to its total by the erection of a Beam station, whereas the laying of a long cable is a much longer job and is, moreover, a matter of millions sterling, as compared with thousands for a Beam.

Signs of the Times.

ALREADY the cable companies are flirting seriously with radio. The well-known Eastern Telegraph Cable Company has secured a wireless concession in Greece, and the American Mackay System has formed a merger to be known as the Mackay Radio and Telegraph Company, which will control as a start some seven radio stations, and is planning Pacific and Atlantic radio transmission.

Jingle in the Jungle.

IT was not to be expected that romantic India would go free from the all-conquering march of radio. Not only is broadcasting an accepted adjunct of daily life in the large towns, but it is being used in the wild and woolly jungles. The Maharajah of Mysore has a 500 watts transmitter in his palace and a portable 20 watts set for the hunting camps.

The Same in Rhyme.

THERE was a *shikar of* Mysore,
Worked a loud speaker outside his door;
But a tiger with nerves,
Put some kinks in his curves,
So the jungle will jingle no more.

To Club Secretaries.

MESSRS. S. G. BROWN, LTD., Western Avenue, N. Acton, W.3, will be glad to arrange for lectures to be given to your members and to lend lantern slides. Please apply to their Secretarial Department, above address, for details.

Oscillation Note.

THE Southend-on-Sea and District Anti-oscillation League is now full steam ahead and inviting more members. They had a show all to themselves at the recent Southend Carnival, when they demonstrated two houses separated by a "party" wall, in one of which was a demon schoolboy oscillating hard, and in the other a pair of victims. I cannot but believe that I live in a most exclusive region, for I have never been troubled by oscillation in the slightest. When inquiring the name of the district, please enclose stamped addressed envelope. The rates here are scandalously high, I warn you.

New Musical Instrument.

I AM rather apprehensive of Professor Theremin's invention. He waves his hands at a brass rod projecting from a small box and produces musical sounds something like those of a violin. I fear the Chamber Music people will get hold of it. One presumes that he has rigged up an oscillating circuit and that the brass rod is part of a condenser, the capacity of which he varies by approaching his hand, thus varying the frequency. An old trick. I once had a dog whose howl I could vary very much in the same way, though it never occurred to me to play tunes on him.

The Rest in Silence.

I READ that the clergy in the diocese of the Cardinal Archbishop of Milan, Mgr. Tosi, have had to dismantle their radio sets because the Archbishop has banned wireless, the reason being that he objects to light opera and the prevalence of jazz music. One man's jazz is many a man's corruption, evidently. But why not tackle the broadcasting stations, too?

History Repeats Itself.

I UNDERSTAND that a well-known firm are shortly to place on the market new sets incorporating double-tuned circuits which will enable the user to receive either from his local station or Daventry. "All done by a switch," is the slogan. Yes, and in our young days we, also, were enabled (or compelled) to receive knowledge by means of a switch. A two-way switch! Double, treble, and four-throw!

"Peace Bridge" Reception.

IN gratifying response to my enquiry about direct reception of this show from 2 X A D, the following report success:—G. S. G. (Twickenham), two-valve "Radiano" type of set. H. J. (Liverpool), two-valve "Radiano." B. F. F. (Teignmouth), one-valve Flewelling ("P.W." type) and 10 ft. indoor aerial. T. C. (Alfreton), O-V-2; has also received Melbourne on this set. S. N. (Bedford Park, W.4), Det. and one L.F.; has received Sydney, N.S.W. Many thanks for all letters. These results speak well for "P.W." sets and are bound to encourage fellow-readers.

Australia Received Direct.

AND now, my hearties, we come to a summary of the reports I have had about the most remarkable receiving performances we are likely to hear of for many a long day. "Valve Barts" are cheap to-day; I shall have to create a peerage. Please note the "P.W." sets used, amongst which figure "Chitos" and "'P.W.' Reinartz."

On One Valve.

I REPORTED Mr. P. A. Hood's one-valve reception last week. Pity he did not mention the type of his set. D. S. C. (Plymouth) shares his honours, having used a one-valve modified Reinartz. Sigs. R3-4. Got 2 M E on September 4th and 2 F C (28·5 m.) September 11th. These two gentlemen are the first "'P.W.' peers." Three rousers, please! And again!

On Two Valves.

T. F. G. (Bristol) used a two-valve "Chitos." Sigs. R 3-4. Also gets 2 X A F, 2 X A D, etc., on a one-valve modified "Hartley." A "'P.W.' peer" in the making. D. S. (Nuneaton), two-valve Reinartz. J. H. H. (Winscombe), using a two-valve "'P.W.' General Purpose Reinartz." Sigs. R 3-4. L. A. M. (Higham Park, E.4), ordinary broadcast set with Igranic short-wave coils. E. E. G. and S. C. C. W. (83, Bective Road, Kingsthorpe, Northampton). Sigs. R 4-5. They would like to hear from readers who got 2 M E on September 4th. A. J. E. F. (Newport). Sigs. R4-6. Reinartz. Indoor aerial and no "earth."

Three and a Doubtful.

M. B. (Southport), three valves (2 L.F.), one-stage transformer coupling, the other Res.-Cap. Aerial 15 ft. high. H. N. S. (Kenilworth). 2 M E at full L.S. strength. Details of set omitted. Altogether, I consider the results first-class, highly creditable to "P.W." and the readers mentioned, and excellent demonstration of what can be done by skill and the right kind of receiver. Best thanks for all the interesting letters, in particular that of A. J. E. F., who gave a workman-like report on the strength and quality of the transmissions.

Wireless and the Church.

ALWAYS conservative as a body—and probably for it that is in the long run the wiser policy—the Church is testing broadcasting as one tastes a strange wine—doubtfully, in tiny sips. Now, I do think radio is no enemy to public worship, for the inveterate churchgoer certainly does not neglect his church for his radio set; whereas many a person listening to broadcast services, perhaps from curiosity, has probably been thereby induced to attend church. Also, there are the aged and bedridden to consider.

Home of the Free.

IT was stated last month at the Newry Petty Sessions that in Northern Ireland more than half the 30,000 sets in use were unlicensed. The Wireless Free State!

ARIEL.

SHORT WAVES.

Mr. J. L. Baird, the inventor of television and phonovision, is reported as saying that some faces sound like a gargle. Still, perhaps it was only ginger beer.—"Punch."

* * *

One irate old gentleman complains that the broadcast programmes nowadays are not fit for pigs. Now is the time for the B.B.C. to supply some that are.

* * *

Now we know why so many stations broadcast jazz. It can't be interrupted by static.—"Glasgow Herald."

* * *

THIS WEEK'S EXPLORER:
The tired man who said he was looking for a *portable* storage battery.

* * *

AN OSCILLATING WAVE-METER.
Irate Father: "So, coming to listen to the new radio was only a blind. Here I find my daughter in your arms with her head on your shoulder!"
Confused Suitor: "Er—no, sir, you see I was simply getting her wave-length"—and he fondly caressed her new permanent wave.—"Radio News."

* * *

A radio salesman has had to appear before the court on a charge of stealing wireless components from his firm.
We suppose he took advantage of the "stock-taking" season.

* * *

Lord Birkenhead is reported to have said: "It's all to the good that men should go on talking."
This seems to find favour with the B.B.C.

* * *

This week's libel is the story of the Scotsman who bought a valve, used it for three years and then took it back to the shop and said he had just learned that it contained a vacuum and he would like either a gas-filled valve in exchange, or his money back.

The ROBINSON INTERDYNE VALVE

In this exclusive article the inventor tells of his new valve, produced with the object of providing H.F. amplifiers that are stable without the need of neutralising apparatus.

By J. ROBINSON, D.Sc.

THE well-known three-electrode valve has had a good innings, and, in fact, it will still continue to be used in large numbers for a long time to come. Its performance is so surprisingly good, and it is so easy to handle that up to the present any departure from the standard type has received no encouragement from the public. In fact, it has not been easy, so far, to introduce new types of valves, for manufacturers have been fully occupied in supplying demands for the ordinary types.

Present-day wireless shows a decided tendency towards the receiving of as many different programmes as possible, and there is now a large and growing demand for receivers which will allow both foreign and British stations to be obtained easily. In order to satisfy this demand, two features of reception require careful attention, amplification and selectivity.

A Robinson Interdyne Valve made by the Mullard Company has the following characteristics :

Maximum filament voltage ..	6 volts
Filament current	·075 amps.
Maximum anode volts ..	150 volts
Impedance	19,000 ohms
Amplification factor	17·5
Mutual conductance	·94

Simplifying D X Reception.

Of course, it is at present possible to obtain large amplifications with considerable freedom from interference by using well-known and ordinary apparatus, but one condition, and a very necessary one, is nearly always missing, and this is that in order to do so, extra adjustments are required, these being of a type which demand skilled wireless knowledge. The great problem at present is then to supply apparatus and complete receivers so that absolutely untrained people in wireless can easily obtain a large number of stations.

If any excuse is required for the introduction of this new type of valve, it is that it enables these conditions to be fulfilled, and we shall now consider how they allow us to obtain amplification and selectivity with the greatest of simplicity, and without having to perform any extra adjustments.

In order to receive various programmes, each free from interference, it is highly desirable to provide high-frequency amplification, and this should be obtained without any trouble. Those who have already attempted to add high-frequency stages to their receivers, or who have attempted to construct a high-frequency amplifier, know that the chief thing to be avoided is instability, or the tendency for the amplifie to break into oscillation, and thus, in fact to become a transmitter which is a nuisance to one's self and to one's neighbours.

Various devices are being employed to control this tendency to oscillate, such as a potentiometer or stabiliser, to put positive potential on the grids of the high-frequency valves, or, in effect, to damp these valves, or make them inefficient.

(*Continued on next page.*)

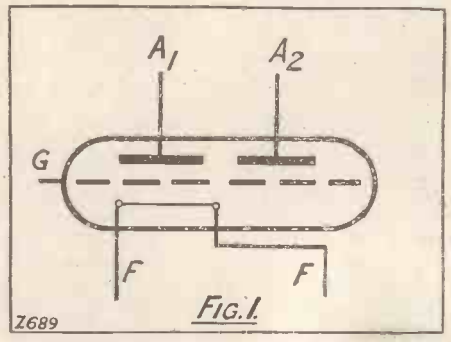


FIG. 1.

If an ordinary valve were employed in this receiver, a neutralising condenser would be needed. But with the "Interdyne" the extra connection serves the same purpose.

THE ROBINSON INTERDYNE VALVE.

(Continued from previous page.)

Again, there is the use of a Neutrodyne condenser which cuts out the inherent reaction which is always present with a normal three-electrode valve.

Both of these devices, and there are also other devices, introduce the one condition that extra apparatus is required with the valves to produce stability, and this extra apparatus involves extra adjustments. We all know that some of us can perform these adjustments, but many of us cannot do so.

This new valve has been produced with the object of providing high-frequency amplifiers which shall not require any extra apparatus to stabilise the valve, but which shall give their amplification without any fear of oscillations being accidentally produced. Thus one great essential is provided for, which is stable amplification without the necessity for any adjustment of the amplifier.

The valves for this purpose have an extra anode with an extra terminal. This does not mean the introduction of trouble in the connecting up, for the two anode terminals can be employed for the two ends of the anode coil. The anode tuning condenser if employed can be connected to the same terminals. Further, the new anode terminal does not modify the ordinary type of valve cap to any extent, and the valves are intended to be used with the ordinary valve holders.

Arrangement of Electrodes.

Fig. 1 shows diagrammatically the disposition of the electrodes in one form of this new valve, F being the filament, G the grid, A_1 and A_2 the two anodes. It will be seen that the anodes A_1 and A_2 are disposed symmetrically with regard to the grid G, and that the filament F does not stretch over the whole of the grid. The object is to achieve different electron currents to the two anodes, whilst allowing the two anodes to be as nearly equally placed as possible with regard to the grid. In actual practice we get practically no emission to one of the anodes A_2.

Fig. 2 shows how the various circuits are connected. The grid circuit L_1C_1 is connected in the usual manner to the grid and filament. The anode circuit L_2C_2 is

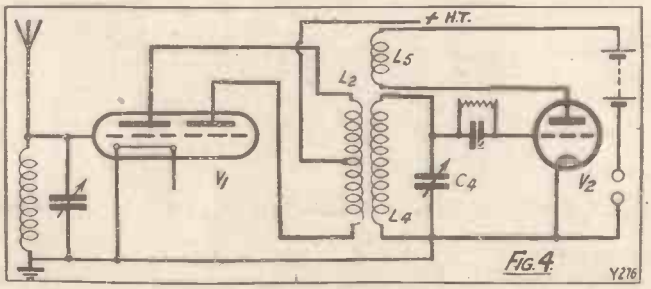


FIG. 4.

connected to the two anodes A_1 and A_2. The anode battery is connected to the centre point X of the anode coil. It is quite easy to appreciate that in this way the anode circuit L_2C_2 cannot influence the grid circuit L_1C_1 through the valve, for any electro-static influence on the grid through one anode, A_1, is balanced by that through the other anode, A_2.

This can be quite clearly demonstrated in practice with one of these valves, for when in use as shown in Fig. 2 satisfactory results are obtained, but the instability of the ordinary three-electrode valve is shown when the connection to the anode A_2 is removed, in which case the receiver oscillates.

These valves can be employed in cascade,

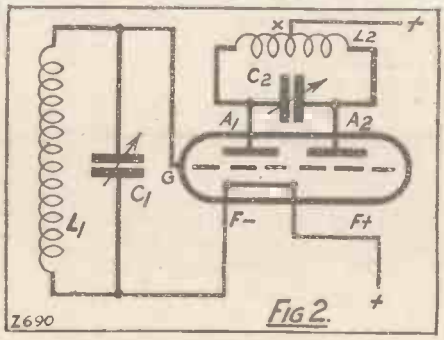


FIG 2.

using the connections similar to the ordinary transformer coupling, or the electrostatic coupling. However, the usual precautions in wiring the receiver must be taken, for it is useless to eliminate the instability of the valves, if we allow oscillations to be introduced by direct influence between the various coils, or by running the various leads in such a manner that they influence each other.

Using these valves in cascade, experimenters will find that a high-frequency amplifier can be constructed to give little or no trouble, and they will find a positive and satisfactory answer to the question which is sometimes asked: "Is high-frequency amplification worth while?" They will find numbers of stations, and they will not be troubled with adjustments to keep the amplifier in satisfactory working order.

Many people have single-valve receivers or two- or three-valve receivers, with the first valve a detector, very often with reaction. One stage or even more of high-frequency amplification can be added with considerable ease. Figs. 3 and 4 show methods which can be employed to do this when there is a single-valve receiver using reaction.

Suppose that at present there is a single-valve receiver V_2 with grid circuit L_4C_4 and reaction coil L_5, and so that the aerial is joined to the grid end of coil L_4. We can use now a complete unit, as in Fig. 2, in front of the detector V_2, as shown in Fig. 3. In this case the coupling is shown from the anode coil L_2 to the grid coil L_4 through a condenser C_5, and the aerial is connected to the grid coil L_1.

Fig. 4 shows another method of introducing this extra stage of amplification, and in this case we use an untuned anode coil L_2, with a centre tapping, coupled to the grid coil L_4.

Such a combination of valves forms a very sensitive device, and many distant stations can be received with it. It has the further advantage that the reaction control is still preserved in valve V_2, so that the amount of amplification is under control. Still more, with such an arrangement the reaction can be increased to the point of oscillation without any fear of annoying one's neighbours, for although the valve V_2 oscillates there is no radiation from the aerial.

Non-radiating.

It is not the oscillation of your valves which annoys your neighbours up to ten miles, but the radiation from your aerials. The introduction of this high-frequency amplifying stage V_1 thus produces greater sensitiveness, and at the same time it allows the detector valve V_2 to be oscillated without any fear of radiation, and it is well known that the easiest way of finding a distant station is to search for the carrier wave by oscillating.

The same precautions must, however, be taken as before, with regard to the wiring. If valve V_2 oscillates, and an aerial lead is brought near to it, then the blocking effect of the valve V_1 is vitiated.

Various combinations of valves can be

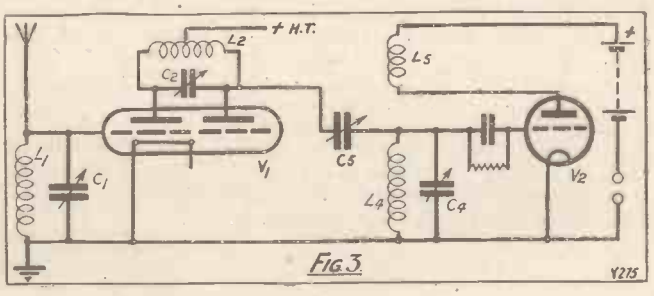


FIG 3.

made, and one well-known firm, Radio Instruments, is supplying complete receivers employing these new valves. They have one model consisting of five stages, the first two being high-frequency stages employing these new stable valves, the third stage being a rectifier, and the last two stages providing low-frequency amplification.

In addition, arrangements are made to provide for only one tuning adjustment, and with only this single control a large number of stations can be obtained at loud-speaker strength. The great feature is that it is not necessary to understand much about wireless in order to operate this amplifier, and in fact it is specially designed to allow a large number of stations to be obtained by people without any knowledge of wireless.

This amplifier incorporates another feature, which is that it has a reaction control in the rectifying circuits. This can be used to increase amplification and to bring in easily some more stations. It also illustrates clearly the anti-radiating properties of the new valves, for the rectifying valve can be made to oscillate without causing the aerial to radiate.

As we go to press we learn that the Interdyne valve is still not yet on the general market and the date of release is uncertain.

The "Cube-Screen" Three

A modern and efficient receiver, embodying one of the new screening boxes. A blue print of this set is given free with this issue of "P.W." Built in the "P.W." Research Department. Designed and described By G. P. KENDALL, B.Sc.

THIS receiver is the second of a series of sets using the standard screening box, the H.F. and detector circuit being in each case very similar, consisting of an inductively-coupled "aperiodic aerial" arrangement, followed by the H.F. valve with a "split-primary" transformer (the 6-pin type) coupling it to the detector valve, reaction of the Reinartz variety being provided at this stage. The circuit also, of course, includes one of the simpler and more reliable neutrodyning schemes, so that high-efficiency modern H.F. valves can be used without any difficulty.

A Complete Range.

With the aid of the standard screening box and good coils this arrangement has given such excellent results that it was decided to produce a complete range of sets, using it as a basis for the H.F. and detector portion, these sets differing from each other in the matter of L.F. amplification, and also in details of make-up. The first of the series, of course, was the "Cube Screen" Two, which appeared in "P.W." No. 274, this set consisting of simply the H.F. and detector valves alone, without L.F. stages, the receiver being intended for 'phone work only. It proved an extremely sensitive receiver, and it may be remembered that one of the tests was to make a search consisting of a single run round the dials, and in the course of this twenty-nine stations were tuned in at readable strength, most of them being quite loud. In estimating the powers of the set from these results, however, it must be borne in mind that the aerial used was good and the set was worked by a skilled operator.

Circuit Details.

The "Cube Screen" Three has in addition a single stage of L.F., since it is intended for the man who wants good loud-speaker results from his local station, 5 G B and 5 X X, and also wishes to get loud-speaker signals from all the stronger Continental stations. Full 'phone strength can also be relied upon from even very distant stations such as Rome and Vienna. Just what the set will do under given conditions will be gathered from the test report to be given next week.

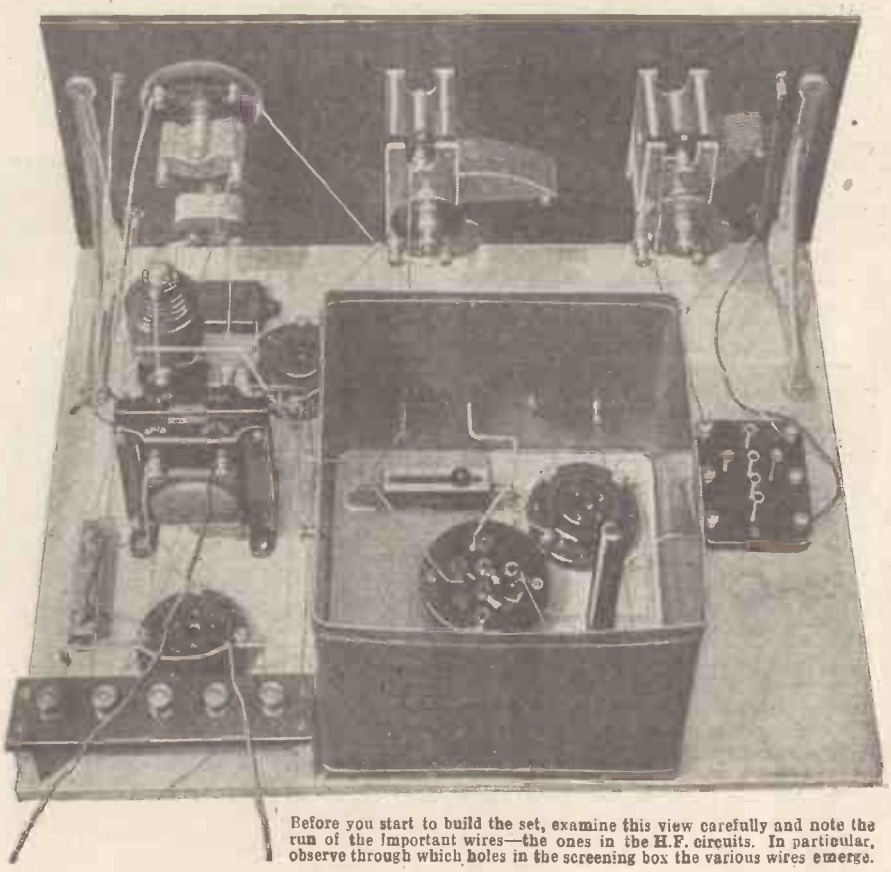
Turning to the details of the arrangement of the "Cube Screen" Three, it will be noticed that the aerial primary and secondary circuits are combined in a single-coil unit, one of the standard 6-pin aerial coils being used, either the plain or "binocular" types being suitable (the binocular is probably slightly better if you are very close to the local station, since it reduces direct pick-up). With most makes of aerial coils this means that the arrangement known as "auto-coupling" is used, two different sizes of aerial winding being available by connecting the flex lead from the aerial terminal either to terminal 3 or terminal 4 on the base of the coil. One of these (No. 3) gives greater selectivity than the other, but usually at slightly reduced signal strength, especially on stations above about 400 metres wave-length, for which latter No. 4 will usually be preferable.

The H.F. valve, with its associated split-primary H.F. transformer (standard 6-pin type), neutralising condenser, and filament resistance, are all contained in the standard box, which will be found to contain their sockets all ready for wiring up if bought complete. Assuming that the box is bought complete, it is as well to examine it carefully before screwing it down, and note whether each component is in the exact position seen in the photos and on the wiring diagram (i.e. on the blue print), paying particular attention to the valve socket.

A Safety Device.

Following the H.F. valve is the detector, which is of the grid condenser and leak type, with Reinartz reaction controlled by a small variable condenser on the panel, the usual H.F. choke being provided in the anode circuit for the purpose of enabling reaction to be obtained. In series with the reaction condenser will be seen a fixed condenser (on the baseboard just below the

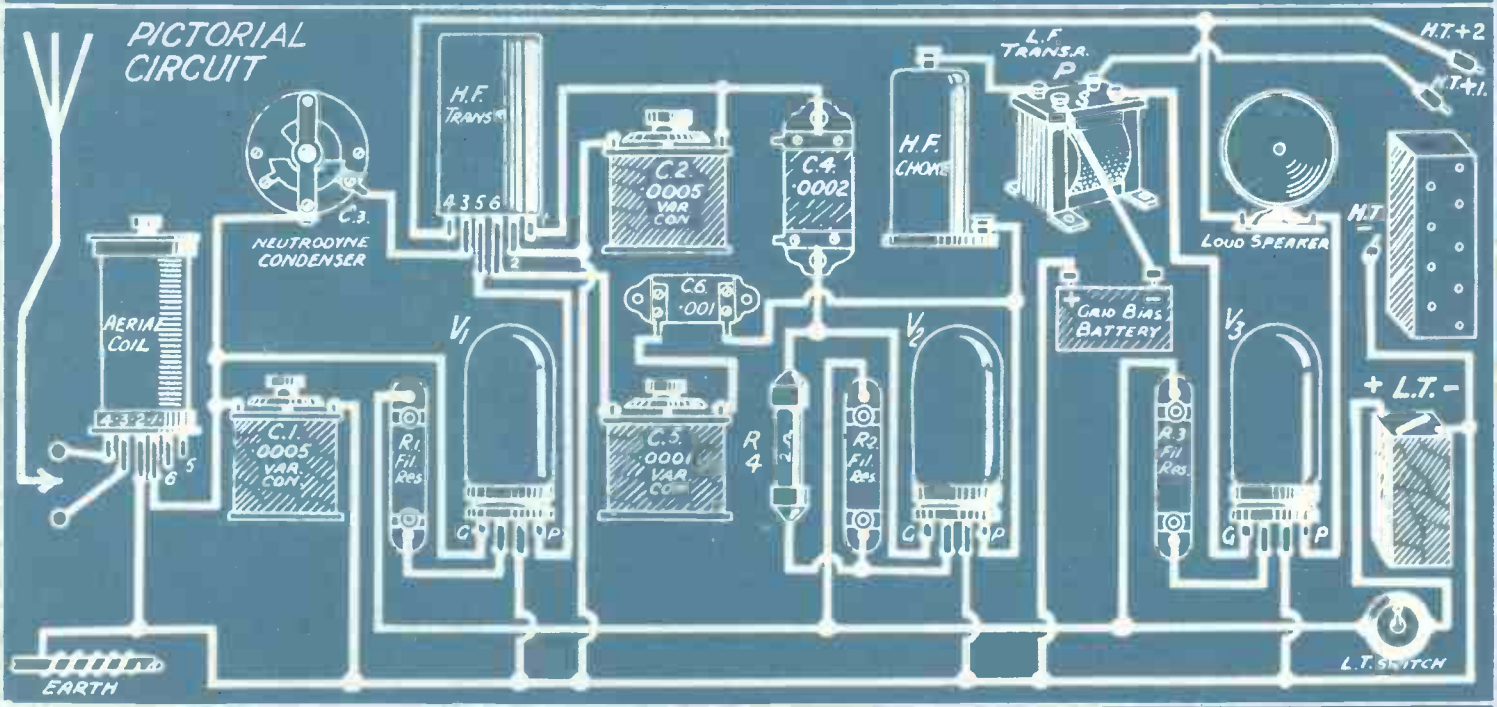
(*Continued on next page.*)

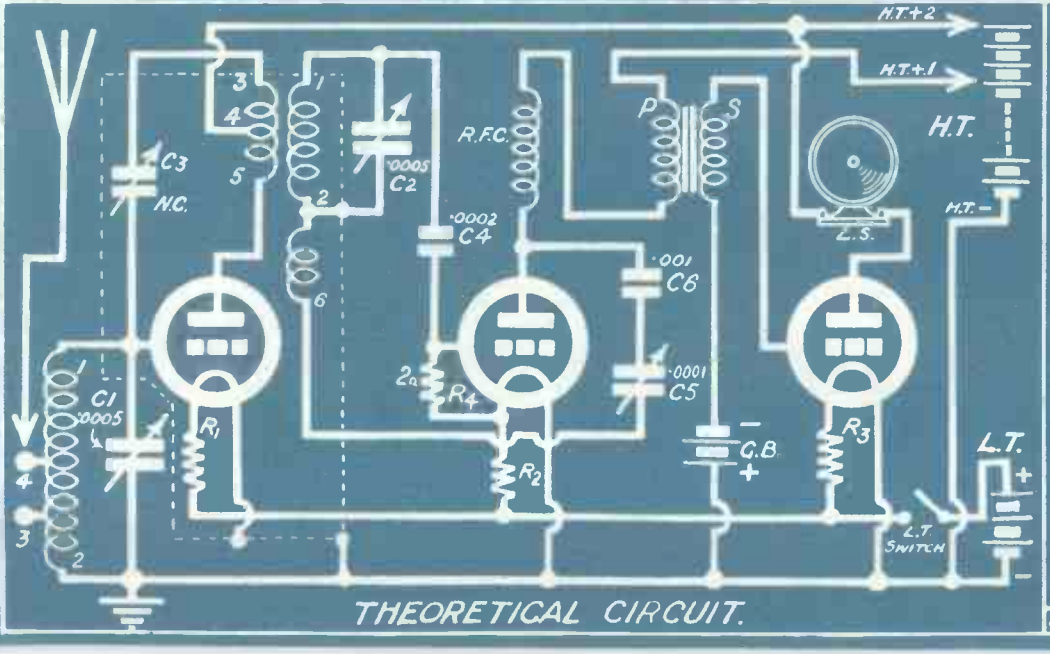


Before you start to build the set, examine this view carefully and note the run of the important wires—the ones in the H.F. circuits. In particular, observe through which holes in the screening box the various wires emerge.

THE P.W. BLUE PRINT No. 32—6d.

The "Cube Screen" Three.





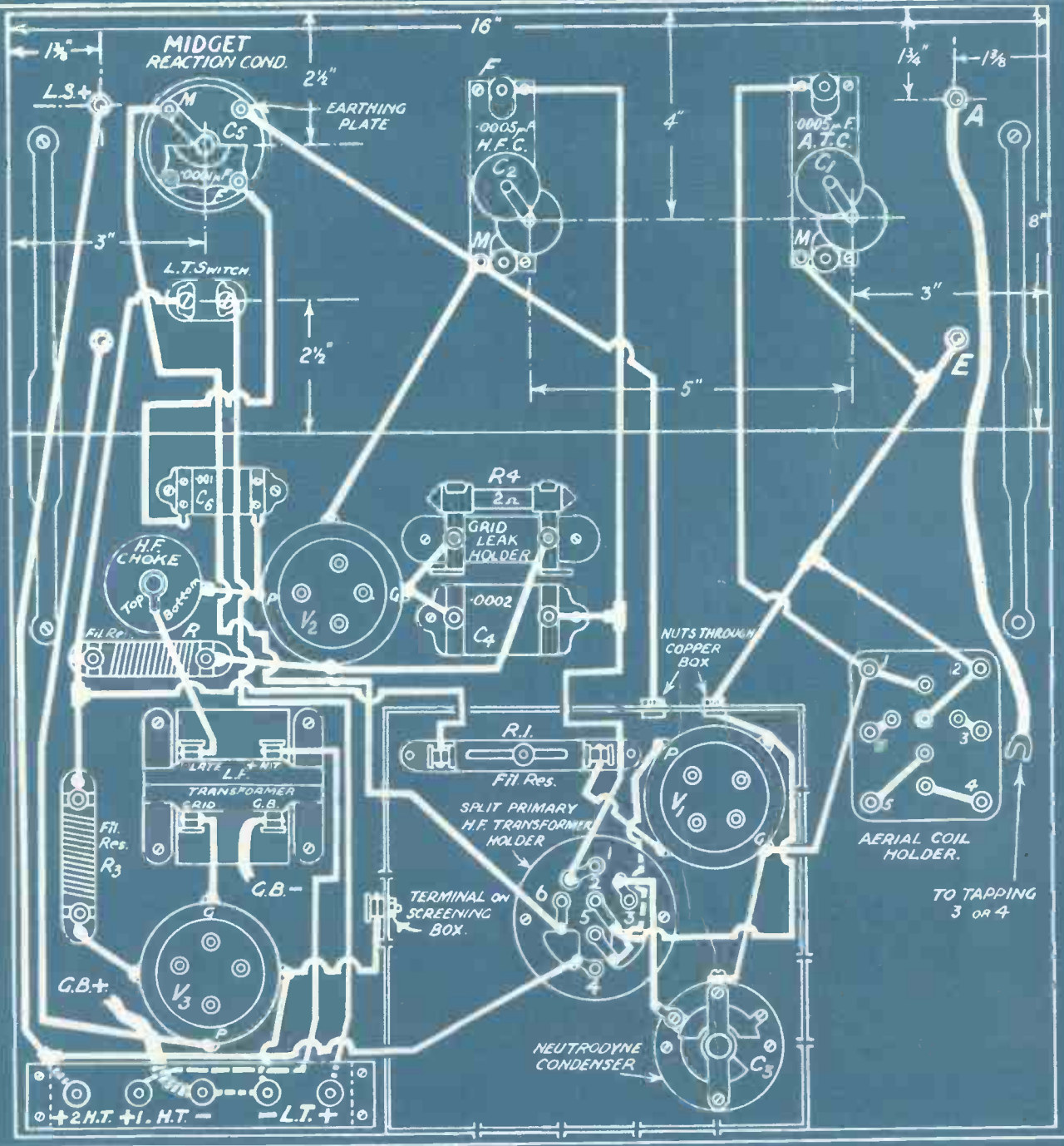
LIST OF COMPONENTS.

1 Panel, 16 in. × 8 in. × ¼ in.
1 American type cabinet, baseboard 12 inches deep, and pair of brackets.
2 ·0005 mfd. square law variable condensers, slow-motion type, or plain type with vernier dials.
1 ·0001 mfd. ("Midget") condenser.
1 Standard 6-pin coil base, unscreened.
1 On-off switch.
1 H.F. choke.
1 L.F. transformer.
2 Baseboard filament resistances.
2 Sprung valve sockets.
1 Grid leak, 2 meg., and holder.
1 Fixed condenser, ·001 mfd.
1 Fixed condenser, ·0002 mfd.
1 Standard screening box with usual contents.
9 Terminals.
2 Plugs for G.B. battery.
1 Terminal strip, 5½ in. × 1½ in. × ¼ in., supported on two small wooden blocks.
Wire, screws, etc.

ACCESSORIES.

2 H.F. valves.
1 L.F. or power valve.
H.T., L.T., and G.B. batteries to suit valves.
1 Aerial coil and 1 split primary transformer for B.B.C. waves, and 1 of each for Daventry wave-band.
Pair of 'phones or loud speaker.

DRAWN BY	W.D	CHKD BY	W.K	SER. NO	BP 15



DRAWN BY	W.D.
CHKD. BY	R.C.B.
SER. No.	BP16

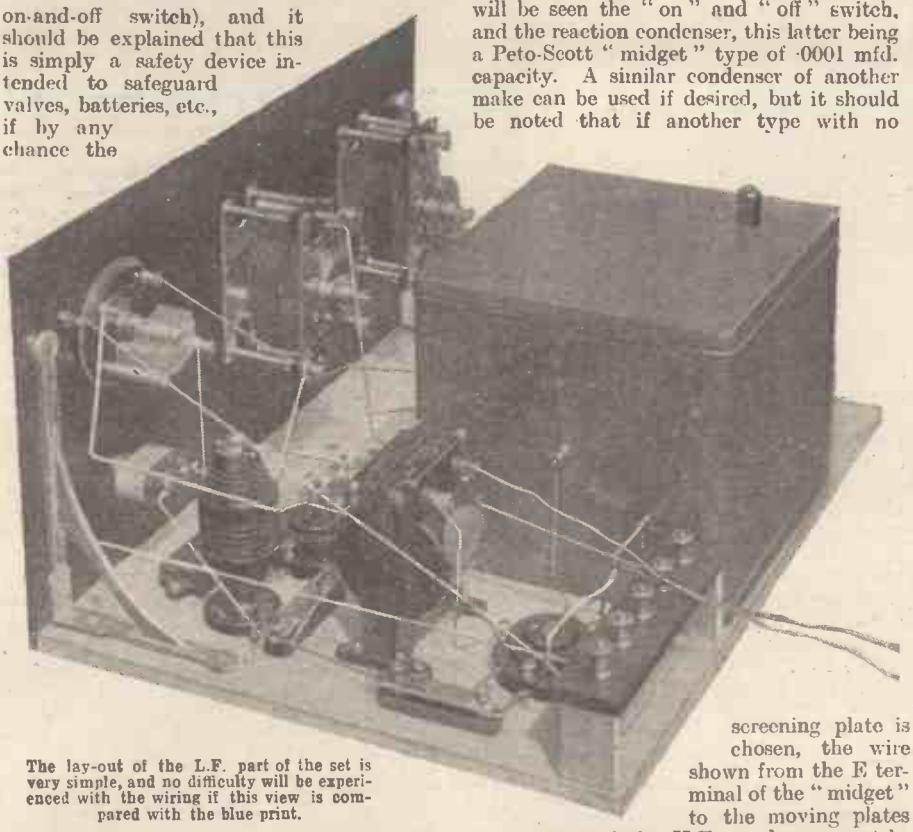
The "P.W." Blue Print Circuit No. 32.—H.F. valve (neutralised and screened), detector, and L.F. valve.

A sensitive long-range set, giving 'phone signals over great distances and loud-speaker results from the nearer stations. To neutralise, set C_3 at minimum, and adjust N.C. until set does not oscillate at any position of tuning condensers. Tune in local station, turn out H.F. valve, and adjust N.C. until station is inaudible despite re-tuning.

THE "CUBE-SCREEN" THREE.

(Continued from previous page.)

on-and-off switch), and it should be explained that this is simply a safety device intended to safeguard valves, batteries, etc., if by any chance the vanes of the reaction condenser should touch.



The lay-out of the L.F. part of the set is very simple, and no difficulty will be experienced with the wiring if this view is compared with the blue print.

The L.F. stage which follows is a simple transformer coupled one, and there is little to say here beyond urging the constructor to use an adequate power valve in the last socket, with proper H.T. and grid bias voltages. For a set like this about 110 to 120 volts H.T. is suitable for the H.T.+2 terminal, since this feeds also the H.F. valve, and in a modern neutralised circuit this latter can quite well be given a voltage similar to that applied to the medium-sized power valve in the last stage. A separate terminal (H.T.+1) is provided for the detector valve, and the usual 50–60 volts will be correct here, slight adjustments being made to secure a smooth control of reaction.

Practical Details.

As regards the transformer to use in the L.F. stage, the constructor can naturally follow his own inclinations as to price and quality here, but the ratio chosen should not exceed about 3 to 1. The original set used a Ferranti A.F.3, but of course there are many other good ones.

Before turning to constructional matters, a word of explanation of the panel arrangement may be useful. On the left will be seen two terminals, and these are for aerial and earth (the latter is the lower one). Of the two variable condensers the left-hand one tunes the aerial secondary circuit and the other the H.F. transformer, and it is advisable to use condensers with either a good slow-motion drive on separate vernier dials. Those used on the original set were J.B. slow-motion type (S.L.F.), but there is room on the panel and behind it for practically any type, S.L.F. or square law, etc., according to preference.

On the right of the two tuning condensers will be seen the "on" and "off" switch, and the reaction condenser, this latter being a Peto-Scott "midget" type of ·0001 mfd. capacity. A similar condenser of another make can be used if desired, but it should be noted that if another type with no screening plate is chosen, the wire shown from the E terminal of the "midget" to the moving plates of the H.F. condenser must be omitted. Further to the right again will be seen the two loud-speaker or 'phone terminals, and these were placed on the panel for convenience in changing from 'phones to speaker and vice versa, instead of in the more usual position on the terminal strip.

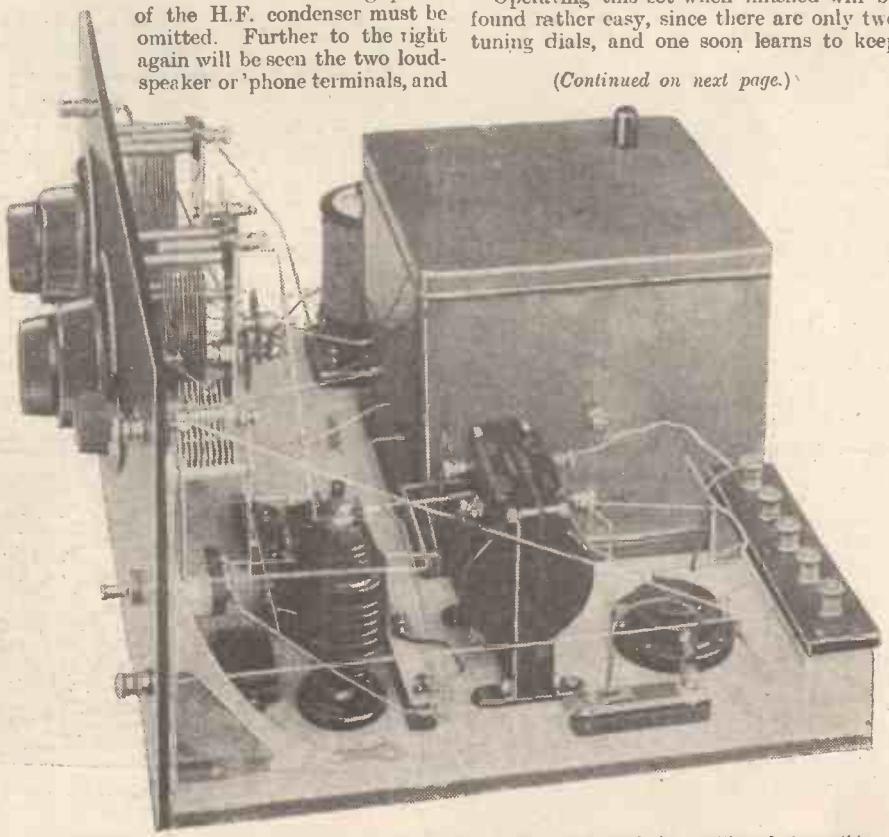
The actual construction of the "Cube Screen" Three will be found rather easier than usual in a set of this kind, because the standard screening box used makes it such a simple matter to copy the original exactly, both as regards lay-out and the actual run of the wires, the latter point being much simplified by noting from which hole in the box each of the critical wires come out. The wiring-up should be begun by making all connections between the various parts inside the screening box, and this should be done before the inner baseboard of the latter is finally screwed down. As regards these wires which pass through holes in the box, it should be noted that these must be well insulated.

The Box Connections.

If a covered wire such as Glazite is used, pains must be taken to see that the covering is not scraped off against the sharp edges of the holes. Alternatively, bare wire can be used, either the plain tinned copper variety, or a material such as "Junit," which is specially prepared for ease in soldering, and pieces of Systoflex tubing slipped over the wires to insulate them where they pass through the box. Another point to which attention should be directed is this: Certain connections require to be made to the box itself, and this is done by putting small screws and nuts through suitable holes and soldering to these. The correct points are indicated on the wiring diagram, and should be duly noted. One of these connections is made to the special earthing terminal provided in the middle of one of the sides of the standard box.

Operating this set when finished will be found rather easy, since there are only two tuning dials, and one soon learns to keep

(Continued on next page.)



Almost all the wiring to the screening box can be seen here. Note particularly the position of the earthing terminal on the nearer side of the box.

THE "CUBE-SCREEN" THREE.

(Continued from previous page.)

these in step with each other as searching proceeds. Before the set can be tried out, however, it must first be neutralised and this can be done as follows:

Set the reaction control at minimum, and likewise the neutralising condenser. Now, on setting the tuning condensers so that the two tuned circuits are in step with each other, it will probably be found that the set is oscillating. If not, bring up the reaction condenser until it just oscillates. To test for oscillation touch one or other of the sets of plates of the tuning condensers. You will probably find that the set will only oscillate under the above conditions when the two circuits are in tune with each other, and this can be used as an indication. It is convenient to perform the operation at some point near the middle of the tuning range. Now, increase the capacity of the neutralising condenser.

A Simple Method.

Test at intervals for oscillation as this is done, and you will presently find that the set has ceased to oscillate, and will not recommence even when the tuning dials are slightly readjusted. Now increase the reaction a little, until the set once more oscillates, and again increase the neutralising condenser setting until oscillation ceases. Slightly readjust the tuning condensers again to make sure that the set is completely stable once more. Proceed in this way until it is found that the correct adjustment of the neutrodyne condenser has been over-shot. Once this point has been passed it will be observed that further increases of the neutrodyne condenser setting no longer stop oscillation, but cause it to become stronger.

The object is to find such an adjustment of the neutralising condenser as will permit the greatest setting of the reaction condenser to be used without producing oscillation. It will then be observed that when the two tuned circuits are in step and the set is brought to the verge of oscillation, a slight movement in either direction of the neutrodyne condenser will cause the receiver to break into oscillation.

Suitable Valves.

As regards valves, it must be realised that to get the full results from any sensitive modern receiver it is necessary to use suitable types in the H.F. and detector positions, more especially the former. Good results will *not* be achieved by using cheap foreign general-purpose valves. The correct ones are the special H.F. types with impedances falling between about 13,000 and 30,000 ohms, with amplification factors of from 12 to 30 or thereabouts. In general, better results are obtainable with 4- and 6-volt, than with 2-volt types. Here are a few examples in the 6-volt range: P.M.5X. D.E.5B, D.E.L.610, Cossor 610H.F., B.4H.

A final point; no shunting condensers are provided across the H.T. in this set, since it was desired to keep the cost down, and they are not essential in a simple receiver like this. If you suspect your H.T. battery is getting old, however, connect one of 2 mfd. straight from the H.T. + 2 tapping point to H.T. negative. This can be placed with the battery for convenience. Another from H.T. +1 to H.T. – may sometimes be needed in extreme cases.

POINT-TO-POINT CONNECTIONS.

One filament socket of each valve holder to one side of the respective rheostats.

L.T.+ terminal to one side of the L.T. switch.

Other side of this switch to the remaining sides of the rheostats.

H.T.– to L.T.– terminal, to the G.B.+ plug via a flexible lead, to the remaining filament socket of V_2 and to the terminal on the screening box.

Aerial terminal to the terminal (either 3 or 4) on the aerial coil holder.

Earth terminal on panel to the moving vanes of the ·0005 mfd. A.T.C., to the No. 2 terminal on the aerial coil base, and to a screw through the copper screening box.

Remaining filament socket of V_1 to a screw through the copper screening box and to the No. 2 socket on the H.F. transformer holder.

No. 3 socket on same holder to one side of the neutralising condenser. Other side of this condenser to the grid of V_1, to the No. 1 terminal on the aerial coil base, and to the fixed vanes of the ·0005 mfd. A.T.C.

Plate of V_1 to the No. 5 socket on the H.F. transformer holder.

No. 4 socket on same base to the H.T.+ 2 terminal and to the L.S.+ terminal.

No. 6 socket on the H.F. transformer holder to the moving vanes of the ·0001 mfd. reaction condenser.

Fixed vanes of same condenser to one side of the ·001 mfd. fixed condenser C_6.

Other side of C_6 to the plate of V_2 and to the bottom contact of the H.F. choke.

Grid of V_2 to one side of the grid leak holder R_4 and to one end of the ·0002 mfd. fixed condenser C_4.

Remaining side of C_4 to the No. 1 socket on the H.F. transformer holder and to the fixed vanes of the ·0005 mfd. H.F.C.

Moving vanes of the ·0005 mfd. H.F.C. to the earthing plate on the reaction condenser, to the remaining filament socket of V_2 and to a screw through the copper screening box.

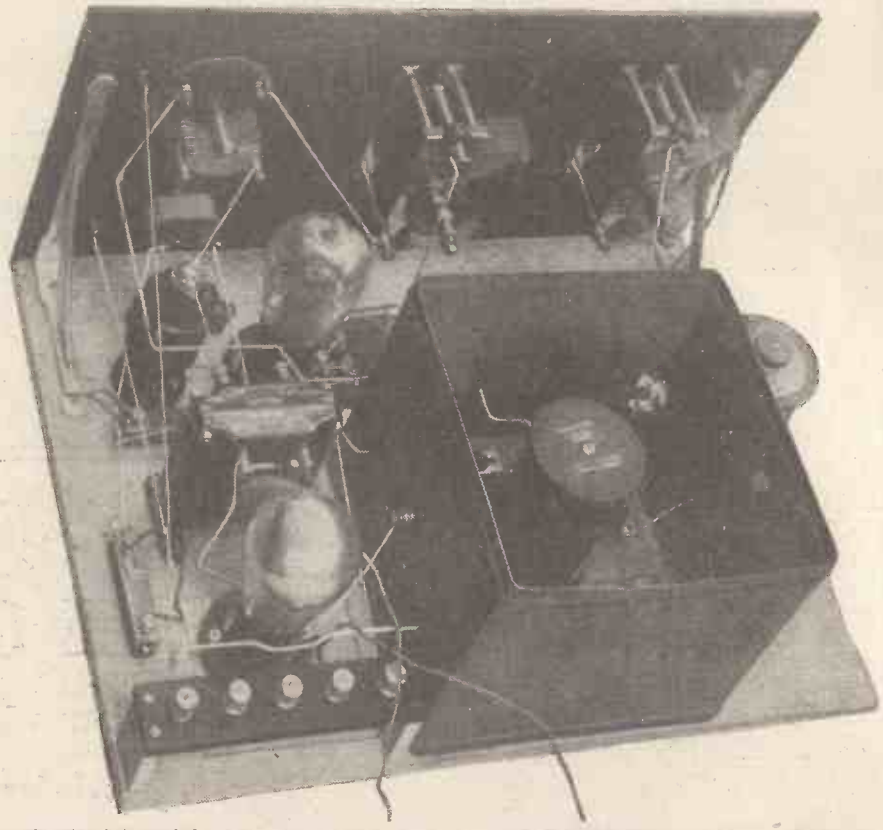
Top contact on the H.F. choke to the "plate" terminal on the L.F. transformer.

"+ H.T." terminal on the L.F. transformer to the H.T.+ 1 terminal.

"Grid" terminal on transformer to the grid of V_3.

"Grid bias" terminal to the G.B.– plug via a flexible lead.

Plate of V_3 to the L.S.– terminal.



This view is to remind you of an important point: do not take the lid off the box when you neutralise the set. Putting it on again may upset the adjustment slightly.

ANOTHER FREE GIFT!

FOUR MORE SIXPENNY BLUE PRINTS WITH NEXT WEEK'S "P.W."

Don't miss your copy of next week's "Popular Wireless," which will contain four more of the famous "P.W." Blue Prints, as follows:—

1. THE "KNIFE-EDGE" CRYSTAL SET.

A very sharply-tuned crystal receiver—sensitive and extremely reliable and easy to handle.

2. THE "SPANSPACE" FOUR.

This well-known circuit in blue print form will supply a long-felt demand. The set is sensitive and selective for long-range loud-speaker reception.

3. AN "H.F.-DET." TWO VALVER.

This circuit is neutralised, with tuned transformer coupling. A useful receiver for long-distance 'phone work—full constructional details in "P.W." editorial pages.

4. THE "UNIVERSAL" THREE.

A Detector and two resistance-coupled L.F. stages, with provision for the use of two valves in parallel in the last stage. Full constructional details in "P.W." editorial pages.

Don't Miss These Magnificent Blue Prints.

Order Now

POPULAR WIRELESS FREE GIFT NUMBER

On Sale Next Thursday

PRICE 3d. **AS USUAL.**

WIRELESS SETS & ROYALTIES.

The B. B. C.'s Empire Short-Wave Station—Alterations to 5 G B.

By THE EDITOR.

AT the inaugural banquet of the National Radio Exhibition at Olympia, Sir Edward Iliffe, M.P. (according to a newspaper report), referred to the rapid progress that is being made in the art of wireless, and said one of the drawbacks to efficient reception was the fact that many receiving instruments at present were out of date. He thought it would be greatly to the advantage of broadcasting generally if the possessors of these old sets could be induced to throw them away and to invest in new ones.

New Marconi Arrangement.

He added that he understood that one of the reasons why old sets were not discarded was that a royalty had to be paid on each set purchased, and that a fresh royalty would therefore have to be paid for the new set. He suggested that the interests of listeners and of the wireless industry would be benefited if it were possible to induce the listener to discard his old set with greater frequency and purchase a new one, and that the necessary inducement might be given in the form of a royalty rebate of say 50 per cent when an old receiving set was discarded for a new one.

We now understand from the Marconi Co. that they have decided that in cases where listeners already possess receiving sets and are desirous of purchasing new receivers employing the same number of valves or more valves than are contained in their old sets, they will be credited with the whole of the licence fee they have already paid. The purchaser will then be called upon to pay a further royalty *only on the number of valves fitted to the new set over and above the number used in the old set.*

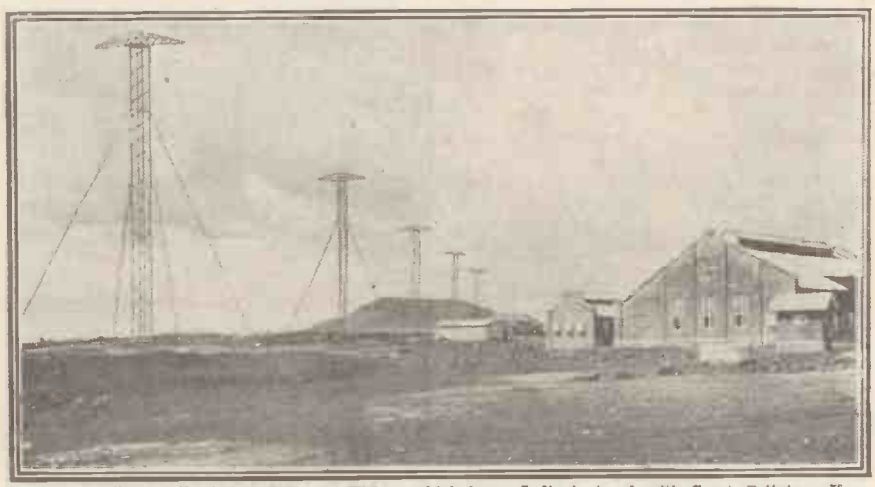
This means that if a listener has a three-valve receiver and wishes to buy a five-valve receiver to replace it, he need only pay a further royalty *on the two additional valves* which he intends to use, provided that he hands in his old royalty plate and makes a declaration that the old set will not be disposed of to another listener without applying for a new plate and paying the appropriate royalty for the set as originally used.

The Marconi Company are supplying the wireless trade with forms upon which this declaration can be made. The procedure will be that a listener wishing to discard an old set and to replace it with a new one will obtain one of these forms on application to the retailer from whom he proposes to purchase his new receiver. He will fill up the form and attach to it the royalty plate from his old receiver. The new receiver will then be sold to him with a royalty charge for the difference between that charged on the valves in the set for which the returned plate was issued and those in the new set which he is purchasing. A man discarding a three-valve receiver and buying a new five-valve receiver would thus pay a fresh royalty of 25s. instead of 62s. 6d.

12s. 6d. Too High.

Although we are very glad that Sir Edward Iliffe's remarks have inspired such prompt action on the part of the Marconi Co., we cannot but express regret that the Marconi Co. did not decide that an opportune moment had presented itself for a thorough investigation of the whole licence question, and further, decide that, in any case, a royalty of 12s. 6d. per valve holder these days should be considerably reduced.

Valves and other wireless components have been reduced in price, and the Marconi Co., since broadcasting began, cannot but have made very handsome sums of money from the royalties from the sale of receivers. A reduction in these royalty charges has long been expected, as there is no doubt that a generous gesture in this direction by the Marconi Co. would substantially assist the sale of British wireless receivers—and incidentally the wireless trade and the Marconi Co. We hope that this reduction will yet be made by the Marconi Co.



The new "Beam" wireless station at Kirkee, which keeps India in touch with Great Britain. If experiments now going forward are successful, it will eventually be possible to use the beam stations for telephony and broadcasting.

B.B.C. Short-Waver.

The B.B.C. has issued yet another statement in connection with Empire Broadcasting, and in view of the great importance of this subject and the general interest in the B.B.C.'s plans, we make no excuse for devoting further space to the matter.

The B.B.C. states that in pursuance of its policy of developing a practical basis for effective Empire broadcasting as rapidly as possible, it has now reached a stage at which it is possible to give an interim report.

As has been explained by Captain Eckersley on several occasions, the problem of effective Empire broadcasting, according to the B.B.C., is as much one of reception as of transmission. The experiments now under review are being conducted by the B.B.C. in co-operation with the Marconi Company.

An experimental short-wave transmitter is being erected at the Marconi Works at Chelmsford. This will make use of the two 480 ft. masts which are situated there. This transmitter will carry out experiments working chiefly on a wave-length of 24 metres. Arrangements have been made for the collection, collation, and analysis of reports of these experiments in various parts of the world. This experimental station, whose call-sign is 5 S W, will transmit using power up to about 25 kw. Should its performance be unexpectedly successful in the early stages, programmes may be transmitted; but it is not anticipated that this experimental station will undertake a regular service.

So far as it goes, this interim report makes welcome reading, for there is now no doubt that the B.B.C. has a short-wave station under way. But why the pessimism? Why anticipate that the station will not be fit to undertake a regular service? This is not the spirit which made P C J J so successful. Still, we mustn't grumble too much now! We must be thankful that a British short-wave station *is being built.* That, at any rate, is definitely optimistic!

Satisfactory Progress.

The B.B.C.'s interim report adds that satisfactory progress is being made with experiments in reception by the use of what has come to be known as the "spaced aerial" method. The chief difficulty experienced hitherto in the reception of

(*Continued on page* 374.)

TECHNICAL NOTES By Dr. J. H. T. ROBERTS, F.Inst.P.

A BATTERY'S WORST ENEMY

TESTING RECEIVERS—CURING A SHORT—NEW USE FOR VALVES, etc.

THOSE readers interested in chemistry may find the following information, extracted from a recent issue of "Power" (U.S.) of service. The article in question is by Mr. A. M. Christopher, and states: "The worst enemy of a battery is impure electrolyte. Tap water may contain traces of iron, copper, chlorine and nitrates which are particularly harmful to the battery.

"Iron is one of the chief enemies of an accumulator. To make a test for this metal, neutralise a small amount of the electrolyte with ammonia, then add an equal amount of hydrogen peroxide and boil. After thus heating, mix with ammonia or caustic potash until the solution is alkaline. The formation of a brownish-red precipitate indicates the presence of iron in the electrolyte.

"The slightest trace of platinum in the electrolyte causes 'local action,' which is evidenced by 'gassing' of the battery when on open circuit.

"Mercury does no harm in the battery, but it often combines with other metals. To test for mercury, take a small sample of the electrolyte and add lime-water. The formation of a black precipitate usually indicates the presence of mercury. Another test for this metal is to add to a quantity of the electrolyte a solution of potassium iodide: if mercury is present an olive-green precipitate will be formed. Copper may be tested for by adding ammonia slowly to the electrolyte, a bluish-white precipitate indicating the presence of copper."

A Rare Metal.

Some experiments by Messrs. Marden & Rich, research engineers of the Westinghouse Lamp Company, U.S.A., have resulted in the preparation of the rare metal vanadium in pure metallic form.

"The beads of vanadium are very bright, have a steel-white colour, are malleable, soft and ductile," say the authors. "They can be melted in a vacuum in a high-frequency induction furnace, drawn into wire and worked up into other forms. From the analysis the metal appears to be 99·9 per cent pure.

"There is no use for this metal at present, but it is probable that, if produced in sufficient quantities, uses will be found for it. Tungsten, for example, was once regarded as a chemical curiosity but a useless metal: it is now of immense value for high temperature filaments, for tool-steel alloys and many other purposes."

Testing Receivers.

The testing of radio receivers has been reduced, in the United States, almost to standard practice, as is shown by a recent Technologic Paper issued by the Bureau of Standards (Paper No. 256) in which it is suggested that the following tests should be made.

"(1) Frequency range.

"(2) Vibration test, which determines how well the set has been constructed mechanically, and whether it will be able to withstand the ordinary shocks suffered in transportation.

"(3) Sensitivity.

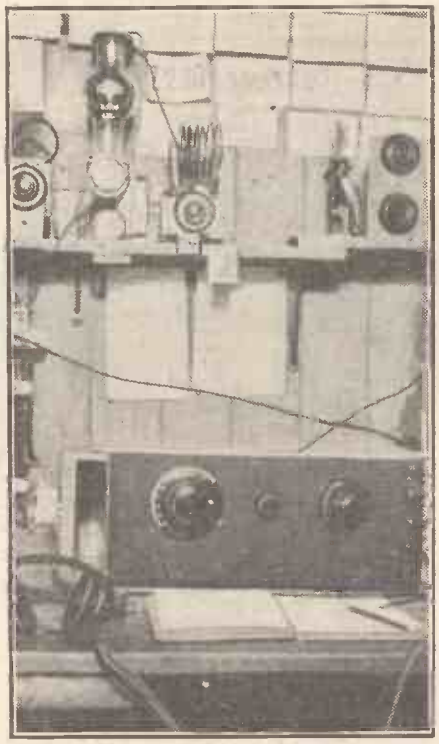
"(4) Selectivity.

"These tests are especially useful as indicating how well the set has been engineered from electrical and other standpoints. A test should be made as to quality and faithfulness of reproduction."

Other Considerations.

"From the point of view of the average user, however, these tests are not entirely sufficient, because he is interested in other things besides the electrical efficiency of the receiver or the faithfulness of the reproduction. In a laboratory test one receiver might show much better than another in regard to sensitivity and selectivity, but the good results might only be obtainable with very accurate adjustments. A single-control receiver, notwithstanding a lack in sensitivity and selectivity as compared with a multi-control receiver, might nevertheless be more convenient in the hands of an ordinary user with little technical knowledge and might, in fact, in such hands give better results than a more complicated type."

A SHORT-WAVE RECEIVER.



The two-valve receiver used by Mr. H. Russell-Boyle, an amateur transmitter of Napier, New Zealand, whose call-sign is O C 2 A S. On this set he says he receives P C J J on 30 metres at good loud-speaker strength! His transmitter operates at 100 watts power input.

The paper states that it is very difficult to judge the performance of any particular receiving set on the basis of any one trial of its operation, largely owing to the very different types of receivers and the different conditions under which they are best operated. The skill of the operator largely determines the performance obtained from the set. It is somewhat the same with receiving sets as with motor-cars: taking half a dozen cars of about the same price, horse-power, and so on, it would be a difficult matter to say which was the "best," without taking into account the varying requirements of the intending purchaser.

Testing Condensers.

Small fixed condensers may be conveniently tested by the use of an ordinary 6-volt battery. If one terminal of the condenser be connected to one terminal of the battery, and a short piece of rubber-covered wire be taken from the other terminal of the condenser and repeatedly touched against the other terminal of the battery, a small spark will be visible if there is a "short" in the condenser.

The use of earphones in series with a small battery for testing by the clicks heard is apt to be deceptive, unless the experimenter is familiar with this type of testing. There is a distinct click, due to the discharge of the condenser, when there is no short present, which may easily be mistaken as an indication of a short.

Curing a "Short."

In testing larger-sized fixed condensers, from ·2 microfarads upwards, the best way is to apply a 100-volt battery to the terminals; then disconnect the battery and short the condenser. If the insulation is perfect in the condenser, a good and unmistakable spark should be obtained. Of course, rubber-covered leads should be used, and only the rubber should be touched with the fingers in carrying out this test, as if the fingers are allowed to come in contact with the condenser terminals, or the metal wire of the leads the charge in the condenser will very quickly leak to earth.

A shorted condenser will not give any spark on being shorted after disconnecting from the battery. It is sometimes possible to repair a condenser which is suffering from a partial short by connecting to an H.T. battery and allowing the short to be burned out; but, generally speaking, a condenser which is in this state is unlikely to be of any real use.

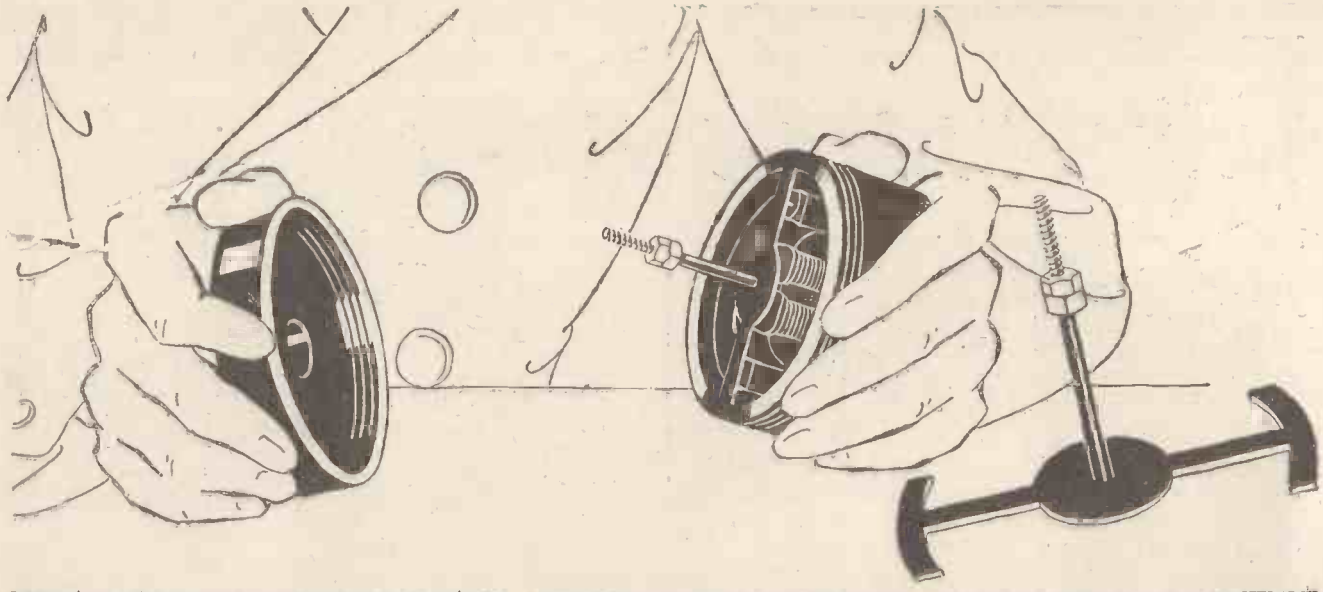
Conducting Paths.

The transmission of power by radio has been the dream of many experimenters. Years ago, Nikola Tesla built a great tower from which it was hoped that power might be transmitted. More recently Tesla has been carrying out experiments at Niagara Falls, and in a recent interview he describes new methods for the solution of the problem. Another scientist has put forward the idea of using a short-wave beam which he thinks might create a conductive path, over or through which power transmission might be made exactly as over a metallic conductor.

New Use for Valves.

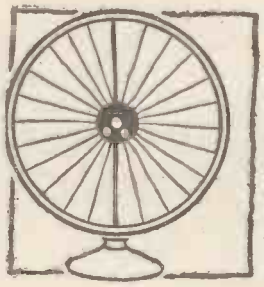
Another interesting use for the vacuum tube has been developed in an entirely different field of wireless. Vacuum tubes

(*Continued on page* 376.)

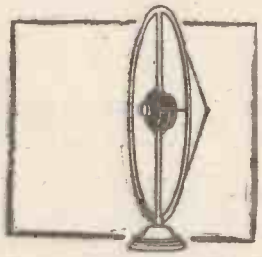


THE WONDERFUL THINGS YOU CAN DO WITH A LISSENOLA UNIT AND A LISSENOLA REED

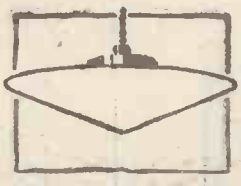
THE LISSENOLA REED is a unique attachment which can be bought for 1/-. By substituting this for the diaphragm of the LISSENOLA Loud Speaking Unit you can make any type of loud speaker that works on the reed principle. Endless experiments can be tried. No other such attachment is made. No other loud speaking unit offers you the same facilities for making so many kinds of loud speakers. Get one and try these experiments for yourself.



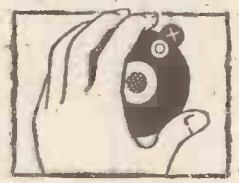
Many experimenters have made, with a sheet of parchment (obtained from a law stationer's) or other suitable paper, and two wooden hoops (such as are used for needlework) a pleated diaphragm loud-speaker. A *Lissenola* Loud Speaking Unit, mounted on a cross-bar, with a *Lissenola* Reed to transmit the vibrations to the paper diaphragm, will complete the loud-speaker.



A cone diaphragm can be made with a little care from card or metal. Here again a *Lissenola* Loud Speaking Unit should be mounted with a *Lissenola* Reed. The centre of the cone should be pierced, the thread of *Lissenola* Reed inserted and locked on with the nuts provided. The tension can be adjusted by these nuts.



The cone type loud speaker can be used in many ways. For instance, it can be suspended from the ceiling as shown in the illustration. The *Lissenola* Loud Speaking Unit and the *Lissenola* Reed would be hidden from view. The cone diaphragm can be varnished or given a "Chinese lacquer" finish.



The *Lissenola* Reed will transmit the powerful vibrations from the *Lissenola* Loud Speaking Unit to any type of diaphragm sound distributor. A piece of 3-ply wood will act as a "sounding-board" by locking on it the *Lissenola* Reed. Or again, the *Lissenola* Reed can be held against the centre of a window pane, and the music will be heard clearly. The experiments you can make are endless.

Base of Lissenola Loud Speaker.

THE LISSENOLA **34/-** Complete.

You can obtain this full-sized, full-toned, full-powered *Lissenola* Loud Speaker complete for 34/- The *Lissenola* Loud Speaking Unit is embodied in the base and can easily be unscrewed in order that the experiments described here can be made. All you need in addition is a *Lissenola* Unit Cap (1/6).

L. 293

A REINARTZ ONE VALVER

A simple one-valve receiver capable of long-distance telephone reception. A blueprint of this set is given free with this issue of "P.W." The set designed and built by the "P.W." Research Department.

Described by A. JOHNSON RANDALL.

TO design a really simple and yet efficient single-valver is not quite so easy as one might think. In the course of my duties in the "P.W." Technical Queries Dept. I have formed the opinion that a large number of the prospective constructors of one-valve sets are beginners. Many of them are crystal users, and wish to try their hand at making a receiver which will give them a little more "beef."

Others have never had a set at all, but are situated too far from a main broadcasting station for really efficient crystal reception.

Essential Features.

On the other hand we have the type of listener who has had experience with various sets. He is ever on the lookout for a slightly better circuit. He takes a delight in logging distant stations with the minimum number of valves.

To satisfy both classes of listeners is a bit of a problem, and after some consideration I came to the conclusion that the chief essentials were as follow:

1. The set must be cheap to construct, and should be such than any equivalent components of reputable make could be used without loss of efficiency.
2. The circuit should employ the smallest number of components consistent with efficiency.
3. The set should be capable of giving good results with 2-, 4- or 6-volt valves.
4. It must be foolproof, sensitive, and reasonably selective.

The circuit finally chosen was that which, I believe, was first described by A. D. Cowper, M.Sc. The aerial circuit is of the so-called "Aperiodic" type, consisting of a single plug-in coil inductively coupled to a tuned secondary. Instead of employing a third winding for reaction purposes, the aerial coil is made to function as a "Reinartz" winding. In this way two coils are used to do the work normally carried out by three. One obtains the advantages of a coupled selective circuit combined with capacity controlled reaction with just two plug-in coils.

Selectivity and Damping.

Alternative aerial terminals are provided, thus enabling the listener to choose the arrangement which best suits his particular aerial. For instance, if the maximum selectivity with minimum damping is required, one would connect the aerial lead to the terminal marked A_2 in the blue print. Those who have a small aerial and who require the loudest signals would probably use terminal A_1.

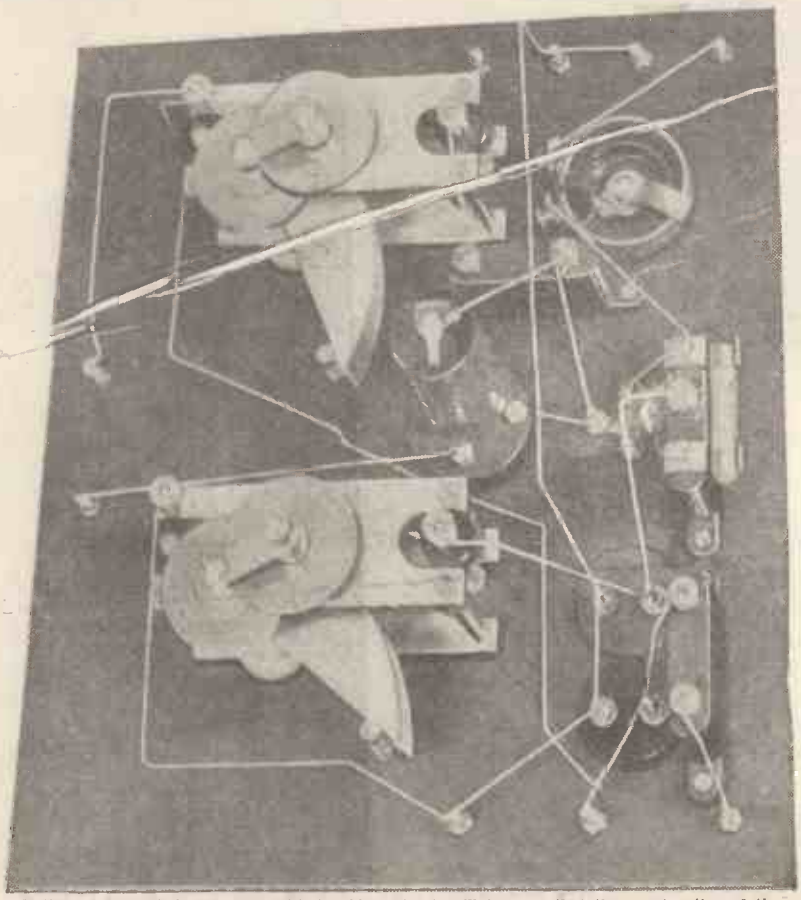
The valve itself functions as a simple grid condenser and leak rectifier, the grid leak being taken direct to the positive side of the filament, an arrangement which gives the greatest sensitivity in a set of this type.

The high-frequency currents in the anode circuit of this rectifier are fed back with the aid of a ·00035 variable condenser into the aerial circuit.

The R.F. Choke.

The radio choke (which, incidentally, is the same thing as a high-frequency choke) acts as a bar to any H.F. currents which may wish to take an alternative path by

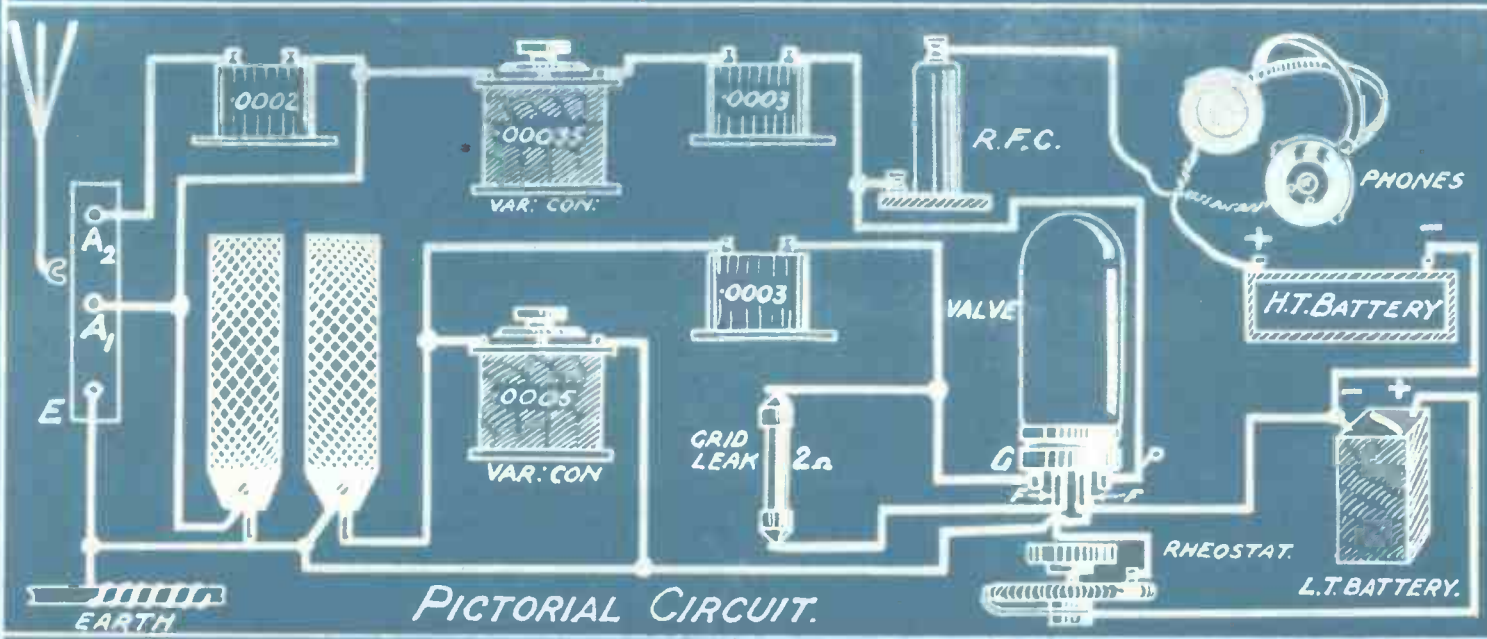
(Continued on next page.)



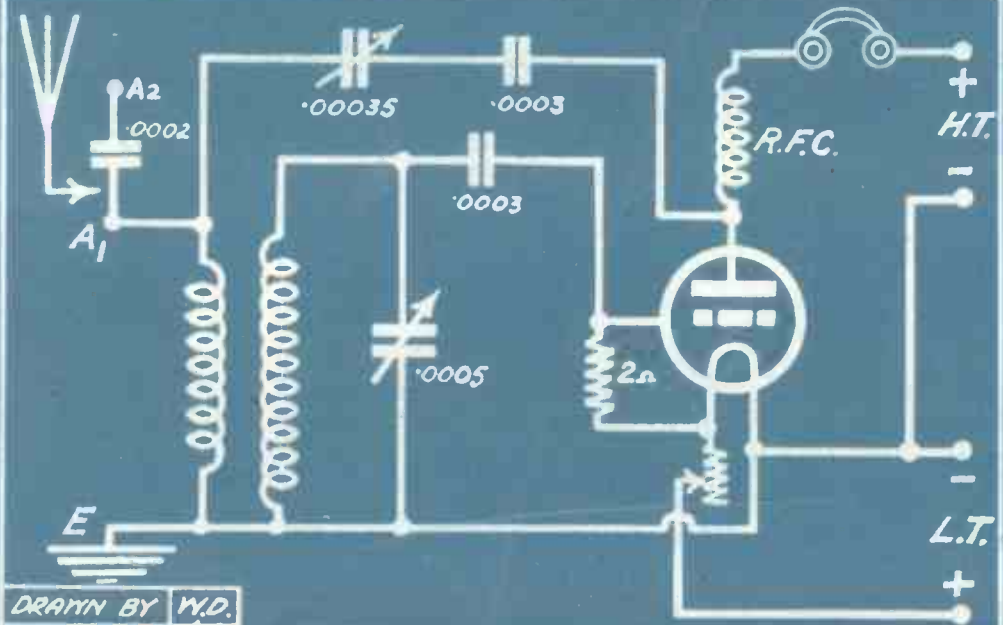
If this photograph is compared with the blue print it will be seen that the construction of the set is both straightforward and simple.

THE P.W. BLUE PRINT No. 30—6d.

A Reinartz One-Valver.



PICTORIAL CIRCUIT.



DRAWN BY	W.D.
CHKD BY.	R.R.C.
SER: No.	B.P.11.

THEORETICAL CIRCUIT.

COMPONENTS AND MATERIALS.

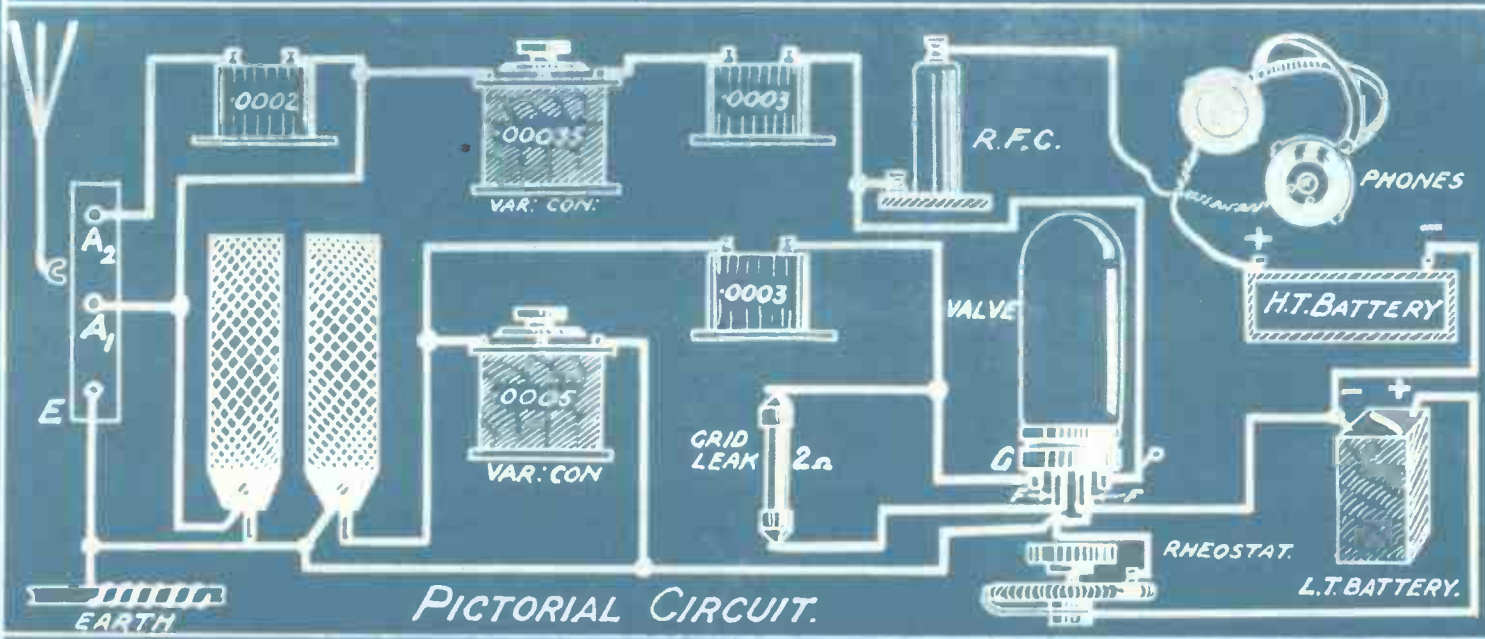
1 Ebonite panel, 10 in. × 9 in. × ¼ in.
1 Flat-topped cabinet to fit.
1 ·0005 slow-motion variable condenser, square law or S.L.F.
1 ·00035 or ·0003 ditto.
2 Panel-mounting single coil sockets.
1 Panel-mounting valve socket, or set of legs.
1 Filament resistance.
1 ·0002 mfd. fixed condenser.
2 ·0003 mfd. fixed condensers.
1 H.F. choke.
1 ·0003 grid condenser and 2 megohm grid leak, combined type.
9 Terminals.
Small screws, wire, etc.

ACCESSORIES.

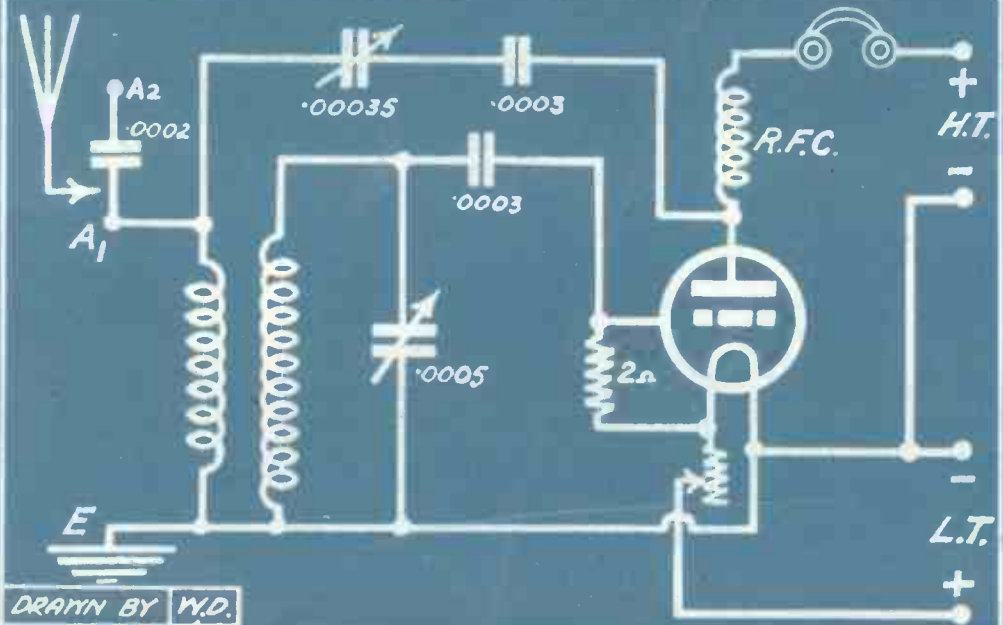
1 Valve.
L.T. and H.T. batteries, according to valve.
Pair of 'phones.
Nos. 25, 35, 50, 60, 100, 150, 250 coils.

THE P.W. BLUE PRINT No. 30—6d.

A Reinartz One-Valver.



PICTORIAL CIRCUIT.



DRAWN BY	W.D.
CHKD BY.	R.R.C.
SER: No.	B.P.11.

THEORETICAL CIRCUIT.

COMPONENTS AND MATERIALS.

1 Ebonite panel, 10 in. × 9 in. × ¼ in.
1 Flat-topped cabinet to fit.
1 ·0005 slow-motion variable condenser, square law or S.L.F.
1 ·00035 or ·0003 ditto.
2 Panel-mounting single coil sockets.
1 Panel-mounting valve socket, or set of legs.
1 Filament resistance.
1 ·0002 mfd. fixed condenser.
2 ·0003 mfd. fixed condensers.
1 H.F. choke.
1 ·0003 grid condenser and 2 megohm grid leak, combined type.
9 Terminals.
Small screws, wire, etc.

ACCESSORIES.

1 Valve.
L.T. and H.T. batteries, according to valve.
Pair of 'phones.
Nos. 25, 35, 50, 60, 100, 150, 250 coils.

A REINARTZ ONE-VALVER.

(*Continued from previous page.*)

way of the telephones and thence back to the negative side of the filament. This R.F. choke could consist of 1,000 turns of 40 gauge S.S.C. wire section wound in slots on a 1-inch diameter ebonite rod. The ·0003 fixed condenser between the plate of the valve and the reaction condenser acts as an H.T. stopping device should the variable condenser become short-circuited. Readers are warned not to omit this fixed condenser. Should a short circuit occur its omission might ruin the H.T. battery and burn out the valve.

The complete receiver makes a very neat little outfit, as this photograph shows.

Constructional Details.

Very little need be said regarding the construction of this simple receiver. The essential dimensions are given on the blue print (Blue Print No. 30). Do your marking out on the back of the panel with a steel scriber, or a sharp nail, and a 12-inch steel rule. Then mark the drilling centres with a centre-punch, giving the punch a smart tap with a hammer in order to make the necessary indentation to prevent the drill from wandering.

I advise beginners to procure a set of drills ranging from $\frac{1}{16}$ to $\frac{3}{16}$ for work of this nature. In addition they will require a $\frac{3}{8}$ drill to fit an ordinary carpenter's brace for use when single-hole-fixing components are employed. Whenever a $\frac{3}{8}$ drill is used a small pilot hole should first be drilled through the panel, otherwise there is a danger of the larger drill wandering out of centre.

The Grid Condenser.

Constructors may be puzzled as to the type of grid condenser and grid leak mounting used. Actually the component employed in the set is the ·0003 grid condenser with three terminals. The grid lead from the top of the secondary coil goes to the centre terminal. The terminal on the right (looking at the back of the panel) is the other side of the condenser and goes to the grid of the valve. That on the left is a "dummy," and enables the grid leak to be connected direct to the filament of the valve. The component is manufactured by T.C.C. In this receiver soldering is unnecessary provided the components employed have terminals, or nuts and washers.

To operate the set, place an H.F. type valve in the valve-holder. Connect up the L.T. and H.T. batteries and join a pair of telephones to the terminals marked. Join the aerial lead to A_1 and the earth lead to E. For the normal broadcast band (250–500 metres) place a No. 25 or 35 coil in the primary coil socket (try both sizes) and a No. 60 in the secondary coil holder. Place the reaction condenser with the moving vanes right out. Turn on the filament resistance to light the valve and place the positive H.T. wander plug in, the 60-volt tapping of a 72-volt battery. Then rotate the secondary tuning condenser until you hear signals from the local station.

(*Continued on page 346.*)

POINT-TO-POINT CONNECTIONS

Join terminal A_1 to one side of primary coil socket, and thence to one terminal on ·0002 fixed condenser. Join other terminal of fixed condenser to A_2. A_1 is also joined to moving vanes of reaction condenser.

Join terminal E to remaining side of primary coil socket, thence to one side of secondary coil socket, to one filament leg of valve-holder, to H.T. + and to L.T. —.

Also join terminal E to the moving vanes of the secondary condenser.

Join remaining terminal of secondary coil holder to fixed vanes of secondary condenser and to centre terminal on grid condenser.

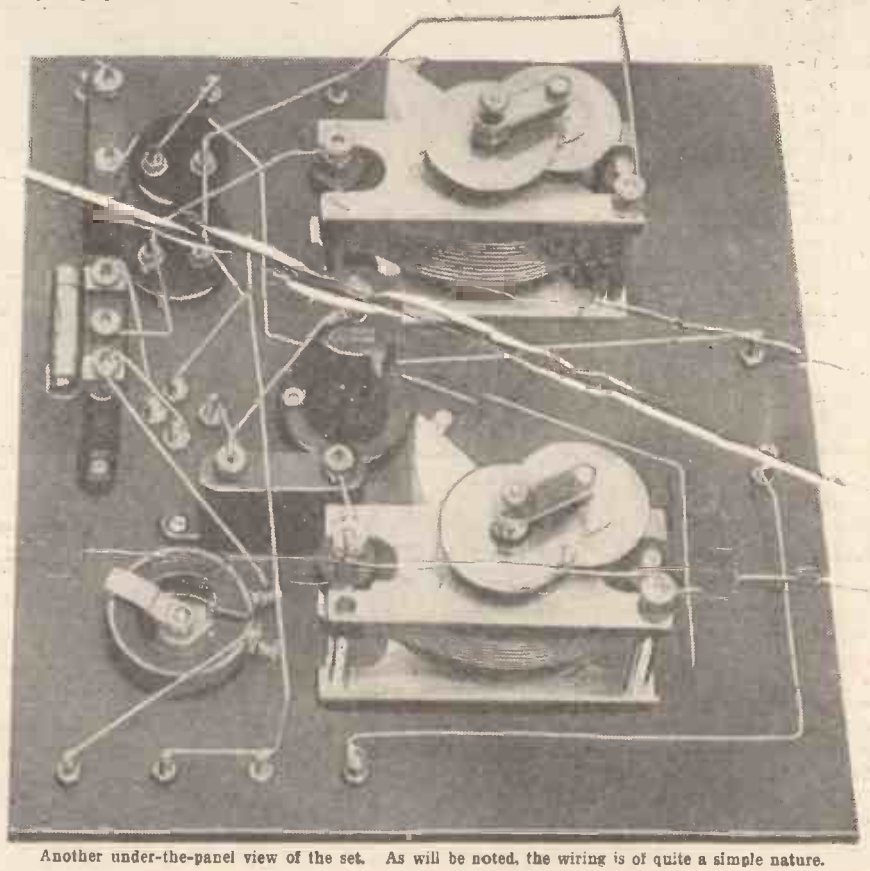
Join the right-hand terminal on grid condenser to grid leg of valve holder. Join left-hand "dummy" terminal on grid condenser to remaining filament leg of valve holder and to moving contact of filament resistance.

Join other side of filament resistance to L.T. + terminal.

Join plate leg of valve holder to one side of ·0003 fixed condenser and to top of radio choke. Join the other terminal of fixed condenser to fixed vanes of reaction condenser.

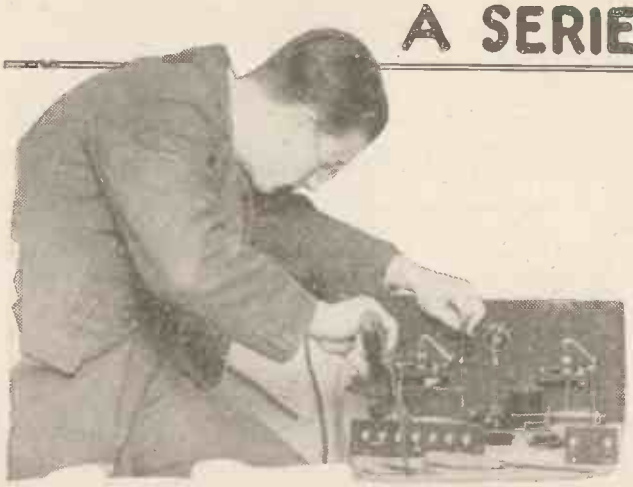
Join bottom terminal of radio choke to one 'phone terminal. Join remaining 'phone terminal to H.T. +.

This completes the wiring.



Another under-the-panel view of the set. As will be noted, the wiring is of quite a simple nature.

A SERIES FOR THE NEW AMATEUR



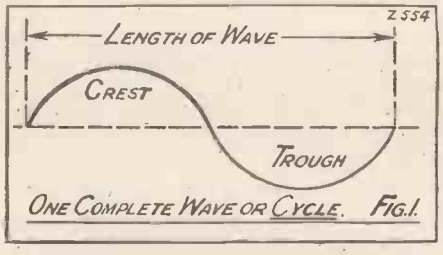
This photograph shows an amateur constructing a wireless set. It is quite a simple business, but if you can combine a little theory with your practical knowledge of the art of receiver construction it makes the work still easier and much more interesting.

No. 1. WHAT THE AERIAL DOES.

This is the first of a short series of articles in which both the theory of radio reception and its practical application to broadcasting and the building of wireless sets are dealt with simultaneously. You do not have to possess much technical knowledge in order to be able to assemble efficient radio sets, and, as this series will show you, many of the most involved-looking radio circuits are quite easily understood after one has made the acquaintance of a few essential facts. However little you know about electricity or radio at the present moment, this series for the new amateur will, in a very short time, make it possible for you to construct any of the wireless sets described in "P.W.," and, further, enable you to appreciate the soundness of their designs.

By G. V. DOWDING, Grad.I.E.E.
(*Technical Editor.*)

THE most complicated wireless diagram ever devised could include nothing that would not come under one or more of the three general heads of "Coils," "Condensers," and "Resistances." And if you knew just a little bit about each of these three things you could tackle practically



anything in the way of radio reception. You could read those queer-looking theoretical diagrams, build your own intricate and powerful receiver and deal expeditiously with any fault that might subsequently develop.

There is no need for intensive study, just light your pipe or cigarette (if you smoke!), lean back comfortably in your chair and read this article. If I manage to hold your attention to the final sentence, then will I have achieved my object in taking you quite a long way on the road to a complete understanding and appreciation of radio in general and radio receivers in particular.

Practical Illustrations.

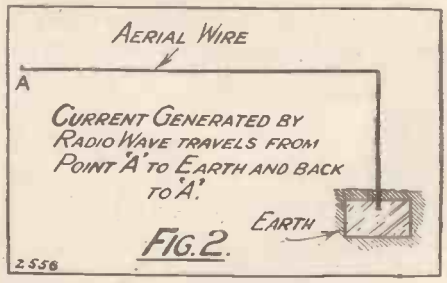
I am going to start right away by drawing your attention to treacle! This substance really has nothing to do with wireless, but it will help me to illustrate a rather knotty point. Now you could hold a quantity of thick treacle quite safely in a linen bag, but this linen bag might not hold water, for water is much thinner in consistency and would creep through such a porous material. But air is much thinner than water and you could conceive of a material that would be perfectly water-tight and yet not "air-tight," couldn't you? Well, stretch your imagination just a little further and mentally visualise something in the nature of a liquid so much thinner in consistency than air that not a single substance on earth could be employed to hold it imprisoned.

If such a thing existed it would simply soak through everything—rubber, iron, wood, glass, china included—just as water soaks through blotting paper. If you pumped every scrap of air out of a glass bulb this all-pervading substance would still be in the bulb. Well, it is actually thought by most leading scientists that there is such a fluid and it has been given the name of ether, but it must not be confused with that ether which is used as an anæsthetic. This radio ether is the medium through which wireless waves travel out in every direction from a broadcasting station. They do not need air; as a matter of fact, if there were no air at all the wireless waves would travel rather more easily.

Wireless Waves.

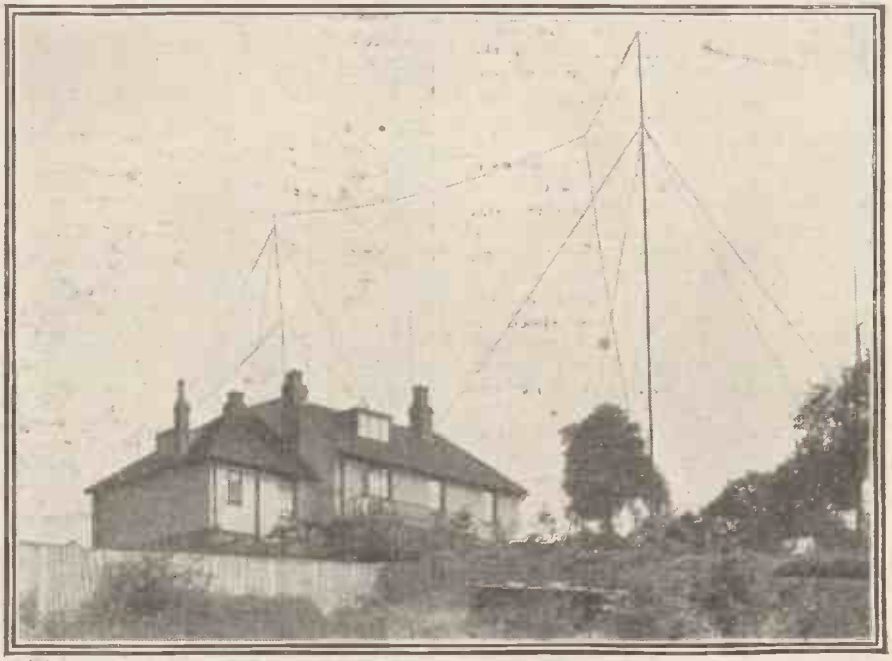
You can think of wireless waves as being very similar to the waves of the ocean only, instead of existing in water or even air they are waves in this invisible, tasteless, scentless, soak-through-everything ether.

The electricity in a broadcasting station's aerial stirs up this ether and causes ripples to travel away through it in every direction. As these ripples pass the aerials stretched



up in listener's back-gardens, so do they cause currents of electricity to flow in these. The waves themselves do not glide down an aerial into a wireless receiving set, the mere

(*Continued on next page.*)



This is an efficient receiving aerial. The wire is high at both ends and is well clear of trees, roofs and all other such obstructions. But the wire used for the parallel length and for the "down lead" to the receiving set makes an aerial of a fairly considerable total length. The bearing the length of wire used in an aerial has on the reception of wireless signals is explained in the accompanying article.

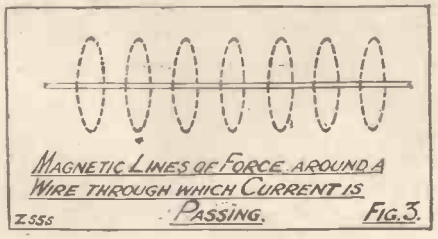
A NEW SERIES FOR THE NEW AMATEUR.

(Continued from previous page.)

act of a wireless wave rippling past a receiving aerial *generates* electricity in this latter.

Now you will have a rough idea of how the broadcast music travels through space. You may consider my explanation somewhat vague, but do not let this disturb you for, however quickly you read the above lines, you will now have knowledge of one fact, the importance of which you may not realise for quite a time but which will form a "keystone" in your progress.

You are now probably wondering how it is that hundreds of broadcasting stations



MAGNETIC LINES OF FORCE AROUND A WIRE THROUGH WHICH CURRENT IS PASSING. FIG. 3.

can use the same medium through which to send their vibrations without causing one general mix-up. The whole secret of this is "tuning," and in this the coil and the condenser both play very important parts. But before we can deal with these from a practical point of view a little more about those ether waves is necessary.

Wave-length and Frequency.

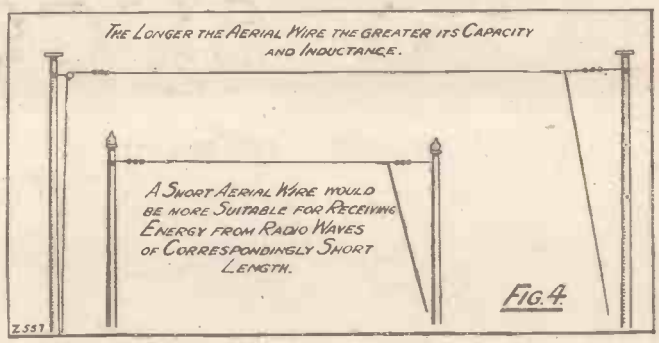
Each broadcasting station has a certain wave-length allotted to it. That is to say, it is made to emit waves in the ether of a certain definite length. Think of these waves again as being something very similar to waves in the sea. There are very big waves in this latter and there are very small ones. Now just what is a wave? It is the rising and falling of the water. The water itself does not move along, although the successive rising and falling make it appear to do so. There are two parts of a wave, namely, the crest and the trough. First of all, there is a depression in the sea and then, as must inevitably follow, a heaping up as it were. The length of a wave is the distance between the highest point of its crest and the same point of the next wave.

Now wireless waves always travel through the ether at the standard speed of 186,000 miles per second. This is approximately 300,000,000 metres. As this speed is constant we are able to calculate the number of waves that would pass a given point in a second by dividing 300,000,000 by the length of one of the waves in metres. If the *wave-length* were 300 metres, the number of waves emitted in one second, which is the same as saying the number of waves which pass a given point in that period of time, would be 1,000,000. And we call this the *frequency*.

Each wave, you will remember, consists of a trough and a crest. First of all, there is a depression in the medium in which the wave exists and then there is a heaping up. These events are successive and one complete wave is therefore referred to as a *cycle*. (See Fig. 1.)

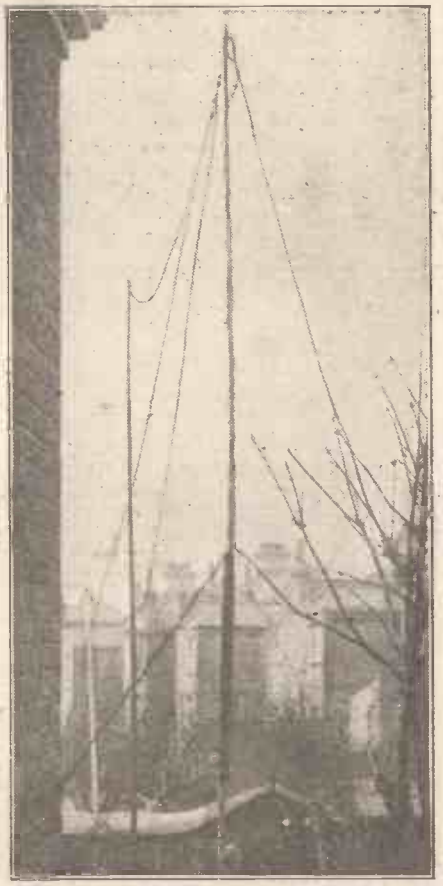
In the case of our above-mentioned wave-length of 300 metres, there are 1,000,000 waves or *cycles* in one second. One thousand cycles are known as a *kilocycle*, so our 300-metre-long wave corresponds to a *frequency* of 1,000 *kilocycles*.

If this sounds rather confusing to you just endeavour to memorise the salient fact that a broadcasting station transmits at a definite *wave-length* (that of the London station is 361 metres, Daventry 5 X X, 1,600 metres, and so on), and that by means of "tuning" a radio receiver can be made to respond to an ether wave of one definite measurement.



Now I have said that as a radio wave passes a receiving aerial it generates in this a current of electricity. Now supposing we erect an aerial consisting of a single strand of wire held between, say, a pole and the chimney of a house, and join one end of this wire to another wire which is connected to a plate of metal buried in the ground. As a wireless wave passed this aerial wire it would generate a current of electricity, which would flow from the farthest point of the suspended wire right along the wire to the plate of metal buried in the ground and back again to its starting-point. (See Fig. 2.) But there would not be only one isolated wave, this wave would be followed in rapid succession by an unending number of others. Just as many in the space of one second as were emitted by the transmitting station in that time.

You will appreciate the fact, however, that it will take a certain amount of time for a current of electricity to travel right along the aerial down to earth and back again, and it might happen that the next wave to come along would start off another current before the first one had time to get back. If it did, the two currents would meet and impede each other's progress. But supposing that next wave came along later. The first current would have completed its journey, but it would not then disappear, but would commence another trip to earth and back and would be followed by the current generated by the second wave. Of course, when number one current turned back at the earth end it would meet number two coming along, and again there would be a clash which would result in an almost complete annihilation of both currents.



This is an aerial having a fairly short horizontal span. Its height is, however, the most important factor. Exactly how such an aerial "picks up" energy from space is explained in the accompanying article. You must have a knowledge of such theoretical facts before you can appreciate the operation of a radio set.

Clumsy Method of Tuning.

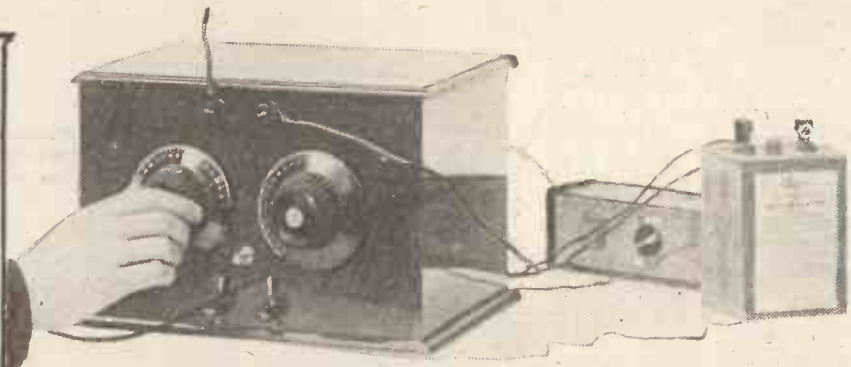
Can you see what we have got to do before we can get a sustained current of electricity in our aerial? We must have waves coming along so that they start off currents at exactly the moment when previous currents have completed one round journey. It is just like a swing or a pendulum. Imagine the current of electricity to be either of these The pushes given by the waves have got to be applied just as the swing or pendulum reaches the maximum point of its swing in order to keep it going. If you apply a push to a swing before it has reached the highest point of its journey you tend to stop it instead of helping it to keep swinging.

Well, we could make our aerial respond to any length of wave by varying its actual length, for by varying its length so would we vary the length of time it would take for a current of electricity to travel backwards and forwards along it. But this would be a clumsy method of "tuning," and you would soon get tired of tuning in several different stations every evening if you had to run out and cut lumps off, or increase the length of your aerial every time you changed over from one station to another. But we can make our current of electricity take a longer or shorter time on its journey by making it pass through *coils* and *condensers* of different sizes.

First of all, have you any idea as to why it should take electricity any time at all to pass along a length of wire? I must give you the answer to this question at some little length, for it is really of considerable importance.

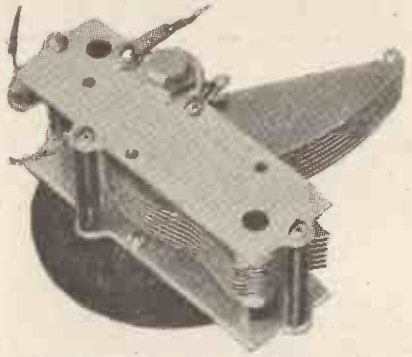
(Continued on page 355.)

TUNING FACTS AND FANCIES



All set builders should read this article by PERCY W. HARRIS, M.I.R.E., Editor of the "Wireless Constructor."

THERE has been so much talk about kilocycles, wave-lengths, frequency differences, allocation of wave-bands, and the like that the listener is liable to lose his sense of proportion and to forget the real facts of tuning and selectivity. For example, several correspondents have written asking whether or not their receivers would "tune sharper" if fitted with "straight-line-frequency" condensers



A popular type of S.L.F. variable condenser.

in place of the "straight-line-wave-length" pattern. Evidently these readers have misread some of the glowing advertisements of the different types.

Let us take the case of an ordinary receiving circuit in which a coil is shunted by a variable condenser, with a valve connected across the two terminals of the variable condenser. When this variable condenser is set at its minimum, the circuit will tune to a particular wave-length or frequency, and when the condenser is set at its maximum it will tune to a much longer wave-length (or a much lower frequency.)

Width of the Wave-band.

The actual width of the wave-band tuned by this arrangement will depend upon a number of factors, but if we assume the coil to have a very low self-capacity and the condenser to be accurate in its rating (by this I mean that if it is called a ·0005 mfd. condenser its maximum is a genuine ·0005 mfd.), then the lowest wave-length to which it will tune will be directly affected by the minimum capacity of the condenser.

It is not generally realised how greatly this minimum capacity varies with different makes of variable condenser, and that with the best variable condenser the capacity is some way above "zero." Some condensers have a minimum which is as high as a tenth of the maximum—i.e. a ·0005 mfd. condenser will have a minimum of ·00005 mfd. Others have a minimum as low as a twentieth of the maximum, but in practice, when calculating tuning ranges, it is good policy to assume that the minimum will be not smaller than a tenth of the maximum.

This gives quite a good tuning range. For example, a coil having an inductance of 200 microhenries will tune from about 200 to 600 metres with a ·0005 mfd. maximum variable condenser having a minimum of ·00005 mfd. It is very easy, however, when building a wireless set, to add to the effective minimum capacity of the variable condenser by the capacity of the wiring and associated parts. The valve capacity, too, is in parallel with the variable condenser, which accounts for the change in calibration often found when we change the type of valve in a receiver. Further, I have known receivers to be built up in such a way that when the moving plates of the condenser are set at a position of minimum capacity with the fixed plates, they are so close to a coil as to appreciably affect the tuning!

Straight-line Condensers.

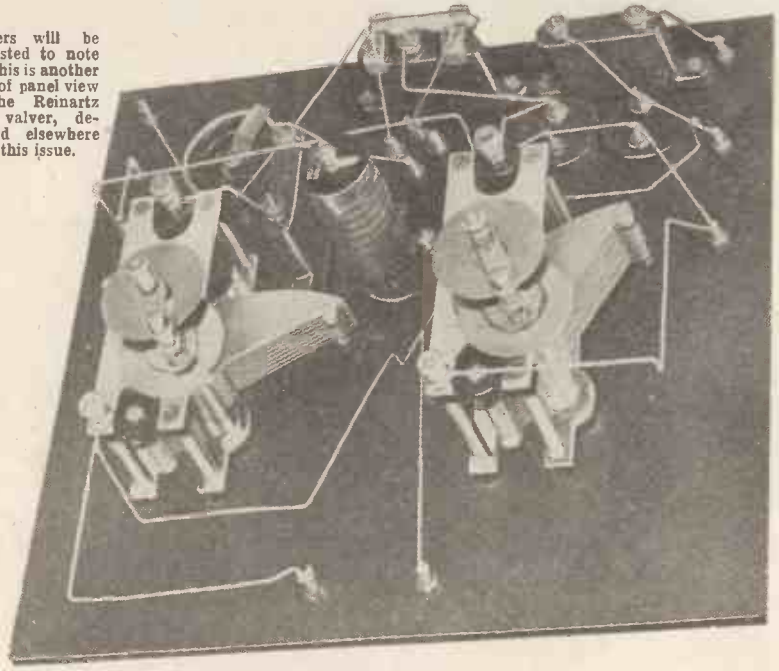
One hears a good deal about "straight-line" condensers. There are three types of "straight-line" condenser available—straight-line capacity, straight-line wave-length, and straight-line frequency. They are called "straight line" because on calibration charts the line joining the various points plotted is approximately a straight line. By this I mean that if we take a straight-line capacity condenser and make a chart on squared paper, marking along the bottom, capacity in micro-farads, and on a vertical line, degrees, then the points on the chart at the intersections of the vertical lines from the capacity figures and the horizontal lines from the corresponding degrees all fall on a straight line.

Convenience in Tuning.

The convenience of a straight-line condenser (whether it is capacity, wave-length or frequency) is obvious. If, for example, we find on a straight-line capacity condenser the three different degree positions for three given capacities, then by joining these three points with a straight line we automatically find the degree reading for any given capacity within the range of the condenser and, correspondingly, the capacity for any particular degree on the condenser.

(Continued on next page.)

Readers will be interested to note that this is another back of panel view of the Reinartz One-valver, described elsewhere in this issue.



In this Reinartz receiver S.L.F. tuning and reaction condensers are employed.

TUNING FACTS AND FANCIES

(Continued from previous page.)

A straight-line wave-length condenser can have a chart prepared on which the horizontal line shows wave-length and the vertical line degrees, and similarly a straight-line frequency condenser can have a chart on which the horizontal line is marked in frequencies, and the vertical line in degrees.

In each case, the various points can all be joined by a straight line.

The Three Types.

I wish particularly to emphasise in this article that the three different types of condensers give straight-line calibration in capacity, wave-length and frequency respectively. The real sharpness of tuning is precisely the same on all three types (assuming, of course, that they are all of good low-loss manufacture). If we assume that we are experimenting with three different condensers (straight-line capacity, straight-line wave-length and straight-line frequency respectively), and that all three have the same minimum and maximum *capacity*, then the wave-band tunable with each type will be *precisely the same.* In the straight-line capacity type the stations will be badly crowded at the bottom and widely spaced at the top of the scale. With the straight-line wave-length they will be much more uniformly separated and with a straight-line frequency condenser they will be separated most uniformly of all.

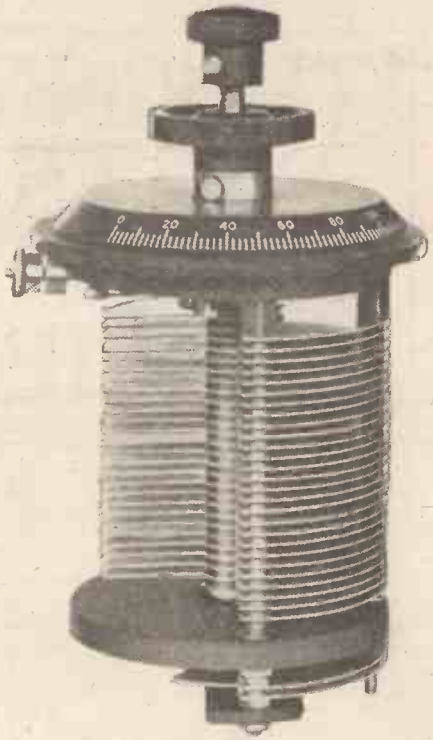
In point of fact, it is very difficult to get a dead accurate straight-line calibration with any type of condenser. The straight-line capacity condenser is no longer used for tuning purposes and can be left out of our calculations. Its scale is too hopelessly crowded at the bottom end to be of practical use. The two we have to consider now are the straight-line wave-length and the straight-line frequency, both of which are in extensive use at the present time. It might be thought that with the new distribution of wave-lengths the straight-line wave-length type of condenser would pass out, but actually it is very much alive. The reason for this is that in the average set most of the important stations fall round about the middle and upper portions of the condenser dial, where the tuning distribution is quite convenient—there being nothing of any particular note round about 200 metres. The straight-line frequency pattern, while giving better distribution of stations at the bottom of the scale, is generally more clumsy and particularly susceptible to the effect of small stray capacities. Pick up a straight-line frequency condenser and examine it carefully, and you will see why this is. First of all, set the plates at the position for minimum capacity, and then slowly turn the dial, when you will find that there is a very small increase of capacity for quite an appreciable movement of the dial. This means, in effect, that stray capacities in parallel with the condenser are particularly prone to upset the calibration line. For, strictly speaking, any "straight-line" condenser can only give a dead straight line in a set of picked conditions.

One type of square-law condenser, without vernier dial.

Sharpness of Tuning.

Sharpness of tuning is something quite different from the distribution of stations over the condenser scale. Let us take, for an example, two stations very close to one another in wave-length but sufficiently far apart to enable a very sharp tuned receiver, such as a super-heterodyne, to differentiate them. Let us imagine that on a straight-line *wave-length* condenser at some portion of the scale these two stations are separated by two degrees, and that on a straight-line *frequency* condenser they are separated by three degrees. If your receiver is such that it *can* separate them, it will make no difference to the sharpness of tuning whether you use a straight-line frequency or a straight-line wave-length condenser, and if it *cannot* separate them the same remark applies, for if, when tuned to one, you hear signals from the other, then you will get precisely the same amount of interference on a straight-line frequency condenser as on one of the straight-line wave-length type.

Remember, too, that if between its minimum and maximum you can tune in fifty stations on a straight-line wave-length condenser, a straight-line frequency condenser with the same minimum and maximum capacity will tune in precisely the same number of stations—no more and no less. On the straight-line wave-length pattern stations will be more widely separated on one portion of the dial than on another. And this may be a convenience or a disadvantage, according to circumstances.



This condenser has a separate vernier control knob.

A REINARTZ ONE-VALVER.

Continued from page 338).

Now try rotating the reaction condenser dial very slowly and note whether signals increase in strength. You may have to readjust the secondary condenser very slightly. If the signals do not increase in strength try reversing the leads to the primary coil. Remember that you can only obtain proper reaction effects when the coil is connected the right way round.

Then vary the H.T. voltage and the position of the arm of the filament resistance until you obtain the smoothest reaction control. If you like experimenting try a 4-megohm grid leak for distant reception. Very often the use of a fairly high value gives louder signals on weak stations. For the reception of 5 X X you will probably need a No. 100 or 150 coil in the aerial circuit and a No. 250 in the secondary circuit. For 5 G B a No. 50 coil in the aerial circuit may give better results than a No. 35.

The Valve to Use.

Practically any valve will work in this receiver, but usually one of the H.F. type having an impedance of about 20,000 ohms and an amplification factor of 16–20 gives the best results.

Valves with a very high impedance, say, above 30,000 ohms, are not so good unless a high value of H.T. is employed.

This receiver is essentially a set to be used in conjunction with an outside aerial. It will work on an indoor aerial provided one is within four or five miles from a local station, but if the best results are to be obtained an outdoor aerial, erected as high as possible, is highly desirable. It is also advisable to employ a good earth, such as a copper lead taken direct to the main water supply pipe.

MUSIC AND BROADCASTING

A Great Musician Discusses Radio.
A Thoughtful Article by
Sir LANDON RONALD.

AT the time when broadcasting was born, I took an early opportunity of inspecting the new baby, and even then I detected in its unformed features promise of great things. It bade fair, moreover, to achieve for the musical world in general all that its grown-up brother, the gramophone, had done and is still doing.

After little more than five years have passed, that promise has been more than fulfilled, and the belief which I have always held, and never hesitated to express, in mechanical contrivances as a means to increase public interest in music has been justified beyond my expectations.

But it is not with the effects of wireless upon musical taste that I wish to deal now; rather should I like to draw attention to an equally important but often-overlooked aspect of musical broadcasting.

It is one which is very close to my heart, both as Principal of the Guildhall School of Music and as a friend of all young artistes who are setting their first footsteps upon the rough and uncertain road of a musical career.

"Boon and Blessing"

I wonder how many people realise what a boon and blessing broadcasting is proving itself to the new generations of singers and players, as well, of course, to many of the more initiated? It is no secret that things have been going from bad to worse in the concert world during the past few years, and it cannot truthfully be said that wireless transmissions of good music or gramophone records are yet bringing new recruits to the concert hall in the numbers which one could wish.

Without the microphone to help them, I fear that there would be but little chance for many musical neophytes who, having reached an advanced stage of their training, *must* make public appearances both for the purpose of gaining confidence and experience, and with the object of getting their names known.

A few with the money to spare are able to give recitals, but even so their public is sadly limited, and the results are often negligible.

The B.B.C. has provided excellent opportunities for such, and later years may well prove that the radio has been the means of bringing to light and placing in their true places at least two or three good artistes who might else have sunk into obscurity.

New Talent Welcomed

There is another matter in this connection which no practical person (and even artistes must be practical to some extent nowadays!) can afford to pass by. Experienced and well-known musicians are seldom rich; beginners in the profession practically never! Having spent many years and much money upon their training, our new singers, pianists, and violinists naturally look to their art for some repayment, or to at least provide them with a wage upon which they may exist.

A recent photograph of Sir Landon Ronald.

Those few guineas a time which the B.B.C. pays to young artistes mean a great deal to them, not only from the commercial point of view but from one of *morale* as well. There is nothing so calculated to drive a beginner in any job to despair than a cruel awakening to the fact that no one considers his services worth paying for. He wants to feel that he is worth *something*, no matter how little.

And here is Savoy Hill, and a score of other stations, welcoming new talent and providing engagements for the unemployed. The B.B.C. cannot be too highly praised for its readiness to give everybody a *chance*, and that is all your young artiste can hope for.

There is yet another way in which broadcasting is helping the artiste. Formerly, with concert singers—and more especially was this so in the case of women—their success with the public depended in large measure upon *personality*.

Everyone knows, of course, that personal appearance should not in any way affect the chances of an artiste provided she has the ability and talent, but it is no good disputing the proven fact that unless your average concert singer has a good platform presence she is badly handicapped, and she might just as well go off and do some other kind of work at once.

But here again the B.B.C. has come to the rescue, for performers before the microphone are heard and not seen! That is a very great thing, and a point that cannot be too highly stressed. It is helping the public, always inclined to set too great a store by appearances, to the realisation that it is *art* that counts, not the good looks or otherwise of the artiste.

More to be Accomplished

What will happen when television comes along, I cannot say, but by that time I hope listeners will be sufficiently educated up to forming their opinions entirely on the evidence of what they *hear*.

These are just a few of the ways in which broadcasting is giving a considerable leg-up to the musical profession, and much more is to be accomplished in the near future, I am sure.

Wireless men in general seem to me to be the most enthusiastic people in the world,

(Continued on next page.)

YOUR VALVES.

How to ensure good service and long life,

By A. V. D. HORT, B.A.

VALVES are a great deal cheaper to-day than they were a few years ago, when they were almost literally worth their weight in gold, but there cannot be many of us even now who can afford to handle valves carelessly. Probably a "favourite" valve is one of your most treasured possessions. You are compelled to use it; putting it in a glass case would give you no satisfaction! But however you maltreat other less favoured valves, you always lavish on that one your most special care.

Are you sure that the careful treatment which you give to your favourite valve is not really doing it irreparable and wholly unnecessary damage? Even if you always handle it with reverence, you may be on quite the wrong lines. You may also be omitting part of the prescription essential to its well-being in operation and vital to its longevity, which is your principal aim.

L.T. Control.

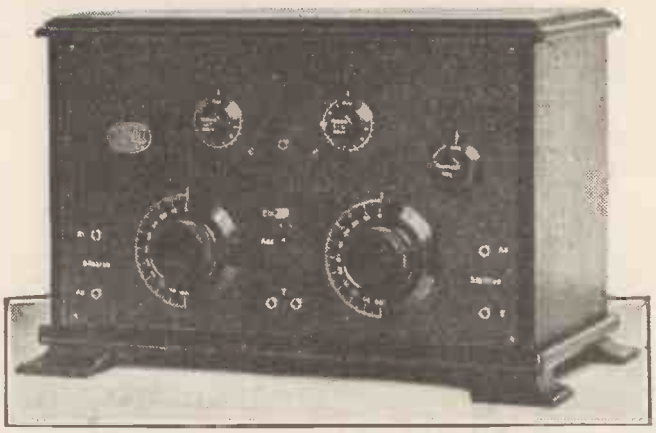
Against overrunning of the filament you are continually warned to be on your guard, and it may be assumed that you are only likely to overrun your valves accidentally.

When you switch on your receiver, do you turn a rheostat, or do you pull out the knob of a plain on-and-off switch? The use of the former method is that generally advocated, in view of the sudden shock presumably applied to the filament by the plain switch system. But it is not by any means established that it is the best method for the filament. Modern investigators recommend that the rated voltage be switched straight on to the valve filament. The filament will take care of itself in the matter of rising slowly to its full temperature, its resistance rising as its temperature increases. So there is really no risk of any "sudden shock" doing it an injury.

Switching off without the interposition of a rheostat to lower the filament temperature gradually can obviously do no harm. The filament will cool slowly enough of its own accord. It is, however, bad practice to remove a valve from its holder immediately after it has been switched off. Leave it for a minute before touching it, because a cooling filament is brittle. The safest way to take a valve out of its holder is to do so while the filament is still glowing, without cutting off the current at all. Then disconnect the H.T. battery, to avoid the risk of short-circuits. But a glowing filament is more elastic than a cold one, and therefore less liable to injury from a jolt as the pins are withdrawn from the holder. Do not forget to put the L.T. switch in the "off" position immediately after taking out the valve, especially if the removal of the valve is the preliminary to alterations inside the receiver.

Another point, do you put in the H.T. battery wander-plugs before you turn on the L.T., or afterwards? You will be well advised to put in the plugs first and then connect the L.T. battery. With many types of valves no great harm will result from the reversed procedure, but some valves of the low consumption dull-emitter class are sensitive to such treatment, especially if the H.T. voltage is high. When the H.T. battery plugs are inserted first, the filament heats up slowly when the L.T. battery is connected, as has been explained already, and the anode current rises to its full value correspondingly slowly. Incidentally, this procedure should help to prolong the life of your L.F. transformer and telephone windings.

On the slip of paper which is to be found in the box with a new valve are given various operating details. Among other data, the maximum voltage which should be applied to the anode of the valve is recorded, and also usually a note, and sometimes a chart, referring to the correct values of grid bias for different anode voltages for reference when the valve is used as an L.F. amplifier. The application of a negative potential to the grid is most important when the H.T. voltage on the anode is near the maximum permissible. The high voltage in itself would do no harm, but a high voltage without the controlling effect of a sufficiently negative grid means an excessive flow of anode current.



One of the most popular types of valve sets being sold in Germany to-day—the Lorenz.

Overrunning the Filament.

When the valves have a filament consumption of only ·06 ampere, for example, a high value of anode current may add an appreciable amount of current to that already supplied by the L.T. battery. The result is overrunning of the filament. A further evil, of course, is the unduly heavy drain on the H.T. battery. In point of fact, the "maximum" anode voltage rating of a valve can be exceeded quite safely, within reasonable limits, so long as the grid-bias negative potential is increased proportionately.

MUSIC AND BROADCASTING.

(Continued from previous page.)

and the ones with the greatest capacity for bringing their enthusiasms to useful effect. No one pretends—least of all those nearly connected with its exploitation—that broadcasting is perfect yet.

I sometimes feel that critics are apt to be a little too hard on those who are running the gigantic organisation at Savoy Hill. Take the composition of programmes, for instance.

I would ask those who are inclined to frequent grumbles at the nature or variety of broadcast entertainment, and who have never been cursed with the responsibility of preparing a programme of any kind, to take it from an old hand at the game that this is an undertaking bristling with "snags" and difficulties of all kinds. For some thirty years I have been drawing up programmes for concerts in all parts of Europe, and it is a job that nobody need envy or wish to do. The knowledge that it is impossible to please everyone, no matter how hard one tries, always serves to damp one's enthusiasm.

Question of Price.

As long as the B.B.C. endeavours to give the public what they want it has my sincere admiration and sympathy. I say "what they want" because I do think it is necessary to cater for the real tastes of the people, and not to force them into listening to something they don't want to hear. "You can take a horse to the water, etc.!"

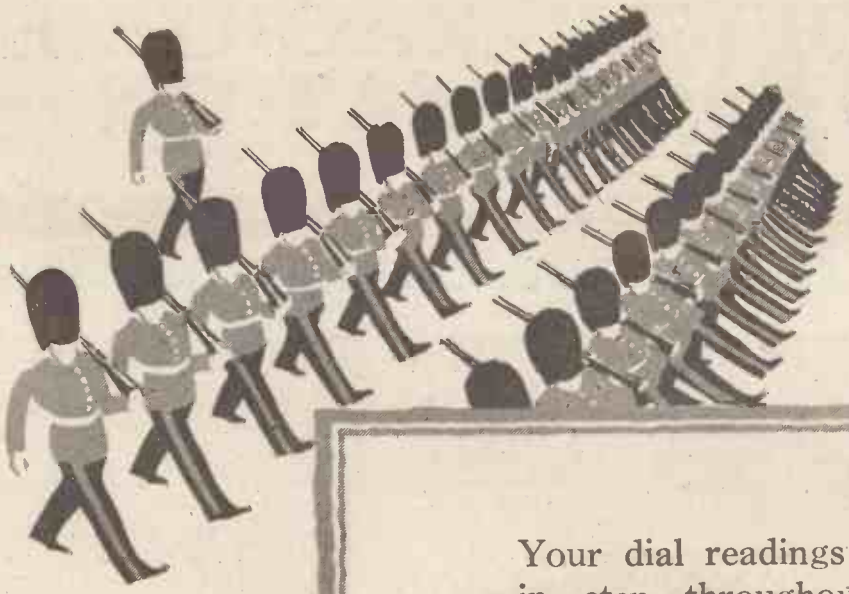
I will conclude with a little personal experience which illustrates what queer notions some artistes have about their value, and serves to show what one is up against.

Not long ago an artiste of international repute was dining with me. He was fresh from a hot dispute with the B.B.C. over the question of remuneration, and although it had apparently offered him quite a good fee he would not accept it.

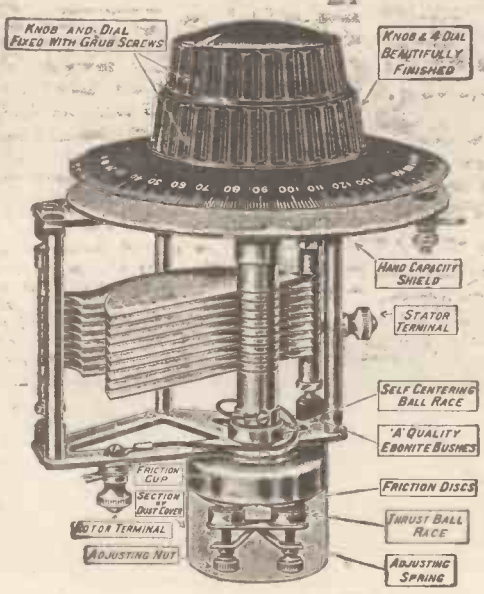
"No," ran his extraordinary argument, "when I give a concert in the ordinary way, there is not one person listening who has not paid at least two shillings for a seat in the hall. Many have given as much as 12s. 6d. Surely, therefore, it is only fair that every listener should pay me at least one penny for the privilege of hearing me sing!"

There are, I believe, some two million people holding listening licences in Great Britain; just imagine the idea of paying one performer two million pennies (between eight and nine thousand pounds) for a brief half-hour's work!

One day it may be so, for we live in an age of miracles. And when that seemingly-impossible Utopian era comes to pass my permanent address will be Savoy Hill, London!



All in step!



Your dial readings will keep all in step throughout the entire tuning scale if you instal Ormond Logarithmic Condensers in your set. And for ease in searching, when multi-tuned circuits are used, these condensers are indispensable.

Similar in construction to the Ormond S.L.F. Condenser, the Ormond Logarithmic Condenser's efficiency at radio frequency potentials is of the same highest standard.

Complete with 4 in. Bakelite Knob and Dial and Earthing Shield.

PRICES:

With Friction Control

·0005	- -	20/-
·00035	- -	19/6
·00025	- -	19/-

Without Friction Control

·0005	- -	13/-
·00035	- -	12/6
·00025	- -	12/-

ENGINEERING "ORMOND" COMPANY LTD.

Registered *Trade Mark.*

Write for our descriptive leaflet.

199-205, PENTONVILLE ROAD, KING'S CROSS, LONDON, N.1.

Telephone: Clerkenwell 9344-5-6. *Telegrams:* "Ormondengi, Kincross."

FACTORIES: WHISKIN STREET AND HARDWICK STREET, CLERKENWELL, E.C.1.

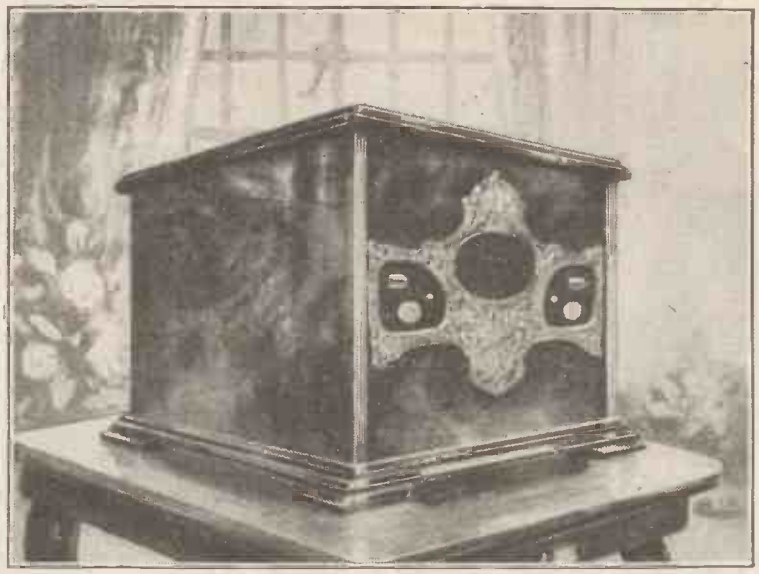
Continental Agents: Messrs. Pettigrew & Merriman Ltd., "Phonos House," 2 & 4 Backaall St., New Oxford St., London, W.C. 1.

NEW GENERAL RADIO SET CREATES SENSATION

Loud Speaker and all Accessories built into one beautiful cabinet

NO ACCUMULATOR : NEW TYPE VALVES

Many other exclusive features



This is the new General Radio Set with its handsome cabinet of genuine hand-polished English walnut. The set is easily transportable, as the Loud Speaker and all accessories are inside the cabinet. GOOD LOUD-SPEAKER RESULTS ANYWHERE.

AT the Radio Exhibition the centre of attraction was the New General Radio Set. This wonderful receiver had so many unique features that everyone was drawn to the General Radio Stand.

NO MORE ACCUMULATORS to CHARGE!
One of the most attractive features of this new set is the absence of the Accumulator. No longer will owners of General Radio Sets need to bother about having accumulators recharged. The General Radio *FILONATOR* (exclusive to General Radio Sets) can be recharged instantly in your own Home simply by inserting special compressed tablets costing 1/-, a charge lasting six weeks with average use. It is much more reliable and efficient than the old style accumulator and lasts much longer. There is no acid in the Filonator, no fumes and no danger.

A TRULY REMARKABLE LOUD-SPEAKER
Another feature of this new receiver is the patent "Magnetic-Cone" Loud Speaker. It gives remarkable volume with an exceptional sweetness of tone and a fidelity of reproduction so outstanding that the music or singing could be in the room beside you. The old horn type of speaker has been done away with and this new loud speaker is built into the cabinet. This big step forward is to a great extent responsible for the very handsome appearance of the new General Radio Cabinet Set.

UNUSUALLY EASY TUNING Tuning-in on the new General Radio Set has been made so easy by the new patent "Astactic" vario-coupler that only one control is needed; this tuning gives so fine an adjustment that you can get the station you want at maximum strength without the slightest trouble. The tuning of the set covers all the European stations *without* additional coils.

SUPER QUALITY VALVES The new General Radio Set is fitted with special new type 1·4 volt valves designed specially by the leading Valve Manufacturers to give maximum efficiency with the General Radio Filonator. The DOUBLE Filament secures double power and double life for each valve.

NO INCREASE IN PRICES
The set complete costs only £12. The royalty is paid and there is *nothing* else to buy. If desired, easy payment terms of 20/- down and 20/- a month for twelve months are available. In every case, and whichever way you buy, all General Radio Sets are

INSTALLED FREE
in your home by our own Engineers, *anywhere in the country*. The Set is left playing perfectly for you, and free service calls are given after installation. No other wireless firm gives this unique service, and never before has so remarkable a set been offered to the public at so low a price.

GENERAL RADIO

SEND TO-DAY FOR FULL PARTICULARS
Say Catalogue E.32—on a post card with your name and address—or cut out this advt., write your name and address in the margin and put in open envelope (½d. stamp).

GENERAL RADIO CO., LTD., 235, REGENT STREET, LONDON, W.1 SHOWROOMS: 105, REGENT STREET, LONDON, W.1

The GERMAN EXHIBITION

Some exclusive details contributed by Dr. ALFRED GRADENWITZ (Our Berlin Correspondent).

THE era of violent economic crises under which German industry had been labouring after the war has, during the latter half of 1926, given way to an unmistakable process of recovery. The German radio industry, which had been struck more heavily than most others by the effects of deflation, and which, in the course of an, as yet, very short life, now shows gratifying symptoms of consolidation which open up rather hopeful vistas of normal production. The rapidly decreasing unemployment enabled the working classes, particularly interested in wireless broadcasting, to purchase receiving apparatus on an ever increasing scale, while the more well-to-do could in growing numbers replace their crystal detectors by valve apparatus.

This demonstration of wireless picture transmission was a very popular feature of the Exhibition.

Three Hundred Exhibitors.

The Fourth Great German Radio Exhibition, as it is officially termed, affords a faithful picture of this state of affairs. While the number of firms making wireless apparatus has been reduced considerably, that of manufacturers of separate parts has been on the increase.

"Great" this exhibition styles itself—and great it is, having outgrown the precincts of the giant radio hall on the Kaiserdamm and filling, in addition, quite a big colony of bungalows left in its garden from the recent Week-end Show. It unites the unprecedented number of three-hundred-odd exhibitors and gives a truthful and comprehensive picture of the present status and recent development of German radio.

Startling novelties are not on show at this exhibition, nor could they be expected from an art fast approaching maturity. Prosperous development and a remarkably high standard of perfection throughout the line, but hardly any result whose equal might not have been foreseen.

"High-Grade Valve Apparatus."

While the vast majority of German radio subscribers are still content with an unpretentious crystal detector set, the high-grade valve apparatus has at the Exhibition relegated its humbler brother to the background, and rules supreme in all the stands of the big hall and its annexes. Still, provision has been made for helping on the owners of crystal sets by placing at their disposal a valveless amplifier in the shape of a microphone excited by a small battery which, of course, reinforces sound without any distortion. In fact, the attachment, devised by a Schoeneberg firm (Konstanz Elementeund Apparatebau, Ltd.), enables

(Continued on next page.)

Berlin's Radio Building, where the Exhibition was held.

THE GERMAN EXHIBITION.

(Continued from previous page.)

excellent loud-speaker reception of the local transmitter to be obtained with any good crystal set.

A tendency to give up the anode—and, if possible, the heating—battery, and to operate the valve set by immediate connection to the mains, is, just as in England and the United States, the most conspicuous feature of recent receiving set construction. Also, the handling of radio sets is fast approaching the ideal one-control stage of American types of apparatus. Finally, the average valve receiver is no longer the three-valve apparatus, but one comprising a far greater number of valves.

Valve Developments.

The multiple valve, exhibited last year by the Loewe firm, has found many followers and imitators, both three-fold and even four-fold valves having been developed.

The valves recently brought out by several firms—e.g. the Telefunken people—are designed to be heated direct from the mains, a special type of cheap transformer being inserted. In order to allow even the older types of receiver to take advantage of the increase in output resulting from the use of multiple valves, a special amplifier has been perfected (by Messrs. Fernfunk, Ltd.) which can be inserted into an ordinary valve socket, while a multiple valve is fitted to its top end. A similar idea has been realised by another firm.

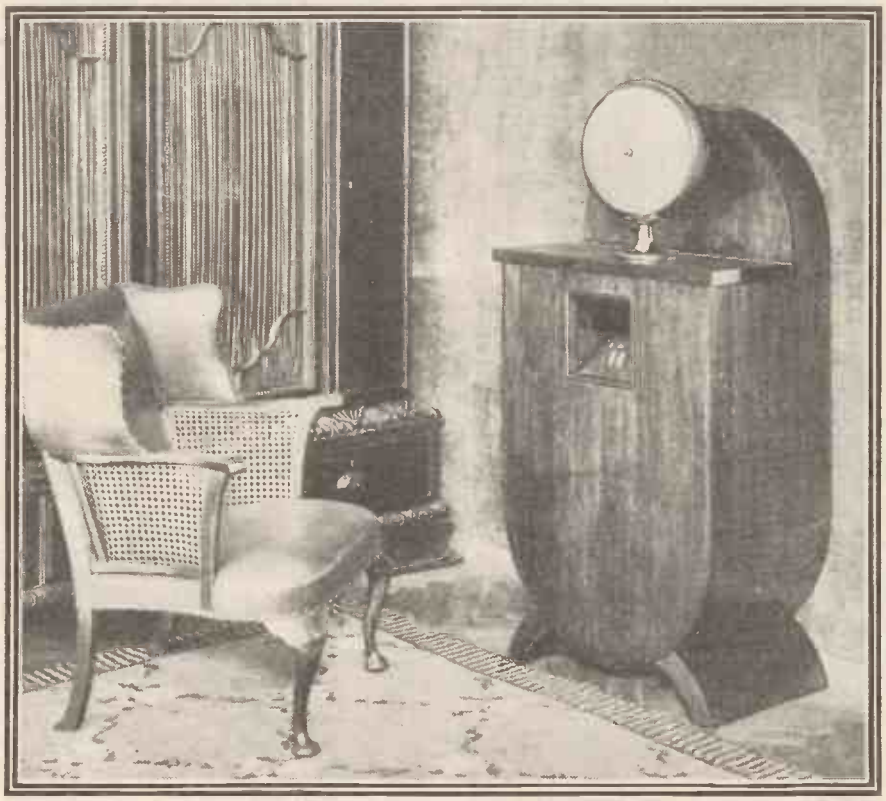
Inasmuch as the majority of valve sets are still operated with batteries, the improvement of anode batteries has been attempted by some exhibitors—e.g. by filling the intervals between individual cells with paraffin, thus increasing their insulation and raising the capacity to 2·5–2·7 ampere hours.

A general view of the main Exhibition hall.

A number of high-grade receivers, comprising neutrodynes with four, five or six valves and heterodynes with seven to nine valves, have been developed by many firms, partly in connection with frame aerials, and particular attention has been given to the pleasing appearance of these apparatus.

The greatest progress has, however, been made in the field of loud-speaker construction. The horn speaker has, with a few exceptions, given way to the most varied types of cone and box loud speaker. The Omniphone is of such minimal dimensions as to be readily put in the pocket, but it can be fitted to any vibratory surface, clinging to it by suction and causing it to vibrate.

The Eloden mammoth speaker, designed for the deck of an ocean steamer, is of striking softness, and the same applies to the smaller types devised on the same (box speaker) principle. A new cone speaker of remarkable purity has been brought out by Dr. G. Seibt, and Hans Vogt, one of the three inventors responsible for the Triergon Speaking Film, has devised a most efficient electro-static speaker termed Statophone.



The "Cabinet" to the right, which contains an eight-valve super-heterodyne, was designed by the celebrated German architect, Bruno Paul.

A German "Silence Cabinet."

The attention of the average visitor was mainly attracted by the most instructive exhibits of broadcasting companies and the German Postal Department. Dr. Reisser, technical manager of the German Broadcasting Co., demonstrated a checking booth of his system. This comprised a sound-proof cell containing a high-grade receiver destined immediately to receive the broadcast and to enable any imperfection, any excessive or insufficient sound intensity, etc., to be gauged by the controller.

Beside the broadcasting microphone there is provided in the studio another microphone leading without any intermediary amplifier to a special receiver in the booth. Behind the amplifier of the transmitter there has been inserted a checking set likewise leading to the sound-proof booth, thus enabling the whole broadcasting process to be controlled, doing away at a moment's notice with the cause of any disturbance and correcting immediately any deficiency. A special microphone installed in the booth serves, whenever required, to act upon the transmitter direct.

A Broadcasting Exhibit.

The very complicated organisation of a German broadcasting company is illustrated by comprehensive statistical returns

(Continued on page 355.)

Six-Sixty "every time!" says the Constructor

"I want certain results," says the constructor, "and I know that with Six-Sixty I shall get them. Firstly, it is a well-known fact that each Six-Sixty Valve is tested under actual broadcasting conditions before being passed on to the public. This is the most exacting test that any valve can undergo. Then, again, what further proof of the excellence of Six-Sixty Valves do I need, when I know that most of the leading Set Manufacturers in the country standardise Six-Sixty in their Receivers? A.J.S., The Langham Portable, General Radio Company's Receivers, McMichael, Truphonic, are but a few of those universally known Receivers in which Six-Sixty are standardised. Manufacturers know the best valve, and their choice is mine. They are the experts, and what they select is bound to be the best, so I say 'Six-Sixty every time.'

"Then remember that eight of the famous range of Six-Sixty valves consume only ·075 amp. filament current.

"I recommend fellow constructors to write for the most attractive booklet describing in detail the full range of Six-Sixty Valves. (They range in price from 10/6.) It is sent post free on receipt of a post card."

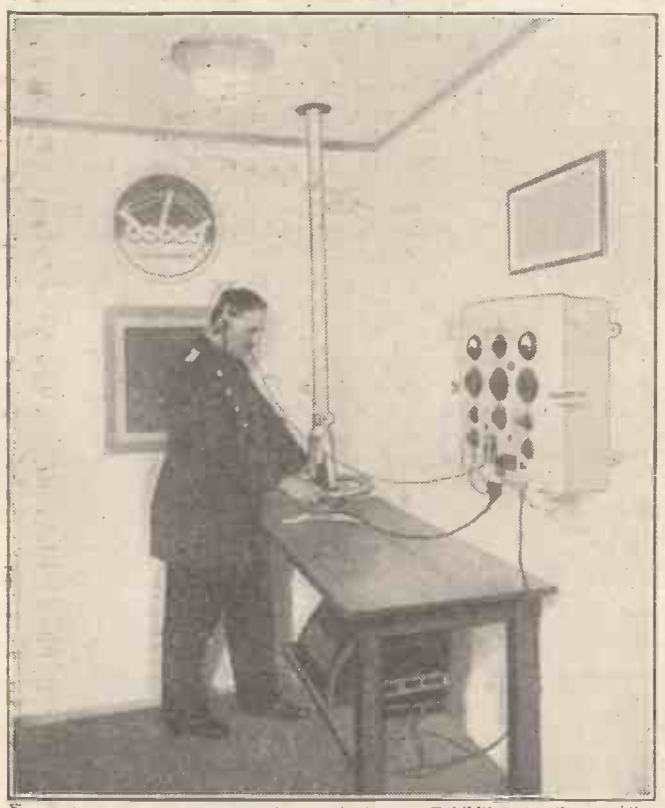
SIX-SIXTY
GLOWLESS VALVES

THE ELECTRON CO., LTD., 122-124, CHARING CROSS ROAD, LONDON, W.C.2.

THE GERMAN EXHIBITION.

(*Continued from page 352.*)

and the development and present arrangement of programmes is shown in a similar manner. The Norag Company (North German Broadcasting Co.) had on view a



One of the interesting demonstrations at the German Exhibition was the operation of a direction finder, illustrated above.

reduced replica of their new Noise Machine, which, to all intents and purposes, looks like a mechanical workshop with its belts, pulleys and motors, the whole being controlled from a switchboard. A model of the new high-power transmitting station, now in course of construction at Zeesen, near Koenigswüsterhausen, was likewise shown, illustrating the arrangement of the antenna system and the lay-out of the transmitter building.

An Interesting Exhibit.

An exhibit of particular interest was the Broadcasting Propaganda Car, which, on a suggestion by Major Schlee, is soon to start on its first propaganda tour through Eastern Prussia and Silesia, with its equipment of receiving sets and loud speakers, and is to make the broadcasting idea popular with the inhabitants of small towns and the open country. A telescopic mast allows an elevated antenna to be provided at short notice, two cone loud speakers, designed to be folded down from the back wall of the car, carry the programme of the nearest station to large crowds of listeners, while a microphone in the interior of the car enables direct information to be given to those surrounding the car.

The exhibits of the German Postal Department comprise a very instructive illustration of recent methods of wave-length gauging by means of quartz crystals and apparatus based on this principle and serving to keep wave-lengths constant.

Easily the most interesting exhibit of the whole show was the picture transmitter installed in a booth in connection with another booth at some distance where the corresponding picture receiver has been installed. Provision was made for every visitor using this installation and thus forming an idea of the mode of working of wireless picture transmission. Anybody was, in fact, entitled to bring along any picture or sample of handwriting and have it transmitted before his eyes.

Another interesting curiosity was the demonstration of wireless communication between the ground and an aeroplane soaring in the air, which was made every day at 6 o'clock.

A SERIES FOR THE NEW AMATEUR.

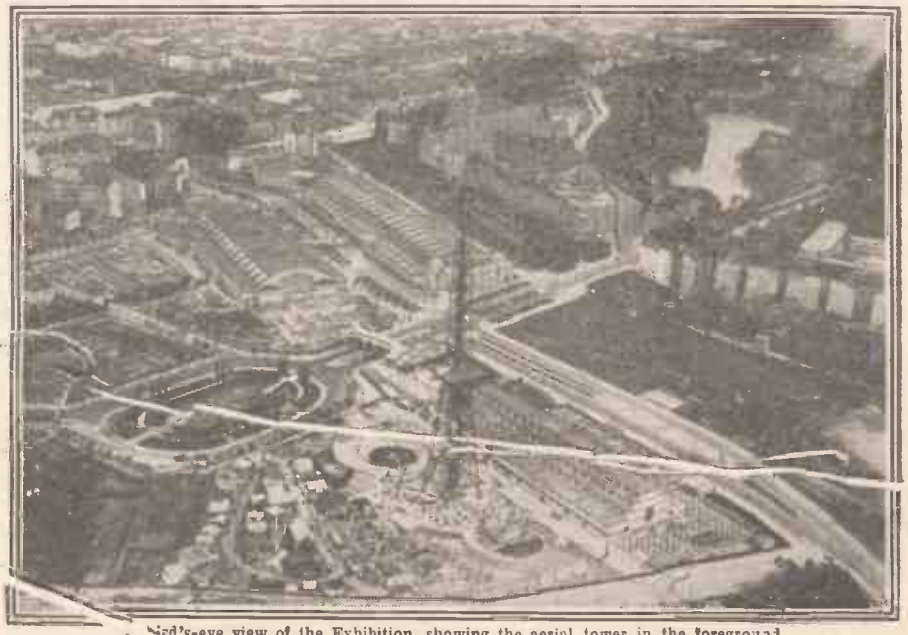
(*Continued from page 342.*)

You must have a little patience, for I must get at this point in a rather roundabout fashion. An ordinary toy magnet of a horse-shoe pattern will pick up light iron or steel objects, such as pins and needles, and you have probably noticed that this object will exert its power of attraction over quite a respectable distance. It will make pins jump up to it. Now these pins do not throw themselves at a magnet of their own accord. Something stretches out from the magnet to them and pulls them forward or upward as the case may be. This something is known as magnetic lines of force.

And when an electric current passes through a wire it causes very similar lines of force to radiate from the wire. (See Fig. 3.) It takes time for it to do this; a very, very small amount of time, but nevertheless, it does take time.

You must not confuse this with *resistance* a term which need not be taken into consideration just yet as it does not affect *tuning*. This opposition to current progress is known as *inductance*, and you will hear a lot about this later on. There is something else the current of electricity has to do and that is, like water flowing into a pipe, it has to fill the wire up as it goes along. The thinner the wire the less time it would take to do this, and if it had to fill up several wires joined together at each end of the journey to earth it would take longer to do the trip for this reason. The *capacity* of the system is, therefore, another factor in this time question. By altering either the inductance or the capacity of our aerial we can alter it to receive impulses from radio waves of different lengths. (See Fig. 4.)

In my next article I am going to deal with coils and condensers and show you how these represent inductance and capacity respectively, in a radio receiving set. This present article has dealt rather sketchily with these two most important factors in radio, but I do not wish to weary you with theory, and as we get down to practical considerations you will find that many of those little points concerning inductance and capacity which may be puzzling you now will straighten themselves out in a very simple manner.



A bird's-eye view of the Exhibition, showing the aerial tower in the foreground.

BROADCAST NOTES.

FROM OUR BROADCASTING CORRESPONDENTS.

Pushing the B.B.C.—Talbot O'Farrel—"How a Revue is Made"—Sir Landon Ronald's National Concert—Sir Frederic Cowen's New Songs—National Wireless Week—Dick Sheppard and the B.B.C.—William McCulloch for Dundee—Report of the W.O.A.C.—Redistribution: The Next Stage.

Pushing the B.B.C.

NOW that Captain Eckersley is on the other side of the Atlantic, progress with Empire broadcasting appears to be accelerating. The latest pontifical utterance of Savoy Hill on this subject declares that the transmitter is under construction, that it will use the masts at Chelmsford, and that its power will be up to 25 kw. working on 24 metres. So far so good. But what is all this about "spaced aerials" for reception? Surely that end will look after itself.

At least the Dominions and Colonies will be able to collect the signals once they are properly put on the air. Now that Savoy Hill is talking specific detail, there is at least some hope of the restoration of part of the prestige lost by Britain when British programmes were introduced to Australasia through the enterprise and courtesy of foreigners. Another significant point in the recent statement or "interim report" from Savoy Hill was the inference that a regular service would be operating in 1928. That *is* getting on. Now there must be no backsliding or delay.

Talbot O'Farrell.

Talbot O'Farrell, the famous Irish singer and entertainer, will be on the 5 G B programme on Monday, October 24th, and will be heard from 2 L O and 5 X X on the following Saturday, October 29th.

"How a Revue is Made."

Captain the Hon. A. Eliot, who is a well-known author of revue books, will describe how he does his job in a 2 L O talk on Tuesday, October 25th.

"Old Heidelberg."

From 9.35 to 11 on Monday, October 31st, 2 L O and 5 X X will give "Old Heidelberg," Wilhelm Meyer-Forster's romantic play, which deals with the life of a young prince who goes to a German University, and falls in love with the beautiful daughter of an innkeeper. Sir George Alexander's impersonation of Prince Karl made this play famous and popular in England.

Sir Landon Ronald's National Concert.

Sir Landon Ronald will conduct the Third National Concert at the Queen's Hall on Thursday next, October 20th. The soloists will be Myra Hess, who will play the Schumann Piano Concerto. Elgar's Symphony No. 2 in E Flat is the other principal work. Ernest Farrar's "English Pastoral Impressions," a new English work, awarded a Carnegie prize, will also be given at this concert. Weber's "Oberon" Overture and Svendsen's "Carnival in Paris" are also to be included.

Last year the B.B.C. was criticised for having too many foreign conductors and artistes for their National Concerts. This year the criticism is likely to be in an opposite sense. Already the hardened music critics are complaining that the B.B.C. is taking too narrow and nationalist a view of its duties in the artistes which should be provided for the National Concerts. Listeners cannot have it both ways. The probability is that the B.B.C. is about in the right place: in the middle, and therefore unpopular with both sets of extremists.

Sir Frederic Cowen's New Songs.

"Songs for My Little Ones," is the title of a new book of songs by Sir Frederic Cowen, the music being set to a number of "Punch" child verses. The composer will conduct a selection of these songs when Miss Dora Labbette sings them at London, on Tuesday evening, October 25th.

National Wireless Week.

The B.B.C. is spreading itself for National Wireless Week, November 14th to 19th inclusive. Very special programmes are being built, and the firmament that week should be ablaze with bright stars. The impetus of the successful exhibition was turned to good account in an access of closer sympathy and cooperation between the trade and the B.B.C. The latter must see to it that there is never again the kind of lapse of contact that occurred in the early part of 1927.

Dick Sheppard and the B.B.C.

Now that several newspapers have made regular writing arrangements with Mr. Sheppard, it looks as if he is to be lost to broadcasting. If this is so, it is up to Savoy Hill to tell millions of disappointed listeners the reasons why. People will not be put off by evasion, however ingenious.

William McCulloch for Dundee.

Mr. William McCulloch, of Paisley, who is the champion Scottish "presider," will be in charge of Sandy Soutar's benefit concert at Dundee next Tuesday, October 18th. This special programme, which is being relayed throughout all the Scottish stations, will be a great event in the broadcasting history of Dundee.

Report of the W.O.A.C.

The Wireless Organisations Advisory Committee of the B.B.C. has presented its first half-yearly report to the governors of the B.B.C., who have issued it for publication. The report gives a skeleton outline of work done, and suggests that it has been a good deal emasculated in drafting. But, despite this impression, there is a residue of useful result.

The W.O.A.C. may have very little claim to represent the listening public, but it appears to be at least a group of intelligent, well-intentioned citizens, whose individual reactions on programme matters must be of some account. It is understood that Colonel Moore Brabazon intends to take up the work of this committee quite seriously in future. There may be other additions. The forthcoming union of the Wireless Association and Wireless League will free some seats at the committee table. Why not a representative of the wireless press?

Redistribution: The Next Stage.

It seems practically certain that the B.B.C. will not tackle more than the new London twin-wave transmitter as the curtain for the new regional scheme. The intention has been to put Manchester and Cardiff in hand simultaneously; but so many new points have been raised by 5 G B's working that the first twin-wave regional transmitter will be erected somewhat tentatively somewhere near the metropolis.

THE GERMAN RADIO EXHIBITION.

One of the stands at the German Radio Exhibition, a report concerning which appears in the pages of this issue of "P.W."

This hut houses Aberdeen's transmitter.

2 BD

A visit to the Aberdeen Broadcasting Station.

By G. V. DOWDING, Grad.I.E.E.
(Technical Editor.)

THE rapid progress that has been made in broadcasting during the past three or four years is strikingly emphasised by the expansion of many of the studio premises. When the Aberdeen Station opened in October, 1923, for instance, two or three rooms above a shop in a side street provided ample accommodation. But the staff was then quite small and consisted merely of the Director, who was Mr. R. E. Jeffrey—now of Savoy Hill, by the way—an assistant and two engineers. And both the staff and artistes had to pass through the shop before they could get to either the studios or offices.

Within nine months two extra rooms had to be requisitioned, but even so it was soon found that further accommodation was necessary. Therefore, the following year saw three more rooms added and a separate entrance made. The result is a very queer assembly, for one half of the station is in one building and the remaining half in another. There is an old house at the back of the shop premises, and most of this has been taken over, and the two buildings linked together by means of a sort of covered-in bridge affair.

The Lonely Englishman.

To get into the station one has to pass through a narrow entrance at the side of the shop—this, appropriately enough, sells electrical gear—and climb a few flights of stairs; one is then faced by the well-lighted connecting corridor-cum-bridge. Across this one reaches the studio and some of the offices.

On the occasion of my visit to 2 B D, Mr. Neil MacLean, the Station Director, was away at Glasgow, where he had been singing for the benefit of listeners in that area. But I met him later in peculiar circumstances, as I shall in due course relate. However, the Assistant Station Director was there to greet me upon my arrival, and a very pleasant young fellow I found him. Like his chief, and, with one exception, the remainder of the staff, he is a Scotchman. Curiously enough, the only Englishman at the Aberdeen Station is the one man I should have wagered anything would be a Scotchman—that is no other than the Engineer-in-Charge!

But it must not be imagined that they are all wild "hielanders" at 2 B D, and that broad Doric fills the air like a fog! On the contrary, I was able to understand every word spoken by the Assistant Station Director, Mr. Munro, the Musical Director, and other of the staff with whom I conversed! And when I add that I had light refreshment offered me, and that I was given free passes to at least three cigarette cases, it will be agreed that I was right in coming to the conclusion that Aberdeen is a much maligned place!

No Humorists!

But I did not find the 2 B D people bitter on this subject, indeed they were so cheery that I asked the inevitable question, "Do you discover many humorists at your auditions?" very early on in the proceedings. And I was staggered to learn that practically no humorists at all present themselves for microphone trials at Aberdeen. The Assistant Station Director ventured the explanation that Aberdonians are too "hard headed" and too logical to make good comedians. I have since wondered whether it is not the intense seriousness of serious Scotsmen that appeals to us Southerners as being humorous!

Nevertheless, the Aberdeen Station has the services of Mr. Arthur Black, who, besides writing successful broadcast plays, appears before the 2 B D microphone as "George," and, in this character, manages to make the North chuckle heartily. Curiously enough he is a local schoolmaster, at least it seemed curious to me that a schoolmaster should blossom forth as a humorous microphone character.

Thirty or forty per cent of the people who attend the Aberdeen auditions qualify for broadcasting, although, as was admitted by Mr. Munro, it is possible that 2 B D's standard is much lower than that of London or any of the larger stations. Also they have not the population on which to draw, although it is interesting to note that the percentage of the population who are licence holders is higher in the Aberdeen area than anywhere else in the country.

Scottish Programmes.

"Do you give many Scottish programmes?" I asked the Assistant Station Director.

"We give one regularly every week," he replied.

"And do these prove popular as far as you can judge?"

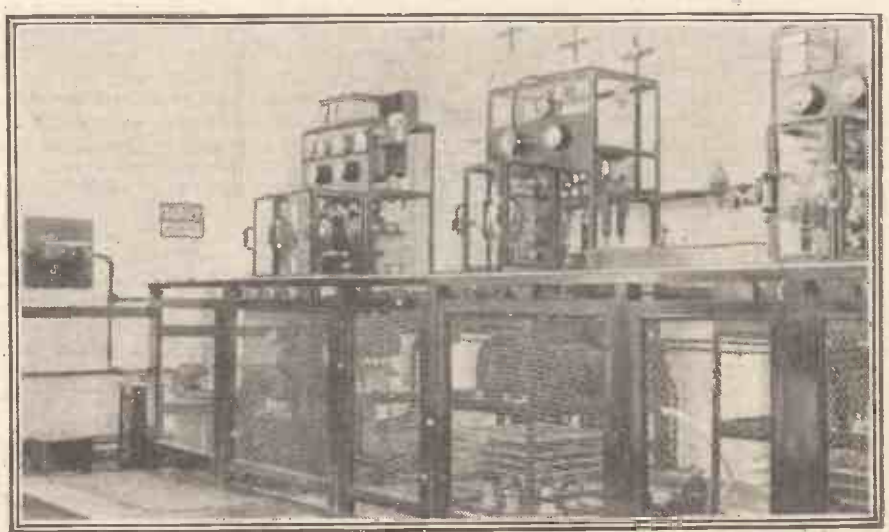
"Very popular indeed," he replied; and he went on to explain that subsequent to the broadcasting of one of the first Scottish variety programmes (the one which, I believe, was relayed to some of the other stations including Daventry and London) more letters of appreciation were received from listeners than were generally received in a whole year.

"But why do you not give even more Scottish variety programmes, if that is the case?" was my very natural query. And then it was pointed out to me by Mr. Munro, the Musical Director, that it is very difficult to compile Scottish programmes of any sort, for the simple reason that there is a limited supply of Scottish music.

"We generally manage to fill up a variety programme," added the Assistant Station Director, in whose office we were seated, "with a play, and it is here that we find Mr. Black of very great assistance."

And while the two broadcasters were talking I was endeavouring to reconcile my gathering impressions with a statement that I had read somewhere to the effect that the B.B.C. is held in almost universal contumely in Scotland. And I must say that I found it difficult to do so, for sitting before me were people who were evidently taking their work really seriously. Their sole object seemed to be to please their listeners. And they appeared to be desperately keen

(Continued on next page.)



Aberdeen's transmitter is a standard "Q" set, but is very neatly arranged within a small brick building, the entrance to which is shown in the above heading photograph.

2 B D.

(*Continued from previous page.*)

to impress upon me that they have succeeded and are succeeding in doing so. Not being a 2 B D listener, I am not in a position to say whether or not this is the case, but I am sure of one thing, and that is that there would be greater toleration and even more appreciation on the part of listeners if everyone had the opportunity, and took it, of meeting our broadcasters in person. Only a very small number of the B.B.C. officials I have met are guilty of that "we know what's good for them" air of "take it or leave it" in respect of the radio programmes.

2 B D's Individualism.

And I do not mind saying that none of these are to my knowledge located at Aberdeen. Indeed, this station gave me the idea that it is doing its very best to get on good terms with its listeners, but that it is severely handicapped by a lack of local material and an excess of Savoy Hill. Not that there were any grumbles on this account, but the following incident is proof of 2 B D's individualism and of the "pernicious" influence of "headquarters!"

One Good Friday, Savoy Hill circulated a full length oratorio. This was simultaneously broadcast by every station with the one exception of Aberdeen, who decided to transmit a general concert instead. Naturally, this was greatly appreciated by 2 B D listeners. I say, "naturally," for although some oratorios are, of course, very beautiful I have no doubt that a vote among listeners would show that the practices of St. Philip Neri do not tend to make *popular* radio fare.

"What do you regard as your one outstanding broadcast?" I asked the Aberdeen studio leaders, and as there ensued a rather awkward pause, "Surely there has been one programme that stands out above all others in your own minds?" I added encouragingly.

A Popular Broadcaster.

"Well," replied the Assistant Station Director slowly, "'Main's Wooing' was as good as anything we have attempted."

"'Main's Wooing?'"

"Yes, it was a full length Scottish play adapted for broadcasting. It was written by Gavin Greig, a country schoolmaster, and it is undoubtedly one of the most faithful presentations of Scottish country life ever conceived." He then proceeded to give me full details of the broadcast. And judging by these, I should imagine it must indeed have been extremely interesting, and were it broadcast again I am certain that I would listen to every word of it. And when Mr. Munro, the Musical Director, added the sad information that Gavin Greig recently died, the enthusiasm imparted me can be judged when I add that I heard this with a sense almost of personal loss.

"George" was frequently cropping up in the discussion, but it appears that there is another Aberdonian who is equally popular "on air." This is Mr. Craig Myle, who, I was informed, can make his talks on the game of football so attractive that his circle of listeners extends far beyond those who are interested in his actual subject.

"Everybody in Aberdeen knows Craig Myle," said the Assistant Station-Director. "Sometimes when he is on his way to give his six o'clock talk, he will pass a tramcar unloading people returning home from work. 'Wait till we get home, Craig boy!' they will shout as he goes by."

A Queer Coincidence.

At that moment the telephone bell rang. The Assistant Station Director picked up the earpiece and commenced a conversation with the caller which I could not help noticing had something to do with a forthcoming talk on football.

"It is Craig Myle himself," whispered the Assistant Director with a smile, turning his head away from the instrument. And that surely *was* a queer coincidence.

"Craig Myle is a very popular local preacher," said Mr. Munro, and that I thought was even stranger still, although I suppose I had no real justification for thinking so, as religion and the game of football need not be opposing interests!

During the following half an hour or so I learnt many interesting things about Aberdeen. For instance, I was told that Sir John Reith is an Aberdonian and not a Glasgow man, as I had previously believed. But this is not Aberdeen's only claim to fame, for I had it pridefully brought to my notice that the first community singing broadcast was transmitted from 2 B D. This was relayed from the Aberdeen Music Hall early in 1924. This "Music Hall" is not a variety theatre, but a concert hall in the local City Hall, which is but one of Aberdeen's many fine public buildings. After the laughter which followed my mistake in this respect, I asked Mr. Munro:

"Does syncopated music prove popular in Scotland?"

"Yes, undoubtedly it does," he replied.

"I suppose that is because it is not unlike Scotch bagpipe music?" I suggested.

"Scottish reels," smiled Mr. Munro, "are in a similar 'time,' and are, I suppose you would consider, equally barbaric."

By this time we had left the Assistant Station Director's office and were strolling round the station.

"This is the Station Director's office," explained Mr. Munro, and then I was shown a large portrait of Mr. Neil MacLean, and in view of subsequent events, this was yet another coincidence.

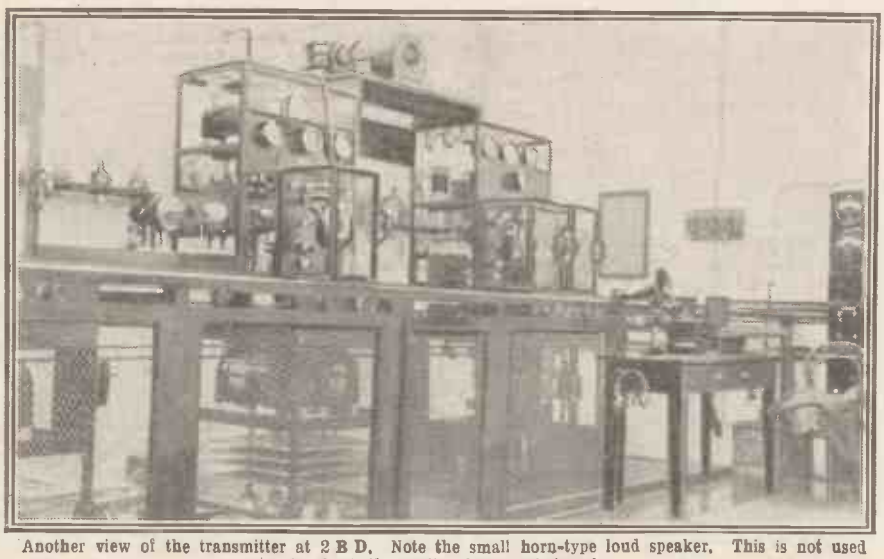
In the control room I listened awhile to 5 X X as picked up on the station "5 X X set." Landlines are not always used for relaying, and frequently it is found that the "radio link" is more satisfactory over the greater distances.

There is a nice little "talks" studio at 2 B D.

"Yes, we can make them comfortable enough in here," commented the Assistant Station Director, referring to radio lecturers.

"I suppose some of them do tend to jib when they are actually brought face-to-face with 'Iron Mike,'" I suggested.

"Some of them," he agreed. "Quite often lecturers arrive overflowing with confidence. Simply refuse to listen to any of our advice, 'That's all right, my boy. I've done this, that and the other. You leave it to me,' are the sort of things they will say. But when they actually start their talk, then they wilt and I can see the perspiration starting from their foreheads, and they will start fumbling with their papers, and so on. However, we make them as happy as we can and they generally get through their broadcasts satisfactorily."



Another view of the transmitter at 2 B D. Note the small horn-type loud speaker. This is not used to check the purity of transmissions!

The Main Studio.

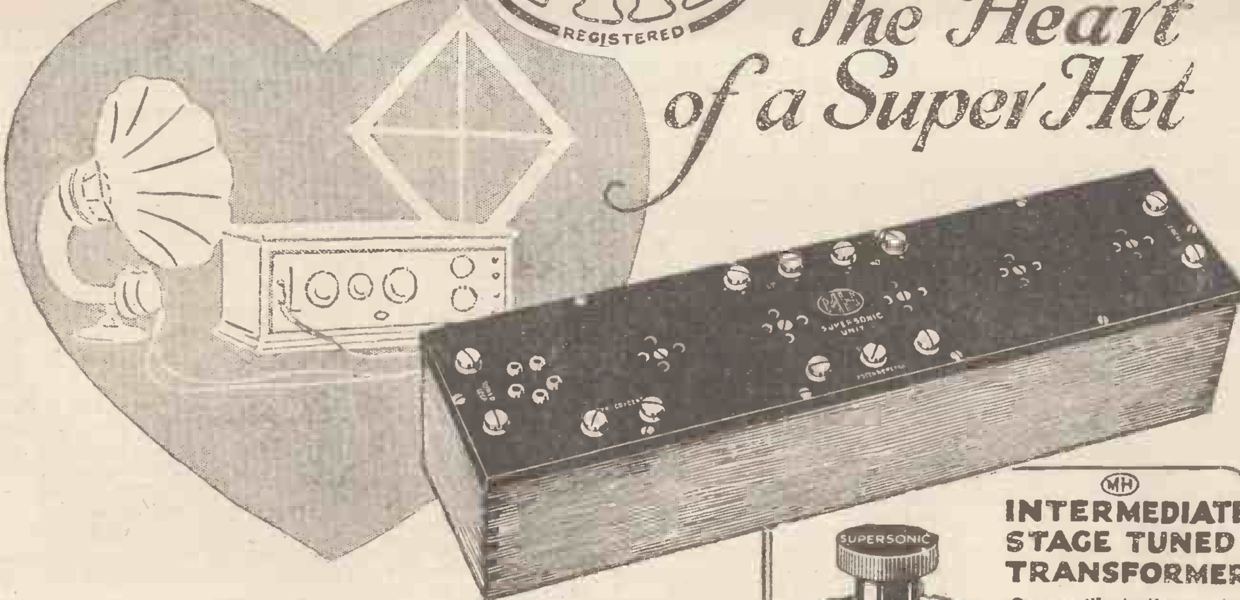
The main studio at 2 B D is small and dark. But, as was pointed out to me, the station has now only to accommodate an octette instead of a full permanent orchestra. At times, however, fairly large bands have to be squeezed in, and how they manage to do this is a puzzle to me!

Two small windows overlook the railway, and this is the main line. Aberdeen station, the railway variety, being but a short distance away and the fact that there is a rather severe gradient, huge express engines snort slowly by this window, but the noise does not interrupt studio proceedings, for the studio is practically sound-proof when all the curtains are drawn. But the sounds

(*Continued on page 372.*)

MH REGISTERED

The Heart of a Super Het



MH SUPERSONIC UNITS

Provide the Best means of Supersonic Reception

Where the extreme limit of range is required without complication, the supersonic system offers marked and unique advantages. The MH series of units comprise Supersonic Transformers, Auto Oscillators, complete Kits, Block Units, and high-grade Supersonic Receivers of seven and eight valves. Space precludes a detailed description of the various applications—suffice it to say that the units illustrated on this page are of the MH standard of workmanship and performance affording results second to none.

THE MH SUPERSONIC BLOCK UNIT FOR RECEPTION ON SHORT WAVES. Short wave enthusiasts will be well advised to give this serious consideration. Here are a few points of advantage:

1. *Simple Control.*
2. *High Amplification.*
3. *Adaptable to any waves between 25 metres and 2,000 metres.*

To purchasers of the MH Supersonic Block Unit two Blue Prints are given, one showing the method of connecting up, and the other the adaptation to Short Waves.

This unit forms the nucleus of the Six-Valve Receiver used by Mr. Allen, A.M.I.R.E., for the direct reception of the Australian Broadcast Programme, a distance of 13,000 miles.

Report of this success appeared in the "Daily Mail," September 5th, 1927.

Price: MH Block Unit (including 5 Point Oscillator) 300/600 Metres	£6:6:0
Price: MH Supersonic Kit of Parts	£4:7:6

We are exhibiting at the MANCHESTER RADIO EXHIBITION Oct. 24 to Nov. 5

Telephone: Slough 441-442.

L. McMICHAEL LTD

Telegrams: Radiether Slough.

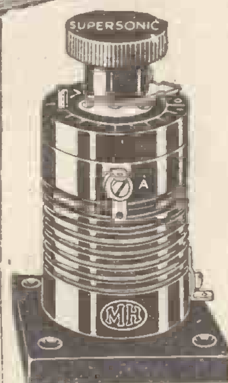
Manufacturers of Wireless and Scientific Apparatus

WEXHAM ROAD, SLOUGH, BUCKS.

IRISH AGENTS: B. N. B. WIRELESS, LTD., DUBLIN & BELFAST.

MH

INTERMEDIATE STAGE TUNED TRANSFORMER



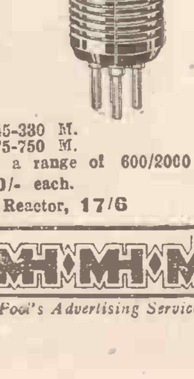
Our illustration is representative of one of three tuned Transformers supplied with the Kit. The remaining units completing the MH Kit are 1 MH Tuned Filter and 1 MH Autodyne No. 1, and Reactor Unit for Broadcast Band.

Price, Complete in Case, **£4 : 7 : 6**
Or separately, **17/6** each.

A complete description with full constructional details of a seven-valve Supersonic Receiver may be had on application enclosing P.O. for 1/-, the booklet being supplied free to the purchaser of our Supersonic Kit of Parts.

MH

COMPLETE NEUTRAL POINT AUTODYNE UNIT & REACTOR



The Autodyne Units, in conjunction with the Receiver, form the essential first valve stage. The reactor is attached to the Autodyne Unit by guide pins. The Reactor, as illustrated, can be used with any range listed below. The Autodyne Units have the appearance of the well-known H.F. Transformer, but the two windings are electrically balanced and join in a common point. Guide Pins are fitted ready for inserting the Reactor.

No. 0 has a range of 145-330 M.
No. 1 „ „ „ 275-750 M.
No. 2 (for Daventry) has a range of 600/2000 M.

Price **10/-** each.
Complete with Reactor, **17/6**

Foot's Advertising Service Ltd.

Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Department 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 unbiassed guide as to what to buy and what to avoid.—EDITOR.

RADIO TENDENCIES.

THE increasing popularity of the cone types of loud speaker must be evident to even the casual observer, and it is of course popularity well merited. In America, where radio seems frequently to be just one step ahead of radio in this country, practically every speaker sold is a "Cone," and it would appear probable that we will be meeting a similar condition before this season concludes.

There are some extraordinarily good cones on the market, and there are some that are bad, but even the worst of the cones seem to be definite advances on moderately good horn types. We must exclude exponential horns from the above remarks but these are very rare.

In horn type speakers one must beware of "coloration," which, in cases, is liable to drug one's aural senses into believing that scandalously mangled reproduction is passing good. We meet the same sort of thing in some cones but seldom to such a marked degree.

The new screened or shielded-grid valves are causing technicians furiously to think. On the one hand there is the indisputable efficiency of these tubes and on the other their rather high prices. With normal methods of stabilising, such as the neutralising systems, it *is possible* to use much cheaper valves. The problem facing radio set designers at the moment is whether or not to ignore the price business and nail their colours on the mast of efficiency in H.F.

The shielded grid valve does not merely line itself up as an alternative to neutralising, it offers the definite advantage of increased magnification. The ultimate solution to the problem rests with constructors, as in many other instances, and no doubt within a very short time it will be possible to gauge the trend of their opinions.

Two-volt valves always were more popular than either six- or four-volters, and it would appear as though they are to prove even more popular still this season.

"Eliminators" are going from strength to strength, and we predict that where there are mains, H.T. batteries are doomed to a very thin time in the future.

The A.C. valves which derive their filament (or cathode) heat from "raw" A.C. have proved their efficiencies and have also shown that they are possessed of long lives. Therefore, there is nothing to be lost and everything to be gained by their use where A.C. mains exist, and this season should see these A.C. valves very much to the forefront.

With better valves, better loud speakers and better components available more attention than ever is being paid to "quality," and the days of "punch" and "selectivity" at the price of clipped frequencies have quite passed. Therefore, resistance-capacity L.F. coupling is coming into its own. And now that R.C. is more widely used both its limitations and its advantages are becoming more widely appreciated. It is now realised by most constructors that it is not advisable to strive for great amplification by using two or more very "high mu" valves and

(*Continued on page* 364.)

APPARATUS TESTED.

(Continued from page 362.)

resistance-capacity components designed to operate with them. In fact, lower amplification with lower anode resistances and "lower mu" valves capable of handling fair inputs without distress, and quality reproduction are now recognised to be primary requirements.

A TWO-STAGE R.C. UNIT.

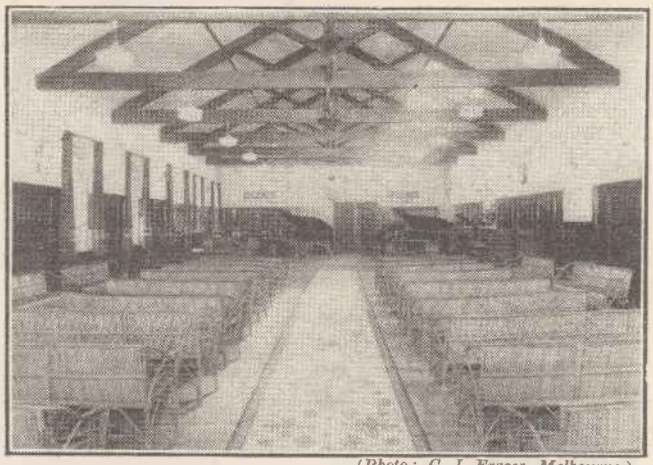
The R.C.C. method of coupling L.F. amplifiers lends itself to compactness, and the Radi-Arc people have gone a step further than usual and have embodied in one unit all the necessary elements for coupling together two stages. This is known as the "Liberty" two stage resistance-capacity coupled unit. It is a neat, flat article having six terminals on it. It occupies but little baseboard space—merely some 3 by 6 inches or so. The device is supplied complete with a blue print and full instructions for 10s. 6d.

The unit embodies two anode resistances, two grid resistances, two grid condensers, and a by-pass condenser for the first anode resistance. And it will be agreed that all these made up into one unit render this "Liberty" component good value for money, more especially in view of the simplification in wiring that it offers to the less experienced constructor.

It is rather a pity that the values of the various components are not given either on the unit itself or in the instructions, for amateurs these days do like to know the "ohms" and "mfds." of their gear. However, on test we found the anode resistances to be each just above ¼ meg. This is quite satisfactory; high notes would have suffered were they higher, although amplification would have been greater. The grid resistances and grid condensers for the two stages are respectively, 1½ megs. —·004 mfd. and 1 meg.—·005 mfd. These are quite well proportioned, and enable about 80 per cent of the full amplification to be obtained at 50 cycles. Only one-grid bias terminal figures on the unit, and this has perforce to serve the two L.F. amplifying valves—in the three-valve circuit this includes the last valve, which is rightly shown as a "power" valve. It is rather difficult to make the same grid-bias tapping serve a valve of the "R.C." type, and one of the "power" type. Nine volts is recommended by the Radi-Arc people, but this is a compromise that would not suit quite a number of valve "teams" that suggest themselves to us. It would be very much worth while to introduce the insignificant complication of another grid-bias terminal.

DUBILIER FIXED RESISTORS.

The Dubilier people have produced a fixed resistor which will fit into their well-known Dumetohm holders. Similarly to their grid leaks it is of cartridge design, and has metal end caps. Notwithstanding its small size the Dubilier fixed resistor can be obtained with a resistance as high as 50 ohms. In fact, the range of resistances available is a very comprehensive one and twenty different values are obtainable between 1 ohm and 50 ohms, all at the one standard and very reasonable price of 1s. each. We have tested several samples and find them all to be accurately rated, and they do not vary but appear to be perfectly reliable in every respect. We can recommend them to the attention of all set builders.



(Photo: C. J. Frazer, Melbourne.)

The new studio at the 3 L O station of Melbourne. As will be observed, this studio is provided with a fairly large auditorium, and is capable of accommodating a considerable audience as well as the artistes, orchestra, etc.

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., M.R.S.L., F.R.G.S.

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

Assistant Technical Editors:
K. D. ROGERS. P. R. BIRD.
G. P. KENDALL, B.Sc.
A. JOHNSON RANDALL.

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

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 enquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work, carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of this paper 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 the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

Questions and Answers

CURRENT FLOW THROUGH A CONDENSER.

B. M. (Lechlade, Gloucestershire).—"If a sensitive meter is placed in series with a large condenser and an alternating potential is

(*Continued on page* 368.)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 366.)

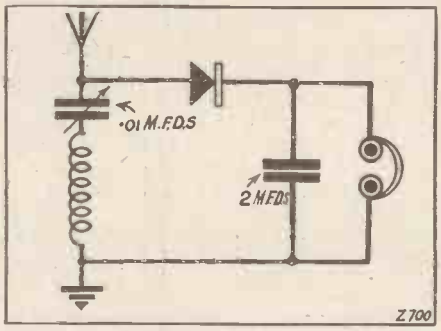
impressed across the circuit, would the meter show a reading? If so, how does current flow when there is an insulator (the condenser's dielectric) directly in series with the circuit?"

A sensitive meter of the hot-wire type would register a current-flow in such a case, but the current registered would not be flowing "through" the condenser. It would merely flow in and out of it.

When no difference of potential was applied to the ends of the circuit, there would be no electron movement (i.e., there would be no current). But when one end was made positive and the other end negative, there would be an excess of electrons on the negative plates, and a deficit of electrons on the positive plates. This electron-movement would constitute a current which would be shown by the meter, and every change of potential on the condenser plates would be accompanied by a re-arrangement of electrons, so that a "current would be flowing" continually.

But the electron movement would be taking place via the external circuit connecting the two sets of plates, and not through the insulation of the condenser. The meter is placed in that external circuit connecting one set of plates to the other, so (provided it was of suitable type) it would register the electron-movement—i.e. the current-flow—in that circuit.

WHAT IS WRONG?



The above diagram is supposed to represent the connections of an ordinary crystal set, with "series" tuning; but it is wrong, and the set would not work. No doubt you can see the mistakes, but can you see them *all?*

Next week the correct diagram will be given, and to test your skill we shall continue to publish every week a diagram in which a mistake (or mistakes) has been inserted. The correction will be published the following week, and the series will work up from a simple crystal set to multi-valvers.

No prizes are offered, but by following this series and trying to solve the problems week by week the reader cannot fail to learn a lot about correct connections.

GRID CURRENT.

J. K. (Beeston, Notts.).—"How does the current in the grid circuit of a power valve compare in amount with the current flowing in the anode circuit of such a valve?"

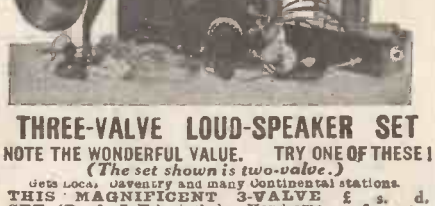
We are not at all sure as to what you mean by "the current in the grid circuit." Under normal conditions the grid of the valve should have sufficient negative bias applied to it to prevent *any* grid current flowing; but if the valve is not biassed (or is insufficiently biassed, so that a signal-voltage on the grid causes this latter to become positive), a certain proportion of the electron-stream will go to the grid instead of to the anode, and will constitute a grid current.

Such currents are very small compared with an anode current-flow. In a valve of the latest 2-volt super-power class, anode current varies from 0 at about 30 volts negative bias to about 30 milliamps, when there is no negative bias. Grid current in such a valve tends to flow when the grid is positive, and at one volt positive the grid current would amount to about 10 micro-amps. As a micro-amp is only one-thousandth part of a milliamp, it will be seen that the grid current, even under such conditions,

(*Continued on page* 370.)

JUST A REMINDER!

FERRANTI A.F.3, 25/-; 4, 17/6. Output 1-1, 20/-; 25-1, 21/-. **Marconi** Ideal, 25/-. **Pye**, 17/6, 20/-. **MULLARD, B.T.H.,** Ediswan, Cossor, Cosmos, Marconi valves, latest stocked. **WEARITE** 2-way coils, switches, M.O. 3 and 4 coils, Screening Boxes, etc. **PETO-SCOTT** (Keystone, Copex), screens, bases, H.F.T., Neutralising all parts. Screening Boxes. **PEERLESS RESISTORS,** 1/3. **BURNDEPT** Rheostats, Dials, Potentiometers, Resistors, and Holders. **R.I.-VARLEY** R.C.C. Unit, 20/-; Tuner, 39/6; Anode do., 25/-; Multi L.F., 25/-; Perm. Detector, 6/-; Chokes, 7/6; Anode res., 9·6 to 18/-. Double Choke, 32/6; Latest Tuner, 47/6. **DUBILIER** Grid Leaks, W.W. Anodes, Mansbridge Condensers, fixed do. **LEWCOS** C.T. Coils, wound Litz wire, 60, 3/6; 200, 5/3. Frame aerial wire, 3/6 100 ft. coil; Multiway Battery Leads, 4-way, 5/6; 5-way, 6/6, 6-way, 7/6, 7-way, 8/6 (5 feet in length); Glazite, 10 ft., 1/2 (4 colours); Screens, Bases, H. F. Transformers, Inductance Coils, 25, 35, 50, 3/6 each; 75, 100, 4/- each; 150 and 200, 4/6 each; 250, 5/-. **LISSEN** Valve-Holders, 1/-; Fixed Con., 1/-, 1/6; Leaks, 1/-; Switches, 1/6, 2/6; Latest 2-way Cam-Vernier, 4/6; Rheostats, 2/6; B.B., 1/6; Lissenola, 13/6; L.F. Transformers, 8/6; 100-v. H.T., 12/11; 60-v. H.T., 7/11; Coils, 60X, 6/4. 250X, 9/9. Stats, minor, major, all parts. **C.A.V** Multiple, 5/-; **CARBORUNDUM** Units, 12/6; Detector, 5/-. **FORMO** Variable Condensers, 7/6. **FORMODENSER,** ·0005 and ·0001, 2/6 each. **CYLDON, IGRANIC, WEARITE, RESISTON, BENJAMIN, NEWEY, PYE, BOWYER-LOWE, COLVERN, PEERLESS** components all stocked here. **ZAMPA** (mic.) Tuner, 200/2000, metres, 19/6. **MARCONI** Switches, Leaks, Condensers, Valves, etc., etc. **LOTUS** V.-Holders, 2/3, 2/6. Remote Control, 30/-. Coil Plug, 8d. **GAMBRELL** Coils, 4/10 to 10/-. **C.T.** 6d. each extra. **LOUD SPEAKERS:** Dr. Nesper Cabinet, 52/6. Amplion Cone A.C.3, 75/-. Celestion, 110/-, 140/-. Sterling, and all good makes. **McMICHAEL** Unimic, 5/-; Dimic, 10/-; Bases, 2/6; Fixed Cond., 2/6, 3/-; Bases, 1/-; 3-pt. Switch, 3/6; 6-pt., 4/6. **BREMER TULLY** S.W. outfit, 41/6. **BULGIN** P. Pull, 1/6; Dialites, 2/6. **BACK OF PANEL,** 2-way, 3/11, 4/6, 7/6. **BELLING-LEE** Terminals. **BRITIMAX** Tuner, 18/6. **VERNIER** Dials: Ethovernier, 9/-. K.K. Port Dial, 10/-. Pilot, 4/6. Ormond, 5/-. All makes stocked. **UTILITY** Friction, ·0002 for S.W., 13/-. Switches from 3/6. Push-Pull, 4/6. **J.B.** Condensers, T.T. Friction Ver., ·0005, 16/6; ·00035, 15/6; ·00015, 15/-; S.L.F. ·0005, 11/6; ·00035, 10/6; ·00025, 10/-; ·00015, 10/-; Sq. Law, ·001, 9/6; ·0005, 8/-; ·0003, 7/-; Neutralising, 3/6. **MANSBRIDGE** Condebsers, T.C.C. 2 mfd., 3/10; 1 mfd., 3/-. All cap. stocked. High Voltage (tc0-v), 4 mfd., 13/10; 2 mfd., 7/10; 1 mfd., 5/8. (Dubilier and Lissen stocked.)



THREE-VALVE LOUD-SPEAKER SET

NOTE THE WONDERFUL VALUE. TRY ONE OF THESE!

(The set shown is two-valve.)

Gets Local, Daventry and many Continental stations.

THIS MAGNIFICENT 3-VALVE SET (D. & L.F.), includes Handsome Polished American-Type Cabinet (all parts enclosed), 3 Dull Emitter Valves, Tuning Coils, H.T. & L.T. Batteries, Aerial Equipment, Leads, Loud Speaker or 'Phones. Tax paid. £ s. d. **5/19/6**

JUST THINK of a 3-Valve Set at £5/19/6! It sounds unbelievable, doesn't it? Carr. forwd. case 2s.

HELLESEN (post free), 66-v., 12/6; 99-v. 21/-. Grid Bias, 9-v., 2/-; 4½-v., tapped 1½-v., 1/2. **PANELS.** Grade A, cut to size, 4d. sq. inch, 3/16, or 2d. for ½in. Reduction Large Sizes. **CABINETS.** Large stocks of really useful cabinets kept, or made to order. Solid oak. Glass finish. American type, hinged lid, baseboard. Post 1/6 each extra.

9 x 6 x 7 ins. deep ... 7/11
10 x 8 x 8 ins. deep ... 6/11
12 x 8 x 8 ins. deep ... 10/6
14 x 7 x 9 ins. deep ... 13/6
16 x 8 x 9 ins. deep ...15/11
24 x 7 x 9 ins. deep ... 27/6

Extra quality in Oak or Mahogany, 5/- each extra, worthy of any set.

RADIO MICRO 2-v. ·2, 5/11; 3·5 ·05, 7/6; 2-v. Power, 10/6; SUPER POWER, 3·5-v. 1 amp., latest valve, 10/9 each. Post 6d. each.

NEUTRALISING. Peto-Scott, 5/-, 6/3, 7/6. Ormond, 4/-. Bowyer-Lowe, 7/-. Magnum, 5/-. McMichael, 4/9. Reaction (Ormond) ·0001, 4/-. J.B., 3/6.

THE NEW No. 3

ORMOND

S.L.F. CONDENSER ·00025, 5/6. ·00035, 5/9. ·0005, 6/-. **With 4" Dial, 6/- ea. extra. With Friction 55-1 4-in. Dial, 6/- ea. extra.**

ORMOND, Square Law Low-Loss. ·0005, 9/6; ·0003, 8/6 (1/6 each less no vernier); **Friction Geared,** ·0005, 15/-; ·0003, 14/6; ·00025, 13/6. **Straight Line Frequency Friction Geared.** ·0005, 20/-; ·00035, 19/6. **S.L.F.** ·0005, 12/-; ·00035, 11/-. **SQ. LAW LOW-LOSS DUAL.** ·0005, 16/- each. **Ormond Friction Dial, 10/-. Filament Rheostats, Dual, 2/6; 6 ohms, or 30 ohms, 2/-. Potentiometer, 400 ohms, 2/6.** ·0001, **Reaction, 4/-; Air Dielectric, 2/-. Neutralising, 4/-; Neutrodyne, 2/-. Twin Gang,** ·0005, **32/-; Triple, 40/-. H.F. Chokes, 7/6. Geared Dial, 5/-.**

WE STOCK IGRANIC, CLIMAX, EVERREADY, HELLESEN, SIEMENS', FORMO, FERRANTI, WEARITE, ORMOND, J.B., BENJAMIN, LOTUS, MULLARD, DUBILIER, LISSEN, LEWCOS, UTILITY, MAGNUM, PETO-SCOTT, PEERLESS, BURNDEPT, PYE, MARCONI, McMICHAEL, COSMOS, CARBORUNDUM, R.I. VARLEY, GAMBRELL, BROWN'S, STERLING, AMPLIONS. IN FACT EVERYTHING IT IS POSSIBLE TO STOCK.

SPECIAL CABINET

12 × 8. 9" deep.

Compartment underneath to hold L.T. and H.T. Batteries. Solid oak, height 16" Carr. 2/6. **18/11**

PERSONAL SHOPPERS.

WE ARE OPEN

ALL DAY SATURDAY
ALL DAY THURSDAY
ALL DAY EVERY DAY

2 Shops, if one is closed the other is open.

Hours 9 a.m. to 8 p.m.
Sat. 9 a.m. to 9 p.m.
Sunday morning 11-1

NOTE WONDERFUL OFFER BELOW!

STUPENDOUS BARGAINS

BE SURE YOU ARE AT RAYMOND'S!

These SPECIAL LINES ARE SOLD to *CALLERS ONLY* who are purchasing their regular wireless supplies *at the same time*. ALL BRAND NEW.

YOU CAN ONLY BUY THESE AT RAYMOND'S WHEN BUYING OTHER GOODS. NOT SOLD AT THESE PRICES ALONE OR BY POST.

MANSBRIDGE CONDENSERS. Brand new, 1 mfd., 1/6; 2 mfd., 1/11; 4 mfd., 3/11. (LIST prices double.)

63-v. BATTERY CASES, complete with Clips, 1/-. (List 2/6 each.) All brand new.

4" EBONITE DIALS, extra quality, 10d. (List 1/8.)

250 CT. COILS, 1/3. (List 3/-.)

AMERICAN CABINETS, various sizes, 6/11, 8/11, 10/11, 12/11. Oak polished. (List double.)

ACCUMULATORS, 2-v. 40-a., 4/11. (List 8/6.)

HEADPHONES (4,000 ohms), brand new, 1/11, 2/6, 2/11. (List prices treble.)

LOUD SPEAKERS, brand new, 4/11, 6/11, 12/6, 15/-, 21/-. SEEING IS BELIEVING. (List prices double and treble.)

LOUD SPEAKER UNITS, 4,000 ohms. 6/11. Brand new. (List 11/6.)

H.F. TRANSFORMERS (6 pin). S.P., 3/6; S.S., 3/11. Brand new. (List 8/6.)

H.F. TRANSFORMERS (4 pin), B.B.C., 2/11. Brand new.

CONDENSERS, brand new, 1/8, 1/11, 2/3, 2/6. S.L.F. Log. mid-line. Sq. law (List price double.)

60-v. H.T. BATTERIES. Brand new. Fully tested. 3/6 & 3/11. (List double.)

100v. H.T. BATTERIES. 4/11 (List 10/6). 5/11 (List 11/9). Brand new. Tested.

H.F. CHOKES (List 5/-) 1/11 & 2/6. Brand new.

VOLTMETERS, d'ble d'd'g, dead beat, 3/11 (List 6/11). Brand new. TRY ONE!

VERNIER DIALS, (W. Log). British. 2/3, 2/6. (List 7/6.) Brand new.

AMERICAN TYPE CABINETS, mahogany polished (16/11 list), hinged lid, baseboard, 14 x 8 x 8 ins. deep, 7/11.

MAHOGANY PANELS. 10 x 8 ins. 1/3; 12 x 8 ins., 1/6. (Absurd prices.)

INDOOR AERIALS, with insulators and lead-in, 3d. (List 1/6.)

HUNDREDS OF OTHER BARGAINS.

PLEASE READ TERMS OF SALE FOR ABOVE GOODS. NO POST.

LOG-MID-LINE

Try our NEW VARIABLE CONDENSERS, made on the Log-Mid-Line principle. ·0005 or ·0003, with a 4-in. Triolite Dial, the best you can buy, for the moderate price of **5/11** each, post free

LOW LOSS SQUARE LAW,

·0003 ·0005 **4/11** each

By Post **5/11**

This variable Condenser is simply marvellous value. It cannot be equalled in price or quality.

With VERNIER 1/- extra.

SET OF THE SEASON

COSSOR MELODY MAKER

— COMPONENTS FOR SAME —

2 Ormond ·0005 S.L.F. at 6/-; 2 Do. Slow Motion Dials at 5/-; T.C.C. Condensers, ·0001, ·0002, ·0003, ·002, 2/4, each; 2 mfd., 3/10; 2 Grid Leak Clips, B.B., 9d.; Dubilier, 3, 4, and ·25 meg., 2/6 each; 3 W.B. V.H. at 1/9; 1 Ferranti A.F.3, 25/-; 2 Bulgin P.S. at 1/6; Paxolin, 7 x 4, 3/-; Terminals, Glazite, Systoflex, 3/-; Variable Resistance, B.B., 3/-; 9-v. Grid Bias, 2/-. 20 and 32 D.S.C. Wire stocked. Handsome American Type Cabinets, baseboard, hinged-lid, solid oak, for 21 x 7 panel, 27/6. Ebonart, Resiston, Parfait Panels, Mahogany or Black Polished, from 5/-.

COSSOR VALVES for ABOVE:

210 D ..	410 HF ..	610 HF ..	10/6 each.
210 RC ..	410 RC ..	610 RC ..	10/6 each.
210 P ..	410 P ..	610 P ..	12/6 each.

WE STOCK ALL LINES IN GENERAL DEMAND. SPECIAL WEST-END AGENT FOR BURNE-JONES (MAGNUM).

JACKS & PLUGS.—Lotus S.C.O., 2/-; S.C.C., 2/3; D.C., 2/6; F.S.O., 2/6; F.S.D., 3/-; Jack Plug, 2/-; P.P.J.S., S.P.D.T., 3/3; D.P.D.T., 4/-.

IGRANIC PACENT 61, 2/-; 62, 2/3; 63, 2/6; 64, 2/6; 65, 2/6; 66, 3/-, etc. Univ. Plug, 1/6.

VALVE HOLDERS, Non-microphonic. — Benjamin, 2·9; Lotus, 2/6, 2/3; W.B., 2/-; Magnum, 2/6; Raymond, 1/9; Harlie, 1/4; Standard, 9d., 1/-.

ACCUMULATORS. 2-v. 40, 7/11; 2-v. 60, 9/6; 2-v. 80, 12/6; 2-v 100, 14/6; 4-v. 40, 13/11. 4-v. 60, 17/11; 4-v 80, 23/6; 6-v. 60, 26/6; 6-v. 80, 35/6. **ALSO** another good make, 1/6 extra on each of above Post 1/- each.

BENJAMIN. — Battery Switch, 1/-. Valve Holder, 2/-; with Grid Leak, 5/3. With Condenser and Leak, 7/-. Rheostat, 2/9.

BRETWOOD.—Grid Leak de Luxe, 3/6; with condenser, 4/6. Anode, 3/6.

BURNDEPT ETHOVERNIER DIAL (with Ethelog Station Indicator), 18-1, 9/-.

CARBORUNDUM. Detector only (No. 30), 5/-. Stabilising Detector Unit, with No. 30 Detector, 12/6.

CELESTION Loud Speaker —Oak, 110/-; Do. "A2," 130/-; Do. "A3," 150/-. Mahogany same price; walnut extra.

CLIMAX. Potential Divider, 5/-. Special Choke, 10/6. Shock Absorbers, 3/- pr. Earth Tubes, 5/-. L.L. Insulators, 1/- pair.

COLVERN SCREENED COILS, &c. Former & Base, 5/-. 6-pin Base, 1/6. Former only, 4/-. Screen and Base, 8/6. S.P.H.F.T., 9/6. S.S. do., 9/6. 2 Monodial, 19/-.

DUBILIER. Duwirohm Wire-wound 20,000 to 100,000 ohm resistances, 5/- each; Base, 1/6; 200,000 ohms, 8/-. Vol Control Unit, 7/6. Duvarileak, 7/6. Dumetohm Holder, 1/-.

DUBILIER MANSBRIDGE. ·1, 2/6; ·2, 2/8; ·25 to ·5, 3/-; ·4, 3/3; ·5, 3/6; 1 mfd., 4/-; 2 mfd., 5/-; 3 mfd., 8/-.

DUNHAM "ALL-WAVE" TUNER covers all wavelengths from 150 to 2,000 metres, and is complete with reaction. "All-wave" Tuner, 9/6.

EVER READY H.T. Popular 66-v., 9/6; Do. 108-v., 15/6. Standard 66-v., 12/6; 108-v., 21/-; L.T.3, 7/6 (4½-v.). Flash Lamp, 4·5, 6/- dozen. Grid Bias 9 Tapped 1½-v., 2/-.

USUAL LINES STOCKED.

FORMO Individual-Gang Control Condenser. Twin-Gang, £2 12s. 6d.; Triple-Gang, £3 3s.

GANG Dual ·0005. **Ormond,** with dial, 32/-. **Cyldon,** no dial, ... 50/-. **Triple** ·0005. **Ormond,** with dial, 40/-. **Cyldon,** no dial, ... 70/-. **Igranic,** no dial ... 75/-. **Bowyer-Lowe,** no dial 70/-.

IGRANIC TRIPLE-HONEYCOMB INDUCTANCE COILS. 30, 2/9; 40, 2/9; 50, 2/9; 60, 3/-; 75, 3/3; 100, 3/6; 150, 3/9; 200, 4/-; 250, 4/6; 300, 4/9; 400, 5/6; 500, 7/-; 750, 9/6; 1,250, 14/-; 1,500, 16/-.

ALL PARTS STOCKED.

GRAHAM FARISH Bakelite Mica Condensers, have S.P.G.L. clip. ·0001 to ·002, 1/-; ·003 to ·006, 1/6; ·007 to ·01, 2/6. Grid Leaks, 1/3; ·0003 and Leak, 2/-.

H.F. CHOKES.—Watmel, 5/-; T.J.S., 4/6; McMichael, 9/-; R.I. Varley, 9/-; Split Coil type, 12/6); Success, 10/6; Cosmos, 6/6; Bowyer-Lowe, 9/-; Lissen, 5/6; Climax, 8/6; Special for Eliminators, 10/6; Wearite 6/6.

R.C. UNITS.—Ediswan, 7/-; Dubilier, 7/-; Cosmos, 8/6 with V.H., 10/-; Magnum, 10/-; R.I. Coupler, 20/-; Graham Farish 3/6.

USE BRITISH VALVES

New reduced prices.

MULLARD 10/6 COSSOR
MARCONI 12/6 P. B.T.H.
EDISWAN 20/- S.P. COSMOS

CALLERS' COLUMN

AERIALS.—100 ft. 7/22 Hard drawn, 1/11. Extra heavy 2/2. Phosphor 49 strands, 1/6. Electron stocked. Special INDOOR Acrials, phosphor, with ebonite separators and rubber rings (12 ft. x 8 strands), total 100 ft. 4/6. O.V., 2/6. Rubber Lead-in, highest quality, 10 yds. 1/-; 10 yds. 1/3; 10 yds. 1/6. Extra heavy, 2d. and 3d. yd. R. & B. Twin Flex (best), 6 yds. 10d.; 12 yds. 1/6; 36 yds. 4/-. Ins. Hooks, 2 for 1½d. Egg Insulators, 2 for 1½d. Ins. Staples, 4 a 1d. Earth Tubes, Copper, extra value, 2/3. Climax, 5/- (also at 2/6).

EASY FIX AERIALS, with 2 insulators and lead-in, 1/3. **EBONITE GRADE A.** Stock sizes, 6 x 6 and 7 x 5, 1/3; 8 x 6, 1/6; 9 x 6, 1/9; 10 x 8, 2/9; 12 x 6, 2/9; 12 x 8, 3/6; 12 x 9, 4/-; 14 x 7, 4/6. ALSO CUT TO SIZE while you wait at 4d. per sq. inch 3/16th, and 2d. sq. inch for ¼" in. Special cheap panels for Crystal Sets.

TERMINALS. Nickel W.O. Pillar, 'Phone, 1/- doz. (3 for 4d. with N. and W.); Brass do., 10d. doz. (1d. each with N. and W.); all high quality. Valve-Pins, with nuts, 2 a 1d. Ormond Screws, 6 or 4 B.A., 6d. dozen with nuts; washers 12 a 1d. Red and Black Spades, screw at side, 3½d. pr. Plug and Socket, Red or Black, 3½d. Wander Plugs, Red or Black, 3½d. pr. (Large, good). 'Phone Connectors, 4d. Flush panel sockets and nuts, 4 for 4d., 10d. dozen. Brass Spade Tags 6 a 1d. Nickel Solder Tags, 4 a 1d. 2 and 4 B.A. Rod, 3d. foot. Nickel Valve Legs and Nuts, 1d.; 8d. dozen. Stop Pins, 2 a 1d. **H.T. BATTERIES.** Highest quality only at lowest prices. Adico (Trade test award best given) 60-v., 6/11; 100-v., 12/11. Theria, 60-v., 5/11; 100-v., 10/11 (with extra Grid Bias). Everready, 66-v., 9/6; 108-v., 15/6. Others from 5/-. 1·5 L.T. Hellesen's, 2/6. Adico, 1/8; B.T.H., 2/-; Flag, 2/-; British, 1/6.

FLASH LAMP. 4·5 Adico, 4½d., **4/3** doz. British, 6d., 3 for 1/3.

SOLDER, with resin, 2d. foot. 1/16 sq. Bus Bar, 2 ft. 1d. Tinned copper, 16 and 18 gauge, round, 9d. per ½-lb. D.C.C. ½-lb. 20 gauge, 8d.; 22 gauge, 9d.; 24 gauge, 10d.; 26 gauge, 11d.; 28 gauge, 1/-; 30 gauge, 1/2.

MANSBRIDGE CONDENSERS. "Hydra" 1 mfd., 2/6; 2 mfd., 3/6; 0·1, 1/9; ·25 and ·5, 2/3

SWITCHES on Porcelain, D.P.D.T., 1/3; S.P.D.T., 8½d. and 10½d. Sound quality. Panel switches, with Ebonite handle, worth double. S.P.D.T., 1/-; D.P.D.T., 1/6. Insulating Tape, 4½d. Copperfoil, 4d. foot (6 in. wide). Grid Bias Clips, 6d. Panel Brackets, 9½d., 1/- pr. Shorting Plug, 3d. **PERMANENT DETECTORS.** Red Diamond (a topper), 2/-. Lion Micro (latest, cannot be equalled), 2/6. Brownie, 3/-. Enclosed Kay Ray, 1/-, 1/3. Service Micrometer, with crystal, 2/9, 4/6. **CRYSTALS.** Superxite, 1/6; Shaw's sealed genuine Hertzite, 8d., 1/-; Wyray, 1/6. **HEADPHONE CORDS.** Good, 1/-, 1/3, 1/6. L.S. Cords, 1/6, 1/9. 4-way H.F. and L.T. Leads, 1/9, 2/-. Lewcos Stocked. **COIL PLUGS.** Ebonite on Base, 6½d., 7½d. Lotus, 8d. Burne-Jones, 1/9. Low Loss, 8½d. Panel, 6½d. Various stocked. **GEARED COIL STANDS.** 2-way, 2/3, 2/6, 2/11 up. 3-way, grand value, 5/11. Back of panel from 2/11. All ebonite.

K. RAYMOND

27 & 28a, LISLE St., LONDON, W.C.2.

'Phone: Gerrard 4637.

COME TO

LEICESTER SQ. TUBE

(Important)

Ask for *back* of Daly's Theatre

This address is opposite.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 368.)

is exceedingly small in comparison with the anode current, and this, of course, is in turn very small compared with the filament current.

WHAT IS "MU"?

E. L. (Pulham, Norfolk).—"What is 'mu,' and what does it mean when applied to a valve?"

"Mu" is simply the Greek letter μ. It is used for the following reason. To shorten electrical formulae and to speed up the working out of calculations, it is usual for electrical and wireless engineers always to employ certain Greek letters to represent the different terms that are in constant use in their work. The letter is a sort of nick-name for the term in question. "Mu" is being used in this way to designate the amplification factor of a valve. Some valves have an amplification factor (mu) as high as 40 or so, and others have a low mu of only about 3.

This "amplification factor" is rather too big a subject to explain in detail without diagrams, but briefly, the above means that some valves magnify the signals applied to their grids by 40, and some magnify by only 3. Both kinds of valve, high-mu and low-mu (and all the intermediate kinds, for that matter), have their own particular uses. High-mu valves, for instance, are mostly used for H.F. work, whilst signals are weak and need magnifying; whilst very low-mu valves are used at the other end of the receiver, i.e. to work the loud speaker.

THE TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good"?

Perhaps some mysterious noise has appeared and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an *unrivalled* service.

Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: On receipt of this an Application Form will be sent to you, free and post free, immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

THE LODGE N. CIRCUIT.

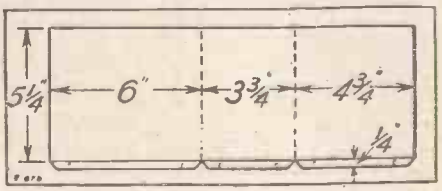
T. R. (Stoke-on-Trent).—"I have been interested in the letters (on page 212, "P.W.", October 1st) about the two-valve N. circuit. Does it tune from 30 to 3,000 metres?"

No. The letters named are from different people about different sets. Details of the set called "30 to 3,000 metres" are now out of print, but a sixpenny blue print (No. 21) of the Lodge N. Circuit can be obtained from the Technical Query Department upon receipt of a sixpenny P.O. and stamped addressed envelope.

SCREEN FOR THE "TOURIST TWO."

N. F. (Maida Vale, London, W.).—"What was the exact size of the metal screen used in the 'Tourist Two' (which was described in 'P.W.' 278, October 1st issue)?"

The exact dimensions of this screen are given in the accompanying diagram.



2 B D.

(Continued from page 360.)

of the express trains have been broadcast several times, a microphone being suspended from one of the windows for the purpose. Unfortunately, the trains will not accommodate themselves to the requirements of the broadcasters in respect to times, so that they do not figure in the regular "effects" repertoire!

2 B D's transmitter is situated on the premises of a large steam laundry. The aerial is suspended between two one hundred and eight foot collapsible masts. Dodging an acre or so of suspended washing and two or three dense clouds of steam we arrived at a neat brick building. We entered, and came into the presence of the standard "Q" set. But although standard, Aberdeen's transmitter deserves special mention, as it is undoubtedly the tidiest assembly of any of the B.B.C. ether shakers, with the possible exception of 5 X X, Daventry. It is properly railed off and is, in fact, quite good enough for exhibition purposes! No doubt the clean white glazed bricks which line the building assist in showing off the gear to its best advantage.

NEXT WEEK.

Another 2/- Gift for Readers.

FOUR MORE 6d. BLUE PRINTS.

Given Free with every copy of Popular Wireless.

Order YOUR Copy Now.

At Aberdeen there was, at the time of my visit, one of the original transmitting valves still in use after completing over ten thousand hours of service. This, I think, is a record.

During my return journey from Aberdeen I ran into a Scotch mist. I was driving through some typical moorland country just north of the famous Glamis castle when the haze descended, and it became necessary for me to peer very keenly ahead. Suddenly another car literally burst into my vision, and at the wheel of this was a man whose broad features, brick-red complexion and tilted "tam" literally shouted "Scotland."

"You'll know him if you meet him," had said Aberdeen's Assistant Station Director referring to his chief, Mr. Neil MacLean. And, although the mist swallowed him in the space of a split second, I certainly did!

WIRELESS SETS & ROYALTIES

(*Continued from page* 333.)

ultra-short-wave transmissions is due to the phenomenon known as "fading."

The B.B.C. believes that the reception of transmissions on ultra-short waves is made possible entirely through reflection. Unfortunately, considerable changes are taking place continually in the reflecting medium. The result is that the strength of signals received at any given point is constantly varying. In the case of extended transmissions, the variations take place so rapidly and with such confusion that they are apt to exercise a disastrous effect upon reception.

It is generally recognised, according to the B.B.C., that the success of Empire broadcasting depends mainly upon the possibility of transmissions being re-radiated efficiently by local broadcasting stations. It is, therefore, essential to devise a method of reception which will minimise the fading effect. Experiments indicate that the signals from two or more aerials spaced at considerable distances apart may be combined and treated in such a way as to produce a more constant and undistorted signal.

The report closes on a hopeful note, but it may be assumed that the B.B.C. sees no reason to revise its prediction that Empire broadcasting may be undertaken with the guarantee of the elementary conditions pre-requisite to service some time during 1928. Contact is being maintained and developed with the broadcasting organisations of the Dominions and Colonies. The chief engineer, now attending the World Wireless Conference at Washington, is evolving a further series of experiments in co-operation with the chief engineer of the Radio Corporation of America.

Things, in short, are moving—and, let us hope, towards an early realisation of, at any rate, an elementary service of Empire broadcasting.

Question of 5 G B.

The B.B.C. admit that 5 G B, the Daventry experimental station, is not at present giving an entirely satisfactory service and that plans have been made to rectify two chief drawbacks to the success of the station. The first is that the transmissions suffer from directional effects attributable in large measure to the influence of the steel masts of 5 G B's neighbour, 5 X X. The extent to which this screening effect takes place is not dependent upon whether 5 X X aerial is energised or not, but is mainly due to the metalwork in the mast system and the fact that energy is being dissipated in it by the 5 G B transmitter. The second is that a number of listeners are still to be found in the Birmingham area who have not adapted their sets to the new conditions. These listeners lived under the shadow of the old 5 I T aerial and found no difficulty in receiving the Birmingham programmes on crude apparatus.

The B.B.C. points out that they should realise that their sets may require considerable adaptation if they are to receive successful transmissions over a distance of 35 miles.

The ultimate power of 5 G B will be from 25 to 30 kilowatts, but it is not an engineering proposition to increase the power of the station suddenly, and the present power of 14 kilowatts will be raised gradually within the next week or two.

TECHNICAL NOTES.

(*Continued from page* 334.)

are now used in a device known as a "synchroscope," for indicating when electrical generators are "in step," before the output of several machines may be pooled into a common supply. The vacuum tube synchroscope gives a direct and immediate indication as to whether machines are running too fast or too slow, and also shows the differences in speed.

Prior to the development of the vacuum tube synchroscope, the "timing" or synchronising of a group of generators was accomplished by means of potential transformers. The first installation of the new type of equipment was made by the General Electric Company at the Menands sub-station of the Adirondack Power and Light Corporation, near Albany, N.Y., other installations having been made subsequently. Potential from the lines to be synchronised is obtained from a capacitance transformer, and is amplified by means of vacuum tubes until sufficient power is obtained to operate the synchroscope.

R/R

Two Outstanding Mullard Achievements

Again Mullard takes the lead—·075 Valves and the New Model E Speaker. This new series of valves with the wonderful Mullard P.M. Filament consuming only ·075 ampere makes all valves consuming 1/10 ampere extravagant. All the advantages of the wonderful Mullard P.M. Filament, great strength, long life, and copious emission are retained for the lowest available running cost.

The Mullard Pure Music Speaker Model E

has solved the problem of Pure Music from a speaker of moderate price. Hear it and realise what amazing value it offers.

Mullard

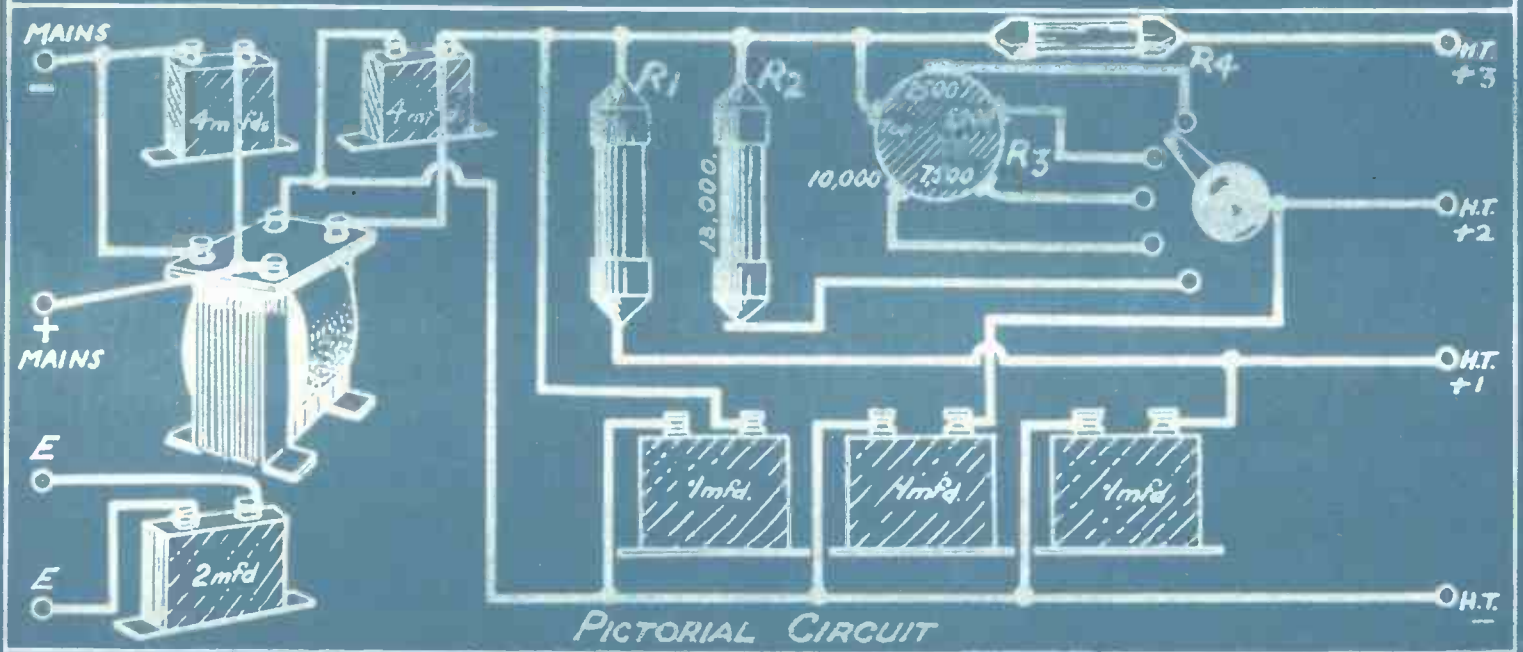
MASTER · RADIO

Price £3 5 0

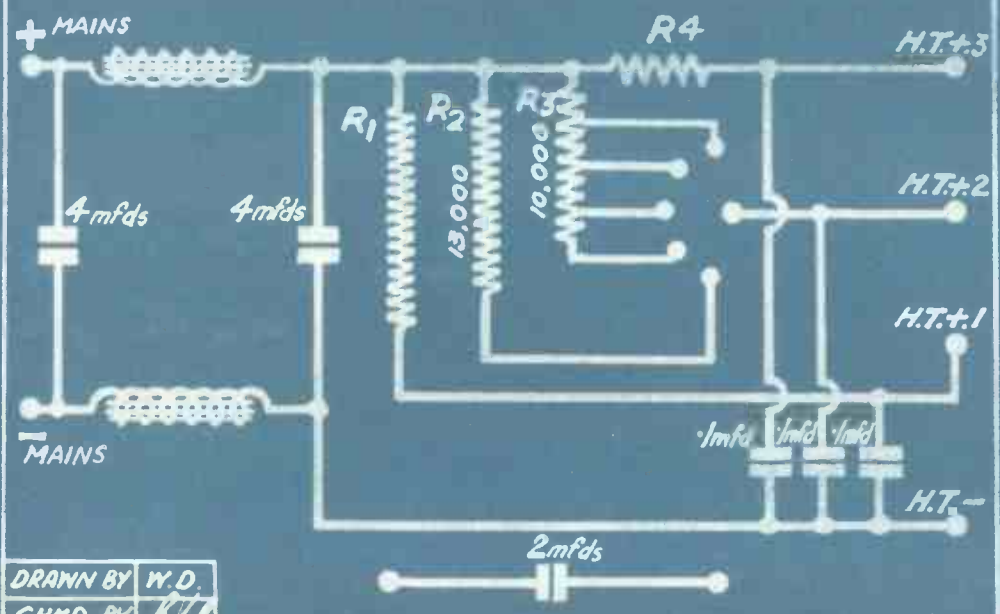
Advt. The Mullard Wireless Service Co., Ltd., Mullard House, Denmark Street, London, W.C.2.

THE P.W. BLUE PRINT No. 29—6d.

An H.T. Unit for Direct Current Mains.



PICTORIAL CIRCUIT



THEORETICAL CIRCUIT

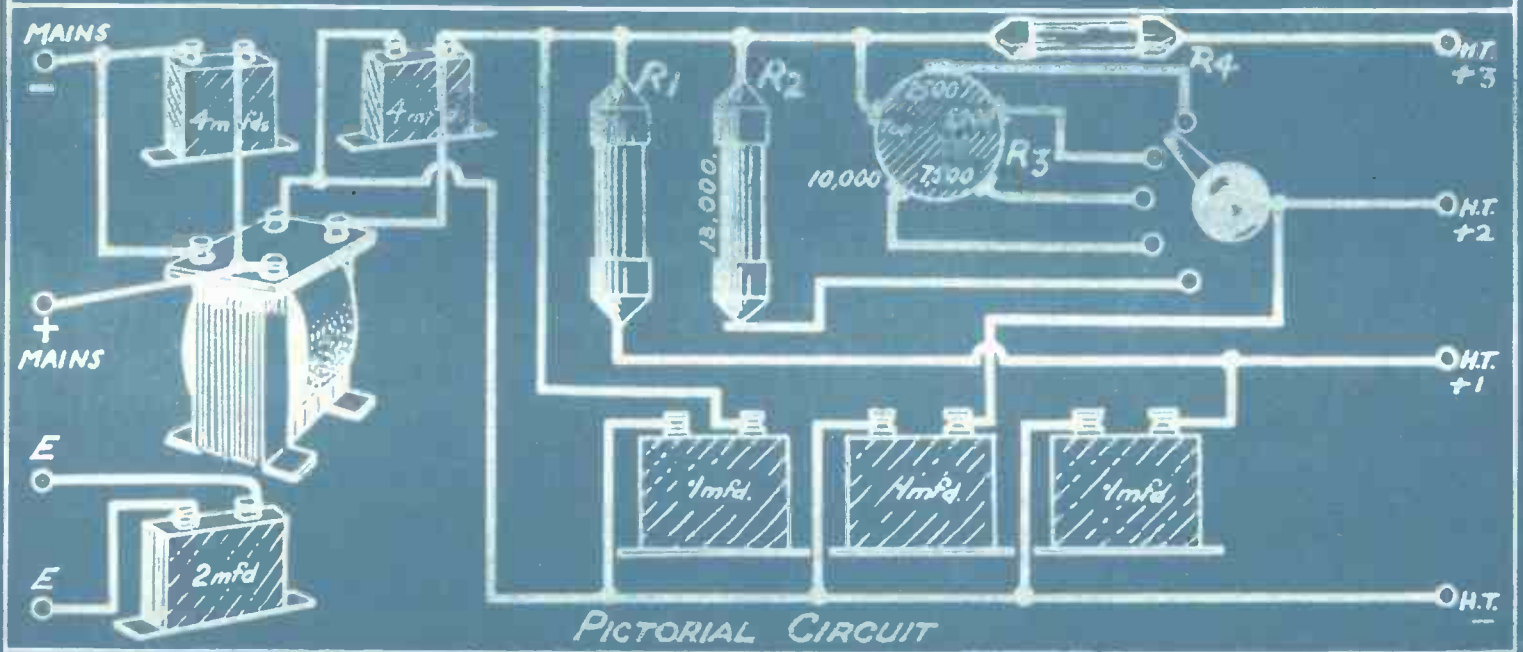
DRAWN BY	W.D.
CHKD BY	
SER: No	BP9.

COMPONENTS AND MATERIALS.

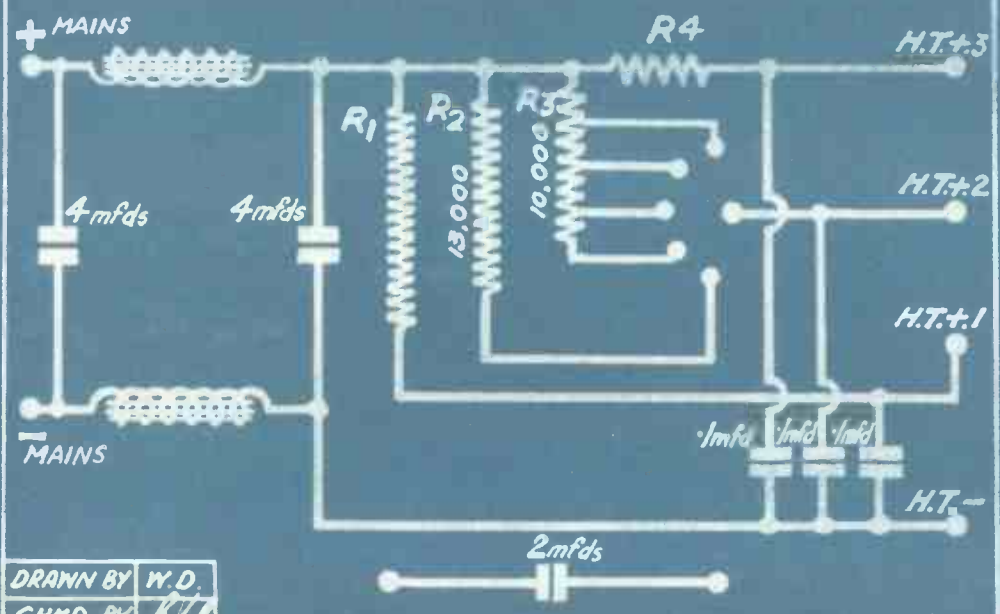
1 Panel, 6 in. × 7 in. × ¼ in.
1 Cabinet, 6 in. × 7 in. × 12 in. deep.
2 4 mfd. (600-volt) condensers.
3 ·1 mfd. mica condensers.
1 2 mfd. condenser.
1 Double eliminator choke.
1 Tapped wire wound anode resistance (min 2,500 ohms., max. 10,000 ohms).
3 Fixed anode resistances of values to suit. and bases.
6 Insulated terminals.
6 Insulated sockets.
2 Insulated plugs.
2 Plain terminals. screws, etc.
Length of flex.

THE P.W. BLUE PRINT No. 29—6d.

An H.T. Unit for Direct Current Mains.



PICTORIAL CIRCUIT



THEORETICAL CIRCUIT

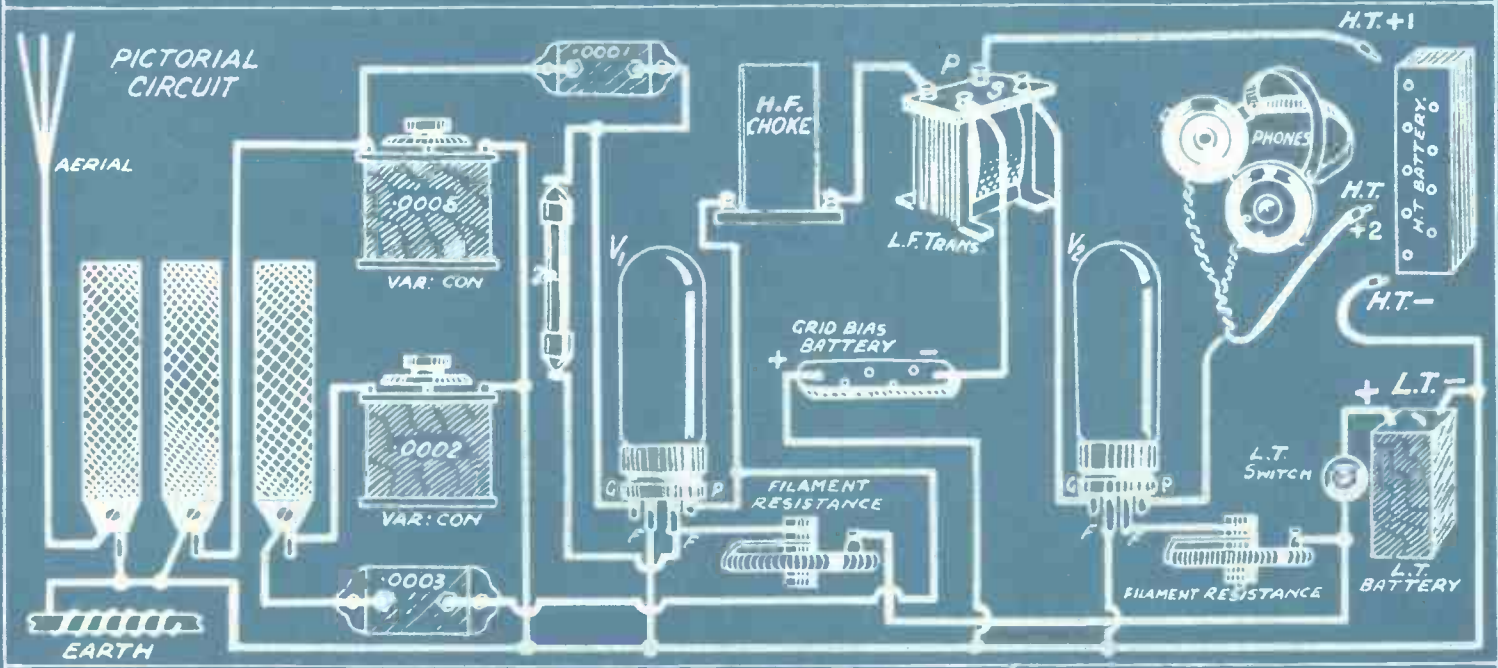
DRAWN BY	W.D.
CHKD BY	
SER: No	BP9.

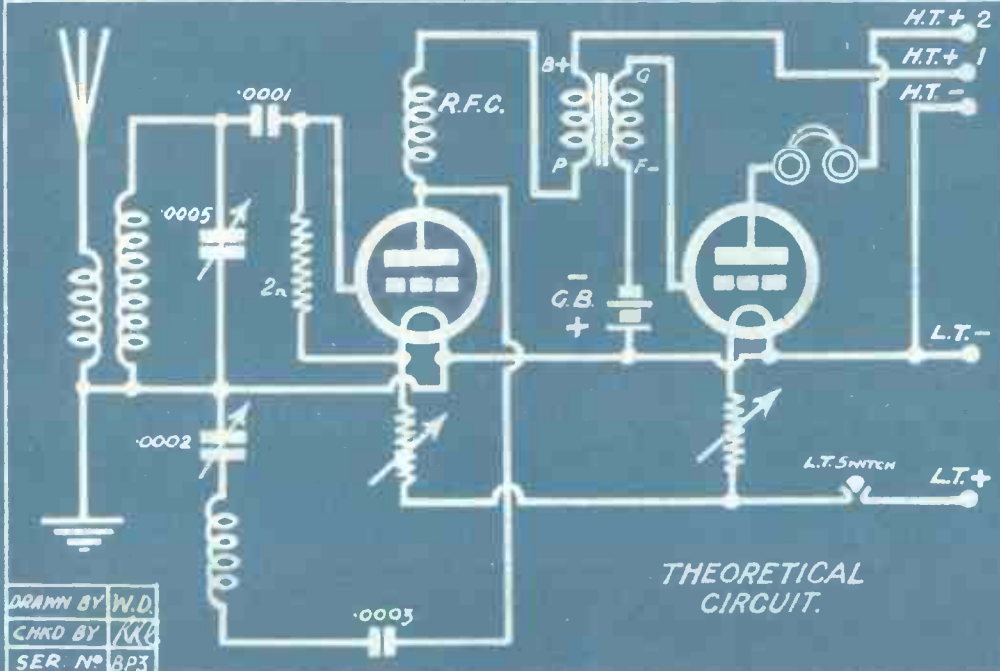
COMPONENTS AND MATERIALS.

1 Panel, 6 in. × 7 in. × ¼ in.
1 Cabinet, 6 in. × 7 in. × 12 in. deep.
2 4 mfd. (600-volt) condensers.
3 ·1 mfd. mica condensers.
1 2 mfd. condenser.
1 Double eliminator choke.
1 Tapped wire wound anode resistance (min 2,500 ohms., max. 10,000 ohms).
3 Fixed anode resistances of values to suit. and bases.
6 Insulated terminals.
6 Insulated sockets.
2 Insulated plugs.
2 Plain terminals. screws, etc.
Length of flex.

THE P.W. BLUE PRINT No. 31—6d.

A Standard Two-Valver (Detector & L.F.) for Plug-in Coils.





DRAWN BY W.D.
CHKD BY RKC
SER. Nº BP3

COMPONENTS AND MATERIALS.

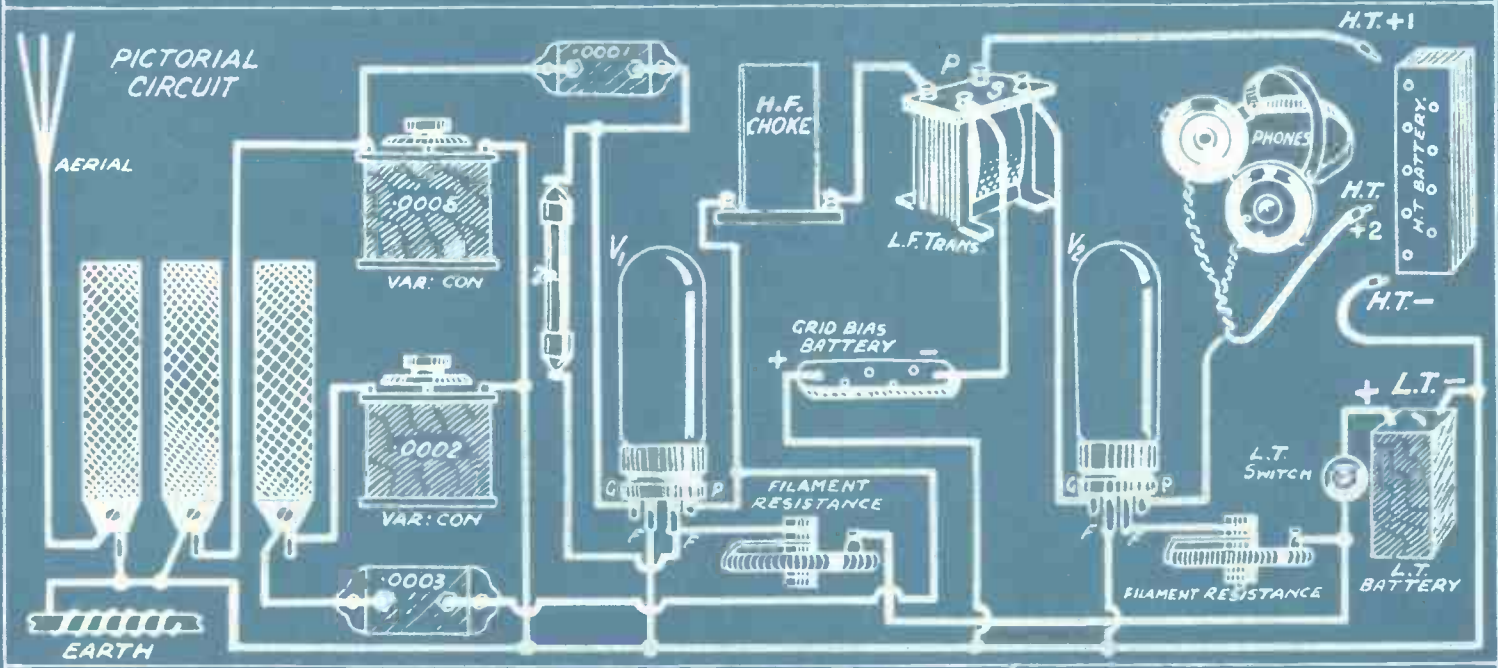
1 Ebonite panel, 14 in. × 7 in. × ¼ in.
1 Vertical front cabinet, with 9-in. baseboard to fit.
1 ·0005 mfd. variable condenser, square law or S.L.F., with slow-motion or separate vernier dial.
1 ·0002 mfd. or ·0003 mfd. ditto.
3 Board-mounting single coil sockets.
1 H.F. choke.
2 Board-mounting filament resistances.
1 ·0003 mfd. fixed condenser.
1 ·0001 mfd. ,, ,,
1 2 megohm grid leak and holder.
2 Sprung valve holders.
1 L.F. transformer, first stage (ratio about 3 : 1).
9 Terminals and 2 terminal strips.
1 On-off switch.
Wire, screws, 4 small pieces of wood to support terminal strips, etc.

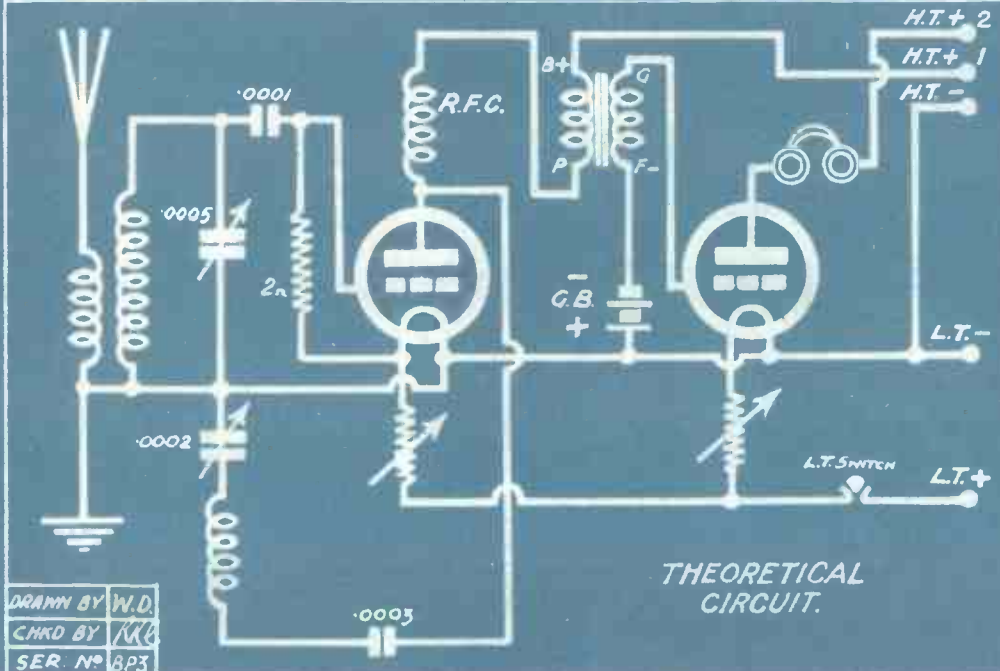
ACCESSORIES.

2 Valves.
L.T., G.B., and H.T. batteries, according to valves.
'Phones or loud speaker.
Nos. 25, 35, 50, 60, 100, 150 and 250 coils.

THE P.W. BLUE PRINT No. 31—6d.

A Standard Two-Valver (Detector & L.F.) for Plug-in Coils.





DRAWN BY W.D.
CHKD BY RKC
SER. Nº BP3

COMPONENTS AND MATERIALS.

1 Ebonite panel, 14 in. × 7 in. × ¼ in.
1 Vertical front cabinet, with 9-in. baseboard to fit.
1 ·0005 mfd. variable condenser, square law or S.L.F., with slow-motion or separate vernier dial.
1 ·0002 mfd. or ·0003 mfd. ditto.
3 Board-mounting single coil sockets.
1 H.F. choke.
2 Board-mounting filament resistances.
1 ·0003 mfd. fixed condenser.
1 ·0001 mfd. ,, ,,
1 2 megohm grid leak and holder.
2 Sprung valve holders.
1 L.F. transformer, first stage (ratio about 3 : 1).
9 Terminals and 2 terminal strips.
1 On-off switch.
Wire, screws, 4 small pieces of wood to support terminal strips, etc.

ACCESSORIES.

2 Valves.
L.T., G.B., and H.T. batteries, according to valves.
'Phones or loud speaker.
Nos. 25, 35, 50, 60, 100, 150 and 250 coils.

Printed and published every Thursday by the Proprietors, The Amalgamated Press, Ltd., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: Messrs. J. H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Registered as a newspaper and for transmission by Canadian Magazine Post. Subscription rates: Inland, 17/4 per annum, 8/8 for six months. 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, October 15th, 1927.