

THE MANCHESTER RADIO EXHIBITION (See Page 443.)

Popular Wireless

Every Thursday
PRICE
3d.

No. 335. Vol. XIV.

INCORPORATING "WIRELESS"

November 3rd, 1928.



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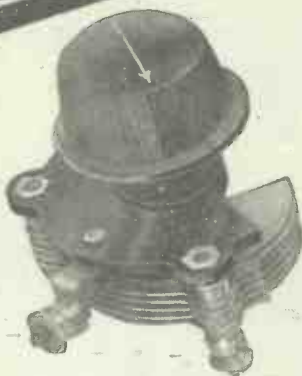
Saving on Sets,
etc., etc.

Our cover photo shows a telegraphist of the Italian Survey ship "Citta Di Milano" holding the wireless set used on General Nobile's Airship "Italia." The pieces of the airship's rigging used as a mast are also shown.

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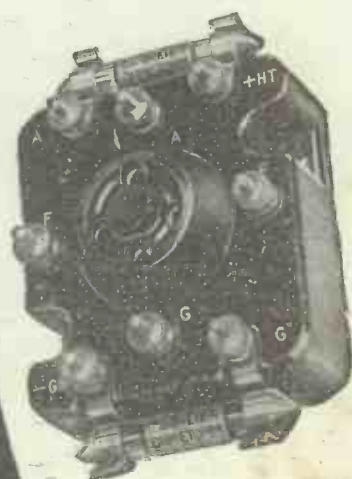


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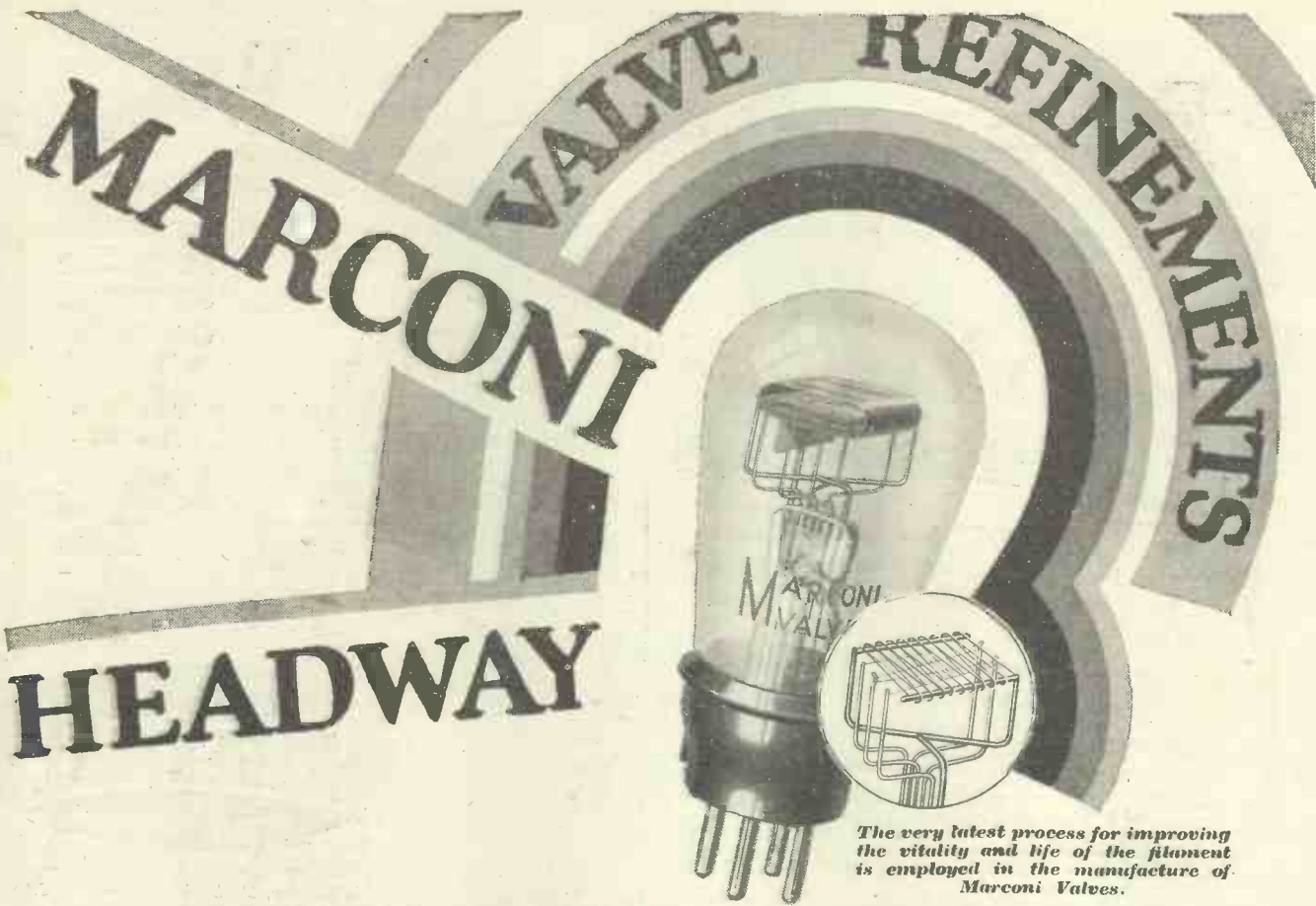
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| Fil. current | amps. 0.25 |
| Anode volts | max. 250 |
| Anode current | max. milliamp. 24 |
| *Amp. factor | 6 |
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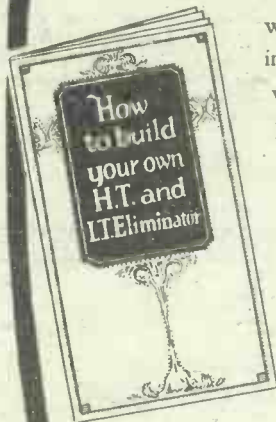
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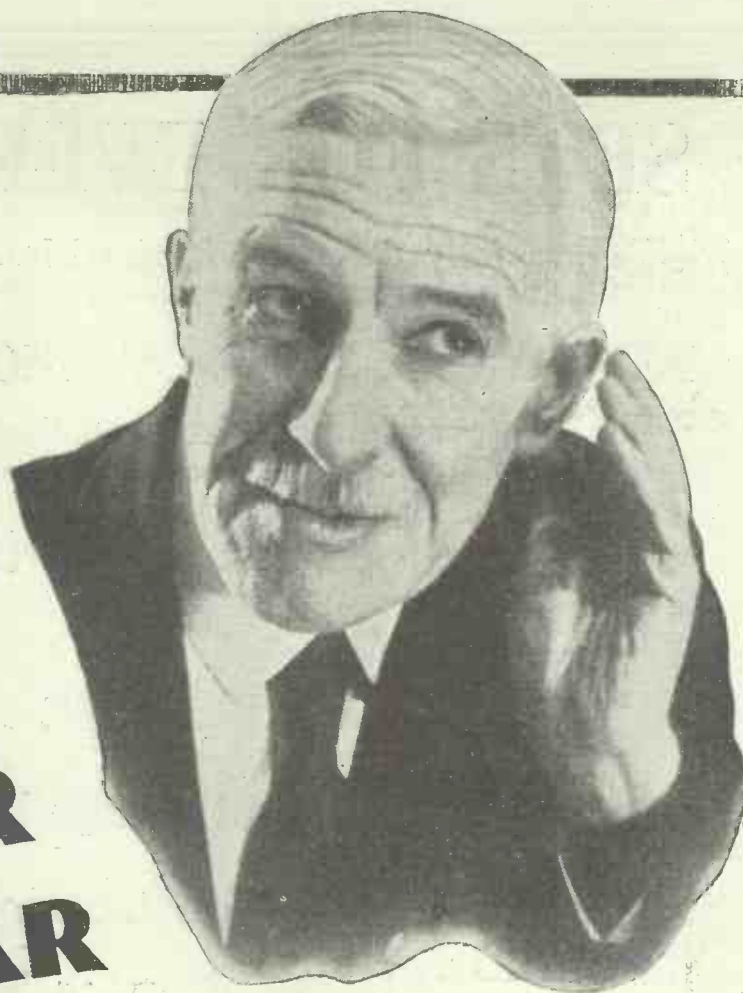
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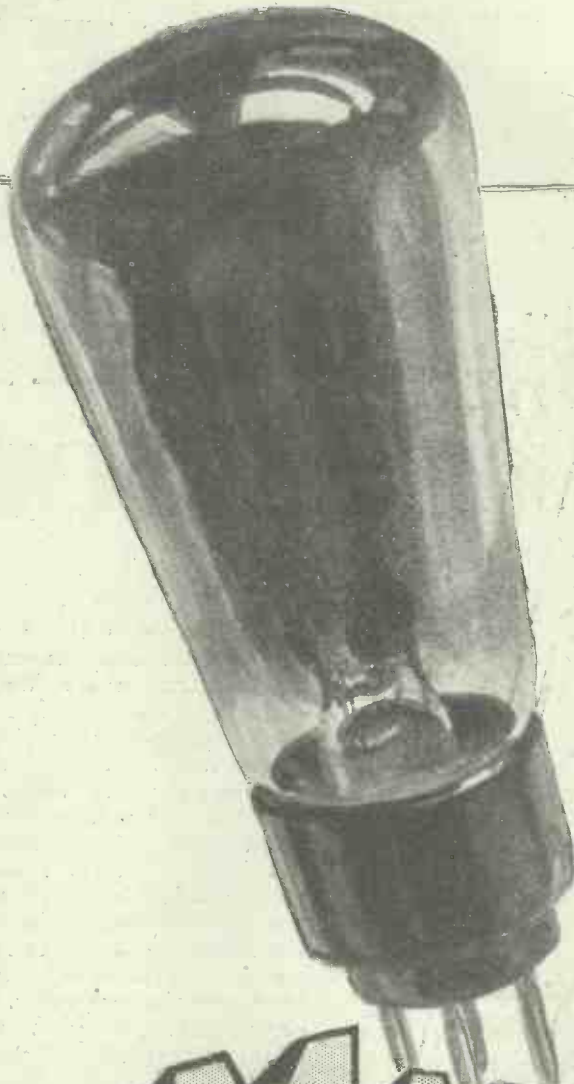
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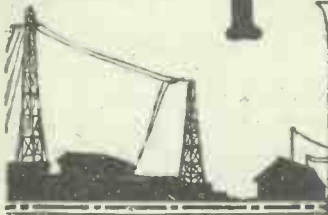
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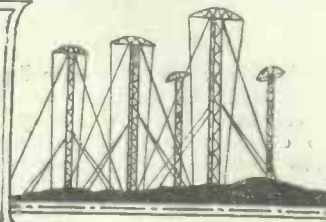
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Scientific Adviser:
 Sir OLIVER LODGE, F.R.S.
 Editor:
 NORMAN EDWARDS.
 Technical Editor: G. V. DOWDING, Grad.I.E.E.
 Assistant Technical Editors: K. D. ROGERS, P. R. BIRD,
 G. P. KENDALL, B.Sc., A. JOHNSON RANDALL.



RADIO NOTES AND NEWS.

Prevision of Television—Had the Byrd?—Placing Your Stations—Chelmsford Again—
 Transatlantic Phone by Cable—Luxurious Listening.

Prevision of Television.

THE "New York Sun" has been spreading sunshine by making merry about television in a good-natured sort of way. "The owner of a two-valve set will soon be able to get everything a picture-house can offer except the ultra-polite ushers, the lobby statuary, and the liar outside the box-office who tells you there are plenty of good seats inside." Also, "The time may come when every radio set will carry a chart giving Charlie Chaplin's wave-length and the number of kilocycles it takes to get Tom Mix."

Have You Had the "Byrd"?

NO, not the "frozen mitt" of the audience, but an audition from the frozen south, towards which Commander Byrd's ship, the "City of New York," is ploughing. Main call, WFBT; auxiliary portable, WFA. Three smaller portables are being carried, KFK (50 watts), WFD (50 watts), and WFE (7½ watts). The ship will work on waves between 600 and 800 metres, but may also use 91.2, 68.1, 53.57, 53.1, 45.59, 34.05, 26.78, 26.55, 22.75, 17.945, 17.857, and 13.758. I wonder if anybody here will pick up the ship this winter.

Placing Your Stations.

A NEW CROSS reader sends a strong card vote in favour of Morse code signals for broadcasting stations, adding that there must be thousands of "P.W." readers who already know Morse. I admit that our readers form a very substantial portion of the world's listeners, but I doubt whether we could persuade the world that we are the chosen people (not the Scriptural kind!). No, what is wanted is a solution useful to all ether-fishers. It's a problem for an international conference.

Another Little Radio Show.

THE Fifth Annual Wireless Show which closed some weeks ago in New York had an attendance of about 295,000 persons, and 'tis said that £7,000,000 worth of business was done with 'em. One specially interesting fact about the exhibits is that the average number of valves per set was seven! Only seven! On an average! Wonder if any sets had twenty-

seven. Frame aerials appeared to be standard equipment, and batteries were decidedly not present.

Radio Society Notes.

THE South Croydon and District Radio Society meets every Tuesday at 8 p.m. (It is to be noted as not unimportant that it meets at the Surrey Drovers Hotel, S. Croydon.) This society, the president whereof is Mr. H. R. Rivers-Moore, old, crafty, and well-known in wireless, makes a special point of helping beginners. Even the treasurer's name is Zeal; and the secretary, Mr. E. L. Cumbers, 14, Campden Road, S. Croydon, (Phone: Croydon 1540), is all ready to enrol new members and take them along to the Drovers.

New Members Wanted.

INHABITANTS of Holloway and thereabouts might note that there is a radio club in connection with the Holloway Literary Evening Institute, Holloway County

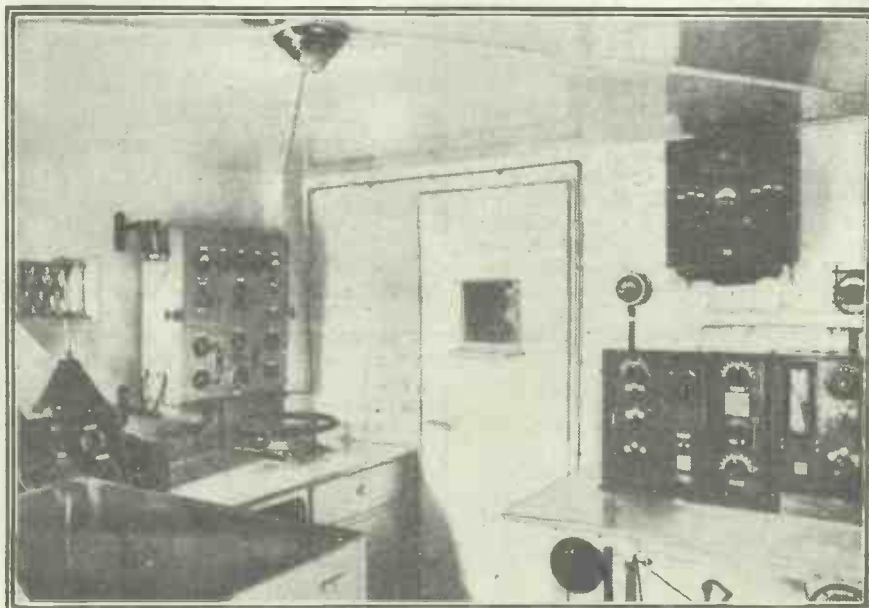
Secondary School, Hilldrop Road, Camden Road, N.7. It meets every Monday from 7.30 p.m. to 9.30 p.m., under the control of the genial Capt. Jack Frost (late B.B.C.). I have seen the syllabus of "events" up to December 12th, and venture to describe it as downright practical and useful. New members wanted. Write to Mr. H. Panter, c/o the Institute aforesaid.

Drama with a Big D.

DURING one of the B.B.C.'s talks not long ago there crept in a big little word which had not appeared in the manuscript, and which does not usually pass current amongst public speakers. It was just a plain d—. Discussing this refreshing departure from B.B.C. precept and practice a B.B.C. official bravely remarked, "It has its dramatic effect." So might an anarchist's fond mamma say in defence of her off-

(Continued on next page.)

DID YOU HEAR THE "GRAF ZEPPELIN"?



This is the radio room on the German airship "Graf Zeppelin," which recently emulated the British Airship R34's feat of flying from Europe to America without a stop.

NOTES AND NEWS.

(Continued from previous page.)

spring's bomb, "It stirs 'em up a bit." It won't do at all. If the thing is to be excused on such grounds let them apply to me for words far more dramatic. I know plenty.

Chelmsford Again!

THIS little town is continually having greatness thrust upon it. Its associations with the development of radio extend over many years. Writtle is at its back door. 5 SW is situated there, and now the new B.B.C. outpost there came heavily into action the other week when the American gent. was helping the Zepp to "hit the grit" softly in the U.S.A. A real good bit of interzeption on the part of the B.B.C., coupled with a lucky moderation in "atmospherics" and "fading." One foresees some good surprise items.

Transatlantic 'Phone by Cable?

UP to the present it has not been possible to establish telephone services by means of long-distance under-sea cables because of the distortion of the speech. It is, however, reported from America that the difficulty has been overcome and a transatlantic telephone cable is being made. If this is a success radio-telephony will have to get a wiggle on itself and go one better or see its new competitor grab the business. But it's all good for "this 'ere progress."

Criticism from Glesca.

A. M. (Glasgow) bemoans his fate in that he lives too near 5 SC to cut it out, and he wants to cut it out because his ideas of programmes (for 5 SC) do not line up with those of the B.B.C. Why does he not describe his set to the "P.W." experts and ask for advice? Or move to Dunoon? He adds a skirl or two about the spate of lady warblers to which the B.B.C. treats us, and says they ought to buy songs a few tones below their top register, instead of hirpling through on or about the high C. Agreed! Give me the lady tenors!

H.H.O.R. Replies re PCJJ.

IT'S no good, lads! After all the ink spent on him, H. R. O. R. sticks to it that PCJJ ain't wot it was in his younger days. Philips themselves have pleaded in vain, and H. H. O. R. has juggled with his aerial and talked severely to the "earth," but all to no purpose. So that's that! Our discriminating friend has now applied for a transmitting licence. I hope he gets it. We will then all listen to his signals—and see whether they maintain their strength, eh?

The Conservative Estimate.

WE shall certainly have to form the League of Young Radio Actuaries. A reader, aged 13 years, set un-described, solemnly avers that he gets (here follows a list of 14 stations)—"and five stations unknown." He modestly adds, "Which is twenty in all." Oh, boy, did Newton and other mathematicians live in vain? And, look you, if you had said "thirteen stations unknown,"

that would have been approximately 35 in all, more or less, E. and O.E., subject to correction and without prejudice. Never mind, sonny, what's a station more or less?

The Avuncular Strike.

AS I write comes the news that all the men sent out by the B.B.C. to the staff of the Indian Broadcasting Company have struck on account of the pecuniary conditions of their jobs. Looks bad for Indian Broadcasting! I have always understood that the B.B.C. itself does not—or did not—pay its rank and file any too generously, and if the I.B.C.'s pay makes

SHORT WAVES.

TO A FICKLE JADE

(Who is using a television instrument).
Though thou sayest with decision
Thou art sad without me, Grace,
Thou forgettest television—
'Tis refuted by thy face.

Thou hast told me that thou yearnest
To be with me, to be here—
But I see the face of Ernest
(Nasty blighter!) lurking near.

Television oft reminds us.

Though Love's dream may seem sublime;
There are other chaps behind us,
And thou flirtest all the time!
—S.A. Wireless Weekly.

"This human machine is always breaking records," writes a London dailly.
We wish Human Machine would break a few of those broadcast by 2 L O.

Soprano: "I've been out all day shopping, and I certainly got a bargain."

Basso: "What did you buy now?"

Soprano: "I got an expensive new radio set for a song."—"Radio News."

A horse feeder was recently fined £5 for operating a wireless set without a licence. It is stated that he attached his crystal set to a wire mattress.

But how could one possibly call that a "wireless" set? he contended.

Major Gladstone Murray, speaking at a dinner of the B.M.A.: "When every house is equipped with radio apparatus—and we believe that will not be long—we shall devote our attention to building more houses!"

America is discarding the use of the word "loud speaker" in connection with wireless, the correct word now being "enunciator." It is rumoured that they are reserving the term "loud speaker" for domestic uses.

BROADCAST!

"An acquaintance of mine, who is employed at one of the B.B.C. stations, recently went into a café for tea and ordered a boiled egg. As soon as he opened it he realised that it had been long in the world, so he took it to the station to be relayed."—"Sheffield Mail."

reasonable men strike it must be fairly slender. No doubt the Indian public will settle the matter.

Notable Back Numbers.

JUST in case you gave us a miss on October 13th, owing to some unusual mental preoccupation, may I point out that the issue on that date was worth 2s. more than usual. For the laboratory pugs had conspired to evolve four new sets and the printers deftly slipped working blue prints of each one between "P.W.'s" pages—all for thee. Item, "The Regional Crystal Set"; item, "The Regional Three"; also "A Simple A.C. H.T. Unit" and "The Wave-change One." All necessary components are specified. What about it, oh, discriminating constructors? And what about the issue of October 20th? Another 2s. 3d. worth!

What Hopes?

A NEWPORT, Mon., reader asks whether readers know of a station which starts between 9 and 10 p.m. bang on Cardiff's wave-length. It is too distorted for him to identify, but he says it is accompanied by a sharp whistle. It couldn't be our office-boy, I suppose. Or a stray parrot or a referee too frightened to go home? Or an oscillator? Well, I shall be happy to know the answer.

Offer from New Zealand.

MR. R. T. STANTON, 9, Forbes Street, Sydenham, Christchurch, New Zealand, who appears to be a demon "fan," would be glad to correspond with any short-wave enthusiast who would like to get into touch with him. Judging from his long and valued letter the conditions of reception in New Zealand are extraordinarily favourable; in fact, he seems to get almost everything worth an amp. Now lads, hands across the sea, if only to prove the solidarity of Arielites.

World-wide "P.W." Market.

THESE "Notes" bear witness almost every week to the ubiquity of "P.W.," and, indeed, we do not need to issue an overseas edition. But I cannot refrain from pointing out with a gurgle of pride that the Croxsonia Co. have been good enough to write saying that they have received orders through their advertisements in "P.W." from such distant parts as Ceylon and the Straits Settlements. Where'er you roam you've a "P.W." pal.

Luxurious Listening.

MRS. GORDON-STABLES has been hitting the high spots in an article about wireless in the home. She recommends a special room with a divan covered with silk and wool and Chinese patterns; the set is to be covered with Oriental lacquer, shelves of poetry books should grace the walls, and there is to be an electric kettle and coffee-making apparatus. Luxury like this helped Rome to fall. But why not have a bucket of attar of roses in the corner and a brace of film stars to fan the atmospherics away and catch the Morse on flypapers made of honey on silk?

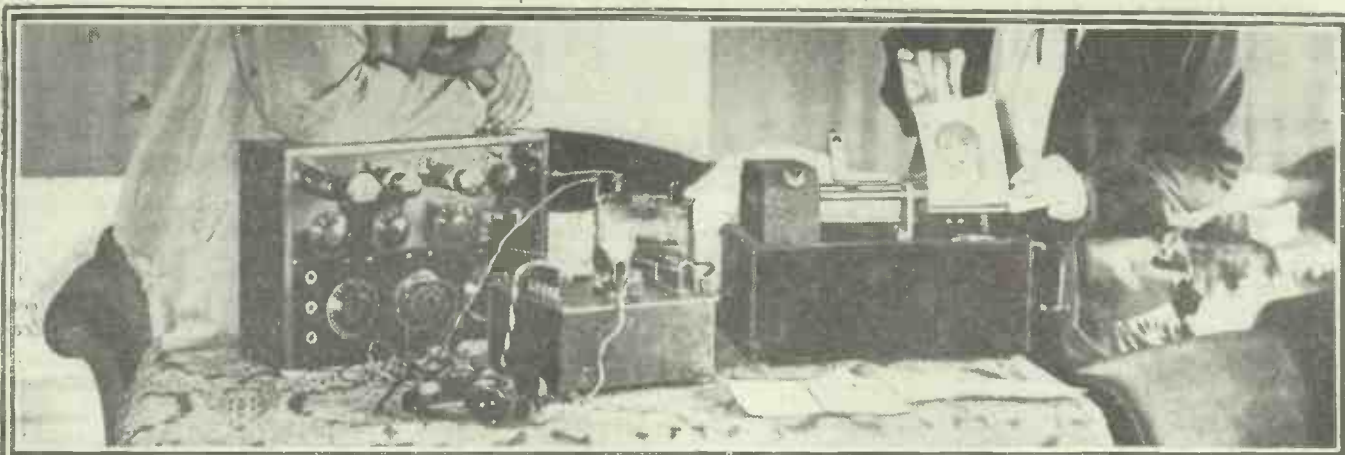
The "Any-Mains" Two.

OWING to a last moment re-shuffle the "Any Mains" Two, announced on last week's cover, was held over in favour of the "Long Range" Three. So it is included in this issue, with apologies to readers who hoped to have it last week.

Starch in the Studio.

IF the newspapers say sooth, the London announcers of the B.B.C. are agitating for starch money. 'Tis alleged that they are supposed to "unk" in boiled shirts of an evening. Hooray! *Toujours le respectability!* And, of course, these dickeys eat starch like one o'clock, and the wages of launderines are unconscionably high. All I say is, if they have to be so posh before the mike, what will they do when—some day—they stand in front of a picture projector thing? All disguised as Russian princes or Public school men?

ARIEL.



RADIO PICTURES IN COLOUR

PROFESSOR MAX DIECKMAN, of the Technische Hochschule, Munich, has his residence and also his laboratories in a small place called Gräfelfing, not far from Munich. Gräfelfing is now rapidly becoming a residential suburb, perhaps partly owing to the fast electric train service on the Munich-Innsbruck line. Twenty years ago, however, when Professor Dieckman first selected the spot as suitable for his experimental station it must have been very quiet and undisturbed indeed out there. Part of his work he has now transferred to the Ammersee, about 30 miles from town, and still one of the most undisturbed larger lakes in the near distance from Munich.

I set out one afternoon to pay the professor a visit, as he had kindly consented to show me some of his apparatus. I was received by him in rather unconventional garb. He was dressed in typical Upper Bavarian or Tiroler leather shorts, as the peasants wear, and a white shirt very open at the neck. He told me that this was his usual working dress. I was permitted to take his photograph for publication in this unique working dress, and he only laughingly hoped he would not be mistaken for a son of the soil by people seeing the photograph in print.

Valuable Experiments.

The experimental station and main laboratory and workshop is some distance from the professor's private house. It stands, as yet, still in an open space with a few trees to one side. The structure is of wood and has been added to as occasion demanded. Several aerial masts, formerly used as anchor masts for balloons, surround the house, the original part of which was built in 1909. I thought I would find nothing but apparatus for the broadcasting of pictures and television apparatus lying about or in a state of completion, but here I was greatly mistaken.

The "Luftelektrische und drahtlostelegrafische Versuchstation Gräfelfing," as the full name of Professor Dieckman's experimental station runs, must originally have been erected to measure the electric conditions of our atmosphere. These measurements were first required for the first Zeppelin, then being built (1909). A whole battery of small balloons were formerly housed round the main building.

Later, during the War, the quiet house

* * * * *

With quite simple apparatus Professor M. Dieckman can transmit colour pictures by radio. Our contributor recently had an interview with this well-known scientist and inventor, and he records his impressions in the following article.

By ARTHUR W. ALLAN.

* * * * *

near Munich played an important part in ascertaining electrical conditions in the atmosphere, and other important data was accumulated there. Professor Dieckman was also asked to take over the necessary measurements for the new airship, "Graf

Zeppelin," recently completed at Friedrichshafen. Readers may wonder at the exact nature of these measurements and will be able to form an idea of them if they consider that any electric conductor hanging or suspended in the air in an insulated condition is bound to be subject to the electric forces in the surrounding atmosphere. Even our aerials when well insulated and neither earthed nor attached to the receivers are, electrically, by no means neutral.

Then, as Professor Dieckman discovered in 1912, together with Kurt Fischer, the engine of a machine suspended in the air takes on the opposite potential to that of its exhaust gases, therefore making it seem possible that a Zeppelin would, by merely moving with engines running, load itself up to quite a high potential. These and other problems beyond my horizon had to and have to be considered.

Weather Charts.

Speaking of the actual cause of my visit, his picture broadcast system, Professor Dieckman said that from the first he had not intended to develop a system permitting of reproducing pictorial material in all detail; like the Korn and Karolus systems, but had originally set out to make apparatus to reproduce at a distance rough sketches. The first instruments of this kind were completed in 1918 for the military authorities.

It was only some years later that Professor Dieckman began to see the actual possible use of his apparatus. He then developed it primarily for the broadcasting of weather charts and for over two years now the Bavarian broadcasting stations transmit daily, shortly before noon, the day's weather chart. About 500 of these chart receivers are installed throughout Bavaria at the present moment. They only cost about £10 and can be used in connection with any broadcast receiver that will work a loud-speaker.

The Dieckman weather chart receiver, by the way, also permits of the reception of pictures sent out by other systems, the reproduction, however, not being as clear as when using a more accurate and expensive receiver. With the Dieckman receiver about 100 picture particles can be recorded every second. The receiver works on the principle of the heated writing needle—i.e. the needle that is used for writing

(Continued on next page.)



Prof. M. Dieckman, in his "usual working dress," "snapped" by our contributor.

A SHORT-WAVE FREAK.

By G. P. KENDALL, B.Sc.

ONE of the most fascinating things about short-wave work is that you occasionally stumble on something which seems to be contrary to all the rules, and gives you a most interesting time before you get to the bottom of it. Even if you never quite fathom the reason for the particular snag you have struck, you generally glean some useful practical information which will probably come in very handy in the future.

Now, one of these peculiar little difficulties which causes great bewilderment when it is experienced for the first time is a form of hand-capacity effect of a very strange nature. Ordinary hand-capacity effects, of course, are fairly simple to understand, and not very difficult to reduce to almost harmless proportions.

Peculiar Effect.

They generally appear at two points: (a) on the tuning condenser, where a slight change in tuning occurs when the hand is placed on or removed from the dial, and (b) on the reaction condenser, where it may happen that on getting the set on the verge of oscillation and then taking the hand away it will either break into oscillation or subside to a point considerably below the most sensitive "just on the edge" state, so that signals disappear altogether.

Simple remedies, such as taking care to put the moving vanes to the "earth" side of the filament, the use of a good vernier dial so designed that the fingers do not approach very near to the body of the condenser, the choice of a good circuit, and so on, will do a great deal to keep these troubles down, but it is far otherwise with another form of hand-capacity effect, which is so freakish as to be quite startling the first time you experience it.

What happens when this is present is that you discover that there is quite a bad capacity effect between your hand and any earthed part of the circuit! For example, if you adjust reaction so that the set is just oscillating and then touch the earth terminal oscillation ceases, while as the hand approaches the terminal, or any other earthed point, such as the L.T. leads, the earthed side of the tuning condenser, and so on, there is a noticeable change in tuning.

The Main Causes.

There appear to be two main causes for this peculiar state of affairs, the first being the use of too long an earth lead, which is most likely to cause trouble on the shorter wave-band (20-35 metres). Where you suspect this is the trouble, therefore, try a "capacity" earth, consisting of a few yards of wire lying on the floor, and any other type of alternative earth (gas or water pipe, etc.) which may be available.

Try, also, connecting the earth to various different points instead of to the "E" terminal, e.g. to the negative of the L.T. battery, to the moving vanes of the tuning condenser, or to the negative terminal of the detector valve socket. (Connect to only one of these points at a time, of course.)

The other possible cause is the presence

of H.F. currents in the 'phones, and where this is the trouble you will generally find that if you adjust the set to the very verge of oscillation and then grip the 'phone cords tightly in the fingers it will immediately oscillate strongly.

This is a rather more difficult trouble to get rid of, but one or more of the following dodges will usually effect a cure:

Put a condenser of .001 mfd. across the 'phone terminals, try a different H.F. choke (a No. 50 plug-in coil is usually quite good), reverse the leads to I.S. and O.S. of the L.F. transformer if one is used (not desirable if it can be avoided), bind the 'phone cords round with No. 24 or 22 D.C.C. wire for about a foot of their length and connect one end of the binding wire to earth.

PRACTICAL POINTERS

A SMALL fixed condenser connected between the slider of a potentiometer and that end of it which is connected to the filament of the valve makes a very useful by-pass in H.F. circuits using potentiometer control.

Accumulators should always be kept in a cool, dry place.

Never hang your 'phones near an accumulator, as the gassing and fumes are capable of causing injury to the delicate windings.

Aid to Tuning.

For very short-wave work, do not forget that a magnifying lens mounted near the dial may be a great help in calibrating and tuning.

The difficulty in obtaining smooth reaction control in a short-wave set can often be overcome by means of a potentiometer the ends of which are across the filament, the slider being connected to the grid leak.

One of the commonest causes of a bad humming noise is a break in the earth lead.

Never allow acid from the accumulator to come into contact with the carpet, as the effect of the acid will be to eat away the fabric, and quickly to destroy it.

'Phone diaphragms should not be pulled upwards against the magnetism; but, if they have to be removed, they should be slipped carefully across the supporting ring in a sideways direction, to keep them from bending.

RADIO PICTURES IN COLOUR.

(Continued from previous page.)

marks the rotating cylinder by melting special ink which then leaves marks on the paper.

Although Professor Dieckman's main work is for the present concentrated on other problems he has not forgotten his picture

transmissions. He developed a much improved apparatus a year ago which permits of receiving and sending pictures in three colours and which is 500 times more accurate and more rapid than the present apparatus. One quarter-plate picture can be received in five minutes at the rate of 500 picture particles to the second.

Briefly, the system employed is the following: Instead of using a heated needle to write with, the writing is now done by squirting, by means of pneumatic pressure, coloured liquid on to a piece of paper wrapped round the rotating cylinder. The liquid is controlled by tiny shutters moving to and fro in front of the openings in tune with the received energy. Three liquids are used squirted from three holes, thus three colours.



A picture received by the Dieckman system. We cannot, of course, reproduce in "P.W." the brilliant colours.

Professor Dieckman intended placing this apparatus on the market this year, but found that after one year's constant work the new instrument had one defect: the holes through which the liquid is squirted are so small that they often clog when the apparatus has been out of use for some time. He now intends trying to use a colourless liquid squirted on to prepared paper, and hopes that this will remove the only drawback to the new system.

Before leaving my kind host I asked one very, I think, impertinent question: How is the whole "Versuchstation" kept up? I then heard that all I had seen was Professor Dieckman's private property, that neither the State nor any private company helped him, with the exception of the Gräufelng laboratory being used for practical work by students of the Munich Polytechnicum when working on their degrees.

He said that I would now understand why he was not always able to work on what he would most like, and why he was not devoting more time to television and picture telegraphy as might be his wish. "Why, there have been times when those nymphs you see strewn about here kept the pot boiling." These were his words when (in translation) he pointed to a number of beautifully-shaped little statuettes in bronze and plaster of Paris standing about the room. Professor Max Dieckman, the well-known scientist and research worker, is also a sculptor of no mean ability. No wonder his scientific models and casts are so beautifully made.

The "ANY-MAINS" TWO



A specially-designed receiver which can be used on either A.C. or D.C. mains, incorporating a complete H.T. unit giving an ample supply of well-smoothed current. An ideal medium-sized outfit for mains working, giving a very good performance at moderate cost. A 6d. Blue Print of this set was given free with our October 20th issue.

IT seems that one of the reasons which hold some constructors back from taking the logical step of working their sets from the mains, so far as the H.T. is concerned, is the rather widespread feeling of uncertainty as to the future which is the natural result of all the talk we have heard about the standardisation of public supplies.

There is a general belief in the large areas at present served by D.C. supplies that, in view of the apparently impending change over to A.C., it is hardly worth while to make a start with mains apparatus.

Advantages of Mains Working.

Actually, of course, this change over is likely to take much longer than most people realise, so far as the country as a whole is concerned, but that fact does little to clear up the position in any given district, which may happen to be one of those chosen for early conversion. It is a pity, however, for anyone to be held back from reaping the many benefits of mains working by this difficulty, for those benefits are undoubtedly very considerable.

To take one alone, it is surely a great relief to know that your H.T. supply will never run down just when you want it most, so that you never need wonder whether the cause of poor reception on a particular night is a fading away of the essential volts. On the contrary, you can assume with confidence that it is more likely to be due quite simply to the night being a bad one for long-distance work, and can wait for better conditions with an easy mind.

True, the mains voltage fluctuates a little in most localities, but not, as a rule, sufficiently to have any noticeable effect on a receiver of the simpler type. The only effect you are likely to be able to detect is in the exact setting of the reaction condenser required to produce oscillation, and this is really a minor matter.

Solving the Problem.

The "P.W." Research Department has given a good deal of attention to the problem of mains sets for use in localities where a change of supply is considered likely in the near future, and we have now produced a design for a two-valver of highly efficient type which we believe will be found a thoroughly satisfactory solution of the problem.

This set has been christened the "Any-Mains" Two, and anyone who decides to build it in a D.C. area can do so with the certainty that he will have a receiver of really excellent performance which can be added to in a very simple fashion to adapt it to the new conditions when his supply goes over to A.C.

Everything originally built into the set for D.C. working remains on duty when it

is converted for A.C., so that there is nothing wasted and no unnecessary expense. It is purely a matter of adding a few more components and providing a rectifying valve.

Although we have emphasised the point that the set is an ideal one for the man who has D.C. at present and expects to change over to A.C. in the near future, it must not be forgotten that the complete design (given in full on the blue print) is equally suitable for the constructor who has A.C. already available, for it is actually something like the ideal outfit of moderate size in such a situation.

The set is nominally intended for use with ordinary battery valves, terminals being provided for the usual L.T. accumulator, but if you want to make the set completely mains-driven, it can be done where A.C. is available by using what are called "indirectly-heated" valves and making a slight modification in the connections of the detector grid leak.

The general performance of the set has been found on test to be definitely a good deal above the average, partly because great

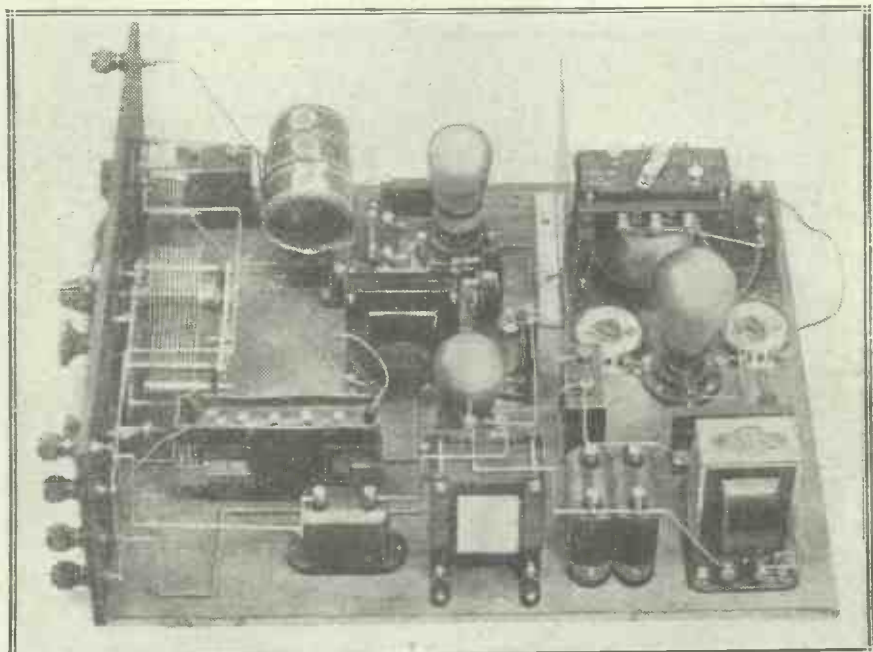
care has been expended on the working out of the details of the actual receiving circuits, and partly because a really adequate supply of H.T. is available for the L.F. stage, so that it is working under far better conditions than are usually to be found where batteries are used, with the limited voltage dictated by considerations of economy and the fairly high internal resistance to be expected from anything but a new dry battery (an accumulator is generally quite low in resistance, of course).

A Safety Device.

The necessary device has been provided on the detector stage to prevent "motor-boating" and ensure high quality, the same arrangement serving to cut down the voltage on the detector to a suitable value.

This device is actually a resistance of the wire-wound anode type, and shunted from the valve end of it to filament is a reservoir condenser of 2 mfd. The actual value of this resistance will depend on the particular detector valve in use, but 100,000 ohms is a

(Continued on next page.)



All the mains circuits are at the back of the set, to minimise the chance of direct interference with the receiving circuit proper. Note the small metal screen between the A.C. transformer and the detector valve.

THE "ANY-MAINS" TWO.

(Continued from previous page.)

good average figure. If reaction is floppy, of course, you should try other resistances—say, 150,000 and 50,000 ohms.

Now for a brief description of the circuit. The first valve is a detector with reaction, using the leaky-grid method of rectification, and the three-coil type of Reinartz circuit. The main part of this latter is provided by the tuning condenser C_1 (see blue print), the reaction condenser C_2 and the three coils L_1 , L_2 and L_3 .

Of these last, L_1 is the "aperiodic" aerial coupling coil, L_2 the tuned secondary coil, and L_3 the reaction coil.

Coupling the detector to the L.F. valve is a low-frequency transformer, to insure good amplification from the single stage.

The last valve is provided with an output filter circuit of the usual type, consisting of a good heavy-duty L.F. choke and a 2-mfd. condenser, thus insulating the loud speaker from the H.T. circuit and providing the various benefits with which the reader is probably familiar by now. (When the set is used on D.C. mains, with the positive main earthed, another 2-mfd. condenser is desirable: see note towards the end of this article.)

Good Smoothing.

The "eliminator" circuits are of quite the standard type, consisting of a double-winding type smoothing choke (Igranite in set) and the necessary reservoir condensers. The arrangement will be found to give quite adequate smoothing with any ordinary loud speaker, the amount of hum remaining being quite small, even on A.C.

It is actually so slight that it can only be heard when nothing is tuned in. To get rid of it altogether, of course simply means spending more money on the smoothing arrangements, and we consider that the

design given will be found quite a satisfactory compromise for all normal purposes.

Following the circuit through, we come next to the A.C. part of the circuit, and this consists of a power transformer, socket for rectifier valve, two optional filament resistances, and a 2-mfd. reservoir condenser.

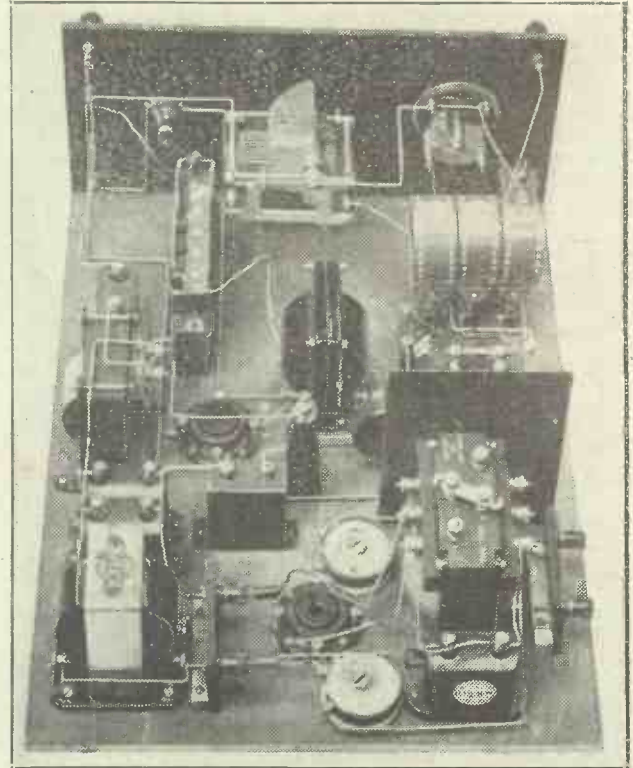
All these parts, of course, will be omitted for D.C. mains, and only added if the supply is ever converted to A.C.

This part of the outfit is all located on one corner of the baseboard at the back, and it will be noted that a pair of input terminals are provided on the primary side of the power transformer for the attachment of A.C. mains.

Mains Connections.

When working on D.C. mains, of course, they will be connected to the other pair of terminals (see blue print). When working on A.C., of course, the flex leads from the 2-mfd. condenser at the back of the baseboard are connected to these terminals, and you should be careful to get these the right way round. Similarly, on D.C. mains, you should reverse the mains leads to the input terminals if the set does not at first work. By the way, you will see on the blue print and photos that the two flex leads just mentioned were furnished with plug ends, and it may be explained that this was merely because the terminals used were of the hollow shank type into which plugs fit snugly.

Now for some miscellaneous points. The two rheostats for the rectifying valve, if used, should be capable of carrying a large current without getting dangerously hot (Igranite in set). They need only be used



Here you see the "power" circuits more clearly. The exact placing of the screen between the detector and the transformer can be determined from this view and an inspection of the blue print.

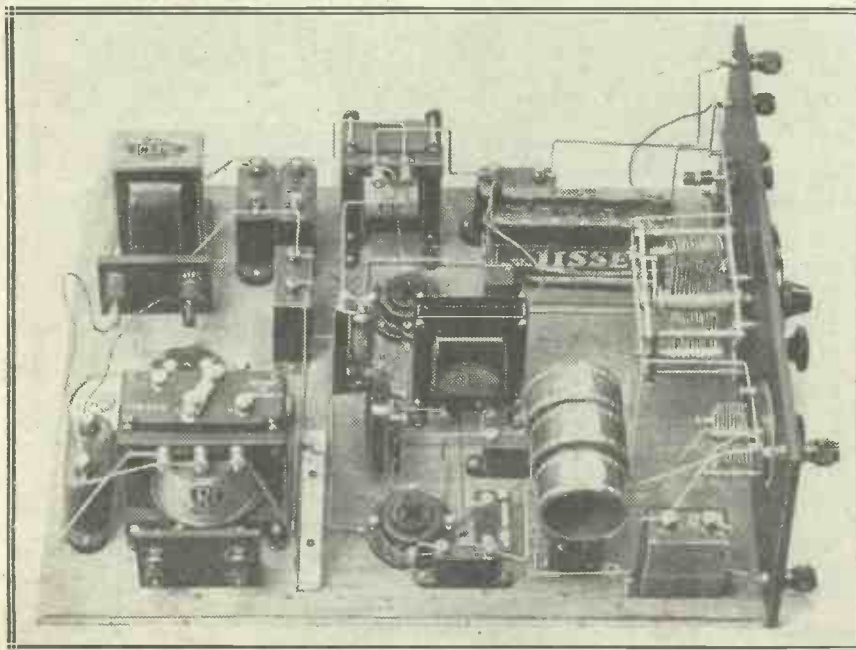
if you think you may some day want to use a 4-volt rectifier with a transformer intended for the 5-6-volt type. In such a case set each to include one ohm in circuit (i.e. a total of 2 ohms). For this purpose the roughly calibrated type with a scale of ohms is desirable.

The metal screen beside the detector valve will only be needed on A.C. mains, and not in every case even with this. For example, if the power transformer chosen has a metal case which can be connected to earth, there will probably be no need for a screen. (Whenever power transformers and chokes have metal cases, it is always worth while to try wiring them to earth. In this set connect them to the nearest point on the filament circuit.)

Another Precaution.

Next, there is the question of complete safety for the loud speaker circuit, i.e., of eliminating all risks of shock to anyone touching the terminals. In the case of A.C. mains the scheme shown on the blue print is ample protection, but it sometimes happens that with a D.C. supply the positive main is earthed, and in such a case it is as well to break the lead between the lower L.S. terminal and L.T. negative and insert another 2-mfd. condenser in series here. When this is done wire the moving plates of C_1 , and also G.B. positive direct to L.T.—instead of to the lower L.S. terminal as shown.

Operating the set is really too simple to call for any detailed instructions, and we think the coil data, valve notes, etc., on the blue print will suffice.



In this photo you can see how the receiving circuit is grouped along the front of the set, the various terminals being placed on the panel to avoid running leads back amongst the mains circuits.

TESTING "S.G.'s and PENTODES



THIS article is not concerned with the taking of curves or anything of that kind. Its purpose is to suggest to the reader simple tests that he may apply when one of these valves has been purchased in order to make sure that it is in good condition before he tries it out in his receiving set.

With the modern three-electrode valve it is generally unnecessary to make any test other than the one of ensuring that the filament is intact. In the old days when filament suspension was not what it is now cases of contact between filament and grid were not at all uncommon, but these seem to be almost unheard of nowadays. But in the four-electrode valve and the pentode, owing to the complicated and delicate nature of their construction, it is possible for faults to develop between the time of leaving the factory and that of reaching the purchaser's home.

Bad for the Battery!

A few weeks ago I received a new screen-grid valve for trial, and rather foolishly put it into the receiving set without previously testing it. I was particularly to blame, since the valve had come through the post and had therefore probably had a certain amount of rough handling—rough for a valve, at any rate. This particular type required 130 volts on the anode and 75 on the screen.

When I switched on, nothing happened, so far as reception was concerned, but a terrific commotion took place within the cells of one part of the accumulator high-tension battery. There was a straight-through short from screen grid to plate, with the result that that part of the battery lying between 75 and 130 volts received a jar that was anything but good for it.

In the screen-grid valve a short between filament and control grid or between control grid and screening grid is not very likely, since there is plenty of space in both these

These new valves require to be carefully tested in certain circumstances before they can safely be used in ordinary sets. Here are some simple ways of carrying out such tests.

By R. W. HALLOWS.

places. But the screening grid comes very close to the plate and a certain amount of mishandling may easily cause an unwanted contact to take place. Luckily this is very simple to detect. The only apparatus required is a portion of the high-tension battery and either a voltmeter, or a milliammeter with a suitable resistance (say 5,000 ohms) in series with it.

The method of testing is shown in Fig. 1. Connect one terminal of your battery to the plate terminal of the valve and the other to the meter (make the connection through the resistance if you are using a milliammeter), attach a lead to the unoccupied terminal of the meter, and with this touch the screen-grid pin of the valve. There should be no reading on the meter. If there is one a short-circuit is present.

These instructions apply to the latest type of screen-grid valve in which the screen is connected to what in the triode is the plate pin and the plate contact takes the form of a terminal at the top of the bulb. In the original "625" pattern both screen and plate are taken to pins in one of the caps and the test is made across these.

Possible Pentode "Shorts."

In the pentode the possibilities of short-circuits are greater, and tests should on no account be omitted, before the valve is used if there is any chance of its having had rough treatment. The two diagrams in Fig. 2 show how the valve is built up. As will be seen at A, the electrical centre of the filament is connected to the third grid, the grid which is responsible for preventing the secondary emission of electrons. At B, is seen a section through the electrodes. It will be noticed that the filament is surrounded by the control grid which, in its turn, lies within the screening grid. Round the latter lies the third grid, and all of these electrodes are arranged within the surrounding plate.

The possible shorts then are:

- (1) Filament to control grid.
- (2) Control grid to screen grid.
- (3) Screen grid to third grid.
- (4) Third grid to plate.

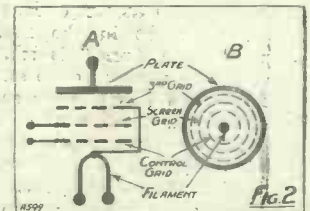
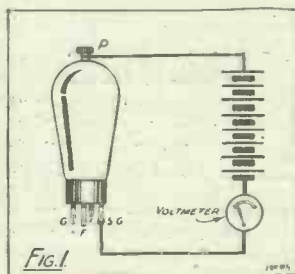
The first of these we may rule out as most unlikely, but any of the others is quite within the bounds of possibility. Both the screening grid and the plate are kept when the valve is working at about the same potential, a matter of 150 volts or so. The control grid is connected through the grid-biasing battery and the transformer secondary winding to low-tension negative. The third grid, being connected internally to the centre of the filament, is also a point of very low potential in comparison with either screen-grid or plate. A moment's attention devoted to Fig. 2 will show how serious the consequences of any of these shorts may be.

Use a Single Cell.

Simple tests are easily made on the lines of that shown in Fig. 1. They should be conducted systematically so that there is no chance of a possible short-circuit going undetected. First, connect your battery to the control-grid pin and with the lead attached to the meter touch the screen-grid terminal. No reading should be recorded.

Next connect your battery, using only a single cell, to one of the filament pins and touch the terminal belonging to the screen grid with the free lead. If there is any short between screen and third grid the meter will show a reading, since the third grid is connected to the filament. Similarly, a short between third grid and plate can be detected by keeping the same connection for the single cell and touching the plate pin with the free lead.

Not only a new pentode valve but any one that has been accidentally dropped a short distance on to the table or otherwise given unintentional ill-treatment should be tested out in this way before it is brought into use.



LATEST BROADCASTING NEWS.

PICTURE WARFARE.

THE RETURN OF DONALD CALTHROP—B.B.C. LOSING ENGINEERS—IN THE NORTH—THIRD HALLÉ CONCERT—SCOTLAND'S OWN REMEMBRANCE PROGRAMME.

"POPULAR WIRELESS" was the only journal to make a correct forecast of what would happen in connection with the recent attempt of the Post Office to "plant" Baird television on an unwilling B.B.C. Savoy Hill stuck its ground. A state of active warfare now exists between television and broadcasting. It is believed that the former attaches importance to contemplated moves in Parliament.

So bitter is the feeling, and so considerable the issues at stake, that both sides are understood to have adopted elaborate precautions, offensive and defensive, against kidnapping, abduction, physical injury, and all the other by-products of "secret watchings, tracings, and enquiries!"

One rumour has it that the Baird Company plans to co-operate with a well-known Continental transmitter, which is about to break away from the International Union in order not to be under the necessity of observing wave-length restrictions. The idea would be to use 100 kw. in the aerial and literally swamp B.B.C. transmissions, in turn on 2LO and on 5XX wavelengths.

It is doubtful, however, whether in peacetime the Government of the foreign country concerned would tolerate "ether aggression" of this kind. Anyway, the war of the pictures is on, and anything may happen. The B.B.C. are convinced that it is their duty to protect listeners from what they believe to be unsatisfactory systems. The Baird Television people are firm believers in their invention, and have tremendous resources both in money and in political influence.

The Return of Donald Calthrop.

The brilliant success of Donald Calthrop the other night in the Fantasy Revue "Quasi-Queen Anne" is regarded as the prelude of a renewed close and continuous association of this popular actor with the B.B.C. It will be recalled that Donald Calthrop was for a time dramatic producer and head of the light programme side of the work, and that, during this period, much freshness and originality were imparted.

Then Donald was seduced by the blandishments of an American tour, from which he returned in triumph to make new conquests in film-land. Now his restless genius leads him back to Savoy Hill, where he is again in the midst of reorganising and developing parts of the work which Mr. R. E. Jeffrey is farming out to him.

B.B.C. Losing Engineers.

More than half the effective strength of the O.B. Department has been stolen from

the B.B.C. by new concerns within the past few months. Starting salaries of £500 a year are freely offered. These are nearly double what the junior engineers get at Savoy Hill. Captain Eckersley was, at first, not disturbed about these raids; but now that they are spreading to other departments of his engineering branch, he is understood to be urging the administration side to revise salaries.

In the North.

Sir John Fitzgerald, ex-Lord Mayor of Newcastle, has made himself responsible for the evening programme from the Tyneside Station on Monday, November 12th. It is one in the series which the Newcastle Station is giving under the title of "My Programme" which are being sponsored by distinguished people in the neighbourhood.

Aberdeen is also giving a programme of a similar nature on Monday evening, November 12th, the person responsible though not quite so distinguished being nevertheless a local "character," namely, Mrs. MacFarlane of Ragbag Lane.

Third Hallé Concert.

The third of the Hallé Concerts, which is to be broadcast on Thursday, November 15th, will be given under the direction of Ernest Ansermet, the famous Swiss conductor. On the same evening, A. J. Alan has promised to tell another of his fascinating stories, this one about a person called "Wottie."

Scotland's Own Remembrance Programme.

Scottish listeners will hear, for the first time this year, their own Remembrance Programme on Armistice Day. They will,

of course, hear the Cenotaph Service in the morning, and the great Trafalgar Square meeting in the afternoon, both of which are to be relayed from London, but later a programme will be given which has been designed as a tribute to Scotland's fallen.

The musical portion will include the first performance of two new choral works by Scottish composers, a Highland Lament by Katherine Wilson, and "The Noble Nature," by David Cleghorn Thomson. Later in the evening a Scottish "Armistice Day" Service will be relayed from Glasgow Cathedral.

SAVED BY AMATEUR RADIO.



When the hurricane ravaged Puerto Rico recently the only touch with civilization [was by radio.] Here is young Pomeranz, of Brooklyn, who received the distress calls and relayed messages to the U.S. Navy Department.

TECHNICAL NOTES.

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

VOLTAGES FOR S.G. VALVES

IMPORTANCE OF OPERATING VOLTAGES—SUPER-SENSITIVITY—TRANSFORMER QUALITY, ETC., ETC.

Importance of Operating Voltages.

Many sets and circuits employing the screen-grid type of valve have been described, but as a rule it is not clearly pointed out that the operating voltages with this type may require close control. For example, it is sometimes vaguely stated that the screen-grid should have a "high positive bias," but in practice it will be found that this voltage is often quite critical and that it varies considerably with changes in other factors in the circuit. In some conditions 20 volts may be satisfactory; whilst in other conditions, up to within 10 volts of the plate voltage may provide the most sensitive operation.

Super-sensitivity.

It is therefore clear that if this super-sensitive valve is to be employed at maximum efficiency—which is generally the intention when using it in place of the

ordinary three-electrode valve—a source of high voltage is necessary, together with some more or less micrometric means of controlling the voltage.

One obvious means is to control the voltage by means of a stepless resistance of very large range, using a by-pass condenser of up to 1 mfd. connected across between the screen-grid terminal and the negative end of the filament, so as to prevent feedback and oscillation. The variable resistance is adjusted until the greatest amplification is obtained.

The anode voltage and grid bias with the screen-grid tube are as a rule not particularly critical.

Transformer Quality.

The ability of a low-frequency transformer to deal properly with the lower musical frequencies—the frequencies which

(Continued on page 468.)

REED-DRIVEN LOUDSPEAKERS

Great interest has been aroused by the introduction of a loud speaker claimed to be equal in reproduction to moving-coil instruments and having greater sensitivity and less complications. Here is the principle upon which it works.

By J. C. JEVONS.

THE superiority of the moving-coil over what may be called, by way of contrast, the "moving-iron" type of loud speaker has been so much proclaimed of late that it is interesting to note the appearance of another rival in the field.

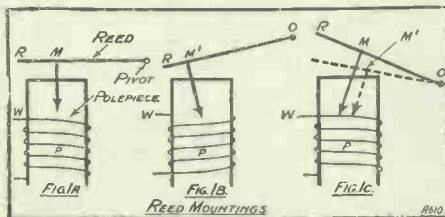
The new reed-driven speaker, which attracted so much attention at the recent exhibition in Olympia, has been specially designed to overcome certain defects which up to the present have severely handicapped the performance of any speaker not driven through a moving-coil system.

Other things being equal, there is a natural bias in favour of any instrument which can be operated satisfactorily, without requiring a separately-energised field winding. The power spent—or, as a critic would say, wasted—in this way may vary from 4 to 20 watts, according to the volume and quality of reproduction desired.

The Magnetic Pull.

This is not, perhaps, a serious item when the supply can be taken from the mains, though with A.C. the eliminator outfit makes a considerable hole in a modest purse. But the question becomes more troublesome if, for some reason or other, the mains are not available, and one has to depend entirely upon accumulators to supply both the filament and the field winding "juice."

In any type of loud speaker it is necessary, in the first place, that the amplitude of mechanical vibration imparted to the diaphragm should be directly proportional to the strength of the current flowing in the output circuit of the last valve amplifier. Otherwise distortion will occur.



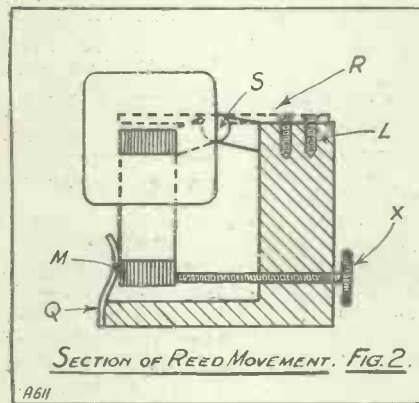
More exactly, the loudness or intensity of a note of any given frequency depends upon current amplitude. It follows that any variation in current amplitude should create proportional changes in the swing or vibration of the diaphragm.

In the ordinary type of reed-driven diaphragm this is not the case. Take, for instance, a typical reed R pivoted, as shown in Fig. 1A, at a point O, so that it normally lies parallel to the surface of the pole-piece P. In this position the pull exerted by the magnet will be in the direction of

the arrow, and can be considered as centred or applied through the point M, at a distance MO from the reed support O.

Now, as the current, corresponding to a note of given frequency, increases through the windings W, the magnetic pull on the reed is intensified. The field strength is approximately proportional to the applied current, because the pole-piece P is already permanently magnetised.

The effect upon the reed is shown in Fig. 1B. It will be noticed that the reed is no longer parallel to the pole-piece. The



gap between the tip of the reed and the magnet is less there than at any other point.

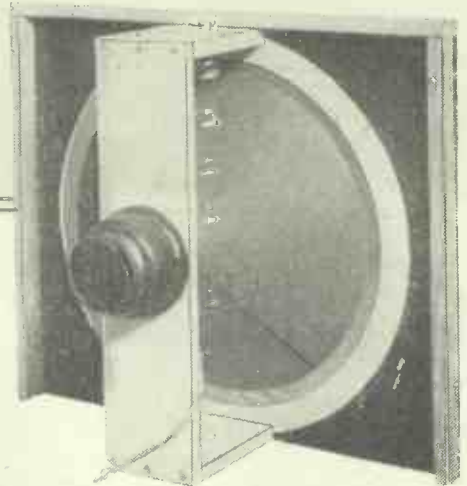
Now, in accordance with a well-known law, the magnetic flux tends to concentrate across the narrowest part of the gap, so that most of the pull is now exerted at the point M'. That is to say, it acts through a greater distance M'O from the fulcrum O than is the case in Fig. 1A.

Counterbalanced Action.

Under such conditions the reed is not vibrated in strict proportion to the changes in the output current. The impulsive force is unduly exaggerated at the lowest point of flexure.

If, however, the reed is pivoted about a point O, lying below the top of the pole-piece P, as shown in Fig. 1C, this defect will be corrected, because as the gap between the reed and pole-piece narrows the effective pull of the field is moved to a point M' nearer to O than M. Accordingly, as the magnetic flux increases, its leverage is diminished, so that one action tends to counterbalance the other.

There is another point to be considered. In an ordinary reed movement the sensitivity of the speaker depends upon the normal distance of the gap between the reed and the pole-pieces, the optimum sensitivity being secured if the reed (when vibrating at maximum amplitude) just fails to strike against the pole tips.



If a straight, flat reed is used, and the surface to which it is secured is strictly parallel with the surface of the pole-pieces, then, as it vibrates, the tip of the reed will make contact with the pole before the rest of the reed. This fact limits the amount to which the minimum average air-gap can be reduced without "sticking," and therefore lessens the sensitivity of the instrument as a whole.

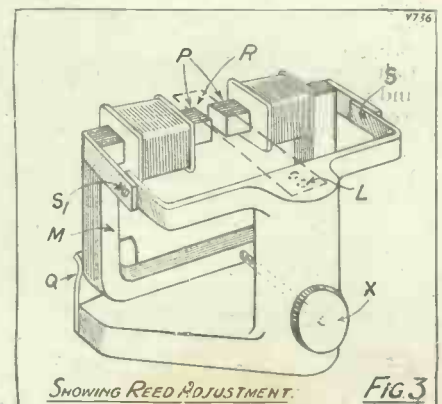
One of the characteristic features of the new reed-driven instrument is a particular method of mounting and adjusting the relative positions of the magnet and reed so that when the reed is in vibration it moves, at least in part, about a definite axis of rotation, which is so arranged that the portion of the reed nearest the axis will touch the pole-piece before the tip of the reed, i.e. it operates on the principle illustrated diagrammatically in Fig. 1C.

Method of Mounting.

The form of mounting is shown in section in Fig. 2, and in perspective in Fig. 3. The U-shaped magnet M is mounted at each side so that it can be swung about two screw pivots S, S₁ which forces it against retaining springs Q.

The reed R is secured at L to a machined surface on the main support, and extends over the pole-pieces P. It will be seen that the points S, S₁ about which the magnet is swung during adjustment, are out of line with the point of support of the reed R, so that the reed does not lie truly parallel over the surface of the pole-pieces.

Amongst other features the conical diaphragm is specially designed and constructed to react in a particularly favourable manner to the lower frequencies.



THE B.B.C. AND TELEVISION.

"The B.B.C. would welcome a Television system of practical utility value—but in their opinion the Baird system is not suitable for public television broadcasting."

By THE EDITOR.

WE reported in our news columns in last week's issue that as a result of a test of the Baird Television apparatus by the B.B.C. engineers, the Governors of the Corporation had decided that they could not undertake at present an experimental transmission service by the Baird Television apparatus through one of the B.B.C. stations.

As our readers will remember, in agreement with the Post Office, the B.B.C.



A demonstration of Baird Televisors at a recent exhibition.

stipulated that a studio demonstration of the Baird television system should be given before the Corporation considered the question of giving public experiments for which one of the B.B.C. stations should be used.

As a result of this stipulation, a test was held on October 9th which was attended by Captain P. P. Eckersley, Major Gladstone Murray, Admiral Carpendale, and other technical and administrative representatives of the B.B.C. The opinion of the B.B.C. representatives was that, while the demonstration was interesting as an experiment, it failed to fulfil the conditions which would justify a trial through a B.B.C. station.

The Full Facts.

The Corporation concluded its official verdict by stating that it would be ready to review its decision if and when developments justified.

Our readers are well aware of the fact that we have in the past criticised not only the Baird television system but the publicity methods of the Baird Company. Wishing to let our readers be well aware of the full facts regarding the technical development of television, we issued some months ago a £1,000 friendly challenge to Mr. Baird. The terms of this challenge were that Mr. Baird should televise by wireless over a short distance a number of simple moving objects, and that this demonstration should be carried out in the presence of bona fide scientific experts. The challenge was declined.

Later on, we again had occasion to criticise the Baird Company when an advertisement appeared in the Daily Press referring to the Baird Television Development Company, which said, *inter alia*: "We can all imagine for ourselves the day cannot be far distant when, without leaving our chairs at home, we shall be able to see Ascot in all its excitement and glory, or a Test Match at Lord's (or at Sydney, for that matter); see, that is, the actual events themselves at the moment of their occurrence, not just moving photographs of them some time afterwards. The truth is that, without envisaging these possibilities of the future, Mr. Baird has provided for our immediate assimilation as much as we can reasonably be called upon to digest."

Not Digestible.

It appears, however, from the result of the recent B.B.C. test that Mr. Baird

failed to provide the B.B.C. with anything which the B.B.C. could reasonably digest!

As a result of the B.B.C.'s verdict, a director of the Baird International Television, Ltd., told a newspaper representative that he and his co-directors were far from satisfied with the decision of the B.B.C. and that they would not take this matter lying down. It has been stated in the "Daily News" that the Baird Company do not think they have had fair play. They may decide to go abroad and erect the necessary transmitting station for the benefit of subscribers in Great Britain and other countries.

Our readers will remember that at the Radio Exhibition at Olympia the Baird televisor was demonstrated in an adjoining building and sets were offered for sale. But on the order form the potential purchaser was informed that if extended broadcasting facilities were not granted by the Postmaster General he would have the right to cancel the order.

The Post Office, questioned by a newspaper representative,

said that the demonstration made before the Post Office engineers was private. It was witnessed with impartiality in order to determine whether the invention of Mr. Baird warranted further or special facilities being placed at his disposal for the continuance of his experiments:

"As a result of the demonstration, our engineers decided that the Baird television system had reached the stage where further experiments of a more practical nature might be worth encouraging."

The B.B.C. were accordingly advised that no objection would be raised to their instituting experimental television transmissions if they desired to do so. Consequently, the B.B.C. asked for a test.

New Discovery Wanted.

Sir Oliver Lodge, Dr. Roberts, Dr. Lee de Forrest, Captain Eckersley and other experts have from time to time pointed out in clear and concise language in POPULAR WIRELESS, and with strict impartiality, the scientific limits of present television systems. Those limits are well known to every student of physics, and it is the consensus of scientific opinion that until some radical and new discovery is made no system of television is likely to prove of any public service utility value. As an experimental device for laboratory work, the present known systems of television are valuable and interesting, but it is a very different matter to remove from the laboratory a system and to adopt it and to adapt it for public service requirements.

The B.B.C. would welcome a television system of practical utility value, and we ourselves should be the first to congratulate Mr. Baird if, by some radical discovery, he could bring his present apparatus up to the standard required by the B.B.C.

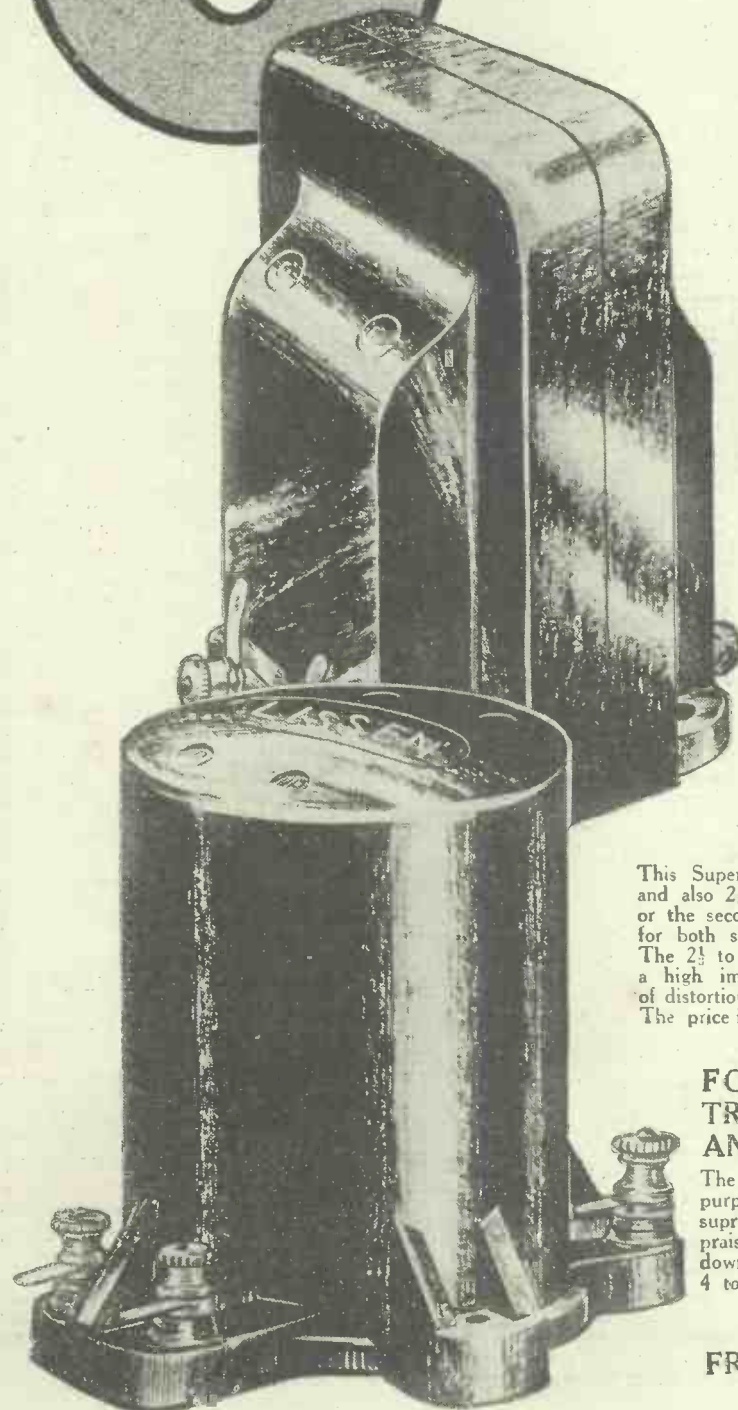
We trust that Mr. Baird will not be discouraged by the adverse report of the B.B.C. experiments, but that he will realise that although countries abroad may venture into experimental television broadcasts, the fact that the B.B.C. has refused should not be taken to mean that he has been treated unfairly or that there is prejudice against him. That is far from the case. The B.B.C. engineers know their job, and there is no question of their not understanding the system or of having any prejudice against it. It is merely that in their opinion the Baird system as at present devised is not suitable for public broadcasting.



Adjusting the Televisor during a landline experiment.



REASONS WHY LISSEN ADDED *the* SUPER TRANSFORMER



SECTIONALISED WINDINGS

There are three separate bobbins. Each is split up into a number of slots. This construction gives a very low capacity between windings and an extremely low self-capacity in each separate winding. The bobbins are very large, with an immense number of turns wound on each.



ENCLOSED PRIMARY

The primary bobbin is in between the two secondary bobbins, giving the tightest possible inter-winding coupling with the consequent elimination of any chance of distortion.



CORE of SILICON STEEL

The generous iron circuit is so arranged that every available fraction of appropriate core space is filled. The well laminated core of individually paper-insulated stampings prevents eddy current losses. The stampings, too, are made from a special Silicon steel with negligible hysteresis loss and with high permeability to resist saturation. So much so, that even in the anode circuit of a large power valve it would be impossible to produce saturation and consequent loss of primary inductance.



BAKELITE CASE

Non-porous, unaffected by heat or damp or electrical conditions. Will not lose colour or become distorted in any climate. Non-metallic, non-conducting, cannot short circuit loose or uncovered wiring, yet the transformer is for all practical purposes sufficiently shielded by the arrangement of the iron core inside.



HERMETIC SEALING

After the transformer is in its case the whole is hermetically sealed, thereby excluding moisture and dust, making the windings immune to all atmospheric changes.



CURVE & PERFORMANCE

A curve has been taken by the National Physical Laboratory, and the Certificate proves it to reproduce radio and gramophone music with an even amplification at all frequencies.

This Super LISSEN Transformer is made in two ratios, $3\frac{1}{2}$ to 1 and also $2\frac{1}{2}$ to 1. The $3\frac{1}{2}$ to 1 is suitable for use in either the first or the second stage of an L.F. amplifier, or can be used in cascade for both stages, and with practically any valve. The $2\frac{1}{2}$ to 1 transformer is suitable for use after a high impedance rectifier valve without fear of distortion or loss of high notes and overtones. The price is the same for both ratios

19/-

FOR GENERAL USE THE 8/6 TRANSFORMER IS STILL SUPREME AND WILL NEVER BREAK DOWN.

The famous 8/6 Lissen Transformer is suitable for all ordinary purposes, and its huge sale proves it still supreme value. It continues to earn high praise as "the transformer that never breaks down." Turns ratio 3 to 1. Resistance ratio 4 to 1.

8/6

**LISSEN LIMITED,
FRIARS LANE, RICHMOND, SURREY**
(Managing Director: Thos. N. Cole.)

THE "ANTIPODES ADAPTOR."

With our October 20th issue we gave away a 6d. Blue Print of this original and popular unit. Here is an article giving further details about its construction, and hints on how to use it.

By G. T. KELSEY.

AMONG the eight 6d. blue prints given free to "P.W." readers was one of a simple unit bearing the title of The "Antipodes Adaptor."

When you examine the picture on this page, which is of the Adaptor in question, and perceive how few components there are in the unit, and how really simple it is to construct, it may perhaps seem incredible that the arrangement, when used in conjunction with your present set, will enable you to hear America and Australia direct.

Yet that is exactly what it will do, and judging from readers' reports of the original Adaptor, there would appear to be no doubt of its capabilities even in the hands of the inexperienced.

For Any Set.

Those of you who were unable to obtain a copy (before it went out of print) of the "P.W." in which the original article was published will no doubt welcome a few words of explanation about the new blue print—not regarding the construction, for that is clearly shown—but about the coils and the operation of the unit.

The Antipodes Adaptor is entirely suitable for use with any straight set in which one or more L.F. stages are employed, and it can even be used with a single valve set, although in this latter case only under exceptional conditions will the reception of Australian stations be possible.

However, you see the idea? You merely remove the detector valve from your present set and insert it into the valve holder of the unit. The plug from the Adaptor takes the place of the detector valve in your set, and all is then ready for the reception of distant short-wave stations.

No extra battery connections are necessary, and the only leads which have to be transferred from the set to the unit are those of the aerial and earth.

On the left of the blue print coil details you will see a dimensioned drawing of an ebonite strip, and for the construction of the coil two of these will be required.

The strips are identical in all respects except that the centre slots should be on opposite sides.

The Cross Coil.

Having formed the two strips into a cross, secure the end of the 22 D.C.C. wire to the centre of one of the arms and, commencing in the second slot up, wind on three turns spaced at approximately $\frac{1}{8}$ in.

Now, continuing the winding in the same direction, cross over to the next slot up—that is, the one on the opposite side—and wind on another three turns spaced as before.

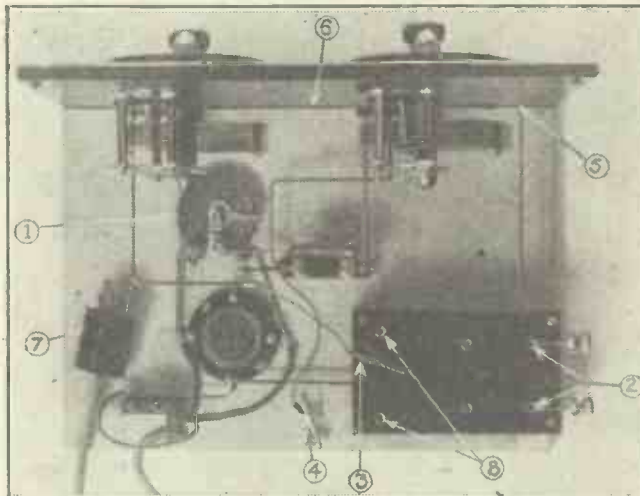
There should now be six turns on the former, and at this point the wire should be cut off and secured through-holes in the former, having a projecting piece about $\frac{1}{2}$ in. long.

Again securing the end of the wire to the former, wind in the next slot up (the fourth from centre) another three turns of the same wire spaced as before. Cross over to the last slot but one, repeat the procedure and secure the end of the wire, leaving this time about four or five inches over.

The cross coil, which is now completed, should next be tied by the string to the two-pin base, full details of which are given in the blue print.

The start of the inner winding and the end of the outer should each be connected to a pin as shown.

Next insert the coil into the sockets marked 8 in the photograph in such a way that the grid pin, to which is joined the end



Used in conjunction with the blue print, this picture of the "Antipodes Adaptor" will be found very helpful when constructing the unit. The numbered components are: (1) the potentiometer; (2) the aerial coil sockets; (3) the reaction coil clip; (4) the grid coil clip; (5) wire joining screen to earth; (6) metal screen; (7) the adaptor plug and (8) the cross-coil sockets.

of the outer winding, is the nearest to the main panel.

Connect the clip marked 3 to the loose end of the inner winding and join 4 to the start—that is, the loose end of the outer winding.

The aerial coil which, in view of its simple nature requires no further explanation, should be inserted in the two sockets midway between those marked 2 and 8.

Connect up the Adaptor in the way mentioned previously, insert a No. 60 or 75 plug-in coil into the H.F. choke socket, and with a pair of 'phones joined to the loud-speaker or 'phone terminals of your existing set, determine if the Adaptor will oscillate.

Reaction Control.

To do this, set the tuning condenser (the left-hand dial) at about 10 degrees, and increase the capacity of the reaction condenser until a rushing sound is heard in the 'phones.

If you are in doubt as to whether oscillation is taking place, touch with a moistened finger the grid socket of the cross coil, whereupon, if such is the case, a double click will be heard, one upon touching and one when withdrawing the finger.

Only one click is an indication that the set is not oscillating, and under these circumstances the aerial coil should be tried in the two sockets farthest away from the cross coil, and a higher H.T. voltage should be applied to the detector valve.

It is essential that the oscillation should be very smooth, and in this connection the potentiometer comes into use.

The slider should be placed as near to the positive end of the winding as is consistent with smooth control.

Tuning-In.

When searching for stations the tuning dial *must* be rotated very slowly, and the reaction condenser should be adjusted until the set just goes into oscillation.

The setting of the reaction condenser at which this takes place will not remain constant over the whole of the tuning range, and readjustments will therefore be necessary.

Having found a carrier-wave, or in less technical language a "howl," slowly decrease the reaction condenser until signals are heard.

Finally, take care to listen for stations at the right times, and if at first you do not succeed, have another try. That may sound rather proverbial, but even so, in view of the ever-changing conditions, it is very applicable to short-wave reception.

Sunday night is Antipodes night, and 3 LO (Melbourne) can be heard under favourable conditions between the hours of 6.30 and 8.30 p.m. The Americans are usually "on the air" every night of the week after about 10.30 p.m., so now see what you can do.

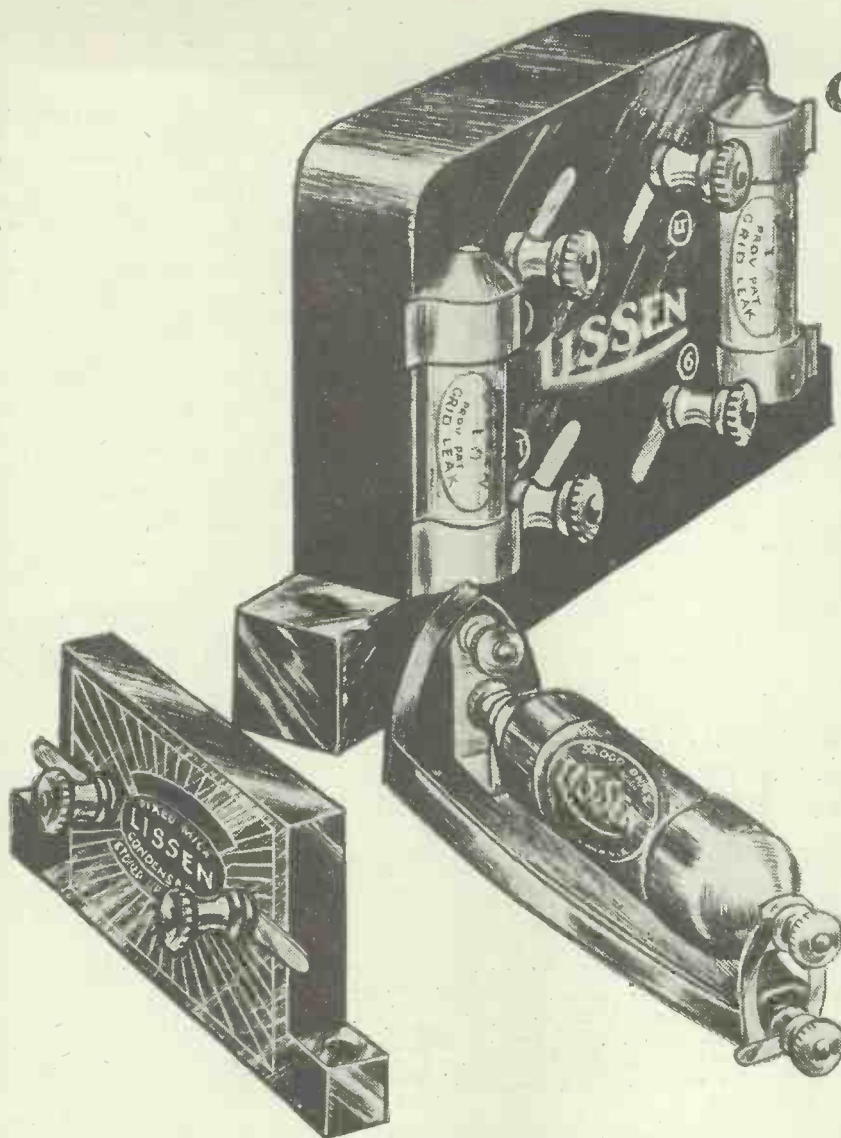
TECHNICAL TIPS.

Do not forget that an earth lead which looks quite all right may be broken under-ground, where the effect is just the same as if the external lead were broken.

Quite a good panel marker can be made from a pen-holder into the end of which an old gramophone needle has been forced.

When the acid of an accumulator falls below the level of the top of the plates, do not renew with ordinary tap water, but use distilled water which can be obtained from any chemist.

How to ensure properly-balanced circuit values



circuit values

YOU can work to any published circuit and instructions you like and *still* use all Lissen parts. You will find it a simple thing to adapt your circuit to replace any parts used in that circuit with the corresponding Lissen parts you can better use.

Use Lissen parts and you ensure that your circuit values are properly balanced throughout. Because every manufacturer has to allow himself certain limits of accuracy within which to work, and if you use parts of several different makers immediately you get parts which have been made with different standards of accuracy according to the ideas of the maker. You therefore cannot get your circuit values properly balanced—BUT YOU CAN IF YOU USE LISSEN, because you are sure there is only one standard of accuracy and that everybody knows to be a high standard.

Not only that, but Lissen parts represent the utmost value for money. Everybody knows that, too.

LISSEN WIRE-WOUND RESISTANCES

By the development of a special resistance wire, wound in unusual fashion, Lissen has produced a range of resistances of a quality comparable with expensive laboratory resistances, but at a price which enables them to be used in ordinary broadcast receivers. These Lissen resistances are actually wire wound, they are of particular value in H.F. circuits as well as in L.F. amplifiers. The low capacity of windings enables the high inaudible tones which are usually shunted by the capacity existent in ordinary resistances and which are then inaudible, now to be passed on to the next valve without loss. They are suitable for use in power amplifiers and are unaffected by current density or atmospheric changes.

The Resistances are made in the following values:

| Ohms. | Price. | Ohms. | Price. |
|----------------|----------------------|-----------------|--------|
| 10,000 | 3/6 | 80,000 | 4/- |
| 20,000 | 3/6 | 100,000 | 4/6 |
| 25,000 | 3/6 | 150,000 | 5/6 |
| 50,000 | 3/6 | 200,000 | 6/- |
| | 250,000 Ohms | | 6/6 |

YOU GUARD AGAINST SIGNAL LEAKAGE WHEN YOU USE LISSEN PARTS

Use Lissen parts—you can use them for any new circuit that comes along and not merely for any circuit that happens to be popular at any given moment. Practically every radio dealer will help you in your use of Lissen parts.

LISSEN LIMITED, FRIARS LANE, RICHMOND, SURREY
(Managing Director: THOS. N. COLE.)

LISSEN R.C.C. UNIT

Here you have a condenser which delivers all its stored-up energy, resistances which will never vary, no matter what the current load interchangeability of resistance values, at a price which is far below anything you can get which is even comparable with it.

Enclosed '01 Condenser Price 4/-

LISSEN FIXED CONDENSER

Holds its charge and delivers it without leak or loss. In any R.C.C. circuit, the condensers you use should be absolutely leakproof, otherwise 50 per cent of volume will be lost. Lissen condensers never leak, never vary, and they are accurate to within 5 per cent of their marked capacity.

'0001 to '001 1/- each.
'002 to '06 1/6 ..

WHY WORRY WITH BATTERIES?



Model "B"
L.T., H.T. & G.B.
Eliminator.

By substituting Cosmos A.C. Valves for your existing valves the new Met-Vick Model 'B' Eliminator enables you to dispense with batteries altogether, and operate straight off your Electric Supply.

Connected to a wall plug or lamp socket, the model "B" will provide you with heater current for your A.C. valve filaments, 5 tappings for the high tension supply to your valves, and automatically regulated grid bias taps for your last stage.

Model "B" Eliminators can also be obtained for supplying H.T. and G.B. only.

| | | |
|--|---|---|
| <p>L.T., H.T. & G.B. £8 0 0 A special model for 25 periods is supplied at £10 0 0 List M.S. 4745.</p> | <p>Prices of 'Met-Vick' Model 'B' Eliminators for providing 180 Volts on the last valve. Complete with S.P. 41/U rectifying valves. 100-110 volts or 200-250 volts, 40-100 periods.</p> | <p>H. T. & G. B. £7 7 0 A special model for 25 periods is supplied at £9 5 0 List M.S. 4746.</p> |
| <p><i>Ask for leaflets shown.</i></p> | | |

These eliminators are eminently suitable for the operation of the Met-Vick A.N.P. receivers described in leaflets S.P. 7117/2 and S.P. 7117/4 and for 3 and 4 valve receivers listed in leaflet M.S. 4742.

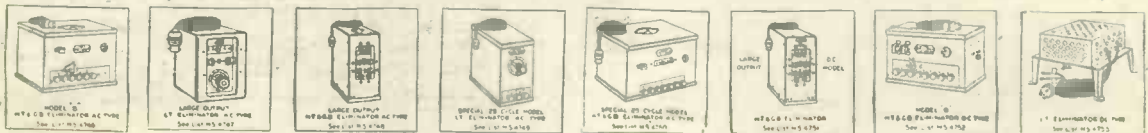
MET-VICK ELIMINATORS

Other types of Met-Vick Eliminators for A.C. and D.C. circuits are briefly referred to below and the corresponding leaflet numbers given.

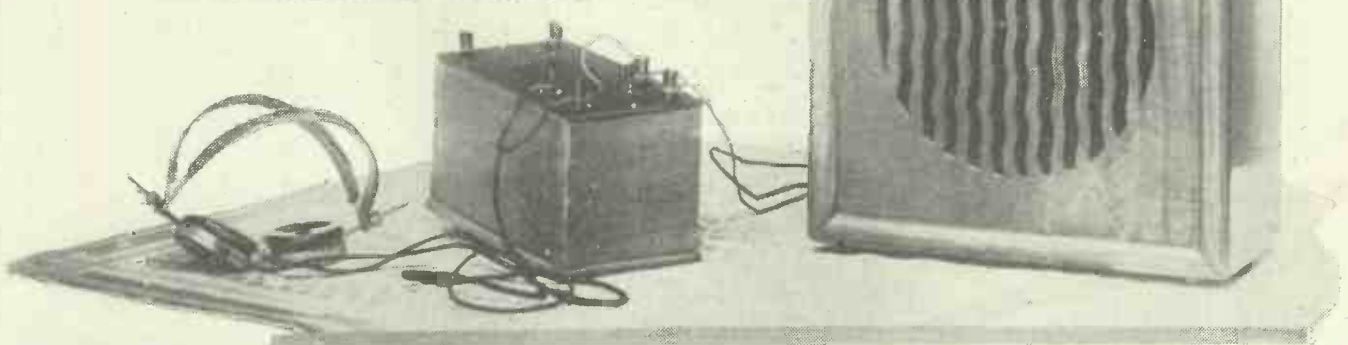
Ask your own dealer for copies or write direct to

See us at
**STAND
No. 30**
Manchester
**RADIO
Exhibition.**

Metro-Vick Supplies Ltd., 155, Charing Cross Rd., London, W.C.2.



The "PW" FLEXIBLE FILTER



Here is an easily-built little unit which will enable you to avoid the drop of volts across your loud speaker which otherwise occurs when you use a super-power valve. It takes the loud speaker out of the "live" circuits and eliminates the risk of shocks. A very simple scheme enables you to make a quick comparison of loud speakers or rapidly to change over from speaker to 'phones.

Designed, Constructed and Described by the P.W. Dept.

THE increasing use of super-power valves and the never-ending search for quality has added to the value of devices designed to separate the steady anode current from the signal impulses in the output circuit of the receiver.

One of the most popular—if not the most

transformer or other arrangement for feeding the loud speaker indirectly. But wherever the loud speaker is placed directly in series between the H.T. supply and the plate of the last valve this filter unit can be used.

The great value of a choke-filter circuit is in circuits where a super-power valve is used in the last socket. It is common practice these days for the listener to replace his ordinary small power valve with one of the super type, with the object of obtaining undistorted volume on the local station.

The anode current taken by a super-power valve is much greater than that required by one of the small power type, and it is for this reason that an output filter is so very valuable.

resistance winding, a drop in volts occurs across the winding.

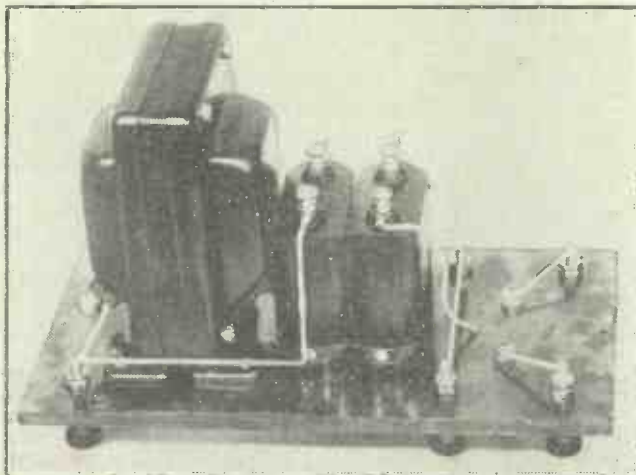
This drop represents so many volts wasted. In the case of a 2,000-ohm loud speaker,

COMPONENTS REQUIRED.

- 1 Panel, size about $8\frac{3}{4}$ in. \times $4\frac{1}{2}$ in. \times $\frac{3}{16}$ or $\frac{1}{4}$ in. (Beccol, "Kay Ray," Ebonart, Resiston, Red Seal, Trelleborg, etc.).
- 1 Box to suit (depth $4\frac{1}{2}$ in.). (NOTE.— This should be of the flat-topped type.)
- 6 Terminals (Igranic indicating type on original. Eelex and Belling-Lee also suitable).
- 1 Wander plug and 2 sockets (Clix or similar type).
- 1 L.F. choke (28/14 R.I.-Varley or similar heavy-duty type of low resistance).
- 2 2-mfd. condensers (Dubilier, Lissen, T.C.C., Ferranti, Mullard, Hydra, Marconiphone, etc.).

assuming the anode current to be 15 milliamps, which is a reasonable figure for a super-power valve, this drop would

(Continued on next page.)



This view of the unit shows the simplicity of the wiring. Note the flexible lead which is joined to one terminal of the second 2-mfd. condenser, and passes through a hole in the panel to a wander plug.

popular—arrangements used to achieve this end is the choke-condenser scheme, better known as a filter.

Super-Power Valves.

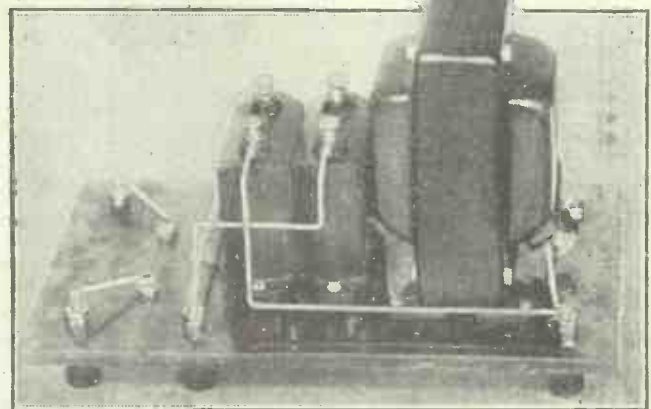
Many modern sets are equipped with a filter circuit which forms part of the design, but there are a number of less up-to-date receivers still in commission in which the loud speaker is connected directly in the plate circuit of the last valve.

The "P.W." Flexible Filter has been primarily designed for such sets as these, but it is, of course, quite suitable for use with any receiver or amplifier not already incorporating some such device.

For example, one would not employ the unit if the output current included a 1-1 ratio output transformer, or, in fact, any

The desirable feature of a choke-filter circuit is this: Many loud speakers have what are termed high-resistance windings. Such instruments are usually very sensitive.

Unfortunately, however, directly we try to use a super-power valve this high-resistance value becomes a nuisance. As was mentioned previously, a super-power valve takes a fairly heavy anode current. Now, if one attempts to pass a current through a

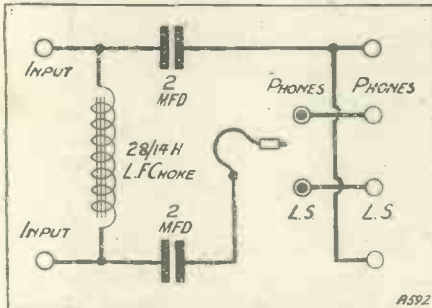


Here we see the other side of the filter. The choke chosen should have a low D.C. resistance and a substantial iron core.

THE "P.W." FLEXIBLE FILTER.

(Continued from previous page.)

amount to 30 volts. If the H.T. voltage happened to be 120, this would represent a loss of 30 volts at the plate of the last valve, the actual applied voltage only being 90.



The circuit of the unit in theoretical form.

This is a serious matter, and it is quite easy to see that distortion can easily occur through this large voltage drop.

The Output Choke.

An output filter, which incorporates a good choke, helps us to overcome this trouble, since the heavy current then passes through the choke winding instead of the

loud-speaker winding. The choke, of course, can be wound with much thicker wire, because space is not a consideration as in the case of the loud-speaker magnet windings, and in consequence the D.C. resistance is very much less, usually about 300 ohms.

Obtaining Comparisons.

If you examine the circuit of the "P.W." Flexible Filter, you will see that the loud speaker is completely isolated from the steady anode current to the last valve. The two terminals marked "Input" are joined to the loud-speaker terminals of the set. The steady anode current therefore passes through the choke winding. The passage to the loud-speaker windings is barred by the 2-mfd. condensers, and only the signal impulses can pass.

It will be observed that there are a wander plug and two sockets in the unit. The idea is that a rapid change-over from one loud speaker to another, or from speaker to 'phones can thus be made. To compare two loud speakers it is perfectly useless to connect one to the set and then to disconnect this and to connect up another.

The ear by this time has lost the true impression which it gained from the first instrument, and for a practical comparison it is essential for the change-over to be made as quickly as possible. Now, if we join one speaker to the two terminals marked "L.S." and the second to the terminals marked "Phones," we can obtain a comparison by placing the wander plug, first in one socket and then in the other.

On the other hand, it may be desirable to use a loud speaker for the reception of the local station, and 'phones when one wishes to listen to distant transmissions.

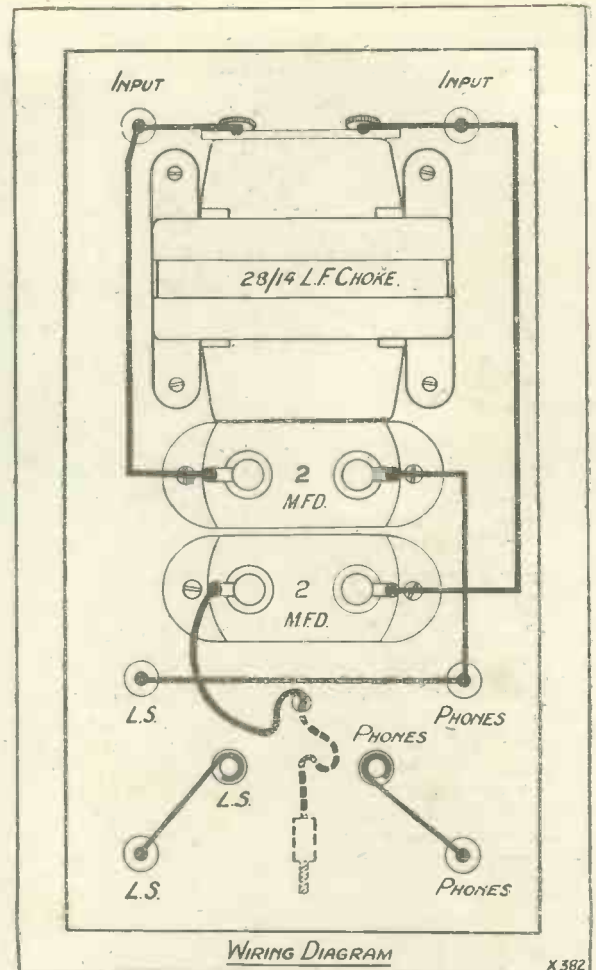
Building the Unit. :

If so, the plug has only to be transferred from one socket to the other and the change-over is complete.

Let us now turn to the construction of the unit.

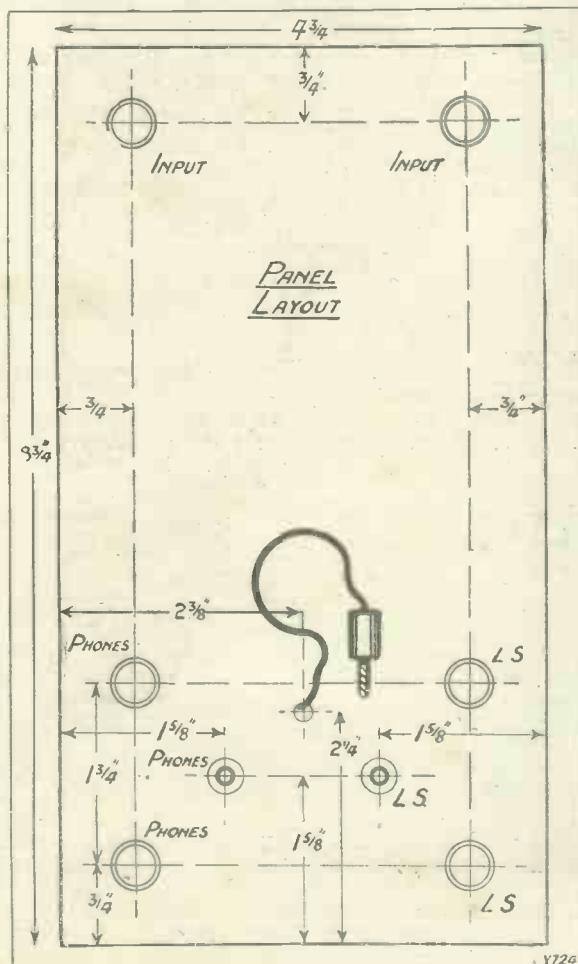
If you glance at the panel lay-out, you will see that all the components are screwed direct to the panel. This is not difficult to carry out, because the components themselves form drilling templates.

The procedure is to first of



WIRING DIAGRAM

X 582



V724

all mark out the drilling centres for the terminals and two sockets. The necessary dimensions are given in the diagram. Then in the remaining space one can place the filter choke and the two 2-mfd. condensers. The simplest way of drilling the holes for these is to place the components in position and then to scratch round the inside of the holes provided for mounting purposes. The centres of the small circles thus obtained can easily be found.

For wiring-up purposes 16-gauge tinned copper wire is as good as anything, and if necessary this can be covered with Systoflex insulating tubing.

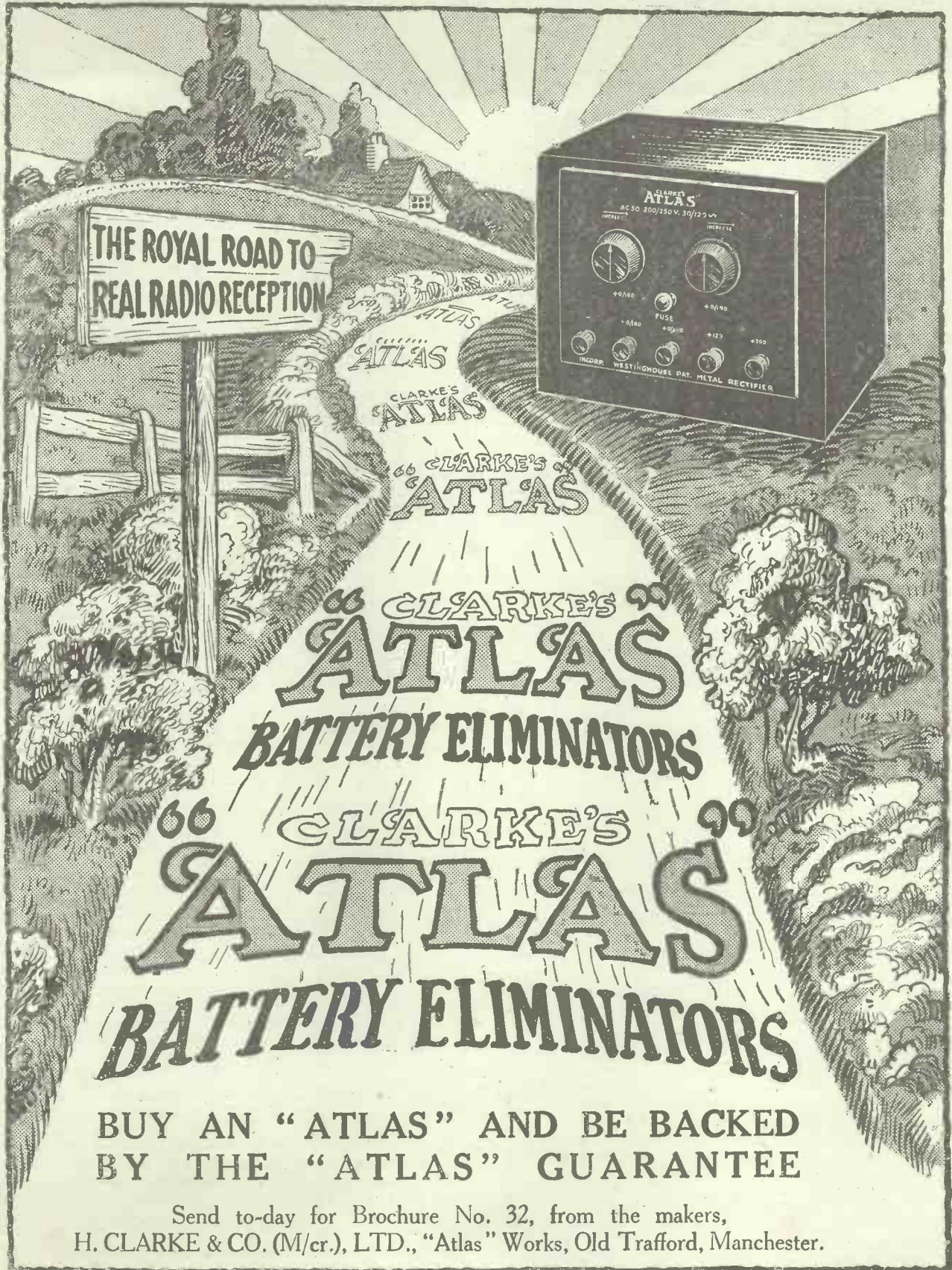
There are certain cases where a choke-filter circuit can be utilised in a beneficial manner to reduce the possibility of low-frequency howling and motor-boating.

An extra terminal on the unit is required, and we will call this L.T.—2. The alteration in the wiring is as follows:

Remove the lead which goes from "Input" to one terminal of the 2-mfd. condenser which is placed nearest the choke in the wiring diagram.

Now join the condenser terminal from which you have removed the lead to L.T.—2.

Note particularly that the "Input" terminal from which the lead has been removed must be joined to the H.T. + side of the loud-speaker terminals in the set, when connecting up the unit to the receiver. The new terminal L.T.—2 is joined to the L.T.— terminal in the set. The other terminals are joined as before.



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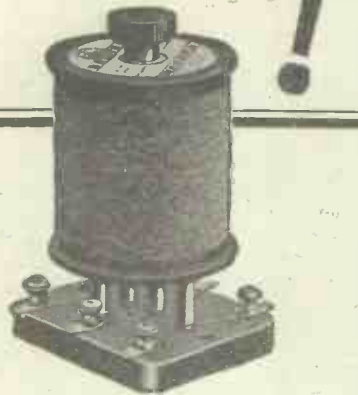


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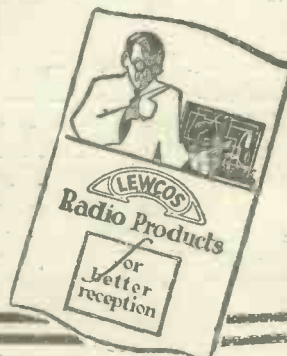
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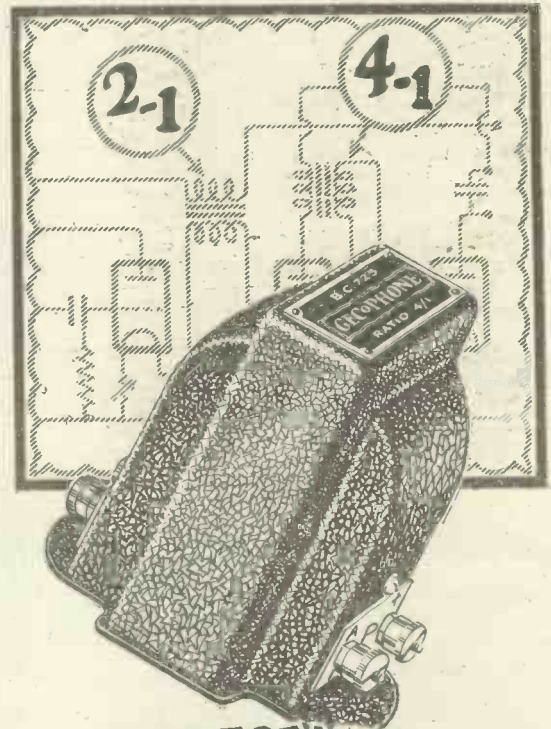
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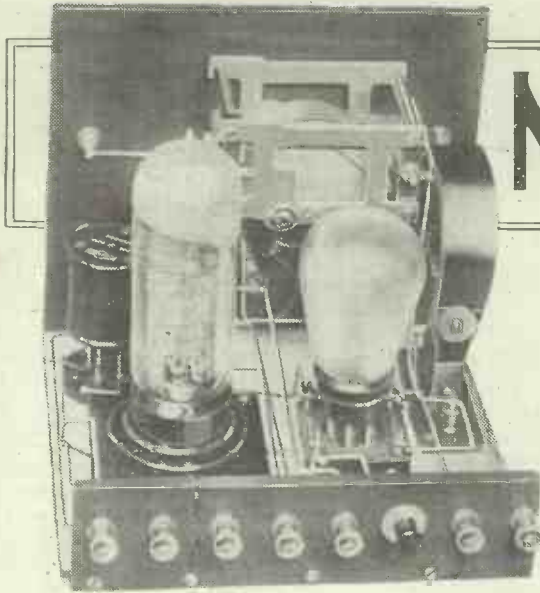
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MULTIPLE VALVES

Loewe valves are shortly to be manufactured and sold in this country, so that the following description of how these novel valves are constructed and operate should prove of more than usual interest.

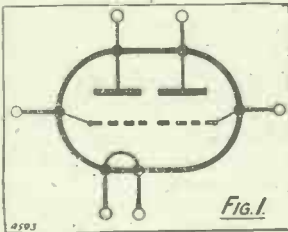
By SEXTON O'CONNOR.

FOLLOWING on recent patent litigation the Loewe Company has been empowered, as matters now stand, to manufacture and market in this country receiving sets fitted with their special multiple-unit valves. Listeners will, therefore, before long have an opportunity of becoming more closely acquainted with this type of valve, which has, by the way, already gained wide popularity in Germany.

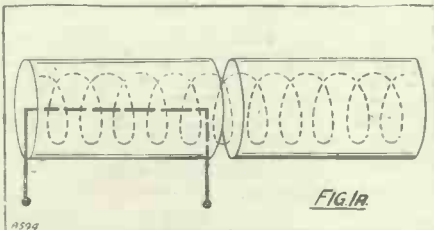
The main feature of the Loewe valve is that several sets of electrodes are enclosed in a single glass bulb, so that the latter becomes the equivalent of two or more separate stages of ordinary valve amplification.

Overcoming an Objection.

In some models, the coupling-resistances and condensers are also mounted inside the bulb. In this case all that is required is to plug the multiple valve into a baseboard, suitably wired to connect the aerial, and the batteries and loud speaker into circuit, and one has a three-valve receiving set all complete.



The first objection that comes naturally to mind is that, so far as the valve is concerned all the eggs are in one basket. If a filament gets burned out, or anything else goes wrong inside the bulb, the consequences are worse than usual, because a new double or triple stage valve must be purchased.

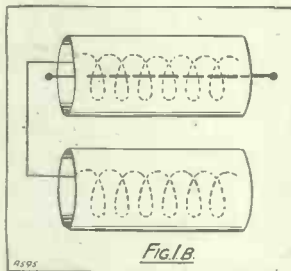


To some extent this objection is overcome by the fact that it is the policy of the makers to replace burnt-out valves at a

very moderate figure, very much below the cost of a new valve.

To meet the same difficulty, the Loewe Company have also recently designed a new model in which the amplifying electrodes are separated from the coupling resistances. The new tube has practically the same overall size as the old, but it is divided into two parts which fit snugly into each other. The upper portion contains two or more filament-grid-plate units, whilst the lower one houses the coupling resistances and condenser together with a grid-leak unit. When assembled, the two portions can be handled as a single valve, and plugged into a suitably-wired baseboard.

With this arrangement the cost of replacing a burnt-out filament is reduced because



the upper portion of the valve can be detached from the lower and repaired separately.

Resistance-capacity coupling is necessarily used between the several sets of electrodes, as it would obviously be impossible to accommodate transformer or choke coils inside a single bulb of reasonable size. This feature introduces some doubt as to whether a multi-stage-valve receiver will prove sufficiently selective in operation to bring in more than one or two stations, particularly on the short-wave range.

The Robinson Valve.

In ordinary sets, the aerial will be the only tuned circuit available, and this will hardly be sufficient to prevent considerable overlap between stations operating close together on the broadcast range of wavelengths.

The broad idea of incorporating two or more sets of electrodes in the same bulb has also been used for other purposes. For instance, Mr. J. Robinson has invented a duplex arrangement designed to automatically neutralise inter-electrode capacity in high-frequency amplification.

His arrangement is illustrated diagrammatically in Fig. 1, Figs. 1A and 1B showing two alternative methods of arranging the actual electrodes inside the bulb.

It will be noticed that in this case both sets of electrodes are not alike. The left-hand set in Fig. 1 is a complete amplifying unit, comprising filament, grid and plate,

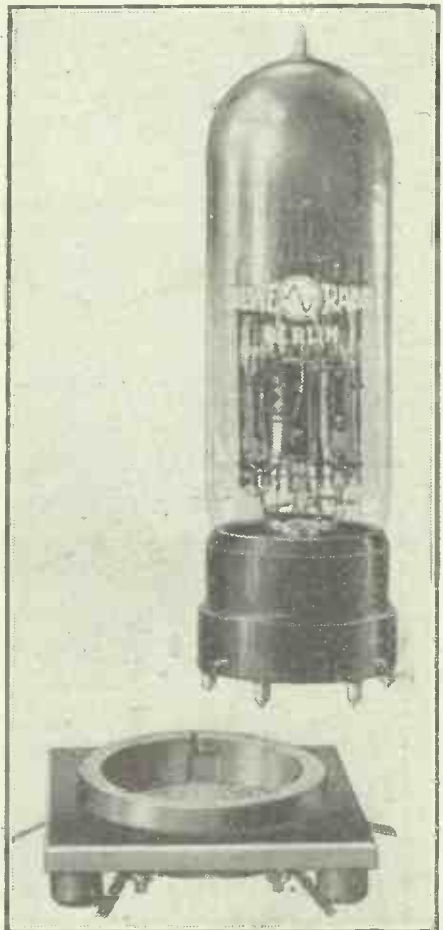
whilst that on the right-hand side consists of grid and plate only.

The latter is in effect "dead," since it receives none of the electron stream. It serves simply and solely to neutralise the capacity coupling existing between the grid and plate of the "live" set.

A "Dummy" Plate.

The action is clearly illustrated in the circuit arrangement shown in Fig. 2. Here it will be seen that one end of the output coil L is connected to the "live" plate, whilst the other end is taken to the "dummy" plate, which, together with the grid, forms a condenser system which neutralises any capacity coupling between the grid and plate of the first or "live" unit.

(Continued on next page.)



A Loewe valve of this pattern is practically a complete two- or three-valve amplifier (according to the type) as it embodies such things as anode resistances, grid leaks and condensers, as well as a multiple grid and plate assembly.

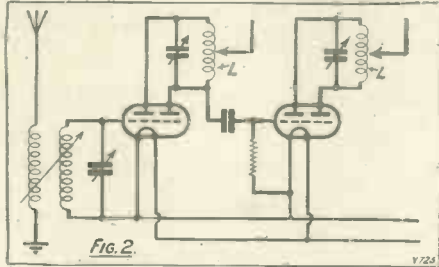
MULTIPLE VALVES.

(Continued from previous page.)

This prevents self-oscillation and consequent re-radiation from the receiving aerial.

Another ingenious multi-stage arrangement is shown in Fig. 3, where two separate plates and grids are mounted at different points along one and the same filament.

The filament is V-shaped, one leg being considerably longer than the other. The grid-plate set 1 which surrounds the single or lower filament portion is smaller



than the second set 2 which encloses the double length of filament forming the point of the V.

The total emission from the doubled filament will obviously be more copious than supplied to the lower set of electrodes, so that the unit 1 is utilised for detection or voltage amplification, whilst the unit 2 is more suitable for power amplification where a large current output is required.

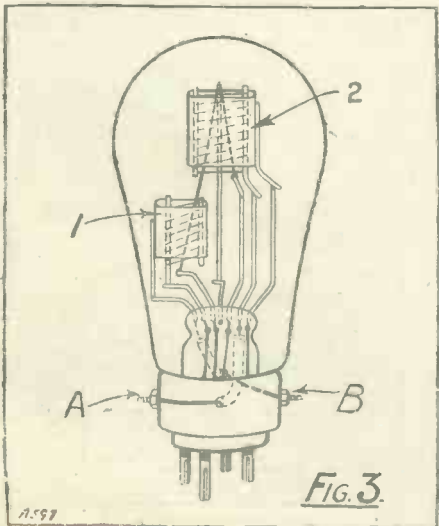
The bulb has the usual four-pin plug so that it can be fitted to a standard holder, the leads to the two additional electrodes being taken out to side terminals A, B as shown.

A Simplified Super-het.

By further lengthening the extended limb of the filament it is possible to arrange another set of electrodes alongside the first, making a total of three amplifying units, all housed within the same evacuated bulb.

Fig. 4 shows one of the latest of the well-known Loewe combinations. It will be seen that here the bulb contains one four-electrode set A and one standard or three-electrode unit B.

This valve is intended for a simplified

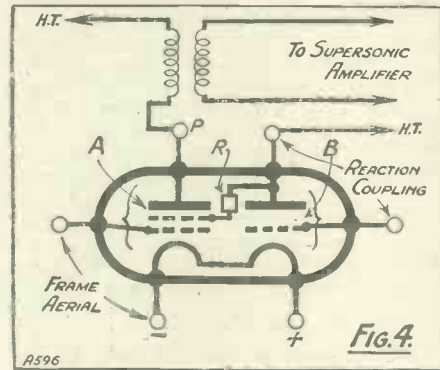


super-heterodyne receiver. The grid and plate of the three-electrode set B are connected through external coupling coils so that the unit acts as a local generator, which feeds back oscillations through a coupling resistance R on to the second grid of the four-electrode set A. A frame aerial is connected across the control grid and filament of the set A, whilst the resulting supersonic frequency is fed to a separate amplifying valve through a transformer connected to the output terminal P.

The two filaments are connected in series, whilst the coupling resistance R is of the special Loewe type mounted inside the bulb. In this way the total number of valve terminals is reduced to six, as shown.

Further Progress.

Two stages of intermediate amplification may be combined with a final detector in a second multiple valve, whilst two or more stages of L.F. amplification may be housed in a third valve, so that a complete super-heterodyne set of long range and high selectivity may be comprised within the compass of three separate valves, instead of using from six to eight tubes as usual.



The tendency to reduce the number of valves in operation is a noticeable feature in modern design. For instance, a screened-grid radio-frequency amplifier is practically equal to two stages of ordinary H.F., whilst the new Pentode valve may be counted as two valves on the low-frequency side.

If further progress is made along the same lines, we may soon have a complete high-powered set self-contained inside a single bulb.

3 LO ON BROADCAST SETS.

By G. T. KELSEY.

IS your circuit a Reinartz "det." in which plug-in coils are used and followed, perhaps, by one or more L.F. stages? Do you know that for a very small cost and with very few alterations you can make it suitable for short-wave reception?

No? Good, then read on.

If you examine the set, you will probably find three coil holders arranged side by side. The centre one of these is invariably the grid coil, while on either side is mounted the aerial coupling and reaction coils.

To make such a set suitable for the reception of short-wave stations, remove the

screw or screws on one side of the aerial coil socket which are intended to hold this coil mount to the baseboard, so that, by swivelling it the distance between this latter coil and the grid coil can be varied.

Place a 3-turn coil of the short-wave plug-in type in the aerial coil socket, a number 7 short-wave coil (7 turns) in the grid coil-mount, and use a 5-turn coil for reaction.

Simple Alterations.

If the tuning condenser (which should be in parallel with the coil) has a maximum capacity of .0005 then it will be necessary to place a .0005 fixed condenser in series with it. To do this, disconnect the wire which goes from one side of the variable condenser (usually fixed vanes), to the grid condenser side of the grid coil, and join one side of the .0005 fixed condenser to the vacant terminal on the variable condenser. Now connect the remaining side of the fixed condenser to the place to which the tuning condenser was joined before the alteration.

Should your set employ a .0003 condenser in parallel with the tuning coil there will be no need for a series fixed condenser.

Having made these alterations, the set can now be used in the normal way, except that much greater care must be taken when tuning, in order not to miss stations. In this connection, a slow-motion dial is a great help.

If there should be any difficulty in making the set oscillate on short waves, use a No. 50 or 60 plug-in coil in place of the H.F. choke at present in the set, and increase the distance between the aerial and grid coils until the set commences to oscillate.

For Two-Coil Sets.

There is a type of Reinartz receiver in which only two coils are used, and to make a set of this kind suitable for short-wave reception it is necessary to introduce a very small variable condenser such as a neutralising condenser for aerial coupling purposes.

The lead in the set joining the aerial terminal to the grid coil should be removed and, instead, this terminal should be connected to one side of the neutralising condenser. A length of flex terminating in a tapping clip should be joined to the remaining side of the neutralising condenser.

For the short-wave grid coil one consisting of 7 turns will cover such stations as 2 X A F and 3 L O, and the tapping clip from the neutralising condenser should be placed somewhere about central on the coil.

Curling "Flat Spots."

The procedure with a "two-coil" set will be exactly the same as with the set in which a separate aerial coupling coil is used, except that to reduce aerial coupling if the set will not oscillate the capacity of the neutralising condenser should be reduced.

It may be found that the set will not oscillate over certain narrow bands on the tuning condenser, although perhaps in all other respects oscillation is normal.

This "dead spot" effect is caused by the aerial, and it can usually be overcome by varying the neutralising condenser, but this adjustment will not be a critical one.

There is so much of interest to be heard at the present time on short waves that there can be no doubt of the "worth-whileness" of the scheme outlined above, especially when it is considered that the outlay is so small.



"It is tiring work 'doing' an Exhibition thoroughly," says Mr. J. F. Corrigan, M.Sc., A.I.C., in this readable radio review of the Manchester show. But our readers will all agree that it was well worth doing, and is extremely interesting to read about.

THEY were all there. The Manchester man and the Liverpool gentleman, the fellow from Bolton and the chap fra' Wigan, as well as their cousins from neighbouring Yorkshire, and a fair sprinkling of more distant relatives from Cumberland and the hill counties.

For it is a fact that these Manchester radio shows, which are organised by Provincial Exhibitions, Limited, together with associated and local bodies, although they may appear to the confirmed Olympia habitué to comprise nothing more than a replica of the great London exhibition, do play a most important rôle in the fostering of the radio spirit in the North, and in keeping the more advanced and technical amateur definitely in touch with the most recent developments and refinements in the science and art of radio reception.

"Dazzling Splendour."

This year's Northern Olympia—the fifth of the series of Manchester exhibitions—was, without a doubt, not only the largest in actual size, but it was also the most comprehensive of them all. At the Manchester Exhibition this year you could see practically everything which was on view at the London Olympia, and, in a few instances, there were additional exhibits.

It was raining when I proceeded along Deansgate in the direction of Manchester's City Hall, in which the exhibition was held, and the typical leaden-grey sky of the city, together with the peculiar yellow soup-like atmosphere which was present at the time, made me wish for a moment that, for once in a way, these exhibition people would hold their shows after more effective consultations with the Clerk of the Weather.

However, I was suddenly aroused from

these meanderings by the appearance of three mystic forms, hooded and garbed in all-enclosing white robes, and bearing on the front of their vesture the mystic symbols, "6.60." Had I not been a close follower of "P.W.'s" advertisements, and read that journal's account of the escapades of these formless creatures at Olympia, I might have found myself in a state of much wonderment, not unmixed, perhaps, with a certain amount of trepidation. As matters were, however, these "6.60" gentlemen served merely to enhance my eagerness to arrive



A good example of mains-drive receivers is this three-valver, displayed by E. K. Cole, Ltd.

at the Exhibition, and to solve, once and for all, the problem of the Mystery Receiver which, I presume, they advertised.

Arriving at the City Hall, I passed at once out of an atmosphere of mist and rain into one of dazzling splendour. It would be difficult to describe the very first momentary impressions made upon a visitor upon his entrance into the Exhibition Hall. An impression of being ushered into a vast apartment of blue and gold, with, here and there, splashes of vivid yellow and crimson, the whole of these colour sensations being inextricably mixed up with a first fleeting glimpse of myriads of receivers, loud speakers, coils, transformers, and every conceivable piece of apparatus belonging to the genus *radio*—all these things, I say, were forced upon my mind in one single instant, and, naturally, I had to stop and recover my scattered bearings before I could proceed with the job I had in hand.

More Room This Year.

The City Hall was very comfortably full, but, during the period of my visit, it did not become literally packed to overbearing, the reason being that the organisers of the show had evinced much foresight in erecting an additional hall at the side of the main one. Thus it was that an additional number of exhibitors were able to be accommodated,

and that the individual stands were more widely separated, making the aisles, gangways, or whatever you call the walking spaces between the stalls, much wider. In a word, therefore, although the total volume of the crowd at the show was the same as in other years, its density per unit area, if you like to have it in technical language, was considerably less—an advantage which was appreciated by exhibitors and visitors alike.

Many of the remarks which have been written about the London Radio Olympia apply with equal force to the Olympia of the North. Here in this northern Cottonopolis you had the same selection of receivers, components, speakers, batteries, accumulators, and so forth, which you could have seen at the London show. There was the usual and expected flock to the pentode and screened-grid valve exhibits, these comprising the most recent and notable advances which have been made in the valve world.

Attractive Exhibits.

Mullards, perhaps, presented one of the best of these exhibits, their pentode and screened-grid valves coming in for a great deal of attention at the hands of the more experienced amateur. At their stall, not only was the very latest thing in valves displayed, but much interest was created by the admirable models which were shown—models, I mean, which depicted on a large scale the inner details of the various valves which are ordinarily hidden away behind the silvering of the bulb. There

(Continued on next page.)



The Marconiphone L.F. Anode Choke is specially suitable for inter-valve coupling, and retails at 12s. 6d.



This Home Charger, which works from alternating-current mains (A.C.), is an Ediswan product, retailing at £2 17s. 6d.

THE MANCHESTER RADIO EXHIBITION.

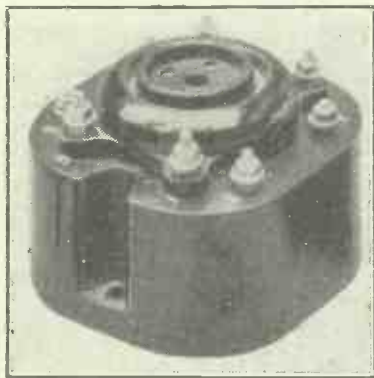
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was a present for every visitor to the Mullard stand. It took the form of a large carrier-envelope containing a copy of the firm's house-journal, blue prints, and catalogues and lists of much interest. "Fans" who were able to appreciate beauty and symmetry of design in directions other than that of radio components and receivers came away from the Mullard stand well satisfied, for the firm had arranged that their literature should be given away by Mullard girls, prettily robed, and wearing long flowing sashes inscribed with the firm's name!

Valve Varieties.

Still singling out the valve makers, I came to the equally interesting Cossor exhibit, the usual range of valves, together with newly designed H.T. eliminators and other components, being on view at this stall. Cossors, too, like Mullards, proved very generous in the way of handing out paper carriers containing attractive leaflets and pamphlets describing their products, and, in particular, a popular receiver which bears their name.

At the Ediswan stall there was a particularly interesting exhibit of transmitting



An interesting instance of compact design is the B.T.-H. R.C.C. Unit which incorporates a non-microphonic valve holder with the unit.

valves, in addition to the usual assortment of receiving valves. I lingered long over a large gas-filled rectifier valve having a D.C. output of 15 amperes, the anode voltage being 35—an attractive proposition for many advanced workers, but rather beyond the reach of many purses.

"It's the slope that matters," ran the slogan of the Mazda valve exhibit, and this statement one found to be illustrated admirably at that firm's exhibit by means of a mechanical working model depicting a very ferocious-looking sergeant-major, whose sole function in life seemed to be the performance of guard-inspection every thirty seconds or so. An excellent propaganda device, and it turned much attention to the display of the firm's valve products!

Famous Transformers.

I suppose that even the veriest tyro hardly failed to miss the Marconi display of valves, as well as their show of fully-equipped receivers and speakers. There was

everything you could think of in the valve line at the Marconi stall, and I noticed not a few individuals enquiring about the firm's indirectly-heated valves.

Then there were the transformers. At the show you could obtain particulars of any conceivable type of radio transformer from a three-and-sixpenny miniature model to a full-sized guaranteed distortionless pattern. Ferranti's naturally came in for a good deal of attention in the way of transformers, and it was noted that their models, along with many others of various makes, showed an ever-increasing tendency to compactness in design, to mechanical and electrical efficiency, and to all-round sturdiness of construction.

Among the Condensers.

A special feature at one of the stalls was the display of a machine for automatically winding at high speed transformers and various other fine-wire coils. To wind the secondary of a transformer, all you had to do was to insert the former in a special holder, to thread the wire through the machine, and, finally, to turn a series of indicating dials to the exact number of turns required for the winding. The machine did the rest, and it stopped automatically after it had finished the job.

There was nothing of any startling newness in the way of condensers, but, like every other component, these articles showed the very greatest evidences of much careful revision of design. Fixed condensers come into this category, also. I suppose one of the most interesting condenser exhibits for the ordinary radio user was that of the Ormond Company, although, let it be said, that many other condenser exhibits proved equally fascinating.

The Dubilier people had a rather interesting novelty on show in the form of a model—one-twelfth scale—of the bank of condensers which they have installed in the P.O. Station at Rugby. The fact that the drum-controlled type of condenser is gradually replacing those of the dial type was evident from a general inspection of the more refined radio sets.

And, talking of radio receivers in general, it was at once apparent that the manufacturing tendency of the last twelve months has not lain so very greatly in the direction of producing long-distance receivers, to say little of "stunt" sets, but that commercial activity has concentrated itself upon the manufacture and sale of receivers which bear, outwardly and inwardly, every possible sign of taste and refinement of design, as well as, of course, high efficiency and British thoroughness of construction and materials.

Ornamental Receivers.

Three years ago there was hardly a set shown which would have provided a real ornament for a drawing-room. Now, however, quite the opposite is the case, and the commercial receiver which does not evince the above characteristics of design and construction will not receive many buyers.

And so, for these reasons, you had at the Manchester Exhibition every conceivable type of receiving set built into every conceivable type of case or container. There were miniature valve sets small enough to fit in your overcoat pocket, and there was, at the other extreme, an elaborately fitted table receiver combining a drawing-room

"occasional table," a card table, a ladies' work-box, and even a receptacle for the containing of wine and spirit decanters—the latter use of the set probably having been allowed for in view of the persistence of the B.B.C. people in the overdoing of their talks and other "educational" stunts.



This new wire-wound Resistance—a Lissen product—is suitable for mounting either horizontally or vertically.

Yes, and—crystal enthusiasts, take heart!—there were even a few crystal receivers on show at the Exhibition, not as curiosities, but as efficient and saleable articles. One stall I noticed seemed to be doing a large amount of trade in branded galena crystals.

But, as regards headphones, I hardly saw a pair at the Show. Certainly, if any manufacturers had them available, they did not make any display of them.

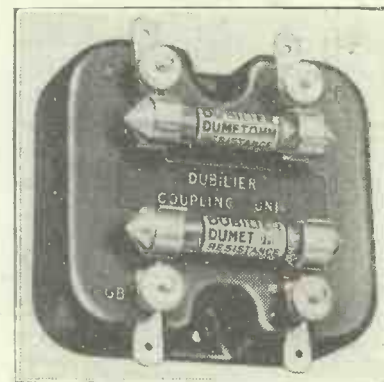
Which, I am inclined to think, is rather in the nature of a mistake. For headphones are certainly not finished with yet. Apart from their demand by crystal users, they are needed by every serious experimenter in the fields of radio, both for comparative work, and for experimental work in long-distance reception.

The Loud-speaker.

Loudspeakers, however, were given a great show at the Exhibition. There were literally thousands of them, from articles of the simple horn type down to the latest thing in the moving-coil and power-driven type of speaker. Naturally, moving-coil speakers, and, in some cases, instruments of the large cone type, predominated among the higher class displays of these articles, but even some of the tiniest of horn speakers which I heard gave remarkably good reproduction, their range of frequencies in this respect, of course, being more limited.

What I call "freak" loud speakers were on view, also. You could obtain speakers

(Continued on page 447.)



One advantage of the Dubilier Resist-nc-Capacity-Coupling Unit is that the resistances are easily interchangeable.

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these fortnightly concerts, are anxious for the Public to have the fullest benefit from this new arrangement and invite suggestions

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| 3. Overture | "Orpheus in the Underworld" | Offenbach |
| 4. Selection | "Let Me Dream Again" | Arthur Sullivan |
| 5. | "The Little Duke" | Lecocq |
| 6. | "Gipsy Serenade" | Valdez-Kreisler |
| | (Violin Solo by Hugo de Groot) | |
| 7. | "Tin Soldiers" | O. Kockert |
| 8. | "Pas des Fleurs" (from Naila) | Delibes |
| 9. | "Ballet Egyptien" | A. Luigini |

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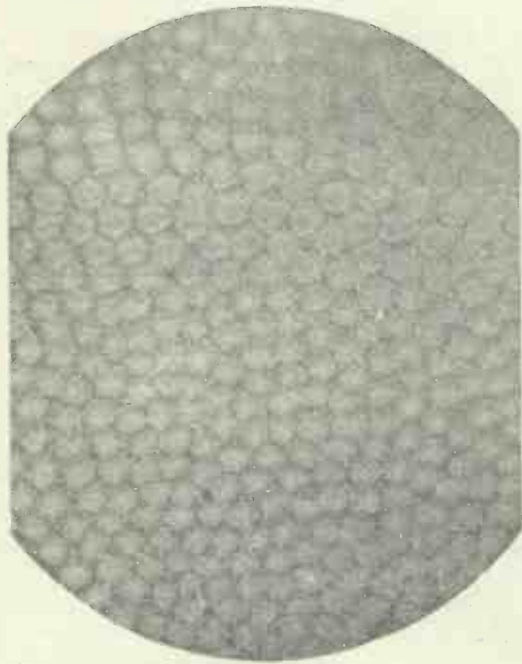
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A SOUND BASIS

It's an axiom. Yet how many wireless constructors follow it? Useless to design a high efficiency circuit; waste of time to assemble carefully chosen components unless—unless the panel is right. The panel is your foundation.

Trolite panels have high insulating properties and do not collect moisture. By using Trolite you have taken every possible precaution against panel leakage. Moreover Trolite keeps permanently good appearance and will not discolour through oxidation however long in use. The etched patterns do not show scratches or finger marks.

Trolite is easily drilled, sawn and machined. The cellulose basis makes it readily soluble in acetone and offers special facilities for labelling, jointing and beading. Special beadings are supplied to mortise at 45°, giving a distinctive finish to the panel.

The panel illustrated is the new "Trolite Morocco." Trolite panels are also available in black, walnut or mahogany grained, and in wavy or cut etched patterns, and are sold at competitive prices. Beadings are made in three colours and two patterns at ninepence a foot.

TROLITE

RADIO PANELS

F. A. HUGHES & CO., LTD. (Dept. W.2.)
204-6, GREAT PORTLAND ST., LONDON, W.1.
MANCHESTER: 185, PRINCESS STREET.

A HIGH MAST IS EQUAL TO TWO EXTRA VALVES

THE JOY OF SURPLUS POWER

Everybody knows that to have a high aerial is to get extra powerful signals. The difficulty of fixing up a high aerial is banished if you fit a

P.R. PATENT STEEL WIRELESS MAST

DAMP PROOF!
ROT PROOF!!
SCALE PROOF!!!

26 Feet high. In 3 sections of 1 1/4 in. Steel tube tapering to 1 in. Carriage, London 1/6; Midlands 2/6; elsewhere 3/6. Weight 24 lbs. Two masts for 23/6. **15/-**

34 Feet high. In 4 sections of 1 1/2 in. Steel tube tapering to 1 in. Carriage, London 2/-; Midlands 3/-; elsewhere 4/-. Weight 34 lbs. Two masts for 40/- **21/6**

The "Super" Mast

42 Feet high. In 5 sections of heavy 1 3/4 in. Steel tube tapering to 1 in. A real bargain. Carriage, London 2/6; Midlands 3/6; elsewhere 4/6. Weight 46 lbs. Two masts for 55/- **29/6**

**NO HOLES TO DIG
ONE MAN'S JOB**

Any intelligent man can assemble and erect a P.R. Mast in a couple of hours. Our patent Mast being tapered it is easy for anyone to raise it from the ground into position. Ordinary tubular Masts require several hands and difficult rigging to do this. To help you the wire rope is sent cut to size—a saving of endless worry. Imagine sorting out 500 ft. of rope in your back garden!

P.R. Sectional Masts are made of British Steel in 9 ft. lengths, from 1 1/4 ins. tapering to 1 in., and are supplied with cast iron bed plate, steel ground pegs, stay rings, galvanised steel flexible wire stays cut to lengths, pulleys, bolts, and fullest erecting instructions. No further outlay necessary.

Minimum Radius 3 ft. 6 ins. The easiest Mast to erect.

Pay C. O. D.

GUARANTEE.
Money refunded without question if not satisfied.

PAINTING.

Any protective coating applied before despatch gets so damaged by the Carriers that it is essential to paint the Mast before erection. All P.R. Masts are sent out oxide-finished ready for painting. One coat of P.R. Colloid covering applied—a 10 minutes' job—to all parts of the Mast when ready to erect sets dead hard in an hour and protects it against all weathers.

PRICE OF ACCESSORIES.

P.R. Colloid Covering sufficient for a Mast—with Brush 2/6.
Halyard Log Line—Ryland's patent rot proof.
For 26 ft. Mast, 1/6. 34 ft. 2/-. 42 ft. 2/6. Per 100 ft. 3/-.
Note.—Double length supplied to make lowering of Aerial easy.

A HIGHLY EFFICIENT AERIAL.

P.R. Aerial is made of 14-28 High Conductivity Pure Copper Enamelled Wire—each strand insulated from its neighbour, to give the highest signal strength obtainable. 100 ft., 4/3. 50 ft. 2/3.

P.R. MASTS

17-13, PATERNOSTER SQUARE, LONDON, E.C.4.
Opposite G.P.O. Tube.

IF YOU USE VALVES it will pay you to write to us for particulars of the famous 3/6 range of P.R. Valves. Each valve has a written guarantee of life and performance. See page 46!

THE MANCHESTER RADIO EXHIBITION.

(Continued from page 444.)

to hang on the ceiling, to hang up on the window, and probably to put on the floor, if you wanted. One very remarkable speaker was constructed in the form of a model of a church organ, complete with a full set of pipes. Which was a rather good idea for slow and solemn music, I thought, but which would prove rather unsuitable for the reproduction of jazz bands and concert parties.

Portable sets and radio-gramophone sets proved a great draw, more especially the



The A.F.5(C) L.F. Transformer, shown by Ferranti's, Ltd., was designed for use in push-pull circuits.

latter. However, let us deal with the portables first. They were mostly of the attaché-case type, and, as has always been my personal experience, they prove anything but portable if you have to carry them for a mile or two.

"Portables" Still Heavy.

Nevertheless, the fact that a complete radio-receiver-cum-loud-speaker can be compressed into a relatively small compass of space, and that such an article will function efficiently in almost any situation without the employment of aerial or earth will exert a great influence upon many good and non-technical folk.

Yes, there's much to be said for all the leading types of radio portables. The only thing which I, personally, don't like about them is the price, which, although it has recently been reduced, is, I think, still a little beyond the pocket of the average amateur. However, there were some very fine portable models at the Manchester Show, and, if what I hear is correct, they have a special appeal to the more elderly type of radio amateur.

Radio-Gram Section.

At one time it was quite impossible to get near the radio-gramophone "department" of the Exhibition, so dense were the crowds of amateurs interested in this comparatively new application of wireless. However, I did at last penetrate into the heart of this region, and the first object I beheld was a copy of "Modern Wireless" on a table, with the journal open at its

Gramophone Supplement page—a rather good and excellent appreciation, I considered.

A feature of the gramophone section of the Exhibition was the reproduction of the gramophone records to the entire hall by means of a bank of power-driven loud speakers, which were situated in the gallery around the hall, the gramophone exhibitors taking turns with the Exhibition orchestra in the provision of music for the visitors to the Exhibition. Complete radio-gramophone sets are still apt to be rather dear in price, all things considered, but there is no doubt that they are coming in for a great amount of popularity. So, also, are all types of electrical pick-ups, and all forms of devices for combining together the gramophone and the radio receiver. Component pick-ups were in great demand, and I was among the many individuals who seized the opportunity of closely examining such instruments at very close quarters.

Wireless Picture Demonstrations.

The advertised novelty of the Exhibition was the newly-introduced Fultograph system of picture reception, demonstrations of which were given almost continuously in the gallery. The principle of the thing is not new, no matter what the present possibilities of the system may be. You have two instruments—a transmitting one and a receiving one.

On the transmitting instrument a copper reproduction of the image or picture to be transmitted is wrapped round a cylinder which rotates at a definite speed. A stylus makes electrical contact with the various portions of the image as it revolves on the cylinder. These contacts are translated into electrical currents which are conveyed by wire or wireless to the receiving end of the system.

Here, again, there is a revolving cylinder around which is wrapped a sheet of porous paper which has been prepared with some soluble iodide compound, and moistened immediately before use. A stylus makes contact with this paper as it revolves, and the electrical pulsations of current, owing to their electro-chemical action, liberate free iodine in varying amounts in the pores of the paper.

Thus a positive reproduction of the image

at the transmitting end is accomplished. It is very important that the revolving cylinders at each end of the system should rotate at exactly the same speed, and this essential is provided for by having a series of magnetic controls and clutches, by means of which each cylinder is stopped for a fraction of a second after each complete revolution, and afterwards restarted.

Price Reduction Wanted.

As the Fultograph people point out, the B.B.C. has recently arranged a series of experiments in the radio transmission of these still pictures, and, accordingly, there may be many possibilities for amateur use inherent in the instrument. It strikes me, however, that the price of the Fultograph sets will have to be reduced before they become really popular, despite the fact that their use does not necessitate the employment of any additional radio apparatus, the Fultograph machine merely being attached to the loud-speaker terminals of a good three- or four-valve receiving set.

Again, I doubt whether the Fultograph pictures, despite their deficiencies in detail, are really permanent and fadeless? Time and experience, I suppose, will show. Anyhow, the whole exhibit was most interesting, and any visitor who failed to witness a complete transmitting and receiving demonstration really missed something of coming importance.

No Television.

I had expected to see something in the true television line at the Manchester Exhibition, but my hopes were destined to remain unfulfilled. Television was conspicuous by its absence, which, to me, seemed rather surprising, considering the gleefully optimistic claims which have been made by its adherents. There were no television components in the way of selenium and photo-electric cells, revolving and scanning discs, and so forth, on view or for sale, so far as I could discover.

The B.B.C. exhibit, situated in the newly-erected hall was a dignified and a well-thought-out affair. At the London Radio Show they charged you twopence to see this feature. At the Manchester Exhibition,

(Continued on page 452.)

THE B.B.C.'S. PICTURE TRANSMISSIONS.



(Here is Captain Fulton (right), inventor of the wireless picture apparatus shown, which is being used for experimental transmissions by the B.B.C.)

THE ZEPPELIN BROADCASTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I wonder if many others had the novel and exciting experience of listening to the arrival of the airship Graf Zeppelin in America.

I tuned in Stuttgart at about 8.25 p.m. and, hearing someone mention the word Zeppelin, I got out my log, and below is the account as I wrote it down:

8.30: Dance music by the "Tea Timers."

8.40: "Schenectady of the N.B.C. calling. The Zep is just passing over Brunswick, New Jersey, heading for New York."

8.48: Announcement by Stuttgart. More Dance music.

9.00: "Zep over Manhattan heading for New York City. I can see it now, looks like an elongated cigar. Gee! some sight. There's 'planes all round. Hear all the folks shouting. She is doing about 60 towards town."

9.5: Switched over to roof of another building in New York. Zeppelin circling over city. Bands playing, crowds shouting. Gone over the Hudson, all boats whistling. Going towards landing-ground.

9.15: Dance music, an announcement from Stuttgart, and more dance music.

Altogether it was a wonderful experience, and it did credit to the engineers on both sides who conducted the relay.

Trusting this has not wasted too much of your valuable time, and wishing success to "P.W."

I am,

Yours sincerely,
T. A. DINEEN.

Winchester.

THE "WORK-WELL" ONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Allow me first of all to express my appreciation of your valuable paper and also to congratulate the designers of the "Work-well" One on a cheap and most efficient set. I built this set according to instructions, although I have since taken five turns off the reaction coil, with this I have received the following stations at varying strengths: 5 GB, London, Manchester, Cardiff, Newcastle and Toulouse, several I cannot identify, one especially loud in the lower settings of the condenser. A most surprising thing to me is the fact that having tried it out on three different aeriols, one about 60 feet, one a 100 feet, and one much higher than those two, and over a 100 feet, the settings on the condenser barely moved a degree either way, reaction being a little more critical on the smallest and largest of the three aeriols.

Until recently I was a crystal-set listener, but it was so uncertain that I decided to take in POPULAR WIRELESS and find out a bit about the working of a valve set. Since then your books have been an invaluable source of interest to me and still continue to be so, one of my delights being to re-read my old numbers for information I had only half understood at the time, but now is quite clear. So now with my little one-valve set I can get 5 GB any time, no matter who happens to be trying to make a receiver into a transmitter, and some of the other stations some of the time. Perhaps, therefore, you

CORRESPONDENCE.

THE ZEPPELIN BROADCASTS.

THE "WORK-WELL" ONE—FRAME AERIAL RECEPTION.

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

and your staff will be glad to know that your simple little sets cause as much pleasure, no doubt, as some of the most elaborate ones.

I am, sir,
Yours gratefully.

Birmingham.

WILFRED BOSWELL.

THE "P.W." Four

The Editor, POPULAR WIRELESS.

Dear Sir,—Having built the "P.W." Four (No. 324), and thoroughly tested it, am pleased to report that it has justified the change from my old-fashioned three-valve plus an "add-on" H.F. unit. ("Full Power from Three Valves," modified slightly—"Wireless Constructor," April, 1925; and "Add-on H.F. Unit"—"P.W.," September 26th, 1925.) The detriments in this combination were unwieldiness, old-fashioned design and swinging-coil reaction.

The "P.W." Four modernises the circuit, reduces bulk, does away with the swinging coil, its hand capacity, and its 10-inch handle, and makes a most handsome receiver.

Don't forget your copy of the
Special Gift Number of
MODERN WIRELESS

Now on Sale.

PRICE 1/- AS USUAL.

The only alteration is the substitution of a 6-ohm rheostat for the switch, and others who construct sets might do the same, as the whole power from the accumulator is a little too much for the efficient working of the valves (2-volt Cossor's), and I find

approximately a 5 per cent increase in efficiency in reducing the L.T. a little, besides it being kinder to the valves.

It may be of interest to know that for H.T. I am using the Ever Ready C.B.1—4½ volt cells; these are seven times the capacity of an ordinary flashlamp cell and stand up well to the requirements of a four-valve receiver.

Yours, etc.,
S. WHITE.

W.C.I.

THE "GRID TAP" ONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Just a line to let you know the results of the "P.W." "Grid Tap" One. On an indoor aerial I have received 15 stations in one evening. Among those identified are: London, Darenty 5 GB, Toulouse, Dublin, Stuttgart, Langenberg, Hamburg.

I consider this set one of the best small sets I have made.

Wishing "P.W." continued success.

Yours truly,
W. HOWLETT.

Surry.

FRAME AERIAL RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—On leaving my old house, where I had a five-valve set with an outdoor aerial, and coming into the above address and finding that I couldn't put up an efficient outdoor aerial, I was about to give up radio when I read Mr. English's interesting article on the possibilities of receiving foreign programmes even on a frame.

I consequently had a carpenter build me a frame four feet square. I adhered to the circuit as recommended by Mr. English—namely, I use a Dubilier R.C.C. unit in the 1st L.F. stage and a Ferranti A.E.3 transformer in the second. Cossor 6-volters are used throughout the set.

A gadget I've found most useful is a 400-ohm potentiometer for the grid-leak return to the filament. Its use in obtaining decent reaction control is most valuable, whilst by using an R.C.C. stage for the first L.F. the mush is not magnified to such an extent as when a transformer is in use.

I must say that the results obtained by far have exceeded my expectations.

Two nights ago I decided to give the receiver a thorough test. Donning the earphones at 7 p.m., I tuned in the following stations at R.5 strength—London, 5 GB, Manchester, Cardiff, Bournemouth, Langenberg, Rome, Toulouse, Stuttgart, Hamburg, Frankfurt, Cologne, Koenigsberg, Bern, and Madrid. There are dozens of others at readable strength, but as I haven't got a wave-meter, I have so far been unable to identify any more.

Thanking you for your interesting and "juicy" publications, besides "Modern Wireless" and the "Wireless Constructor," which I take in regularly.

I am, yours truly,
S. H. PEARSE.

N.16.

I HAVE heard unofficially at the time of writing this that the first transatlantic work on 10 metres has at last been accomplished. At all events, I heard W 2 J N, of the United States, calling G-2 N H and telling him that his signals were being received R6.

Whether actual two-way work was accomplished I do not know; but doubtless that will follow very soon, even if it was not done at the first attempt. A piece of work like this reflects great credit on both stations concerned, since it is much easier to repeat such performances at a later date, after all the pioneer work has been done, than it is to "open the ball" in this way.

The New Wave-bands.

The work took place, by the way, at about 2.30 p.m. on a Sunday afternoon, which seems the general time for American signals on 10 metres to come through.

Now that practically all the licensed amateur transmitters have found their places in the new wave-bands, it is possible to express an opinion on the conditions likely to obtain next year. At present the whole thing seems rather an unholy muddle!

Instead of having the Americans at the bottom of the band and the Europeans at the top, as has usually been the case hitherto, we have the whole of the world's

SHORT-WAVE NOTES.

By W. L. S.

amateurs mixed up without rhyme or reason in the narrow band from 41.35 to 52.53 metres and in the corresponding 20-metre band.

Doubtless in time they will be able to sort themselves out, but at present a British station, wanting to carry out a test with an American whose signals are none too strong, has to take the risk of another Britisher sitting right on top of him at the outset, and it generally does happen that way!

A Amateur Picture Transmitters.

At least two London amateurs are working on picture transmission, using the 160-metre wave-band. On several occasions I have heard mysterious noises that could only be likened to the transmission of pictures or television, but recently I heard 2 MS and 6 TN carrying out some really interesting tests, and although I could not receive the picture in its entirety, I could

form all sorts of opinions as to what it was all about! It is surely time that a few more amateurs turned their thoughts to something like this instead of spending hours at the key sending "test DX"!

I hope, incidentally, that a little more interest is taken in future in the 160-metre wave-length, not only for the reasons I gave in a previous set of notes, but also on account of the absence of an 80-metre band for amateur use under the new conditions. I often preached about the neglect of the old 90-metre wave; and we are now rewarded for that neglect by the taking away of the wave-length altogether. If the 160-metre wave is not more used, I imagine that history will repeat itself.

The Zeppelin Relays.

The recent broadcast of the running commentary on the arrival of the Zeppelin at Lakehurst, N.J., was a good example of the use of short waves. All the German stations relayed either 2 X A D or 2 X A F, and we hear that Berlin listeners could hear the news in the streets. This most certainly would not have been dreamed of as possible in, say, 1924, while two years back there would have been a spice of uncertainty about it! Even now, for some queer reason, I am inclined to think that 2 X A D direct was clearer than the B.B.C.'s relayed version of it!



The Osram

MUSIC MAGNET

for the home constructor is the only
ADVERTISED CIRCUIT

with **SINGLE TUNING control, GANGED CONDENSER, drum dial CALIBRATED in actual wave-lengths and needing NO COIL CHANGING**

The GECOPHONE components used in the OSRAM "Music Magnet" have been specially designed and manufactured with particular regard to compact layout and reliable performance. The Valves are the latest improved **OSRAM VALVES** with the "TENACIOUS COATING."

You can build the circuit in ONE HOUR and get 27 stations. It is the best engineering job for the home constructor.

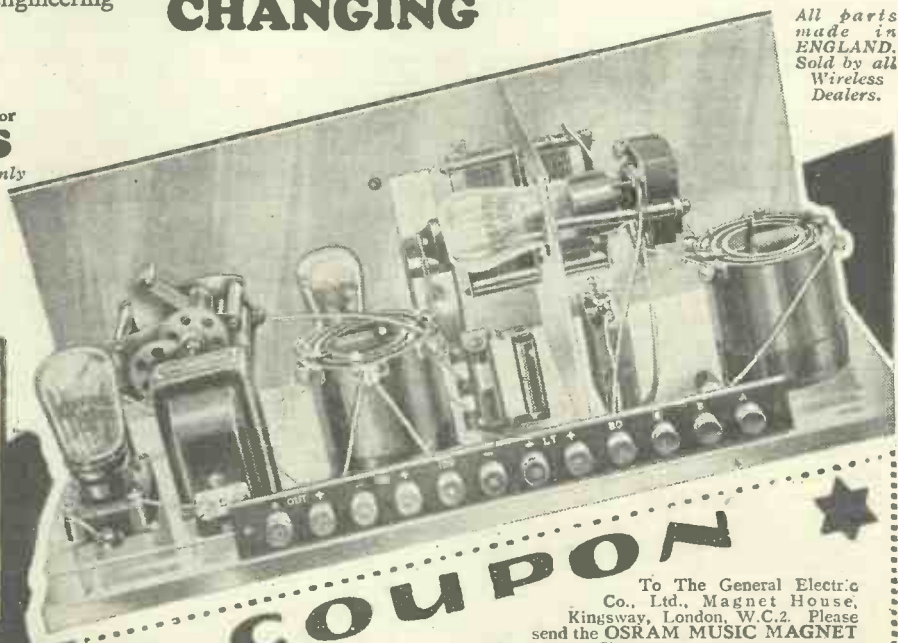
All parts made in ENGLAND. Sold by all Wireless Dealers.

REMEMBER !

The OSRAM MUSIC MAGNET is designed for **OSRAM VALVES** only
OSRAM SCREEN-GRID S215
OSRAM HL210 and
OSRAM DEP215 or DEP240

6 POINTS

1. SINGLE TUNING CONTROL.
2. NO CHANGING OF COILS
3. One hour to make.
4. No soldering.
5. Gets 27 stations.
6. No interference with your neighbours through oscillation.



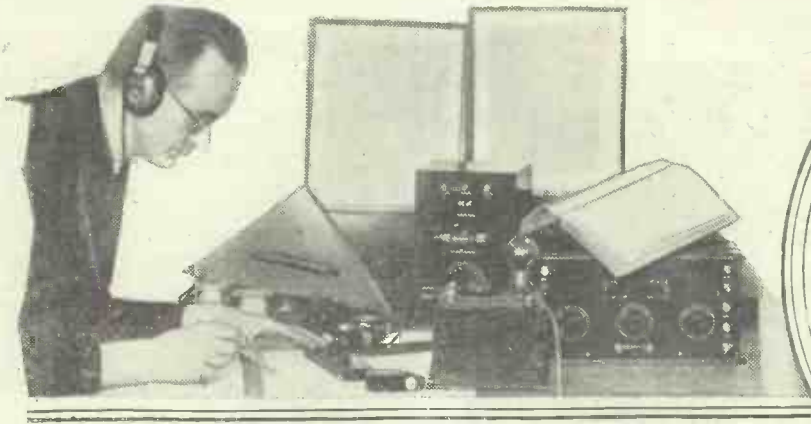
COUPON

To The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. Please send the OSRAM MUSIC MAGNET Instruction Chart to:

Name & Address

P.W.

The 3 VALVE set with a 5 VALVE performance



SAVING ON SETS

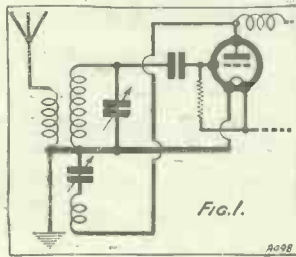
IN an endeavour to guard against all eventualities, a set designer often has to make his set slightly more complicated or costly than in certain conditions it need be. He cannot know in exactly what circumstances or by whom the receiver will be operated and he has to do his best to ensure successful results, no matter to what adversity duplications of his scheme are subjected.

Some practical hints on how to economise in the building and running of radio receivers without losing quality or distance.

**By G. V. DOWDING,
Grad.I.E.E.**

Cabinets and Panels.

The constructor who cares to use a little initiative can frequently build a receiver for considerably less than a published estimate. But if he is not quite sure of his ground he should not attempt economies. There is an old saying familiar to all about a ship and a harporth of tar. This applies most aptly



to radio-set construction.

However, let us examine the business in detail. The first requirement in set assembly is a panel and cabinet. Everyone will know that the quality of the cabinet has no bearing on the working of a set; it is merely a matter of appearance. The most sensitive and selective set yet designed could be housed in a plain deal box.

But in cases a first-class ebonite panel is an important necessity, and the only alternative is a panel of equally insulative material such as bakelite or glass. However, many modern sets could embody wooden (or cardboard, for that matter) panels without suffering the slightest harm. Especially is this the case when all the terminals are mounted on a strip at the back of the base-board. The kind of set I have in mind is one where the panel carries only variable condensers and, perhaps, an L.T. switch and the mounting screws or spindles of these condensers all are connected to "earth" (or L.T.). (Fig. 1.)

Valve-holder Economy.

A metal panel could be, and frequently is, used in such instances; insulation cannot be of interest here except in regard to a wave-change switch should such figure in the assembly.

In a four- or five-valve set, four or five valve holders of an anti-microphonic

character are invariably specified these days, but it might be interesting news to many amateurs that it is, in most cases, only the detector valve that need be feared as a source of microphonic trouble. It is fairly safe to say that money can be saved by using good but cheap valve holders of a straightforward nature for all the other valves.

There is a little risk here, I must admit, but the constructor can use his own discretion. Unless the set is a "freak," the valves are very "dud," and the room in which the receiver is used is a vibrating sound box, the outfit will be as quiet as could be, more particularly if it is stood on some soft material. I have known sets, and quite a few, too, which gave no trouble even although no "anti-pong" holders at all figured in them.

In a portable set "sprung" valve holders serve the dual purpose of protecting the valves against mechanical shocks as well as preventing microphonic noises, so in such the specifications should rigidly be followed.

Do You Need Rheostats?

Filament rheostats are, in certain cases, quite unnecessary luxuries. Especially is this so when the constructor is going to run 2-volt valves with a 2-volt accumulator cell; even fixed resistors will be quite unneeded. The modern 2-volt valve (one that is actually rated at this exact figure) will operate at the slightly extra current which will be met with when the cell is fully charged without damage occurring or even without any real effect on its length of life. And the valve will not noticeably decrease in efficiency when the current falls, as with the discharging of the battery.

In any case, a rheostat won't help one to increase the current when the accumulator is only capable of providing a pressure of 1.8 volts just before being recharged. It is only against the overload one is able to guard with a rheostat or resistance, and this will not be of great moment when one remembers one never gets the full battery voltage across the valve; there is always

the wiring in the set and the battery leads to supply some extra resistance.

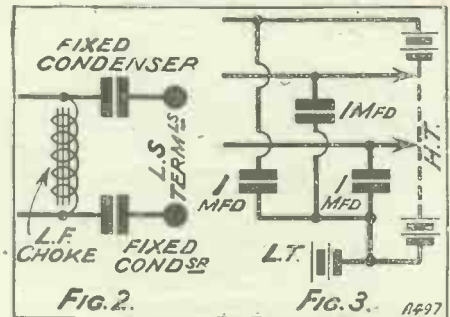
In some circumstances rheostats, or resistors, will be essential, such as when 2-volt valves are to be operated from a 3-volt source of supply. But it may not always be absolutely vital for more than one "master" rheostat or resistance to be used. Seldom can it be necessary to have one for every valve.

Sometimes it happens that a set which takes a constructor's fancy incorporates refinements which are really not justified by the depth of his purse. These could without real ill effect be eliminated. But the problem is for him to be able to distinguish what are refinements.

Regarding By-passing.

I do not consider a loud-speaker by-pass circuit a luxurious refinement. Even in a moderately small set it is useful in the majority of cases from a reproduction point of view; it safeguards the loud speaker and it makes extension leads easy to run and safe.

This part of the circuit usually consists of an L.F. choke and one or two fixed condensers, as in Fig. 2. But in an average



set H.T. by-pass condensers are by way of being absolute gilding. Personally, and I will receive all criticisms with sang-froid. I never use such condensers even when I build a four or five-valve set.

According to the book, these condensers are required for eliminating "battery coupling" and smoothing irregularities in the H.T. I do not find them successful in the first respect (others may be more lucky!), while, in my opinion, if the H.T. battery gets into such a bad condition

(Continued on page 466.)



Gallery . . . or stalls? Sound straining its way to your ear and losing all sense of personality in the process . . . or sound intimately audible? One reason why everyone is enthusiastic about the new



Amplion Speaker is that it seems to bring your receiver so much nearer to the microphone. You hear more perfectly because you hear more completely. You hear the low notes and the high notes naturally balanced, for the new Amplion Speaker gives an even response over the whole range of frequencies. It has been claimed by competent authorities that the new Amplion is the most accurate reproducer of sound on the market, not excepting the moving-coil type of instrument.

An achievement in itself—but here is the greater achievement. It is so sensitive that it can give this splendid performance from a simple two-valve set. It requires no batteries, transformers or mains connections to operate it. The secret is an entirely new form of moving-iron movement, employed exclusively in the new Amplion Speakers and fully covered by patents. Hear the new Amplion Speakers and you will double your radio pleasure.

21 Models 35/- to £42

Amplion Standard Speakers, Cone and Horn Types, 52/6 to £5. Junior Models, 35/- to £3/3/-.

The New Amplion Speakers, in handsome Cabinets of Oak or Mahogany range in price from £9/10/- to £42.

The Amplion Radio Gramophone in Oak, £58/12/6 . . . in Mahogany £63/12/6, including Royalties.

Catalogue from all Radio Dealers or from
Graham Amplion Limited.
London: 25/26, Savile Row, W.1.
Manchester: 10, Whitworth Street West.
Glasgow: 6/8, West George Street.
Head Office and Works: Slough.

AMPLION®

"ASTATIC" COILS.

By A. JOHNSON-RANDALL.

ONE of the chief dangers in designing a sensitive long-range receiver is that of coil interaction. It is well known that any single or multi-layer coil has a magnetic field. A receiver which incorporates an H.F. stage requires at least two coils, viz., those for the aerial and H.F. coupling circuits. Now if the lay-out is such that interaction can occur between these coils, there is every likelihood that instability will result. In any case the set can never be 100 per cent efficient.

Use of Screens.

How, then, can we minimise this danger? One method is to place a screen right round one of the circuits, including its coil, thus shielding the coil magnetic field from the other tuned circuit.

special manner which makes the field radius from each winding very small.

One method adopted is as follows: The winding is laid on in two halves, and one of these is wound in the opposite direction to the other.

For the broadcast band the aerial and tuned-anode coils may consist of 80 turns of $\frac{1}{4}$ Litz wire. The first half winding of 40 turns is laid on in a clockwise direction, and the remaining 40 turns in an anti-clockwise direction.

Constructional Details.

The coil is wound on a 3-inch diameter former of good insulating material, such as Pirtoid, Paxolin, shellacked cardboard, etc. The centre points of the two half-windings are joined together, and in the case of the aerial circuit the aerial lead is joined to this centre-tap through a small fixed condenser of .0001 mfd.

For 5 X X the anode coil may consist of 350 turns of No. 36 gauge D.S.C. wound in two halves of 175 turns, and the aerial coil 280 turns wound in two halves of 140 each. It is not necessary in this case to connect the aerial to the centre-tap through a series

MANCHESTER RADIO EXHIBITION.

(Continued from page 447.)

however, the B.B.C. people were more kind, and they let you in for nothing. More than that, even, the worthy Corporation, with a well-meant gesture of generosity, presented to every individual visiting their exhibit a copy of a pamphlet on the upkeep and well-being of radio sets.

Successful "Record" Concerts.

The refreshment-room and café which the Exhibition authorities provided along one of the upper galleries was a well-patronised affair, and thither I eventually repaired, not merely to refresh the inner man, but also to make some sort of feeble attempt to sort out temporarily the vast collection of miscellaneous radio literature, leaflets, books and pamphlets which I had gained, acquired, or had had thrust upon me. From my table up aloft I had an excellent chance of comparing the tonal qualities of the broadcast reproductions proper with those of the radio-gramophone type which were alternatively given to the hall via the bank of loud speakers situated on the right-hand gallery. Suffice it to say in this respect that my good opinion of the new radio-gramophone sets was very much confirmed.

I next proceeded to the many battery and accumulator stalls. The Exide people put up a very excellent show with the many types of their products, and I was particularly interested in the display of Lissen new-process dry batteries.

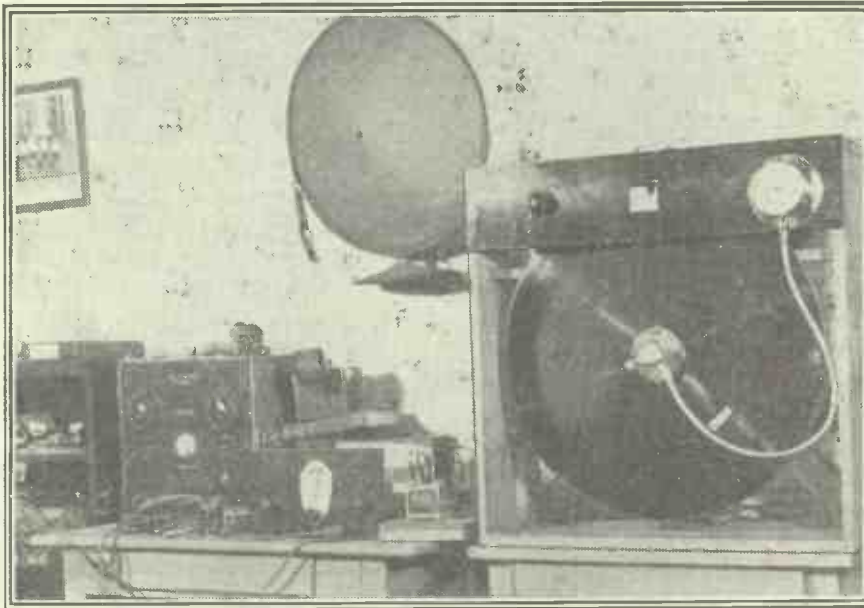
Things such as electrical soldering and welding irons, new panel materials, patent fluxes, various terminal attachments, panel metres and switches interested every single technical amateur who visited the Exhibition, I am sure. Coils, battery eliminators, home-charging units, anti-interference devices, and a host of other smaller but nevertheless very desirable gadgets attracted my attention, but the time was flying, and I knew that my train, like the time and the tide, would wait for no man.

A "Great Show."

Consequently, I had to cut short my first visit to the Manchester 1928 Radio Exhibition, leaving still one or two of the smaller exhibits to be seen at the first opportunity. But it was a great show, and certainly the largest which has been held in Manchester's City Hall. One came away from it well convinced that radio in the North is still as active a factor in the life of the community as ever it was, and that its only direction of change is a progressive one—from good to better, from efficiency to still greater efficiency.

And, therefore, if you have not been able to visit the Exhibition, I only hope that my description of it will enable you to realise what it meant and implied to Northern radio amateurs. I have painted you a little canvas of the Exhibition. You may, perhaps, think that the colours are too glowing. But they are accurate enough. Take your thumb off them, there! My canvas is still wet, and, at least, in my mind, it will take a whole year to dry!

MORE MOVING-PICTURE BROADCASTING.



The receiving apparatus with which James Millen, at Malden, Mass., picked up moving shadowgraphs transmitted by radio from Washington, 500 miles away. The images were affected by fading and swinging, and were far from perfect.

The common method is to screen the H.F. stage. This is quite a sound scheme, but unfortunately it tends to make the construction of the set rather more difficult than it would be otherwise, because certain components and wires have to be carefully arranged in the screening-box.

Minimising Interaction.

There is a way of minimising interaction, and that is by using a static screen in conjunction with astatic coils. A static screen is simply a sheet of copper placed across the baseboard and interposed between the tuned circuits. Thus, any capacity coupling which may give rise to interaction effects is reduced.

In order to cut down all changes of linkage between the fields of the tuning coils, the coils themselves are wound in a

condenser. There is another scheme which is more common commercially, and this is known as the binocular method.

The two halves are wound upon separate formers and the coil, in appearance, resembles a pair of binoculars, hence the name.

This method is rather too difficult for the home constructor to attempt, but actually the field of a binocular coil is smaller than that of an "astatic" winding of the type already described.

Unless great care is taken in winding these coils their H.F. resistance tends to become considerable and selectivity and sensitivity are decreased.

This is a disadvantage with practically all astatic windings, but then set design is always a compromise, and it is not yet possible to obtain the ideal conditions of maximum stability, sensitivity, and selectivity.

Electrify your set



Use

THE PHILIPS TRICKLE CHARGER

In one shot the Philips Trickle Charger solves your L.T. problem simply, safely and automatically. It makes your receiver take its L.T. Supply like a mains receiver . . . gives you at the turn of a special switch the charging current to keep your accumulator in tip-top condition or disconnects the mains during use of your receiver. No changing of connections.

Compact . . . efficient . . . the last word in modern trouble-free radio. Every radio owner with A.C. House Mains should fit the Philips Trickle Charger to his accumulator and have unflinching L.T. current all day and every day.

55/-

PHILIPS

for Radio

Please send me full particulars of the PHILIPS Trickle Charger.

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Radio Dept., Philips House,
145, Charing Cross Road, London, W.C.2.

M.....

P.W.

FROM THE TECHNICAL EDITOR'S NOTE BOOK



"EKCO" MAINS UNITS.

The firm of E. K. Cole, Ltd., of Leigh-on-Sea, Essex, is unique. Years ago they caused considerable stir in radio circles by bursting into being with H.T. mains units. Some thought they must be before their time, but time has seen their enterprise and optimism bear full fruit. To-day, when mains devices of all kinds are extremely popular and widely used, E. K. Cole still hold a position well in the van. And, progressing from the start, they have kept moving forward.

I have just been examining and testing two of their latest H.T. units. They are both IV.A.20 models, one being for D.C. and the other for A.C. mains. The A.C. model employs valve rectification, the valve being completely enclosed in a separate compartment. Both models have two voltage tappings of one variable between



The "Ekco" A.C. model IV.A.20.

0 and 120 volts, and giving any current from 1 to 6 milliamperes approximately, and one fixed at 120 volts at 16 milliamps approximately. The price of the D.C. type is £2 18s. 6d., and the A.C. £5 8s. 6d. They are compact devices, and of safely-enclosed patterns.

The mains on which the D.C. model was tested are more than usually noisy, but the smoothing was found to be adequate, and no hum was audible even when reaction was closely adjusted and there was no modulation. A four-valve receiver employing one H.F. stage was operated with results equal to those obtained with batteries. The A.C. model was found equally satisfactory.

MODERN RADIO CATALOGUES.

During the past few weeks I have received a large number of catalogues from radio firms, and for the most part these are most excellent productions and far removed from the crude leaflets that were at one time circulated.

For instance, the new Met-Vick (Cosmos) wireless catalogue is a magnificent affair. It is extremely well printed and copiously illustrated, the paper being thick and glossy. It is divided into well-defined sections covering valves, receivers, mains units, and equipment, etc., each section having blank pages for note-making.

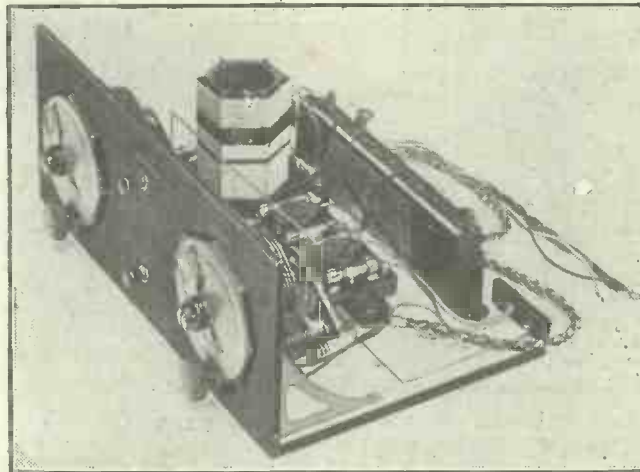
Individual sections and even individual pages covering special items are, I am informed, freely available at all wireless dealers.

Another excellent catalogue is one due to the Dubilier Condenser Co. This embodies some remarkably useful information regarding condensers and should prove of considerable interest to radio amateurs. The ground covered by the Dubilier catalogue reveals the wideness of their range of products and more particularly the comprehensive nature of their condenser types. This catalogue also is a de-luxe production in regard to paper and printing and general "make-up."

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

NEW EDISWAN R.C. "THREESOME."

This season there are really two Ediswan R.C. Threesomes. In general construction both are identical, but in the one the three-valve circuit is a 'Det.-2 L.F. resistance-coupled throughout, and in the other



The new Ediswan "Threesome," incorporating two stages of R.C.C.

the last stage is transformer-coupled. The same remarkably ingenious and simple method of coupling the units has been retained, although the circuit has been revised.

The proved and stable capacity-reaction control known as the Schnell is incorporated, the two geared dials used making a symmetrical and artistic front-of-panel lay-out. Also on the panel are an on-off switch and a switch enabling the set to be changed over from the short to long wave-lengths and vice versa. The R.C. Threesome is still a wonderfully compact assembly.

There is an inductance unit which carries the coils, the detector valve, and its grid leak and condenser. This unit plugs into an R.C.C. unit complete with valve holder. This in turn can couple with another R.C.C. unit or a transformer unit which comprises an L.F. transformer and valve holder.

Into the last unit of the arrangement plugs the multi-flex cable for connecting the

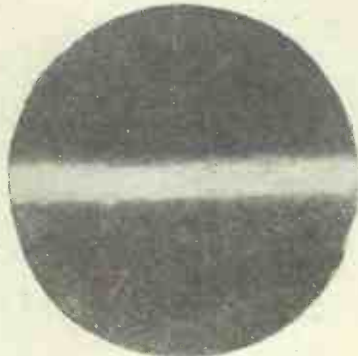
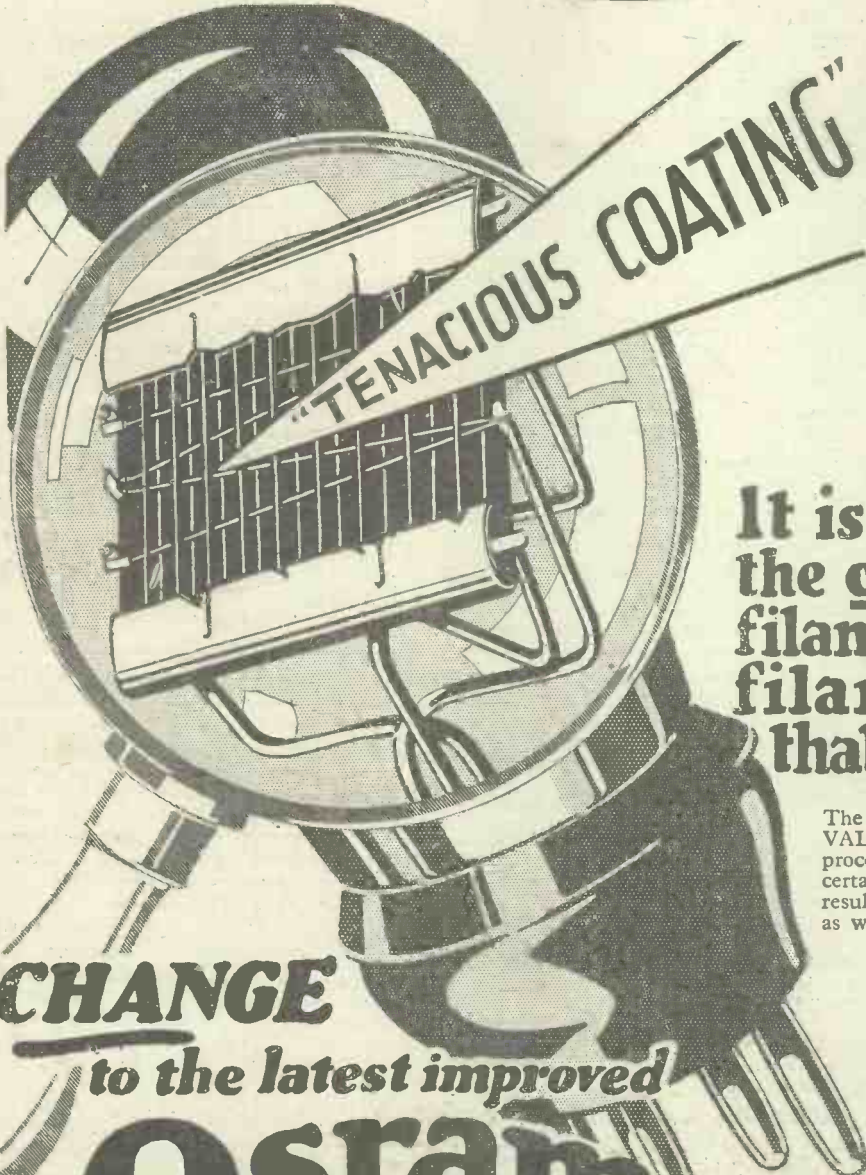


This is the transformer unit which figures in the Ediswan "Threesome" R/3T.

set to the high- and low-tension batteries. This coupling scheme eliminates innumerable leads and, indeed, makes the building of the receiver "mere child's-play." And I really must compliment the Ediswan people on the paper models they supply. These each consist of a flat piece of stout paper which, when bent up, gives a remarkably faithful picture of the assembly.

I amused myself one evening building two Ediswan R.C. Threesomes, and even this did not occupy the whole of the evening. I was able actually to test both sets as well. Having acquainted myself with the circuit and the general design of the receivers, I anticipated first-class three-valve results, and was not disappointed. Certainly, I prefer the circuit No. R/3T, the one which uses an L.F. transformer, but with both circuits there was no difficulty in tuning in a half dozen or more stations on the loud speaker with commendable punch and purity. The reaction controls on both long and short waves were found to be smooth and easy, the sets were stable and free from hand-capacity effects.

EVERYTHING **The G.E.C.** ELECTRICAL
your guarantee



OSRAM FILAMENT with "TENACIOUS COATING"

This reproduction shows the coating typical of all OSRAM VALVES. Notice the absolute evenness of the coating. There are no gaps, the coating clings, so that the full benefit of the coating is maintained. The secret is the startling new discovery of the scientific process of "TENACIOUS COATING."

It is the coating on the filament, not the filament itself that gives results

The coating on the filaments of OSRAM VALVES is applied by a new scientific process. It is so tenacious that users are certain of getting the same wonderful results after months and months of use as when the valves were first bought.



BADLY COATED FILAMENT

Reproduction from an untouched micro-photograph of part of the filament of a badly coated valve before use, showing a serious gap in the coating. A gap such as this starts the valve off in its life with a poor performance, and may bring about a further portion of the coating falling away or peeling off. The valve then prematurely fails.

CHANGE
 to the latest improved
Osram Valves
 and

CHANGE for the Better!

Scientifically made by Experts in England. Sold by all Wireless Dealers.

WRITE

for Booklet "Osram Wireless Guide" giving full particulars of "Tenacious Coating" & full range of Osram Valves. Sent Post Free on request to The General Electric Co., Ltd., Publicity Organisation, Magnet House, Kingsway, London, W.C.2. Copies also obtainable from your local Wireless dealer.



RADIOTORIAL

All Editorial Communications to be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Life, 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.

THE "TOM-TIT" TWO.

W. G. N. (Lancaster).—"The set is called the 'Tom-Tit' Two, and I believe it was described in POPULAR WIRELESS for last September. I have not got the description of it, but before connecting up I should like to make sure that the wiring is O.K. Could you give me the wiring in words instead of in diagram form, which I believe was given at the time?"

You can check the wiring of the "Tom-Tit" Two from the following list of the connections.

Join L.T. -- to H.T. --, to one filament contact of each valve, and flex for G.B. +.

Join L.T. + to socket on short-wave tuned coil mount, earth, socket of short-wave aerial coil mount, pin of long-wave tuned coil mount, pin of long-wave aerial coil mount, moving vanes of tuning condenser, and one side of L.T. switch.

Join other side of L.T. switch to remaining filament contacts on valve holders.

Join aerial 1 to one side of .0003 fixed condenser.

Join other side of .0003 fixed condenser, to aerial 2, top centre of wave-change switch, and fixed vanes of reaction condenser.

Join bottom centre contact of wave-change switch to one side of grid condenser and leak and to fixed vanes of tuning condenser.

Join remaining sides of grid condenser and leak to grid of first valve.

Join top right-hand contact of wave-change switch to socket of long-wave aerial coil mount.

Join bottom right-hand contact of wave-change switch to socket of long-wave tuned coil mount.

Join top left-hand contact of wave-change switch to plug of short-wave aerial coil mount.

Join bottom left-hand contact of wave-change switch to short-wave tuned coil mount (plug).

Join plate of first valve to one side of H.F. choke and one side of .002 fixed condenser.

Join other side of .002 fixed condenser to moving vanes of reaction condenser.

Join remaining side of H.F. choke to anode terminal of L.F. transformer.

Join H.T. + terminal of L.F. transformer to H.T. + 1.

Join grid terminal of L.F. transformer to grid of second valve.

Join grid-bias terminal of L.F. transformer to flex lead for grid-bias negative.

Join plate of second valve to L.S. - terminal.

Join L.S. + terminal to H.T. + 2.

IMPROVEMENTS ON OLD CRYSTAL SET.

"ONE OF THE B.B.C.'s 10s. SHAREHOLDERS" (near Kidderminster, Worcs.).—"I am writing as one of the many who do not understand wireless, unless we read your 'P.W.' When a gentleman begins talking about amps., ohms, etc., we think he is one of those highbrows, and we open the door for him quick! Now, your paper tells us all we wish to know, bar one small thing, which we may have missed a year ago, when we did not take your paper in, or any other, i.e. improvements on old crystal sets, variometer tuned. Most of us in this country place have one, and the highest wage earned by us is £2 per week (mine, 35s.), so we bought ours, by bits and dabs, ready-made from London.

"I bought mine four years ago, and I think it is a good set. Now, since 5 G B has come on the map we don't get 5 X X very good, so we looked and looked every week this year in your paper for the why. Not finding it, we got to it ourselves, and we added a No. 200 coil to the aerial lead-in, and now we get better results than ever, no interference, two pairs of headphones, and hear Big Ben on the wall!

(Continued on page 458.)

Get your power supply from the mains this winter with these BURNDDEPT units



If you have A.C. mains and you use the BURNDDEPT "Ethopower" or L.T. Battery Charger, you will never be put to inconvenience and annoyance by run-down batteries. Ask your local radio dealer to show you these trouble-saving, economical BURNDDEPT units!

THE BURNDDEPT ETHOPOWER

Even if you possess an eight-valve set, with super-power valves, the "Ethopower" will supply all the current necessary for H.T. and grid bias—and at a cost of only one penny per ten hours, with electricity at 6d. per unit. Requires no attention whatever when once set up, and its filamentless "Ethotron" rectifying valve hardly ever needs replacing. No noise. No Hum. Perfectly safe; conforms to I.E.E. regulations. Tappings are provided to give correct H.T. voltages; for detector, amplifier, or screened-grid valves. Grid bias automatically adjusts itself. Maximum H.T., 150 volts. Total output, 25 milliamperes. For A.C. mains, 100/240 volts 40/100 cycles. PRICE £6 18s. 3d. (Marconi royalty, 12s. 6d.)

THE BURNDDEPT L.T. BATTERY CHARGER (Incorporating Westinghouse Metal Rectifier)

Your L.T. Battery always fully charged for 2d. a week! NO UPKEEP COSTS. NO ACID. NO VALVES. NO HUM. NO ATTENTION OF ANY KIND NECESSARY. The Charger is absolutely safe, for it conforms to the I.E.E. Sub-Committee's Regulations. A special feature of this Charger is the indicator fuse-lamp, which shows whether the battery is being properly charged, and also safeguards the transformer and metal rectifier against overload. Universal type, for A.C. mains, 100/110 volts, 40/100 cycles. Charges 2-, 4- or 6-volt accumulators at half ampere. PRICE £2 9s 6d. NOTE.—This Charger may be used, with excellent results, to excite the fields of 6-volt .5 ampere moving-coil loud-speakers, such as the Magnavox.

AUTOMATIC CONTROL

An optional device, which disconnects the Charger and connects the H.T. eliminator (if any) and vice versa when the set is switched on or off. PRICE £1 5s. Can also be used for automatically cutting off field supply to moving-coil loud-speakers when set is switched off.

BURNDDEPT

Wireless - (1928) - Limited
BLACKHEATH, LONDON, S.E.3
Showrooms: 15 Bedford Street, Strand, W.C.2

FERRANTI

RADIO METERS



FLUSH PATTERN
WITH SWITCH

ALSO IN PORTABLE & PROJECTING TYPES.

AN ALUMINIUM SHOWCARD
as supplied to

Messrs. FERRANTI, LIMITED,
the well-known electrical manufacturers.

THIS SHOWCARD IS DELIBERATELY
ARRANGED FOR USE AS AN
H.F. SCREEN IN A RADIO SET
and can be obtained FREE OF CHARGE
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THOUSANDS OF PEOPLE HAVE
FOUND THAT THEY GET BETTER
RESULTS WITH THE 29/6 POPULAR
PLAQUE THAN WITH OTHER
SPEAKERS COSTING TWO
OR THREE TIMES AS MUCH



Its amazing value and tone have astounded the critics and public alike. Substantially built, in either dark mahogany or oak, its success is due to patents exclusive to M.P.A. To hear it is to buy.

Other M.P.A. Models include the De Luxe Plaque 47/6, Table Cabinet Speaker 41/7, 6, Table Grand Speaker 5 gns., Dual Inductance Speaker 7 gns. and Moving Coil Speakers from 10 to 12 gns. All Wireless Dealers stock M.P.A. Products.

The M.P.A. WAY — Products to the value of £5 and over can be obtained on Hire Purchase Terms for £1 down.



Streets

DEPT. 3, M.P.A. WIRELESS, LTD., 62 CONDUIT ST., LONDON, W.1. Tel. GERR. 6844-8

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 456.)

"Could you put a short bit in 'P.W.' about wiring these sets into any room, how to get them better, etc., also how to get them fixed to a loud speaker, cheap and good? I am sure there's a way to improve these sets if only someone can get it, and I know you are the ones if there's any 'get' at all.

"There's just one other point. How to get down to a low wave, such as 200 metres, and lower than that, if possible (these sets are from 1,800 to 900 and 900 to 300); also, how to fix valves after them for best results."

We should like very much to be able to help you to get stronger results with this set, but, unfortunately, any crystal set, no matter how good it is, always is under a disadvantage as compared to the valve set. This disadvantage is that all the energy you use to work the crystal set has to be derived from the broadcasting station. There is no supply of local energy of any type such as batteries, etc., which can help you to get really loud signals, and, consequently, no matter what you do to the set you soon come to its limits if it is a crystal set.

Getting Louder Reception.

However, although all the power to work a crystal set must in the first instance come direct from the broadcasting station, there are several ways of making the best of this instead of letting some of it be wasted. First and foremost, you must have a good aerial and earth connection, and if you have not tried experimenting with these at all, we should certainly try some of the tips, etc., which appear in "P.W." from time to time so as to get the maximum efficiency out of this part of the set.

It stands to reason that the more energy your aerial can pick up from Daventry, the more you will receive in the 'phones, so be sure to have a good high aerial and as far away from screening, etc., as possible, and a really good earth connection, as short as possible, without any waste owing to bad joints in the earth leads, dirty terminals, dirty insulators, or leakage through nearby metal pipes, etc.

Having got the very best strength it is possible to get into your crystal set, you will find that the best way to get results in any other room is to use fairly

thick wire—say No. 16 gauge—and to keep the leads as short as possible and well separated. Instead of taking two long leads to any additional room, it is generally necessary only to take one lead provided that you can find a really good earth plate in the other room as well.

For instance, if the set is in the back room of the house, and you want to listen in the front room as well, there is generally no necessity to take two wires, one from each telephone terminal. If you have an earth plate buried just outside the front room window, and a lead from that is shorter than the lead from the set would be, you can connect that earth plate to one of the new telephone leads; the other telephone terminal to the long wire which goes to the

set itself, and then try connecting this first to one telephone on the set, and then to the other.

On one connection it will give no results at all, because that is the terminal which is joined to the earth in the set, but on the other telephone terminal on the set you will find that you get good results in this way (much better generally than could be obtained by having two wires, one to each telephone terminal). We should certainly try this if you can, provided that you can get a really good earth at both the front and back of the house.

Regarding the loud speaker, we are afraid that you will never be able to work a loud speaker satisfactorily without valves. Several really efficient and very cheap amplifiers have already been described in "P.W." which would be suitable for this purpose, but if you have not the particulars on hand you can get them again from the Query Department, who will gladly advise you as to how you can economise as far as possible.

"P.W." 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," The 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.

Altering to Lower Wave-length.

The final point you raise, that of reducing the wave-length of the receiver, is not so difficult with an ordinary crystal set, but it is almost impossible to do this satisfactorily with one of the variometer-tuned kind such as you have. Sometimes it can be done by carefully altering the windings on the variometer, but as you are not experienced technically we do not advise this, though you will be reducing the wave-length to some degree if you use a small series condenser in the aerial.

This need not be purchased, but could be made up exactly like the one used for the "Sydney" Two, and which was described constructionally in "Radiotorial" a few weeks ago. (The cost is negligible.)

In any case the very short wave stations are not, as a rule, picked up on crystal sets at all, as the very low wave-lengths employed renders them unsuitable for reception upon crystal sets of any kind. In conclusion, we would point out that with any type of crystal set the most important thing in order to obtain strengthened results is to get the aerial and earth as good and as efficient as possible, and, generally speaking, the only way to do this is to experiment with different kinds of aerials and earths until a really good form has been found for the particular conditions under which the set is employed.

WHICH SWITCH?

D. T. (Newcastle-on-Tyne).—"To change over from grid rectification to anode-bend rectification I am going to fit up the detector

(Continued on page 453.)

MARCONIPHONE TRICKLE CHARGER



& POWER UNITS

For the complete elimination of batteries, instal one of the new Marconiphone All Power Units. Your existing receiver is easily converted. Full instructions are given. Model D.C.4 All Power Unit for Direct Current Mains. Designed for the two-three valve receiver, it entails little or no alteration to existing circuits. Wiring and resistances are entirely enclosed.

THE MARCONIPHONE CO., LTD., 210-212, TOTTENHAM COURT ROAD, LONDON, W.1.
Showrooms: 210-212, Tottenham Court Road, W., and at Marconi House, Strand, London, W.C.2.

The low tension accumulator need never be run down when a Marconiphone Trickle Charger is installed. Switch on, and a steady current of half an ampere flows into the cells until they are again required for reception.

There is no need to debate whether to instal a 0.1 amp. valve or one of the new 0.25 Marconi Super Power Types which give such improved quality and volume. Filament current becomes so cheap and reliable that such considerations no longer limit efficiency of reception.

Enclosed in a strong metal case with moulded top, this unit will deliver half an ampere to 2, 4 or 6-volt batteries from mains of 100-125 or 200-250 volts. The energy consumed is so small as to be practically negligible.

*No. B. 1146 Model A for 200/250 volt A.C. mains.

*No. B. 1145 Model B for 100 125 volt A.C. mains.

Incorporating Westinghouse Metal Rectifier. Both at frequencies of 40 cycles and over. PRICE (either type) £2.9.6

One model only. Model B. 1154 for 200-250 volts. £5.5.0. Model A.C.4 All Power Unit for alternating Current Mains.



May be used in conjunction with Marconi indirectly heated cathode ("X") valves or new "8 series for small receivers. New system of connection renders it absolutely safe in use. With power supply costs only 2d. per week.

One model only. 100-125 v. and 200-250 v. 40 cycles or over. Price, including valve and royalty £4.15.0



MAKE YOUR OWN CONE SPEAKER

The New Wonder "Nightingale"

CONE UNIT

Exactly as fitted to our Cabinet Cone Speaker. Guaranteed to give results equal to the most expensive Loud-Speakers yet made.

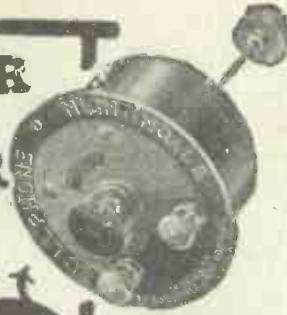
Full constructional details with each Unit.

GRAMOPHONE ATTACHMENT

Reduced from 32/6 to 15/- solely as an advertisement for the famous Bullphone Nightingale Loud-Speakers. Cobalt Magnet guaranteed for all time.

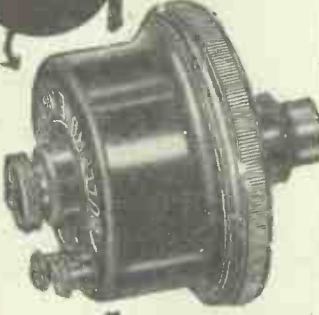
With 4-inch Diaphragm.

Instantly converts your own Gramophone into a full power Loud-speaker, giving a wealth of pure undistorted volume which must be heard to be believed.



15/-

SATISFACTION GUARANTEED or money refunded!



AS FITTED TO OUR £8 POST HORN

BUY ON EASY TERMS

5/- Secures this Speaker

The Nightingale "DE LUXE"

50/- cash, or 5/- deposit and 11 monthly payments of 5/-

21 in. high with 14 in. Bell, Mahogany finished, with plated arm & stand.



5/- Secures this Speaker



BAKELITE SOUND CONDUIT & TONE ARM
26" HIGH BELL MOUTH 14" FINISHED IN MAHOGANY

NIGHTINGALE CONCERT SUPREME SUPER

Guaranteed free from metallic resonance.

60/- cash, or EASY TERMS, 5/- deposit and 12 monthly payments of 5/.

Send Deposit NOW!

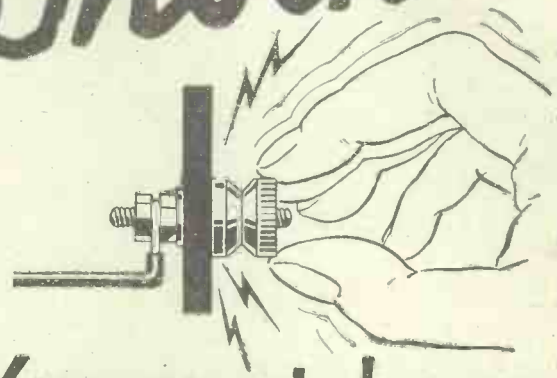
Obtainable from your Local Dealer or direct from:—

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38, HOLYWELL LANE, LONDON E.C.2.

NIGHTINGALE SPEAKERS

Shocks!



You must have Insulated Terminals

- fit BELLING-LEE and be SAFE!

Ask for type "B" as illustrated, entirely insulated, price 6d. each; or type "R," head only insulated, price 3d. each.

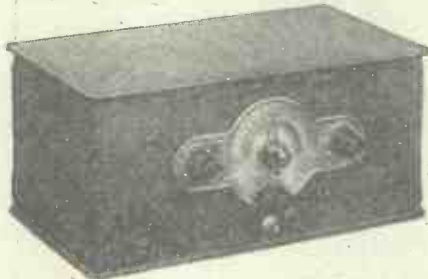


Patent.

BELLING-LEE TERMINALS

BELLING & LEE, LTD., Queensway Works, Ponders End, Middlesex.

Radio becomes cheaper and more efficient



With no coils to change one tuning control, a range of 250-2000 metres, the "Popular 3" is the finest utility set on the market. Supplied also as a 2-valve model, price £5 complete. The "Standard Console" incorporating a Qualkon reproducer—a real luxury model—costs £12 complete.

The **"POPULAR Transformer Coupled 3"**

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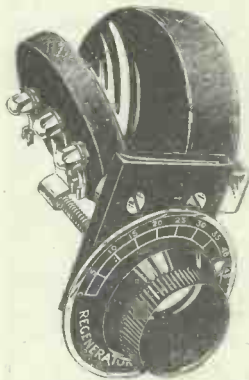
On Messrs. Tutills Stand No. 16 at Manchester will be seen a complete range of Lamplugh models

All Lamplugh Radio Products



are guaranteed for 12 months.

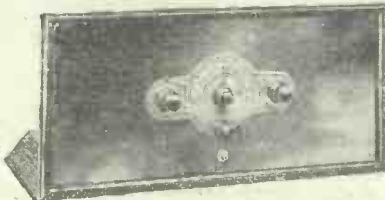
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Here are the units that simplify Radio Set construction for the amateur, making good results certain and providing the professional finish that is so desirable. Send for descriptive folder and Circuit Diagrams at once.

The Quality Tuner

Price **12/6**



The Panel **Price 35/-**
PLATE TUNER UNIT

S. A. LAMPLUGH, LTD.
KINGS ROAD, TYSELEY,
BIRMINGHAM.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 458.)

valve with a single-pole double-throw switch. But I cannot make up my mind which is better, a single-pole double-throw switch of the usual variety, one of the push-pull type, or a piece of flex for the centre-pole with a sunken socket acting as the other contact in each case. Does it matter which?"

From an electrical point of view the chief point to consider in such a case is that of good contact, and any of the types named will certainly give you this. Consequently, we should use whichever happens to be handiest for the particular type of lay-out you have in mind.

BAFFLED BY THE BAFFLE.

"BAFFLE" (Oxford).—"What I cannot make out is why it should be impossible to get a really good moving-coil loud speaker to work properly without a baffle board. I cannot understand this as other types of speakers do not have it. What is the object of the baffle board?"

In effect the baffle board is a kind of extension of the diaphragm, and in order to understand why it is essential it will be necessary to consider for a moment the principle upon which a loud speaker of any kind works.

In order to produce audible sounds the diaphragm has to move backwards and forwards at a certain frequency, thus displacing the air in the vicinity of the diaphragm and setting up the air-waves which correspond to the sounds. For high notes or for speech the movements of the diaphragm are fast ones, something of the order of thousands per second, but for low frequencies, such as the low notes of the organ, drums, etc., the frequency of the diaphragm is merely, perhaps, thirty per second.

With such a comparatively slow frequency the necessary movement cannot be efficiently applied to the air round about the diaphragm unless this diaphragm is large, because there is a tendency for air which is being compressed at the front of the diaphragm to sneak away over the sides and round to the back, and thus to fail to be compressed.

With a large diaphragm, however, there is a kind of air inertia brought into being which prevents them from leaking round, and it is for this reason that the baffle board is used as an artificial extension of the diaphragm which enables low frequencies to be impressed upon the surrounding air. The small horn loud speakers, etc., have no necessity for a baffle board because the lower frequencies will not reproduce with this class of instrument. (As stated previously, with the high frequencies corresponding to the voice and many musical instruments, the diaphragm's movement is much faster, and consequently there is no need for a baffle board because the effect of "leakage" around it does not arise.)

DIRECT PICK-UP.

E. J. (Oxford Street, London, W.1).—"Is it true that as I am so close to a transmitter working on high power it will be impossible for me to cut out these transmissions unless I am using a screened receiver?"

Situated as you are, right close to the powerful transmissions from 2 L.O., it will certainly be necessary to take some precautions against direct pick-up. You will find that even with no aerial on to the set you can tune to the local station at great strength, and if you are able to do this over a fairly wide part of the tuning scale, it is certain that you are receiving a great deal of the station's energy direct into the wiring of your receiver, coils, etc.

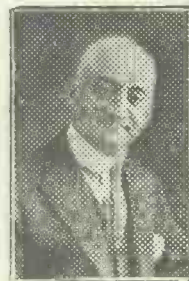
To overcome this it will be necessary to use a metallic screen which is earthed, but even when this scheme has been carried out the addition of an aerial to the set will, of course, bring in the London station immediately at enormous strength, so that you will need an extremely selective circuit in order to be able to tune in other stations.

BACK NUMBERS OF "P.W."

A. J. (Leamington).—"Where can I get back numbers of 'P.W.'?"

Back numbers of POPULAR WIRELESS can be obtained from The Amalgamated Press, Ltd., Back No. Department, Bear Alley, Farringdon Street, London, E.C.4, price 4d. per copy.

I · SEE · ALL



LET ME BE YOUR FATHER.

I have acted as father and adviser to thousands of others. I give advice free, and when I do so I feel the responsibility of a father, either in advising a career or in guiding our students to success. Having been the self-constituted father and adviser to thousands of others, it is possible I may be able to help you

and guide your footsteps so that you may make a success of your life.

THE MOST SUCCESSFUL AND MOST PROGRESSIVE CORRESPONDENCE COLLEGE IN THE WORLD.

IT IS QUITE TRUE

and I state most emphatically that there are thousands of men earning less than half of what they could earn simply because they do not know where the demand exceeds the supply. Thousands of people think they are in a rut simply because they cannot see the way to progress. This applies particularly to Clerks, Book-keepers, Engineers, Electricians, Builders, Joiners, etc. They do not realise that in these particular departments the demand for the well trained exceeds the supply. In Technical trades and in the professions employers are frequently asking us if we can put them in touch with well trained men. Of course, we never act as an employment agency, but it shows us where the shortage is. In nearly every trade or profession there is some qualifying examination, some hall-mark of efficiency. If you have any desire to make progress, to make a success of your career, my advice is free; simply tell me your age, your employment, and what you are interested in, and I will advise you free of charge. If you do not wish to take that advice, you are under no obligation whatever. We teach all the professions and trades by post in all parts of the world, and specialise in preparation for the examinations. Our fees are payable monthly. Write to me privately at this address, The Bennett College, Dept. 106, Sheffield.

J. Bennett

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POPULAR WIRELESS, Sept. 8, 1928: "Has quite remarkably good characteristics, and should appeal to those to whom the price of the usual British valve is still too high."

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"Unsurpassed for purity of tone and selectivity—the equal of any," is the opinion expressed in hundreds of letters from satisfied users—the originals can be seen at our offices.

Tell us your set—we will send correct Valves.
Matched Valves 1/- extra.



7/6 Each **P.R. VALVES**
Post 4d. Opposite Post Office Tube.

All orders executed by return of post.
GUARANTEE. All valves despatched under guarantee of Money Back in Full if not satisfied. All valves are carefully packed and breakages replaced
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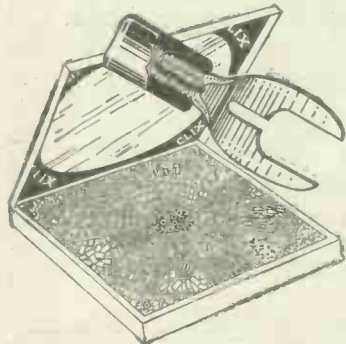
3 VALVES FOR THE PRICE OF ONE

"CLIX"—The Pioneers of Perfect Contact

WHICH SET ARE YOU BUILDING?

Cossor's New Melody Maker
Mullard Master Three*
Ediswan 1929 R.C. Threesome
Six-Sixty's Mystery Receiver.

For easier assembly and certainty of contact, be sure and ask your Dealer for "Clix."



World-Wide Patents. Look for this Show-case on your Dealer's counter.

CLIX

SPADE TERMINALS

"Clix" Spade Terminals are far ahead of all other makes because the patented Bridge Wiring Channels and Shank slot present the most effective and convenient means of wire attachment ever devised. Made of best brass and highly plated. Obtainable in two sizes suited to all types of Screw terminals.

Price 2d. Each
Red or Black Insulators

CLIX

PANEL TERMINALS

For quick and efficient contact and also for fine appearance, you will find these terminals are better for Spade, Pin or Wire connections.

Price 4d. Each
Indicating Discs 1d. Each



Prop. Pat.

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THERE IS NO BETTER SOLDERING IRON IN THE WORLD

Guaranteed for One Year.

Ask your dealer to show you the K.N. range (from 12 ozs. to 31 lbs.) If any difficulty write direct (giving dealer's name) to sole manufacturers and patentees:

K.N. ELECTRICAL PRODUCTS, Ltd.,
87, Wardour Street, London, W.1.
Phone: Regent 4632.

12/6



Can be used with any set.

Uses any type of Screened Grid Valve.

All parts can be obtained at all good dealers.

He added hundreds of miles to the range of his old Cossor Melody Maker

"JIM recommended me this Peto-Scott H.F. Unit. Said he'd made one and it had worked wonders with his old Melody Maker. He told me he brought in over 40 stations directly it was fitted to his Set. He was very enthusiastic over increased range, greater selectivity and improved volume.

"The H.F. Unit is amazingly simple to build, too. I'm a perfect fool with tools, and I have no wireless knowledge, but with the simple instructions and 'easy-to-follow' diagrams, why a child couldn't go wrong.

"Why don't you bring your Melody Maker up-to-date, Bob?"

"Think I will. This H.F. Unit sounds good. I've heard a great many people praise it. I'll just drop a line to these Peto-Scott people and get a chart."

POST THIS COUPON TO-DAY
PETO-SCOTT Co., Ltd.

77, City Road, London, E.C.1

and
62, High Holborn, W.C.1

4, Manchester Street, Liverpool.

To the Peto-Scott Co., Ltd., 77, City Road, London, E.C.1
Please send me free of charge your Constructional Chart which shows how to build an H.F. Unit for the Cossor Melody Maker.

Name: _____ Address: _____

P.W. 3/11

THIS MARS BUSINESS.

By A "P.W." TECHNICIAN.

ONCE again the old problem of sending a wireless message to Mars has cropped up in the Daily Press. The latest attempt centres round Dr. Mansfield Robinson, who was for many years Town Clerk of Shoreditch.

Some two or three years ago we first made the acquaintance of Dr. Mansfield Robinson when he called at our offices and showed a particular interest in a twenty-four valve set we were constructing for purposes connected with amplification tests. We had built this receiver with a view to ascertaining how many H.F. valves could be used with any degree of success, but Dr. Mansfield Robinson had other ideas. He suggested that we should use this receiver for listening-in to Mars!

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containing

Full details of Eight Efficient Receivers

and

GIVEN AWAY

with the

NOVEMBER

MODERN WIRELESS

Get a Copy Now!

Usual Price - ONE SHILLING

Accordingly, more as a joke than anything else, the set was taken down to our experimental station at Dulwich, and there on a certain evening when Mars was supposed to be in a favourable position for the reception and transmission of messages, Dr. Mansfield Robinson, Mr. A. M. Low, and other gentlemen interested, gathered for the "great occasion."

Dr. Robinson, having been left alone with a colleague in a neighbouring room in order that he might get into "telepathic communication," with his Martian guide, informed the expectant company that within three and a half minutes a message would be received from Mars!

The writer can still remember (with considerable amusement) that auspicious occasion; the expressions on the faces of the people present varied with the degree of credulity felt by each individual. The giant receiver was tuned to 30,000 metres and connected to a loud speaker. Morse Code from some of the great high-power stations could be heard and a terrible din of atmospherics; but, alas! no three "M's"—the anticipated message—from Mars!

100% EFFICIENCY

ELIMINATOR with the "ELIMETER"

(Trade Mark) A SIFAM

Radio Instrument. Designed specially for Eliminator work, the "Elimeter" represents the ideal instrument on the market for this class of work. It accurately indicates both total voltage and all intermediate tapings, and has a resistance of 100,000 Ohms. Exceptionally handsome, guaranteed dead beat accuracy and precision. One of the famous Sifam range of measuring instruments within everybody's reach. Ask your dealer or write for particulars.

PRICE 30/-

White Ivory board dial calibrated up to 220 volts. 100,000 Ohms Res. Heavy Nickel Plated finish.

Send for free leaflet, "What 5 makes Meters Cost Less Than You," to Dept. P.W.

The Sifam Electrical Instrument Co., Radometer Headquarters, Bush House, Aldwych, W.C.2.

HEADPHONES REPAIRED 4/-
Transformers 5/-. Loudspeakers 4/-. All repairs remagnetised free. Tested, guaranteed and ready for delivery in 24 hours.
Discount for Trade. Clerkenwell 1795
MASON & CO., 44, East Rd., City Rd., N.1.

Protect Your Set with the AERMONIC Safety Earthing Switch

Scientifically designed to adequately protect your set in all conditions. Has a fuse between the aerial and the set, thus giving security from lightning even if the set is left connected. Specially made with Bakelite cover to keep it waterproof. Price 4/6.

If dealers can't supply we send post free on Money-back guarantee.

AERMONIC List Free.

JAMES CHRISTIE & SONS, Ltd., 246, West St., SHEFFIELD, or London Agents: A. F. Bulgin & Co., 10, Cursitor St., E.C.4

(Continued on page 464.)

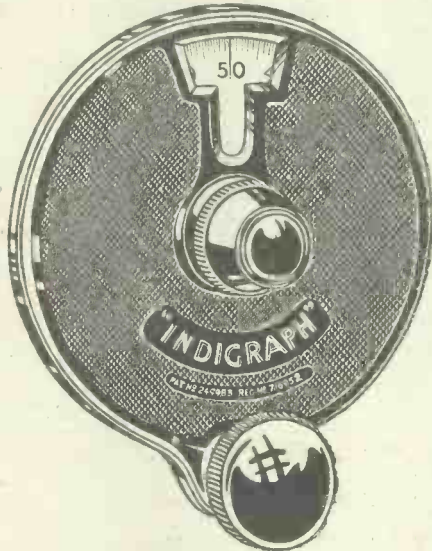


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MYSTERY RECEIVER

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| 3 Variable "LOKVANE" Condensers | Price |
| 2—'0005 mfd. | 10/6 |
| 1—'0003 mfd. | 9/6 |
| 2 Indigraph Slow-motion Dials | 6/- |
| 1 Indigraph 2 in. dial | 1/6 |



- Price
- | | |
|---|-----|
| 1 50-ohm Rheostat (Igranic-Pacent) | 2/6 |
| 1 Neutralising Condenser (baseboard mounting) | 4/- |
| 1 Single Filament Lighting Jack | 3/9 |



The Indigraph Slow-motion Dial, here shown, is the one that guarantees the highly accurate selectivity demanded by Radio to-day.

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Works: BEDFORD.

IT'S VERY IMPORTANT!

—THE BATTERY SWITCH

The whole set depends on the battery switch to "start it up." Therefore, be sure the switch you use is reliable, that it makes certain constant contact. In fact be sure it's a Benjamin.



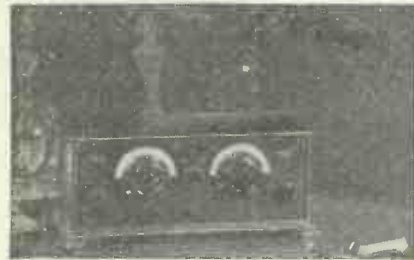
PRICE
1/3

This switch may be obtained without terminals.
PRICE 1/-

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THE "PENTOVOX THREE"

A BIGGER brother to the valve preserves fine quality of the reproduction in ample loud-speaker volume. Wave-length ranges are 250 to 500 metres, and 1,200 to 2,300. There are no coils to change. Log scales are provided to chart the various stations.

the extra screened grid H.F. Valve extending considerably the range of stations and satisfying within few limitations the most ambitious "searcher." The Pentode amplifying

List No. 344. Set with three special valves tested and matched to set. Including Royalty

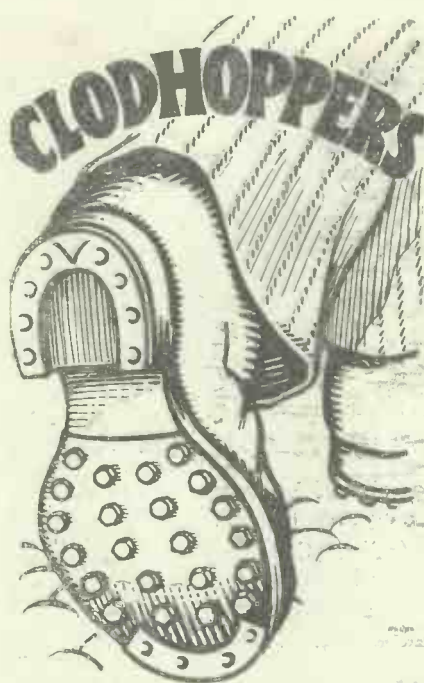
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Pentovox 3

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The Pentovox Two.
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The Gramo-Radiophone.
The Senior Tone Reproducer.

Bowyer-Lowe Co., Ltd., Spring Road, Letchworth.



THAT'S precisely what it does sound like when someone blunders across the room and all you hear from the Loudspeaker is a wail. . . . Clodhoppers.

You don't need to worry about that thump if you have W. B. Anti-phonics Valve-holders in your set. Micro-phonics noises disappear altogether.

Ask your dealer to show you these valve-holders which were included in the famous "Cossor Melody Maker." The price is 1/6 complete with terminals, or 1/3 without terminals.

Write to us also for our catalogue showing a complete range of Radio products, including the famous range of Whiteley-Boneham Loudspeakers.



ANTI-PHONIC VALVE HOLDER

WHITELEY, BONEHAM & CO., LTD.,
Nottingham Road,
Mansfield, Notts.

THIS MARS BUSINESS.

(Continued from page 462.)

And now we find that Dr. Mansfield Robinson is again taking up the question of radio messages from Mars. The other day, at his request, wireless messages were sent to that planet on a wave-length of 18,500 metres. The message was handed in at the Post Office for transmission via the Rugby station, and as there is nothing in the Post Office regulations to prohibit messages being sent to Mars, they were despatched, although not on the 30,000 metres wave-length pleaded for by the Doctor.

"An Amazing Experience."

According to Dr. Mansfield Robinson the Martians stopped up to receive the message, but so far there has been no proof that it has been received! Dr. Mansfield Robinson claims that he can talk with the Martians as easily as he can talk to anybody on this earth. His "etheric body" has travelled

Have You Seen

The
November
Modern Wireless?

This issue, NOW ON SALE,
contains an unprecedented
wealth of constructional
articles describing
TWELVE RECEIVERS

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35,000,000 miles in four minutes. According to him it was an amazing experience. It must have been.

He says the Martians are much bigger than we are, the men being about 7 ft. 6 ins. high and the women about 6 ft. He has a Martian collaborator, a lady who it appears is "very sweet."

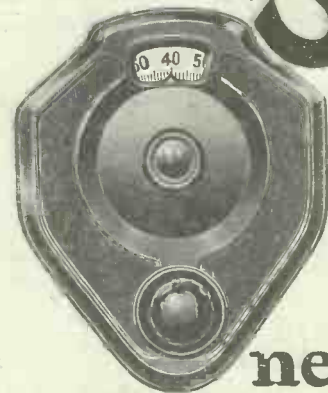
The message sent by Dr. Robinson reads like this:

"Oom ga wa na wa
which, translated, means:
"God is all in all."

According to the learned doctor, such messages as "Love from Mars" have been received. The charge for the transmission of Dr. Robinson's message was 1s. 6d. per word. It certainly seems cheap at the price.

I · SEE · ALL

Finished in black or beautifully grained mahogany.



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accurate and
inexpensive

Watch for Brownie's latest triumph in artistic moulded Bakelite—"The Dominion Vernier Dial." Special non back lash slow motion drive gives very accurate tuning, while the action will fit any condenser and the new design of the dial will enhance the appearance of every set. See this latest Brownie production at your nearest Radio dealer.

BROWNIE WIRELESS

"DOMINION" VERNIER DIAL
The BROWNIE WIRELESS COMPANY (G.B.) Ltd.
MORNINGTON CRESCENT, LONDON, N.W.1

THE P.D.P. WAY

BUY your Components, Loudspeakers, H.T. Units, etc., etc., from US
BUILD your Receiver and SAVE MONEY.

EVERYTHING WIRELESS

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- EKCO H.T. UNITS and ALL MAINS Receivers;
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- NEW MASTER THREE *;
- NEW COSSOR H.F. UNIT;
- NEW MASTER FIVE PORTABLE;
- MULLARD H.F. UNIT; NEW EDISWAN SETS;
- RADIANO FOUR, etc., etc.,
- COMPONENTS for ALL circuits supplied.
- COMPLETE RECEIVERS of all makes supplied.

Call and see us or post your list of requirements.

Best Monthly Terms Quoted By Return

CASH ORDERS EXECUTED PROMPTLY.

COILS for ALL circuits, Standard Loading

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COMPONENTS for P.W. CIRCUITS.

Simple A.C., H.T. Unit: Regional Three Crystal

Set; Wave Change One; Regional Three;

Bandmaster; Any Mains Two; Antipodes

Adaptor; Long Range Three.

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Ask about the New Wet Cell Valve.

PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS

Is your H.T. down?



DOES this question ever worry you? It need not if you have alternating current mains in your home. The new B.T.H. H.T. Eliminators provide a constant H.T. current. They are free from all "hum" and are definitely guaranteed to deliver the milliamperes specified.

The 5 m.a. type is intended for use with the average 1 or 2 valve set working at present from a small capacity dry battery. For larger receivers, the 10 m.a. type should be used. Instal a B.T.H. Eliminator today, and have a constant, unflinching, trouble-free and inexpensive supply of H.T. from now on.

Ask your dealer to tell you all about these eliminators.

B.T.H. ELIMINATORS

5 Milliamp Type
200/250 volts, 40/100 cycles.
Price £4 10 0, including valve

10 Milliamp Type
200/250 volts, 40/100 cycles.
Price £6 15 0, including valve

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

The British Thomson-Houston Co. Ltd.

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High-grade instruments for A.C. Rectifiers, Chargers, Eliminators, etc.; also Inter-valve Transformers.

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Special heavy-gauge Earth Wire, suitable for all purposes where high efficiency and reliability are the first consideration. 20 ft., with clip, 2/6 net. (Add 1½d. per foot if more is required.)

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15" x 6", complete with terminal, 5/6 net. The above prices include delivery in United Kingdom and are for cash with order.

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THE WIRELESS MANUAL

By Captain JACK FROST, Member of the Institute of Radio Engineers.

A Complete Guide to Choice, Use and Maintenance of Wireless Sets, written in popular style, and full of useful and interesting facts for the listener-in.

Illustrated. **5/- net.** 228 pages.

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Ebonite cut while you wait at 1d. square inch also 1/2 in. at 1d. Only the best supplied. Drifted Panels for all Circuits.

C.O.D. orders must be over 5/-

We stock Igranio, Climax, Ever-Ready, Hellesen, Siemens, Ferraro, Ferranti, Wearite, Ormond, J.B., Benjamin, Lotus, Mullard, Dubilier, Lissen, Leveos, Utility, Magnum, Peto-Scott, Peerless, Burndep, Pye, Marconi, McMichael, Cosmos, Garbantuan, E.F. Varley, Hambrell, Brown's, Sterling, Amplions—in fact, everything it is possible to stock.

KITS of parts for all CIRCUITS. Make out LIST for keen quotation. **DON'T worry, if it's Wireless WE HAVE IT.**

COSSOR NEW MELODY

I Can Supply Spares for Same (sold separately, post extra).

2 Ormond .0005 Log at 6/- each; 2 Cossor pattern S.M. Dials at 3/9 each; Ormond Reaction .0001 (bushed), 4/-; Ormond P.P. Switch, 1/3; 6-ohm Rheostat, 2/- (all knobs to match cabinet); 5 Lotus new type Valve Holders at 1/3; 1 Wearite H.F. Choke, 6/6; 3 T.C.C. Condensers, 2 mid., 3/10; S.P. .0005, 2/4; A. 1/10; Dubilier 3 meg., 2/6; 3 to 1 L.F., 15/- (compact, well-known British make); 2 Wound Coils (Wearite), 15/- pr. **Total £4:0:0. Carriage 1/-.**
For 7/6 extra, if you purchase above lot only, I will include handsome Metal Cabinet to specification, ready to assemble, drilled, with all nuts, bolts, spanner, screwdriver and baseboard, brackets, Glazite, 9-volt grid bias, rubber feet and plugs, screen assembly, 2 drilled terminal blocks and 9 terminals.
Carriage 1/- (Free to callers.)

COUPON No. 8

ONLY ONE COUPON ON ANY ONE ORDER
IF YOU SPEND 25/- OR MORE YOU CAN BUY FOR 3d. EXTRA ONE (ONLY) OF THE FOLLOWING:

S.M. Dial, Permanent Detector, 100 ft. 7/22, 12 Nickel Terminals, Battery Switch, Indoor Aerial, 60X Coil, .0005 and 2 meg., 12 yds. Lead-in, H.F. Choke, 9-volt Grid Bias, 6-pin Coil Base, Fuse Bulb and Holder, Pair Panel Brackets, 12 yds. Twin Flex, Loud Speaker Cord.

ONE OF ABOVE, 3d. WITH 25/- ORDER.

MULLARD MASTER 3*

This new and wonderful set must appeal to young and old, amateur or experimenter—in fact, EVERYBODY!

YOU CAN PURCHASE

ANY ITEM SEPARATELY (OR A KIT OF PARTS). Every component is available at short notice. This list is strictly to Mullard specification. 3 Valve Holders, Lotus, at 1/3. Colvern Combined Wire Coil, 17/6. Permacore Transformer, 25/-. Climax LFA Transformer, 25/-. Climax H.F. Choke, 7/6. Benjamin Battery Switch, 1/3. J.B. .0005 Log, 11/6. .00035, 10/6. Mullard .0003 and 2 meg., 5/-. Magnum Panel Brackets, 2/6. Mullard .0001 Fixed, 2/6.

Total £5:12:6 Carriage Paid

VALVES, 2 at 10/6.
Power, 12/6.

OAK CABINET, hinged lid, 12/6. Carriage 2/-.

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COSSOR VALVES
MULLARD VALVES
SIX-SIXTY VALVES
B.T.H. VALVES
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MARCONI VALVES

H.F.; L.F., R.C., 10/6.
Power, 12/6. Super
Power, 15/- Screen-Grid,
22/6. Pentodes, 25/-.

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; Lissencola, 13/6; L.F. Transformers, 8/6; Coils, 60 X, 6/4; 250 X, 9/9; 60-v. H.T., 7/11; 100-v., 12/11; Super 60-v., 13/6; Grid Bias, 1/6; 4-5, 5d.; Super L.F., 19/-; Variable .0003, 6/-; .0005, 8/6.

SAVING ON SETS.

(Continued from page 453.)

that it develops irregularities, it is time it was changed. Anyway, its voltage cannot be what it should be!

Such "by-passing" (in my opinion, again) should be confined only to mains units. Certainly I have never had any trouble through not taking advantage of the scheme. And it is surely significant that it usually figures only in the so-called "luxury multi-valver."

When I build a set my principle is, start with no by-passing anywhere and introduce it when needed. Others seem to adopt the idea of by-pass everything! I must hastily add that by-passing is indeed vital in certain places.

Quality of Components.

So far, I have dealt with eliminations, and it is time I had something to say about component quality. There are certain parts vitally concerned with the actual operation of the set on which it pays to spend as much money as possible and go to the highest possible grade of first-class British manufacture. There are others where a slightly less perfect standard can be aimed at without prejudicing the working of the set.

Grid leaks do not need to be expensive wire-wound resistances, as they do not have to carry appreciable currents. A reaction variable condenser seldom need have a slow-motion control or be fitted with a "vernier" dial.

A fixed condenser used in a series aerial position can, generally speaking, be of the cheapest variety, but not if it is to be used to break the earth connection when a mains unit is being used. Then a high quality condenser capable of withstanding high pressures is needed, as with the grid condenser used in R.C. couplings.

Using Cheap Valves.

If you must economise in valves, then make the detector your scapegoat. I have used, with great success, half-crown foreigners in detector positions, but seldom, if ever, have they given results equal to good Britishers in H.F. and L.F. stages.

Don't economise in respect of an R.C.C. unit or an L.F. transformer; these items are keystones of a radio-set assembly. If you must save more money, buy the cheapest possible tuning variable and fit it with a respectable slow-motion dial. The results may be equivalent to those obtainable when a first-class variable condenser is used.

On the other hand, they may not. Trouble might be experienced owing to vanes scraping, completely wrong capacity and, therefore, tuning range, and so on. You see, this economising business is dangerous if carried too far, and I commend it only to the discriminating amateur.

EASIEST TO ERECT



STEEL MASTS

| | | |
|-------|--|------|
| 26ft. | Tapering from 1 1/2" dia. to 1" in 3 sections. | 10/- |
| 34ft. | Tapering from 1 3/4" dia. to 1" in 4 sections. | 15/- |
| 42ft. | Tapering from 1 7/8" dia. to 1" in 5 sections. | 21/- |

Being the actual manufacturers our prices are 50 p.c. less than similar masts, and include Steel Tubes with Mast Rings, ample galvanised stranded Stay Wire, Pulley, Foot Rest, galvanised Stay Fasteners, and necessary bolts and instructions for erecting. NOTE.—C.P. Masts will not blow down. 26ft. has 12 stays; 34ft., 16 stays, and 42ft., 20 stays.

HALYARDS. Best Manila, will not rot. 50ft. 1/3; 100ft., 2/3. **AERIAL WIRE.** Pure copper; 12 strand, 28 gauge, 100ft., 2/6. **Special ANTI-RUST PAINT.** Sufficient for 1 Mast, 1/-.

MONEY REFUNDED IN FULL IF NOT COMPLETELY SATISFIED.

Extra for carriage to Scotland, Ireland and Channel Islands, 3/6 per mast.

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EASY PAYMENTS

LOUD-SPEAKERS, HEADPHONES, H.T. ACCUMULATORS. Anything Wireless

Send a list of the parts you are requiring, and we will send you a quotation on monthly payments.

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H.T. ACCUMULATOR 5/- dpst.; 5/- mthly.

Anything Wireless on easy terms.

WORLD'S WIRELESS STORES, WALLINGTON

Build your Set

now—we will help

If you cannot afford the immediate expense of a complete kit of parts for the Set you would like to build, we will supply you with every component you need on the first payment of 10%, and you can pay the balance in 11 monthly sums. These are our

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Our regular customers will tell you of the courtesy, promptness and satisfaction they continually receive. We invite you to send us your list of requirements. Ask for Order Form P.W.2 and we will let you know the full cost by return.

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Solve all H.T. Troubles.

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AMPLIFIERS 30/- 2-VALVE SET 4s. P. TAYLOR, 57, Studley Road, STOCKWELL, LONDON



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Selective Reaction



Ensure this by fitting the
POLAR Q.J. CONDENSER

Both fast and slow motion are provided. Fitted with Phosphor Bronze Balls. Supplied either with double knob as illustrated, or with 3 in. graduated dial and knob. The same knob and dial can also be fitted to the Polar "Ideal" Condenser and a perfect match thus secured.

FOR PORTABLE SETS

Q.J. 10/- Polar Reaction Condensers

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·00005 or ·000015, 7/6

·00025 ... 10/6

·0002 ... 10/4

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TELSEN
Radiogrand
L.F. TRANSFORMER
FOR BETTER RADIO RECEPTION



Home constructors should pay particular attention to the L.F. Transformers they propose incorporating. The efficiency of these components is essential for good reception. Therefore select a TELSEN "RADIOGRAND" which is unsurpassed for Quality and Value.

Made in Ratios 5-1 and 3-1 **12/6**

British made and fully guaranteed.

Detachable feet enable terminals to be at top, bottom or side, whichever is most convenient for wiring.

All good Radio Dealers sell TELSEN TRANSFORMERS.

TELSEN
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ELECTRIC SOLDERING IRON

For constructing your New Set -

In Various Sizes

Send P.O. for 10/- and the Iron will be forwarded Post Free. State Voltage.



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THE SIX-SIXTY MYSTERY RECEIVER

THE MULLARD PORTABLE V, etc.
BE SURE AND SPECIFY



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"Resiston" panels are as good as they look. They have enormous insulation properties as well as a fine appearance.

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Visit a wireless shop. Ask to see a "Resiston" panel and note, first, its lustrous polish. So hard it resists scratches with ease. No minute cracks or roughness to harbour dust and invite leakage. Then examine its colour. You will appreciate at once how remarkably free it is from sulphur and the other adulterants used in "cheap" ebonite. Its superior quality is obvious. Remembering that everyone will judge your Set first by its external appearance, you'll very wisely decide to use a "Resiston" panel.

"Resiston" panels are supplied in black and also in a mahogany finish. Either finish possesses the same enormously high insulation properties and the same beautifully polished surface.

"Resiston" panels come to you like this—each in a sealed envelope, squared-up and cut dead to size.



Send for new booklet.

Please send me, free, a copy of your new booklet, "The Panel Makes all the Difference."

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ADDRESS.....

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PANELS

6224, (A)

American Hard Rubber Co., Ltd., 25A, Fore St., E.C.2.

TECHNICAL NOTES.

(Continued from page 430.)

give mellowness to the reproduction—depends upon its inductance. According to the chief-engineer of a well-known firm of transformer manufacturers, the transformers used in a receiver from which a high standard of reproduction is to be expected must have a high inductance.

"In the manufacture of audio transformers," he says, "there has been a steady increase in the size of iron core used, the purpose being to give greater inductance to the transformer.

"In the primary of an audio-transformer there are both direct and alternating currents, the direct current flowing from the high-tension supply to the anode of the valve and the alternating audio current

Are You Interested

in the

New Mullard "Master Three"?

If so,
get a Copy of the

November Modern Wireless

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with full details of

How to Make It

On Sale Everywhere. Price 1/-

flowing through the anode and filament circuits through the primary and so in the secondary.

"The direct current tends to saturate the core of the transformer and reduce its effectiveness in handling the alternating current.

"It is for reasons of this nature that extra large amounts of iron are now used, in order that the value of the core may be so large that even with the high anode voltages and currents used in modern radio receivers, the direct current saturation point of the core may not be approached."

DARIO VALVES.

In the review of the Dario super-power valve in our October 27th issue we gave the impedance as approximately 6,000 ohms. It should have been 4,500 ohms, we are informed. This is, of course, a better characteristic.

THE ROLLS-ROYCE OF RADIO

IS THE

DIX-ONE METER

THE HIGH GRADE RADIO TESTER.

Low price. High Value. Worth £10.

INSTRUMENT, 55/-. MULTIPLIERS, 6/6 each.

Radio Test Booklet. All Radio Users need one.



Capacity Meters, 58. Wheatstone Recorders, £12. Multi-Micro Galvos, 60/-. Res. Boxes, 17/6. Hydrometers, 1/6. Relays, 6/6, and Remote Switches, 15/-. Transmitting Sets and Wave-meters, £2. Loewe Triple Valves, 38/-. Cabinet Violina Speakers, 25/-. Browns "A" Phones, 30/-. Sullivans, 3/- pair. Tons of Bargains.

GRAMO PICK-UPS Magnetic Ear-piece Units for making your own 40/- reproducer. Adapted with a little work, 1/2 each. Sullivans are the smallest and have aluminum case, 1/6 each. Adapted Brown A pick-ups, 16/6. Electradix, 23/-. Complete outfit £5 10s.

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ELECTRADIX RADIOS,

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St. Paul's and Blackfriars Stations. Phone: City 0191

**SPEND £5 and be
PROUD of WIRELESS!**

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Full particulars FREE.

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In many sizes.

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YOUR Kit 20/-, completed 22/6. Balance by easy pay-
MELODY ments to suit your income. Send deposits day to
MAKER ensure an early delivery. Any set or kit supplied
MONOTUNE The 40 station, 3-valve, single tuning receiver
THREE by Allinson. Particulars free. Complete
constructional envelope, 1/2.

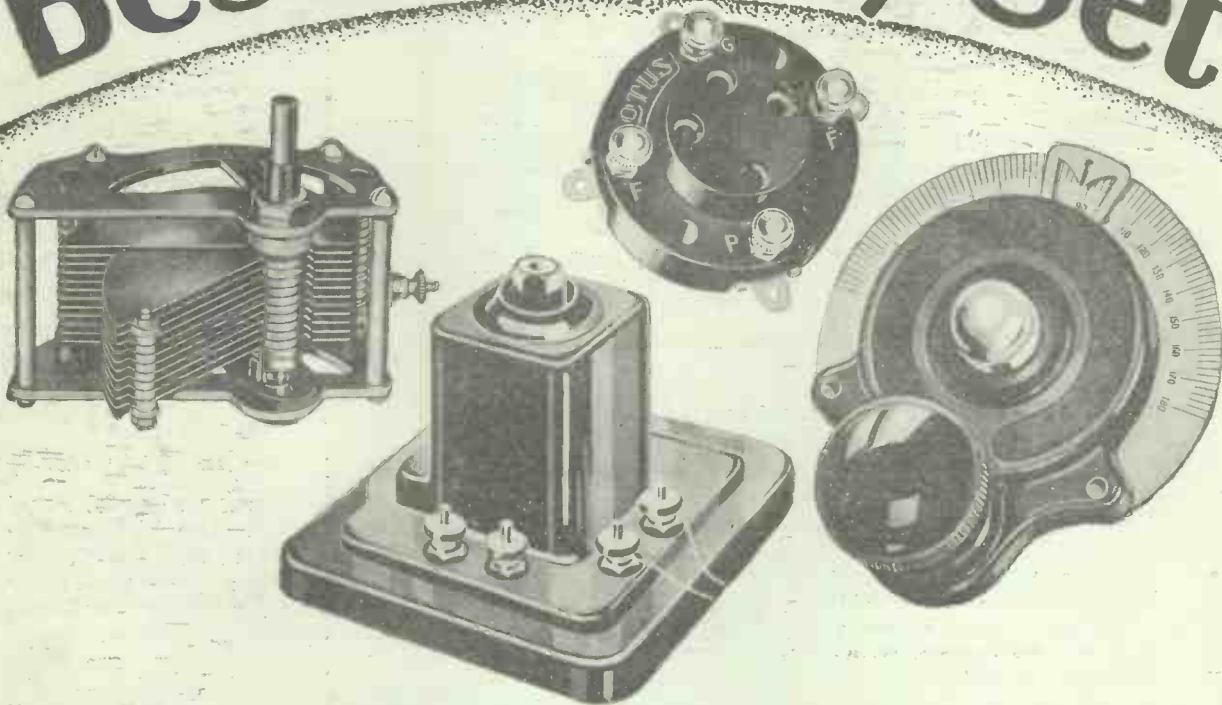
A. E. OAKLEY, 43, Carleton Rd., London, N.7.

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EASY TERMS

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Best for Any Set



Whether you make or buy your set, remember that good components make a good set. When you choose your set, choose Lotus Components. They are the best for any set.

Experts recommend Lotus components for all such circuits as Mullard "Master Three*" and Cossor "Melody Maker." Accurately made and beautifully finished, these components embrace valve holders, condensers, dials, jacks, switches, plugs and coil holders, as well as a range of Lotus Remote Controls providing wireless in every room for any kind of set.

From all wireless dealers.

LOTUS COMPONENTS

Made by the makers of the new Lotus Sets.

Dept. P.W., Garnett, Whiteley & Co., Ltd., Lotus Works, Broadgreen Road, Liverpool.

Have you had the new Lotus Booklet? This little Booklet comes free on receipt of a post-card to Garnett, Whiteley & Co., Ltd. It tells you all about the new Lotus Screened and Pentone Valve sets. If you do not possess a copy, send for it to-day!

ONE DIAL TUNING



The wonderful new Mullard Master 3★ is proving itself Britain's favourite receiver. It is the ideal domestic receiver. It fulfils every condition for popularity.

It is the most powerful three-valve receiver ever designed. It gives an amazing choice of the World's best radio programmes at full loud-speaker volume. Its tone is rich and realistic. Its selectivity is of the highest consistent with purity of reproduction. And yet its operation is of the simplest—one dial tuning! Simply revolve one dial and station after station is tuned in; turn the other dial to increase volume and selectivity.

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You can build this wonderful receiver yourself; though you know nothing whatever about radio you can build the Mullard Master 3★ with complete success. And, by building it yourself, you obtain a receiver of the highest efficiency at the lowest possible cost. Learn more about this wonderful receiver—post the coupon now.

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Plan of Assembly of the new
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Use Mullard P.M. Valves
in every receive you build.
They make an old set modern
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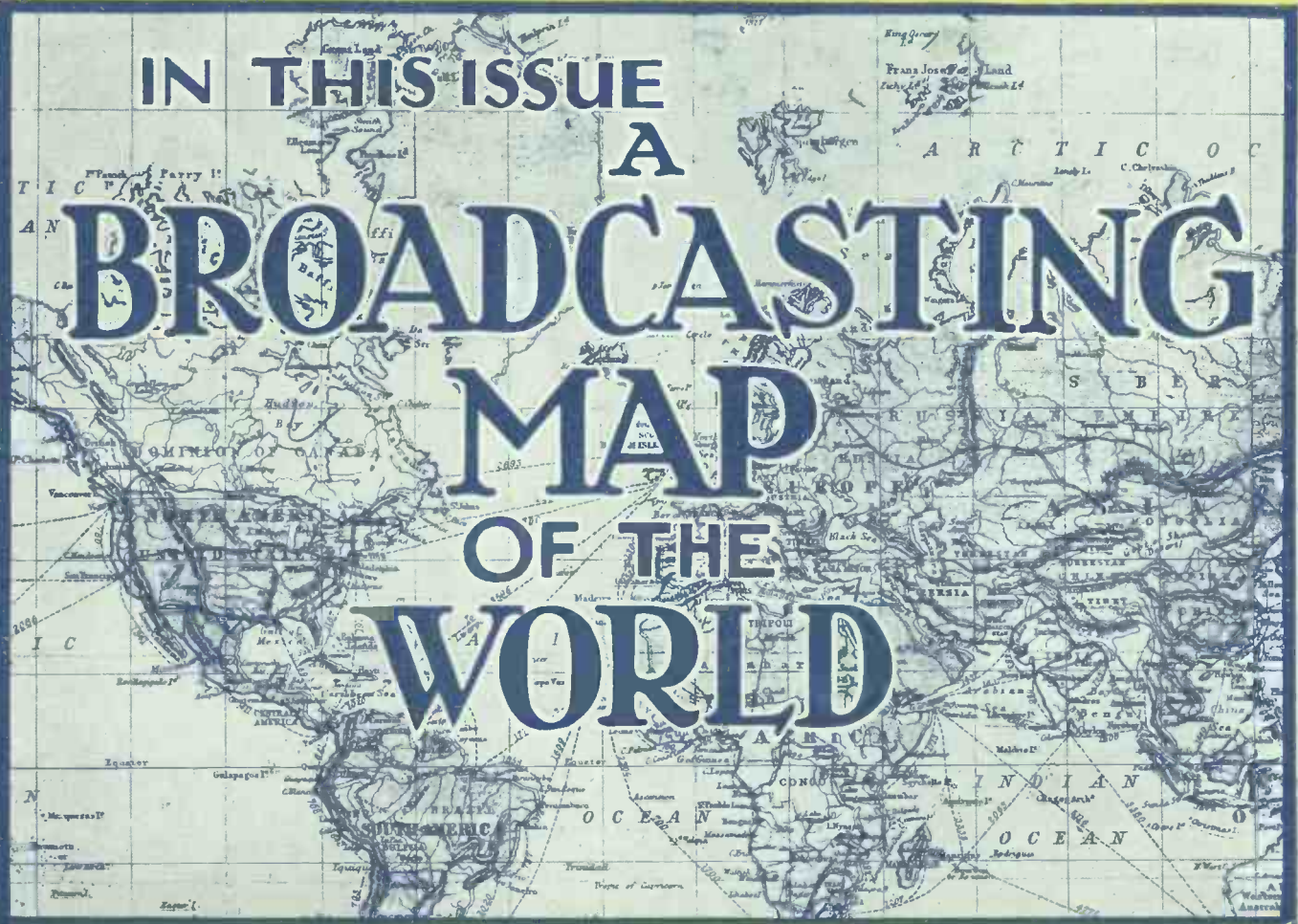
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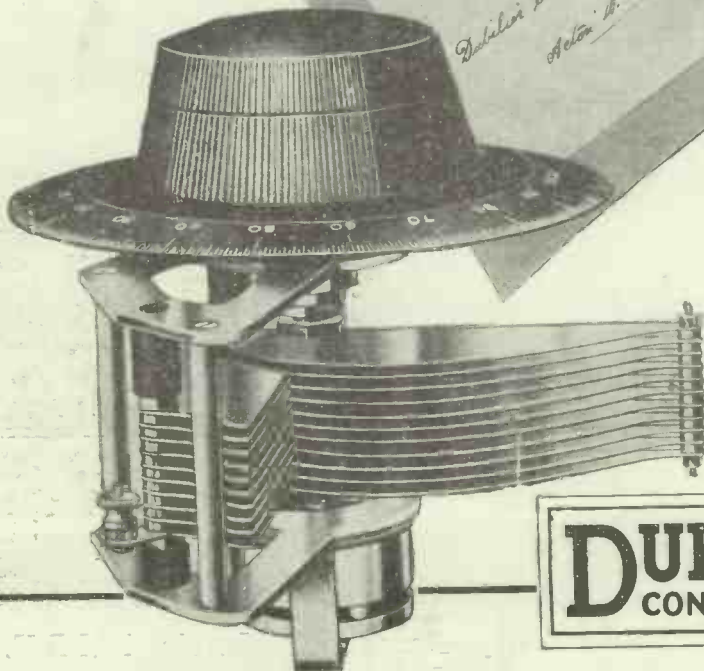
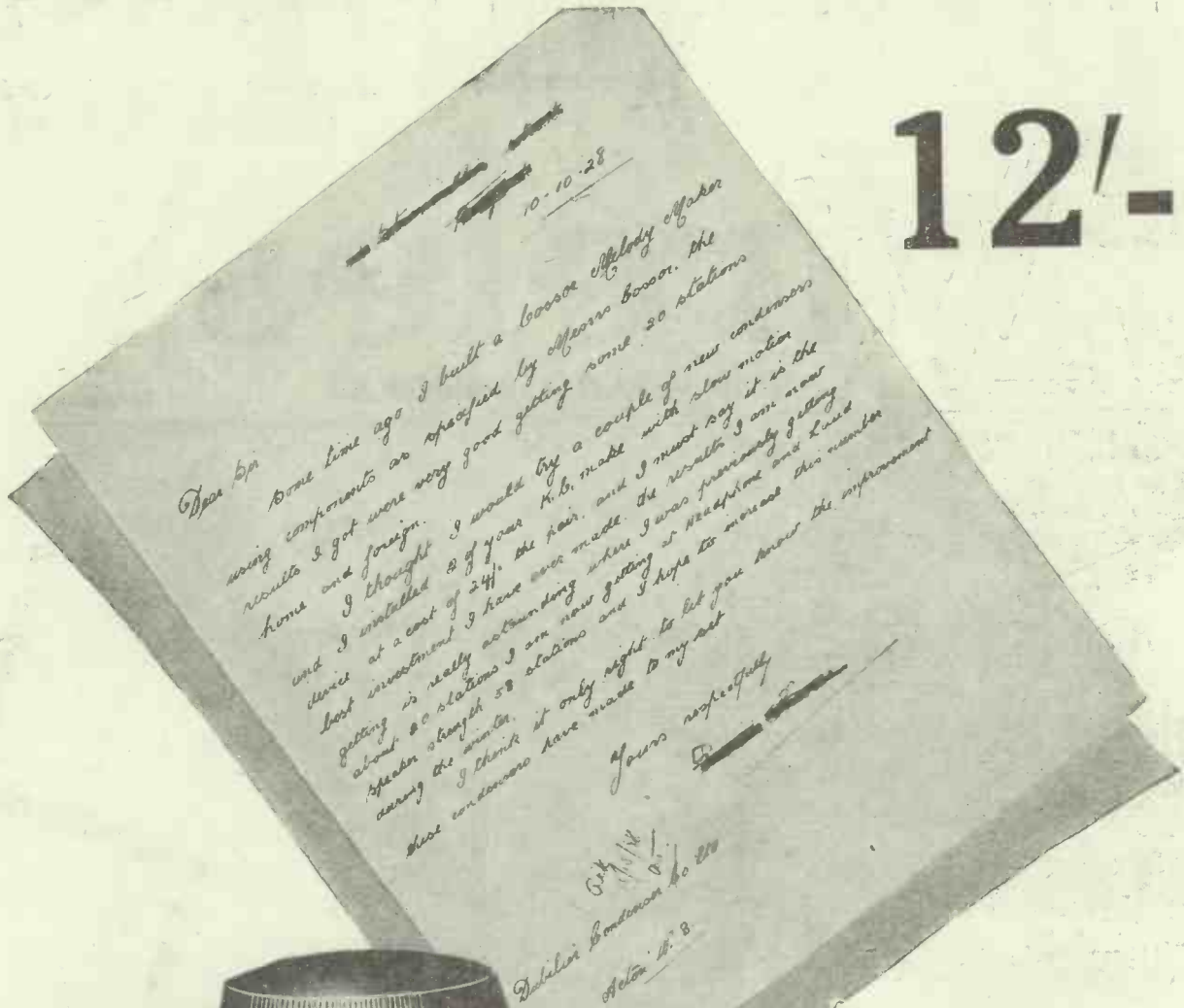
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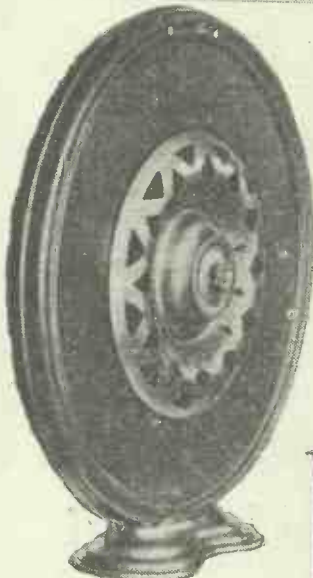
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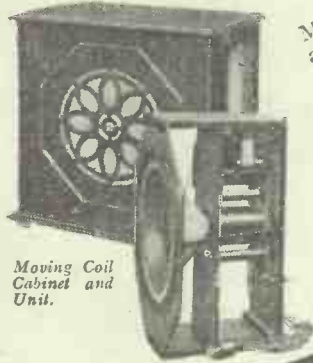
LOUD SPEAKERS



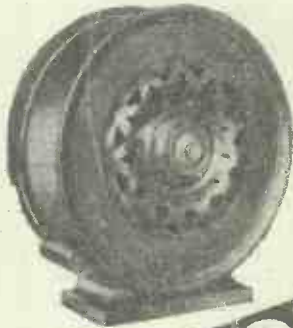
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Model 45.



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Turn to Marconiphone for your new loud speaker. For though each Marconiphone Speaker is obviously the leader in its class—a definite triumph of technical efficiency—prices are most moderate. Send a Card now for Publication 523, mentioning POPULAR WIRELESS, or better still ask your dealer for a demonstration.

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MARCONIPHONE TRANSFORMERS

All the latest transformer developments are to be found in the new Marconiphone range. In conjunction with the present series, they offer a choice which satisfies every demand of the constructor. Send now for descriptive booklet.

An inexpensive but efficient little instrument suitable for small receivers or portable sets. Price 12/6

POPULAR TRANSFORMER

These have a higher inductance than any other of a similar price and offer extraordinary value. Two ratios are available. Price 16/-.

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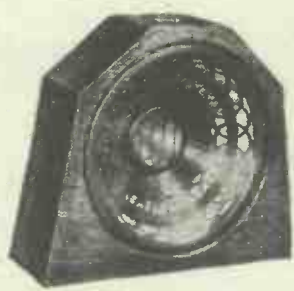
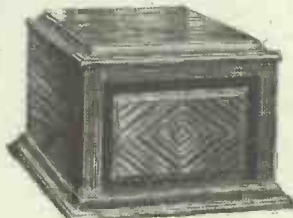
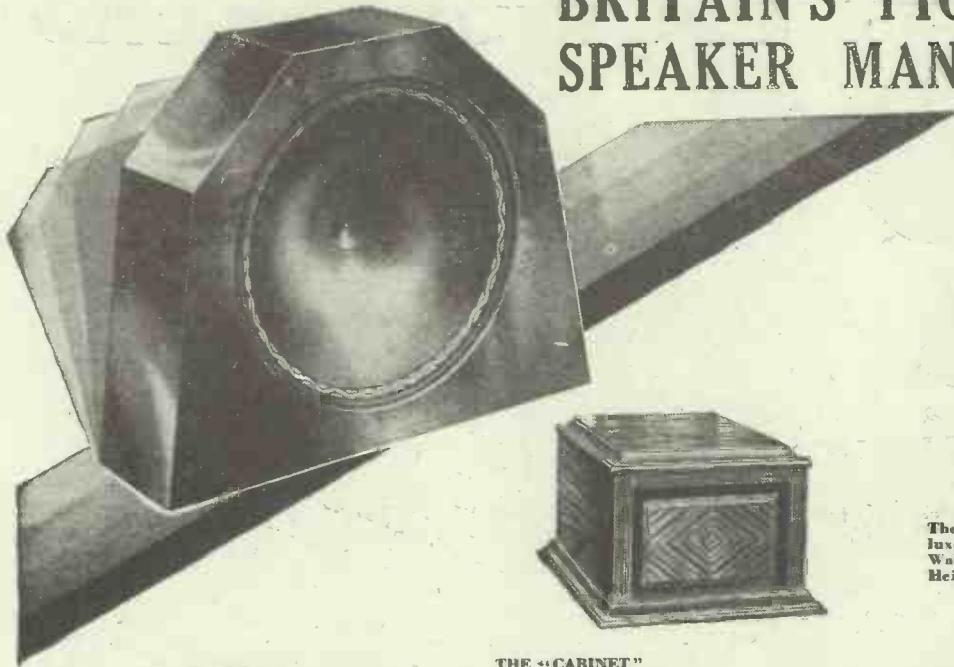
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The "Brown"
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 Cone Type
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 (as illustrated above)

42/-

Have you heard the "Brown" "Cubist"? This is another addition to the wide range of "BROWN" instruments. The "Cubist" is a Moving Coil Loud Speaker which needs no extra accumulator or mains unit. It will give perfect results with any good set having three or more valves. You can hear the "Cubist" at your dealer's.

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ON (Receiver Operation)

- (1) Connects H.T. Eliminator to lighting circuit.
- (2) Disconnects Trickle Charger from lighting circuit.
- (3) Connects L.T. Battery to Set.
- (4) Disconnects L.T. Battery from Trickle Charger.

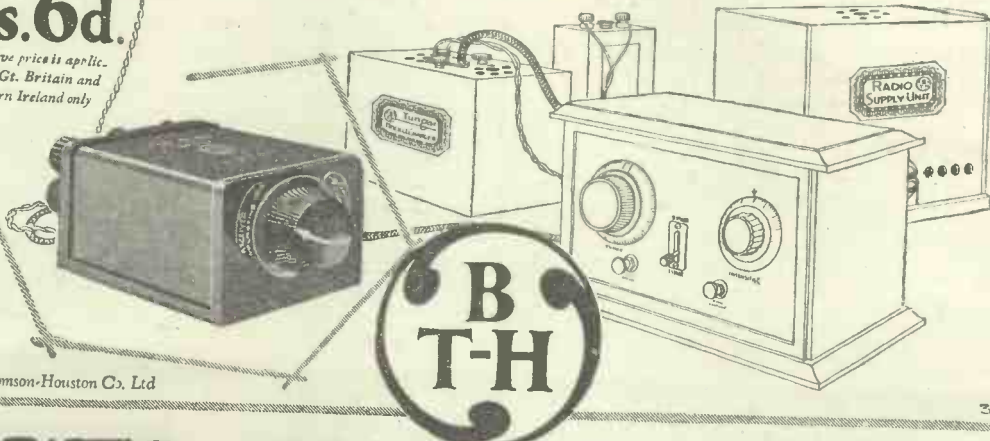
OFF (Battery Charging)

- (1) Disconnects H.T. Eliminator from lighting circuit.
- (2) Connects Trickle Charger to lighting circuit.
- (3) Disconnects L.T. Battery from Set
- (4) Connects L.T. Battery to Trickle Charger.

Buy a B.T.H. Power Control Switch—one of the most ingenious radio conveniences ever invented.

PRICE
17s.6d.

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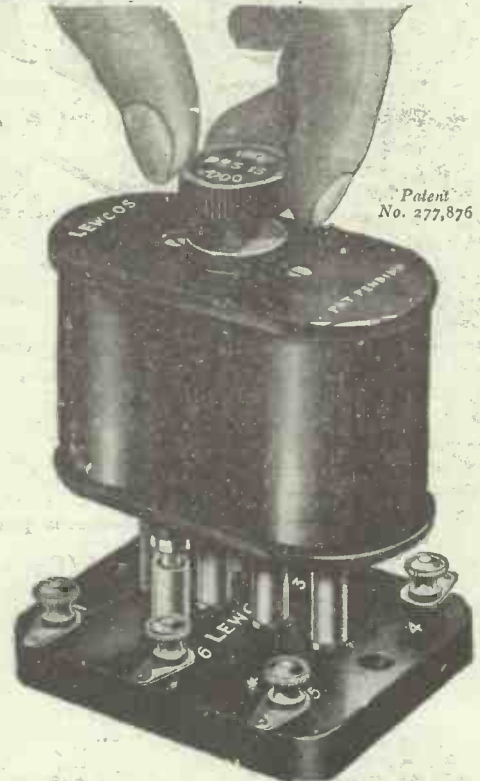
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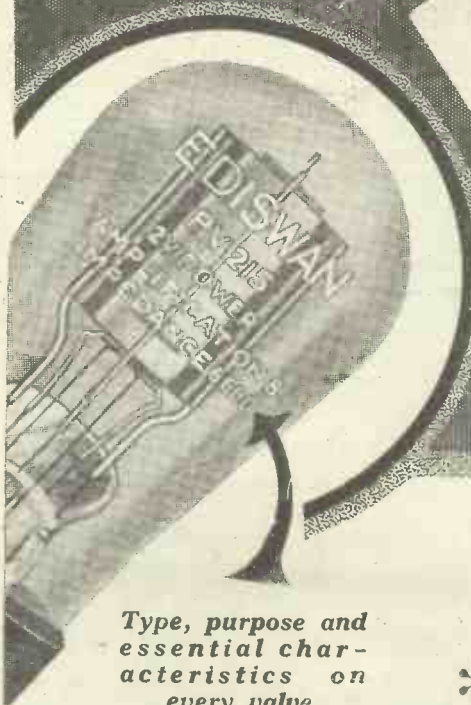
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RADIO NOTES AND NEWS.

“Pirates” in Russia—Mars Again—L.C.C. and Beauty—Two Tips from the Stables—Radio Down South—B.B.C. and Labour—Good News for Sunday.

Firework Night.

A GOOD deal of interference was observed by radio fans on the evening of November 5th as they crouched in their attics, all ears and expectancy. Some workers reported considerable difficulty in distinguishing between “crashes” of “X’s” and the remarks of Chinese crackers. Doubtless, in years to come the youngsters will be taught that the Nov. 5th rejoicings celebrate the capture of a high-brow who tried to blow up the Regional stations.

Fashions Tyranny.

AN American shoe firm sent a man to the Newmarket Races to stare at the beetle-crushers of the Upper Ten. When he spotted the pair he had dreamed of he secured the name of the makers. (Fancy asking the Earl of Bloodstone, “Say, who built your footwear!”) Next, the hustler got a photograph of the chosen hoof-cases and whirled it to New York by the photogram service, where the snobbers got busy with the production of an American edition. And *that’s* what we do with the work of Hertz and his successors!

Beg Pardon!

VARIOUS reports have come to my notice according to which the B.B.C. has been prospecting around Barkisland, in the Halifax district, for a site for one of the five new high-power stations. It is too early yet to say that the matter is settled, but one thing is certain; “Barkis is willin’.” (Sorry! but that was too good to miss and I hope I got it in before all the other Dickens readers.)

New Radidea.

I AM not sure whether German listeners-in will be truly thankful for the form which the “reduction” of their licence fee is to take. The fee is at present two shillings a month and, instead of making it less, the authorities are to insure each licensee against death or injury or destruction or damage to property caused by his radio apparatus. The maximum payment for the personal insurance is to be £5,000. Very pretty scheme for a grandmotherly government, but out of place!

News for Morse Readers.

PHILIPS LAMPS, Ltd., 145, Charing Cross Road, W.C.2, make the very interesting announcement that a new short-wave transmitter is in operation at Eindhoven. It is not a broadcaster, but a C.W. telegraphy station; call-letters P B F 5, wave-length 41.3 metres. It is intended for communication with amateurs all over the world, and anyone hearing it is requested to write to Philips’ at the address given. This will make some of our Army and Air Force lads abroad get their ears to the ground.

Loud Applause.

WHO are those folk who write woefully to the newspapers, complaining that the B.B.C. has blotted out the applause? Lor bless me! are handclapping and a storm of “core”

THE DOWN-GRADE UNCLE



Here is the apparatus for broadcasting from a parachute, and the “Uncle” who tells the world what it is like to fall from 20,000 feet

what they listen for, and have they not enough imagination to supply the deficiency they feel? Of course, the B.B.C. has done a perfectly sensible thing in toning down and then cutting out a deafening and, to the radio-listener, absolutely useless effect. Some people will, no doubt, wish the B.B.C. to include the dulcet cry of “Preowgrem” when the theatre is “put over.”

“Pirates” in Russia.

ACCORDING to a note in the “Scientific American,” a radio “pirate” in Russia is there looked upon as a dangerous criminal. A case is cited of a Leningrad boy who was sentenced to three months hard labour for owning a set without a licence. The judge said that he was “lenient” (it ought to be “Leninant”) because the boy was young. Evidently he strained the quality of mercy. In spite of the maximum penalty being three years in prison, it is estimated that 15 per cent of Leningrad’s listeners are “pirates.”

Mars Again!

DR. MANSFIELD ROBINSON filed a message with the Post Office on Oct. 24th, addressed to Mars. In defiance of telegraph etiquette, the P.O. accepted it, and at eighteen pence a word, too. Then the P.O. wireless people listened-in for the answer, which was a lemon. It’s quite time the P.O. gave up its radio when it lends itself to frivolity of this kind. However, as it can’t be expected to concern itself as to whether the addressee is at home or not one supposes that it would accept telegrams for Saturn, Venus and *Alpha Centauri*. I wonder how it would calculate the charge!

L.C.C. and Beauty.

H. C. (Bermondsey) is hot under his collar because the L.C.C. have ordered him to remove a 12-ft. bamboo from his roof and another which protrudes 3 ft. from the building, because they render the building ugly. On the other hand, the L.C.C. offers to erect an aerial—presumably it will beautify the house—for £1. On the facts as stated by H.C. this seems to be a somewhat high-handed action for an authority

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

which is responsible for some of those horrors called "Council Houses," and I advise him to protest to the L.C.C. Surveyor's Dept. at County Hall, and to point out the other aerial on the same premises.

The Unmaking of a Fan.

HC's case is particularly hard. He is a "P.W."-made fan, and has built and swears by the "Regional" Two, whilst in crystal sets the "100 Per Cent" is his choice, giving him 2 L O on the L.S. Now, if he does not pay the L.C.C. £1 he must give up his hobby, because the steelwork of the house prohibits the use of an indoor aerial. Let us hope he can find a way of hoisting a bit of wire without blasting the public's eyesight with a vile bamboo stick.

Two Tips from the Stable.

ONE of those curious and practical fellows who "want to know why," to wit, B. R. J., of Folkestone, contracted crackle in the set. All the rules for tracking crackle broke down; it wasn't in any of the right places. In a fit of philosophic calm he tapped his H.T. (accumulator) battery and got all the crackle in creation. So he glued thick rubber sponge underneath and between the cells and the row ceased. He was also blessed with an intractable reaction; it was as rough as the rhino's lipstick. His set is Hale 1-C-2, and the aerial is usually connected to the A terminal, and the "earth" to E. He reversed this, putting aerial to E and earth to A. All's well!

The Wobblers Revealed.

THE Technical Committee of the Union Internationale de Radiophonie has been measuring the frequency of European broadcasting stations, and their chart of the results is very interesting. The stations whose frequencies were steadiest include nine of the B.B.C. Manchester, Glasgow and Edinburgh appear to wiggle a bit. London is about as steady as it could possibly be, but I am sorry to say that some of the French stations, Lyons, Bordeaux and Toulouse, especially are far from constant. No doubt this unkind chart will cause many an engineer to pull up his socks. It's all to the good, anyway.

Queen's Park Rangers.

THESE do not dribble the ball; they range the globe—on the ether. The Queen's Park Radio Society—Hon. Sec., Mr. F. J. Batho, 37, Enbrook Street, Queen's Park, W. 10—meets on Wednesdays at 8 p.m. in the "Shaw" Room attached to St. Jude's Church, Lancefield Street, Queen's Park, W., and Mr. Batho will Shawly welcome any genuine fans, local or otherwise. Beginners gently nurtured; old-timers shown a trick or two.

From the Seven Seas.

"ARIEL'S" inky little kennel up by the eaves is a sort of Mecca. Men from all parts of the globe drop in casually and say rude-words about my pipe—and borrow tobacco, meanwhile telling yarns of the Seven Seas and lands beyond Lizard Light which make me sigh for my travel-

some days when I and a disreputable port-manteau went about our radio business and diddled a hundred Customs officers. One six-foot lot of an engineer, who can coax a ginger-beer bottle to be a valve if need be, has just left me.

Radio Down South.

HE told me that he had spent a year in a South American republic where telegrams were sent by steamer and mails by hydroplane. He said that monkeys used his aerial as a tightrope, and when he shot them he found that they were sacred monkeys, and that to prevent a native rising the Government solemnly enacted a Bill declaring them to be secular monkeys, and as such liable to be filled up with duck-shot. He said that the Navy had never been to sea because the next state would

SHORT WAVES.

Complaint is being made that broadcasting comedians are getting into the habit of making private jokes for the benefit of their friends.

But surely they may be allowed their lighter moments.—"Punch."

RETORT PUNGENT.

Accused Man at Highgate: "It was very dark?"

A Witness: "It was."

The Man: "Yet you could see all I did forty yards away from you?"

The Witness: "I could."

The Man: "You ought to be on the Television Board."—"Evening News."

Sweet Young Thing (in music shop): "I'd like to get a good DX record, please. My friends say that every good radio set ought to have one."

A Croydon resident when fined for using a wireless set without a licence, said that his set was not used; and, in proof, declared that pieces of fat for the birds were strung from the aerial!

After all, some birds can sing.

What is the difference between a storage battery and a native of Aberdeen?

The storage battery can be overcharged.—"Radio News."

"Everything wireless," runs an advertisement in the Staffordshire Sentinel. That's what the canary wished.

There's many things in the radio world

That really have us guessing,

And the Royal Commission surely is

A noble, holy blessing,

The licence fees we think too high,

And our one increasing purpose

Is a detailed explanation

Of what happens to the surplus.

But there's something that we know of

That causes grief and pain.

We really know the meaning of—

"A Special Programme's Been Arranged."

—"Pop. Radio Weekly."

regard it as an unfriendly act, and that the admiral rode a "penny-farthing" bicycle dating from the 'seventies!

B.B.C. and Labour.

WHAT money cannot do Art has done. For the B.B.C., pumping out the "juice" from 2 L O, which as all the civilised world should know, is on top of Selfridge's in Oxford Street, has electrified a crane in Portman Square. Then they electrified the foreman, who probably thought it was the rheumatics. And then they actually electrified the workmen, a sight which would, I suppose, make a Trade Union Secretary think he was tight. If the contractors don't stop this process the building will be up before the foundations are down. They say the men are turning into Radio Robots, and refuse to have "Smoko" at 11 a.m.

Wireless and the Weed.

AS proof that radio enthusiasts do not become dehumanised, one may cite the winter programme of the Croydon Wireless and Physical Society. The subject for one evening is to be "Tobacco," a topic which certainly needs ventilation. Personally speaking, the radio club I should join would put "and Tobacco" after every subject on its agenda. How can a man explain diagrams properly without clouds of smoke and the swapping of pouches?

Football Broadcasts.

AS a result of the recent action of the F.A. in regard to the broadcasting of commentaries of matches, readers are manifesting some anxiety about the repetition of those popular broadcasts, especially overseas readers. It seems hard that they should suffer, and one gentleman living at Caudry (France) suggests that the B.B.C. should announce merely that an important match will be broadcast, without mentioning names. People here would not then stay away from any match they wish to follow, thus calming the fears of the F.A. I think the idea is worth consideration.

Transmitting Note.

MR. C. J. L. DIXON, "Middlefield," Wrecclesham, Farnham, Surrey, asks me to announce that his call-sign is 2 A M M, and that he would be pleased to co-operate with other amateurs in short-wave work. I have done so. And as C. J. L. D. has read us from No. 1, I underline it at great expense, in red.

Good News For Sunday.

THROUGH the enterprise of that well-known firm, Brandes, Ltd., listeners who can receive Hilversum (1,071 metres) will have the Sunday gap from 5.40 p.m. till 7.10 p.m. filled every other Sunday by a popular concert. The next concert will take place on November 18th. Readers will be interested to know that these concerts will be directed by Mr. Hugo de Groot, and will employ the talent of some of the finest players on the Continent. This arrangement will prove a boon to many, and is, emphatically, a Brandes' brain-wave.

Scots! What Ho!

GIN ye hae no seen the wee book o' the Embro Deestric Radio Society ye mun inspectit the same. Losh! it gars the Sassiety kenspeckle, I'm tellin' ye. "Tr-r-ansactions," an' a', juist like yon Royal Sassiety! Well, that's all the Scots I know, and I expect it will make the Jocks stiff with laughter. However, it will inform them that Auld Reekie boasts a fine Radio Society, worthy, I hope, to rank with the famous "Spec," so beloved of R. L. S. Hon. Sec.: Mr. E. I. Robertson, 10, Richmond Terrace, Edinburgh.

A Call to 5 S W.

I LEARN that a new and powerful short-wave station is to be erected in Germany whose function is to broadcast propaganda to the ends of the earth. The old Nauen spirit is bobbing up again. Here is an excellent opportunity for 5 S W to temper the blast by broadcasting British news. If the Government does not wish overseas Britons to rely for news on foreign sources, let it whirl in now with a brisk and forceful news service via 5 S W.

ARIEL.

The NEW-TUNE CRYSTAL SET



cabinet of the panel-fronted type will serve, and the only point to observe with a little care is to see that the coils are not squashed up too closely to the body of the variable condenser.

The circuit is really very simple, although possessing some quite valuable features. It is most simply described as being an adaptation to crystal purposes of the well-known Hartley scheme used in valve circuits.

Good Selectivity.

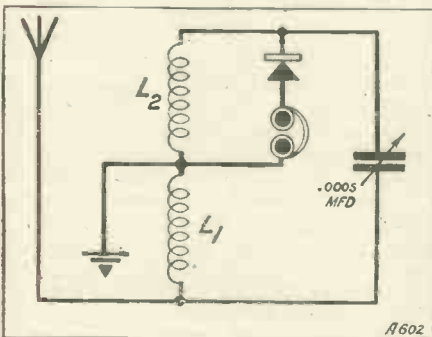
If you look at the circuit diagram you will see that the tuned circuit is made up of two coils, L_1 and L_2 , joined in series and shunted by a .0005 mfd. variable condenser. The crystal and 'phones are shunted across only one of these coils, so giving the arrangement known as a "crystal tap."

This is an important feature, giving a noticeable increase in selectivity and a slight gain in volume. It is, of course, desirable to be able to vary the proportion of the tuned circuit across which the crystal is

(Continued on next page.)

To produce something both novel and efficient in a crystal set is getting rather difficult these days, yet it does not seem fair that the valve enthusiasts should be the only class of constructor to

* Here is a novel crystal receiver with the special advantages of flexibility and adaptability. You can build it entirely with standard parts. Designed and described by the "P.W." RESEARCH DEPARTMENT.



are composed of a plain .0005 mfd. variable condenser and a pair of plug-in coils connected in a special fashion, and these are of sizes which are practically certain to be found in everyone's collection. Again, the layout is very simply arranged, and there is no critical spacing anywhere, so that it can quite well be made up in any odd cabinet or box you may happen to have, so long as it is of roughly the right size.

Either a simple flat-topped box or a

be constantly provided with the interest of new things to try out.

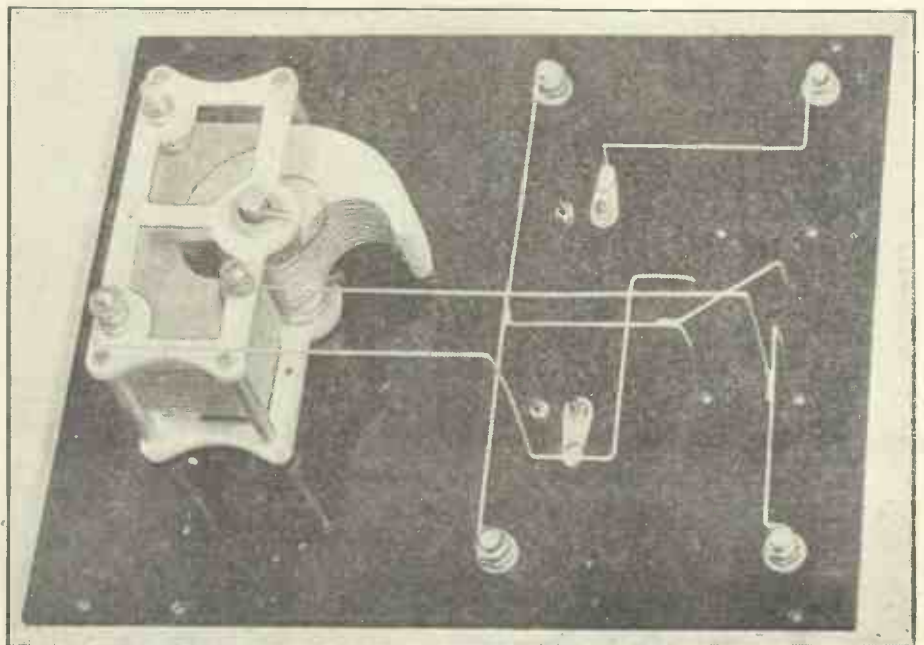
Many of us are limited, for one reason or another, to receivers of the crystal type, or occasionally build one for friends or relations, and it increases the interest of things greatly if we can get hold of some new schemes to try occasionally.

All Standard Parts.

The scope for really meritorious novelty in crystal sets is rather limited, but the "P.W." Research Department devotes quite a considerable amount of time to the question, and our readers may have observed that a design of special interest to crystal users is produced at intervals, an example which they may remember being the "Inducto-Crys" in its various forms, which incorporated a special circuit with certain notable advantages.

Another of these special designs is being presented this week, and it will be found to possess several interesting and attractive features. First and foremost, it will appeal to the constructor who has a certain amount of material on hand, for it can be built entirely with standard parts of such types as almost everyone has about the place.

For example, the tuning arrangements



The use of the older system of flat panel construction still has much to commend it for simple sets, since it makes the practical work extremely easy and straightforward.

THE "NEW-TUNE" CRYSTAL SET.

(Continued from previous page.)

tapped, and this can be done in the "New-Tune" set very simply by varying the size of the coil L_2 within certain limits.

For example, by making L_1 and L_2 equal in size you get a one-half tap, which suits many conditions, while by using a slightly larger coil as L_2 and a smaller one as L_1 , you get a higher tap, which may suit other types of crystal, and so on.

The coupling of the aerial to the circuit is arranged by making use of the coil L_1 as a coupling winding. The aerial is connected to one end and the earth to the other, the latter being the common point between the two coils. This arrangement enables you to suit the set to your own conditions as to size of aerial, degree of selectivity required, and so on, very easily.

Try Different Sizes.

As a rule you will find that a No. 25 or 35 will suit for a station on the ordinary broadcast waves, but if you happen to have rather a small aerial it will usually be better to use a rather larger size, say, a No. 40. This is particularly the case where the station you want is near the upper end of the tuning range and you do not require a great deal of selectivity. For the long waves (5 X X) a No. 100 or 75 is usually correct.

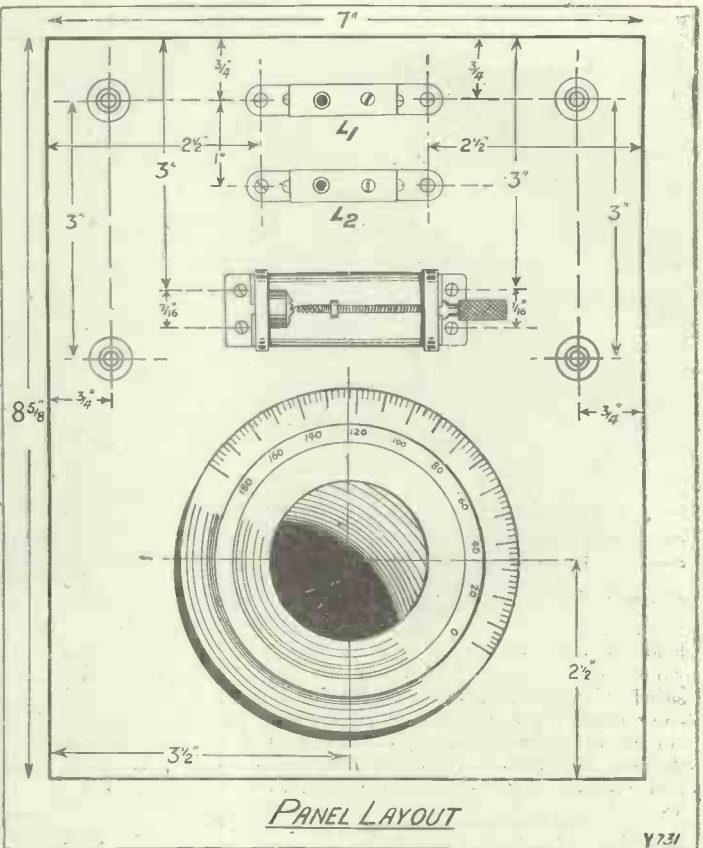
For the other coil (L_2) the best size will be in the neighbourhood of a No. 35, but a little experimenting is very desirable here. Different sizes do not as a rule vary the volume very greatly, although they make

some difference, but they affect the selectivity considerably.

Sizes also worth trying, then, are Nos. 25, 40 and 50, the first usually giving high selectivity and the latter low. The actual best size, of course, depends upon such things as the resistance of the phones and the crystal, and the efficiency or otherwise of the aerial.

A very little testing should enable you to determine a good combination, and when you have found it we think you will be agreeably surprised by the excellent performance this little set will put up, especially when you remember how simple it is and how easy to build.

For the long waves you will probably find a No. 150 best in the L_2 socket. In this connection it should perhaps be explained that it was decided not to make this a wave-change set, since to have done so with this particular circuit would have meant a rather complicated scheme.



PANEL LAYOUT

Y 731

one of the cat's-whisker variety or a semi-permanent type, such as the R.I.-Varley or the Brownie, but if you use one of the latter kind resist the temptation to keep re-setting it too frequently.

When you do find it desirable to seek a fresh setting be very careful to avoid

The constructional work calls for no detailed instructions on so simple a set, but it may perhaps be as well to explain that if a flat-topped box is used the coil holders can be of the panel-mounting type, which give a very neat appearance. The ordinary baseboard type can be used, if desired, of course, and they are perhaps easier to mount, since the other type calls for some rather accurate drilling.

Easy to Work.

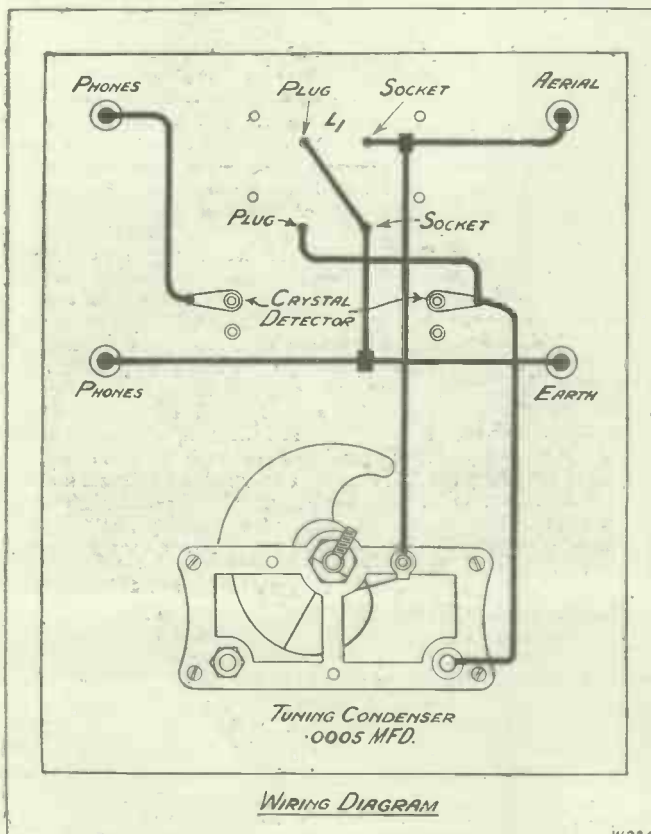
Operating the set is very simple. The question of coil sizes has already been considered, but it should be added that the operator must remember to retune on the condenser whenever he tries a different coil in either of the sockets. Another tip concerns the crystal. You can obviously use either

COMPONENTS AND MATERIALS REQUIRED.

- 1 Panel, 8 1/2 in. or 9 in. x 7 in. x 1/4 in. or 3/8 in. (Any good branded material, Ebonart, "Kay Ray," Trelleborg, Becol, Red Seal, Radion, etc.).
 - 1 Flat-topped box to take above panel, about 4 in. or 5 in. deep (see text). (Gilbert, Camco, Bond, Pickett, Makrimport, Raymond, Caxton, Artcraft, Lock, etc.)
 - 1 .0005 mfd. variable condenser, with plain dial (Raymond, Igranic, J. B., Peto-Scott, Ormond, Utility, Bowyer-Lowe, Cyldon, Lissen, Colvern, Dubiller, Geophone, etc.).
 - 1 Crystal detector (see text regarding this item. Either cat's-whisker or semi-permanent type).
 - 4 Terminals (either plain or engraved or indicating, such as the Igranic, Belling-Lee, Felex, etc.).
 - 2 Coil mounts or set of parts for panel mounting.
- Wire, screws, etc.

scratching the crystal surfaces against one another. In particular, never revolve the knob when the crystals are in contact: always draw it back a little first. This may seem an obvious point, but it deserves emphasis, since it is easy to spoil a good detector with a little rough usage.

(Continued on next page.)



WIRING DIAGRAM

W 225

PROTECTING MOVING-COIL SPEAKERS.

A simple arrangement which ensures safety against "surges."
FROM A CORRESPONDENT.

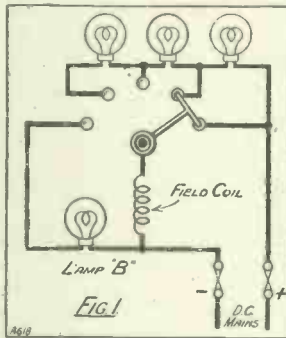
ALTHOUGH the moving-coil loud speaker is becoming deservedly popular, very little has been said up to the present about the necessity of providing some form of discharge resistance connected in parallel with the magnetising coil at the time of breaking the circuit. A very high and dangerous voltage is induced in the coil when the circuit is interrupted, and on this account the spool carrying the field coil should be well insulated with mica stuck to the spool by shellac.

A Special Switch.

The writer has constructed a combined field discharge switch and volume control which can be easily made and is very satisfactory in operation. In many cases the current consumption can be cut down considerably without any perceptible reduction in volume. When a coil-driven loud speaker is energised from D.C. mains and the energy is paid for at the lighting rate, any economy in consumption is desirable. Carbon lamps can be used conveniently as resistances, and the accompanying diagram, Fig. 1, shows the connections.

The last contact connects the coil direct across the mains, and when the switch arm is moved to the second contact, one lamp is placed in series with the magnetising coil. The third contact inserts two lamps in series, while the next contact adds another

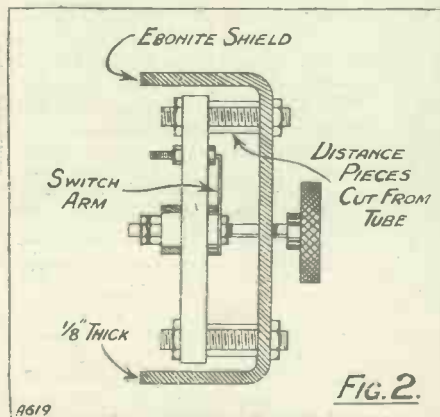
and 860-ohms resistance respectively. The resistance of the magnetising coil is roughly 1,700 ohms for a 220-volt circuit, the corresponding current being 0.13 amperes, so that with all three lamps in series, the resistance is increased to about 3,570 ohms, and the current will be reduced to 0.0615 amperes, which represents a reduction in consumption of from 29 to 13.5 watts.



It should be pointed out that these calculations neglect the fact that the resistance is higher at the lower temperatures. The contact arm of the switch is made wide enough to bridge two contact studs, so that when the arm makes contact with the last two studs, the lamp "B" is connected in parallel with the magnet coil, and when the switch is moved to the last position, the coil is disconnected from the mains, and the lamp "B" is left connected across the coil as a discharge resistance.

Very Simple.

The switch can be easily constructed from the sets of stud-switch parts on the market. It is recommended that the width of the laminated switch arm should be sufficient to allow a gap of $\frac{1}{4}$ in. between the contact studs; the base should be of either good quality ebonite or bakelite, and it is desirable to provide some form of shockproof cover over the switch front. This can be easily arranged, as shown in Fig. 2, by bending a piece of ebonite $\frac{1}{8}$ -in. thick on a block of wood to the shape illustrated. The ebonite can be bent easily after being soaked for a few minutes in hot water.



lamp. The writer has found that three carbon filament lamps of 30, 25 and 16 candle-power can be connected in series with the field coil, the volume still being ample for the average household, when the speaker is operated by a three-valve set consisting of detector, followed by one stage of resistance coupling and a good transformer, with either a super-power valve or two ordinary power valves in parallel in the last stage.

Allowing 3.5 watts consumption per candle power for carbon lamps the resistances will be approximately 460, 550

spool of many designs will accommodate a few thousand more turns than specified, and by filling the spool with wire of the same gauge, the winding will have the same number of ampere turns, while the resistance of the coil will be increased with a corresponding saving in consumption. Alternatively, the spool could be filled up with wire of a larger gauge, thus increasing the number of ampere turns, but adding very little resistance, so that the ampere turns will be increased with practically the same current consumption.

THE "NEW-TUNE" CRYSTAL SET.

(Continued from previous page.)

By the way, when you are testing out the set do not forget that whenever you change the size of either coil it will alter the condenser reading for the station you are receiving, and hence you must be prepared to retune a little each time. One more hint: remember that if you want a relay station you should choose rather small coil sizes.

POINT-TO-POINT CONNECTIONS.

Aerial terminal to one side of L_1 socket, to moving vanes of condenser. Other side of L_1 to one side (socket) of L_2 , to earth and to one 'phone terminal. Remaining side of L_2 (plug) to one side of detector and fixed vanes of condenser. Other side of 'phones to remaining side of crystal detector. This completes the wiring.



This is how the original set was made up. There is nothing critical about it, however, and you can use any panel and cabinet of roughly the right size and shape.

THE BAIRD CO. REPLY TO THE B.B.C.

It will be remembered that after B.B.C. officials had attended a demonstration of the Baird system they published an adverse report. The Baird people have now issued a statement concerning this which raises interesting points.

By THE EDITOR.

THE recent official statement by the B.B.C. regarding the Baird Television system has called forth an official reply from the Baird Television Company.

In the course of this reply, it is said:

"The Baird system of television advancement makes it, in the opinion of many independent authorities, fit for a public service. Accordingly, the Baird Television Company applied to the Postmaster General for broadcasting facilities. The Postmaster General required a demonstration, and stated that the question of authorising the use of a British Broadcasting Corporation station would be considered in the light of the report on that demonstration.

The Answer.

"Following the demonstration, the Postmaster General informed the Company that he was prepared to agree to the use, subject to suitable conditions, of one of the B.B.C.'s stations for further television experiments. At the suggestion of the Postmaster General a private demonstration, of the working of the apparatus, was given to officials of the B.B.C. for the purpose of enabling the details of the arrangements to be discussed. The B.B.C. have now announced that they do not propose to proceed further with television in its present stage. The decision of the B.B.C., which, incidentally, was not communicated to the Company until some time after it had appeared in the public Press, is contrary to the considered opinion of many independent engineers, including those of the Post Office, who, after the demonstration, did not require the apparatus to fulfil any further conditions in order to justify the Company for taking steps with a view to securing independent broadcasting facilities for television."

That is the official reply of the Baird Television Company to the B.B.C.'s refusal to proceed with television experiments.

There are, of course, some independent engineers—and possibly including some at the G.P.O.—who think that a television service should be proceeded with. That will always be a matter of opinion. But, nevertheless, the balance of opinion of the most eminent scientific authorities in this country to-day, lies with the B.B.C.'s engineers.

Independent Views.

We need not stress the point that Captain Eckersley, who was present at the television demonstration, has been acclaimed throughout this country and abroad as one of the greatest living authorities on the technique of broadcasting, both from the transmission and reception point of view. And we feel sure that our readers will agree with us that if television is not good enough for Captain Eckersley, and if it is not, in its present known system, good enough to

convince such authorities as Sir Oliver Lodge, Dr. Roberts, Dr. Lee de Forest, Mr. A. A. Campbell Swinton, and others, there may be legitimate doubts as to the value of "independent engineers' " opinions, that it can serve as a useful function as a public utility service.

There seems to be an impression abroad that the Baird people have been treated unfairly. Nothing can be further from the truth. They have been given every facility for proving that their system is worth the B.B.C.'s while as regards putting one of their stations at its disposal for a series of television transmissions.

Any rumours which suggest that Captain Eckersley and his confrères were biased when attending that demonstration are not only unfair but untrue. Captain Eckersley, with whom we have discussed the question of television many times, and who has accepted our invitation to contribute to these columns his considered



John L. Baird (right) is showing Mr. G. W. Mitchell, founder of the Television Society, some of his latest Television apparatus. The next Television move is awaited with considerable interest.

opinion on television in the general sense of the word, would be delighted if some system could be devised whereby television would be of some utility, or even of some amusement.

But, by the overwhelming majority of people of scientific authority who have examined television systems (quite apart from any value as to entertainment), it is realised that there are technical drawbacks to a television service inherent in the particular systems known to-day.

We need not recapitulate here those technical drawbacks. The wide wave-band necessary is probably one of the chief drawbacks and, furthermore, the very small image obtainable—smaller than a cigarette card—the lack of detail and the constant blurring and general indistinctness of the image would constitute another drawback

which, although not serious in the laboratory, and not serious for a series of short, entertaining demonstrations illustrating the possibilities of television, could not be tolerated from the public service utility point of view.

If any of our readers have seen the demonstrations given by the Baird Company at Olympia, which, of course, was by wire and not by wireless, they will realise that those demonstrations, greatly interesting as they were, were more of the nature of laboratory experiments, and that, when taken out of the laboratory and used for broadcasting purposes by wireless, their entertainment value would, after the first novelty had worn off, be negligible.

Using Listeners' Licence Fees.

Consequently, the B.B.C. is justified in not making use of the licence money they receive, in any way to put into operation a television system at the moment, and they are justified, apart from any financial expense they might incur, in not devoting further programme time to experimental work of this nature.

That experimental work can be quite adequately carried out by the Baird people themselves.

They have a fully licensed experimental station at Long Acre, and those amateurs who are interested in receiving such televised images as may be sent these days, have an opportunity of receiving them quite apart from any co-operation with the B.B.C.

Exclusive Television News

is one of the features which have gained for

MODERN WIRELESS

its proud position as

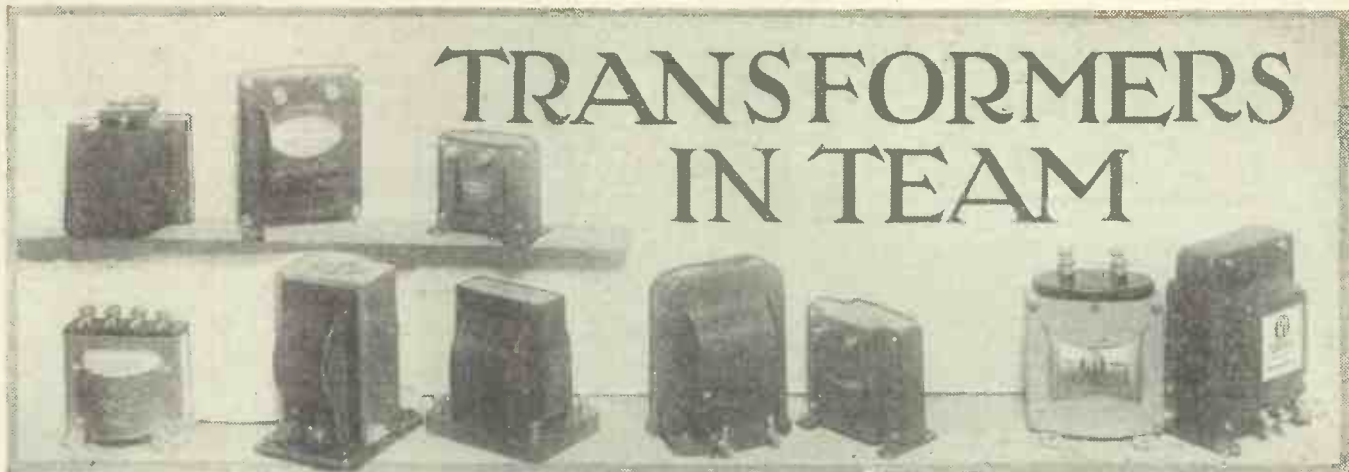
Britain's Leading Wireless Magazine

The November Issue—Now On Sale—is a Special Wireless Constructional Number with which is presented a

GREAT GIFT BOOK

Showing how to build SETS FOR EVERY POCKET, for 2/6 to £10.

Get Your Copy To-day!



TRANSFORMERS IN TEAM

IN the comparatively early days of wireless the standard way of arranging two stages of L.F. amplification was with a pair of transformers, usually with a high-ratio one first, and a low-ratio one to follow, and a wonderful noise (there is no other word) they used to make!

Things got a little better when it was discovered that the proper way to do it was to put the low-ratio transformer first—i.e. after the detector—and the high-ratio second, but even so, what we heard wasn't very much like music. After making all possible allowances for the poor loud speakers available in those days, and the not very good valves, it must still be confessed that most of the trouble was due to the use of two stages of transformer coupling on the L.F. side.

That Howling.

And then the troubles we had with L.F. howling! The shrieks and whistles we used to hear when the H.T. battery began to run down, and the trouble we had to make a new set stop howling when we hadn't been lucky with our lay-out and wiring! One remembers, too, how often one had to tell unlucky set builders who complained of a continuous howl to "reverse the connections to I.S. and O.S. of one of the transformers," for that was the standard remedy for our troubles on the L.F. side, to be followed by more drastic steps still if the trouble continued.

When we remember these early difficulties it becomes easy to understand why designers have nowadays more or less standardised on a stage of resistance-capacity coupling followed by a single transformer, for such a combination is normally much more stable, and is decidedly easier to arrange for real quality as compared with two transformers used in the old fashion without any form of stabilising device. In some cases, even, both stages may be resistance-coupled in an effort to obtain an unusual degree of perfection in reproduction, but this is generally done only where the set is intended for working a moving-coil speaker.

The Stability Problem.

Now, we have lately been reviewing the whole L.F. question in the "P.W." Research Department in the light of the latest modern developments, and we have come definitely to the conclusion that the time has come to modify our ideas a little. The point is this: The improvements made of

An interesting announcement concerning the arrangement of the L.F. stages of future "P.W." sets is contained in this article by the Research Department. Remarkable results have been obtained in the removal of the risks of howling and poor quality when two L.F. transformers are used.

late in the performance of L.F. transformers have been very great indeed, and there is no apparent reason, if the stability problem can be solved, why two of them should not be worked into a team capable of giving quality of reproduction quite adequate for any ordinary loud speaker. The magnification obtainable, of course, is definitely a good deal greater than with an ordinary "one resistance and one transformer" combination.

The stability problem has been practically cleared up comparatively recently in a rather unexpected direction. In earlier days we used to think that the cause of L.F. instability and howling was mainly to be found in interaction between com-

ponents and wiring producing stray reaction effects at low-frequency, and we used to devote a great deal of care to the placing of transformers at right angles, spacing out all parts and wiring, and so on. Even then, despite our best efforts, a set might howl, and most of us had a lurking suspicion that there must be some other factor at work of which we knew little or nothing.

The Mystery Explained.

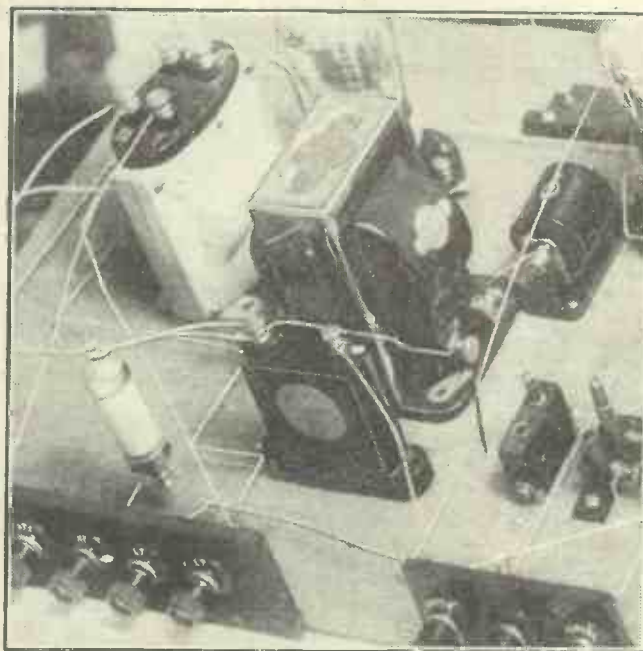
Lately this mysterious cause of instability has been located in the H.T. battery itself, and it has been discovered that it is the resistance here which, being common to the anode circuits of all the valves, acts as a coupling between the stages and so may easily produce enough "feed-back" to set up a howl unless something is done to wipe out its effects. The trouble, it has been shown, is not really confined to two transformer stages at all, but is more noticeable here partly because the greater magnification makes the amplifier more easily rendered unstable, and partly because there are slightly more chances of real interaction between the stages in such an amplifier.

Correctly expressed, then, interaction

between the stages in the old-fashioned two-transformer L.F. amplifier was often just the little bit of extra feed-back which served to turn the scale and set up an actual howl. Even when interaction was kept well down there still might be enough battery coupling to start a howl, or, short of that, to spoil the quality of reproduction completely.

Quality.

This last is a most important point, and very largely explains the poor quality so often noticed with two transformers, even when two comparatively good ones are employed. A considerable amount of work has been



Part of the L.F. side of one of the experimental sets used for the work described in this article, showing the "safety device" incorporated in the detector circuit.

(Continued on page 525)

A NEW "S.G." CIRCUIT



A method of coupling a screened-grid valve stage which reduces battery-coupling effects.

By C. P. ALLINSON, F.Inst.P.Inc., A.M.I.R.E.

THE introduction of the screened-grid valve has considerably altered the technique of high-frequency amplification, and though the use of this type of valve has solved many of our difficulties in H.F. work, it has introduced one or two new problems of its own.

You will probably have found some of them out for yourself during the course of your experiments, and of the more obvious difficulties the one most usually experienced is due to insufficient shielding. This shows itself especially in the case of the tuning condensers. If an ebonite panel is used, even though the condensers have metal end-plates which are at earth potential as regards H.F., it is very frequently found that when tuning in with one hand on each dial the set will oscillate owing to the capacity coupling provided between input and output circuits.

If a metal shield is used, then care must be taken to insulate the condenser tuning the anode coil in the output circuit of the screened-grid valve. This means extra work in the construction of the receiver, while as soon as a little dust gets into the anode tuning condenser the set gets noisy to handle.

A Serious Problem.

Shunt feed is very often employed in preference to series feed when using a screened-grid H.F. stage to prevent battery coupling from producing instability. As you know, this valve is extremely sensitive to the smallest amount of feed back, however introduced, i.e. either capacitive, inductive or resistive, and every precaution must be taken to eliminate it.

If shunt feed is used then it is easy to use a metal panel and mount both tuning

condensers on it, but in this case the damping due to the choke which is connected in parallel with the second tuned circuit will reduce the efficiency of the latter. Fig. 1 shows clearly in theoretical form how shunt feed introduces the choke damping into the tuned circuit.

The choke L_2 is connected between anode and H.T.+, and since this is at earth potential with regard to H.F. voltages it must be considered as being in parallel with the tuned circuit $L_3 C_3$. If the choke happens to be a poor one with an equivalent shunt resistance of only 50,000 or 60,000 ohms, the efficiency of this circuit will be seriously reduced. The resistance R , shown dotted, is to all intents and purposes placed in parallel with $L_3 C_3$.

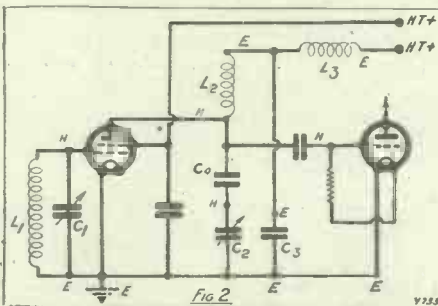
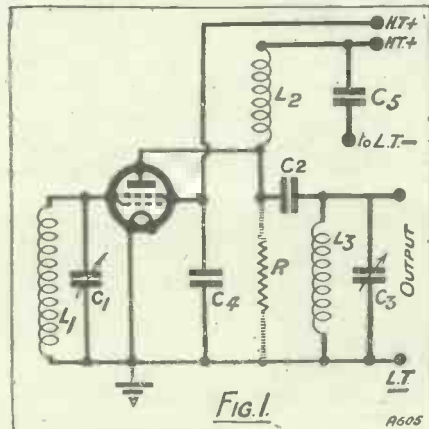
I came up against this problem in the case of a receiver I was building just recently in which I had used a metal panel. I was

condenser. As a further precaution if you wish to be on the safe side, and avoid every possibility of a short-circuit occurring through the accidental shorting of the condenser C_2 , another fixed condenser may be connected in series with it, as shown in Fig. 2 at C_4 , which completely isolates it from all high D.C. potentials. Further, to make the matter clear, points at high H.F. potential have been marked H.

How the Circuit Works.

I have redrawn the circuit in Fig. 3, slightly rearranging the circuit, and this shows quite clearly how this circuit works. I have left out the H.F. chokes L_3 so as not to confuse the diagram.

It will be seen that the beauty of this scheme is that, notwithstanding the fact that the H.F. choke is there preventing battery coupling, both ends of it are at earth potential as regards H.F. voltages, and so it is not possible for it to introduce losses in any way. This system is therefore far preferable to shunt feed, except, of course, in cases where a little extra damping is needed for stabilising.

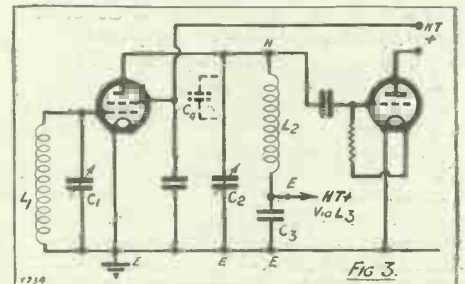


unwilling to have to insulate the anode tuning condenser.

I further did not want to use the ordinary arrangement of shunt feed because of the losses it introduced, and I finally evolved the arrangement shown in Fig. 2. The anode inductance L_2 is connected in series in the usual way, but the tuning condenser is connected between anode and L.T., as shown. In order to prevent the feed back, which produces instability, known as "battery coupling," an H.F. choke L_3 is connected in series with anode coil.

A Further Precaution.

By connecting a large fixed condenser C_3 between the H.T. end of L_3 and L.T.—our tuned circuit $L_2 C_2$ is completed, and provided that C_3 is not less than .002 it will not affect the tuning range of $L_2 C_2$, and if it is a mica condenser of good make it will not increase the H.F. resistance of this circuit by an amount that is measurable. I, myself, prefer to use a rather large condenser in this position, such as a .01 mica



SOME PRACTICAL POINTERS.

WHEN a tuning coil is used inside a screening box it should be placed centrally, not only as regards its distance from the four sides, but also from the top and bottom, or otherwise there will be unnecessary damping.

In order to control volume by means of a potentiometer it is essential to use a high resistance potentiometer of approximately the same ohmage as a grid leak. (The old-fashioned potentiometer as used for H.F. damping has a resistance of about 400 ohms, and is quite useless for volume control.)

White wood showing through the stain of a scratched cabinet can often be darkened successfully by several applications of a solution of permanganate of potash.

When ebonite tubing has to be cut into short lengths for frame aerial supports, etc., the difficulty of holding it in the vice can be overcome by using a wooden block drilled to about the same diameter as the tube and then halved to form two shaped blocks, which can easily be held in the vice.

If your accumulator is a new one, keep the terminals in good condition by making a practice of coating them with petroleum jelly, which prevents the acid from attacking them.

A NEW RADIO PICTURE SCHEME

The description of a very rapid system of transmitting and receiving radio pictures originated in America.

By OUR SPECIAL CORRESPONDENT.



A RADIOPHOTO apparatus capable of picking electrical impulses out of the air and converting them in less than one minute into a complete photograph was recently demonstrated publicly for the first time in America.

The apparatus had been used previously with marked success in experimental transmissions over short waves.

Because of the difficulty of securing radio-wave channel assignments, the demonstrations were carried on with the use of wires, rather than air channels, for the transmission of the pictures. It is stated, however, that the equipment functions equally as well by radio as by wire within the limits of fading and static familiar to the broadcast listener.

Standard Photographic Processes.

Even in the field of transmitting pictures by wire, it is said that this new equipment is superior to any that has yet been developed, for the reason that it requires less than one minute to build up a photograph five inches by eight inches in size, whereas other sets take between four and five minutes for the same operation.



DR. VLADIMIR K. ZWORYKIN, the inventor of the new Radio-photo transmitter. He is shown inserting one of his photo-electric cells into the transmitting apparatus.

Unlike most other radiophoto and telephoto equipments, this new apparatus, which has been developed by the Westinghouse Company, employs standard photo-

graphic processes for making pictures. Its pictures are produced by the exposure of sensitised paper to light, in exactly the same way that pictures are customarily made in photographic studios.

The Westinghouse radiophoto apparatus is the product of the research and development work carried on by Dr. Vladimir K. Zworykin, over a period of several months.

A System of Mirrors.

In addition to ordinary short-wave transmitting apparatus, the new radiophoto system uses three principal pieces of equipment: a sending set, a receiving set, and a "synchroniser."

In the sending set, an ordinary photograph or manuscript is placed on a cylinder, which rotates slowly and at the same time moves forward longitudinally. In this way, every point on the picture comes within the range of a tiny beam of light.

By a system of mirrors, the beam of light is reflected at an angle from the photograph to a photo-electric cell, or "electric eye," which gives out an electrical impulse corresponding in intensity to the degree of light or shadow of the particular pinhead of space on the photograph covered by the beam of light at that particular moment. This procedure, in other equipments, generally requires that a transparency be prepared.

For radio transmission, the feeble currents given out by the photo-electric cell pass through three stages of amplification and then go by wire to the radio broadcasting station, which may be located a short or long distance from the radio-photo sending set. There the light waves, already converted into electricity, go out in the ether in the form of radio waves.

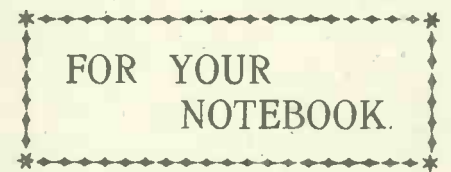
The Synchroniser.

At the receiving end, which may be situated anywhere within the effective range of short waves, a standard short-wave receiving set is used to pick the impulses out of the air. The impulses are carried to a special lamp, which flickers according to the fluctuations in intensity of the current.

The light from this lamp is focussed into a tiny beam which plays on a cylinder moving in the same way and at the same speed as the cylinder at the sending end. This cylinder is covered with sensitised paper, and, as the light falls on it with varying brightness, a series of impressions of varying degree are made on the paper, which, when "developed," present a facsimile of the picture placed on the sending cylinder.

An essential feature of this system is that the cylinders at the sending set and at the receiving set rotate and move forward at exactly the same speed. To accomplish this very difficult feat is the duty of the "synchroniser." Synchronisation is accomplished by the transmission, over the same wave-length used for the radiophoto transmission, of the constant frequency note which regulates the speed of identical synchronous motors driving the two cylinders.

The finished photographs, after passing through the "dark-room" processes of developing and drying, correspond in practically every detail with the originals. If the pictures are held two feet away, it is impossible to tell the original from the copy which has been sent through the air.



THE plus and minus markings upon a speaker can be disregarded when it is connected to a set in which a filter output circuit is employed.

A run-down accumulator should be taken as soon as possible to the charging station and should not be allowed to stand aside indefinitely.

The usual method of connecting the windings of a plug-in coil arc, outer end of the winding to the socket, inner end of the winding to the plug of the coil.

One metre is equal to 39.37 inches.

When connecting up a strange L.F. amplifier to a set leave the H.T. negative terminal unconnected. (Otherwise you may short your L.T. battery.)

Generally speaking, the best length for a single-wire aerial and lead-in combined is about 75 ft.

LATEST BROADCASTING NEWS.

A POST OFFICE
DISCLAIMER

THE BIRTH CONTROL FIASCO—
B.B.C. NEWS—G.B.S. ON 5 GB—
BIRMINGHAM RADIO CIRCLE
ENDOWS A COT—A TALK ON SLUGS
—TEST PLAYERS FROM "DOWN
UNDER"—SOCCER COMMENTARIES
AGAIN.

A Post Office Disclaimer.

POPULAR WIRELESS is authorised by Sir William Mitchell Thomson, the Postmaster-General, to say that neither he nor his department has any knowledge of the rumoured attempt of the Foreign Office to give up several British broadcasting wave-lengths in exchange for diplomatic advantages of another kind, presumed to have a bearing on the current disarmament discussions.

Apparently the P.M.G. is very anxious to be informed of all indications of moves of this kind, possibly sponsored by other departments or Ministers. He has asked POPULAR WIRELESS to pursue this subject further, and to place at his disposal all available information. This is being done.

The Birth Control Fiasco.

Euphemistically known as a discussion on the population question, the Birth Control Debate has now been abandoned through the inability of the B.B.C. to match two well-balanced and competent debaters. Friends of Mr. Bertrand Russell declare that there was no one with the courage to dispute his thesis; so that's that, and good Catholics can breathe again.

B.B.C. News.

The reorganisation of the B.B.C. news service so long advocated by POPULAR WIRELESS has been taken in hand, and important developments will be announced shortly. It is not known yet whether this will be considered together with the problems of the incorporation of pictures into the service.

G.B.S. on 5 G B.

Mr. George Bernard Shaw will be heard by 5 G B listeners on December 7th, when he gives the first of a series of four lectures entitled "How it Strikes Me," which are to be relayed from the private theatre of the Royal Academy of Dramatic Art.

Birmingham Radio Circle Endows a Cot.

In two years the members of Birmingham Radio Circle (now 5 G B) have raised £1,000 to endow a cot at the Birmingham Children's Hospital. Silver paper accounted for a large proportion of this money. A few days ago a cheque for £1,000 was handed over by the Lord Mayor of Birmingham (Alderman A. H. James) to the authorities of the Children's Hospital, and now over a little bed is fixed a brass plate suitably engraved, commemorating the gift for all time. And the children of the Radio Circle are starting another charitable task at once.

A Talk on Slugs.

A nice little chat on "Slugs" is set down for Wednesday evening, November 21st, at about 7.30. It will be given by Mr. Roebuck, an advisory entomologist to the Ministry of Agriculture. Savoy Hill put the blame for this kind of thing on Government Departments. This is a poor excuse. The B.B.C. could easily prevent obviously unsuitable talks of this kind.

Test Players from "Down Under."

The fifteen minutes between 7.45 and 8 p.m. on Saturday, November 10th, will be an anxious time for the engineers in charge of the B.B.C. listening post at Keston.

NORTH POLE CALLING!



This photograph shows young Clifford Himoe, the radio operator of the MacMillan Polar Expedition, recently returned from an exciting exploration trip to the frozen North.

During that time an effort is to be made to pick up 2 FC at Sydney, a special transmission consisting of greetings from the M.C.C. team in Australia.

Arrangements have been made by cable, and even if conditions are favourable it is impossible at the moment to say who listeners will hear. The experiment will certainly be one of the most novel that has been attempted for many months. The idea, of course, is to re-broadcast the greetings to English listeners, who, perhaps, should bear in mind that it will then be round about breakfast-time in the Antipodes.

Soccer Commentaries Again.

Some of the difficulties which have prevented the broadcasting of running commentaries on Association football matches of the English League have been overcome at least with one London club, the Arsenal, from whose ground at Highbury Mr. George Allison, the well-known authority on the game, will describe the play between the home club and Aston Villa during the second half of their fight for points on Saturday, November 24th.

Another commentary will also be given a fortnight later from the same ground on the match between the Arsenal and Manchester United. It is hoped that the broadcasting of a description of only the second half of these League games will effectively combat the debatable contention of some of the clubs that people who would otherwise pay to witness the games prefer to sit at home and hear all about it by wireless.

The real football fan, whatever may be said to the contrary, wants to see his favourite side, otherwise it can be argued with equal truth that the newspaper accounts of the play would be just as damaging as broadcasting to the attendance.

TECHNICAL NOTES.

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

THE STORY OF ELECTRICITY

IGNITION INTERFERENCE—CURING AT THE SOURCE—LOUD-SPEAKER
TROUBLES—VIBRATING AIR COLUMN—RATTLING—Etc.

The Story of Electricity.

IF the development of electricity in its application to electric lighting and innumerable industrial purposes is a fascinating story, what shall we say of the visions which are conjured up for the future?

I have before me a little booklet written by Mr. H. G. Massingham, who was one of the early pioneers of electric lighting, in which a most interesting and popular account is given of the development of electricity, and of the probable lines upon which electrical applications will proceed in the immediate future. The author of this little booklet states that he is in his seventy-eighth year and, therefore, we may assume that during his lifetime he has had the opportunity of witnessing the most important of electrical developments.

The booklet is entitled "The Past and Future Developments of Electricity and Its Bearing on World Peace." It is priced 6d. and is obtainable from Messrs. Hutchinson & Co. (Publishers), Ltd., of 34, Paternoster Row, London, E.C.4. It is a little booklet which I can recommend to readers.

Ignition Interference.

Radio reception in aeroplanes is, of course, subject to very serious interference from the ignition system of the aeroplane engine, the radiation from which, in addition to being of considerable intensity, is at very close quarters with the receiver.

The United States Bureau of Aeronautics, in co-operation with a well-known U.S. radio manufacturer, has lately developed a special form of shielded sparking plug which, according to claims, almost completely cuts out interference from the ignition. If the claims made are true this invention should be of great value in increasing the range of aircraft receivers.

Curing at the Source.

The problem which has here been solved is, however, a simple one compared with the problem of spark interference, which cannot be cured at its source. With a spark transmitter it is obviously impossible to apply a similar remedy, inasmuch as the

(Continued on page 518.)

With Lissen transformers, each stage of amplification emphasizes the silence of the background—the startling definition of the notes!

YOU BUILD UP VOLUME AND RETAIN PURITY IF YOU USE LISSEN TRANSFORMERS

BECAUSE Lissen Transformers amplify in a background of *dead* silence, each added stage of amplification makes more noticeable the startling definition of the notes. There is no parasitic noise to be heard, no extraneous sound to mingle with the incoming signals. As the volume is increased by extra amplification, so do the notes of music seem more and more to stand out in sharp relief. The low notes as well as the high ones are there, because there is even amplification over the whole band of audible frequencies.

LISSEN SUPER TRANSFORMERS, 19/-

In transformers in this price field, you expect something approaching perfection of amplification—and in Lissen you get it! The laboratory curves taken of the Lissen Super Transformer prove that there is *exceptionally* even amplification over the whole band of audible frequencies, and it should be noted that these curves have been taken with ordinary standard valves. If you are building for a quality of reproduction that cannot be excelled, use the Lissen Super Transformer for each stage.

Two ratios, $3\frac{1}{2}$ to 1 and $2\frac{1}{3}$ to 1, 19/- each.

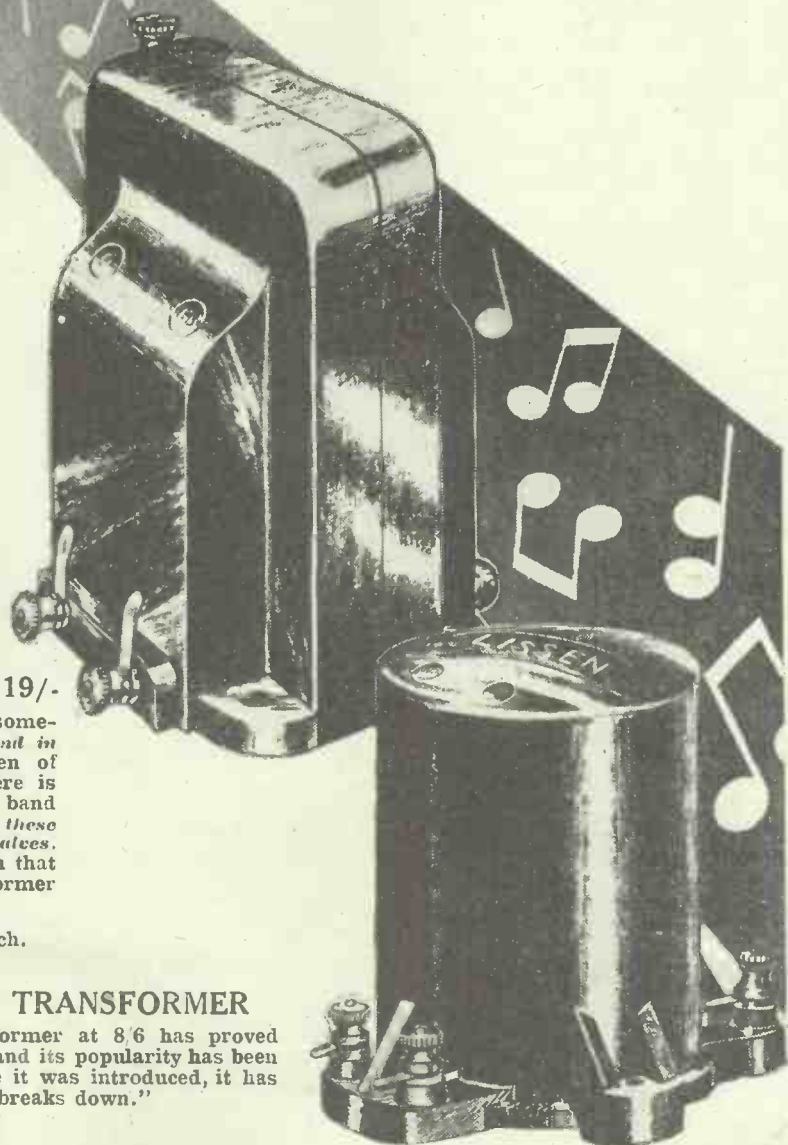
THE FAMOUS 8/6 LISSEN TRANSFORMER

For all ordinary purposes this Lissen Transformer at 8/6 has proved itself the equivalent of many at double the price, and its popularity has been reflected in huge sales. In the two years since it was introduced, it has earned the title of "the transformer that never breaks down."

Ratio, 3 to 1, 8/6

Obtainable of all Radio Dealers

LISSEN LIMITED, FRIARS LANE, RICHMOND, SURREY. (Managing Director: Thos. N. Cole.)



'SNAPSHOTS' FROM THE INTERNATIONAL

LISSEN'S

triumphant entry into the constructional receiver field!

At last you have all the broad horizons of radio thrown wide open to you—thrown open to you because of the new Lissen arrangement of a Screened Grid Valve circuit. Others have claimed selectivity for their receivers and have promptly damped that selectivity by using iron (tin) for the case. You would never get Lissen using iron, it is too bad in or near any tuning circuit. The panels and screens used for this new Lissen arrangement are aluminium—*there is no iron*—that is one point of superiority for LISSEN. Then the shapes of the components are printed in silhouette on the baseboard. All you have to do is to cover the image of each component. Has anybody but Lissen ever thought of doing that? Then, if you like you can buy the parts as you build, building up by instalments and buying by instalments. There is no complete kit to wait for. You also put the set into any cabinet you choose—

not iron, but wood which remains an article of furniture for all time and is dead to the touch and does not rattle when you move it. You can use all makes of valves—you are not tied down to one make which may be in short

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**BUILD THIS NEW RECEIVER THAT
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How to use **LISSEN** parts IN A **SCREENED GRID** VALVE RECEIVER

The whole circuit can be built of Lissen parts. Minor accessories such as wire, terminals, screws, panels, screens, baseboard and terminals are all enclosed in an envelope, price 10/-. The rest of the parts you buy separately. If you use all Lissen parts it means that you have one high standard of accuracy running right through the parts, and the finished receiver gives results which would never be possible if you used mixed parts.

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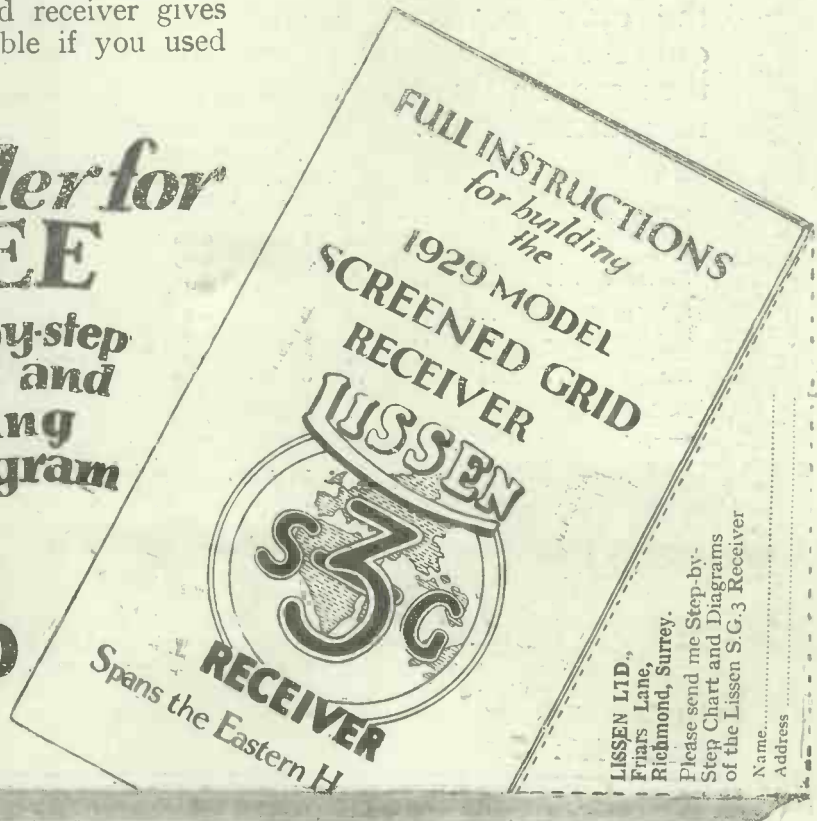
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Ask for the step-by-step chart and wiring diagrams. Your radio dealers will give you this Lissen folder of instructions for building the Lissen S.G.3 Receiver, or you can post the coupon on the right direct to factory, enclosing it in an unsealed envelope with a ½d. stamp, and get the chart by return of post.

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(Managing Director: T. N. COLE.)





*“To gild refined gold
to paint the Lily.”*

To Paint the Lily is a problematical task at best, but art is not nature and art is always capable of development.

So with COSMOS VALVES, good as they always were, the new 2 Volt and 6 Volt series are now even better. Look at their characteristics, particularly their slope. Note also that as grid current is prevented from flowing until 1.5 volts positive, no grid bias is necessary, and the working impedance is the rated impedance.

For Mains Operated Sets (No Batteries) COSMOS A.C. VALVES are indispensable. Standardised by leading Set Makers, they are the only indirectly heated Valves without grid emission. The only A.C. Valves entirely free from “hum”. The only A.C. Valves that can be fitted to existing sets without re-wiring. Absolutely non-microphonic. Why use other Valves at the same price?

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CHOOSING A LOUDSPEAKER

This problem becomes greater and greater with the increasing number of types and makes put on the market, and no doubt many makers will welcome advice from an admitted authority on the subject.

By PERCY W. HARRIS, M.I.R.E.



ANY visitor to the recent wireless exhibition must have been bewildered by the shape, size and variety of loud speakers exhibited. Every manufacturer seemed to claim something special for his instrument, and many claimed every possible virtue under the sun. Some of these wonderful instruments looked like golden basins in polished mahogany boxes, others like fire screens, picture frames, lamp shades and even idols. Just a few looked like loud speakers!

Now what is a man to do when faced with the problem of buying a loud speaker and confronted with all this bewildering array? Let us imagine that you, for example, have decided to purchase one. What is the best way to go about it?

A method of approach which I recommend to my friends, and which has proved very helpful with many, is to consider a loud speaker from the following aspects:

1. Maximum price to be paid.
2. Strength of signal required, i.e. for dancing, large room, or average living room.
3. Kind of set which will be used to drive it.
4. Is electric light available in your home?

Question of Price.

These may seem very strange questions to the uninitiated, particularly the last, while No. 3 has often provoked the rejoinder: "What on earth has that to do with it?" No. 2 has puzzled some, while No. 1 is the only question which seems obvious.

Let us consider price first. Part of the price you pay for a loud speaker is accounted for by the actual loud-speaker mechanism, and part by the form of cabinet in which it is contained. If appearance is not important, remember that many makers have several models which differ from one another only in the appearance and finish of the cabinet work, the sound reproduction being identical in each case.

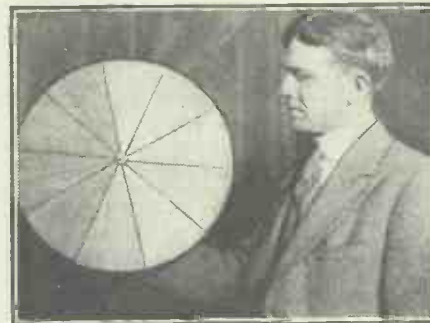
In the cheaper grades of loud speaker do not be misled into thinking that any cone type is bound to be better than any horn type. In spite of the greatly increased popularity in cone types of loud speaker, there are still numbers of horn types

which give very pleasant reproduction, and this is particularly the case concerning cones where everything has to be cut down to very fine limits in order to get down to the low price.

Generally a first-grade modern cone type of loud speaker in a well-finished cabinet will cost from five to ten pounds, although excellent little cones, representing splendid value for money are obtainable as low as 29s. 6d. The ingenious home constructor can build himself a very efficient cone by purchasing one of the high-grade balanced armature movements and following one of the constructional articles which have appeared in this journal.

Quality Gradation.

Sets of parts for moving-coil loud speakers are also obtainable at reasonable prices, but more of these later. Before leaving the subject of price, I might mention that if you are prepared to pay five or six guineas for a good modern cone loud speaker your money will not be wasted, but if at the moment you do not feel justified in going to so high a figure, then remember that below as well as above the figure you get what you pay for. You must not expect to get as good results either in strength or quality for thirty shillings as for a five-pound note.



A loud speaker built by an American amateur entirely of wood, with the exception of the unit and a few screws. See also the photo on the next page.

Point No. 2. The strength of signal required leads me to mention a very prevalent fallacy. It is that with a given set the larger the loud speaker the more "powerful" it will be and the louder signals you will get. Much trouble has been caused by this erroneous belief. I have, indeed, known people who have said they did not propose buying a large horn-

type loud speaker for their set as it would "strain it," believing that the position is something akin to that of valves and accumulators, for we all know that if you run a large number of valves off a very small accumulator you will take more current than is good for it.

Nothing like this happens with a loud-speaker, and no "strain" is imposed on any set by any type of loud speaker. Generally speaking, a large loud speaker will be slightly more efficient than a small one on a given set, being able to give a greater strength of output for a given signal, but the real advantage comes not in strength but in improved tone.

A good deal of the quality of loud-speaker reproduction depends, in the case of the ordinary cone types, upon the actual size of the cone itself, and very small cones without baffles are incapable of giving faithful reproduction even with the best receiver, and the general size of cone chosen by most loud-speaker manufacturers is a kind of compromise between the ideal size which would be much larger, and the most convenient size for the home and for the cabinet work used. With horn types, generally speaking, and provided the horn is properly designed, the larger the horn the better the reproduction.

Loud-Speaker Efficiency.

Loud speakers vary a great deal between makes in their efficiency of input to output, by which I mean that if you compare a couple of makes of cone speaker both having cones of about the same size, you will often find that one will give signals nearly half as loud again as the other. For this reason I always recommend my friends to try loud speakers before purchasing them, and if it is possible, to try them on the set with which they will be used.

In many cases the efficiency is not of great importance, for the set may be capable of giving much louder signals than you need to have for comfortable reproduction, but in other cases, where you are some distance from the station to which you regularly listen, the additional strength of one make over another may be of quite considerable importance.

During the last month or two, two or three types of loud speaker of greatly improved efficiency with regard to ratio of input and output have appeared on the market and probably during the next year there will be an all-round improvement in this direction.

If you desire to use a loud speaker for reproduction in, say, a works' canteen

(Continued on next page.)

CHOOSING A LOUD SPEAKER.

(Continued from previous page.)

where considerable strength of signal is required, or for dancing in very large public rooms or a hall, then your problem will be quite different from that of the man who only desires to use his speaker in an ordinary living room.

Indeed, in such a case your problem will be as much concerned with the set as with the loud speaker, for the average set is quite incapable of giving really loud undistorted signals. For proper reproduction in large halls, canteens, rooms for dancing, etc., super-power valves in parallel, with high plate voltages are absolutely necessary.

The Ideal Speaker.

Provided you have a set capable of giving loud undistorted signals, then you will need in the cases I have just mentioned a loud speaker capable of distributing this sound without overloading and distortion. The ideal type of loud speaker for this purpose is undoubtedly the moving coil with a suitable baffle, and in theatres, cinemas and the like, where gramophone records are electrically reproduced, the moving-coil type (either with a cone or an extremely large horn) is practically universal.

At the same time, however, it should not be imagined that the moving-coil type is the only kind of loud speaker capable of handling very large volume without overloading, for the new "Amplion" "Lion" and the new "Ultra" Air Column public address models are neither of them moving-coil instruments, while both are capable of handling enormous volume without overloading, as I know from personal experience.

To sum up this section of our analysis, I would say that for an ordinary living-room the cone and some of the horn types are generally satisfactory, but for very large audiences, canteens, dances, etc., one should use either a good moving-coil type of loud speaker or one of the newer "public address" models of the balanced-armature speakers.

Concerning the Set.

We have now to consider the kind of set with which the loud speaker is to be used. It is not quite easy to explain this aspect clearly, but we can start off by saying that no loud speaker in the world is capable of giving pure reproduction if the set itself does not yield such signals, and if you are limited in the set then the additional virtues of one model loud speaker over another may not show up at all!

For example, a set consisting of a detector and two stages of note magnification, using small cheap transformers, and only 60 or 70 volts high tension, may actually sound much worse on a good quality cone loud speaker than on an inferior horn! The reason for this is rather complex, but one aspect of it relates to the reproduction of low tones. A poor set will give practically no rendering whatever of the low tones, such as the cello, drums, the lower notes of the violin and of the human voice, the place of these notes being taken on a good speaker by a kind of "dither," the overall effect being nasal, high-pitched and "tinny."

A good modern cone loud speaker capable of giving fairly uniform reproduction of all tones heard in the human voice and in most music, will by its very faithfulness of reproduction indicate very markedly the absence of these lower tones, whereas on an inferior loud speaker, false low tones may be obtainable by box resonance.

Low Note Reproduction.

The proper way of reproducing low tones is, of course, to have first of all a receiver capable of giving them out and secondly to pass them to a loud speaker giving faithful reproduction of all tones.

Most of the horn types of loud speaker are deficient in low tones, but efficient on the high frequencies, whereas the majority of cone types are good on medium frequencies and some of the low, with a slight deficiency in the high. Probably six out of ten of the cone loud speakers over-accentuate certain low frequencies, compensating to some extent for the relative weakness in the receiver reproduction of these frequencies.

Good moving-coil loud speakers (and please remember that all moving-coil



Another view of the wooden loud speaker. The diaphragm is formed of ten strips of veneer wood. Sensitivity and realism are claimed for this novel design.

speakers are by no means excellent!) have a very excellent reproduction of the low and medium tones and fall off somewhat in the high. In addition to this they are comparatively insensitive, requiring a stronger signal from the receiver to operate them at a given strength than do most of the balanced-armature types of cone, or the horn speakers.

This is a very important point which is often overlooked, for a receiver may give a good strength of output without overloading the last valve or valves when used with a good cone loud speaker, whereas when the same set is attached to a moving-coil instrument it will have to be "forced" somewhat in order to get adequate strength.

The H.T. Supply.

This very forcing causing overloading of the output valve or valves, gives consequent distortion in the loud-speaker reproduction. Moving-coil loud speakers have often been blamed for rattle, blasting, etc., when these effects have been entirely due to overloading of the output valve. To do real justice to a good moving-coil speaker requires a really high-grade receiver with a good super-power valve, or valves, in the output, and quite considerable plate voltages, with currents far higher than can be economically obtained from dry batteries.

Summing up this section, if you have a

two- or three-valve set run from dry batteries, you will probably get more satisfactory reproduction from a good modern cone type of loud speaker than from a moving-coil type unless you are prepared to put up with signals which are relatively weak. This latter procedure is not advised, as few moving-coil speakers give faithful reproduction unless they are handling a really loud signal.

If you are prepared to pay for or build for yourself a really good set with adequate high tension, good forms of coupling and proper output stages, then the moving-coil speaker will probably be your choice. If you have an old-fashioned set with the type of low-frequency transformer which did not properly reproduce the low notes, you may be able to find a loud speaker which by over-accentuating the lower tones to some extent balances the deficiencies of your set.

Use the Mains.

Point No. 4 concerns electric-light mains, and is important if you are considering the purchase of a moving-coil loud speaker. Although there are permanent magnet types of moving-coil loud speakers which do not require any external energising current for the field magnet, they are relatively insensitive and practically every moving-coil loud speaker requires quite a strong field current, either at a high voltage and relatively small current, or low voltage and large current.

The low voltage models are generally made to run from a 6-volt accumulator and may take anything up to one ampere, this current being additional to that required for running the valves in your set. Now, one ampere is a very considerable drain on any accumulator, being very much in excess of the total current required by practically any model of wireless receiver.

For example, a good modern five-valve set rarely requires more than .65 of an ampere, even allowing for a super-power valve in the output stage. The average three-valve set with a super-power valve in the output requires .45 of an ampere, while very good results can be obtained with a three-valve set using only .3 of an ampere.

Accumulator Drive.

If you run your set for five hours a day—which many people do—a 30-ampere-hour 6-volt accumulator will require charging about once a week when used for operation of a 6-volt moving-coil loud speaker and, of course, you will also have to see about the charging of the other accumulator used for the set. If you have mains in the house and charge your own accumulators it will not bother you so much, but if electric light is fitted I would strongly recommend those who have D.C. mains to use a special mains winding for the field magnet (most of the moving-coil manufacturers will supply a speaker so made), or if alternating current is in the house then a step-down transformer from the mains voltage down to 9 volts, a dry rectifier such as the Westinghouse or the Kuprox, and a 6-volt field winding.

No special smoothing arrangements are necessary in such a case, as the high inductance of the field windings gives all the smoothing necessary. If you have no electric-light mains in the house consider the points I have just made very carefully before deciding to buy a moving-coil loud speaker.

THE FERRANTI SPEAKER

*Let the Ear
decide!*

When choosing *your* loud speaker endeavour to forget all questions of horn v. cone.

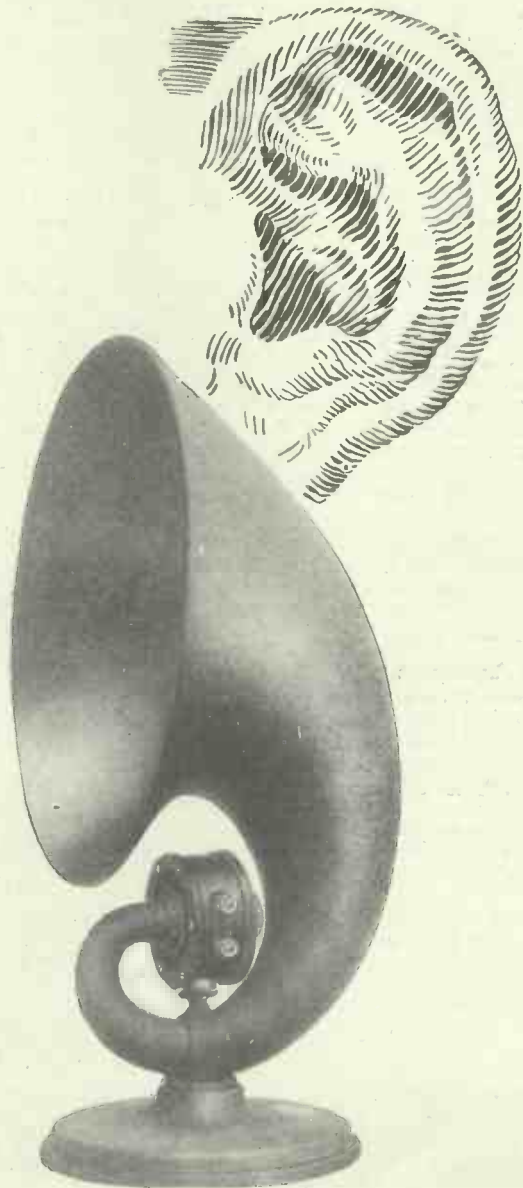
Give your ear a chance! Listen to the Ferranti speaker on broadcast speech or music. Be as critical as you like; compare with any speaker you like, irrespective of pattern.

Then, when you've listened, LOOK! Just as the ear tells of reproduction supremacy, so the eye will tell of constructional perfection.

Built on the unrivalled exponential system, the Ferranti is exceptionally robust throughout. All metal parts are non-rustable, and the use of heavy-gauge wire for the windings gives immunity from breakdown without loss of sensitivity.

A truly remarkable speaker, capable of truly great performance; but then, it's a Ferranti production.

£ 3 - 3 - 0



FERRANTI LIMITED
HOLLINWOOD LANCASHIRE

NATIONAL WIRELESS WEEK.

Details of the special Armistice Day Programme, which also marks the opening of a National Radio Week, and some more about the "electrified crane."

By THE EDITOR.

AS already reported in our columns, National Wireless Week will begin this year on November 11th, and, to mark the occasion, there will be a special broadcast of the Armistice Day Service from the Cenotaph in Whitehall. This will be the first occasion on which the Home Secretary has given permission for this service to be broadcast.

Broadcasting will begin at 10.30, with relays of music from the bands of the Brigade of Guards, and at 10.50 there will be a pause while the King places his wreath on the Cenotaph. The chimes of Big Ben striking 11 o'clock will then be heard, ushering in the two-minutes' silence.

Special Services.

A religious service will follow at 11.20. The B.B.C. are going to a considerable amount of trouble to make extra special arrangements for the broadcasting of this great occasion, and lines are being taken to Whitehall where they will be linked up to microphones placed near the Cenotaph and in trees near by close to the Home Office.

It has also been arranged that the service will be broadcast by 5 S W, so that listeners throughout the Empire will have an opportunity of listening to this solemn celebration.

On the evening of Armistice Day a special service will be relayed from St. Martin-in-the-Fields, and listeners will again have the opportunity, health permitting, of hearing the Rev. H. R. Sheppard preach.

A Peculiar Phenomenon.

There was a curious case reported the other day of a crane being electrified by energy from 2 L O's aerial. Although a good deal of fuss seems to have been made about this, it is, of course, nothing very remarkable.

Many of our readers have no doubt passed by the site in Portman Square where big building operations are being carried out, and where several large metal cranes are in operation; in particular, one is only about 120 yards from the B.B.C. transmitting aerial on top of a store in Oxford Street, and, according to reports from the engineers connected with the building operations, the first intimation they had that anything was wrong was when several of the workmen operating the crane complained of receiving shocks whenever they touched metal parts of the crane, especially the hook or the buckets attached to it.

Several of the men found that when they touched the crane blisters were raised on their hands, and later on when a meter was connected up in series with the crane and the earth there showed a voltage of over 350.

Set on Fire.

As a result of this the workmen on the crane now have to wear rubber gloves, and the B.B.C. have had to fix up a special bell arrangement which rings directly 2 L O starts transmitting. Tests have also been

made showing that shavings and hemp can actually be set on fire by the electrical power induced in the crane.

No Danger to Listeners.

The B.B.C. have issued a statement concerning this phenomenon, in which they say that they wish to assure all listeners and householders in the vicinity that there is absolutely no danger to life or property. As they rightly point out, the crane and its steel cables became, in effect, a receiving aerial absorbing a certain amount of energy radiated from 2 L O. But it must be remembered that the crane in itself is a great mass of metal with long metal cables, and for a householder to get a shock similar to that received by the workmen on the crane, he would have to erect a crane or a huge mass of similar metal in his own drawing-room.

And even then when he got the shock it would not be really dangerous to his life or property.

Of course, the electrification of the crane from the energy radiated by 2 L O is capable of a very simple explanation and affords one of the simple elementary experiments in physics.

THE NEW RADIO-PARIS STUDIO.



A corner of the great new studio which has been built at the Radio-Paris broadcasting station. Adjustable velvet draperies are provided to govern the studio's acoustical properties.

The B.B.C. transmitting station, when working, is sending out very powerful alternating current, and consequently any mass of metal, whether it was earthed or not, would become electrically charged if near by. The ordinary wireless man need not worry, simply because there is nothing in the average householder's domain comparable to a mass of metal similar to that of a crane. In other words, there is nothing of a similar capacity in the average house.

It has been suggested in some of the newspapers that metal has dropped us a hint as to the possibility of transmission of power by wireless, and the "Morning Post" even suggests the accident at Portman Square will galvanise inventors into creating a new era comparable with the change from nomadic to pastoral civilisation. Of course, this reads very nicely, but there is nothing inventors did not know before in the Portman Square incident.

Experiments have been made before of setting up huge pillars covered with metal foil and provided with huge spikes which have become charged by electricity from the atmosphere; and there is, of course, the classic example of Franklin sending up his kites and obtaining a discharge which very nearly killed him.

Power Transmission

But all this has very little to do with the problem of transmission of power by wireless. Senatore Marconi has probably made the nearest contribution to the problem by the development of the Beam system. The ordinary wireless station dissipates its energy so profusely that it is only by some means of concentrating wireless energy in a beam that there is any likelihood of a practical system of power transmission by wireless being evolved.

Simple experiments of lighting lamps by induction, etc., are more or less power by wireless examples, but, of course, of no practical value except to the student in the laboratory or for the conjuror on the stage.

The day when some central power transmitting station will light all the electric lamps in London by wireless has often been speculated upon by writers in the Press, but although theoretically possible we know of no development likely to lead in the near future to the consummation of such an electrical engineering ideal.

NEXT WEEK.

The
"Pentode"
Three.

A receiver of
amazing powers.



THE difficulties which still hamper the achievement of true radio-vision, or the transmission of moving scenes by wireless, do not arise if it is possible to connect the transmitter to the receiving station by one or more line wires. Most of the successful demonstrations of "moving-picture" effects claimed by various experimenters have, in fact, been carried out over connecting wires.

Such a limitation is, of course, fatal to the popular conception of a moving-picture service in which signals will be broadcast through the ether and picked up on an ordinary garden aerial. If it is necessary to provide a connecting wire between the central distributing station and each individual receiver, the initial cost of installation will be so high as to restrict the service to a comparatively small circle of wealthy subscribers.

A Fatal Limitation.

There are two main reasons why a connecting wire is necessary in the present state of television development. In the first place, owing to the number of separate modulation frequencies required to transmit a clear picture, there is no "elbow room" available for them in the ether. A radio service of moving pictures must therefore be confined to inconvenient hours outside the ordinary broadcasting times, or else give rise to wholesale interference with existing broadcast programmes.

In the second place, the energy picked up by an aerial from a radiated signal wave is so small that an expensive outfit is necessary to amplify the received currents up

The Bell Telephone Laboratories of America are developing a combined television and telephone scheme which, if successful, should prove highly useful and diverting!

From OUR
SPECIAL CORRESPONDENT.

to the point where they are capable of operating the Neon receiving lamp.

Quite apart from the expense of a multi-stage amplifier, it is well known that beyond a certain point the effect of atmospherics and internal "tube noise" becomes so great as almost, if not wholly, to mask the effect of the original signals.

Telephone Vision.

Assuming that the use of connecting wires is necessary, the existing telephone service appears to offer the best medium for operating television apparatus in its present state of development.

The Bell Telephone Laboratories have, in fact, now developed a combined telephone and television system in which it is possible for a speaker at one end of the line to see the distant person with whom he is conversing, and also to have his own features simultaneously televised and transmitted to the far end of the line.

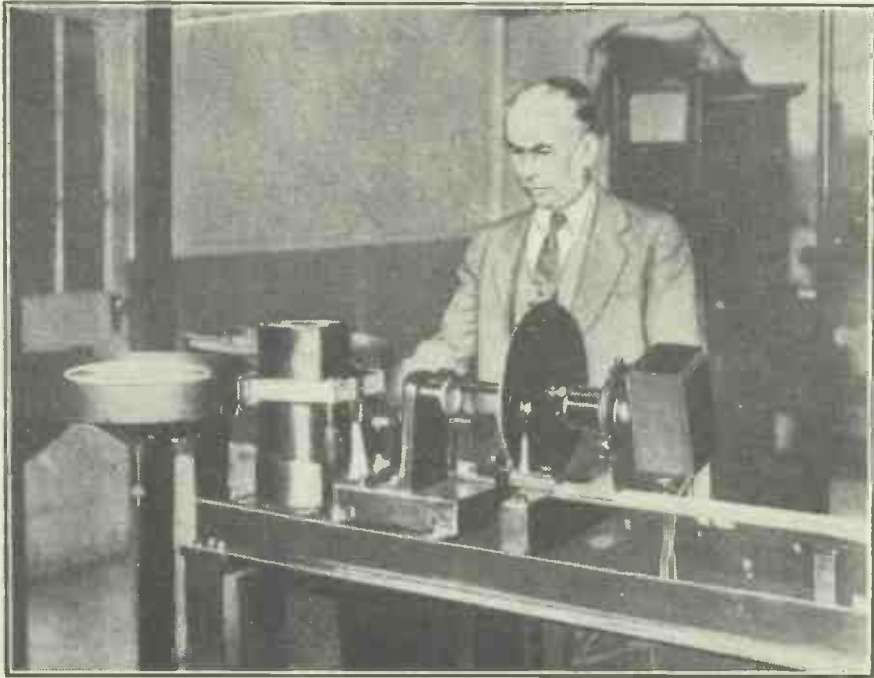
How the System Works.

This achieves the ideal of telephonic conversation. Not only does the user hear, but he also sees the person with whom he is conversing. It is a definite step forward in the annihilation of space.

As the speaker talks into the microphone he faces a mercury-vapour lamp, bent into the form of a circle, so that the whole of his features are illuminated. Beyond the lamp is a screen containing two apertures. In the second of these appears the image of the distant speaker.

The reflected rays from the head and shoulders of the local speaker pass through the second aperture, and, after being analysed by a rotating disc fitted with spirally arranged holes, fall on to a photo-electric cell. This converts the light- and - shade effects into corresponding electric currents, which are then fed to the line wire and reappear as a visible image before the distant speaker.

Meanwhile, the incoming picture signals from the distant station cause the intensity of a local Neon lamp to fluctuate. These light variations are built up into an image by a second series of spiral holes formed in the same rotating disc, and are then thrown on to the first aperture in the screen referred to above.



Dr. Frank Conrad, a Westinghouse expert, who recently carried out experiments in the radio transmission of moving pictures.

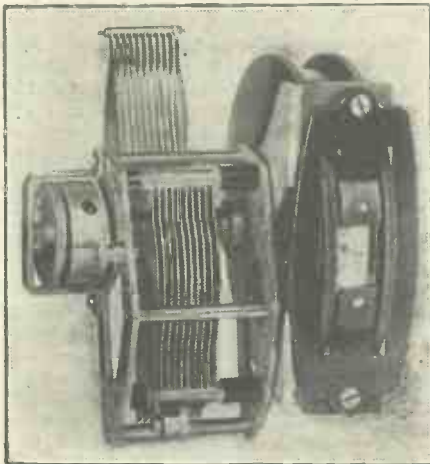
FROM THE TECHNICAL EDITOR'S NOTE BOOK



DUBILIER K.C. DRUM-CONTROL CONDENSER.

I AM inclined to think that the new Dubilier K.C. Drum-Controlled Condenser is the finest component of its nature which has yet come to my notice. You will be able to gauge its general form of construction by the accompanying photograph. The device has two drums, one providing a smooth direct drive, the other a velvety vernier. Between the two is revealed, in an aperture, a cleanly-drawn scale which, with the hair line, enables minutely placed settings to be obtained.

The vanes are of hard brass and the metal framework is robust and clean cut. This drum-control condenser is obtainable in



The "Dubilier" Condenser described.

.0003 mfd. or .0005 mfd. capacities, at 15s. 6d. It is in every respect a quality reproduction and one that is a delight to handle.

EXCELLENT CABINET WORK

"A good set deserves a good cabinet," is a phrase which merits constant repetition. It is a fact that many people judge one's receiver just as much by its appearance as by its efficiency. And there is no reason why a radio set should not be an ornament, for there are some really good cabinets now available at reasonable prices.

I have particularly in mind the Radiola series made by Pickett Bros., of Bexley Heath. They recently sent me one of their Radiola wireless bureaux which is, indeed, a fine piece of furniture. Its design is such that it will take a gramophone or a moving-coil loud speaker.

Access to the top portion of the cabinet can be obtained by lifting the top lid or dropping the front. This forms, in bureau

fashion, a writing desk if such is required. The back of the lower compartment can be opened, while the front has two doors. The fittings are first class and the workmanship is brilliant.

The price of the model sent me is £6 16s., a surprising figure, for it has the appearance of something costing much more. Radiolas can be obtained in either Jacobean or Queen Anne styles and in oak or mahogany. I should certainly advise constructors of sets to send to the Pickett people for descriptive literature before deciding upon the housing of their receivers.



A "Radiola" Bureau.

A FREE CIRCUIT BOOK.

From the Rothermel Corporation, Ltd., of 24, Maddox Street, London, W.1, I recently received three interesting publications. The Rothermel 1929 Radio Catalogue and the second edition of the Great Voice Booklet can be had at 6d. and 3d. respectively, while the Centralab Volume and Voltage Control circuit book is distributed free of charge.

SOME BURNDIPT ITEMS.

"As we have always found the instrument wire which we use in the construction of our apparatus so very satisfactory," say Messrs. Burndip, "we have decided to list this in our catalogue so that the constructor may have the benefit of our experience and choose a really fine wire for any receiver or unit he might be building."

And certainly "Ethowire" is a fine material. It is a copper wire heavily tinned to enable soldering to be easily carried out, covered first with paper and then with rubber. The outer covering is heavy and tough, although the whole of the insulation can easily be stripped when needed.

The paper is provided to keep the wire clean and free from sulphur deposit. "Ethowire" is obtainable in white, black, blue, green, and pink at 8s. per dozen coils of 10 ft. long each. I consider it ideal material for the wiring of mains devices, as well as being eminently satisfactory for ordinary receiver work.

When sending this wire, Messrs. Burndip also enclosed samples of their latest universal

square terminals. These will take tag or spade adaptors or wire leads equally well. They are provided with substantial soldering tags. The head is round and milled, and is provided with a slot enabling it to be screwed down with a screwdriver. These terminals are supplied complete at 2s. 6d. per dozen. They strike a new note in terminal design, and one which will no doubt strongly appeal to practical constructors.

AMPLION "LION" LOUD SPEAKER.

Probably no other radio set or accessory of specific make has, within the past few years, received the publicity of the Amplion "Lion" Loud Speaker. Months before the article was placed on the market many columns about it appeared in the Daily Press. Indeed, the "mystery loud speaker," as it was termed, was by way of being a radio sensation. Personally, I must plead guilty to having had a considerable amount of scepticism regarding it and its claims. However, I have now been able to give it a series of tests in our research laboratory and, right away, I must say I consider it a fine instrument. It is certainly superior to the

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for tests. All tests are carried out with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

average cone and has many of the qualities of a moving-coil speaker.

I cannot honestly say that I think it as good as a good moving-coil instrument although, on the other hand, I have no hesitation in placing it above quite a few moving-coil speakers I have heard. Its sensitivity is above the average and undoubtedly it can handle considerable inputs without distress. It deals with the upper register brightly and crisply, while it has creditable bass. And in that the "Lion" takes its place in the leading position of an outstanding range of loud speakers, it must inevitably prove one of the season's outstanding features.



This is one of the new Amplion "Lion" loud speakers. These instruments incorporate a new reed-drive. Details of the system were given in our November 3rd issue.

THE ROYAL ROAD TO
REAL RADIO RECEPTION



CLARKE'S
ATLAS
BATTERY ELIMINATORS

CLARKE'S
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H. CLARKE & CO. (M/cr.), LTD., "Atlas" Works, Old Trafford, Manchester.

MAKE YOUR OWN CONE SPEAKER

The New Wonder "Nightingale"

CONE UNIT

Exactly as fitted to our Cabinet Cone Speaker. Guaranteed to give results equal to the most expensive Loud-Speakers yet made.

Full constructional details with each Unit.

GRAMOPHONE ATTACHMENT

Reduced from 32/6 to 15/- solely as an advertisement for the famous Bullphone Nightingale Loud-Speakers. Cobalt Magnet guaranteed for all time.

With 4-inch Diaphragm.

Instantly converts your own Gramophone into a full power Loud-speaker, giving a wealth of pure undistorted volume which must be heard to be believed.



15/-

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5/- Secures this Speaker

5/- Secures this Speaker

The Nightingale "DE LUXE"

50/- cash, or 5/- deposit and 11 monthly payments of 5/-

21 in. high with 14 in. Bell, Mahogany finished with plated arm & stand.



BAKELITE

5/2nd CONDUC & TONE ARM

26" HIGH BELL MOUNT 14" FINISHED IN MAHOGANY

NIGHTINGALE CONCERT SUPREME SUPER

Guaranteed free from metallic resonance.

60/- cash, or EASY TERMS, 5/- deposit and 12 monthly payments of 5/-

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VIBROOLDER



BEST AT ANY PRICE

What do you require in a valve holder? Shock-proof design—perfect contact—easy wiring—low capacity. You get all these qualities in the Benjamin Vibroolder, all of them combined into the neatest, most efficient valve holder on the market. There's no doubt about it—the Vibroolder is best at any price—

YET IT COSTS ONLY

1'6

1,500,000 Benjamin Clearer Tone Valve Holders are already in use. Due to this widespread popularity this model is still retained ... Price 2/-.

BENJAMIN

ELECTRIC LIMITED

Brantwood Works, Tettenham, London

WET H.T. BATTERIES.

The Editor, POPULAR WIRELESS.
 Dear Sir,—Some time ago you asked your readers who had installed wet H.T. batteries to let you know their experiences, and as perhaps my report may be interesting I am accepting your invitation.
 At the beginning of August, 1927, I installed a 108-volt (No. 2 size sacs) battery made by the Standard Wet Battery Co., and at the time of writing the voltage varies slightly between 100 to 103, and under load is a steady 100.
 My set is a det., 2 L.F., both power stages, with switch for third valve, which is only used on distant stations, but I am satisfied that this is very good, as it has never given the slightest trouble, and does not look like doing so for some time to come.
 My valves take about 14 volts grid bias without the least sacrifice of quality, and perhaps this saves the battery a good deal.
 If you should publish this, I should like to say that I have found the Wet Battery Co. very considerate and obliging to deal with.
 Wishing "P.W." the best of success,
 Yours faithfully,
 R. G. HARRISON.
 Newcastle-on-Tyne.

THE "P.W." FOUR.

The Editor, POPULAR WIRELESS.
 Dear Sir,—I should very much like to thank you for the "P.W." Four.
 It is undoubtedly the finest four-valver of to-day. A little while ago I built this set, and, working with a small aerial in a downstairs room, and 60 volts H.T., I managed to get a fine bag! all at good loud-speaker strength. I think this is a really fine performance. I will not enumerate the number of stations I got (including a Spaniard) because someone will write to you either to say I didn't, or they have had more. Have any other constructors of this set noticed that touching the aerial hardly makes any difference, and that in series with a fixed condenser the human body will act as an aerial? Wishing "P.W." every success,
 Yours faithfully,
 C. J. HARRIS.

P.S.—Has anyone substituted a transformer for the R.C. coupling?
 Aldridge.

5 SW

The Editor, POPULAR WIRELESS.
 Dear Sir,—I am going to give you this information regarding the transmission of 5 SW Chelmsford, England, of British Broadcasting Corporation.
 This is their test report with the station 2 X A D, (New York), dated September 27th, 1928. The transmission of the station 5 SW was very clear, loud and the wave-length was very steady, speech was very clear like a local station (Calcutta station of Indian Broadcasting Company). Their general evening transmission from London and from Big Ben was very clear and very loud.
 Regarding the transmission of 3 L O (Melbourne), Australia, is very low and the speech is not clear, the wave-length is too unsteady.
 It seems to me that 5 SW (Chelmsford) of B.B.C. is one of the most powerful stations in short-wave telephony.
 Yours faithfully,
 M. MOZOOMDOR.
 Calcutta.

CORRESPONDENCE.

WET H.T. BATTERIES

THE "P.W." FOUR—THE 5 SW STATION—A BATTERY SWITCH—ADJUSTING A SPEAKER, ETC.

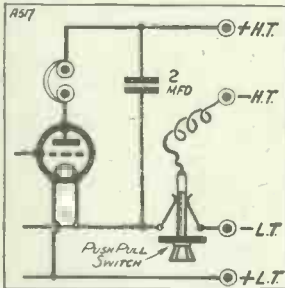
Letters from readers discussing interesting and topical wireless events or recording unusual experiences, are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents and we cannot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

NEWCOMER TO RADIO.

The Editor, POPULAR WIRELESS.
 Dear Sir,—May I be allowed to thank "P.W." for the three-valve receiver given recently under "The Newcomer to Radio" series.
 Not being quite a newcomer myself, having had radio and all "P.W.'s" for more than six years, I quite thought my old receiver up to date, being a "P.W." set of twelve months' standing; but this seems to be years ahead with same components.
 Logging up to the present being 33 at readable strength, and some 12 at full L.S. volume.
 With best wishes to "P.W." I am,
 Yours faithfully,
 W. TALBOT.
 P.S.—I use two valves only for 6 B M, 5 X X, and 5 G B. Hants.

A BATTERY SWITCH.

The Editor, POPULAR WIRELESS.
 Dear Sir,—The enclosed rough sketch may interest your readers as showing a simple way of using an ordinary battery switch to disconnect the H.T. battery and smoothing condenser, so reducing leakage losses and making the set safer when making minor adjustments.
 Yours faithfully,
 P. A. HAIGH.
 Rugby.



Mr. Haigh uses a simple push-pull on-off switch, and takes a third connection to the central plugger. This is done in some "P.W." Wave-changes sets.

ADJUSTING A SPEAKER.

The Editor, POPULAR WIRELESS.
 Dear Sir,—I hope this little "tip" may be useful to readers of POPULAR WIRELESS.
 On some makes of balanced-armature loud-speaker units, especially foreign makes, the terminals are not marked. The correct connections can be ascertained by connecting the speaker to the set and noting the movement of the adjusting device from when it "clicks" on to one pole until it "clicks" on to the opposite one. The leads should then be reversed and the travel of the adjusting device noted again. The connections, which give the last travel, are the correct ones. The explanation is that when the unit is connected correctly the field is stronger, and therefore the armature is attracted to the poles sooner than when the connections are incorrect and the field weaker. The "sooner" the armature is attracted it will, of course, reduce the necessary movement of the armature. This method is very useful when it is impossible to test by loading the coil cams with pins or other magnetic material.
 Yours faithfully,
 T. ANDERTON.
 Royal Air Force,
 Halton Camp,
 Bucks.

PENTODE PECULIARITIES.

The Editor, POPULAR WIRELESS.
 Dear Sir,—The article which appeared in a recent issue upon the subject of the Pentode valve was both interesting and badly needed. I, for one, quite see the snags that await the unwary user of these valves—should he be fortunate enough to get some—and can appreciate the reasons which have made the "P.W." Research Department hold back from blindly rushing into the "design" of what must have, and in many other cases already have, proved unsatisfactory receivers. Thanking you for saving our pockets from unnecessary depletion and for many other things,
 Yours truly,
 K. EVANS.
 London, N.W.3.

THE "INEXPENSIVE FOUR."

The Editor, POPULAR WIRELESS.
 Dear Sir,—In March last I built the "Inexpensive Four" set described in your issue of February 11th, and I should like to thank you for this excellent circuit.
 We are a good distance from any main broadcasting station here (Plymouth does not come in well, as there is a range of copper-ore hills between us which absorbs the signals), yet the results I have obtained on it are remarkably good. 5 X X, 5 G B, Bournemouth, and, strangely enough, Newcastle, all come in very well, while the Continental stations team in. Of these Vienna, Milan, Langenberg, Copenhagen, Berlin, Toulouse, and Frankfurt are the best, but they are all very good. The selectivity is wonderful; stations step in and out crisply, without any difficulty. (All the above are loud-speaker strength.)
 I can readily recommend this set to any of your readers who wants a long-range, loud-speaker set.
 With all best wishes to POPULAR WIRELESS and its staff,
 Yours faithfully,
 J. A. POWELL.
 Cornwall.

SHORT-WAVE NOTES.

By W. L. S.

I HAVE been doing a good deal of work on short waves recently with one stage of "screened-grid" H.F. amplification, and up to the present have been very favourably impressed by the possibilities of this scheme of H.F.

If the H.F. stage is tuned it is, of course, necessary to screen it from the rest of the set fairly thoroughly, but if we use an aperiodic aerial circuit or a "partially tuned" circuit it is possible to get a stage to work with no screening at all, and I have a set of this type going at present.

H.F. Really Useful.

The advantages derived from the H.F. valve are undeniable. Quite a fair amount of amplification is obtained even with an untuned stage, while no extra complication is introduced into the set, and distant stations improve in strength in a manner which is out of all proportion to the background.

By next week I should have two stages going, and hope to produce a real "he-man" type of short-waver which still has a simplicity of operation comparable with that obtained with a straight "low-losser."

I am afraid I have dropped short-wave super-hets. once and for all. There are so

many stations now in possession of our narrow bands of wave-lengths that the "second channel" interference that is inevitable with a super-het. becomes a real bugbear.

My first super-het. received its first tests in the days when it was something of an event to find an interesting station on short waves at all, and it was rather a pleasure to have the sensation of receiving twice as many stations as one really was. Now, however, there are far, far too many stations there in the first place, and the zoological noises produced by the average super-het. as one swings the dial are too much for my nerves.

When are the commercial stations going to make a serious attempt to clean up their notes? I remarked a few weeks back on the horrible noises turned out by some of

them, but it really worries me seriously to see that there is no sign of improvement whatever.

Are they going to be like this in 1929, or will some of the governments scrap their obsolete stations and put the redesigning in the hands of engineers who have heard of crystal control? At present sparky, uneven interrupted C.W. seems to be the favourite method of torture, and it is a marvel to me that it ever gets anywhere with any regularity, although I admit that it seems to hit my own receiver fairly hard.

Wave-length Changes.

WIK has shifted his wave-length slightly, and it is as well to mention the change for the benefit of those who have been looking upon him as a calibration point for their receivers. Instead of his old 21.25-metre wave-length he is now on 21.54 metres.

2 X A D and 2 X A F as yet retain their old wave-lengths, but radical changes are likely to occur during the next few months. I will do my best to keep readers advised of new wave-lengths and new stations till the end of the year, when a comprehensive list should be available.

WORLD BROADCASTING

POSITION OF BROADCASTING STATIONS RELATIVE TO LONDON



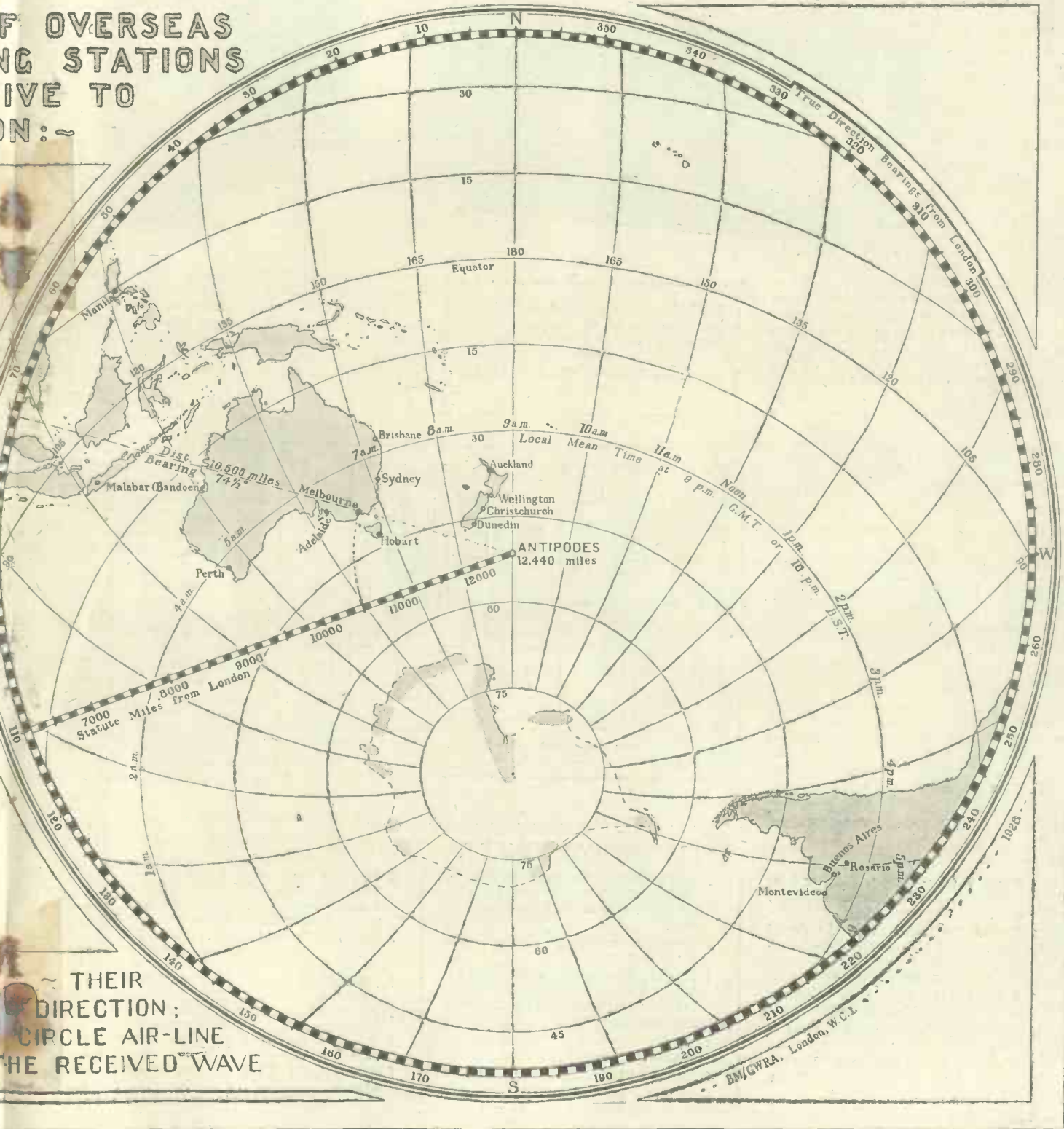
ON THE NEAR HEMISPHERE

the distance and direction scales are read directly, as shown for Schenectady. Every straight line through the centre of either hemisphere is part of a Great Circle, i.e. the shortest possible track between two points.

The map being specially computed for London, the scales are strictly correct for the British Isles. To use it for a place at some distance from London, it is necessary to measure the distance from London to the place, and to measure from these accordingly, using the London distance as a scale. The difference in Mean Time with the longitude, assuming 9 p.m. G.M.T., which selection of the broadcasting stations of the world can be shown in the space provided, is in no way confined to broadcasting. It may be utilised for any purpose concerned.

MAP for LONDON

OF OVERSEAS
STATIONS
DIRECTIONAL
TO
LONDON:~



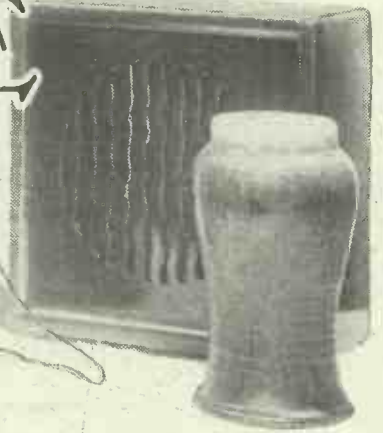
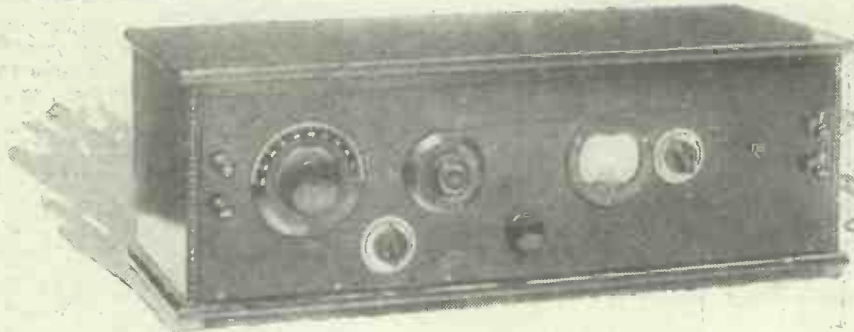
THEIR
DIRECTION;
CIRCLE AIR-LINE
THE RECEIVED WAVE

ON THE FAR HEMISPHERE

from there only, but will be found close enough for the rest of
recommended to mark the place in by the aid of another map, also
ence scale as an ordinary separate scale. An indication is given of
ence any other hour may be readily obtained. Manifestly, only a
available. Others may be entered as desired. The map's applica-
e where the distance, direction or shortest track from London is

measure as though from the Antipodes; but the scales, being reversed, apply to London as directly
as on the other hemisphere. The Great Circle air-line is outward to the graduated border, then
inward from the corresponding direction-bearing on the near hemisphere; as shown for Melbourne.

THE "D.C." THREE



IN view of the fact that I am the fortunate possessor, or unfortunate, as the case may be, of D.C. electric-lighting mains, I have for some time been working on the question of eliminating all batteries so as to be able to run my wireless receiver straight from my mains supply.

The elimination of H.T. batteries, of course, has been a simple matter, and a small box, 8 in. wide, now provides me with anything up to about 200 volts of constant, silent and ample high-tension supply.

The question of eliminating the low-tension battery, however, is not quite such a simple matter. It is now probably some six or eight months since I first tackled the subject at all seriously, and in the preliminary experiments which I carried out for running the filament supply from the mains I found that the hum introduced was extraordinarily severe, even interfering with the reception of the local station.

Many Circuits Tried.

The use of the ordinary type of filter circuit was found to be quite inadequate to cope with the difficulty, especially in view of the fact that the chokes which I had were not designed to carry anything above 20 or 30 milliamps. The receiver

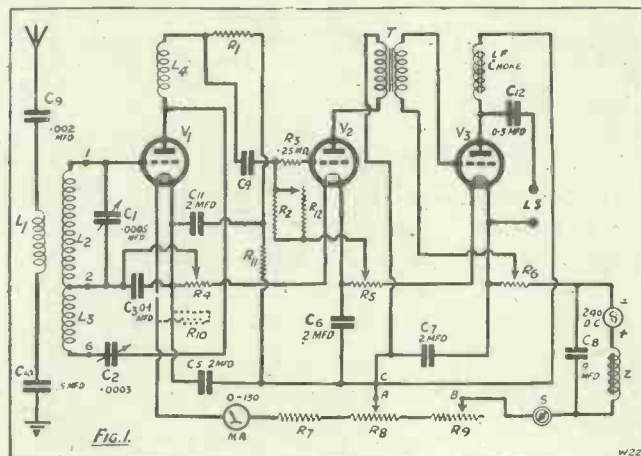
No batteries, no mains units, just the set—that is all there is in the complete three-valve described here.

By C. P. ALLINSON, A.M.I.R.E.,
F.Inst.P.Inc.

with which I was experimenting was fitted with .1-amp. valves, the filaments, of course, being run in series, so that the chokes were considerably overloaded and their inductances had probably fallen to a negligible value.

A number of other circuits were tried, various potentiometer devices, balancing devices and the like, before I finally hit upon the circuit which is used in the receiver to be described in this article. This final arrangement has enabled me to dispense with all batteries entirely, the D.C. mains supplying what the Americans term A, B, and C radio batteries.

The method of obtaining grid bias is really quite a simple one when we realise that it is necessary to drop the voltage of the mains supply by the insertion of high resistances in the neighbourhood of 2,000 ohms. It at once becomes obvious that by connecting



LIST OF COMPONENTS.

- 1 Panel, 24 in. × 7 in. × $\frac{5}{16}$ in. or $\frac{1}{4}$ in. (Kay Ray, Radion, Becol, Ripaults, etc.).
- 1 Cabinet for same, with baseboard 10 in. deep (Aircraft, Bond, Raymond, Camco, Pickett, Makerimport, Peto-Scott, Gilbert, Lock, etc.).
- 1 Variable condenser, .0005 (Dubilier in set). (Any good make.)
- 1 Variable condenser, .0003 (Formo in set). (Any good make.)
- 1 Standard 6-pin coil base (Lewcos, Bowyer-Lowe, Burne-Jones, Colvern, etc.).
- 1 Resistance-capacity-coupling unit (R.I.-Varley Type A in set). (Any good make.)
- 1 L.F. transformer (Igranice Type G in set). (Any good make of fairly low ratio. Lissen, Mullard, Ferranti, R.I.-Varley, Marconiphone, etc.)

- 1 Output filter choke, about 20 henries (Any good heavy-duty type, such as the R.I.-Varley 28/14, British General, etc.).
- 1 Filament smoothing choke (Marconiphone).
- 1 H.F. choke (Lissen, Lewcos, R.I.-Varley, Cosmos, Burne-Jones, Climax, Colvern, Bowyer-Lowe, Dubilier, Marconiphone, Igranice, etc.).
- 4 Baseboard-mounting potentiometers (400 ohms) (Igranice).
- 1 400-ohm fixed resistance (Igranice).
- 1 50-ohm panel-mounting potentiometer (Igranice).
- 1 0 to 150 milliamp. meter (Ferranti or other good make).
- 1 50,000-ohm fixed resistance and base (this should be a wire-wound resistance) (Mullard, R.I.-Varley, Lissen, Igranice, etc.).

- 3 Sprung valve holders (Lotus, Igranice, Burndept, Benjamin, W.B., Burne-Jones, Redfern, B.T.H., Marconiphone, Bowyer-Lowe, Pye, etc.).
- 1 4-microfarad fixed condenser (T.C.C., Dubilier, Lissen, Ferranti, Mullard, Hydra, etc.).
- 4 2-microfarad fixed condensers (see above).
- 1 1-microfarad fixed condenser (see above).
- 1 .1-microfarad fixed condenser (see above).
- 1 .5-microfarad fixed condenser (see above).
- 1 .002 fixed condenser (Lissen, Mullard, Igranice, Dubilier, Clarke, Marconiphone, Burne-Jones, etc.).
- 1 Batten lamp holder.
- 1 Aerial and 1 earth terminal, and
- 2 Loud-speaker terminals (Belling-Lee, Ealex, Igranice, etc.).
- Wire, screws, and flex, etc.



Having mentioned that the title of this picture might be "Just a Song at Twilight," let us get down to more pertinent things. The instrument in the picture is the new Amplion speaker around which there is a pleasant little controversy raging. Is it as good as the best type of moving coil loud speaker? Really there is no comparison, for whereas the moving coil type of speaker gives an artificial depth to reproduction by boosting the bass, the new Amplion gives absolutely accurate and natural reproduction, overstressing neither bass nor treble, providing a balanced performance at all frequencies. And of course, the new Amplion has this tremendous advantage — it can be operated from a simple two-valver.



It requires no extra valves; neither does it require batteries, special transformers or mains-connections to actuate its field. Hear the new Amplion and be critical. We are inclined to believe that you will fully endorse the verdict of Dr. N. W. McLachlan, D.Sc., M.I.E.E., who wrote recently, saying that "it reproduces sound better than any loud speaker now on the market." Dr. McLachlan is, of course, the authority whose installation at the South Kensington Museum has hitherto been regarded as the most perfect of all radio speakers. And rather than cap his tribute with other comments, we will just add the old tag—*verb. sap.*

The new Amplion Speakers in Handsome Cabinets of Oak or Mahogany range in price from £9 10 0 to £42.

The Amplion Radio Gramophone in Oak £58 12 6... in Mahogany £63 12 6, including Royalties.

Amplion Standard Speakers, Cone and Horn Types, 52/6 to £5. Junior Models, 35/- to £3 3 0.

Catalogue from all Radio Dealers, or from Graham Amplion, Limited.

London: 25/26, Savile Row, W.1. Manchester: 10, Whitworth St. West. Glasgow: 6/8, West George St. Head Office and Works: Slough.

AMPLION®

THE "D.C." THREE.

(Continued from page 500.)

a portion of this resistance between successive valve filaments we get a voltage drop across the resistance which can be utilised in order to supply the necessary grid bias.

At the same time it is found in practice that a much quieter operation is obtained

by using this voltage drop across the resistance than by the use of a separate grid-bias battery for each L.F. valve, and the necessity for providing a large and expensive smoothing system is thereby eliminated.

This voltage drop across the resistance is also utilised in the case of the

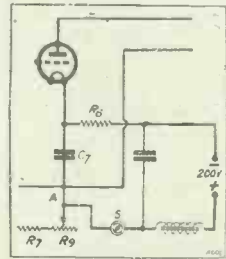


Fig. 3.—Showing how R8 is cut out for 200-v. mains.

detector valve to allow anode-bend rectification to be carried out. This, therefore, enables us to use a high-mu detector valve in conjunction with a resistance-capacity coupling so that a satisfactory degree of amplification is obtained in the first stage.

A Straightforward Arrangement.

Let us now turn to the theoretical circuit diagram shown in Fig. 1, and it will be found on examining this circuit that it is a

perfectly straightforward detector and 2 L.F. receiver.

At first sight this circuit diagram may seem somewhat complicated, and I would therefore refer the less experienced reader to the skeleton form of the circuit shown in Fig. 2. This shows the general scheme of the arrangement used in this receiver in a very clear and simple manner.

You will be asking, of course, at once why I have not used this arrangement instead of the apparently far more complicated scheme shown in the first figure.

If you will examine Fig. 2 you will find that the arrangement of the resistances in series with the filaments, by means of which the current is limited, and grid bias is obtained, is such that we have a lower value of effective H.T. on the last valve, which is the amplifier valve, than we have on the detector. The arrangement is such, in fact, that when working on 240-volt D.C. mains, the plate voltage on the L.F. valve is considerably less than 120 volts, so that it is easily overloaded and distortion introduced from this source.

The Fig. 1 circuit is merely a rearrangement of the resistances in such a manner that the detector valve automatically receives less H.T. than the first L.F., and the first L.F. less than the second L.F. This, of course, is what we require, and is a far more logical arrangement than that shown in Fig. 2. It also has the advantage that the filament of the first valve does not have to carry the H.T. current as well of the other two.

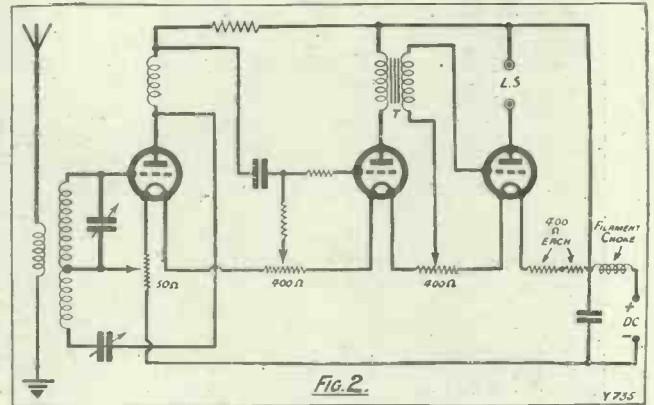
Considerable Saving.

Fig. 1 also includes various H.T. shunting condensers for each valve, and this, together with the rearrangement of the circuit, makes it look somewhat complicated. It might be thought that the provision of all these condensers would make the set unduly expensive, but one must consider that an H.T. eliminator alone for D.C. mains would entail considerable expense for a smoothing choke, potential divider, and numerous condensers.

In this set, however, a slightly less expensive equipment than that required for the H.T. eliminator also does away with the need for an L.T. accumulator, a saving of at least £1, and also grid-bias batteries, while the current taken by the set is less than that required for a 30-watt lamp.

Before going further into the construction of this receiver, I think it would be advisable if I dealt with the general principles underlying this circuit, as shown in Fig. 1.

The filaments of all three valves are run in series. All three valves should preferably be of types of which the filaments all carry the same current. This is easily done in the case of V_2 and V_3 , which are L.F. valves taking .1 amp. each, but as regards the first

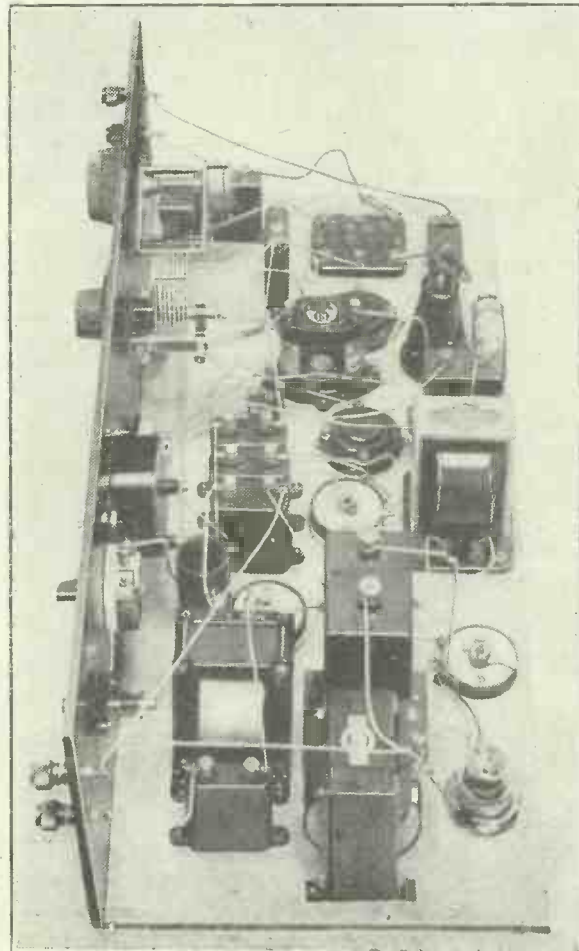


valve, which is a high-mu R.C. valve, a number of makers have recently altered their filament rating from .1 to .075.

The Filament Supply.

In this case it is necessary, of course, to shunt this filament by means of a resistance so that the correct current only passes through the filament. This resistance is shown as R_{10} , and will be needed only if a valve is used in this position having a lower current consumption than the other two.

In order to cut the current down to the required value a number of resistances will have to be inserted in series in the mains supply lead. With 240 volts D.C. mains it is necessary to have a total res-



Not a complicated set is it? There is nothing tricky about building this receiver.

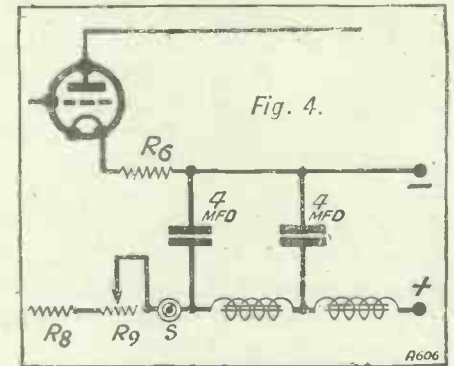


Fig. 4.—Adding extra smoothing to the "D.C." Three.

sistance of 2,400 ohms in the circuit in order to reduce the current to .1 ampere.

Now let us see what resistances we have in the circuit. We have three filaments taking .1 of an ampere, therefore representing (if the valves are of the 6-volt type) 180 ohms altogether. We also have R_4 , a 50-ohm potentiometer, by means of which the necessary grid potential is applied to the grid of the detector valve for rectification to take place.

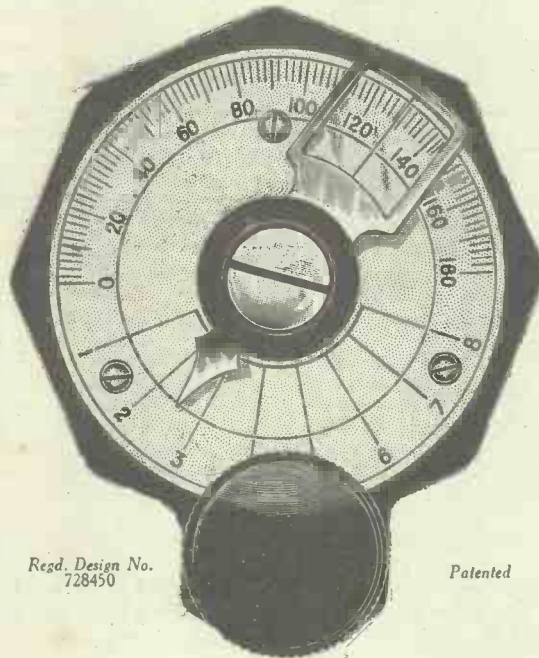
The Required Resistance.

We also have an L.F. choke Z, which has a resistance of 250 ohms, these three resistances totalling up to 460 ohms, therefore we have another 1,940 ohms to supply in order to bring the total resistance up to 2,400 ohms.

The required resistance is provided by the

(Continued on page 504.)

ORMOND SMALL SLOW MOTION DIAL



Regd. Design No.
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Patented

ACTUAL SIZE.

This Dial is very similar to the popular Ormond Slow Motion Dual Indicator Dial, with a reduction ratio of approximately 9 to 1.

The cursor moves in the same direction as the rotation of the knob. Fine hair line for accurate reading.

Terminal is provided for separately earthing the Dial, the latter may then be used as an anti-capacity earthing shield.

Extremely easy to mount.

A Dial to be thoroughly recommended where smallness in size is of greatest importance.

Cat. No. R/320

Price **3/6**



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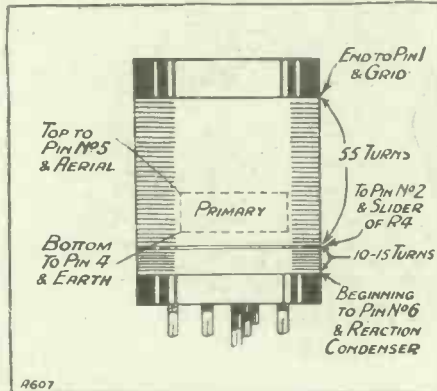
"Phonos House," 2 & 4, Bucknall Street, New Oxford Street, London, W.C.1.

THE "D.C." THREE.

(Continued from page 502.)

resistances $R_5, R_6, R_7, R_8,$ and $R_9,$ all of which are 400 ohms. $R_5, R_6, R_8,$ and R_9 are 400-ohm potentiometers, while R_7 is a fixed resistance. By using one of these resistances shown at R_9 as an ordinary variable resistance we can control the current passing to the desired valve.

By connecting the two resistances R_5 and R_6 as shown we can make use of the voltage drop across them (this is actually in the neighbourhood of 40 volts) to give the



Details of the coils for the "D.C." Three.

requisite grid bias for the particular valves in use. By placing them in these positions we further prevent an excessive plate voltage being applied to the valves; and the arrangement shown provides about 90 volts on the detector, 100 on the first L.F. valve, and 140 on the second one.

The circuit as shown is correct for use with 240-volt D.C. mains. In the case of the mains supply being only 200 volts, then, of course, one of the 400-ohm resistances must be left out, and this will be the resistance R_8 , the point C being in this case connected to the point B instead of to A, as shown. (See Fig. 3.)

Beyond these small alterations, however, the rest of the circuit will not be affected in any way.

Further Circuit Details.

Having discussed the general principles of the circuit I think I can now go on to describe the individual circuits in more detail. The aerial is loose-coupled to the grid circuit of the detector valve by means of a winding L_1 . This consists of any desired number of turns wound on an interchangeable former plugged inside L_2 , which consists of 55 turns of 24 D.S.C. wire on a 3-in. Colvern featherweight former. The reaction coil L_3 consists of 10 or 15 turns, though in some cases it may be found advisable to go up to 20 turns in order to get a satisfactory control of reaction.

Anode-bend rectification is employed, the voltage drop across the resistance R_4 , which has a value of 50 ohms, being used to apply the necessary negative potential on the grid of the detector valve, which should be of the high- μ R.C. type. The usual shunting condenser having a capacity of .01 is shown at C_7 . Reaction is obtained by means of a variable condenser C_2 , having a value of .0003, while the anode resistance R_1 , the coupling condenser C_4 , and the grid

leak R_2 , are all contained in an R.C. coupling unit; the H.F. stopper R_3 being connected externally to this. The grid leak is connected to the slider of R_5 , by means of which grid bias is applied to the first L.F. valve V_2 . This is coupled to the last valve by a transformer, grid bias being applied by means of the slider on the resistance R_6 .

H.T. Voltage Control.

By taking all the H.T. leads to the slider on the resistance R_8 , a control of the total H.T. voltage applied to the valves is obtained. The variation in the voltage available is in the neighbourhood of 40 volts. With the slider A turned round so as to make contact at the left-hand end of the winding of R_8 the lowest voltages are applied to the plates of all three valves, whereas when the slider is at the right-hand end of the winding then the maximum voltage is applied.

All the necessary smoothing is obtained by the use of one choke shown at Z connected in the positive lead, while the variable resistance R_9 allows the filament current to be adjusted to the correct value in conjunction with the meter shown at M/A. This, of course, is an indispensable adjunct for use in this receiver, but for those who do not wish to tie up the meter in the set it may be connected externally and the required adjustments made in that way.

The three fixed condensers, $C_5, C_6,$ and C_7 , are the by-pass condensers for the H.T. supply to each plate, while C_8 is an additional condenser connected between one end of the choke and the negative and the other main lead.

C_9 is a small fixed condenser which may be inserted in the aerial lead in case the insulation of the aerial is inadequate, while C_{10} is connected in the earth lead and must on no account be left out, otherwise a partial short-circuit of the mains may result.

We now come to two further components which I have not yet dealt with, and these consist of an extra resistance R_{11} and a fixed condenser C_{11} , which are connected in the plate circuit of the detector valve.

During the course of my experiments I had found that a certain amount of residual hum, which interfered with the enjoyment of reception with this set, was introduced in the detector valve circuit, and as a result of various experiments which I tried I found that by including an extra resistance R_{11} in series with the coupling resistance R_1 , and connecting a condenser having a value of 2 mfd. across the point between the two resistances and the negative filament of the detector valve, the remainder of the hum was practically eliminated.

The value of the resistance is 50,000 or 60,000 ohms, and although a higher value may slightly reduce the hum still further it also reduces the plate voltage on the detector

valve and interferes with the control of reaction.

The small degree of hum which was then left was not sufficient to interfere with reception in any way, and I came to the conclusion that to add another L.F. choke to the set, together with another high-capacity condenser, in order to smooth out this residue entirely, was a somewhat unnecessary expense.

To those, however, who do not mind the extra expense, I would say add the extra choke and condenser, especially if they are at all critical as regards having an absolutely silent background. How this is done is shown theoretically in Fig. 4.

The Volume Control.

In view of the fact that the volume given by this receiver is very great indeed on the local station, it is obvious that some form of volume control should be incorporated. I know that the strength of the signal can be cut down by detuning, but this is not sound practice, and the use of a special control for cutting down the signal strength is infinitely to be preferred.

The variable high-resistance R_{12} is used for this purpose, and is fixed in a handy position next to the reaction control on the panel.

(Continued on page 507.)

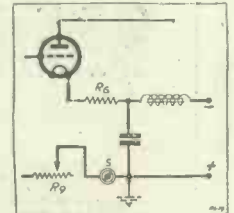
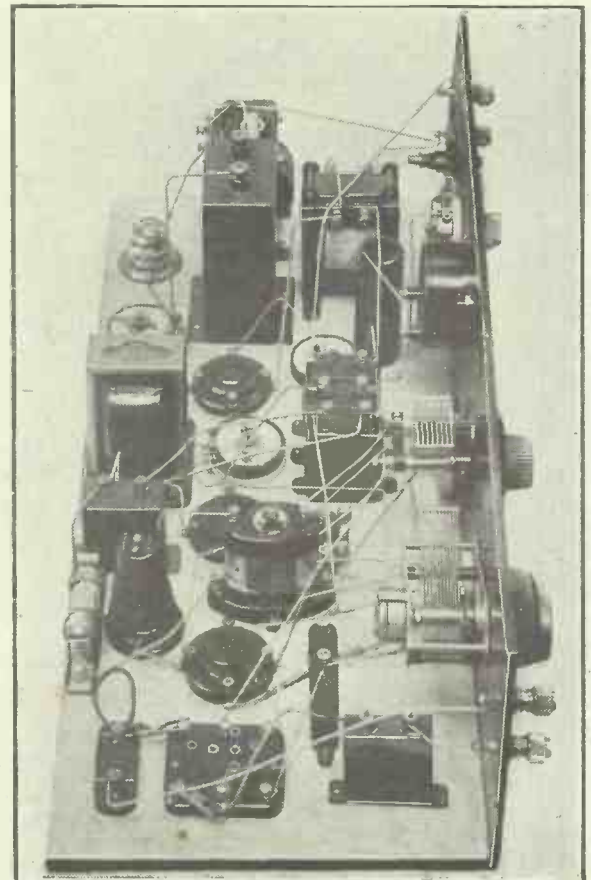
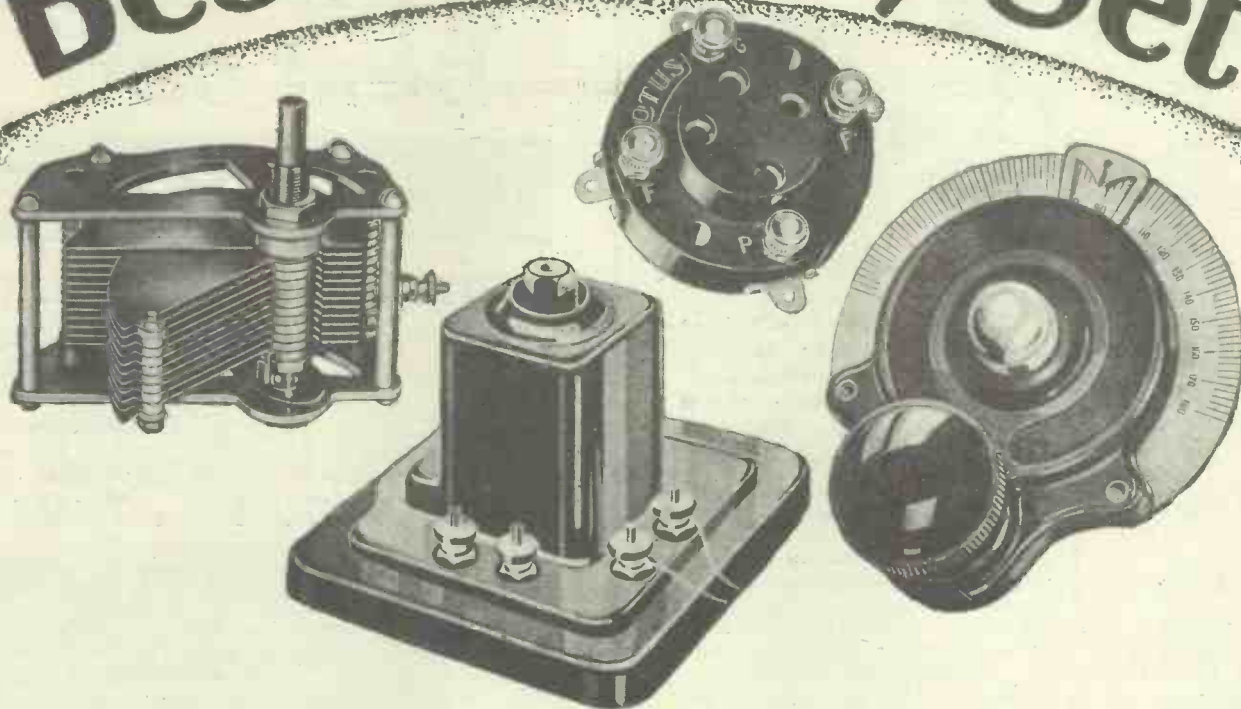


Fig. 5. How to deal with mains that have the positive lead earthed.



The aerial end of the set showing the six-pin coil holder and the general layout

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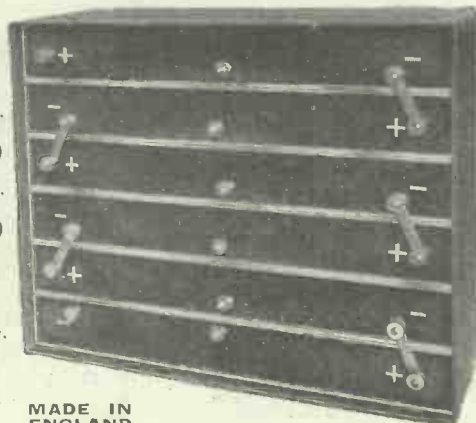
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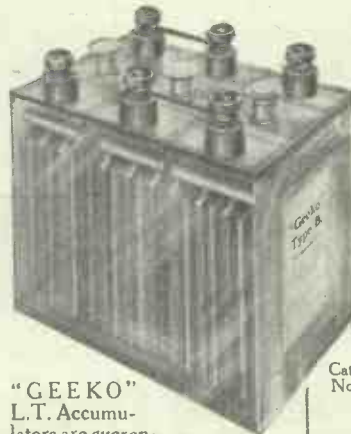


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THE "D.C." THREE.

(Continued from page 504.)

If you will examine the photographs of this receiver you will see that it is exceedingly neat in appearance, while the panel layout is reasonably symmetrical. The only controls which are carried on the panel are the tuning and reaction dials, together with the resistances R_4 , R_9 , and R_{12} , by means of which the correct adjustment for rectification is obtained in the one case and the correct current for the valves in the other, and the third gives control of volume. R_8 is preferably mounted on the baseboard, and when once adjusted can be left set. The whole receiver is switched on and off by means of the switch S.

Results Obtainable.

The meter which I am using in this receiver is a 0-150 milliamp meter and is connected permanently in such a position as to read the filament current only. If connected on the other side of R_9 it would give both filament and plate current, and would not therefore give the right reading.

I think perhaps now I had better say a few words about the results obtainable with this set, and the most important point is, of course, the quality of reproduction on the local station and the question of freedom from hum.

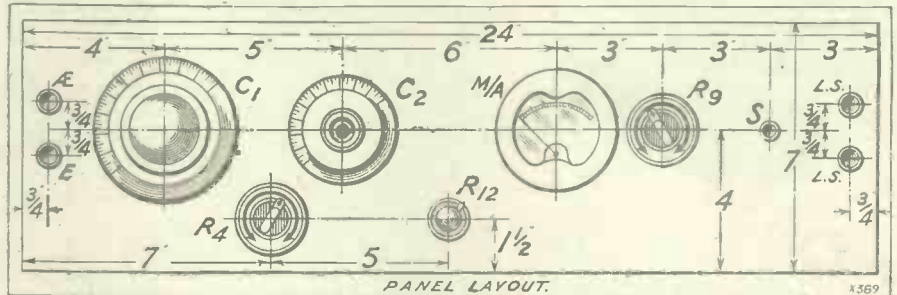
Using this receiver at about one mile

from 2 L O in conjunction with a Celestion cone loud speaker, it was found necessary to make drastic use of the volume control, since the signal strength was far too great. When correctly cut down, however, the quality of reproduction was of a very high order, while little hum was noticeable in the loud speaker.

When receiving distant stations with the set fairly close to oscillation, no extra trouble from hum was experienced, though it might be expected that under these

however, to deal with the components which are required to construct this receiver, as I shall have to say a few words about these.

It is most important that the resistances and smoothing choke used be capable of carrying a current of .1 ampere without the slightest sign of overheating. I strongly advise you, therefore, to adhere to the components which I have used myself, unless you are certain that those which you intend to substitute are in every way

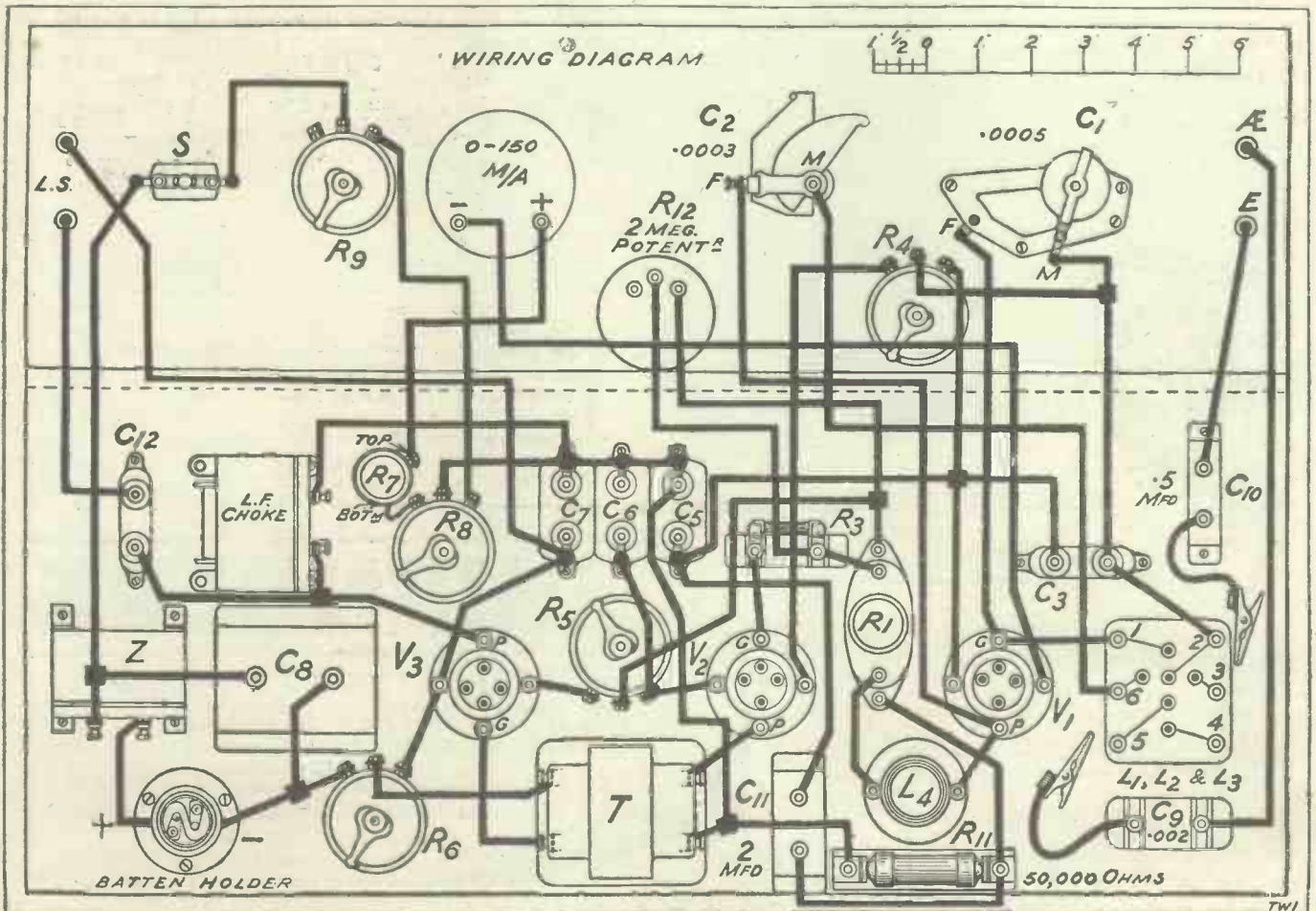


conditions interference from a source of this description might be serious. It was not found, however, to interfere with distant reception, and stations such as 5 G B, Langenberg, Frankfurt, Nuremberg, and others were listened to with considerable enjoyment.

I would like to say a lot more about the results which are obtainable with this receiver, since, although not designed for long-distance work, it has shown surprising capabilities in this direction. I think it time,

suitable for the purpose. The dials on the condensers should preferably be all of insulated material, especially if the set is to be handled by members of the household with little electrical knowledge. This is especially the case where the positive of the mains of the electricity supply is earth, since in this case the detector circuit would be at high potential compared with the earth lead, and a shock might therefore accidentally be received.

(Continued on page 520.)





RADIOTORIAL

All Editorial Communications to be addressed to the Editor, **POPULAR WIRELESS**, Tallis House, Tallis Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lyle, 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.

A LONG AERIAL LEAD-IN.

D. J. W. (Northampton).—"At the back of the house there is a 50-ft. garden, and in the front there is just a small garden about 10 ft or so. At first, I thought of standing one mast in the front and one in the back garden, but I found the landlord objected to this. So I am having one pole at the bottom of the long garden at the back, and I can fix the other end of the aerial to the chimney. "What I should like to know is this. Would it be better for me to have the aerial come

straight to the chimney and then for me to hold it off the roof by means of a short mast and bring it down in front of the house, i.e. right over the house and into the front room, or would it be better to run from the pole in the back garden to an insulator on that side of the chimney?"

"The chimney would then support the wire and the lead-in could come down at the back of the house. It will be a three-valve set, and I could conveniently put it either at the front or at the back, as we shall be using both rooms a great deal, and it really does not matter which room it is in. As the garden is 50 ft. long I should like to have the aerial as long as possible, but it seems an unusual arrangement to run it over the house, and maybe there is some snag in it.

"I should rather prefer to have it running down at the back if I shall not lose much. What do you think?"

We do not think we should bother to bring it over the house, as you suggest, as although this method will give pretty good results provided that the aerial is

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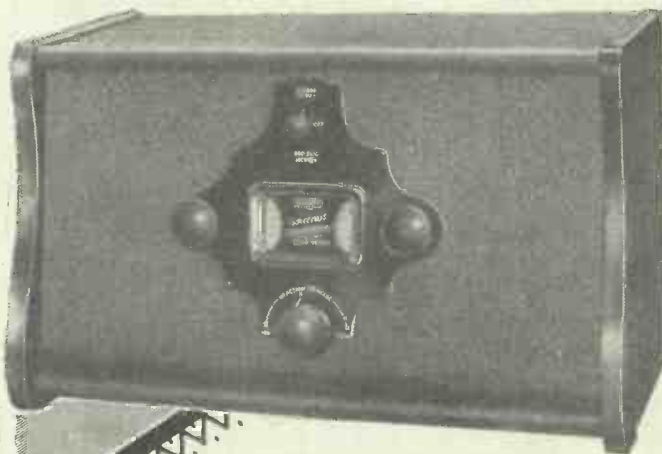
Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," The Fleetway House, Farringdon Street, London, E.C.4.

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.

really well spaced away from roofs, gutters, etc., the result you would get would probably be no whit better than if you brought the lead-in straight from the aerial at the back of the house.

Certainly this latter would look much better, and as the landlord is rather keen on the appearance

(Continued on page 510.)



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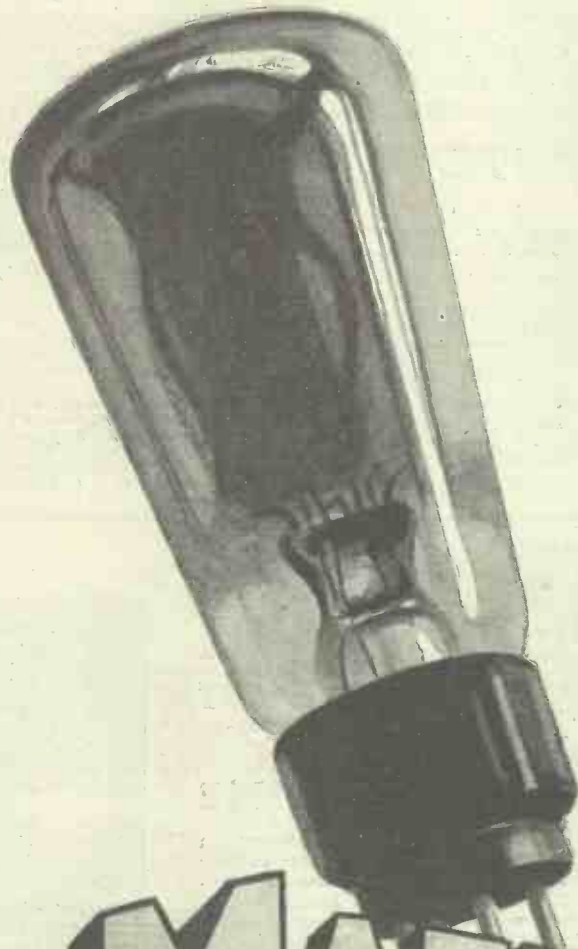
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 508.)

of the house being kept as nice as possible, there seems little point in trying to bring the aerial right over the house. If you have a garden as long as 50 ft. and you can get the mast and its support up 30 ft. or more, you will have as good an aerial as most of your fellow listeners, and a far, far better one than many of them will ever get.

ADDING AN R.C. STAGE.

H. C. (Shrewsbury).—"My set is a two-valve Reinartz Det. and L.F. built in accordance with POPULAR WIRELESS Blue Print No. 25, and has given utmost satisfaction. Having recently removed from Manchester to the above address, I find I should like to add another valve. Could you tell me, when opportunity permits, how I can introduce a third valve employing a resistance-capacity unit?"

The connections are as follows: That "phone" terminal which is next and connected to H.T. + is joined to the H.T. + terminal on the R.C. unit.

The other "phone" terminal on the strip goes to the "P" (or "A") terminal on the R.C. unit. (The .005 fixed condenser should be removed, as it is not necessary now.)

"G" terminal on the R.C. unit goes to the grid socket of a new valve holder. The plate (or anode) socket of this will go to one of a new pair of terminals, the other of which must be provided with an extra H.T. plus flexible lead, to be plugged into the H.T. battery at the maximum H.T. + voltage.

Across these new terminals the phones or loud speaker will be connected. The filament terminals of the new valve holder can, for simplicity's sake, be joined to the corresponding filament terminals on the second valve holder (provided, of course, that it has the same voltage requirements).

Finally, the G.B. (or "L.T.") terminal on the R.C. unit should be fitted with a flex lead and black plug, to be plugged into the grid-bias battery. This latter may now require to be of 9 or more volts maximum, to meet the recommendations of the makers of the power-valve used. (See their leaflet re grid-bias values required.)

CUTTING OUT THE LOCAL STATION.

E. J. (Jesmond).—"Although all the week the set is used solely and simply for listening to the local station, during the week-ends we want to do a bit of long-distance listening. The set is capable of it all right, because when the local station is shut down we are able to get several German stations at real good strength and also French, Spanish and Italian stations. But this means sitting up half the night, because when the B.B.C. programmes are on they simply block out all distance reception.

"I have been told that I can make a wave-trap to get over this difficulty and that particulars of this can be supplied by 'P.W.' If so, and if it can be added to the set without altering the internal wiring, I should be very glad to know about it."

There is no need to alter the set in any way, because it can be added outside, and it is easily made and fitted. It is called the "P.W." Standard Wave-trap, and it is assembled upon a small wooden baseboard measuring 3 1/2 in. x 3 1/2 in. and about 1/2 in. thick; the intention being that this baseboard shall

be screwed down directly upon the wooden base on the receiver.

The coil is mounted on this in a horizontal position with its centre at a height of 2 in. above the bottom of the small-baseboard. This point of the height of the coil is of importance in cases where the trap is screened, the position of the trap inside whatever screen is used naturally being a matter which must be watched.

The coil is wound upon a tube of chonite, Paxolin, Pirtoid, or similar good material, 2 in. in diameter and 3 in. long, and this can be mounted in any convenient fashion which does not entail the use of large pieces of metal. A good method is to fix an chonite end disc into the tube and attach this by means of a screw to an upright strip of 3-ply wood, whose lower extremity is similarly secured by means of screws to the edge of the little baseboard.

Construction of Coil.

The coil consists of 64 turns in a single layer of 28 D.C.C. wire. As the coil is wound, tapings are made in the 16th and 24th turns, these being the alternative positions for the aerial tap, the ends of the winding being secured by the simple procedure of passing them through two small holes drilled in the tube at the correct points, while the two tapings may be made in a variety of ways.

For example, the whole coil can be wound without making any tapings whatever, and then the 16th and 24th turns can be prised up slightly with the blade of a pocket-knife and two short pieces of matchstick about 1/2 in. long slipped under them. The wires thus lifted up can be scraped bare of cotton covering by means of a knife and the appropriate leads soldered on to them.

Capacity of Condenser.

Mounted upon the baseboard immediately beneath the end of the coil is a small variable condenser of the compression type which is now becoming so popular for work of this sort, the capacity of this component depending upon the wave-length of the station it is desired to eliminate. If the wave of your local station is below 400 metres, a .00025 mfd. or .0003 mfd. will be required, while if it is 400 metres or over, one of .0005 mfd. should be chosen.

The alternative capacities of .00025 or .0003 mfd. have just been given because in some makes only a .00025 mfd. is available, whereas in others .0003 mfd. is produced and, as a matter of fact, either will serve. These components have a screw-down adjustment which can be performed by means of a screwdriver and, of course, the condenser can be left permanently set to the correct capacity once this has been found.

(Continued on page 512.)

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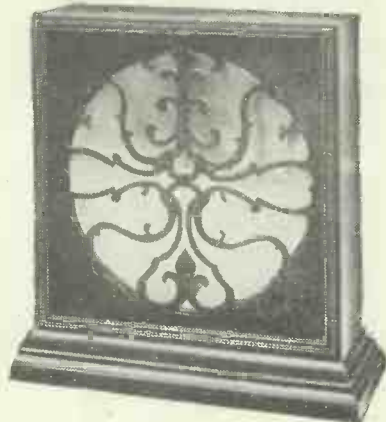
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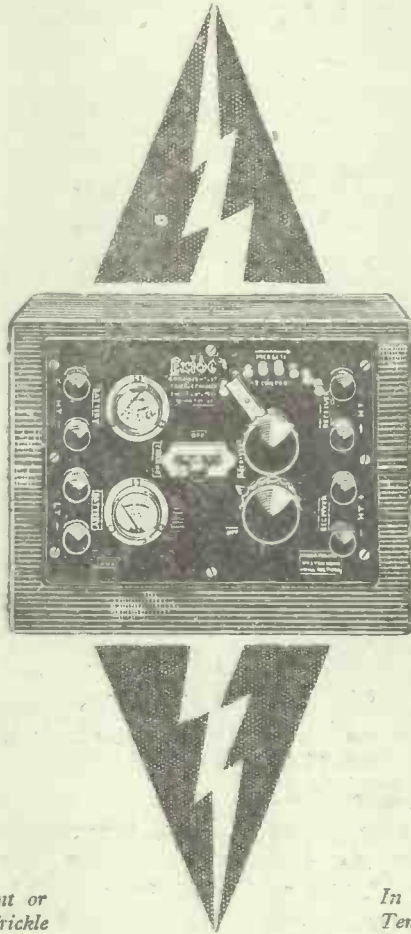


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second but it put your batteries into touch with the house electricity supply. Your batteries will be drinking all night—not so much drinking as sipping. When you use your set again tomorrow your batteries will be re-charged — everything made up that you took out. Would you like to know more about the Exide Trickle Charger in scientific terms? If so, literature is at your service.

The Exide Service Agent or Dealer who supplies the Trickle Charger will adjust it to your set. You use it as he leaves it.

In Three Models — For High Tension Batteries, £5 : 5 : 0; for Low Tension Batteries, £3 : 10 : 0; and for both, £8 : 0 : 0.

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Motor owners will be interested to know of the recent important price reduction in Exide Starting and Lighting Batteries.

EXIDE BATTERIES, CLIFTON JUNCTION, NR. MANCHESTER

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 510.)

Screwed to the edge of the baseboard of the trap is a small piece of 1 in. thick ebonite, 2 1/2 in. x 1 1/2 in., carrying a terminal and two sockets such as the Clix or Ecelex types, these being for the external connections to the trap. In use, the lead from the set to the trap will be connected to the terminal, while the aerial lead will terminate in a plug which will be inserted in one or other of the sockets, according to the number of turns on the coil which it is desired to use for coupling purposes.

FITTING GRID BIAS.

F. C. T. (Hertford).—“It is a two-valve set with a transformer, and I am told that I ought to fix grid bias to this. But I do not understand how to do this, and I have only recently found out what a grid-bias battery looks like.

“Now that I have seen one all that I can tell you is that there is plenty of room for it inside the set, but the transformer is rather an old-fashioned one with four terminals marked IP, OP, IS, OS. Would it be possible for you to tell me how to fit the grid bias, or should I send the set to a shop and get it done?”

It is a very easy matter to fit the grid-bias battery and you should certainly try and do this yourself.

You will need one of the small grid-bias batteries tapped at every 1 1/2 volts. You will find that one end of it is marked +, the next socket on it is marked 1 1/2 volts, the next socket 3, etc. Mount this battery in a convenient position near the last valve and take care not to disturb any of the other wires.

Then prepare two flexible leads, and fit each with a plug, one red and one black. The lead with the red plug will have to be long enough to reach from the positive end socket of the grid bias battery to any one of the leads on the set which goes to the L.T. negative terminal. (Now, as this particular terminal is generally joined to about a third of the wiring on the set, either direct or through a make-and-break switch, there should be no difficulty in finding a place near to the battery where you can fix a short lead.)

If you are not able to solder this flexible lead to the L.T. lead it is not a bad plan to carry it to the nearest screw-down terminal which is connected to L.T. negative (either the L.T. negative itself or H.T. negative, if that is closer, or perhaps to one of the valve sockets). In any case, all that is necessary is to run this flex wire from the L.T. — wiring to the plug which terminates in the grid-bias battery.

Having fixed this, turn your attention to the L.F. transformer. You will find that either the IS or the OS terminal goes to the grid socket of the last valve holder, the other one of this pair of terminals going to the L.T. wiring. Leave the lead which goes to the grid alone, but disconnect the wire which connects either the IS or the OS to the L.T. wiring.

Having removed this wire place on that terminal the flexible lead which carries the black negative grid-bias socket. Then plug this in at about 1 1/2 or

3 volts on the battery, and, after making sure that you have not disturbed any of the rest of the wiring, connect up again.

You should get improved results, but try varying the position of the plug from 1 1/2 to 3-volts negative to see which gives the better reception. If you can at the same time increase the H.T. to the last valve it is an advantage to do so.

INDOOR AERIAL CONSTRUCTION.

M. B. (Hackney, London, E.)—“So what with the landlord and one thing and another I have decided not to have an outdoor aerial at all, but to put one up inside the house. Shall I have a frame aerial, or one of those criss-crossing across the ceiling? I only want the London programmes, but I should like to get these as loud as possible as I am a little hard of hearing, and as I have to stay indoors a great deal owing to my infirmity I should like to get the set as loud as possible in the circumstances. How shall I start about it?”

We do not recommend you to try a frame aerial, as this is quite inadequate when used with a crystal set (although with powerful valve receivers it will sometimes give better results than an outdoor aerial). In your case, however there is no doubt that an indoor aerial will be much better.

To construct this you must first of all find a suitable place inside the house. Generally the place for such an aerial is in the rafters if you are placed near the top of the house and can get through a trapdoor into the loft or some other way. Failing this a long hallway or passage will be O.K., or as a last resource a wire can be stretched across the room. (The objection to doing this in all cases is that by utilising a roof or passage a longer spread is generally available than across the room.)

If you can get to the space underneath the roof run three long wires across this side by side at a distance of, say, 2 ft. from each other. At the far end, each of these wires should be connected to an insulator suspended to the wall or rafter. At the other end the three wires are joined together and taken down to the set, in as direct a line as possible.

It is important to keep the aerial wires themselves and the downlead as far away from the walls, etc., as possible. When they have to pass, for instance, through walls they should pass straight through it. Do not run an aerial close to a wall or ceiling for a greater distance than is absolutely necessary.

(Continued on page 514.)

Amongst the MANY FINE ARTICLES


in the NOVEMBER issue of
MODERN WIRELESS


are

The “Invincible” Five
The “Rhapsody” Four
The “Harris” Three
The 1929 Mullard Master Three

How To Avoid Distortion
On the Short Waves
Radio Abroad
Etc., Etc.

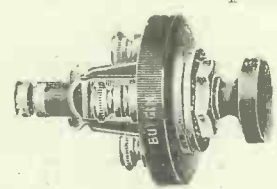
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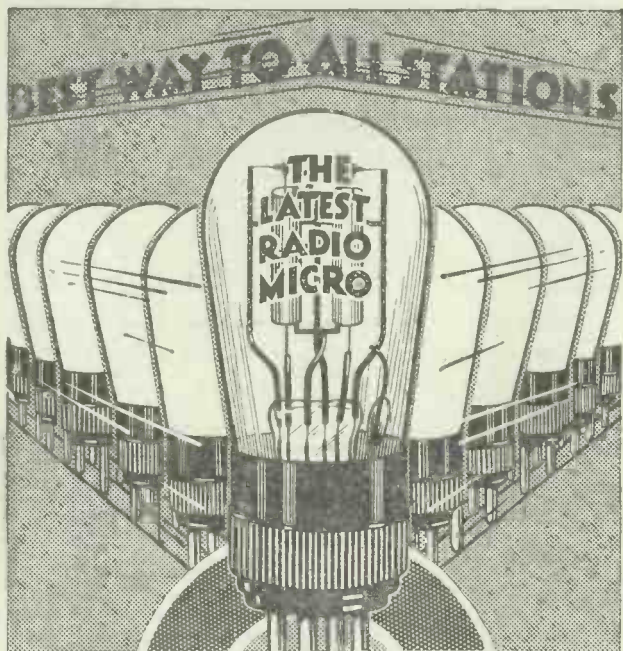
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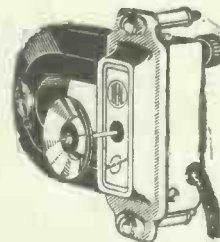
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The driving unit employed in this speaker is the new 66K adjustable pattern and is obtainable as an independent unit for the use of the constructor. Complete with instructions for building a cone speaker at home. Price **25/-**



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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 512.)

If a roof, passage, or hall is not available to fit an aerial, and it must be in a small room, it may be advisable to alter the shape. In such an instance, perhaps the pick-up from the broadcasting station will be greater if the wire is wound round and round the picture rail, or in zigzag fashion backwards and forwards from one end of the ceiling to the other. Much depends upon the exact situation of the house and of surrounding buildings, etc., but the only way to determine the most satisfactory way to erect such an aerial is to experiment with different forms until the best form is found.

CHARGING H.T. ACCUMULATOR FROM A.C. MAINS.

K. H. G. (Oxfordshire).—"For several years I have been a regular reader of your excellent journal, but I do not ever remember having read any articles on simple battery charging off A.C. mains.

"There must be many hundreds of listeners who are in a similar position to myself. When H.T. accumulators became popular I invested in four 30-volt units which still give me very satisfactory results. I was then able to look after the charging of them at home, using a lamp resistance, off the mains, the supply being 100 volts D.C. However, about 12 months ago this supply was changed to A.C. of the same voltage, preventing my doing any more home charging. I now have two alternatives—either to carry the batteries several miles into another district where there is still D.C., or send them to the tender mercies of the nearest charging station, about which I may say I am not over enthusiastic.

"As I am rather keen on making things for myself, and rather than spending several pounds on a trickle charger or similar unit, I have in mind the simple old type of electrolytic rectifier—i.e. aluminium and lead sheets immersed in a solution of ammonium phosphate.

"I am wondering about a few constructional details, sizes of plates, and pots, strength of liquid and number of cells required (the maximum current required in my case would never exceed 3 amp.)"

The old-fashioned type of electrolytic rectifier you mention is capable of giving very good results, and if you care to try it you will probably find it very satisfactory. As the current that you require is quite a low one you need use only about four jars of the type known as 1-lb. glass jam jars.

Each jar must be fitted with an ebonite cap, having a small vent hole in the centre. Towards the outer circumference of the ebonite cap two holes are made to support the two rods. One of these

is of aluminium and the other is of iron, and they are both $\frac{1}{4}$ in. long by $\frac{1}{8}$ in. across.

Each rod projects through the ebonite cap, and is suspended in the jar for the greater part of its length, and nearly touching the bottom. The jar is then filled with a saturated solution of bicarbonate of soda and distilled water. Before being immersed in this, both the iron and the aluminium rod are covered to within a quarter of an inch of their bottom ends with rubber tubing.

The method of connecting up four such jars to the mains is as follows. One of the mains is taken to a lamp holder and the other comes direct from the mains. Number the jars one, two, three and four. Each of these will have an "I" terminal and an "A" terminal, I being iron and A aluminium, and they should be connected as follows.

I on the first cell to A on the second cell, A on the first cell to A on the fourth cell; A on the second cell is already connected to I on the first cell; I on the second cell is connected to I on the third cell; A on the third cell is connected to I on the fourth cell. A on the fourth cell is already connected to A on the first cell (A on the fourth cell is already joined to A on the first).

The lead from the lamp holder is taken to the junction of I on the first cell and A on the second cell. The other mains lead is taken to the junction of A on the third cell, and I on the fourth cell. The negative charging lead is taken from the junction between I on the third cell and I on the second cell. The positive charging lead is taken from the junction between A on the first cell and A on the fourth cell. It is a good plan to place a low-reading ammeter in the negative lead to the battery under charge, and as only a rough indication is required, quite a cheap meter will serve this purpose nicely.

SEND A SKETCH.

D. C. J. (Blackheath).—"As a matter of fact the set never was satisfactory, and as no one seems to be able to lay their hands on the trouble I should like to know if I can send you a sketch of it. Do you think that the spacing might cause the trouble, and if so will you be able to check it over if I draw a diagram to show you all the components?"

"I can give the various values, and although I am not an expert draughtsman by any means I think you would understand just how the set looks if I took trouble to draw a large

(Continued on page 516.)

Apart from its wonderful TECHNICAL ARTICLES the NOVEMBER issue of MODERN WIRELESS

contains many absorbing
FEATURES FOR THE
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Sir Oliver Lodge,
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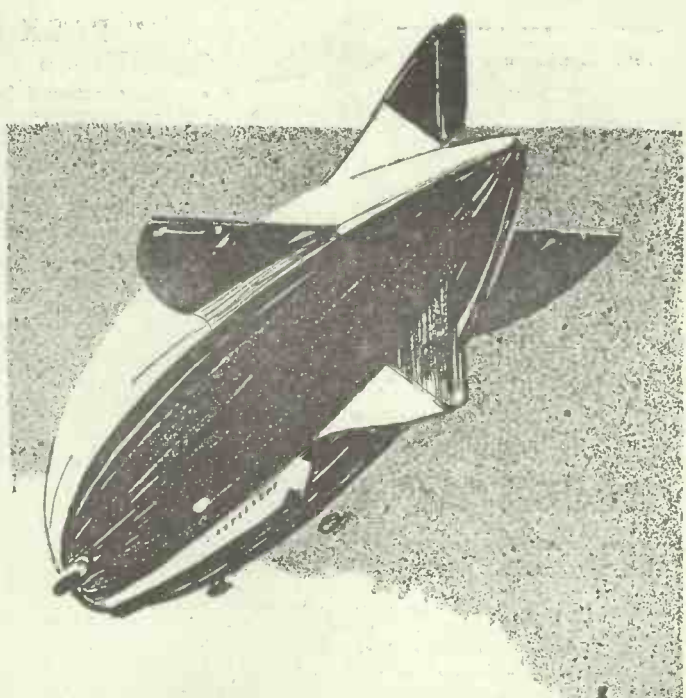
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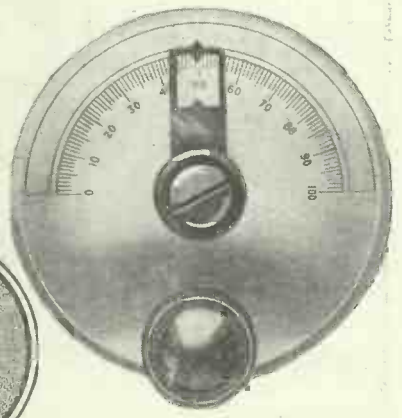
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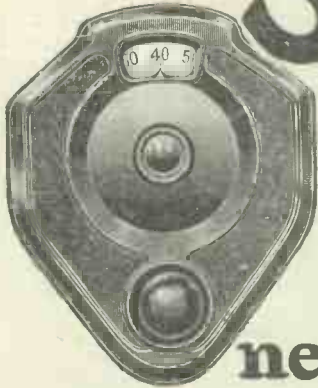
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RADIOTORIAL QUESTIONS AND ANSWERS
(Continued from page 514.)

diagram so as to give you the clearest possible idea. What would the charge be if you would do this, and do you think you would be able to suggest where the fault lies?"

We have put scores and scores of sets right in this way, and if you are able to give us a good clear diagram we can certainly advise as to circuit values and correct spacing, which is often of utmost importance. The charge is 2s 6d. per diagram.

GRID SWING AND GRID BIAS.

A. F. D. (Hampton Court).—"What I cannot make out is the relation between the grid swing and the grid bias handled by the last valve. Should grid bias be equal to the grid swing or should it be double, and why is it so important that the grid bias should be adjusted so correctly for good purity?"

A glance at the accompanying diagram will clear up the points you raise. The "curve" shows the grid-volts plate-current characteristic of a power valve working under various conditions of grid bias.

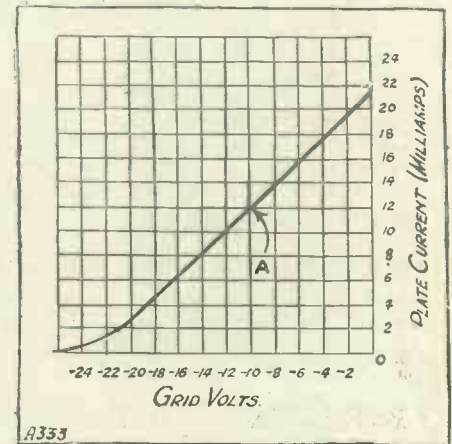
It will be seen that if there is no grid voltage applied, the plate current will be 21 milliamps. When 10 volts negative grid bias has been applied the current falls to the point shown at A, which corresponds with an anode current of only 12 milliamps. Similarly, with a negative grid voltage of 20, the plate current has been reduced to about 2½ milliamps, whilst a little extra grid bias will have the effect of cutting off the plate current altogether!

In order to amplify correctly and evenly it is essential that any change in the voltage applied to the grid of the valve should have a corresponding effect upon the plate current. A little consideration will show that this will be true only if the valve is worked on that portion of its curve which is "straight." In the instance given in the diagram if the valve is biased at the point A, i.e. at 10 volts negative, the plate current will be exactly 12 milliamps. Four volts positive on the grid will reduce the effective grid bias to 6 volts—i.e. (10 - 4 = 6), and consequently the plate current would then rise to 16 milliamps. An additional 4 volts negative on the grid would make the effective grid voltage 14 negative,

and would have the effect of reducing the plate current to 8 milliamps.

It will be seen that the change is a corresponding one, i.e. equal positive and negative charges upon the grid will entail equal increases and decreases in the plate current. For good working, therefore, the valve can be permanently biased to bring the working point to the centre of the straight part of the curve, which means that negative grid bias will have to be equal to the negative grid swing.

The valve shown here could safely be called upon to handle a total swing of 20 volts, because if biased to ten volts negative, the plate current would vary equally between 3 milliamps (when the full negative



was applied), and 21 milliamps (when the full positive was applied). If, however, the total swing was more than 20 volts, distortion would be sure to arise, because when the applied voltage was positive, grid current would be caused (owing to the fact that the grid would then be positive in respect to the filament), and when more than 10 volts negative is applied to the grid the plate current would fall unevenly and very rapidly, or else cease altogether. (It will be seen that this latter would happen if 15 or 20 volts additional negative were applied to the grid in addition to the 10 volts negative which the point A represents.)

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18-25A

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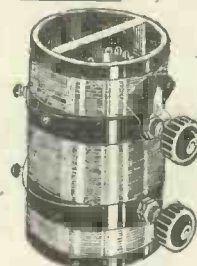
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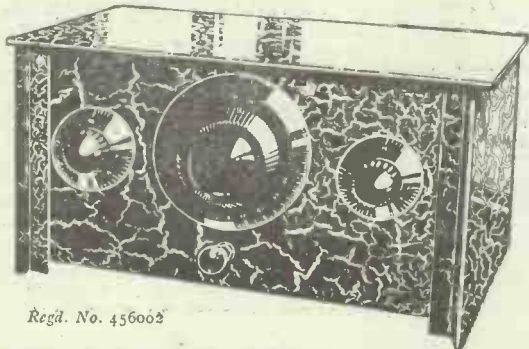
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TECHNICAL NOTES.

(Continued from page 484.)

object of the transmitter would be completely defeated if its radiation were cut off. What is wanted, so far as the broadcast listener is concerned, is some simple and equally effective method of cutting out spark interference at the receiver.

Loud-Speaker Troubles.

I have a letter from a reader in which he complains of what he calls loud-speaker "resonance," and rattling of his loud speaker on certain notes. He has tried all sorts of remedies, but has been unable to eliminate the effect and wants to know what is the cause.

Although rattling is in a sense an example of resonance, it is hardly what is commonly understood by that term, and it is better in considering this trouble (which, by the way, is very common) to think of the resonance and the rattling as two separate effects.

The resonance, properly speaking, is the extra amplification—I mean acoustical amplification—which is often found to occur on certain notes or more generally on one particular note. As a rule, this is due to the natural acoustical properties of the horn (it is more liable to occur with a horn speaker than with one of the cone type).

Vibrating Air Column.

It is, therefore, something which is inherent in the speaker itself and cannot be cured. You have to bear in mind that the air-column within the horn has a natural frequency of vibration and when a note issues from the speaker, which is the same, or very nearly the same, as the natural note of the air column, you are bound to get an extra air oscillation set up, with correspondingly augmented re-inforcement of the sound.

Sometimes, however, you may get vibration of the horn itself, and if this is the case, it can often be cured by winding insulating tape in a spiral fashion over the outer surface of the horn. This has a damping or deadening effect and will generally cure, or at any rate reduce, resonance of this particular type.

Rattling.

As regards the rattle, this can only occur if some screw or other part of the speaker is loose, or if the diaphragm is striking the pole-pieces of the magnet. The remedy for a rattling loose part is obvious: the various screws and other parts of the speaker should be carefully "gone over" to make sure that there is nothing that is sufficiently loose to cause the rattle.

Chattering Diaphragm.

As regards the striking of the diaphragm against the pole-pieces of the magnet, this is due to the clearance between diaphragm and magnet being insufficient. In most loud speakers the adjusting screw is for the purpose of varying the distance between magnet and diaphragm, and as the clearance between the two is reduced the loudness of the reproduction is increased. You may make an adjustment which gives you excellent reproduction for a selection which is fairly uniform in loudness, and yet when a note of exceptional loudness occurs you may get a rattle or "blast."

The remedy here is equally obvious: the adjusting screw must be turned in the

direction to decrease sensitivity until all rattling and chatter are eliminated. As a rule, the chatter caused by the diaphragm striking the magnet is quite unmistakable, and there is very little likelihood of it being confused with any other kind of rattle.

Simplified Coil-Drive.

Whilst on the subject of loud speakers, I should like to mention another matter which has been touched upon from various angles by a number of my correspondents recently. I refer to the question of the use of coil-drive loud speakers with 2- or 3-valve receivers and with a comparatively low value of H.T.

Many listeners seem to have the impression that a coil-drive loud speaker, whilst representing much in the way of loud-speaker refinement, is something which is not within reach of the owner of a small valve set, and which, in any case, calls for high values of H.T. and all sorts of other complications.

Such an idea, although widespread, is really quite mistaken.

Experimental Development.

Like many other radio innovations, the coil-drive loud speaker served a period of apprenticeship, so to speak, in the hands of

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the experimenters and the technical discussions of its merits and operation which have appeared in the radio journals for the past year or two have no doubt tended to frighten off the more modest broadcast listener.

The coil-drive loud speaker has, however, now been brought to a form in which it is quite foolproof and, beyond the need for a source of current to energise the field-windings, its operation may be said to be as simple as that of an ordinary permanent-magnet type of speaker.

Price Reductions.

Another point which should be mentioned is that whereas coil-drive speakers are decidedly more expensive than the more conventional types of a year or two back, the price has now been brought to a much lower level and I have seen coil-drive loud speakers being used with excellent results with an ordinary simple 2-valve receiver using no more than 100 volts in the anode circuit. Ample volume for an ordinary room was obtained in these circumstances, and I need not say that the quality of reproduction was at least equal, if not superior, to that obtainable from a high-grade speaker of the conventional type.

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THE "D.C." THREE.

(Continued from page 507.)

It should be noted, further, that in the case where the positive lead is earthed, the choke Z should be transferred to the negative lead instead of being connected as shown. This variation is shown theoretically in Fig. 5.

This will, however, in no way affect the general functioning of the receiver, but it is a point to bear in mind before actually carrying out the constructional work, and you should therefore first of all ascertain which of your mains is earthed.

Panel Preparations.

Remember, there are two slight alterations which may have to be made in constructing this receiver. Firstly, in the case where you are working on 200-volt mains and not 240-volt mains, the resistance R₃ will be omitted, and the connection between C and A will, of course, be absent, and the point C will be connected to the slider on the resistance R₀B instead. This is shown in the theoretical diagram.

Secondly, where the positive main is earthed the choke will be connected in the negative lead between the shunting condenser C₃ and the batten lamp holder by means of which the set is connected to the mains.

The most difficult part to manage in preparing the panel will be to cut the hole through which the meter is mounted. There are two ways of doing this. One is with a washer cutter if you have one, which is put into a brace and used to cut out a circular disc having the same diameter as the meter, or else by drilling a large number of small holes just within the circumference of the circle which is drawn having the same diameter as the meter, and after the piece of ebonite has been knocked out, filing it all out nice and smoothly. In any case, the Ferranti meter which I have used has got a satisfactory wide flange which will serve to cover up any slight mistake which may be made in cutting the hole.

To complete the constructional work, first drill the panel according to the panel layout diagram for the other components, and mount them on it. Now turn to the wiring diagram, which is drawn to scale, and with this as a guide, place on the baseboard the various components which are indicated.

Before fixing these into position, make sure that these are correctly placed, and note the various leads shown in the wiring diagram.

Layout and Wiring.

Particular care should be taken where you use components other than those which I have myself employed, as the leads may not run quite in the same way, and a slight rearrangement of certain parts may be necessary to get the most convenient layout.

Having fixed on the baseboard all your components, the wiring should now be commenced, and this may most conveniently be started from the detector. Try putting in grid, anode, and filament lead, as is most convenient, and gradually working over to the low-frequency end.

Although from a first glance at the wiring diagram and also the theoretical circuit diagram you may think that the receiver

(Continued on page 522.)

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(See page 513.)

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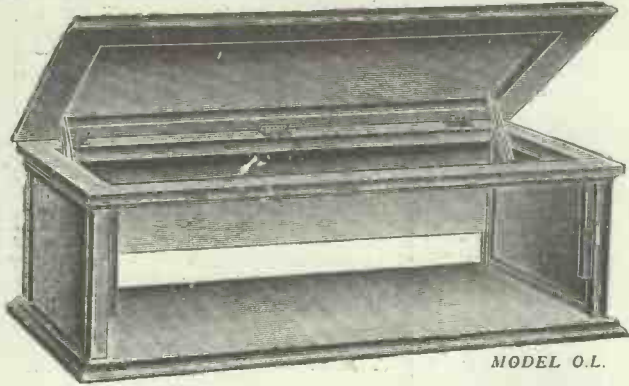
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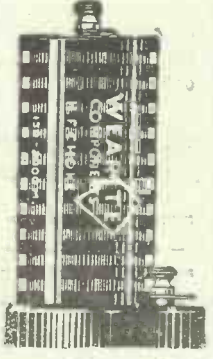
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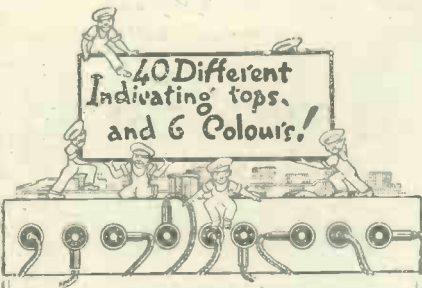
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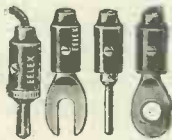


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THE "D.C." THREE.

(Continued from page 520.)

is somewhat difficult to wire—I did myself, as a matter of fact, when I first started—once you have started on it little difficulty will be found, and if you are fairly skilful at this kind of work you will probably complete it in two or three hours.

If you are not particularly keen on using a soldering iron you will find that the greater part of the connections on this receiver can be done without one, the components chosen practically all being provided with terminals, and in some cases with soldering tags as well.

Connecting the Meter.

You should note when wiring up the leads to the meter, which lead goes to positive and which lead goes to negative, for should you use a meter in which the polarity of the terminals is reversed you will have to reverse the connections to it also. There is also one point which is yet to be dealt with, that is the shunting resistance R_{10} , which is shunted across the filament of the detector valve.

This will only be necessary in cases where you use a detector valve designed to carry a filament current of less than 1 ampere, and its value will, of course, depend on the actual filament current which is carried by the valve.

The connections to the lamp holder may be taken through two holes drilled near the base, one on each side. Flex should be used, with an extra covering of Systoflex for safety's sake.

Having now completed the wiring of the set we can proceed to test it out. First of all plug in three valves—a high- μ R.C. valve for detector, a medium-impedance valve for the first L.F., and a power or super-power valve, preferably the latter, in the third holder, all taking 1 ampere.

Suitable Valves.

For the first two valves there are plenty of different makes available, all carrying the required current. For the last valve, however, I only know of one super-power valve which has a filament current of only 1 ampere, and that is the Cossor Stentor 6.

I have used this valve in this set and have found it to handle a very high degree of volume extraordinarily satisfactorily, and I can certainly recommend it for use if you wish to use this type of valve in the receiver. Valves may be in the 2-, 4- or 6-volt class as long as the filament current is 1 amp.

The following valves have been used and found satisfactory in this set:—

For the detector in the 2-volt class P.M.1A., P.M.1H.F., D.E.H.210, H.L.210, S.P.18B. will all be all right, though if you are purchasing a valve it will be better to get the special R.C. type.

In the 4-volters, D.E.H.410, P.M.3A. or a similar type of valve.

In the 6-volt class D.E.H.610, P.M.5B., S.P.50B., H.L.610, or others having similar characteristics. The P.M.5B. must be shunted with a resistance, however, since the filament current is only 0.75. The value of this resistance should be 240 ohms.

For the first L.F. any good general-purpose or small power valve may be used.

For the last valve the best valve I have used, so far, is the Cossor Stentor 6 which has a filament current of 1 amp. only.

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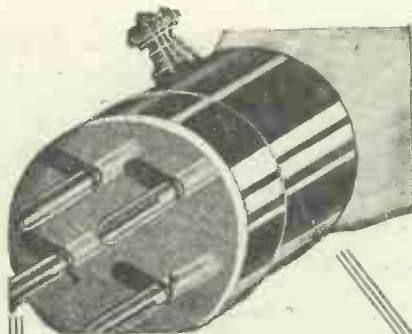
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FOR THE WIRELESS CONSTRUCTOR.
Details of a Great Free Gift.

WHEN, in its last February issue, the "Wireless Constructor" presented to its readers the now-famous handbook, "Thirty-One Tested Circuits," the results more than justified the great expenditure involved. Thousands of listeners and experimenters who had not previously taken the "Wireless Constructor" purchased it and have continued to do so since. Indeed, the increase in circulation was phenomenal.

A Unique Gift.

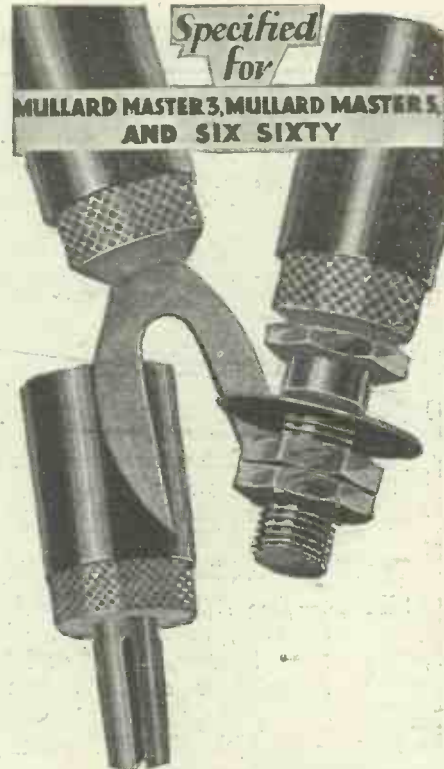
The giant circulation possessed by the "Wireless Constructor" led to the decision to present another circuit book with "Thirty-One More Tested Circuits" in the forthcoming December issue. The new circuit book will be twice the size of the old, with larger diagrams, more descriptive matter, more articles and hints, and an attractive coloured cover. No such book has ever been presented with a magazine before, and, for that matter, the information contained in the new book is not obtainable elsewhere even in the most expensive handbooks.

The circuit book will be unique in many ways, up to date in every particular and of the greatest value to beginner and advanced student alike. Here, for example, are a few circuits selected at random from the new book.

Local and long-distance receivers with push-pull output for working moving-coil loud speakers; circuits for both high- and low-tension mains units with full details of chokes, condensers, resistances, etc.; circuits showing you how to improve your present high-tension mains units and how to add additional voltage taps; volume and tone-control devices for addition to existing receivers; Gramophone pick-up circuit; high-frequency units with ordinary and screened-grid valves for addition to existing receivers. Buzzer and oscillating wavemeter circuits. Circuits for charging high-tension accumulators from D.C. and A.C. mains; circuits with switch control for long and short waves. How to use a trickle charger without an accumulator to run your valve filament from A.C. mains; how to alter your existing receiver to improve its quality of reproduction; how to alter your present set to cut out the last valve when required; circuit for the highest selectivity; circuit for those who want good quality at the lowest possible cost, etc., etc.

Don't Be Disappointed.

Remember the fact that the next issue of the "Wireless Constructor" will contain a valuable free gift will be known to others besides yourself. If you order your copy you will be sure to get it. Otherwise, you may have to join a group of mourners at the local bookstall when all the copies are sold out!



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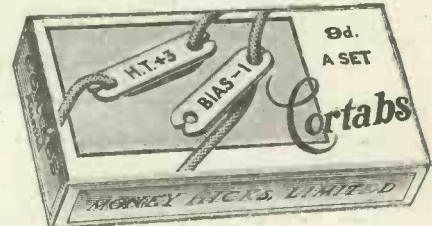
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TRANSFORMERS IN TEAM.

(Continued from page 481.)

done on this question in the "P.W." Research Department, and it has been found that if some special devices are used to prevent battery coupling, two-transformer L.F. stages can definitely be rendered so stable that quite a cramped layout can be used without causing a howl, and surprisingly good quality is obtainable, with, of course, tremendous magnification.

To show how effective these anti-coupling schemes are, it may be mentioned that one of the sets used for test purposes would set up a howl when a resistance of only 15 ohms was added in series with the H.T. battery (a new one), this being equivalent to quite a moderate resistance battery. This, of course, was without safety devices. When one was added on the last stage only (a form of output filter) a resistance of 210 ohms was required to start a howl.

Remarkably High Amplification.

When another type of device was used on the detector stage (a resistance-capacity anti-motor-boating filter) the set remained quite stable with 210 ohms added to the battery resistance, and when both these schemes were used together it was found that no amount of resistance would start a howl short of a value quite impossible to reach with any battery in a useable condition.

As a result of these and other experiments, we shall be able to provide "P.W." readers with some very interesting designs in the near future, giving remarkably high amplification on the L.F. side with a considerable "safety factor."

Of course, it has always been possible to turn out designs using two transformers, and capable of giving great amplification, but the risks of poor quality and even howling have been considered too grave.

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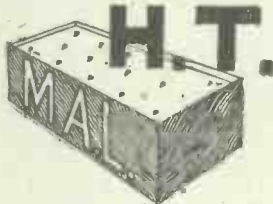
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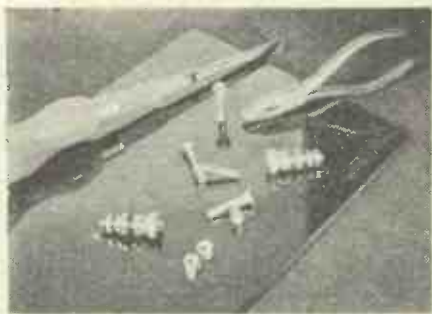
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| 1 '001 Fixed Condenser | 1 0 |
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| 3 Valve Holders | 3 0 |
| 1 Cabinet | 17 6 |
| 1 Pair Brackets | 8 |
| 1 6-pin Coil, B.B.C. | 4 0 |
| 1 6-pin Coil, 5XX | 5 0 |
| 1 2-volt Accumulator | 8 6 |
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| 1 2-volt Valve | 3 6 |
| 1 2-volt Valve | 3 6 |
| 1 2-volt Power Valve | 8 6 |
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| 1 Grid-Bias Battery, 9-volts .. | 4 0 |
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| 1 Condenser and Leak, fixed .. | 2 0 |
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| 8 Wander Plugs | 8 0 |
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(See page 513).

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By OUR SPECIAL CORRESPONDENT.

NEW apparatus produced by Philo T. Farnsworth, a young research student at the Crocker Laboratories, San Francisco, seems to me to be the most radical advance in television for a long time.

It dispenses with mechanism, and may still prove that spinning discs do not provide the best method of achieving television.

Although Farnsworth says that difficulties with the wave-band are causing him trouble, I cannot find that he has yet been able to transmit his images, but his method of producing them is new and exciting to television experts who, for some years now, have seen no real novelty.

The transmitter is a large tube, something like a great photo-electric cell, a foot long and about 4 in. wide. Its cathode plate is a potassium hydride coated mirror.

On this plate an image of the object or scene to be transmitted is focused by lenses.

You know how the photo-electric cell works—when light is shone on the plate a

TWELVE FINE SETS

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NOV. ISSUE

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stream of electrons fly from it, strong or weak according to the strength or weakness of the light.

The presence of the image on the plate causes to be emitted what Farnsworth calls an electric image: it is formed of electron streams instead of light rays.

Four coils placed round the tube, operated by alternating current, then oscillate the electric image over a tiny aperture, so that each small part of the electric image passes in turn over the aperture.

Streams of electrons then fly through the aperture—the electric image is pulled out into a long string.

Zig-zagging Electrons.

In demonstrations he has given Farnsworth used these streams directly to operate a cathode ray oscillograph receiver. The streams were zig-zagged by electro-magnets placed at right angles, in the usual way, over the fluorescent screen. So the image was

(Continued on next page.)

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TELEVISION WITHOUT MECHANISM.

(Continued from previous page.)

built up of glowing patches caused by the impact of the electrons on the screen. The received image was again projected on a larger screen.

The oscillations were timed so that the electric image passed completely over the small aperture thirty times a second, and of course the image on the fluorescent screen was repeated the same number of times.

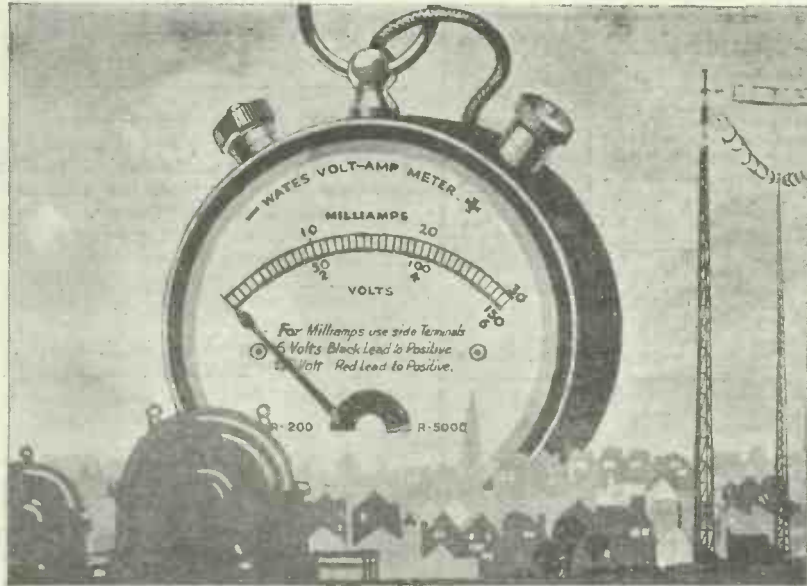
This is considerably faster than in most television systems, and Farnsworth says he could operate the apparatus faster still, though he points out rightly that there is nothing to be gained by a greater speed; indeed, there is little to be gained by any number of repetitions greater than the 16 a second of the cinematograph.

With his present apparatus, the young inventor estimates, the images are divided into 8,000 elements. This, as you will realise if you count the dots making up a newspaper photograph, cannot give an exactly detailed image. Farnsworth has made a tube to give 12,000 points, however, and he says that the number could be increased almost indefinitely by making the collecting aperture smaller and increasing the frequency of the alternating currents which cause the oscillation of the image over the aperture.

Twenty pounds will be the price of the receiver, or it will be if the business men who have been backing the young inventor decide to turn out the apparatus commercially. Actually, if mass production methods were used, the cathode ray oscillograph receiver could be sold for little more than the price of a good valve.

But there is obviously much to be done to this apparatus before we need consider commercial points.

The apparatus is extraordinarily interesting from the scientific and technical point of view. Nevertheless, Farnsworth, after five years of research, has with refreshing novelty produced an idea which has been the Golden Fleece of television experimenters—harnessing speedy, almost weightless electrons for transmitting apparatus.



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VOLT-AMP
RADIO TEST METER

Dead-beat movement, crystallised black finish.



M.B

MIND YOUR MAINS!

THE electric-lighting mains are playing a more and more important part in wireless to-day, and it is therefore advisable to take due precautions when working with them.

The one thing that you wish to avoid for yourself is a shock. Never, then, work on a main circuit unless you are sure that the switch is off. Remember that the further away you are from the ground the safer you are. Electricity-supply mains usually have one side connected direct to earth, so that if you are in contact with the unearthed line and are standing on a damp floor on the ground floor of the house, you will complete the circuit between mains and earth, and so get a very severe shock.

(Continued on next page.)

OAK CABINETS.—Mystery 66017/6: Master 3, 15/-; Melody Maker, 15/-; Radiano 4, 15/6; Master 5 Portable, 30/-; Baseboards included. Hand made and French Polished. Rubber feet. Crated and Carriage paid. Send for list, **GILBERT, Cabinet Maker, SWINDON**



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Scientifically designed to adequately protect your set in all conditions. Has a fuse between the aerial and the set, thus giving security from lightning even if the set is left connected. Specially made with Bakelite cover to keep it waterproof. Price 4/6.

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SUNDAY GRAPHIC



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MACAULAY ST., HUDDERSFIELD

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WET CELL VALVE

Valves that run from "Eton" and Leclanche Cells. The latest radio development. H.F., L.F. R.C., 2/6, L.P. 3/6. The valve that eliminates accumulators. Don't change anything. Just push in "Eton" Wet Valves and use Primary Batteries. Send 1/2d. stamp for further particulars to: **ETON GLASS BATTERY CO.** "ETON WORKS," GRANGE ROAD, LEYTON.

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are the best Bargain ever offered to Radio users. £10 worth of precision, Multi-range Mirror scale. Jewelled knife-edge Instrument for - - **55/-**

NEW A.C. MODEL "One-meters" Ready. Ask for A.C. Leaflet.

THE VIOLINA LOUD-SPEAKER DE LUXE CABINET gives wonderful reproduction over the complete tonal range. Beautifully polished mahogany. List price, 5 Gns. Viola producer and cord, 25/-.



Sale price, with

DIXON DISTANT CONTROL for Valves. On and off any distance. Pol. Oak Case, 15/-.

POWER TRANSFORMERS, 220 volts to 3, 5 or 6 volts, 12/6. To 20 volts, 14/6. Double-wound for H.T. from A.C. mains, 220 volts, two centre-tap secondaries for H.T., 20 m/a, 22/6 each; 50 m/a, 35/- each.

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MELODY MAKER Inductance Wire E. and C.C. Copper. Sale 1/6 lb. Paxolin Tubes, 3" by 3 1/2", 4d. each. Quarter usual price. 1/2 oz. reels, 28 gauge S.S.C., 6d.

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500 volt Condensers: 2 mfd., 2/9; 4 mfd., 6/6; 10 mfd., 15/-; Fullertype Chokes, 200, 600, 1,000 ohms, 1/6. Power Chokes, 1,000, 1,400, 3,000 ohms, 4/6. 2 Electrode Rectif. Valves, 7/6.

PHONES for 3/-. Sullivan's Double L.R. phones, Royal 2,000 ohm make, tone brand new, 5/- per pair. Hear Easy phone pads, 2/6 per dozen. Brown's double headbands, 2/- per pair. Brown single phones, 13/6. L.S. Reed Units, 10/-, 12/6 and 14/-.

VIBRO-MASSAGE SETS. Cost £4. New, in case. Sale 25/6. X-Ray Tubes, 35/-, Neon Lamps, 2/-.

MAINS UNITS. The DIX D.C. No live Terminals, Humless Filter, 3 taps, 30/-. De Luxe Model with Meter, 40/-. A.C. Unit with Control and 3 taps, Two Valves and Special Filter, £4 10s.

MICROPHONE BUTTONS, as used in the Service, solid back inset type, 10d. each. Genuine Skinderviken in original boxes, 2/- each. The wonderful little units are used for amplifying without valves, speech magnification, sound detection, and Micro-Stethoscope fitting, 5/-, Reed Micro Receiver, 8/-, Transformers, 3/6.

BARGAIN RECEIVERS. These are all by first-class makers, 2-Valve, No. 33 Marconi, Lid Case, all waves, 50/-, 2-Valve Mark 32, 250 to 1,800 metres, £4. Western Electric, 3-Valve, £6 5s. 3-Valve Aircraft, £4. Polar 4 Pol. Cab., £6 10s. 5-Valve R.A.F., with Valves, £5 7-Valve Marconi, £4. Sterling surplus Anodized, £5 10s. Marconi R.B. 10 Crystal and 1-Valve, closed Cabinet, complete with Valve, 22/6, 25 per cent. discount on all Receivers over £5, carriage extra.

ELECTRIC FESTOONS. 16 Fairy Lamps on Flex, with clips and battery adaptor. 220 volts, 25/-.

H.T. ACCUMULATORS. 1,000 m/a., 30-volt, 10/-; 60-volt, 19/-; 90-volt, 28/-, Ebonite case.

THE LATEST BARGAIN A.C. to D.C. BATTERY CHARGERS. Work off lampholder and charge a 2-, 4-, or 6-volt battery up to 6 amps. max. Sale at half-price, £2 10s. Larger type for 12-volt Car Cells, £4. Both fitted plug, cord and C.Z. Ammeter. Limited number of these bargain sets available.

ELECTRIC. Electric Hot and Cold Hair Blowers, 30/-, Flat Irons, 10/-, Electric Two-Plate cooker, 12/-, Single Hotplates, 7/6 and 5/-. Immersion Heaters, E.S., 7/6. Tube, 5/-, With plugs and cord. Fine Cabinet Set Home Massage Vibrator. Cost £4. Brand new, 25/6. Electric Soldering Irons, all sizes, from 7/6 to 15/-. Glass Boring Outfits for lead-in holes in window, 10/6.

CHARGING DYNAMOS. L. and R., new 6 to 12 volt, 8 amp., shunt ball bearings, enclosed with pulley, 50/-, 20 volts, 5 amps., 35/-, 12 volts, 40 amps., £5 10s., 22 volts, 12 amps., £5 10s. Crompton, 30 volts, 15 amps., with pulley, £6. Panel for same, fitted ammeter and voltmeter, £2. Switches, Boards, and Resistances. All Sizes in Stock. We carry large stocks, and can still supply many lines advertised at bargain prices. If you cannot call at our show-rooms, send 4d. for our unique illustrated catalogue to

ELECTRADIX RADIOS,
218, Upper Thames Street, E.C.4
Phone: City 0191.

MIND YOUR MAINS!

(Continued from previous page.)

If, however, you are on the second floor standing on a dry rug and not in any way in contact with an earthed object, such as a gas-stove or water pipe, the chances of getting a shock are very remote.

In cases where work is being done on D.C. mains always find out which main is earthed. If the negative main is earthed see that the positive side is broken by the switch and vice versa.

A more severe shock is given by A.C. mains than by D.C., the voltage being the same.

Charged Condensers.

Remember, also, that a healthy shock can be got off a large fixed condenser of the type used in H.T. eliminators, and that where no means for discharging the condenser is provided it will hold its charge for hours. Moral, always switch the H.T. off first. By the time you have switched off the L.T. any residual charge will have been used up as plate current.

If your eliminator is fitted with a potential divider you need not worry about the con-

12 SETS FOR 1/-

No less than twelve sets are fully described in the November issue of **MODERN WIRELESS**

and the Magnificent Book presented free with it. You must not miss such a bargain as this.

BUY YOUR COPY NOW

denser retaining its charge, for it will discharge through the resistance.

Another precaution that should always be taken when working on apparatus to be run direct from mains is to insert a fuse, or else a limiting resistance, wherever a short-circuit would result in a dead short on the mains. In the case of a D.C. eliminator, for instance, where the maximum H.T. plus would be direct off the positive lead a lamp might be inserted in series in the positive main lead, so that should a short occur on the eliminator between H.T. - and H.T. +, the lamp would merely light up and none of the house fuses, or possibly the main fuse would be blown.

Frayed Flex.

A fruitful cause of trouble is due to the use of flex leads with frayed ends, especially when the terminals under which they are to go are fairly close together. This flex usually consists of a number of strands of 36-gauge copper wire. One of these straying across to the other terminal will result in a bright green flash accompanied by a kind of a pop, and you will be seeing purple patches for about half an hour; and remember it takes anything up to 15 or 20 amperes to blow 36-gauge wire.

You don't know what a fuse blowing is really like, though, if you have not heard a 500 amp. one go at a power station. That does make a noise if you like.

fit

HYDRA CONDENSERS

and forget them

You know how troublesome cheap condensers can be—when your set is out of use, or breaking down in your eliminator and causing trouble all around.

Fit HYDRA Condensers in your set or eliminator and you need never give them another thought Because HYDRA condensers are made to a scientific standard of precision which is constant throughout their life; they are constructed with the one dominating idea that the name of HYDRA must always stand for utter reliability.

Tested 500 volts, 240 volts D.C. or 160 A.C. working voltage.

PRICES: 2 mfd. .. 3/6 1 mfd. .. 2/6 Obtainable from all radio dealers. If any difficulty write—

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34, Kingsway, London, W.C.2.

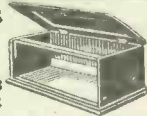


NO RADIO WITHOUT DARIO

(See page 518).

PEKE CABINETS OF MERIT OAK

12 x 7 .. 12/8 | 16 x 7 .. 16/8
14 x 7 .. 14/- | 18 x 7 .. 18/4
Melody Maker 25/-
Master Three 25/-



PEKE WORKS, 68, Harlesden Road, N.W.2.

WET H.T. BATTERIES

Solve all H.T. Troubles. SELF-CHARGING, SILENT, ECONOMICAL. JARS (w.-zed) 2 1/2" x 1 1/2" sq. 1/3 doz. ZINCS, new type 1 1/4 doz. SAOS 1/2 doz. Sample doz. (18 volts), complete with bands and electrolyte, 4/3, post 9d. Sample unit, 6d. Illus. booklet free. Bargain list free. AMPLIFIERS 30/- 2-VALVE SET £4. P. TAYLOR, 57, Studley Road, STOCKWELL, LONDON



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We are now the sole suppliers of the genuine U.C. and Thorpe valves, as specially tested and recommended by "Popular Wireless." U.C.5 Cash with order. and Thorpe K.4 (both 4-electrode 5-pi valves). Post free. Only direct from—**UNIDYNE VALVE CO.** 1, CHARING CROSS, LONDON, S.W.



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- Uniformity of Vacuum
- Uniformity of Construction
- Uniformity of Emission
- Uniformity of Efficiency

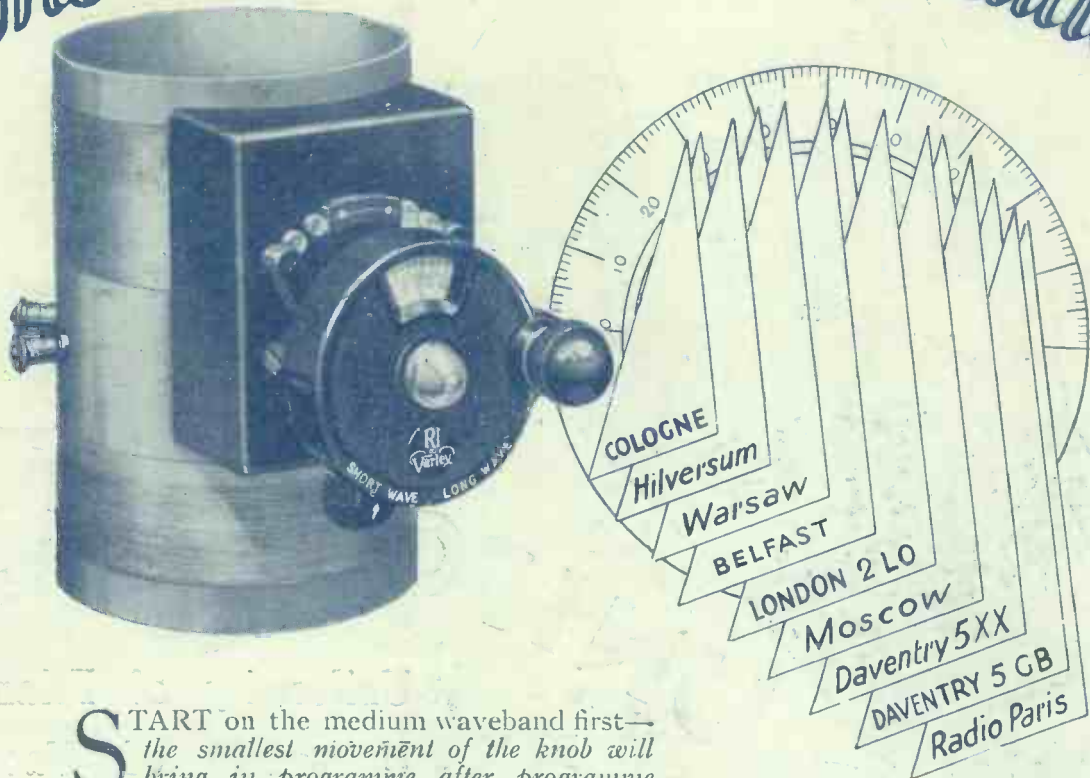


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P.M. Valves — four
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THE · MASTER · VALVE

The way to pick out the stations



START on the medium waveband first—the smallest movement of the knob will bring in programme after programme with brilliant clearness—until all the stations have come in round the dial; then switch over to the long waves—no tiresome coil changing—and do just the same.

This entirely new type of Tuner, designed on the aperiodic principle for aerial coupling is undoubtedly a real achievement. When used with a 0005 mfd. variable condenser, it has a range of 265 to 600 metres on the medium waveband, and of 1200 and 2000 metres on the long waves. It has the maximum degree of selectivity possible with a coil covering both long and medium waves. The variable reaction coil is fitted with our slow motion dial—ratio—14 to 1—ensuring smooth and fine reaction control. Adequate reaction is provided for both wavebands. This new component is beautifully finished and is designed for one-hole fixing.

Detailed instructions and a selection of highly efficient circuits are provided with each Tuner purchased.

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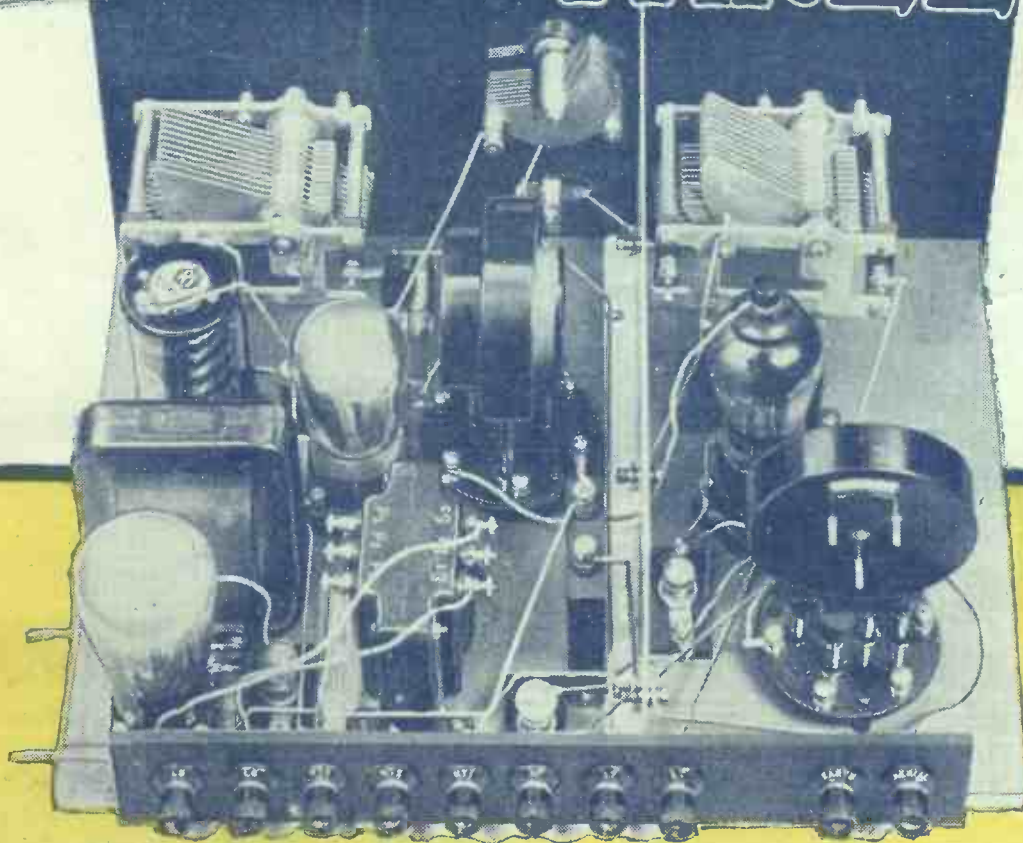
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INCORPORATING "WIRELESS"

November 17th, 1928.

In this issue
**The "PENTODE"
THREE**



It's the condenser that counts —



Not the colour of the BOX



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**MARCONI TYPE U8
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RECTIFYING VALVE**
Filament Volts, 7.5 max.
Filament Current,
2.4 amps.
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Max. Rect. Current,
120 milliamps.
Price 22/6



**MARCONI TYPE U8
FULL WAVE
RECTIFYING VALVE**

FULL volume demands a plentiful supply of high tension. That is why Marconi research produces the new U8 super-rectifying valve, capable of delivering 120 milliamperes at 400 volts. The twin electrodes ensure a constant output with a less costly smoothing circuit.

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Write for full particulars of New Marconi Valves mentioning "Popular Wireless."

The very latest process for improving the vitality and life of the filament is employed in the manufacture of Marconi Valves.

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VALVES**

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If you have electric light you are taking "coals to Newcastle" every time you buy an H.T. Battery or L.T. Accumulator.

BATTERIES and Accumulators are expensive to buy and maintain. You are wasting money in using them if you have a switch in your house.

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Get this **FREE Book**—it will save you pounds

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T.C.C. CONDENSERS

How to Build your own High Tension and Low Tension Eliminator.

To Telegraph Condenser Co., Ltd., Wales Farm Rd., N. Acton, London, W.3.

I enclose 1d. stamp. Please send me your book showing how to build Eliminators—H.T. or L.T.

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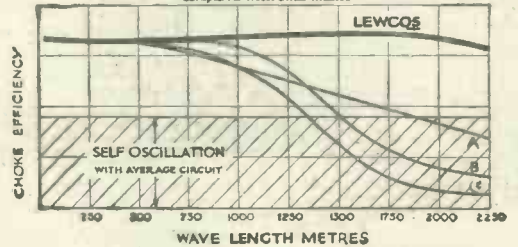
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CHOKER EFFICIENCY ON ALL WAVEBANDS

From 20-2,000 Metres

H.F. CHOKER CURVES
Showing the performance of the Lewcos H.F. Choke compared with other makes



The above diagram shows the percentage Choking effect of the LEWCOS H.F. Choke on all wavelengths from 20 to 2,250 metres, as compared with three other popular makes.

The terminals are arranged one at the top and the other at the base of the coil to eliminate the risk of additional self-capacity in the wiring of the receiver. Equip your set with a LEWCOS H.F. Choke and get maximum efficiency on all wavebands from 20 to 2,000 metres.

LEWCOS

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HIGH-FREQUENCY CHOKER

THE "LEWCOS" STANDARD LOADING COIL can be purchased through all Radio Dealers. Suitable for use in all circuits in "Popular Wireless" where standard loading coil is specified. Price 7/6 retail.

The London Electric Wire Company and Smiths Limited,
Church Road, Leyton, London, E.10.
Trade Counter & Cable Sales: 7, Playhouse Yd., Golden Lane, E.C.1.



Phone: Walthamstow 2531.

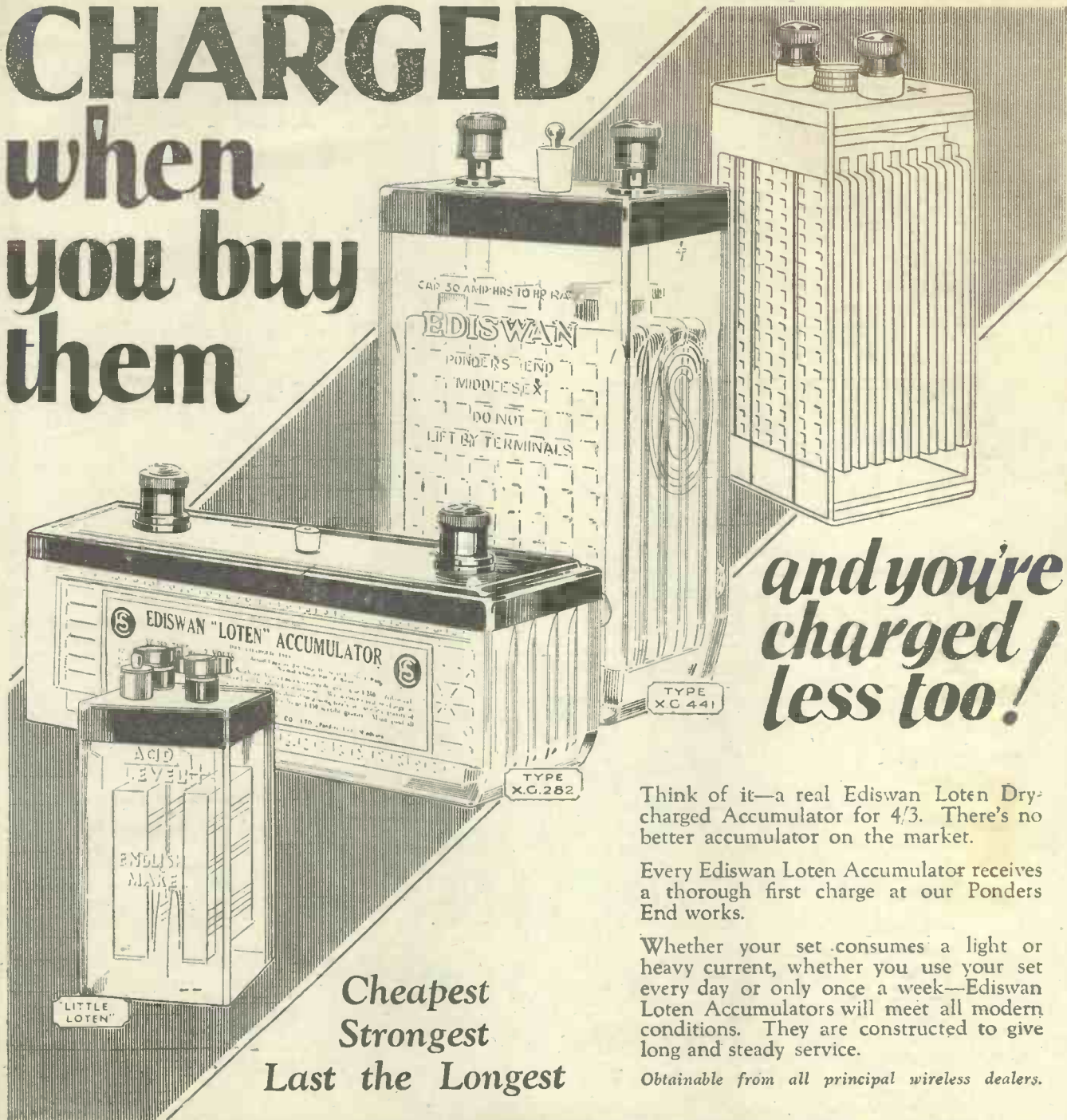
Grams: "Lewcos, Phone, London."

PRICE
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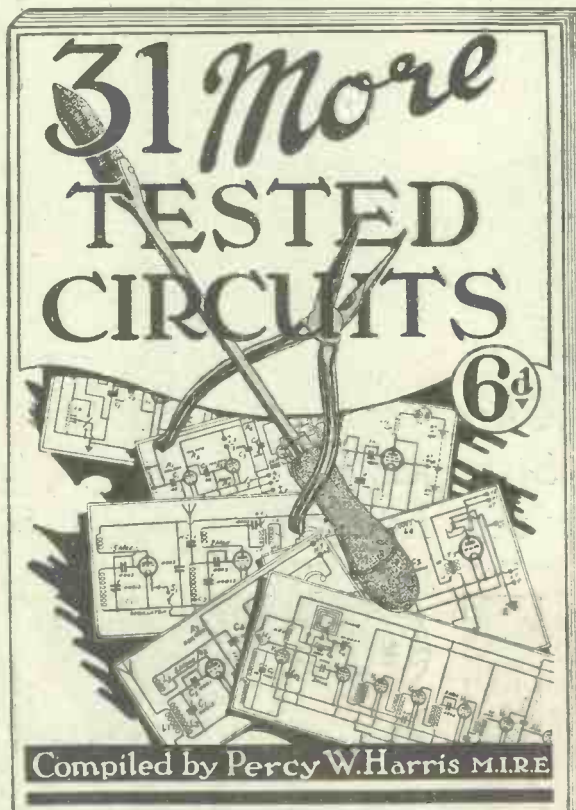
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WIRELESS CONSTRUCTOR

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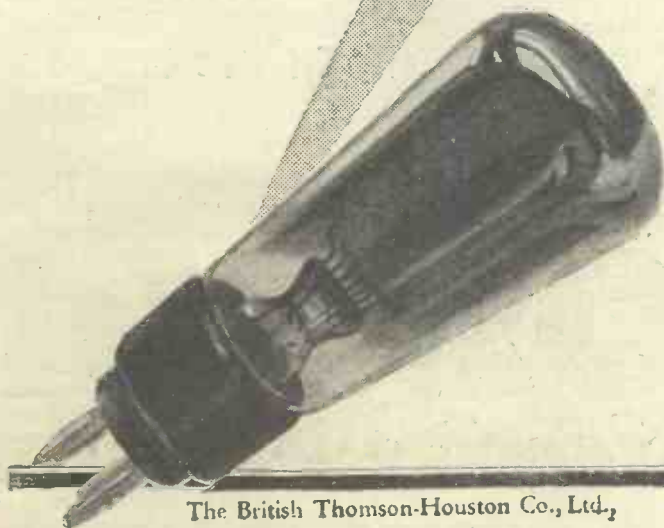
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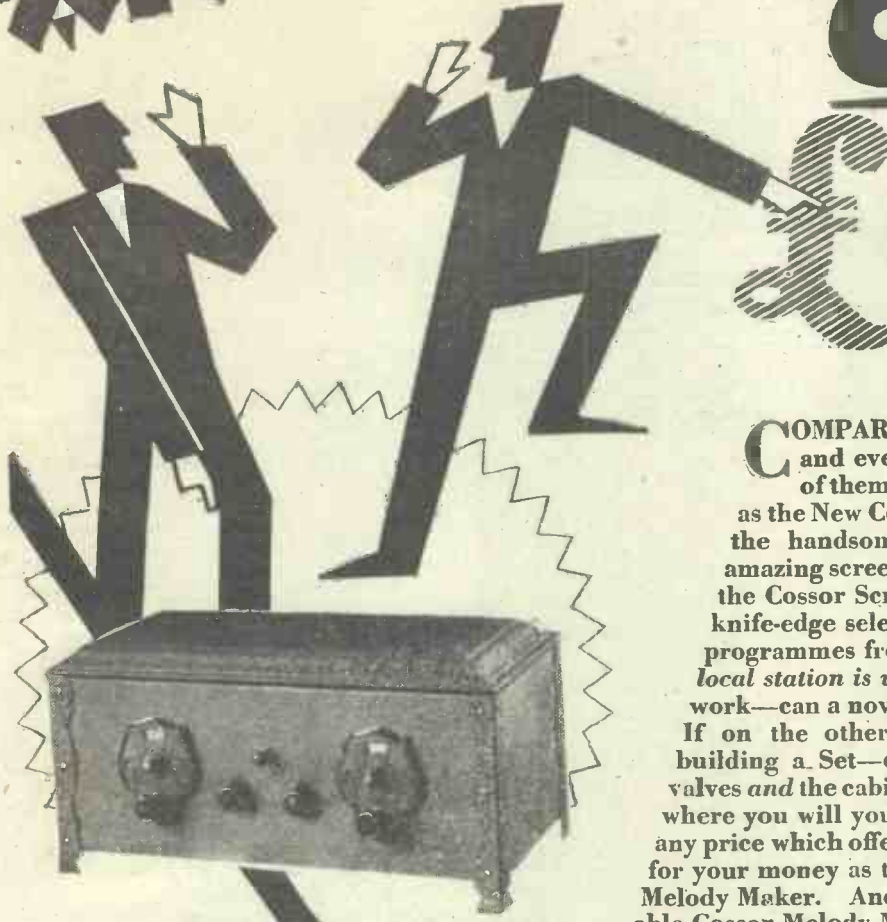
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AND ITS PRICE IS ONLY

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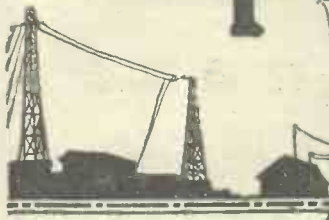
Please send me free of charge one of your Cossor Envelopes which tells me how the New Cossor Melody Maker is built in 50 minutes.

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RADIO NOTES AND NEWS.

A "Concrete" Example—Radio and Wireless—Back to Methuselah—It Makes the Cat Weep—Faraday's Radio Club—"Sydney" Two Bobs Up—Indian Broadcasting—Great-Grandfather of Valves.

The Governess Speaks.

SPEAKING at the opening of the Manchester Wireless Exhibition, Mrs. Philip Snowden, Governess of the B.B.C., is reported to have let fall this pearl: "I look forward to the day when young men and women will regard a wireless licence with as much interest as a marriage licence." That is very long sight indeed. I hope the lady's utterances at the council table of the B.B.C. are not so devoid of wisdom and that she really has a better sense of proportion than the remark I have quoted displays.

Still Hoping.

BUT what hopes? I understand that Mr. Robinson, who sent the radio message to Mars is continuing his investigations and is looking for a receiver which can be tuned to 32,000 metres. I gather that he simply must have this receiver before the end of the year, because by January Mars will be showing Earth another part of itself—and their station will be round the corner.

But Is It Possible?

I DO not know why Mr. Robinson has pitched on 32,000 metres, unless it be that the Martians told him to do so. Anyhow, I fancy that he would deserve better luck if he tried to send and receive his messages on very short waves, because long ones are supposed not to have right of way through the Heaviside layer. Very short waves, I should say, with a frequency somewhere between a million and a billion.

Fans' Farewell!

"DETECTOR," writing in the "Bradford Telegraph and Argus," says, "The set-building craze is one which cannot have a much longer life, and it is already considerably on the wane." I wonder what evidence he has to support that. His main argument in favour of this theory that the amateur is doomed is the development of mass-production. I think he does not understand that the bulk of home-constructors are such not because they want a cheap set, but because they like making sets, and that many of them spend far more on bits and pieces than they would on a mass-produced set. I believe that in five years there will be more "hams" than ever.

A "Concrete" Example.

A GOOD example of an American new way of doing an old thing is afforded by Edison. A museum to commemorate his inventions is to be built at Dearborn, Mich., U.S.A., and Edison turned the first spade of earth on the site. Then he walked across a bed of newly-laid concrete and scrambled his name beside his "footograph" with a stick. Who will re-write the old verse, beginning "Feet of great men all remind us."

Radio and Wireless.

I AM surprised to see that the editor of "Radio in Australia and New Zealand" devotes a whole page to an explanation that radio and wireless are names for the same thing. Can it really be true that the public, particularly the readers of that periodical, were ever ignorant of the meaning of those words? In the article I notice, "... in America and some European countries ... wireless has become a word of contempt and disparity." Anything

RADIO RESCUE SHIP.



This vessel is the Citta di Milano, that played an important part in the rescue of General Nobile, of the airship "Italia," which was wrecked on drifting ice near the North Pole. Note the elaborate aerial equipment.

might happen in America, but Europe—oh, no, sir! Unless, maybe, in the G.P.O.

Times Change.

THE Canadian National Railways make a special feature of receiving British broadcasts on their trains and have recently scored a "bull," for they were able to give their passengers fifteen minutes of 5 S W, the train being some 1,219 miles west of Montreal or nearly 4,000 miles from Chelmsford. Just imagine this happening bang in the middle of the ancient haunts of the Red Indian and the buffalo!

Behind the Times.

I NOTICE a report to the effect that Professor Petrovsky, of the Institute of Applied Geophysics, Leningrad, has invented an apparatus for enabling ore veins to be detected by radio. It looks to me as though the Russians are trying to bluff the world. You remember that they made a determined attempt to convince us that Popoff forestalled Marconi. Nobody swallowed that, however.

Back to Methuselah!

THE location of ore by electrical means dates back to 1890. In 1909 Chilson, of Nevada, U.S.A., began to experiment with the use of radio in prospecting. From 1920 to 1922 the University of Arizona fostered more experiments and brought the process much nearer perfection. Radio has also been applied to the location of oil, water and buried pipes.

It Makes the Cat Weep.

A FELLOW-SUFFERER has sent me a cutting from the top of page 153 of "The Radio Times" for October 19th. Thereon appears a little picture of a loud speaker by which sits a cat with a comically woebegone face, the sole auditor. Underneath the picture are the words "The London Chamber Orchestra," which are really the heading of a paragraph. A most apt but unfortunate juxtaposition!

Natural Philosophy.

A LADY who lives deep in the heart of the country tells me that her set went wrong, and whilst she was waiting for succour from the nearest town she called in the village handyman. That worthy,
 (Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

after staring wisely at the back of the loud speaker, pulling the aerial about and smelling the accumulator, shoved his cap to the back of his head, ran his fingers through his whiskers, and said: "Well, mum, it ain't the cearth nor it ain't the heerial, and the contraption is as fine as ever I seen. Reckon it's just natur. No call to worrit. Just natur, mum!"

Closer Still to Nature.

THAT note reminds me of a letter I have been keeping for you, and this seems to be the moment to produce it. We paid quite a lot of money to retain it, as it was stamped with a used U.S.A. stamp although it was posted in Africa! Here goes. "Great Mr, cullud subget of K. Gorge H.M. i abscribe me in hope of glorious resrection just the same as wite christians, mr. balson other days left this city leaving copy PIPULOR WIRE paper behind without him, which I am reading and hop you willing sending music from the air box like mr. bilson carry. No nonnie. Poor man but one wife. (Sgd. I—M—)"

Faraday Radio Club.

IN the spirit of Faraday, the Newington genius, this organisation carries out interesting radio research at the Walworth Men's Institute, Beresford Street, S.E.5, from 7.45 p.m. to 9.45 p.m., every Monday and Thursday evening under the direction of Dr. F. A. Williams, M.Sc. A bob a nob per session, which covers membership of the Institute. Hon. Sec., Mr. T. O. Hawkins, 72, Inville Road, Walworth, S.E.17.

Eiffel Tower.

IF you ever tune in Eiffel Tower you had better tie a knot in something to remind you that its wave-length is to be altered from 2,650 metres to 1,400 metres. Beware lest ye enter it in your diary, for this is the time of year when the pages of that neglected book are a reproach to the keeper.

"Sydney" Two Bobs Up.

THIS little set has made more Valve Barts. than any other this year. J. H. H. (Tunbridge Wells) gets a Bartship, free of income tax. On his "Sydney" Two, or, as he says, "that set of sets," he claims to have received signals from all continents. His bag includes 195 U.S.A. stations, 6 Brazilian amateurs, 3 in New Zealand, 1 each in Cuba, Indo-China, Java, and Morocco. But I don't see 3 L O in the list. What about it? If you report it before the end of the financial year, the Bartship is free of entertainment tax also.

Valve Pioneer Honoured.

DR. J. A. FLEMING, F.R.S., was this year honoured by the award of the Faraday Medal of the Institution of Electrical Engineers. The story of his discovery of the valve is old and hackneyed, but in view of the numerous claims of others I think the words of the President of the Institution should be repeated here. Referring to the advances made in wire and wireless telegraphy, he said: "... everyone will agree that it is Dr. Fleming's invention of the thermionic valve which

has resulted in these advances." Dr. Fleming, in replying, disclosed the fact that some of his research was done in a little underground room where Faraday actually worked at his experiments on polarised light.

Indian Broadcasting.

IT appears that the strike of the Indian Broadcasting Company's staff was not wholly inspired by the unsatisfactory dimensions of their salaries, but had to do also with their opinion that their efforts were being stultified by insufficient expenditure on the service itself. The queerest strike I have ever heard of. Anyhow, it is stated, with what foundation in fact I know not, that Marconi's are to finance the Company.

SHORT WAVES.

HOW HE COULD TELL.

Harry: "How long have you been married?"
Harold: "Let me see, I bought this loud speaker for my radio set four years ago."
"Radio News."

Customer: "You told me that set I bought would bring in the coast. I can't even get local stuff."

Salesman: The last person who owned that set was a lighthouse-keeper, and we took his word for what it would bring in.—
"Life."

A certain miner says he can play ten musical instruments at once. Streuons efforts are being made to keep this from the B.B.C.

A FAITHFUL REPRODUCER.

Radio Dealer: "And here is just the thing you want for your radio set to make it complete. This is the latest in loud speakers."

Radio Prospect (not a bachelor): "No, never mind showing it; I've got an old model at home now that repeats everything she hears."

It is now definitely reported that the B.B.C. can see nothing in television.

At the Waldorf we dine,
Where the music's like wine;
Then toddle around to some show
Where there's statuesque peaches
On tropical beaches,
And the seats are six dollars a throw!

And from there we ding out,
With a laugh and a shout,
En route to a gay cabaret,
Where we sing and we dance,
Like two fools in a trance,
Till almost the breaking of day.

'Tis a wild sort of life
For myself and the wife,
This nocturnal cruising about;
But we'll follow the pace
To the end of the race,
If our radio'll only hold out!
—"Radio News."

Berlin on the Spree.

IN their thirst for knowledge of the ways of short waves the "fans" of Berlin have been overstepping the bounds, and 150 verboten transmitting stations have been detected by the German Post Office. It is said that the authorities have some marvellous new way of finding illicit transmitters, which fact is causing a fluttering in the radio underworld. I don't see why it should. There are only two ways, apart from employing informers—of finding wireless stations. One is to look for them with the naked eye; the other is to use a position-finder.

A Valve Catalogue of Note.

TALKING about amateur transmitters, I would mention for the benefit of licensed key-punchers and mike-manglers that Edison Swan's have just

issued a useful list of transmitting and rectifying valves, complete with large illustrations and specifications of constants, together with other data attractive to the expert.

Great-Grandfather of Valves.

CONSIDERING that the electric lamp is the father of the valve, it is interesting to remember that October 31st last was the centenary of the birth of Sir J. W. Swan, who began in his brother-in-law's chemist's shop as a boy his physical and chemical researches, which led him to fame and fortune. From his youthful experiments came the incandescent lamp, which in 1860 was represented by a glass bottle with an indiarubber cork through which passed the wires from a battery. Inside the bottle the wires were joined by a strip of carbon.

Genesis of Cheap Silk Stockings.

WIVES, sisters, lady cousins, and aunts will be amused to learn that Swan laid the foundations of the artificial silk industry in his attempts to make better filaments for his lamps. In 1833 he introduced a new method of making these filaments, when he squirted cellulose through a tiny aperture and produced a long thread thereby. In 1835 he actually exhibited some doyleys made of these threads. These were the first artificial "silk" goods ever displayed. Unfortunately for him, the days of short skirts had not dawned, so he missed the 'bus which later men caught.

Oh! Clerk Maxwell!

A CORRESPONDENT of the "Electrician" produces a reminder that great men, even great mathematicians, have their lucid and tender moments. Let us not forget that the immortal author of "Alice in Wonderland" was a highbrow mathematician. Clerk Maxwell, who is known on the scroll of fame chiefly for his great electro-magnetic theory of light, occasionally descended to a lower plane and demonstrated his humanity. Here is one of his nonsense verses.

Romeo on the Wire.

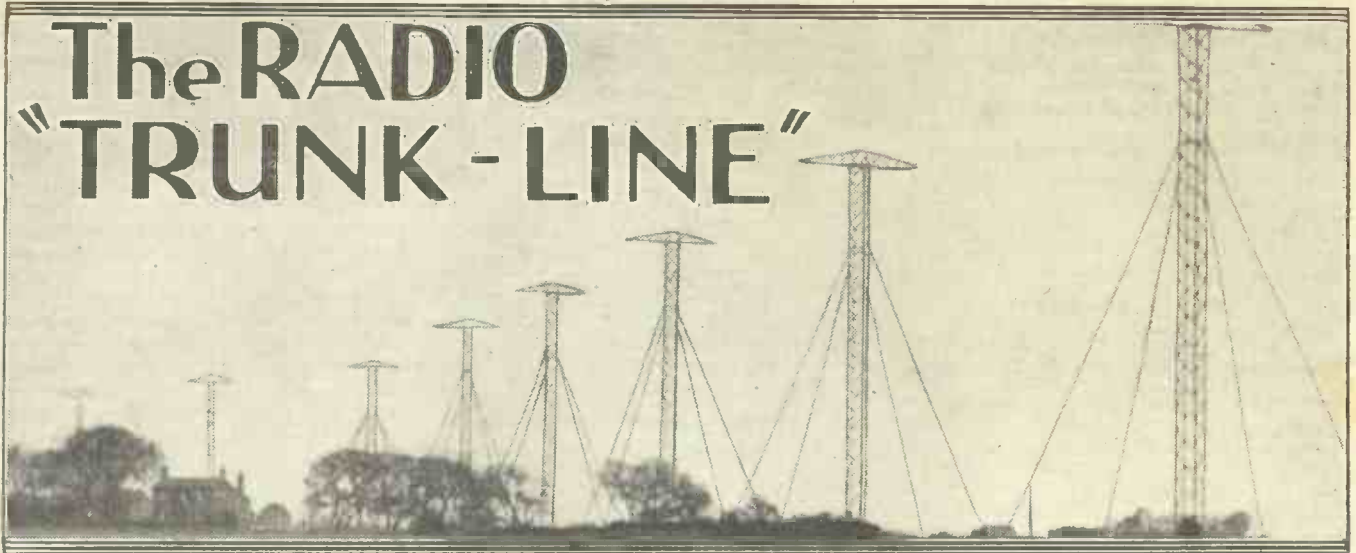
The tendrils of my soul are twined
With thine, tho' many a mile apart;
And there in close-coiled circuits wind
Around the magnets of my heart.
O, tell me when along the line
From my full heart the message flows,
What currents are indeed in thine?
One click from thee will end my woes.

"Worse Aerial—Better Results?"

THAT note of mine (October 27th) has not yet aroused the Valve Barts. in great number and I hope to hear from them. J. E. C. (Bournemouth), who says he discarded an outdoor aerial for an indoor one for DX work, describes his theory in the form of a parable, in which a cow, a bunch of starlings, a milkmaid, a thrush, and a chaffinch take part. Very amusing, but it does not explain, electrically, why an indifferently absorber of electro-magnetic energy, such as an indoor aerial, should be more useful for long-distance work than a comparatively good absorber such as an outside "inverted L" aerial.

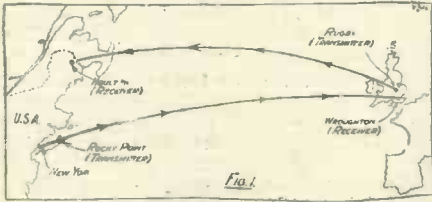
ARIEL.

The RADIO "TRUNK-LINE"



WHEN the London-New York wireless telephone service was first opened to the public, nearly two years ago, it was criticised on various grounds. In the first place it was said to be superfluous in view of existing telegraphic facilities both by cable and radio.

In the next place, it was too expensive—the public were not educated to it and would not risk paying the heavy fees demanded merely for the privilege of hearing distorted



speech mingled with atmospherics. Lastly, there was no secrecy—one's private conversation would be open to any listener who cared to tune in on a broadcast receiver.

In actual fact all these objections have proved to be ill-founded. The trans-oceanic trunk via the ether is carrying a steadily increasing volume of traffic, and has certainly come to stay.

The Reduced Charges.

During the first year over 2,300 conversations were recorded—about seven a day including Sundays and holidays. For the first two months the average was much higher—chiefly owing to the exchange of formal courtesies over the new ether link, and to what may be called "curiosity calls."

The summer months witnessed a falling-off, but a definite increase commenced in the following autumn, and has since been steadily maintained. On Christmas Day about 44 calls were made.

Since March of the present year the scale of charges has been reduced from £15 for three minutes' conversation between London and New York to £9.

This rate, it must be remembered, is only charged when definite connection is established as between the person calling and the person called. In this way the service is more satisfactory than the ordinary "number to number" connection made by our own telephone exchanges. If a particular person cannot be reached when the call is made, and the call is then

The giant Rugby Station is assuming an international importance and its activities are to be considerably widened. For some two years it has operated as a successful Transatlantic telephone link. Problems of secrecy and reliability are being tackled, and in the following article details of the latest systems used in the process of development are described.

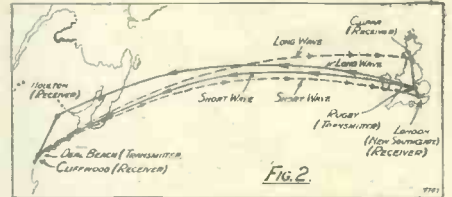
By J. C. JEVONS.

cancelled, the fee payable is a "report" charge of £1.

As regards secrecy, it is by no means an easy matter for any unauthorised person to listen-in to transatlantic trunk calls. In the first place the message is transmitted on a single side-band only. The ordinary carrier-wave, and one of the two normal side-bands, are eliminated before the message leaves the transmitting aerial.

Such a message can only be heard as intelligible speech on a receiver fitted with a local heterodyne and with special filter circuits to restore the missing components. In addition, an ingenious system of inverting the normal speech frequencies has been developed which will definitely baffle any attempt at unauthorised "eavesdropping."

In general, the quality of the speech transmission is extraordinarily high, quite as good, in fact, as that heard over any



long-distance land call. During the two mid-summer months atmospheric conditions were found to render clear speech impossible for an average of only two hours a day. During these times the service had perforce

to be suspended, but otherwise the lost time due to "static" has been amazingly small. The daily hours of operation now extend from 12.30 to 11 p.m. London time, or from 7.30 a.m. to 6 p.m. New York time.

"Static,"

In connection with "static," a long series of experiments has established the curious fact that the further North the receiving station is located the greater is its immunity from atmospheric disturbances.

Originally the incoming signals from Rocky Point in America were received at Wroughton as shown in Fig. 1, whilst the outgoing

(Continued on next page)



One of the engineers adjusting the radio-telephone modulation apparatus at the Rugby Station.

THE RADIO "TRUNK-LINE."

(Continued from previous page.)

English messages from Rugby were picked up at Houlton which lies far to the North.

A more favourable Northern location was therefore sought on this side, and Cupar has now been substituted for Wroughton as the English receiving station, as shown in Fig. 2.

The same figure also illustrates an alternative short-wave route which has been

"In connection with 'static,' a long series of experiments has established the curious fact that the further north the receiving station is located the greater is its immunity from atmospheric 'disturbances.'"

brought into operation as an emergency channel during the severe static season. Incoming channels are shown dotted, whilst the outgoing channels are in full lines. The English short-wave receiving station is located at New Southgate, near London, and co-operates with the American transmitter at Deal Beach, New Jersey. A similar short-wave transmitter has been

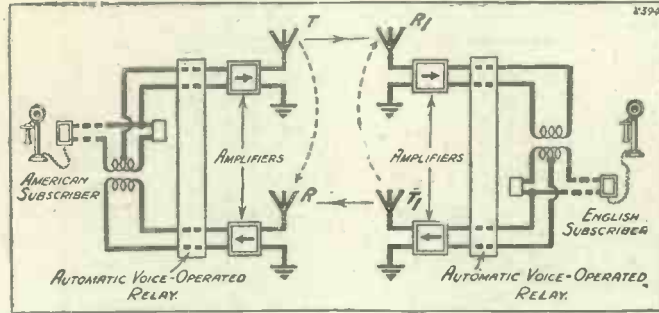
speech actually commences. This represents a considerable saving in power, especially as compared with ordinary broadcasting, where over two-thirds of the radiated energy is expended on the carrier-wave, which in itself carries no message.

The "suppressed carrier" system of transmission therefore enables the high-

in the technique of short-wave signalling promise even more startling developments in the not far-distant future.

The actual operation of the transatlantic 'phone presents many problems of peculiar difficulty. For instance, the telephone subscribers in America number at least 18,000,000, whilst we on this side boast of some two million.

During conversation a line wire on one side is connected to a corresponding line on the other side by a "radio link" covering three thousand miles of ocean. Varying atmospheric conditions cause the ether link in the chain to fluctuate enormously in its transmission efficiency.

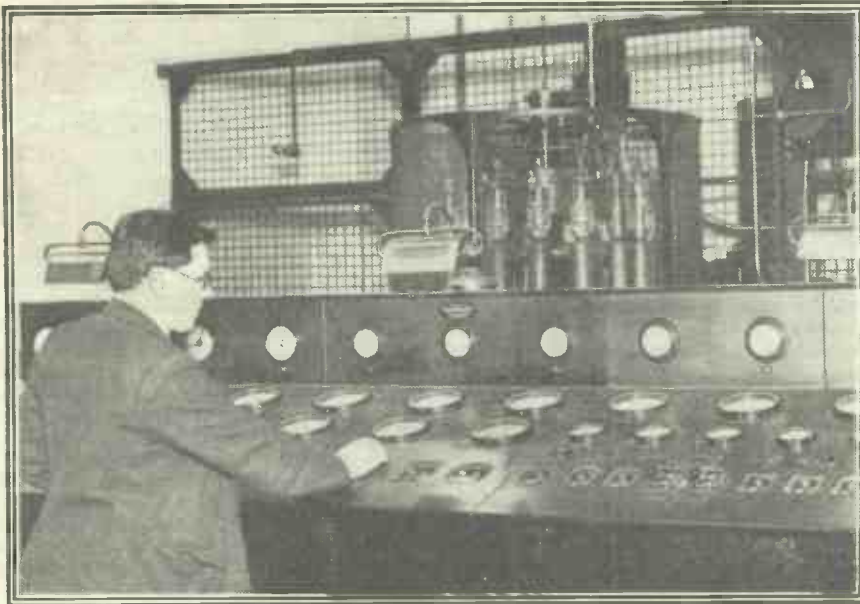


frequency power generated at the transmitter to be utilised three times as efficiently as in ordinary broadcasting, whilst by eliminating one of the two side-bands the efficiency is again doubled.

Extremely Efficient.

The use of a highly-directional aerial system both at the transmitting and

This causes fading and similar inequalities in signal strength, which vary at different times in the proportion of one to several thousands. In order to ensure a constant signal strength in the 'phones, the transmitters are always worked at full power, so as to give an ample margin, and the necessary regulation is then effected by adjustments made in the amplifying circuits connected with the receiving aerial to the subscribers' telephone.



This is the control table at Rugby. By watching the dozens of meters arranged before him the engineer can determine exactly what is going on at every point in the complicated apparatus used for Transatlantic telephony.

erected at Rugby to work with the Cliff-wood receiving station in America.

The Short-Wave Channel.

Long-wave working takes place on 60,000 cycles or 5,000 metres, whilst the short-wave channel is operated on 22 metres or 14,000,000 cycles. The short-wave stations are worked on the beam system. Owing to the high directional properties of this type of aerial, signal strength is increased more than a hundred-fold by comparison with non-directional transmission.

As previously stated, the ordinary carrier-wave is eliminated, so that no energy leaves the transmitting aerial until

receiving ends represents a further hundred-fold gain. Finally, taking into account the advantage secured by using the more favourable Northern location of Cupar, as compared with Wroughton, and the consequent freedom from static interference, it has been estimated that the present London-New York service has been made approximately 30,000 times more efficient, power for power, than ordinary broadcasting.

All this naturally represents the outcome of many years of accumulated experience and research. Amazing as the figures are, it must not be assumed that the radio-engineer has reached the limits of possible improvement. In fact, recent discoveries

LOUD-SPEAKER HINTS.

IF you have a powerful receiver and operate a large loud speaker, you may have been troubled from time to time by slight harshnesses creeping into the reproduction. Perhaps you have put this down to overloading the valve or to some other trouble in the set itself. At the same time it is quite possible that resonance in some article in the room may have caused it.

A cigarette-box may be standing on the top of the set and may be sympathetically resonating at its own frequency every now and then. There are all sorts of objects in a room (and not necessarily very close to the set) which might vibrate at certain frequencies from time to time. As a matter of fact, it is highly possible that there will be dozens of articles, large and small, vibrating, although it is only in exceptional cases that these vibrations will be great enough to be really noticeable.

Vases and other mantel-piece objects are prone to sympathetic resonance, as also are fire-irons, and small panes of glass in book-cases or china cabinets. If you have fairly sensitive fingers such vibrations can be easily discerned by lightly touching suspected objects. In some cases the only cure may be to remove the object entirely from the room. To obtain perfection of results, many more points besides this one of resonating objects would have to be attended to in the acoustics of the room, and although many amateurs may not feel inclined to go to the trouble of a patient investigation of all such effects, they will find it of interest to feel some of the objects immediately adjacent to the loud speaker. They will be surprised to find how much resonating energy can be developed.



MANY and considerable were the difficulties to be overcome before this set could be built, but the final product is one about which we feel a much greater degree of enthusiasm than we usually do about even the most promising of our designs. There is something extraordinarily impressive about a three-valver which can put up such a performance on test as this one has done, even though one tries to make due allowance for the fact that the H.F. valve is of the screened-grid type, while the L.F. is a Pentode.

Remarkable Results.

To give a general idea of its capabilities it may be said at once that on distant stations it gives results rather better than one would expect from a really good four-valve combination of a neutralised H.F. stage, detector, and two L.F. valves, bringing in station after station at really full loud-speaker strength when used on an average outdoor aerial, with perfectly simple operation, no neutralising adjustment, and selectivity much above the normal standard of a screened-grid set.

This last will be found a particularly valuable feature in modern crowded ether conditions, and will cause many to revise their ideas as to the possibilities of selec-

The arrival of the five-electrode valve—the Pentode—has marked a new era in valve-set design. Here is a real "hot stuff" three-valver using a screened-grid valve, det. and Pentode. All the snags have been removed by careful design. Designed and described by the "P.W." RESEARCH DEPARTMENT.

tivity with the screened-grid valve. The "Pentode" Three makes it possible for the first time in an ordinary home-construction screened-grid set to vary the degree of selectivity within quite wide limits, by making a very simple adjustment in the interval circuit, and so suit the exact needs of the moment perfectly.

Great Flexibility.

For example, for the reception of the local station you require fairly flat tuning to ensure the best possible reproduction and, in this set, good amplification. Then, when you want 5 G B a trifle more selectivity may be needed if you are close to the local station and have a fairly large aerial, and you can make the necessary change in a few moments.

Again, when you want to search for foreign stations you may require higher selectivity still if you live in a broadcasting centre (say within about eight or ten miles of a main station), and these conditions can be met with another readjustment on the H.F. transformer.

In situations well away from a main station, of course, you do not require such sharp tuning, but merely good amplification, and you would then use one of the intermediate adjustments unless you happened to find a couple of distant stations very close to each other in wave-length, requiring good selectivity to separate them.

Coupling the Aerial.

Just how this is done we shall see if we run through the circuit and note its special features. First, we shall see that the H.F. valve has the usual tuned grid circuit composed of a coil and variable condenser C₁, to which the aerial is auto-coupled, by placing it upon any one of three alternative tapping points. These points are terminals numbers 3, 4 and 5 on the six-pin socket of the aerial coil, and you will see on the wiring diagram that a flex lead from the aerial terminal runs to whichever of these may be desired.

(Continued on next page.)

COMPONENTS AND MATERIALS.

- 1 Panel, 14 in. × 7 in. × ½ in. or ⅝ in. (Any good branded material, such as Red Seal, Resiston, "Kay Ray," Ebonart, Becol, Trelleborg, etc.).
- 1 Cabinet to fit, with baseboard 10 in. deep (Raymond, Camco, Caxton, Lock, Bond, Gilbert, Makerimport, Pickett, Artercraft, etc.).
- 2 ·0005-mfd. variable condensers, slow-motion type or plain type with a pair of vernier dials (Cyldon "Log mid Line" condensers and Brownie dials in original. Any good makes, Lissen, J.B., Igranic, Dubilier, Peto-Scott, Raymond, Gecophone, Brandes, Bowyer-Lowe, Ormond, Colvern, Marconiphone, Utility, Burton, etc.).
- 1 ·0001 or ·00015 reaction condenser (Dubilier, Cyldon, J.B., Igranic, Ormond, Bowyer-Lowe, Peto-Scott, etc.).
- 1 On-off switch (Lotus, Benjamin, Lissen, Peto-Scott, Igranic, Burne-Jones, etc.).

- 1 Standard perforated screen, 10 in. × 7 in. (Burne-Jones, Paroussi, etc.).
- 2 6-pin coil sockets, unscreened type (Burne-Jones, Lewcos, Bowyer-Lowe, Peto-Scott, Colvern, etc.).
- 3 Sprung valve holders (Bowyer-Lowe, Lotus, Benjamin, Pye, Burndept, Igranic, Ashley, Wearite, W.B., Marconiphone, Redfern, Burne-Jones, B.T.H., Formo, Burton, etc.).
- 2 Mansbridge type condensers, any capacity from .2 to .5 mfd. (Dubilier, Lissen, T.C.C., Ferranti, Marconiphone, Hydra, Mullard, etc.).
- 3 Flash-lamp bulb type fuses, with holders (Burne-Jones, Hunt, or similar type).
- 1 H.F. choke (R.I.-Varley, Cosmos, Bowyer-Lowe, Climax, Igranic, Colvern, Lissen, Wearite, Burne-Jones, Marconiphone, Lewcos, Peto-Scott, Dubilier, etc.).

- 1 L.F. transformer of fairly low ratio (Lissen Super in set. Any good make, Ferranti, R.I.-Varley, Mullard, Igranic, Philips, Marconiphone, Brown, etc.).
 - 1 Pentode output transformer (Marconiphone universal type).
 - 1 ·001-mfd. and 1 ·0003-mfd. fixed condensers (Lissen, T.C.C., Dubilier, Igranic, Clarke, Mullard, Burne-Jones, etc. NOTE: The ·0003-mfd. condenser should be provided with grid-leak clips or a separate holder such as the Lissen or Dubilier).
 - 1 2-meg. grid leak (with holder if no clips provided on grid condenser. See note above). (Lissen, Mullard, Igranic, Dubilier, Pye, etc.).
 - 1 Terminal strip, 12 in. × 2 in. × ½ in. and 10 terminals. (Igranic Belling-Lee, Eclex, etc.).
- Wire, screws, flex, G.B. plugs, etc.

THE "PENTODE" THREE.

(Continued from previous page.)

This tapping is adjusted to suit the particular aerial on which the set is being operated, and also gives an adjustment of selectivity, although this is not the one to which we were referring previously. You will find that on an average aerial signals will grow progressively a little stronger as you transfer the aerial lead from terminal

Special safety fuses have been used to prevent damage in the case of excessive H.T. breaking down the gaps between the Pentode or S.G. electrodes.

3 to 4 and to 5, but tuning will be sharpest on 3, less sharp on 4, and least sharp on 5.

Thus, on most aerials No. 4 will be a good compromise, on a small aerial it will suit best to use No. 5, while a large one will usually call for the use of No. 3, especially for stations near the lower end of the tuning range.

How To Vary Selectivity.

It only takes a few moments to try out these tapings, and you will soon find the one which suits your particular requirements best. Of course, it is quite likely that the position of strongest signals and least selectivity (No. 5) is best for the local and 5 G.B. while No. 4 or even No. 3 may be helpful in getting the higher selectivity needed for picking out the foreign stations

the special feature of a readily interchangeable primary winding. It is this latter arrangement which gives us the power to get different degrees of selectivity in a very simple and easy fashion. By obtaining a few of these interchangeable primaries of assorted sizes it becomes the work of a few moments to replace one with another, and so change the whole character of the set to meet any particular requirements.

Each primary is a neat little ring-shaped coil, completely cased in, and provided with a three-pin fitting by which it is fixed to the side of the unit in a moment, each being clearly marked with its size.

Lest the reader may wonder why three pins are provided it should perhaps be explained that the transformer is intended for use with either a screened-grid valve of one of the ordinary type. With the latter a neutralising circuit would be used, when the extra connection is needed. With a screened-grid valve the neutralising and primary windings are placed in series, forming one large primary and so suiting the particular characteristics of the "S.G." type.

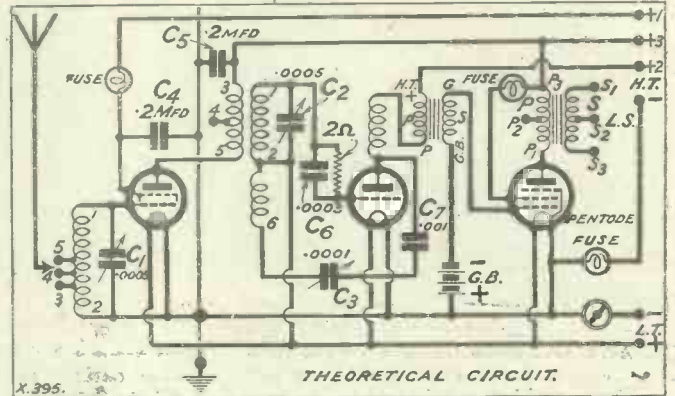
Do not assume from this, by the way, that either a screened-grid or ordinary valve can be used in the "Pentode" Three. It is definitely arranged for the S.G. type, and the connections would require to be altered slightly, and a neutralising condenser added if an ordinary valve were to be used.

You could do this if you wished, of course, but the amplification would be lower, and you would have the slight drawback of a neutralising adjustment to carry out.

Now we come to the L.F. stage, and the first thing we note is that transformer coupling is used, and since the whole of the amplification is carried out in this one stage it is obvious that it is more important than usual to choose a really good transformer and ensure the maximum magnification. The actual L.F. valve is, as the reader will have gathered, one of the special new type known as a Pentode, which gives something like as much amplification as two L.F. stages of the usual R.C. and transformer type.

This valve has been on the market for some little time now, yet this is the first set specially designed for it to appear in "P.W." for reasons explained in a recent short article entitled "The Pentode," in which it was pointed out that this valve

definitely called for a certain amount of experimental work to overcome certain difficulties and elucidate various points before it could be used to the full advantage, and until this had been done we had no intention of presenting a design to our readers. We have now arrived at a point where we feel we can release a design



with a confident expectation of entirely satisfactory results in our readers' hands.

The difficulties which we have found with the Pentode valve were mainly these: First, a special output device appeared to be necessary to suit the average loud speaker and make allowance for the very high impedance of this valve. Secondly, there was the question of safety devices. This is of considerable practical importance, since experience has shown that with valves of complicated internal construction there is a distinct risk of a jar causing some of the electrodes to touch and produce a disastrous "short" if no precautionary measures are taken.

Saving the Battery.

Now, it should be explained right away that the object of using such precautionary measures is not to save the valve from damage: to cause a "short" it may be assumed that the valve is already ruined, and there is no need to worry about it any more. What we want to do is to save the H.T. battery, and we have found that this can be done quite adequately by using judiciously the simplest of fuses, namely, the flash-lamp bulb type.

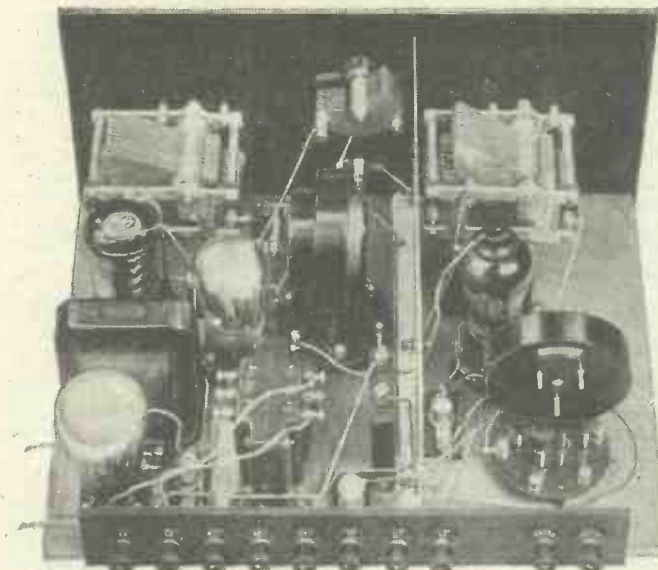
The proper placing of fuses of this type is not so simple a matter as one might think. In simple sets a single fuse between

Range—volume purity. All are exemplified in the "Pentode" Three—the set of the season.

H.T. — and L.T. — gives quite a good measure of protection, but where Pentode and screened-grid valves are used we have found it wise to use others in certain of the positive leads as well. The reason is that it is possible for "shorts" to occur between positive tapings of different voltage, which do not affect a fuse in the negative lead.

In the present set, therefore, you will see that there are actually three fuses in all, and it is thus very well protected against possible trouble due to internal faults in valves, forgetfulness in disconnecting the H.T. when doing anything inside the set, and so on.

(Continued on next page.)



The "Pentode" Three ready to pull in the stations for you—and it DOES pull them in, too!

if you are in the intensive interference area of your local station.

It is when we come to the H.F. coupling circuit between the H.F. valve and the detector that we find the main selectivity adjustment, however. Here, and for the aerial coil also, we have used the new Lewcos six-pin coils, which we find to be of decidedly high efficiency.

The intervalve coupling scheme is actually an H.F. transformer which incorporates the necessary reaction winding, and also

THE "PENTODE" THREE.

(Continued from previous page.)

We should like to explain, before leaving the subject of fuses, that there is no need for the reader to be unduly alarmed by all this talk of the risk of short circuits inside certain types of valves. The risk is there, and should be provided for, but after all, a defect of this nature is a rare thing, and it is merely because its effect on the H.T. battery can be so disastrous that due care is necessary. Actually, of course, such defects in screened-grid and Pentode valves are only liable to occur as a result of pretty rough handling, in the post, for example.

The third point considered to require investigation in connection with the

siderable current is required and provide a battery of adequate size.

After all, this is only reasonable when we remember the really extraordinary amount of amplification which the valve will give us; we must be prepared to pay a reasonable price in current for such performance.

We have found it necessary to cover the more theoretical aspects of this set rather fully, since it contains so many unfamiliar features, but the reader has now the satisfaction of feeling that he understands the "whys and wherefores" pretty thoroughly. So far as the constructional work is concerned there are only a few points to

be dealt with.

First, note carefully how the two coil bases are placed, and take pains to do likewise, so that your coils may be correctly placed in relation to each other and to the screen.

Next, observe that one of the new standardised perforated screens is used, so that you have no drilling or other awkward work to do. All that it needs is to be screwed down in place. By the way, don't forget that all the leads which run through the screen must be of insulated wire (Glazite, or ordinary bare wire with Systoflex sleeving) to obviate

risks of short circuits.

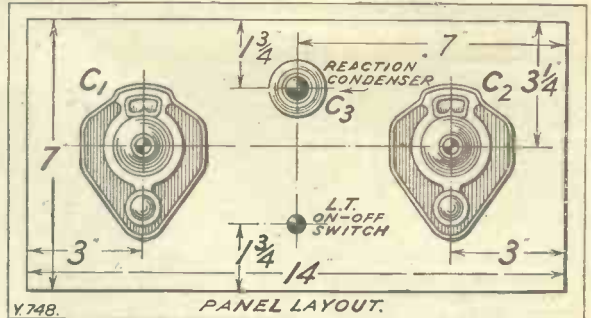
Also, note carefully that at three points a screw and nut is inserted in the perforations in the screen and connections made thereto to complete various "earthed" circuits. You will find these points quite clear on the wiring diagram.

Just one other constructional hint. Drill the hole in the panel for the reaction condenser, but do not fit it in place until near the end of the wiring-up process. You will find it much easier to make the connections to the on-off switch if you do this part of the wiring before fitting the reaction condenser in place.

This completes our consideration of the constructional work, and the reader is now in a position to go ahead and complete the receiver. Now for operating details.

If it were not for certain matters of coil adjustments, H.T. voltages, and one or two other matters, there would be no need for this section at all, for the

simple reason that operating the set is so easy that no particular instructions are necessary. The "Pentode" Three is almost



certainly the easiest set of the H.F., Det. and L.F. type which has ever appeared in "P.W."

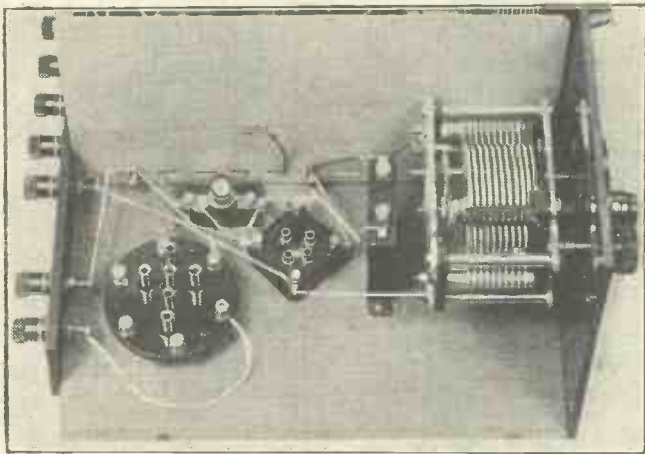
There is no neutralising adjustment, reaction control is very sweet and smooth, and it is a simple matter to move the two tuning dials in step with each other (you hear a slight crackle of atmospherics and general sound of liveliness which will help you to learn the trick of this), keeping the set just below the oscillation point as you do so, and we think you will be delighted at the easy way you can rake in the foreign stations in the process.

Equal to a Five?

The actual range and power of the set is really rather extraordinary when one remembers that it boasts only three valves, so much so that observers little given to extravagant praise have pronounced it the equal of many a five-valve set of the normal type using ordinary valves.

This is probably a slight over-estimate of its powers, for we believe that a good modern five-valver would win pretty easily, yet it is probably quite true if the comparison is with a "five" of, say, a year ago. Among up-to-date receivers it can probably be compared best with a really good four, to which it should be slightly superior in almost every respect. (Very decidedly so in case of handling, of course!)

(Continued on next page.)



The H.F. end is carefully, but simply screened, and the tuning of the set is simplicity itself.

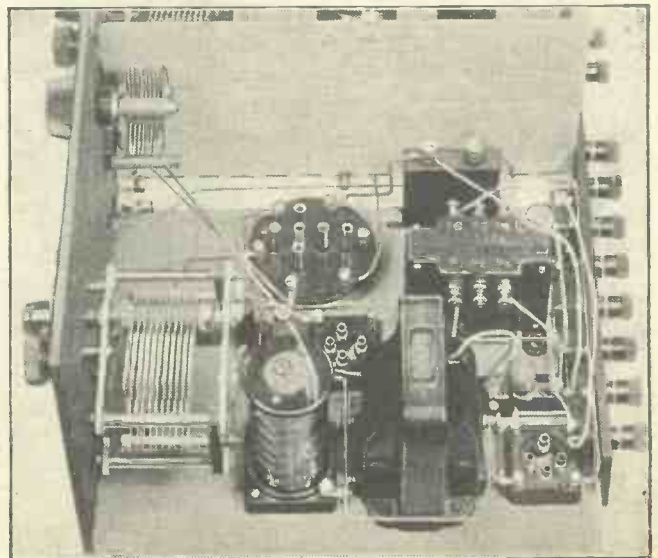
Pentode was the question of H.T. consumption. An examination of the makers' curves indicated that under the normal recommended conditions the anode current was pretty heavy, very much the same, in fact, as that of an ordinary super-power valve. To give some figures, it was found that with 100 to 120 volts H.T. the valve took about twelve milliamps, or even a little more, depending, of course, upon the exact amount of grid bias applied.

This is a rather heavy drain upon the H.T. supply, and means that if a dry battery is used it must be one of the larger capacity type. Since this seemed something of a drawback from the point of view of the ordinary listener we investigated ways and means of cutting it down, noting what sacrifice of efficiency resulted.

How Much Current?

It has been suggested in various quarters that the Pentode can be worked more economically by reducing the amount of H.T. on the extra ("screening") electrode, i.e. on the special terminal on the valve base, and we have found that it is true that by applying, say, 100 volts to the plate and only about 60 to the extra terminal the valve can be made to work on perhaps 6 milliamps, but the full benefit of its remarkable amplifying powers is lost.

The reduction in efficiency, i.e. in actual amplification and also in quality, is noticeable, and it seems that we must make up our minds that to get the full results we must face the fact that a con-



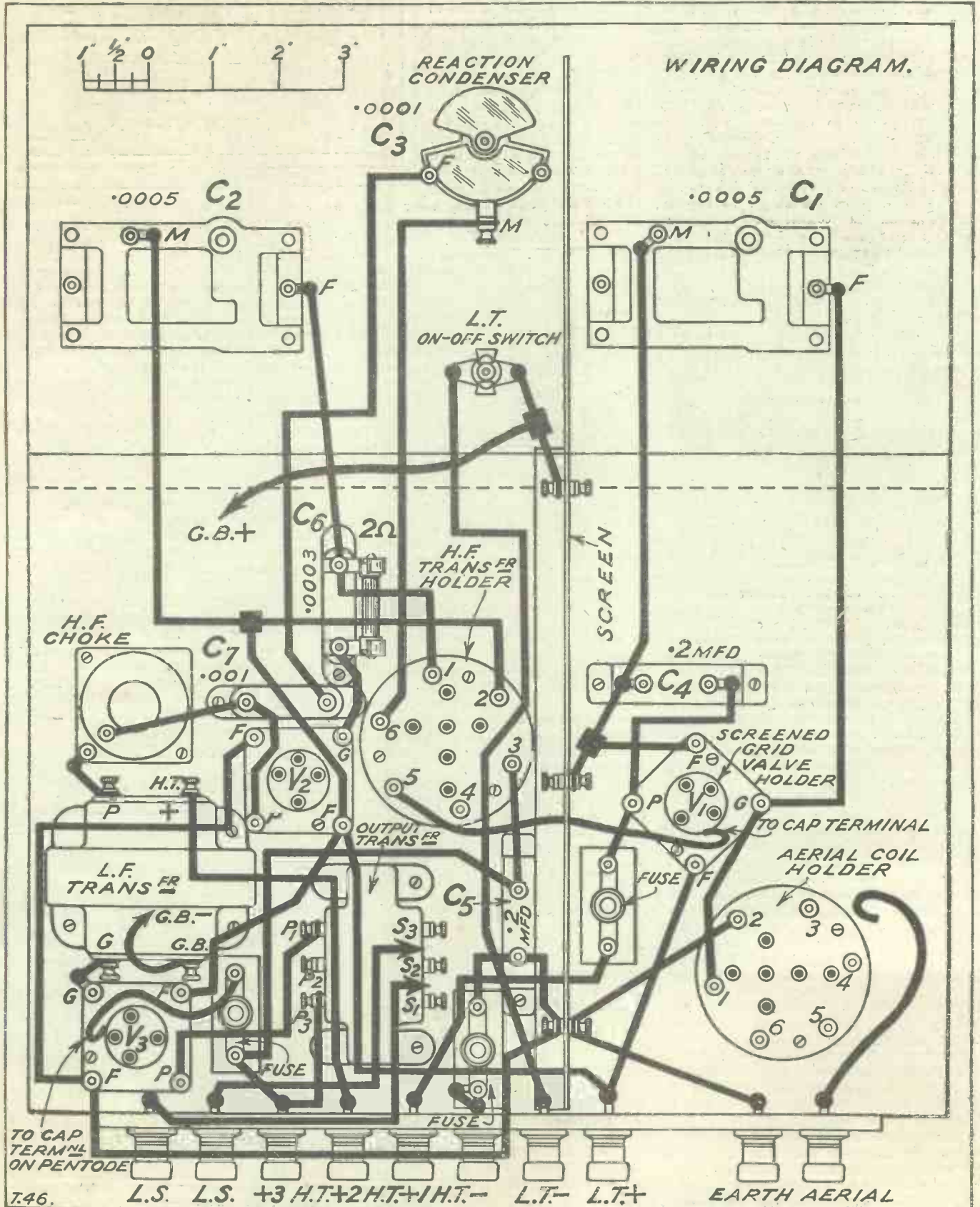
Where the signals are finally boosted up on the L.F. end of the set, showing the special output transformer.

THE "PENTODE" THREE.

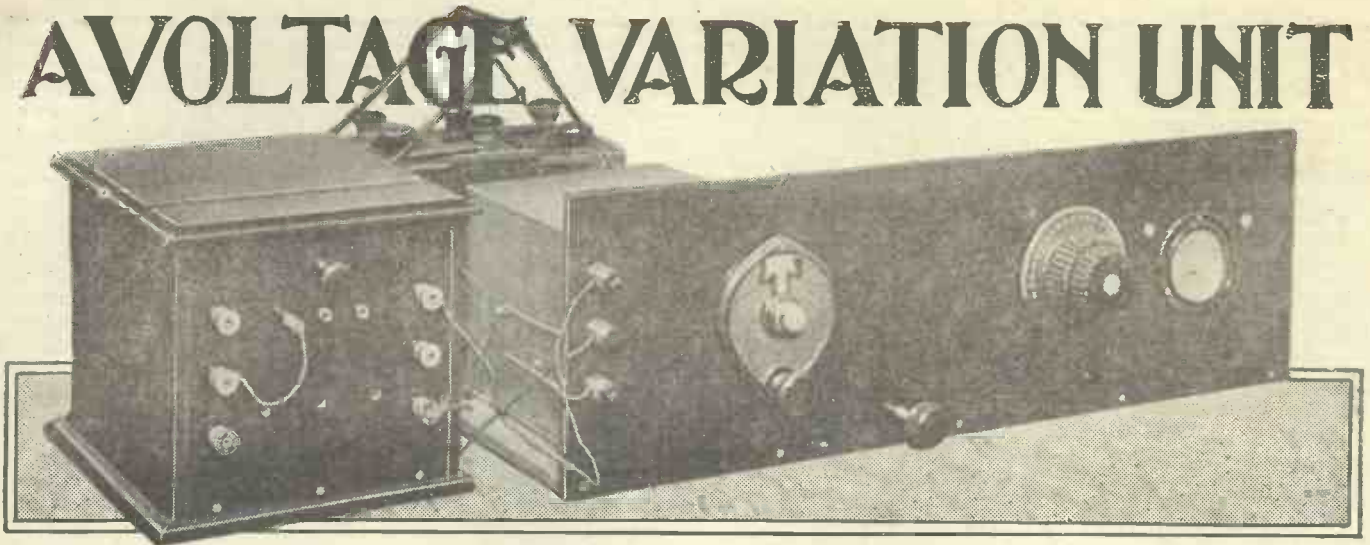
(Continued from previous page.)

The first adjustment required to get the very best from the set is a simple one—namely, the aerial coupling. There is a flex lead provided in the set running from the aerial terminal to any one of three terminals on the aerial coil socket, and this gives you

the means of suiting your conditions very closely. By trying the flex lead on terminals Nos. 3, 4 and 5 in turn, you will soon find one which suits your requirements, but we shall be going into all these points more fully next week.

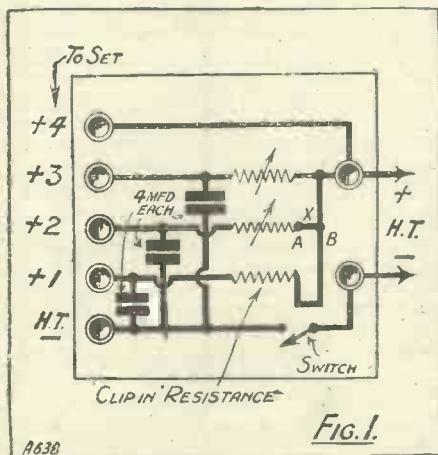


A VOLTAGE VARIATION UNIT



THE great and almost the only advantage of the H.T. accumulator is that it gives a perfectly silent supply of high tension, at a voltage that is to all intents and purposes constant. Both points of importance, especially the latter, to the experimenter and research worker.

A drawback that the ordinary listener finds with this type of H.T. supply, when working a set with several H.T. tappings, is that the battery is discharged unevenly.



Especially when using S.G. valves, H.T. smoothing and close voltage variations are essential. Here is a unit which provides both, even when batteries are employed.

By C. P. ALLINSON, F.Inst.P.Inc., A.M.I.R.E.

battery, a needless extravagance. So I made up a little unit containing several variable and fixed resistances to allow of various voltages being obtained.

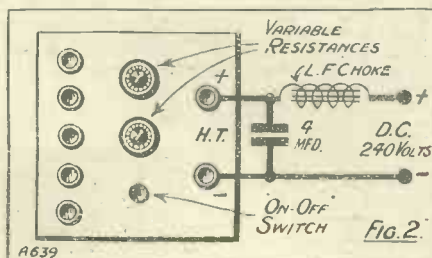
The circuit diagram is shown in Fig. 1, from which it will be seen that two variable and one fixed resistances are included, thus giving three H.T. voltages differing from the maximum available.

The variable ones are exceedingly useful for H.F. work. One for a screening grid for instance, and the other for actual plate voltage, while the third can be used for a detector, oscillator, separate reactor, etc.

Prevents Motor-Boating.

The resistance is mounted in clips and easily interchangeable. If I am in doubt as to what value to use, I use one of the variable resistances, and adjust it till I get the desired conditions. Then I measure the value of the resistance as set, with a megger, and then insert the nearest fixed resistance I have in the holder and connect up to it.

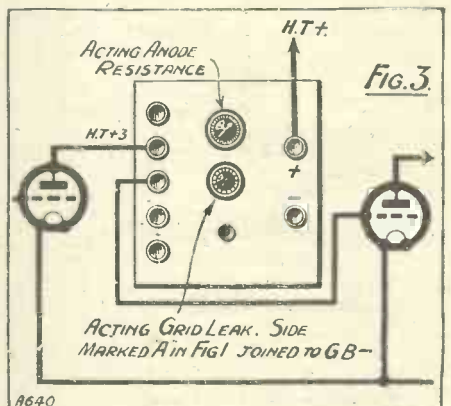
When using D.C. or A.C. mains for H.T. it will further be seen that this unit forms a very useful anti-motor-boating unit, with the advantage of being able to reduce the values of the resistances to the lowest limit, which will give the desired separation of H.T. feed, without unduly cutting down the voltage.



Also, in an emergency, it can be used in conjunction with a good choke and a big condenser, to enable H.T. to be obtained from D.C. mains, when the eliminator usually employed is in use elsewhere. Fig. 2 shows how it is connected up.

Some Further Uses.

By connecting an L.F. choke across the clip-in resistance base a maximum H.T. tapping with extra smoothing is provided, if desired. It is not advisable to short this resistance out entirely, for should a short-circuit occur across the H.T. circuit somewhere in the set, the mains would be shorted.



The portion of the battery which has the greatest demands made on it is usually the least visible, and it begins to give trouble before anything is noticed, unless the battery is very carefully looked after.

At the best of times, H.T. accumulators require careful attention; and I find that this question of unequal discharge is quite an important one nowadays, when screened-grid H.F. valves are used, with the screen taking quite an appreciable current.

Series Resistances.

Some time ago I came to the conclusion that something would have to be done about it, and a method of obtaining an even discharge would have to be found. I finally decided to follow eliminator practice in which a common source of H.T. is made to supply different voltages, either by the use of a potential divider, or else by the use of series resistances.

Obviously a potential divider would be unsuitable, since this would place a constant drain of about 5-8 milliamps on the

This can be avoided by connecting a lamp in series with the positive lead, but this, of course, will cut down the voltage a bit.

Lastly, the unit can be used as a resistance-capacity coupler at a pinch for power work, by breaking the lead between points A and B, marked X in Fig. 1, and connecting it up as in Fig. 3, and this arrangement gives you both anode and grid resistances variable, thus enabling you to get almost any desired characteristic from the amplifier suitable for use in conjunction with the particular valve you are using. By putting terminals for A and B on the panel, the change can be made very quickly by removing the strap normally connecting them together.

Since the resistances used are of the power type, the unit can be employed for the above purpose with big valves of the L.S.5B. type, or similar valves which pass heavy-plate current.

COMPETITIVE BROADCASTING.

Television from the Continent—Running Commentaries—The Second Regional Station.

By THE EDITOR.

AS a result of the B.B.C.'s refusal to co-operate with the Baird Television Development Company, it was recently announced that arrangements are being made by those interested in the development of television, and also those interested in providing an alternative service to the B.B.C., that broadcasts may soon commence from the station at Scheveningen, in Holland, and listeners in this country would therefore be given, not only alternatives to B.B.C. programmes, but also a series of television broadcasts.

Whether this scheme will ever come to anything remains to be seen, but it has certainly provided a topic of interest for those who have watched the development of the negotiations between television interests, the Post Office, and the B.B.C.

More Details Wanted.

Unfortunately, of course, there can be no proper criticism of this scheme until more facts are available; for example, the wave-length and power to be used by the station at Scheveningen. We understand that the old station at Scheveningen is not a particularly powerful one, nor particularly up to date, but doubtless, if the scheme goes through, alterations and improvements will be made, and the power increased sufficiently to guarantee good reception in all parts of this country—in which case, of course, the station would have to be a pretty powerful one.

Should television broadcasts transpire, then, from Scheveningen, listeners in this country will have an opportunity of judging for themselves whether the B.B.C. was right or not in giving adverse reports after television tests. It is possible, of course, in fact in our view highly probable, that when television broadcasts do begin, unless there has been some radical development as regards the frequency band of these television transmissions, interference will be caused on other wave-lengths, and the *Union Internationale de Radiophonie* will have something to say about the matter.

However, all is more or less speculation at the moment, and beyond rather excited newspaper reports which we have seen, we have no definite authentic information as to how far these plans have progressed or whether they are likely to come to fruition.

Running Commentaries.

Our readers will remember that in last week's *POPULAR WIRELESS* one of our broadcasting correspondents reported the fact that arrangements have been made for a re-continuation of running commentaries on Association football matches of the English League, and that the first of these commentaries will take place on Saturday, November 24th, when Aston Villa play the Arsenal at Highbury.

Another commentary will also be given on the same ground when the Arsenal play Manchester United a fortnight later. Arrangements have been made only to

broadcast the second half of these games. Many of the English clubs objected last year to the broadcasting of these running commentaries on the grounds that people who could stop at home on a Saturday afternoon in comfort and listen to a vivid description of the match were less inclined to visit the football field. In other words, they suggested that gate money was severely affected.

Illogical Argument.

This seems a very illogical argument because, as we pointed out last week, they might just as well say—and with even more justification—that people stop away from football matches because they know that within an hour or so after the match they can read a full and vivid description of the game in their evening newspaper.

However, it seems likely that the popular



This portrait of H.M. the King was sent via wireless by the Fullograph method when the B.B.C. commenced its tests of the system. The dark marks on the forehead were the result of atmospheric conditions, which were particularly bad during the transmission.

broadcasting commentaries will be continued throughout this season, although listeners will only have an opportunity of hearing the second half of the game described.

We suggest it would have been much more satisfactory to broadcast the first half

of the game, for, even then, many listeners might have got so excited as the first half proceeded, that perhaps they would have dashed off to the ground in order to see the second half! Little points like these sometimes make a lot of difference, and we are surprised that the B.B.C. and the Football Associations concerned have not thought of this.

The Second Regional.

It appears quite likely that the new high-power station for the North will be in the Barkisland area, near Sowerby Bridge. This is in Calderdale, in the neighbourhood of Blackstone Edge, a part of the Pennine Range.

The site will be fairly near to Manchester, and it has been pointed out by the wireless correspondent of the "Leeds Mercury" that both these towns are likely to obtain excellent signal reception, but that if the regional station is built on the proposed site, the result would be of serious consequence to a large portion of the West Riding country and to listeners residing in that district.

The "Leeds Mercury" suggests that if circles were drawn round Sowerby Bridge, representing distances of five and ten miles, it will be found that a greater part of the first circle will represent the wipe-out area defined by the B.B.C. as the area where the signal strength is so great that it is impossible, however selective the receiver, entirely to tune out the signal in favour of another and more distant one.

This first circle represents no "sparsely populated district"—the condition laid down by the B.B.C. themselves as necessary where their regional transmitter should be erected. In fact, this district is very thickly populated: it contains, for example, the County Borough of Halifax.

According to the Leeds correspondent, a large proportion of its listeners are valve-set owners.

Good-bye "DX."

The second circle drawn to include places ten miles from the proposed station, would represent an area where a multi-valve set would be required in order to let the listeners receive distant stations. In this circle will be found the big towns of Bradford and Huddersfield, and a very dense population.

The result of the station, according to the paper we have quoted, would be that these listeners in the second circle would be treated as crystal-set users and, as it is maintained that they are very keen enthusiasts, spending a lot of money on up-to-date valve sets, there is likely to be considerable objection if the B.B.C. goes ahead with its proposed regional station on the Barkisland area site.

Altogether, the reasons to be quite a number of sound, logical objections to the proposed site, and we hope the B.B.C. will give the matter further consideration before definitely going ahead.

NEXT WEEK

The first of a Special Series of Articles on:

How to Make Loud Speakers

2 D A'S RECEIVERS



WORK at the POPULAR WIRELESS experimental station is naturally not confined to only the short-waves. Observations and experiments have frequently to be made on the broadcast wave-lengths, while it is quite a usual state of affairs for reception to be maintained for about a week on wave-lengths as high as 25,000 metres.

Quite recently, for instance, a good deal

A considerable amount of reception research is carried on at the "P.W." Experimental Transmitting Station, and in this article are described some of the sets used.

By THE ENGINEER-IN-CHARGE.

effects between the valves. Resistances and condensers connected like this should form part of every receiver which works from an H.T. supply possessing either a large internal resistance—such as dry batteries have—or a natural frequency of its own—as is the case with the filter of an H.T. mains unit. The whole object in using this arrangement is to prevent either high- or low-frequency currents getting into the source of H.T. supply and setting up undesirable oscillations.

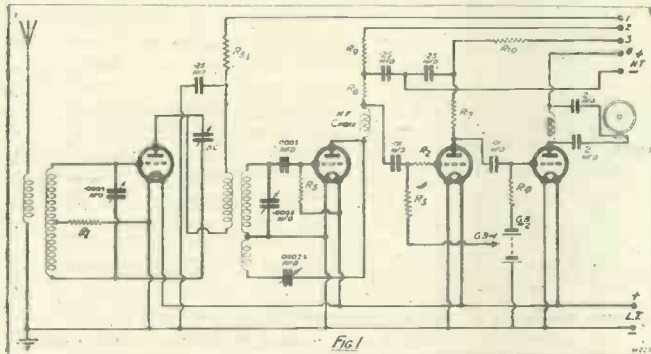
voltage dropped in them. Partly for this reason the size of the resistances is decreased where the valves take more anode current, but actual experiments at 2 D A have shown that it is better to have all the resistances as large as is feasible, while .25 mfd. is the smallest value for the shunting condensers that may be relied upon to be definitely effective. It is much safer to use something in the neighbourhood of 1 mfd.

Valves of 30,000, 10,000 to 20,000, and 2,000 ohms are used—in that order—with 150 volts H.T. on the first three, and 210 on the last which has been found to give excellent results. Unfortunately, the H.T. consumption of the last is rather heavy, and unless a mains unit is used, it is certain that expenses in connection with the H.T. supply will mount up. It used to be a general custom to run old D.E.5a valves at H.T. voltages sometimes as much as double the rated maximum. With the modern output valves this is not necessary.

No Distortion.

At the rated maximum of 180 volts H.T. a Kone loud speaker can be worked at full volume without any trace of distortion due to overloading of the valve. The grid swing at 180 volts H.T. is approximately 36 volts—quite large enough for all normal

(Continued on next page.)



This is the circuit of a 2 D A set. The values of the various resistances are : R₁, 100,000 ohms; R₂, 1 meg.; R₃, R₄, 2 meg.; R₅, 1.5 meg.; R₆, 250,000 ohms; R₇, 100,000 ohms; R₈, 50,000 ohms; R₉, 30,000 ohms; R₁₀, 15,000 ohms.

of reception was done on about 100,000 metres in observing and comparing the intensity of atmospherics. On a high wave-length, such as 100,000, atmospherics—particularly the "grinders"—lose their familiar gruffness and frequently take on a not unpleasant low musical sound! This is probably because they are being received more or less on their fundamental wave-lengths, whereas atmospheric interference as experienced on broadcast wave-lengths is set up by shock-excitation.

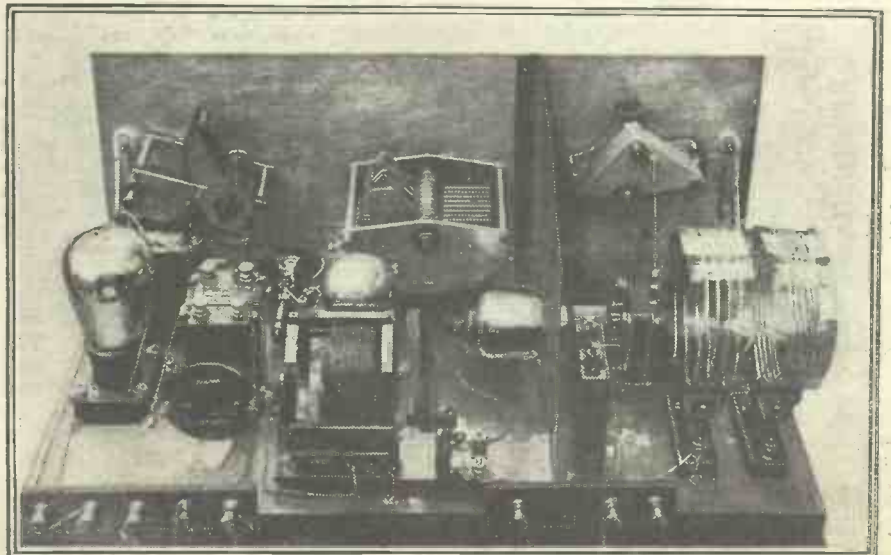
However, all this is by the way, for it was originally intended to describe the station's permanent receiving apparatus, and not the actual experimental gear—which is, of course, always changing.

Designed for Quality.

The station's broadcast receiver is designed for good quality loud-speaker reception up to 150 to 200 miles, and consists of a stage of neutralised H.F., detector and two stages of low-frequency resistance-capacity-coupled amplification.

The circuit used (shown in Fig. 1) is quite straightforward, but it will be noticed that an arrangement of series resistances and shunting condensers has been placed in each H.T. lead. This is merely to prevent motor-boating and undesirable coupling

Provided the series resistances are not too large, it is unnecessary to increase the H.T. voltage in order to compensate for the



The short-wave receiver used at 2 D A covers the 13 to 200-metres band, and consists of a transformer-coupled stage of screened-grid H.F., Detector and one L.F.

2 D A's RECEIVERS.

(Continued from previous page.)

requirements. As a matter of fact, a P.625A was for some time run at 250 volts, H.T. during a test at 2 D A, and although it stood up to this quite all right, it "ran" very warm indeed; in fact, it was not possible to bear one's hand on the glass bulb!

Apparently there is little advantage to be gained in running the valve above the maker's specification like this unless phenomenally powerful loud-speaker results are required, so that the valve has to accommodate exceptional grid swings.

The P.625a has a very low impedance (1,750 ohms), so that great care must always be taken not to alter the grid-bias values or otherwise break the grid circuit while the H.T. is applied.

Very heavy H.T. currents will flow if by any chance the grid negative is reduced in this way, and the valve will suffer.

Saved by a Fuse.

At 2 D A recently the grid circuit was accidentally broken, and had it not been for one of the excellent fuses incorporated in a Ferranti 0-50 milliammeter, which was in the anode circuit, the valve would certainly have been damaged.

It is, perhaps, interesting to note that this four-valve receiver will work for 280 hours at a total cost of 1½d. The mains unit and the charging apparatus for the accumulators are worked off the "heating" mains, which are rated at 1½d. a unit. Readers would do well, though, to make sure of the conditions applying to the use of their "heating" mains before they use them for the power supply of their sets, as in most cases such mains are definitely "for heating purposes only," and it is assumed that the H.T. of a wireless set



The station's four-valve broadcast receiver is self-contained in a cabinet. The accessibility of the set and its batteries is well illustrated by the above photo.

comes under the "power" rate—which is dearer. L.T. eliminators should surely come under "heating" rates, though, as the current they take from the mains is used for HEATING the filaments of the valves.

A Moot Point.

Going a step further, of course, it might be said that accumulator charging gear may be worked off the "heating" mains as the accumulator is simply a convenient means of



When closed up the cabinet containing the broadcast receiver forms an attractive piece of furniture.

conveying energy from the mains to the filaments of the valves. However, that is a point which does not appear to have cropped up as yet, and goodness knows what the Electricity Commission will say when it does!

For compactness and neatness the whole set is fitted into one of Messrs. Pickett Brothers' magnificent "Radiola" bureau type cabinets. This cabinet, which is of beautifully finished mahogany, is in itself a fine piece of furniture and would enhance the appearance of any drawing-room. It will be seen from the photograph that ample cupboard space is provided for the accumulator, grid-bias battery and the Benjamin H.T. mains unit; while, if necessary, it would be quite possible to put a moving-coil loud speaker in as well.

For Short Waves.

For the short waves—below 200 metres—a separate three-valve receiver is used at 2 D A. This employs a stage of screened-grid H.F., detector and a transformer-coupled L.F. stage. The photograph shows this receiver very clearly, and it will be noticed that the set has a metal baseboard as well as a metal panel in order to ensure perfect screening. Recently, the last valve has been replaced by a pentode, but in all other ways this set is the same as one used at 2 D A when it was described in "P.W." some weeks ago.

WHY VALVES GROW BIGGER.

IT does not seem very long since dull-emitters were first introduced, and sceptics doubted whether they would ever replace their brighter brethren. We were warned of their excessive fragility, and perhaps we heard stories of "poor tone" being obtained from them.

They soon became well-established, however, and then the .06 amp. filament and the tiny "peanut" valve came on the scene, and we began to wonder how much smaller they would get before they reached finality.

Higher Consumption.

Then the dull-emitter power valve, which may almost be said to have marked the starting point of good loud-speaker reproduction, made its appearance, and its filament consumption steadily decreased as successive models were produced.

Yet to-day, a glance at an up-to-date valve guide reveals new types of power valve rated to consume up to an ampere of filament current, and requiring as many as 300 volts on the plate, the plate current in some cases being almost sufficient to heat the filament of a .06 amp. dull-emitter. What is the reason for this recent increase in the current consumption of valves?

It is not that valves are less efficient than they used to be, but that the output required from the last stage of a modern receiver is very much greater than in the past.

The reasons for this are not far to seek.

For one thing, we have now got types of loud speakers which are capable of reproducing the volume of sound actually existing in the studio, without rattling or seriously distorting. It is obvious that speakers of this type (such as the moving coil, and one or two makes of cone) require an amount of power to operate them which has hitherto been associated only with public address systems.

Avoiding Overloading.

Another, though not entirely distinct reason, which is an indication of the very creditable lines on which the radio art is advancing, is that the British amateur—more possibly than the amateur of any other country—appreciates what really good reproduction means. He realises that good quality is the most important attribute of a receiving set, and that this can only be obtained from a receiver in which there is an ample reserve of power in the later stages.

There must be a very high factor of safety if there is to be no harshness on occasional peak notes, and this margin is only obtained by employing valves which are normally very much "under-run," but which can deal with the sudden peak loads produced, for instance, by the crash of a full military band on a particularly loud passage.

Although every enthusiast will welcome reductions in the operating costs of a receiving set, such reductions should never be effected at the expense of power-handling capacity.



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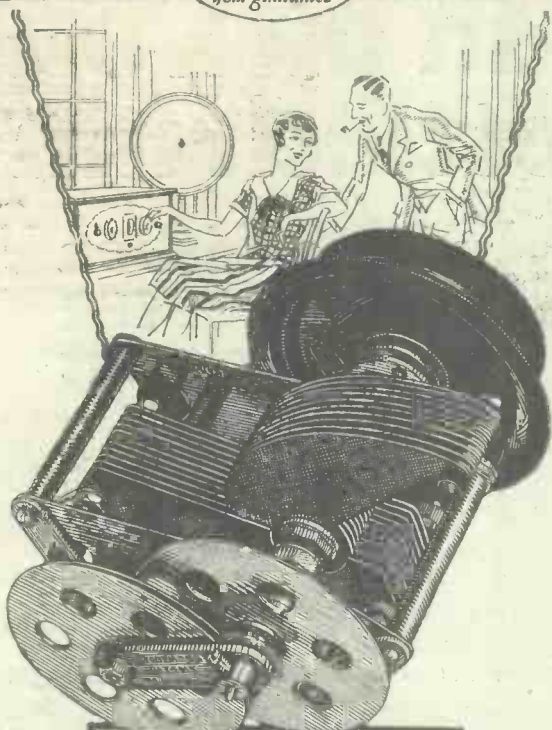
For all ordinary purposes this Lissen Transformer at 8/6 has proved itself the equivalent of many at double the price, and its popularity has been reflected in huge sales. In the two years since it was introduced, it has earned the title of "the transformer that never breaks down." Ratio 3 to 1 **8/6**

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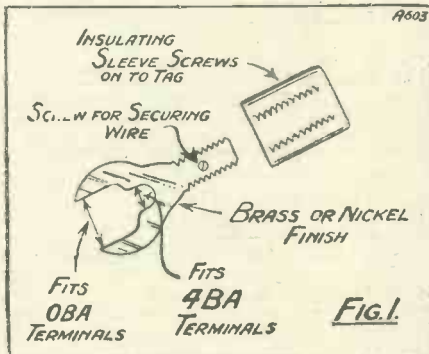


THE wireless experimenter's work is greatly facilitated if he has by him for immediate use a large number of leads of every description. I have, after many years, I flatter myself, reduced this question of leads to a fine art.

They come under three divisions:

1. Long leads suitable for batteries, loud speakers, and loud-speaker extensions, meter leads, and leads from electric-light sockets for use with eliminators;

2. Short leads of various lengths fitted with spade tags at each end for connecting up odd pieces of apparatus. By having a large number of these at hand they can be used for the actual wiring up of an experimental receiver;



3. Various short leads provided with spring clips at each end. These are extremely useful for making temporary connections that you wish to change over during the course of your work, while they are also valuable for experimental receivers where components are used that have no terminals fitted.

Meter Leads.

Another set of long leads which is also useful is a set specially designed for use with meters. These should be heavy, well-insulated leads. For voltmeters the leads should be fitted with brass spikes inside insulating handles at one end, and with good, solid spade tags at the other. A type of tag very useful for meter work on account of the fact that it gives good contact under different size terminals is illustrated in Fig. 1, while in Fig. 2 is shown the construction of the brass spikes referred to above. Two equal lengths (about 6 in.) of 1/4-in. diameter brass rod are tapered off to a point at one end, while a 3/32-in. hole is drilled up it at the other end for about 1/2 in., and another hole then drilled in from the side at an angle to meet it.

About half of the hole drilled up the centre of the rod is then opened out so as

It does not take long to make a number of flexible leads, but you will find that they save time and trouble when testing and experimenting with a radio receiver. Properly arranged leads are also strongly recommended for ordinary battery and other such connections.

By P. C. BAKER.

to allow the wire which is being used for the leads to enter, while a fair-sized flat is filed on the rod where the hole is drilled in at the side. Two holes are now drilled into the rod about 1 in. or 1 1/2 in. apart, these being tapped 6 B.A. These holes will receive countersunk screws to fix the brass spikes in the insulating sleeving.

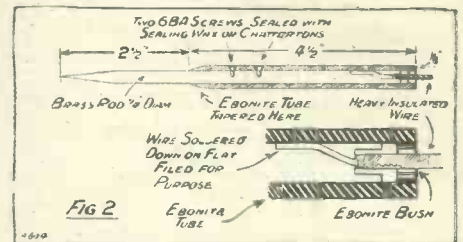
Fitting the Rods.

This sleeving consists of a 4 1/2-in. length of ebonite tube, with walls about 1/8 in. thick, the internal diameter being 1/4 in. Two holes are drilled to coincide with the small 6 B.A. tapped holes on the rod, and one end of the tube is tapered off as shown in the sketch.

The full assembly is shown in the figure, and the procedure is as follows. Bare about 3/4 in. of the lead, which should be fairly stout, rubber-covered multi-strand wire, Twist the bared end up tightly and push it through the hole till it emerges at the side. Pull it through as far as it will go and solder it into the flat which has been filed to receive it. Put plenty of solder on with a good hot iron and see that the strands are well bonded.

You will now find in all probability that the rod will not go inside the tube, owing to a surplus of solder, and this should carefully be removed with a medium cut

file so as to give a curved surface. After this has been finished off, something should be done to fix the lead tightly in position where it enters the insulating sleeving. This can be done either by turning up a small ebonite bush that is a tight fit on the wire and also is tight in the tube, or else by wrapping some sticky tape round the wire at the right place.

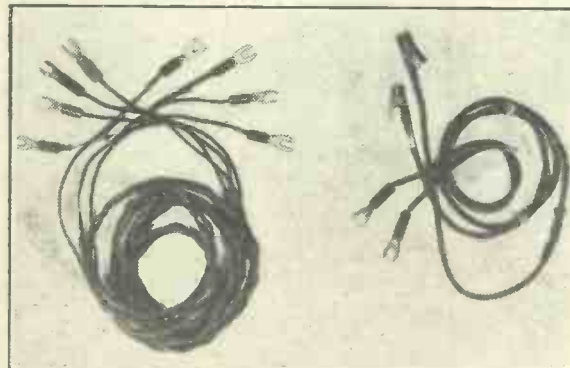


The spike is now pushed through the tube till the screw holes coincide. Two 6 B.A. countersunk screws are now inserted, and should be driven well home, the countersinking being deep enough to prevent the metal head from projecting at any point. Now fill up the countersunk with Chatterton's, sealing-wax, or heel-ball, smooth it off to the same radius as the tubing, and the job is done.

For Filament Connections.

Other useful leads are made out of two-colour twin flex, spade tags being fitted in pairs at regular intervals. One set of leads may have three pairs, another four pairs, etc. These will be found very handy when wiring up a model set, as they will enable the filament leads to be put in in a moment. Fig. 3 shows what I mean.

Other useful leads are 4-, 5-, or 6-way leads, made from ordinary lighting flex of different colours. These leads can be fitted with the requisite spade tags and/or wander plugs, according to the purpose they are to be put to, and will prove extremely useful as battery leads in particular. If intended for this purpose see that the two leads used for the L.T. battery are sufficiently heavy not to present any appreciable resistance to the flow of current, or else it will be found that the valves will not be getting their full voltage.



Here are some of the leads made by the author, and found to be very useful. On the right is a "twin," having spade terminals at one end and spring clips at the other. The other is a four wire cable having spade terminals throughout.

(Continued on next page)

LINKS AND LEADS.

(Continued from previous page.)

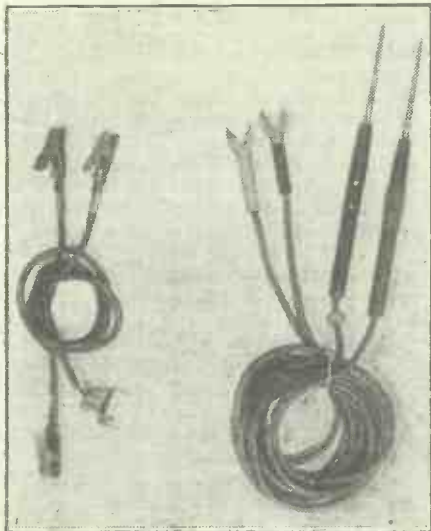
These and various other leads are shown grouped together in the photograph. I myself use an H.T. accumulator alternatively with a D.C. eliminator, so I use spade tags almost entirely. All the same, I have a selection of leads with wander plugs on them, as these are useful for making connections to grid-bias batteries and also for plugging into a valve holder when it is desired to take a lead to it—e.g. when tapping the aerial into the anode socket so as to cut out an H.F. stage.

Storing the Leads.

Long leads may conveniently be hung over a large hook, while the shorter ones are best kept in a small wooden box in some handy place where they are easily got at as required. A little time spent in making them up will be more than repaid by the time saved in completing your experimental work.

There are also two other forms of leads that are exceedingly useful for experimental work. One of these should be made of heavily insulated rubber high-tension wire. It consists of two leads laid side by side and bound together. One end of each lead is provided with a spade tag, one being black and the other red, so as to enable polarity to be followed when necessary. The other ends of the leads have good stout spring clips fitted to them, a small red bush being slipped over the positive lead so as to enable it to be identified with ease.

I have these leads permanently connected to a megger, they make it a very quick and easy matter to test a component before building it into a set or for testing



Two more useful types of lead connectors made by the author.

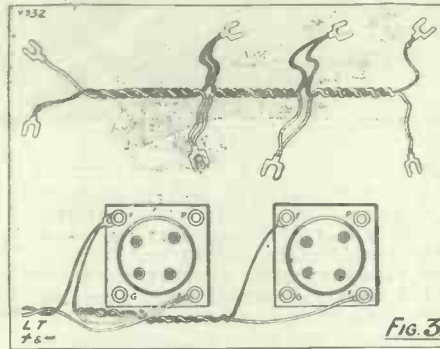
any part of a set "in situ"; but they also come in exceedingly useful for all kinds of other odd jobs.

The other set of leads that I find convenient on many occasions is made of two-colour twin flex for preference. Two ends are provided with spade tags for fixing

under ordinary terminals, the other ends carry pin tags.

This lead is very useful for connecting a piece of apparatus to a plug where a plug and jack system is employed. The two pins are easily inserted in the plug, and the two spade tags are connected to the input or other terminals of the loud speaker, or amplifier which is to be plugged into the jack.

Both these are shown in the photograph of some of the leads which I have gradually



collected during the last year. I have other special sets of these leads, but they are all intended for special jobs, and will be of little interest to the average amateur.

A word of warning here—NEVER use ordinary twin flex for H.F. circuits. The losses it introduces are very high, and its self-capacity is also undesirable.

AN "ELIMINATOR" PRECAUTION

If you use a D.C. Mains Unit there are certain points you should bear in mind.

NOWADAYS when so many sets are worked with H.T. eliminators from D.C. mains, it is not always advisable to earth your L.T. direct, and it is therefore better to have a fixed condenser in series with the earth lead.

For the experimenter it is, to a certain extent, an inconvenience to have to make arrangements every time a different set is connected up.

Easily Solved.

A simple way of overcoming the difficulty is to have a condenser permanently connected in the earth lead in series with the aerial-earth switch, as shown in the sketch. It will be seen that it is arranged so that when the switch is connected so as to earth the aerial the aerial is connected straight to earth, and not via the condenser, but when the set is in use the condenser is in series so as to avoid any trouble that might otherwise arise. Also with the aerial earthed the set is entirely disconnected so that it is quite "safe" to work on under any conditions.

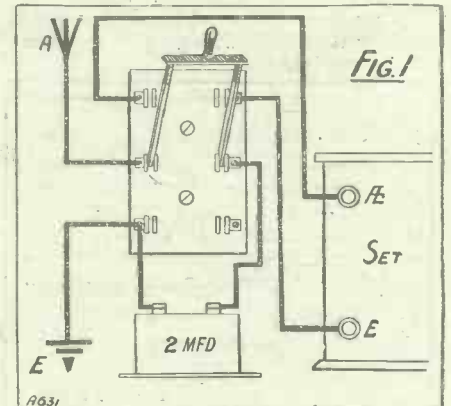
The necessity for this precaution is shown by the fact that in the case of one of the London lighting supplies (D.C. mains with the negative earthed), there is often a difference of potential up to 40 volts between the negative line and the direct earth connection used for the set.

This is quite enough to be exceedingly troublesome, and shows the importance of taking precautions of this description.

Safeguard the Aerial.

In cases, however, where the positive main is earthed, as occurs where the three-wire system is in use, it is essential that this condenser be used, since if this is not done and the L.T. circuit is earthed the main supply will be directly short-circuited. The condenser in this case should be a fairly high-voltage type, so as to give an ample factor of safety and so obviate any possibility of breakdown. It is not a bad idea, in fact, to connect a fuse wire in series with the earth wire. A 10 amp. fuse box will give the necessary protection without affecting the performance of the receiver in any way whatsoever.

Where positive mains are earthed, it is also advisable to have a condenser in series with the aerial lead. Aerials sometimes swing and touch gutters, or trees or roofs, and a live aerial with 240 volts on it is certainly inadvisable. You never know what may happen some day. You may want to take the aerial down to clean the insulators, or make a new joint, and should it happen by any mischance that the eliminator is plugged in you would, at the very least, get a serious shock.



Even the use of loose-coupling is not a sufficient precaution, as it is possible for a connection to be made between the aerial coil and the grid coil, so that a series condenser is the best and surest protection.

TECHNICAL TIPS.

The paste inside the ordinary flash-lamp battery should not be allowed to come into contact with carpets, etc., as it is just as destructive as ordinary accumulator acid.

Green deposit on accumulator terminals (due to the action of the acid) may be removed by a solution of ordinary washing soda.

The commonest causes of distortion are: the use of valves of an unsuitable type; incorrect voltages of either H.T., L.T. or grid bias; use of a grid leak of unsuitable value; too much reaction; or one of the batteries running down.

6 Simple steps to make it!



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You have not got to buy any particular make of valve—you can choose whatever make you like. You have not got to buy a particular cabinet—you can choose one for yourself. You have not got to buy a complete kit of parts.

When you have built it, the Lissen S.G.3 Receiver will bring in far-distant stations that you have never heard before; it will enable you at a moment's notice to switch on to almost any European programme you desire; in fact, so sensitive is this receiver that practically you cannot switch it on without some station coming in.

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You can buy the parts by instalments or all together, just as you like; and probably you already have some suitable Lissen parts in use in an old receiver. Your radio dealer will help and advise you; and remember you will have no difficulty in obtaining Lissen parts, because there are 10,000 radio dealers who sell them.

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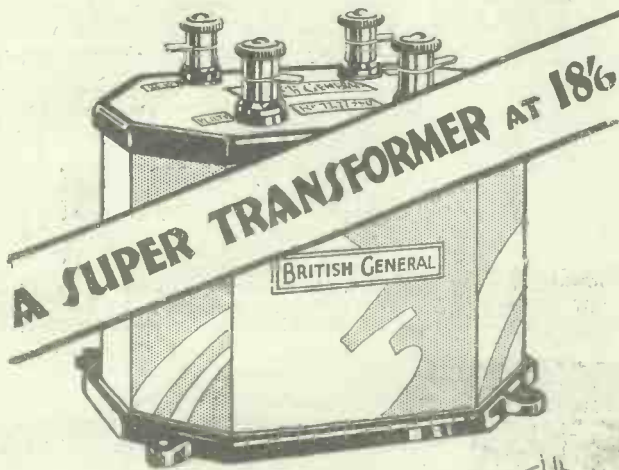
(Managing Director: Thos. N. Cole.)

Player's Please



REGD No 154011.

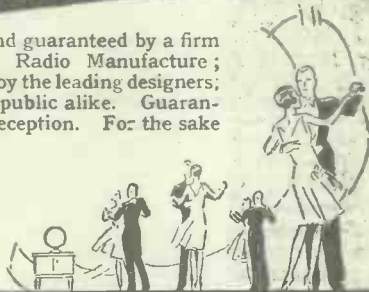
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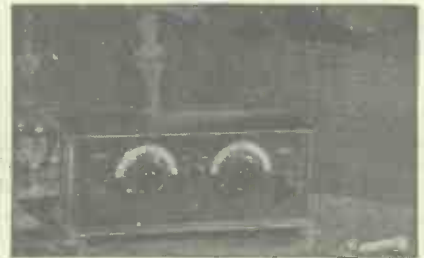
Two ratios, 5:1 and 3:1



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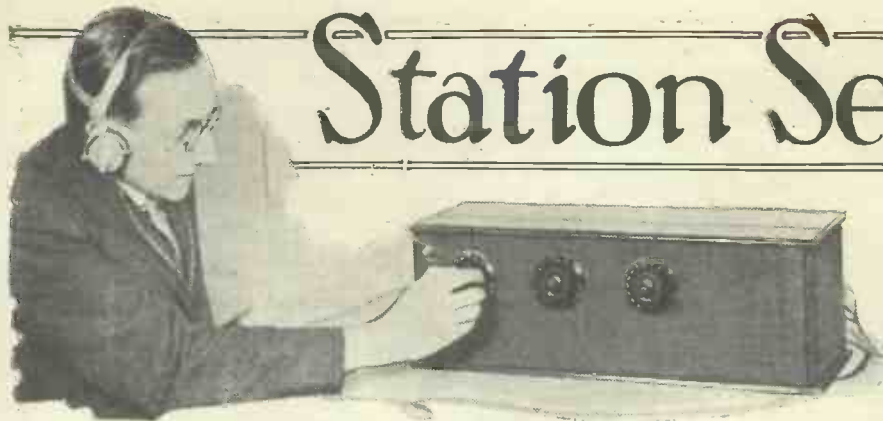
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Station Separation

A description of some simple but effective ways of making your set more selective.

By G. T. KELSEY.

IN its unselective state, an old set is, to my way of thinking, almost comparable to a piano without a keyboard—to put it somewhat bluntly, it has got “innards” that cannot be used.

Perhaps that is rather a crude way of taking it to analogy, yet, in a few words, it gets down to the purpose of the present

aerial coil (the new socket), while a 250 coil will be required in the old socket.

Perhaps now that you have examined your set you find that there is not room for the extra coil. This being the case, it is still possible to improve upon the old arrangement by the use of centre-tapped or “X” coils.

Disconnect the lead between the grid coil and the aerial terminal, and to this latter join a length of flex.

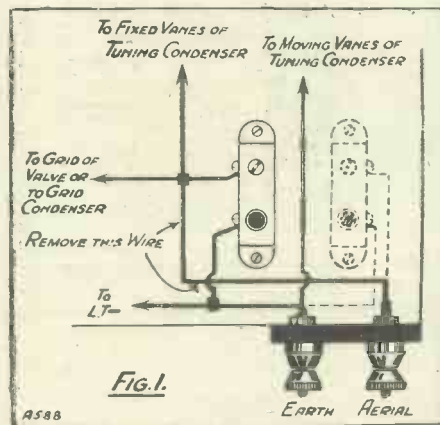
Now insert in the coil socket either a 60 “X” or centre-tapped coil. The former will give greater selectivity but slightly less signal strength, so you must choose the coil which will best suit your own requirements.

Another Effective Scheme.

I would just add, however, that with a set consisting of only one valve, a coil of the centre-tapped variety is preferable.

The flex lead from the aerial terminal should, of course, be joined to a terminal on the actual coil. Incidentally, in the case of the “X” coil, it is important to note that the pin of the coil holder must be connected to earth.

There is still another method of improving your set without even going to the expense of special coils, and for this a small quantity of No. 24 D.C.C. wire is required.



article which is to supply the “keyboard”—to suggest simple ways in which you can improve the selectivity of your old receiver.

Three or four years ago, it was quite the vogue to use direct aerial coupling—a state of affairs with which under modern conditions it would be difficult to separate even the local station and 5 G B, to say nothing of the stations in between.

To improve upon a set with direct aerial coupling is not a difficult job, and, as it happens, there are several ways in which this can be done.

If your set is of an old design in which plug-in coils are used, examine it carefully, and you will probably find that the aerial arrangements are very similar to the heavy lines of Fig. 1.

A New Aerial Coil.

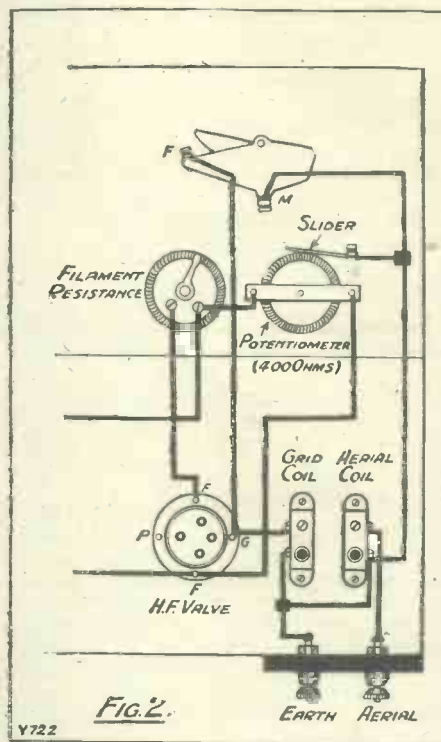
It is so?—right, then the first way in which it can be improved is to fix another single-coil mount next to the existing coil, as shown by the dotted lines of Fig. 1. The wiring alterations are clearly shown in this figure, and it only remains for me to add a few words about suitable coil sizes.

For the broadcast band the new coil should be a number 25 or 35 (depending upon the size of the aerial) and in the old coil mount a number 50 or 75 should be used. On the long wave-band, a number 100 or 150 should be about right for the

Take from the coil rack a number 50 or 75 coil, and carefully measure the diameter of the winding. Obtain a tin, a jug, or any similar “former” approximately the same diameter as the coil, and round it wind 25 to 30 turns of the cotton-covered wire.

The completed “hank” coil when removed from the “former” should be held together by string and tied, also by string, to one side of the plug-in coil.

The lead in the set between the grid coil and the aerial terminal should next be



removed, and instead this terminal should be joined to one end of the hank winding. The remaining end should be joined to the filament side of the coil to which it is tied.

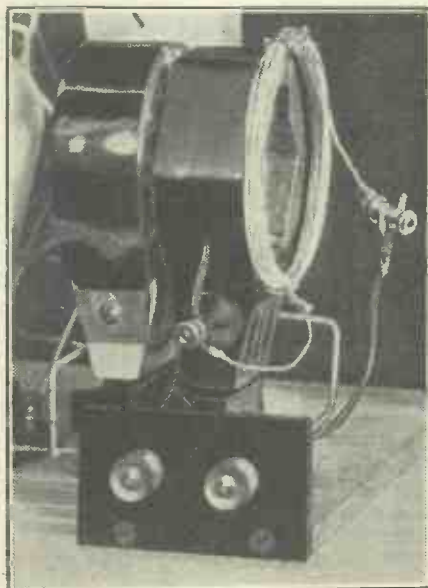
Curing Instability.

For this, and, in fact, for all the improvements suggested above, the tuning condenser should be in parallel with the grid coil.

The schemes outlined whereby selectivity can be improved are applicable to all old sets in which plug-in coils are used, whatever the number of valves employed.

In the case of sets using an H.F. stage, however, it is just possible that the selectivity improvements will cause instability in this stage due to the reduction of aerial “damping.”

Fortunately, instability of this nature can usually be cured by the simple process of fitting a potentiometer, and the diagram given as Fig. 2 shows how best this can be done.



A coil of wire can be tied to your existing aerial coil in order to make the set considerably more selective.

LATEST BROADCASTING NEWS.

PICTURE BROADCASTING
IN THE BALANCE.

THE GREAT PERMANENT
ORCHESTRA SCHEME—THE
DECLINE OF APPEALS—SPOT
THE MUSIC—SIR PHILIP
SASSOON ON HIS TOUR—
TALK ON CHRISTMAS PRE-
SENTS—NOTABLE SPORT
BROADCASTS.

IN undertaking to arrange public experiments with the Fultograph system of still-picture transmission, the B.B.C. laid it down that it would depend upon public demand whether these transmissions would be discontinued or made a permanent part of the programmes.

Now that the experiments have been going on for nearly a month, people are naturally wondering what Savoy Hill is going to do about it. More than this, Savoy Hill itself is wondering what to do about it. What is the criterion of an adequate public demand? Should the experimental transmissions go on indefinitely?

A Struggle Coming.

These and kindred problems are exercising the minds of those who run the B.B.C. There is believed to be a strong school of thought, well-entrenched in the engineering side of the business, originally sceptical, and now in definite opposition to going on with the Fultograph. There is bound to be a struggle about this question within the B.B.C.

No final decision will be taken by the Governors until early in the New Year, and it is quite impossible now to forecast the nature of this decision. It would be intriguing if the B.B.C. turned down the Fultograph, thereby effecting an alliance of misfortune between it and Television. It is probable, however, that no such drastic step will be taken even if Savoy Hill does not take still-pictures to its permanent bosom.

The Great Permanent Orchestra Scheme.

Sir Thomas Beecham's friends are in no doubt concerning the progress which has been made recently in the negotiations between Sir Thomas and the B.B.C. for co-operative action to found a permanent national symphonic non-deputising orchestra.

It is stated confidently, for instance, that the finances of the new scheme have been arranged to the complete satisfaction both of Sir Thomas and the B.B.C. No public announcement will be made until early in the new year.

The Decline of Appeals.

As the weeks go by, each one with its broadcast appeal on Sunday evening, the springs of charity tend to dry up. During the past year, with one or two exceptions, notably Lord Knutsford's £25,000 for London Hospital, reported results are very meagre indeed. Many charities learn nothing by experience, and waste their time at the microphone.

Where the nominated beggar knows how to talk through the microphone there is, even now, a worth-while response. But the error is the frequency and number of appeals. It is understood that the B.B.C. is considering drastic restrictions for the future. Close students of broadcasting are agreed that one appeal a month, really well carried out, is all that the B.B.C. should impose on its public.

Spot the Music!

The B.B.C. have not umpteen thousands to offer listeners every week for prophesying

THE OLYMPIA OF THE NORTH.



The City Hall, Manchester, where the recent Radio Exhibition was housed.

which football teams will win, lose or draw next Saturday, but that is no reason why the programme should not occasionally be made the subject of a harmless little competition, such as the Glasgow station is arranging for Thursday, November 29th.

The idea is that the Station Orchestra shall play various items, to be announced only by numbers, listeners being invited to try and remember the titles. The senders of the first six correct results will be allowed to witness a programme at the local station. What an opportunity for Scots to see something for nothing, but who is going to find the six tramcar fares to Blythswood Square?

Sir Philip Sassoon on His Tour.

Sir Philip Sassoon, the Under Secretary for Air, has promised to give a talk in the London Studio on Monday evening, November 26th, on his recent tour in India and the Near East, where he has been carrying out an inspection of the various air stations on the proposed Air Highway to India.

But whether the talk is given on the 26th, or later is contingent on Sir Philip arriving in England in time, a matter on which there is some little doubt, as he has been somewhat delayed at various points on his return journey.

Talk on Christmas Presents.

The B.B.C. is not behind the rest of us in making preparations for Christmas, and consideration of the Yuletide programme is already engaging the attention of the responsible officials at Savoy Hill.

The first hint of the festive season is a talk given on Friday evening, November 30th, by Miss Margery Lovell-Burgess, who will endeavour to assist listeners to solve that most difficult problem of choosing Christmas presents. One rather

suspects that this talk will have a special interest to the fair sex, since Miss Lovell-Burgess edits the woman's page of a provincial paper in the South of England.

Notable Sport Broadcast.

Mr. H. M. Abrahams, who captained the British team in this year's Olympic Games, is giving an eye-witness account of the Inter-Varsity Relay Races during the early part of Saturday, December 1st, the day on which the event takes place at Cambridge.

A description of the English Rucker Trial Match, which takes place that afternoon, will also be broadcast.

TECHNICAL NOTES.

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

THE PENTODE

A GOOD DEAL OF MISAPPREHENSION EXISTS REGARDING THE PENTODE
BUT THIS WEEK'S NOTES WILL MAKE ITS MAIN FEATURES CLEAR.

The Pentode.

MANY readers seem to be confused between the new pentode and the screen-grid valve. Some of my correspondents are evidently under the impression that they are one and the same thing, whilst others imagine, on the other hand, that they have no connection whatsoever with each other. Both these impressions are wrong, and it would be more correct to say that the pentode (or 5-electrode valve, as the name implies) is a natural development of the screen-grid valve.

For high-frequency work careful screening is required with the H.F. screen-grid valve. For low-frequency amplification it was found that in its original form the screen-grid valve was unable to handle a sufficient output and therefore it was of little use for L.F. purposes.

Screen-grid For L.F.

This effect is connected with the secondary emission which is obtained with the standard tetrode, but by introducing an additional grid electrode, this secondary emission effect may be overcome.

(Continued on page 530.)

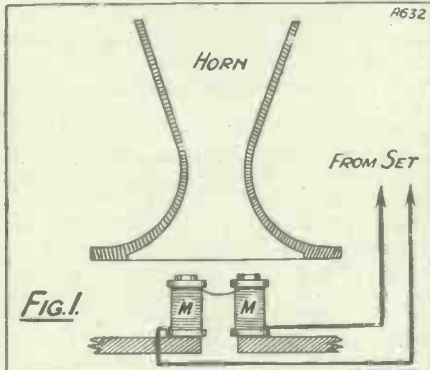


Here is the whole science of the loud speaker in a nutshell. If you want to know the difference between any of the various types read this article by one of "P.W.'s" oldest and most popular contributors.
By C. E. FIELD, B.Sc.

THERE are not many of us who have not listened to both horn and cone types of loud speaker, and probably most of us have heard one of the moving-coil type. Although opinions differ, it is generally agreed by critical listeners that the moving-coil type is capable of the most faithful reproduction, the cone coming second and

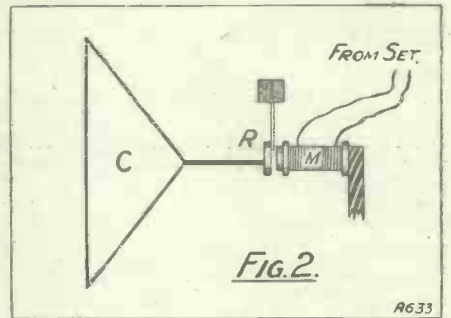
vibrate at a certain rapidity (or frequency) when it has been struck or set moving. For example, the string of a violin possesses resonance, because if it is plucked it will vibrate at a certain frequency, this depending upon its weight and the tension to which it is stretched. If it were allowed to get very slack, it would become "floppy," and would not vibrate when it was set in motion. Hence it would no longer be resonant (i.e. possess resonance).

end of it. Now, holding the other end rigidly against the edge of a table so that the heavy mass is sticking up into the air, take hold of the steel about two inches up from the table, and try to bend it about, first slowly and then very rapidly. It will be found surprisingly difficult to get the steel to vibrate at any rate except one, and when that particular rate is approached it will vibrate very violently



Natural Frequency.

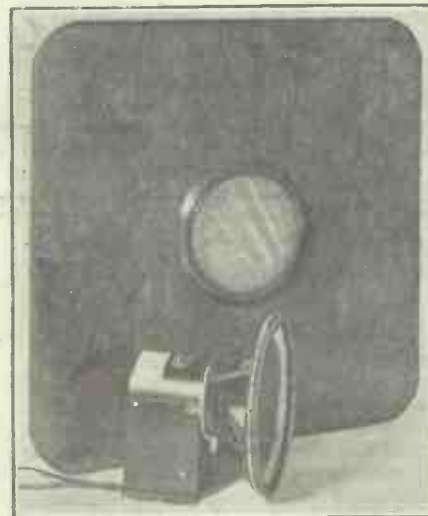
The feature about a resonant body in which we are particularly interested in connection with loud speakers is this. If such a body is given impulses at many different rates, it will be found that it is only at the frequency at which it naturally vibrates, which is known as its natural frequency, that it will vibrate at all readily. On the other hand, if it does not possess resonance, it will vibrate equally readily at any frequency. To illustrate this, the reader should try the following simple experiment: Take a strip of flexible steel, such as a foot rule, and fix a lump of putty, or an apple, or some such mass on to the



the horn last in order of merit, although the various makes of cone differ so much that some inferior types are less natural than a good horn speaker. We are all aware, probably, that sound is produced by air vibrations, and that if a body can be made to vibrate with a certain rapidity, and cause a corresponding vibration in the air, a note will be produced.

What Resonance Is.

A loud speaker is simply a device by means of which electric currents from a receiving set are caused to set the air vibrating by actuating a diaphragm of some sort. Why, then, is there such a difference between the results obtained from different types of loud speaker? Nearly the whole of the trouble is due to what is known as resonance, and as this is of such vital importance to loud-speaker reproduction, before going any further let us see just what it means. Resonance may be described as that which causes anything to continue to



A moving-coil loud speaker. The unit, shown in the foreground, fits behind the large baffle board.

with very little applied effort. This occurs, of course, when the impulses are given at the same frequency as that at which it would naturally vibrate if it were simply pulled to one side and allowed to fly back of its own accord. In short, then, a body possessing resonance will respond very much more readily to impulses occurring at its own natural frequency than to any others, and if the vibrations are of such rapidity as to give rise to sound waves, the most intense sound will occur at that frequency.

The Horn Speaker.

Let us turn our attention now to the horn type of loud speaker. The action of the speaker is probably too well known to require description, but a simplified diagram of the usual movement is shown in Fig. 1. The diaphragm is set in motion by speech currents passing through the magnet winding M, and the air in the horn is vibrated at the same rate, giving rise to sound.

If nothing in the system were resonant, quite good results might be obtained, but
(Continued on next page.)

WHY LOUD SPEAKERS DIFFER.

(Continued from previous page.)

this is not the case. To begin with, the diaphragm itself is resonant, and if it were struck it would vibrate and emit a certain note. Consequently, when signals are received, it will respond much more strongly to that and neighbouring notes than to any others.

The particular notes which are thus over-amplified by the resonance of the diaphragm vary with different makes of speaker, but they are usually in the upper octaves of the pianoforte range. The result of this is that when the notes concerned are pleasantly loud, others, most of which are lower in the scale, are very much more subdued, and in some cases almost inaudible.

Hence, we have a speaker giving poor reproduction on the lower registers, and having a tendency to "blast" on certain high-pitched tones.

Further Faults.

Unfortunately, there are other resonances present, besides that of the diaphragm. The horn itself may be resonant, especially if made of thin metal. If, when the rim of the horn is tapped, a ringing note is emitted, there will be a tendency for that note, and those near to it, to be over-emphasised when the speaker is working.

Then again, the whole mass of air inside the horn possesses resonance (for air is a flexible substance), and will vibrate at a rate which depends chiefly upon the length of the horn.

In the case of a cone type of speaker, we have no horn and no metal diaphragm, but resonances which very largely determine the character of the reproduction are nevertheless present. A diagram of a typical cone mechanism is given in Fig. 2. The diaphragm of Fig. 1 is replaced by the large paper cone C, which is moved by the vibrations of the armature or reed R, this being a small piece of iron placed near the



A representative horn-type loud speaker.

poles of the magnet, which is energised by the speech currents received.

The reed must be mounted on some sort of a spring in order that it shall always return to its central position when not in vibration, and this spring gives the movement a resonance just as did the metal diaphragm in the horn speaker.

Then the cone itself, being fixed at the edge as is usually the case, has a resonant frequency of its own, just like the top of a drum.

"Drumminess."

Being a large, flexible mass, it normally vibrates slowly and so tends to exaggerate low notes—an exaggeration which is usually more prominent than that due to the armature. Here we have the reason for the drumminess of many cone speakers, and also the reason for the more faithful reproduction of music than is obtained with the horn type.

Finally, we have the moving-coil loud-speaker,



A cone loud speaker of fairly conventional design.

shown diagrammatically in Fig. 3. This possesses neither diaphragm nor reed, but a coil of wire M, which is free to move wherever it is driven, except that it is attached to the cone.

The latter is suspended in a frame F, by a ring of flexible, non-springy material such as soft leather, L. and this is the only thing which restores it to its normal position after it has been moved.

If the cone is pushed to one side and released, it will flop back to its normal position, and if it vibrates at all it will simply shake a few times per second. Hence we have a loud speaker in which there is practically no resonance, and anyone who has heard a really good moving-coil speaker properly operated will testify to its capability of natural reproduction.

Although resonance is practically absent, the speaker is by no means perfect, as there are other factors which affect the relative intensities of different notes to a smaller degree.

These are beyond the scope of this article, however, which will have served its purpose if it has explained the "reason why" of the characteristics of the different types of speaker in everyday use.

IMPROVING LOUD-SPEAKER REPRODUCTION.

(Continued from next column.)

cone, or moving-coil type. See to it, therefore, that in considering the possibility of making further improvements in the tonal quality of your loud speaker you give attention and consideration not merely to the instrument itself, but also to the details and arrangement of the room or apartment in which it is placed.

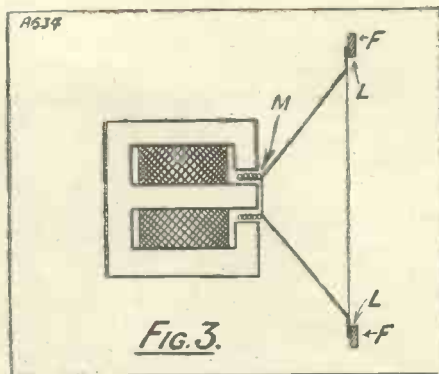


Fig. 3.

IMPROVING LOUD-SPEAKER REPRODUCTION.

"QUALITY" reproduction by means of a loud speaker is influenced greatly by considerations other than those appertaining to the instrument itself. For instance, even the very best of speakers will give a rather harsh and reverberant tone—a quality of reproduction which, to use a common phrase, "gets on one's nerves" after a time, if it is used in a bare and empty room, or a room which contains merely a linoleum flooring and hard unpadded chairs.

The factor of echo is, of course, responsible for unwanted effects such as the above. And, accordingly, anything which can be done to subdue and to control the echo effect will, almost invariably, give rise to an improvement in loud-speaker reproduction.

Obviously, the aim is not to smother the echo effect entirely. Such a feat would merely result in a muffled and unlife-like quality of reproduction. On the contrary, an endeavour should be made to re-arrange the furnishings of the room in which the loud speaker is operated so as to obtain just the degree of echo which is needed to keep the tone of the speaker bright, refined, and lifelike.

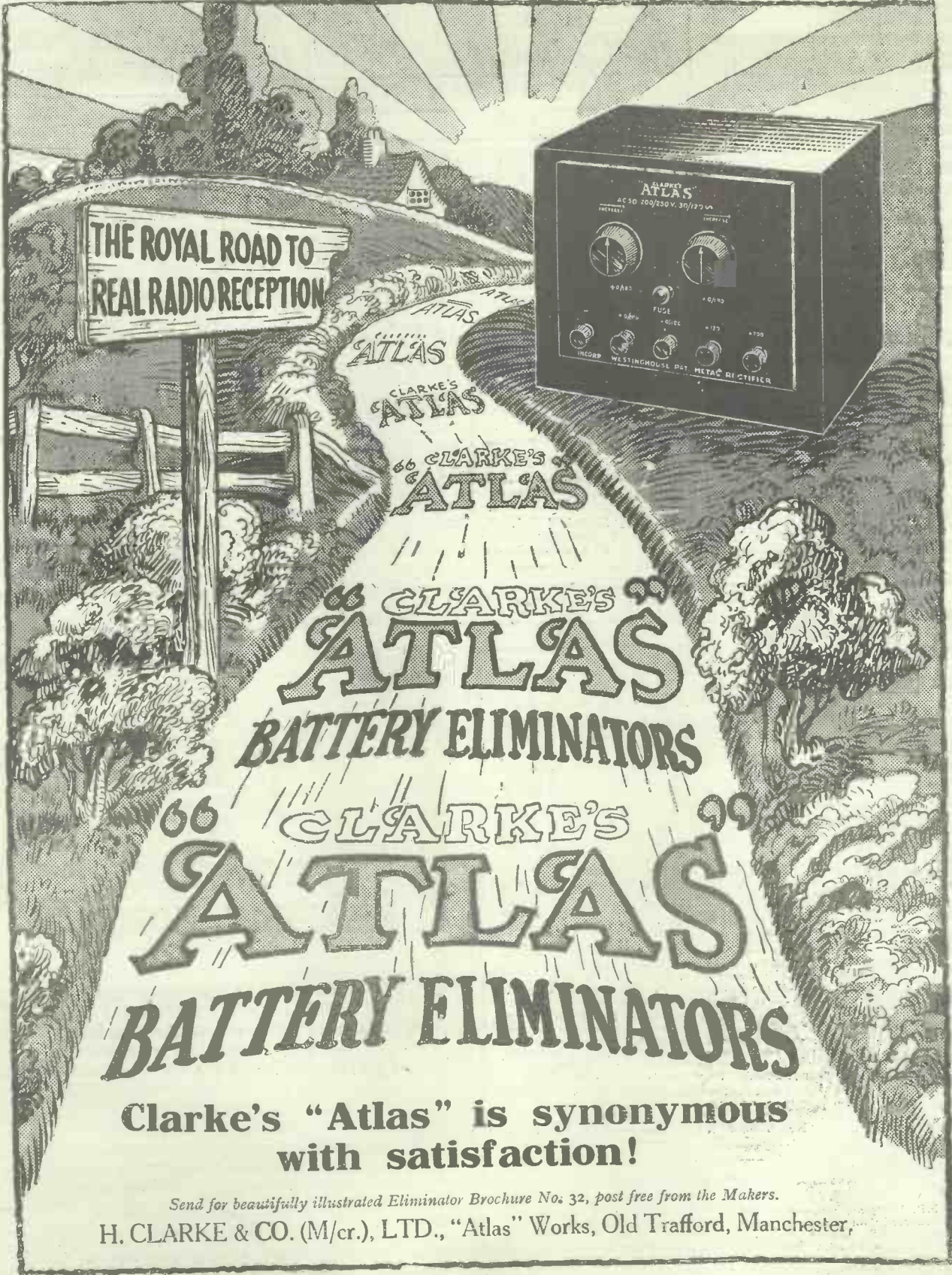
Regulating Echo.

Bare rooms, and also apartments which have only oilcloth or linoleum floor coverings, thin curtains, and very few draperies, as we have said, always tend to impart to the loud-speaker reproduction a harsh and a too reverberant tone. Especially is this true of horn-type speakers.

Much improvement will be effected if a little attention is given to the re-arrangement of the room furnishings. Even a heavier window curtain will often take away the unpleasant tone from a loud speaker. A few extra cushions in the room, one or two additional pictures, a chair or two more, a door curtain, and so forth—all such articles may, after a few trials, be found to effect a surprising improvement in the quality of the radio reproduction.

Naturally, a carpeted floor—provided that the carpet is not an excessively heavy one—is almost indispensable in the effecting of the highest degree of refinement in loud-speaker tone, no matter whether the reproducing instrument be of the horn,

(Continued in previous column.)



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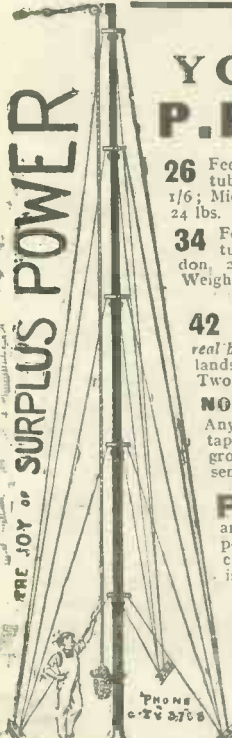
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OVERHAULING YOUR COMPONENTS

A loose condenser bearing, a film of dust or a layer of verdigris and your set may go "right off colour." In this article you are told where to look for such troubles.

By J. ENGLISH.

IN carrying out an overhaul of one's wireless equipment the obvious starting-point is the aerial and earth, and next comes the tuning system, whether the receiver be a crystal set or a super-heterodyne. This is even more important than the aerial system from the point of view of selectivity and initial signal strength, and careful attention to the coils and condensers of your receiver will make all the difference to your results this winter. When we are receiving a distant station the energy circulating in the input coils and condensers is so small that the resistance of faulty contacts, etc., prevents the signal voltage from building up to anything but a fraction of what it might be if such resistances were absent.

The Variable Condensers.

Now different types of sets have widely different combinations of coils and tuning condensers, so that it will be easier to know just what faults to look for if we consider them separately, taking the variable condensers first. Variable condensers are now so soundly constructed that there is little that can go wrong with them mechanically. The main causes of inefficiency present in a receiver which has been in constant use for some time, or even left unused during the summer months, are faulty insulation, dusty vanes, and dirty contacts.

During the warmer weather there are always more dusty particles suspended in the air than in winter, and slow deposition of this dust produces a partially conducting film on exposed components of a cabinet-enclosed set. This dusty film is easily removed with a soft brush and by vigorous blowing. Also there may have been a very fine spray of flux left on the insulated parts of the condensers during construction.

Dusty Vanes.

This should be removed with a rag or a fine brush moistened with methylated spirit. In any case it is advisable to dust and clean the insulation between the fixed and moving vanes. You can then be sure that there is no leakage between the two sets of vanes.

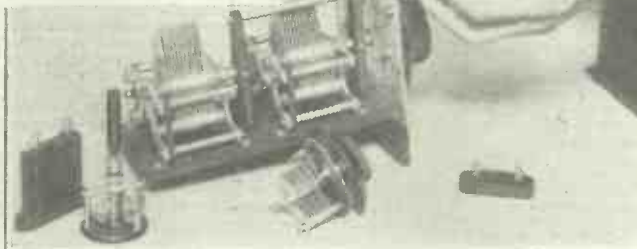
Dusty vanes are very often found in most sets and can cause quite appreciable losses. Especially is this so in variable condensers where the vanes are closely set, the particles of dust on moving and fixed vanes often touching and thus causing high-resistance leakage paths. In reaction condensers dusty vanes upset the control of reaction.

This dusty film seems to adhere rather tenaciously to the vanes and vigorous blow-

ing will not dislodge it. The best method to employ is to moisten one of those fluffy pipe cleaners with methylated spirit and pass it between the vanes, both fixed and moving, until they are quite clean.

Modern variable condensers of good design have a "pigtail" or positive contact to the moving vanes, but older and less expensive modern types very often make connection to the moving vanes by some form of rubbing contact. After a period of use, a fine metallic dust forms at this contact and produces either flat tuning and poor results or horrible scratching noises.

There are two courses to take: either remove the condenser end-plate and clean up the contact, or else scrap the condenser and



"Having satisfied yourself that the variable condensers are in order, you should now examine the mechanical movement of the moving vanes."

substitute one of the modern forms with a "pigtail" connection. The latter course is the best, but it is not at all difficult to remove the end-plate of most condensers. You can then wipe the moving contacts over with vaseline, and after reassembly there should be no further trouble.

If your receiver uses condenser control of reaction, it is highly advisable to spend a shilling or two on a fixed condenser of '001-mfd. capacity and connect this in series with the reaction condenser, if there is not one there already. This will save a great deal of trouble should the condenser vanes at any time short across.

Slow-Motion Dials.

Having satisfied yourself that the variable condensers are in order, you should now examine the mechanical movement of the moving vanes. For the best results, this must be very smooth and easy, and for "DX" work slow-motion dials are more or less a necessity. So it would be as well to fit one to the main tuning condenser at least.

If your condensers are already fitted with slow-motion dials or movements, examine them carefully for stiffness or

backlash. A little lubrication will often improve matters, but if the dials are of old pattern they can be replaced quite cheaply with very efficient modern ones. This will make all the difference to your results, as you will be able to tune in much more easily those weak distant stations.

Coming now to the coils of the receiver, the main faults and causes of loss of efficiency are due to dirty pins and sockets and corroded or loose connections, all resulting in an increase of H.F. resistance with a resultant loss of signal strength and selectivity.

Whatever the type of plug-in coils you may find in your set, remove them from their holders and carefully clean up each pin with emery paper, wiping them over lightly with vaseline afterwards. A piece of emery paper wrapped round a large nail or a thin piece of wood can be used to clean out the sockets, which is just as important as cleaning the pins. Then see that the coils fit properly in their holders so that all pins make firm contact with the sockets. All

this will ensure complete absence of resistance losses at the coil contacts, with consequently better results.

Corroded Connections.

Other faults to look for in coils and H.F. transformers are corroded connections and loose contacts. In H.F. transformers the fine wire primary and neutralising windings are liable to corrosion where they are soldered to the contact pins, which necessitates re-making the connection. Also the nuts on pins, terminals and contact screws to holders should be tightened up.

Where home-made coils are tapped by loops in the wire, these tappings should be cleaned up with emery paper, as well as the tapping clips. This applies also to bare-wire short-wave coils.

In short-wave receivers the elimination of all faulty and loose contacts is doubly important, but owing to the generous gauge of wire usually used for short-wave coils, and the simple methods of mounting them, such faults are easier to eliminate than in the more complicated medium-wave coils. The main tuning condenser should not have a maximum capacity in excess of '0003 mfd.

THE ZEPPELIN BROADCASTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—After reading "Ethercomber's" letter, I am writing to you in the hope that this might be of interest to him and those listeners who heard the messages from the Graf Zeppelin.

During her recent trial flights, I have picked up messages which I believe came direct from the airship itself, and the wave-length used was somewhere about 1,190 metres. At first I thought it came through Berlin Königswusterhausen, but this station was not broadcasting anything in connection with the Zeppelin when I heard it, and I think that the word "Lou-chrey" was the German word Leichthiffe, because she announced like this: "Leitung, Leitung, heir ist der Leichthiffe Graf Zeppelin unter Herr Eckerner," and this was followed by details which my small knowledge of German could not permit me to follow.

I also tuned-in Frankfurt and Stuttgart and heard part of the relay which your correspondent also heard. I might mention that I heard the American relay of the airship's arrival in America, through Langenberg, and I did not know that the B.B.C. also relayed the running commentary until the next day when it was published in the press.

My set is an ordinary one-valve with a reaction condenser which I made myself from one of your excellent circuits, and I would like to take this opportunity of congratulating you on the excellent standard of "POPULAR WIRELESS." It is by far the best wireless magazine on the market.

Trusting this will interest you and "Ethercomber."

Yours very truly,
LEONARD S. MASSINGHAM.

Norfolk.

A "VARIATOR HALE."

The Editor, POPULAR WIRELESS.

Dear Sir,—I am a keen reader of your book and am always interested if you have anything new. I always try them out just for curiosity against the circuit I use (a combination of two circuits from "P.W." which for number of valves cannot in my opinion be beaten). When I saw the "Variator" set in "P.W." first, I knew that if I could get it to work with the "Hale" I should have a decent set. I tried it and after a few minor difficulties got it going. Here is the result of these two together, Variator—Hale (2 valves). P.M. 3 and P.M. 254. Announcer's voice (5 G B) understood at 250 yards away, while people have told me they have heard music half a mile away. All this in daytime.

Volume and clarity are not the only good points of this set, as I have had 32 stations on the speaker. By the way, I often get a foreign station that sends out at intervals a series of notes that seem to come from different toned gongs—it is a few degrees below 2 L O on the dial.

All the above number of stations are well worth listening to on the loud speaker. I once asked a local dealer if a "two" would work a moving-coil speaker—he laughed at me, so I asked him to hear it. He came to hear it and would not believe it was less than four valves till I lifted lid of cabinet and let him see for himself.

I am not "stretching" it in the least; it is the other way about if anything.

Yours, etc.

Nr. Wolverhampton. J. T. WOODHALL.

SINCE I wrote the notes which appeared a fortnight ago, I hear that I was incorrect in my remarks about 2 N H, who unfortunately was not working on 10 metres at the time I heard W 2 J N calling him. Since then, however, 10-metre work has taken a tremendous stride, and the honour of the first 10-metre communication with the United States falls to Mr. J. W. Mathews (G 6 L L), of London.

Simmonds' Success.

Very soon after his contact, Mr. Simmonds, of G 2 O D, was in touch with two Americans, and since then several other stations have been across. Nearly all the work hitherto has taken place on Sunday afternoons, on account of the fact that 10 metres appears to be very definitely a daylight wave.

G 6 L L, by the way, was crystal-controlled. G 2 O D's achievement is remarkable since it was his first attempt at 10-metre work!

G 2 F N has been in touch since then with the U.S. 6th district. This is a wonderful achievement, and is easily the DX record from this country, although the longest 10-metre work done as yet is that between O Z 3 A R, of New Zealand, and the U.S. 6th District. The latter, of course, is right

CORRESPONDENCE.

THE ZEPPELIN BROADCASTS.

A "VARIATOR HALE"—THE ZEPPELIN BROADCASTS—TUNING A CRYSTAL SET.

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

THE ZEPPELIN BROADCASTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Referring to the letter from Mr. T. Dineen, of Winchester, published in a recent issue of POPULAR WIRELESS, no doubt it was quite exciting to receive the Zeppelin broadcasts from U.S.A. via Stuttgart; but why not "go one better" and have them "direct," via the "Sydney" Two? Such was my experience on the evening he mentions. It has been announced in "World Radio," and I believe, in POPULAR WIRELESS, that short-wave broadcasts from U.S.A. will take place on Mondays and Thursdays from 7 p.m. until 9 p.m., for the benefit of the B.B.C. (I have not noticed the B.B.C. utilising them.)

This announcement prompted me to "try for them" on these evenings, and I have been usually more or less successful, and strange to say the evening (this side) of the arrival of the Zep in U.S.A. was the best I have experienced these many months on short-wave reception.

I did not have the "Zep" business in mind that evening referred to, and when I tuned in I heard a lady making a political speech to a meeting of the National Women's League in the Waldorf Astoria Hotel, New York City, and following this the particulars as mentioned by your correspondent came along, making the business much more interesting, for sure.

Another matter—a Newport, Mon., reader asks "Ariel" re the heterodyne, etc., on Cardiff's wave-length. Well, this has been published in "World Radio" as Algiers station, and particulars are exactly as he stated. In fact, with this jamming, Cardiff is a "washout," and an announcement has been made by that station that every effort is being made to remedy matters. "So far, so—rotten!" With the usual good wishes,

Believe me to be,

Yours sincerely,
"H. W."

P.S.—Further particulars to your correspondents, via "P.W." if they desire.—H. W.
S. Wales.

SHORT-WAVE NOTES.

By W. L. S.

on the Pacific Coast, and most of the active "G" stations are in California.

My prophecy re broadcasting stations on 10 metres will be fulfilled yet! Not too soon, please, though, because the amateur transmitters have been more or less forcibly crowded off the other wave-lengths, and have made a fresh bed for themselves on 10 metres where they have plenty of room.

New German Short-waver?

I listened a few nights ago to a wonderful programme of gramophone records from an unknown German station working on about 37 metres. No announcements were made other than the titles of the records, and the station eventually closed down immediately after announcing that one more record would be played!

If any of my readers have heard this station and have any further information about it, I shall be glad to hear from them.

TUNING A CRYSTAL SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—Some of your readers who still use crystal sets might like to try the method of tuning which I find gives better results than any of the many I have tried. Two coils comprise the tuning arrangement whose separate inductances are a little higher than is necessary to bring the required station in at maximum strength. These two coils should then be connected in series between aerial and earth, and the coupling between them varied till maximum signals are received. Readers with a little technical knowledge will, of course, see that this method is merely a home-made variometer; but the secret of the decent signal increase would appear to be because the two coils have to be opposing and not, as usual, assisting each other.

Another tuning arrangement I have used with complete success comprises a wave-trap to be used in series with the aerial for use with valve sets. It is merely an adaptation of the well-known "F.W." wave-trap, and the theory of the trap is to vary the coil tappings instead of the condenser. Any reader who possesses a fixed condenser of between .0001 and .0005 can try this method of wave trapping.

To vary the coil tappings a slider and contact studs would be useful, but not essential, as when the correct inductance has been found the trap will be almost permanent. A coil of 60 to 80 turns is required which can be easily tapped at different points. Across this coil, that is, in parallel, connect the fixed condenser and from either end take a lead to the set. Then start trying to find the correct tapping for the aerial beginning from the end nearest to where the lead has gone to the aerial terminal on the set. It will be found quite easy to find a tap which traps the unwanted station to a big extent, and then working near that point another which does all the trapping that is necessary.

I should, of course, like you to publish my letter in the usual columns, but if you could not do so with the information in its present form, you can cut it in any way whatsoever.

Sincerely yours,
R. W. CAPEWELL.

Stoke-on-Trent.

WEAK B.B.C. STATIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—What has happened to the B.B.C. stations during the last year or so? A few years ago, on a two- or three-valve, I used to be able to pick up Aberdeen, Glasgow, Newcastle, Cardiff, Birmingham, and often Manchester, every night. Now I hear none of these, Bournemouth being the only one that is "any good" besides 5 G B, 2 L O, and 5 X X. Belfast I hear, and occasionally Dublin and Cork, while the foreigners come in better than ever.

Is it due to the changes of wave-lengths? The provincial stations have often changed and may have had to go on wave-lengths which do not suit their individual characteristics as well as the former wave-lengths used to do.

Whatever the cause, it is peculiar that the B.B.C. should drop off so completely while the rest of Europe has "come on."

Yours truly,
FREDERICK LEWIS.

Radlett, Herts.

The modulation is excellent and the strength tremendous—both are slightly better than from PCJJ.

We used to hear a lot about the "technical difficulties" encountered when trying to obtain good reproduction of speech and music on short wave-lengths, both in connection with the receiver and the transmitter. Nowadays we know that the whole business was a bugbear, and there is no real difficulty about it.

No Special Precautions.

The point was that short waves used to be considered as something different from other branches of radio, and governed by strange, unknown laws, whereas we know now that all the special knowledge we need for short-wave work is a little extra ration of sound common sense!

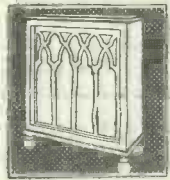
The surest way to meet with success in short-wave work, in fact, is to treat them with contempt and to refuse to acknowledge that anything need be done in the way of special precautions which is not really necessary on the longer wave-lengths as well.

However, we must continue to draw some distinction between short waves and others, or this section on "Short-Wave Notes" will no longer be wanted!



"Wireless humour," say the critics, "never gets across." They put it down to lack of intimacy; the obtruding personality of the indifferent loud speaker. ■

Now hear the next variety programme via the new Amplion. The vividness of the overture indicates at once that you are in the sixth row of the stalls. Isn't that fellow with the drums good? Next item—Tommy Handley. You've always chuckled; but now you roar. He's real . . . living . . . leaning over your piano and entertaining no mere million listeners but you . . . and just your friends. And so the show goes on. You hear the performance not as an eavesdropper but as a spectator. Rather wonderful—this new speaker! ■ Wireless has



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The new Amplion Speakers in Handsome Cabinets of Oak or Mahogany range in price from £9 10 0 to £42 0 0. Chassis only, £6 and £8.

The Amplion Radio Gramophone in Oak £58 12 6 . . . in Mahogany £63 12 6, including Royalties.

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FROM THE TECHNICAL EDITOR'S NOTE BOOK



THE "BEAMU" DRIVE.

WHEN one uses a gramophone pick-up in order electrically to reproduce records the gramophone as such is not wanted, indeed, its sound vibration conducting tone-arm and sound amplifying horn become menaces to perfect results. It is obvious that results are bound to be poor if the mechanical chattering of the pick-up and direct scratch are allowed to mingle with the loud-speaker's output. As a matter of fact, even a moving-coil loud speaker and a first-class amplifier sound harsh and scratchy unless the gramophone is perfectly sound-proof.

In view of this I am greatly surprised that we have had to wait so long for an instrument designed specially for pick-up work. But there is one available now at any rate, and it should achieve immense popularity. It is known as the "Beamu"



This is the "Beamu" Drive, an instrument designed especially for gramophone pick-up work.

Drive, and I have recently received one for test. It is not a gramophone at all and will not work as such, but it seemingly incorporates every point necessary for perfect pick-up work, several of which are, I confess, quite new to me.

The device is contained in a handsome and solid figured oak cabinet, and its lid, which can be closed even when a twelve-inch record is in use, has a small bevelled lip so that it is quite sound-proof. There are three terminals at the back, two for pick-up connections, and an earthing terminal which, connected both to the motor and the pick-up carrier, enables these to be earthed for stabilising purposes. No trailing wires have to be wangled through the side of the case or lid!

The pick-up carrier (it is not a tone-arm) is non-resonant, has an adjustable counter-

balancing movement, and is tracked for central needle alignment (good points these). And a very novel feature is that a raised ridge is provided just beneath the turntable to prevent needles, dust, etc., getting underneath.

One of those excellent double-spring Garrard motors which will run two twelve-inch or three ten-inch records is fitted to the "Beamu" Drive, and there is an automatic lid catch-support.

The pick-up carrier has a removable cup at its end, and this can be changed for one suitable for any kind of pick-up. The clumsy expedient of an adaptor does not have to be entertained. (The "Drive" can be purchased with or without a pick-up.)

The whole job appears to me to be bristling with new, attractive and eminently common-sense points, and it makes one wonder why it is that they have been left to one firm to "corner." The primary object of the "Beamu" Drive seems to me to place at its two pick-up terminals (fitted in insulative bushings at the back of the case) L.F. impulses derived from a gramophone record, and completely to smother all mechanical scrapings and chattering.

AN "EXPANDING" OUTFIT.

It certainly does this effectively and has additional refinements. Finally, the instrument as a whole is very well made; one would decidedly rank it as a high-class production. I understand from an accompanying letter that, while the "Beamu" Drive is in itself an artistic and quite complete article and retails separately, it forms a section of a unique "expanding" type radio-gramophone arrangement and can be added to other units to form one ensemble. The other units comprise a receiver (a "Beamu" Three or Four), a "Beamu" cone loud speaker and batteries or eliminator container, and a record cabinet. This last can fit directly beneath a "Beamu" Drive, and this or any other section can be added at any time. Additionally, any single section can be purchased complete or in a set of parts for home assembly and used alone. "All electric" "Beamus" are available.

The whole scheme is extraordinarily novel, and yet so logical and practical that, in my opinion, its success is certain. The "Beamu" Drive alone fills a niche all of its own, and as far as I know has no competitor. Further details can be obtained from the makers, Messrs. Beagley and Musto, of 47, Cranbourn Street, W.C.2, and representative models are being demonstrated at that address. I would advise "P.W." readers who can to examine the outfit for themselves: I think they will consider the time so spent well worth while.

A USEFUL TEST METER.

The Standard Wet Battery Company has produced a most useful device. It consists of a small, neat watch-pattern meter having the two voltage ranges of 0 to 6 and 0 to 150. These are brought into use by employing one or other of two flexible leads. Additionally, two terminals are fixed to the meter, and these enable milliamp readings to be taken. This scale provides a range of 0 to 30 milliamps.

The instrument, therefore, can be used to test the voltage of H.T. or L.T. batteries, and to check the milliamp consumption of a set. The scale is a clean, bright one, and the action of the needle is dead-beat; and, within the scope of its necessarily abbreviated scale, I find the instrument quite accurate. Certainly it has all the accuracy needed, or I should say the readings can be taken closely enough for ordinary test purposes. The instrument

Traders and manufacturers are invited to submit radio sets, components, and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiassed guide as to what to buy and what to avoid.

is sold complete with an instruction leaflet at 8s. 6d. It will meet nearly all the needs of the ordinary listener in the maintenance and adjustment of his outfit.

I.E.P. ELECTRIC SOLDERING IRON.

The Ilford Electrical Products Co. of 907, Romford Road, London, E.12, recently sent me one of their soldering irons selling at 8s. 6d. This tool carries a twelve months' guarantee. The "iron" appears to me to be particularly suitable for radio-set assembly and such work. It is a cleanly-designed and well-constructed article and, complete with a flexible lead and adaptor, seems to be good value for money.

COSSOR L.F. TRANSFORMER.

The Cossor "Melody Maker" L.F. Transformer is contained in a frosted metal casing, brown in colour. It is rather smaller than usual and its shape is distinctive. The terminals are placed well down to the base of the component, two on each side. Its characteristics are distinctly good. Despite its compactness and moderate weight it provides even amplification and its primary can accommodate good working currents without saturation. I should certainly place the Cossor "Melody Maker" L.F. Transformer in the front rank of such components.

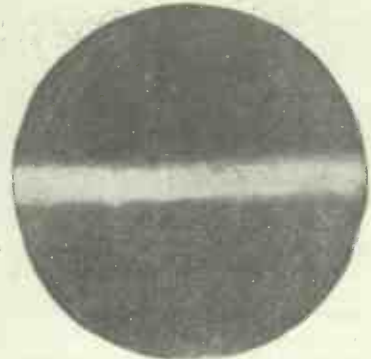
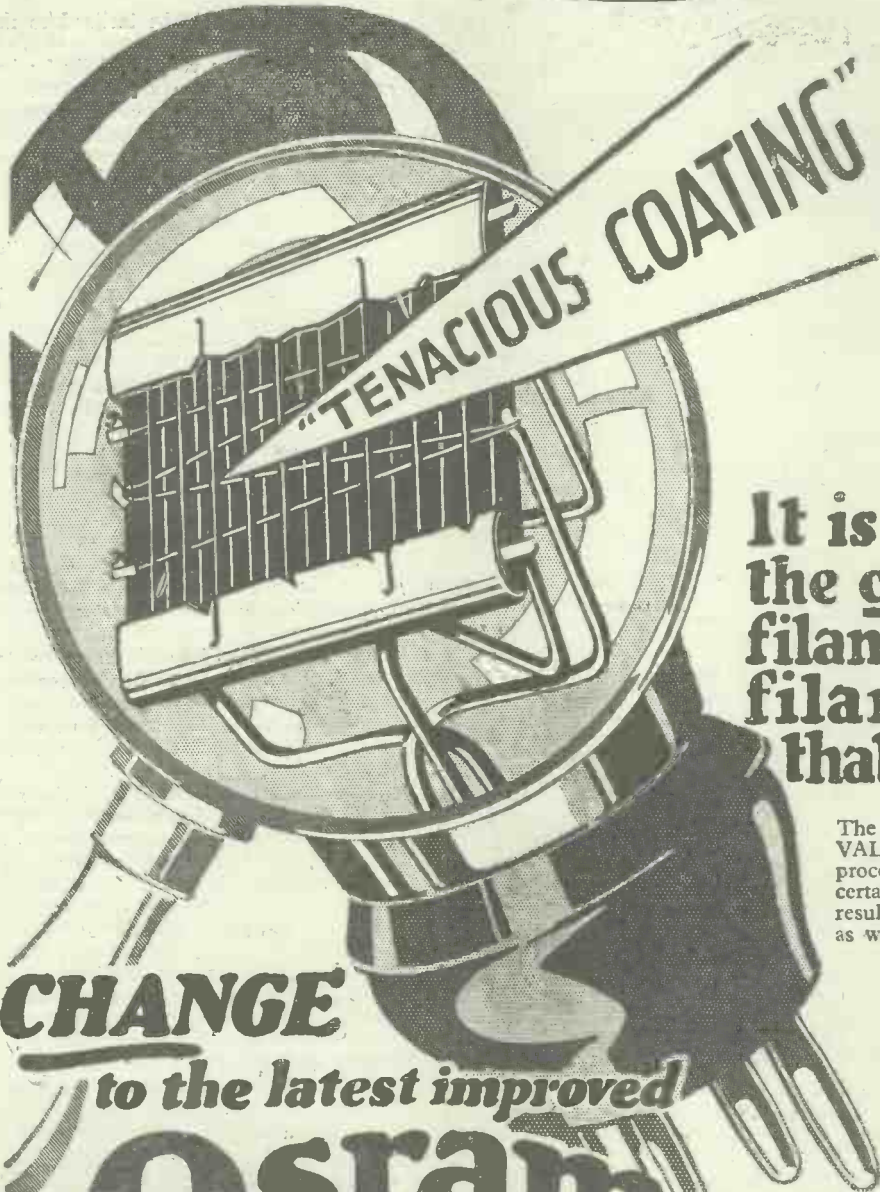


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ELECTRICAL



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Reproduction from an untouched micro-photograph of part of the filament of a badly coated valve before use, showing a serious gap in the coating. A gap such as this starts the valve off in its life with a poor performance, and may bring about a further portion of the coating falling away or peeling off. The valve then prematurely fails.

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PICKING PICK-UP "PIECES."

Choosing Records for Electrical Reproduction.
By K. D. ROGERS.



IT seems an unnecessary waste of time to discuss the question of choosing a record, as everybody who has had a gramophone thinks that all one has to do is to go to the gramophone shop, ask for a certain item, pay the money, and walk away with the record. Or, alternatively, one can go into a shop and ask to hear some interesting records and pick out those which appeal to one's taste best.

But when the question of electrical reproduction of gramophone records is being considered, it requires a little more care at first when choosing a record which is to be played by means of a pick-up.

We will assume that the pick-up and amplifier and loud speaker being employed are capable of bringing out the bass notes to a reasonable extent and are fairly faithful all over the musical scale. Of course, some pick-ups emphasise the high notes and some emphasise the bass notes and the amplifier and loud speaker may do either, but we will assume that whatever the reproduction, it is to the liking of the owner of the pick-up and amplifier.

Difficult to Judge.

When he wants a new record, then, what does he do? Does he simply go into the shop and say, "I want such-and-such a record," having been recommended it, and then walk away with it, or does he say, "I am rather keen on such-and-such an item. What records have you giving that particular piece?"

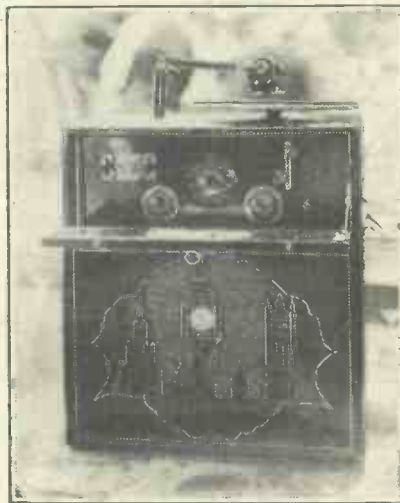
This latter is the better way of going about it. If you go with the idea of getting a record of an item, preferably by some particular maker, then you may, or you may not, be lucky in your reproduction. But if you go along to the shop, and hear all those records which feature this particular item, or type of item, then you stand more chance of getting a record really suitable for pick-up reproduction.

I have heard a number of makes, four or five sometimes, which have recorded on the same kinds of instruments some particular piece and of which only one was really suitable for pick-up work. The others were either too harsh, or lacking in bass notes, or something else was wrong with them.

Now the danger when you go round to the shop lies mainly in the fact that the records you will hear will be played on a more or less efficient gramophone, probably one of the latest makes. This will tend to emphasise the bass notes, give a roundness

to the whole reproduction and in some cases somewhat stifle the high notes, the violin sounding more like a flute than anything else. This is all very well, if you are prepared to choose your records to suit that gramophone, but you are picking a record to suit a pick-up and amplifier, which is altogether a "different pair of shoes," as they say.

You must remember that the gramophone you will hear the record on will, to some extent, "manufacture" bass out of its own resonance and the particular acoustic properties which have been deliberately given to it by the makers. In any case,



A novelty in the way of Radio-gram sets is the "Westminster" combined set sold by Dubiliers and shown above.

really deep bass notes of about 50 or 60 cycles will not appear at all, although their harmonics an octave or two higher may be heard, so you must look out for that point when you are listening to your record.

See if there is any real bass coming through or whether it is merely pleasant "deepness" which sounds enjoyable but which cannot be defined as any particular instrument or any particular pitch.

Similarly, where the treble is concerned, see if you can pick out the violins and see if they sound like violins. The more they sound like violins the better will they sound when you reproduce them on your own apparatus. If there is chatter or blast in a record, any sudden note predominating

over the rest, it will be inclined to make your pick-up chatter.

Above all, listen very carefully for background. Some records are beautifully reproduced, but have a certain amount of hiss behind them which may not sound too annoying on an ordinary gramophone, but which will probably be very greatly amplified by your pick-up until it approaches proportions which spoil the whole record. It is often found in piano pieces, solos by people like Jack Smith (the Whispering baritone), and in organ records, that the background hiss predominates through the greater part of the record. When soft notes are being played, or when a particularly thin, reedy stop on the organ is being used, this hiss comes through and spoils the whole lot.

Artificial Roundness.

And especially striking can this hiss be if the record is used with a pick-up which tends to amplify the higher notes and give a particularly bright reproduction.

The average gramophone cannot be said to be particularly crisp though it is certainly forceful. It has a sort of roundness and mellowness which is specially given to it, but that in the case of a pick-up has to be done by the amplifier and loud speaker, and if these do not give the roundness of the gramophone, then the record will not sound anything like it did when you heard it in the shop.

You must remember that if the record shows it has some bass, then that bass will be amplified by your pick-up when working properly, and if it shows it has got treble notes and real brightness, then they will be increased in brightness by your pick-up; while if it has notes inclined to blast, notes that come out stridently and rather offend the ear, then those notes are far more likely to be emphasised by your pick-up and will probably cause overloading in your set. In such a case the volume control has to be turned right down and the brilliancy of the record is lost in all but those particularly strident passages.

"Blasting."

A record which has no strident passages, but which has just the ordinary use of light and shade and is more or less uniform, comes out best on a pick-up, and those should be chosen before the others.

Records by artistes like Gracie Fields and Sophie Tucker come out excellently when the pick-up and amplifier circuits are working properly, but if there is the slightest suspicion of blast they will be quite likely to cause that blast to be very unpleasant, and they will do it often.

So look out for that sudden crescendo, and those sudden trumpet notes, and see that they do not cause blasting in your set. You are bound to make a few mistakes in choosing a record, but the foregoing should help to make those mistakes as small in number as possible.

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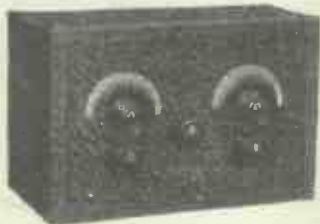
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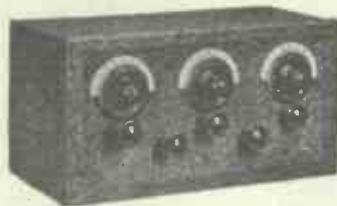
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- 1 type 'AB' Mains Transformer
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WORKSHOP WRINKLES

THE simple and very useful scribing-block shown in Fig. 1 is made from an old 3-in. ebonite dial, a 5-in. length of $\frac{1}{16}$ -in. round brass rod, two terminals, and a piece of steel wire about $\frac{1}{8}$ in. in diameter by 5 in. long. The ebonite knob is drilled through (preferably in the lathe), and one end of the rod is threaded and fitted, as shown at A in Fig. 2.



Fig. 1.—The scribing block, which can be made with an old ebonite dial and various small pieces of material that you may have on hand.

The terminal (which carries the scriber) is at right angles with the enlarged hole in the other terminal.

A Simple Saw Stop.

Another useful workshop gadget which can easily be made from scrap materials consists of an adjustable saw-stop (Fig. 3).

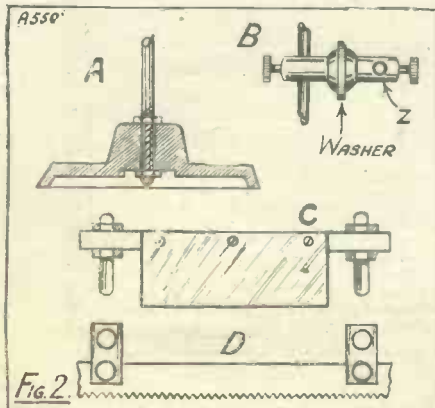


Fig. 2.

* * * * *

Here are some useful hints which will help you when building sets. Some interesting gadgets are described which were evolved by the author during his own experiments in hooking up radio receivers.

By OSWALD J. RANKIN.

* * * * *

Amateurs who construct their own frame aerials, low-loss coil formers, etc., will appreciate the utility of such a device, since it solves the problem of cutting a number of slots of accurately equal depth.

A hardwood support, 6 in. long, by $\frac{3}{8}$ in. in square section, is drilled at each end and provided with a recess to which is attached a piece of sheet ebonite about $4\frac{1}{2}$ in. by $1\frac{1}{2}$ in. The ends of the support are then fitted with pins about $1\frac{1}{2}$ in. long, which are made from $\frac{1}{16}$ -in. round brass rod. (See diagram C, Fig. 2).

It is then only necessary to fit two ordinary flash-lamp battery connectors to the saw-blade (as at D), insert the pins in the top ends of same, and adjust the stop (C) as required; i.e. so that the saw does not cut beyond the desired depth.

Useful Connectors.

If preferred, the pins may be clamped or soldered permanently into the connectors, and the ebonite provided with slots, in place of the screw holes, so that its height may be varied by means of the slots and screws.

Other uses for these handy little connectors are shown in Fig. 4. A really satisfactory drill-stop is acquired by simply fitting the connector to the drill, as at E, the small terminal screws being well tightened with the pliers.

The busy experimenter who devotes his time to the trying out of new hook-ups, and who has no time for soldering, may do well to consider the multi-connector idea shown at F and G (Fig. 4). At F two connectors are soldered together in "T" fashion, one end of either connector then being clamped to a terminal shank on the hook-up board.

An extra (third) connecting point may be obtained by soldering the connectors together in cross fashion, as at G and H.

Do not attempt to economise by using a biscuit tin as a screening box, because it is unsuitable.

Bad contacts on clips or terminals of anode resistances are a frequent source of crackling noises.

If you are trying R.C. coupling, do not forget that when the coupling resistance is inserted in the plate of a detector valve it may be necessary to shunt a .0001 mfd. fixed condenser across it in order to obtain reaction effects.

When soldering there is no need to open the flux tin and to run the risk of dirty clothes, etc., for if a small hole is punched in the lid a matchstick can be

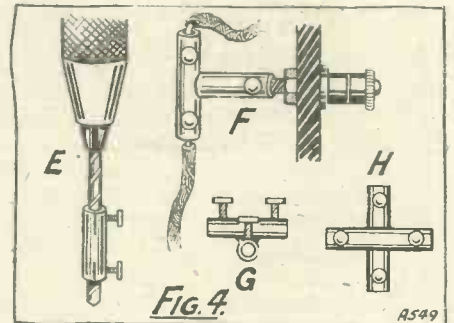


Fig. 4.

A549

passed through it thus saving both bother and flux.

As soon as a joint has been soldered and whilst still hot it should be wiped with a clean cloth, to remove all traces of flux.

If one soldered joint has to be made close to another, the heat should be prevented from spreading by wrapping a damp cloth around the neighbouring joint.

Using a paper clip or a wooden clothes peg is a convenient means of holding wires together when soldering.

To save time in soldering, tin both surfaces before attempting to join them.

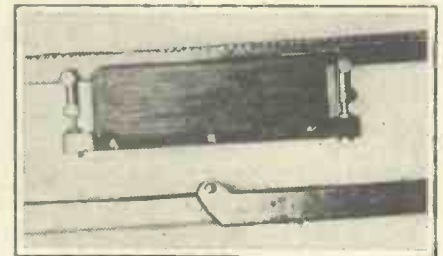


Fig. 3.—An adjustable saw stop which completely solves the problem of cutting slots in coil formers.

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- | | | |
|----------------|--|------------------------|
| | November 18th. | |
| 1. Overture | Lysistrata | P. Lincke |
| 2. | Valse lente (Rose Mousse) | A. Bosce |
| 3. | Heinzelmannchens Wachtparade | Noach |
| 4. | Legende d'Amour | Giuseppe Becce |
| 5. | Three dances from "Nell Gwyn" | Edward German |
| 6. | Midnight Bells from "The Opera Ball" (Violin solo by Hugo de Groot) | Heuberger- Kreister |
| 7. Overture | "The Black Domino" | Auber |
| 8. Serenade | Spring Morning | Lacombe |
| 9. Melody | "A Remembered Kiss" | Kate Vannah |
| 10. Selection. | "The Mikado" | Sullivan |
| 11. | Czardas from "Ghost of the Warrior" | L. Grossmann |



RADIOTORIAL

All Editorial Communications to be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. The 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.

CURING A THRESHOLD HOWL.

J. C. S. (Leicester).—"A friend who has a short-wave set told me that he also used to suffer from 'threshold howl' when he was using a set of this kind, but in his case he had seen something in 'P.W.' about curing it with H.F. chokes. It was a method of connecting two chokes in series, with a condenser across them, but he cannot remember the exact connection and although I have tried it I have had no success. Can you tell me what the method was and what are the right connections?"

Probably your friend was thinking of the H.F. filter which was recommended for use in the detector circuit when a certain amount of the H.F. energy was finding its way into the L.F. end of the set and gave rise to threshold howl. The method recommended is not quite as you described: but consisted in putting two good H.F. chokes in series with one another in the plate circuit of the detector with a condenser taken to earth from the mid-point of the two chokes.

We would point out, however, that this is not an infallible cure for threshold howl, as there are several ways in which the trouble occurs and consequently what is effective to cure it in one set is quite inadequate in another. One common cause of the trouble is an unsuitable value of grid leak in the detector, and if the above fails to shift the trouble, try using a leak of different resistance.

Another dodge is the substitution of a different transformer for the one in use, which will often effect a complete cure. Alternatively shunt a high-resistance across the primary of the transformer as this is sometimes effective, or, better still, shunt a 30 or 50-henry choke across it. Yet another cure is to

try a choke output circuit instead of connecting the 'phones in the anode circuit of the last valve direct. In some cases the disconnecting of the 'phones and re-connecting there a 20-henry choke will clear reception, when the 'phones are joined in series with a 2-mfd. condenser, the remaining end of the condenser being connected to the anode of the valve, and of the 'phones to H.T. —

THE "P.W." STANDARD LOADING COIL.

W. E. P. (Hertford).—"Could you kindly let me know as soon as possible where I could get the Standard Loading Coil for the 'Regional' Crystal Set described in your paper No. 332?"

The "P.W." Standard Loading Coil can be obtained from the following manufacturers—Burne-Jones, Ltd., Lewcos, Ltd., E. Paroussi, and Wright & Wearle, Ltd. (See advertisement pages of "P.W.")

SPARKING FROM A CHARGER.

P. S. R. (Leamington).—"The charger is one of those vibratory ones and I get rather a lot of sparking from it. I am told that a condenser would help this. Where should I place it and what size should it be?"

In such cases it is usual to place a large fixed condenser, either of 2 or 4 mfd. capacity, across the two contacts which are sparking. Needless to say, the condenser should be a good one of really irreplaceable insulation, as it will have the full voltage across it.

THE "SYDNEY" TWO.

E. C. N. (Brockenhurst, Hants).—"So, what I would like to try out is a kind of short-wave set which works from about 20 to 50 metres and which is capable of picking up Australia and America. I am told that the 'P.W.' 'Sydney' Two will do this, so I should like to build this if it is not too expensive, and you can tell me where I can get the how-to-make details."

The set is quite an inexpensive one to build, and you will find all the details of the "Sydney" Two in the "P.W." Blue Print No. 39. Blue prints can be ordered direct from the Technical Query Department,

(Continued on page 570.)

Orphean RADIO

"STANDARD" CABINET CONE SPEAKER

For those who prefer something more ornate than the ordinary cone speaker we recommend this artistic and beautifully made cabinet speaker which will add charm to the appearance of any room. It is made of solid oak and contains a standard 9 in. Orphean cone loud-speaker which is famed for its purity of reproduction and tone. The size is 13 in. high, 12 in. wide and 5½ in. deep. It is a speaker which is absolutely free from "drumming" effects and gives both high and low notes their true value. So do not hesitate any longer, write for our descriptive folder and the name of the nearest dealer, who will always be pleased to demonstrate.



Price: £3. 15. 0

3 VALVE PORTABLE

This new set is completely self-contained, easy to operate and combines extreme efficiency with handsome appearance. It measures 17½ in. high, 15 in. wide and 8½ in. deep and is contained in a polished cabinet of solid oak mounted upon ball-bearing turntable. The Price is only £21. Royalties extra. Deferred terms can be arranged.

LONDON RADIO MFG. CO., LTD.

Head Office & Works: Station Rd., Merton Abbey, London, S.W.19

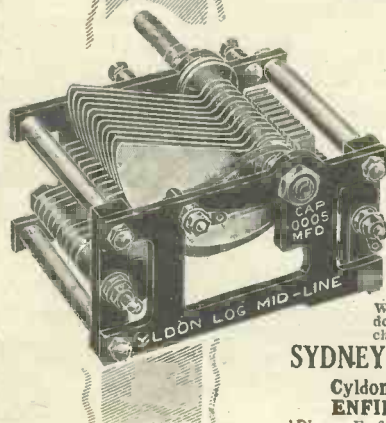
18-21 Telephone: WIMBLEDON 4638.

CYLDON

Specified for the PENTODE 3

LOG MID-LINE CONDENSERS

This condenser is on the Logarithmic principle, and the vanes are shaped approximately midway between the square law and straight-line frequency types, the variation in capacity being intermediate. The effect is that the usual crowding of stations at either end of the scale in the S.L.F. and S.L. Condensers is eliminated, and in the case of multi-valve receivers will give identical readings over the whole tuning range.



PRICES

| | | |
|-----------------------|---|------|
| *001 | - | 19/- |
| *0005 | - | 15/6 |
| *0003 | - | 14/6 |
| *00025 | - | 14/- |
| *0002 | - | 13/6 |
| 4 in. dial 2/- extra. | | |

BÉBÉ CONDENSERS PRICES

| | | |
|---------------------------|---|------|
| *00005 | - | 7/- |
| *0001 | - | 7/6 |
| *00015 | - | 8/- |
| *0002 | - | 8/6 |
| *00025 | - | 9/6 |
| *0003 | - | 11/6 |
| Complete with 2 in. dial. | | |

Write to day for full particulars of all Cyldon Condensers, including the new "Synchrature" model for better gang control

SYDNEY S. BIRD & Sons, Ltd.,

Cyldon Works, Sarnesfield Road, ENFIELD TOWN, MIDDLESEX.

*Phone: Enfield 2071-2 *Grams: 'Capacity, Enfield'

OTHER "ORPHEAN" BARGAINS

| | |
|---------------------------------|------|
| "SUPER" CABINET Cone Speaker | £6 |
| "THE ORPHEAN CONE" Loud-Speaker | £2 |
| HORN TYPE LOUD-SPEAKERS | |
| "DE LUXE" .. | 50/- |
| "STANDARD" .. | 40/- |
| "GEM" .. | 30/- |
| SEND FOR LIST. | |

MAKE YOUR OWN CONE SPEAKER

The New Wonder "Nightingale"

CONE UNIT

Exactly as fitted to our Cabinet Cone Speaker. Guaranteed to give results equal to the most expensive Loud-Speakers yet made.

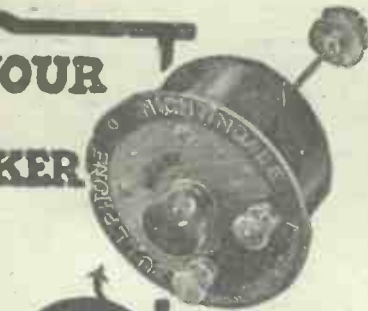
Full constructional details with each Unit.

GRAMOPHONE ATTACHMENT

Reduced from 32/6 to 15/- solely as an advertisement for the famous Bullphone Nightingale Loud-Speakers. Cobalt Magnet guaranteed for all time.

With 4-inch Diaphragm,

Instantly converts your own Gramophone into a full power Loud-speaker, giving a wealth of pure undistorted volume which must be heard to be believed.



15/-

SATISFACTION GUARANTEED or money refunded!



AS FITTED TO OUR £6 POST HORN

BUY ON EASY TERMS

5/- Secures this Speaker

The Nightingale "DE LUXE"

50/- cash, or 5/- deposit and 11 monthly payments of 5/-

21 in. high with 14 in. Bell, Mahogany finished with plated arm & stand.



5/- Secures this Speaker



NIGHTINGALE CONCERT SUPREME SUPER

Guaranteed free from metallic resonance.

60/- cash, or **EASY TERMS**, 5/- deposit and 12 monthly payments of 5/-

Send Deposit NOW!

Obtainable from your Local Dealer or direct from :-

BULLPHONE LIMITED
38, HOLYWELL LANE, LONDON E.C.2.

NIGHTINGALE SPEAKERS

The "EKCO" Independent Series Anode Feed System

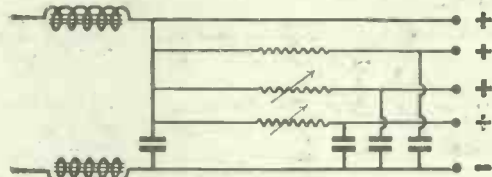
UNIQUE IN MAINS POWER RADIO

This now famous system is fully patented by "Ekco" and has played an important part in the wide success of all "Ekco" Mains Power Radio Devices, the most popular of to-day.

The "Ekco" Anode Feed System definitely eliminates all "hum" and "motorboating." It also assures correct voltage output and lower running costs.

The diagram of this remarkable system is shown below, and it will be observed that although an extra "Ekco" resistance of the finest grade wire is incorporated with each fixed voltage tapping, yet prices of all "Ekco" devices are phenomenally low.

We frankly admit that our low prices are only made possible by reason of a small margin of profit and our very large output.



Circuit Diagram of Model 2V.60.D.C.

FULLY PROTECTED UNDER PATENT NO 262567. THE "EKCO" INDEPENDENT SERIES ANODE FEED SYSTEM

SAFE! SILENT! SOUND!

MODELS RANGE FROM 17/6 D.C. AND £2-12-6 A.C. COMPLETE IN HANDSOME DARK BROWN CRYSTALLINE METAL CASES. EVERY DEVICE CARRIES A FIRM GUARANTEE FOR ONE YEAR.

WRITE FOR NEW ILLUSTRATED BOOKLET.

EK COLE LTD "EKCO" WORKS,
(DEPT. A) LONDON ROAD, LEIGH-ON-SEA.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 568.)

POPULAR WIRELESS, The Amalgamated Press, Ltd., Fleetway House, Farringdon Street, London, E.C.4. A stamped, self-addressed envelope *must* accompany each application for a blue print, together with a P.O. or stamps to the value of 6d.

A SIMPLE METHOD OF NEUTRALISING.

E. G. F. (Bordeaux).—"It is a three-valver—H.F., Det., L.F.—but since I have changed the valves, it is a little unsatisfactory owing to its tendency to oscillate, and I think the cause is that I have not neutralised it properly. Can you tell me how to do this?"

The following method of neutralising is recommended for use in sets employing one stage of H.F. and provided with a reaction control. 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.

To test for oscillation, touch one or other of the sets of plates of the tuning condensers (this may be either the fixed or moving, according to the particular set). 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. (In the case of such condensers as the Gambrell "Neutrovernia" this means screwing downwards.) 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.

Note.—It is to be understood that in the preceding notes, where a reaction condenser is spoken of, any form of reaction control may be understood.

"P.W." 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," The 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.

TESTING THE H.T. BATTERY.

E. D. C. (Tunbridge Wells).—"Although I always buy the same kind, I find that the H.T. batteries are most unreliable as regards length of service.

"I do not mean to say that they do not last as long as they should, for as a matter of fact I have had very good service in this respect, and it is easily the cheapest form of supply for a small set like mine. But what I cannot make out is that, although I always buy the same type and make of battery, sometimes they last me three months or more and sometimes well over six months. On other occasions I have the feeling that either the battery is running down before it should, or else that it has lasted so long that I should be getting better results from a new battery.

"If I get a good voltmeter would it enable me to keep an eye upon the exact condition of the battery so that I could renew it as soon as necessary, but never before? And, if so, how much should a battery be allowed to drop in voltage before it is considered dud?"

If you have a really good high resistance voltmeter this will give a reliable indication of the condition of the dry battery if it is connected to it after the set has been in use about an hour, i.e. whilst the battery is still on load. If the voltage is tested in this way (about once a week) after the battery has been in service for a month or so, it is the work of only a moment to verify that it is in good condition. But make sure that the voltage is always read while the battery is on load, and has been supplying current for some time, and do not let the total voltage of the battery drop below about 90 per cent of the rated voltage.

IMPROVING THE LEAD-IN.

C. F. R. (Gateshead-on-Tyne).—"So as to make a good job of the papering and repainting we disconnected the proper insulated wireless leads which come along the walls and were going to put them back again when the job was finished. But not having much to do

(Continued on page 572.)



NO OTHER SPEAKER IN THE WORLD GIVES BETTER RESULTS OFF A 2-VALVE SET THAN THE NEW M.P.A. DUAL INDUCTANCE

and it is the finest "speaker" value you can possibly buy. A speaker built on the moving coil principle which requires neither accumulators, mains connections, special valves, nor transformers! A self-energising model exclusive to M.P.A.! More sensitive than a magnetic movement, yet . . . uses no more H.T. voltage than an ordinary loudspeaker! Low notes without a boom! High notes without shrillness! Every part balanced and in perfect unison! Speech excellent! "It gets the best from your set." Ask for the M.P.A. DUAL INDUCTANCE SPEAKER. Price 7 guineas.

Other M.P.A. Models include the Popular Plaque, 29/6; De Luxe Plaque, 47/6; Table Grand Speaker, 5 guineas; Table Cabinet Speaker, £41/7/6; Moving Coil Speakers, from 10 guineas; and the "Octroda" 8-Electrode Self-Contained Stationary Set, 12 and 17 guineas. For Irish Free State prices write Brown Bros. (Ireland), Lower Abbey St., Dublin, C.8. All Wireless Dealers stock M.P.A. Products.

THE M.P.A. WAY

Products to the value of £5 or over can be obtained on Hire Purchase Terms for £1 down!



M.P.A.
Hearing that is
Almost Seeing

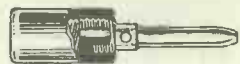
CLIX

FOR EVERY CONCEIVABLE FORM OF CONTACT

You will need some of the Clix products illustrated below if you are building these famous receivers.

**COSSOR NEW MELODY MAKER
EDISWAN R.C. THREESOME
MULLARD MASTER THREE***

"CLIX" practical aids to perfect contact are the outcome of careful study into the causes of those annoying interferences in reception which are invariably traced to bad contact:



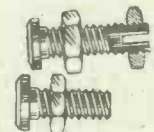
1. **CLIX PARALLEL PLUGS.** A boon to experimenters. 2d.



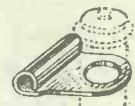
2. **CLIX SPADE TERMINALS.** Bury all contact troubles. Nickel or Lead Plated 2d.



3. **CLIX SPIRAL WANDER PLUGS.** Give full surface contact 2d.



4. **CLIX PARALLEL SOCKETS.** Eliminate the use of solder 1d. & 1½d.



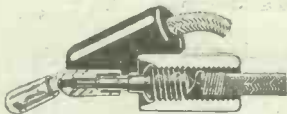
5. **CLIX TERMINAL BRACKETS.** Make plug contact simple 1d.



6. **CLIX PIN TERMINALS.** The pins with many uses. 2d.



7. **CLIX COIL PINS.** An all-purpose fitment . . 2d.



8. **CLIX-LOX WANDER PLUG.** The wonder wander plug 2½d.

Look for the "CLIX" Showcase on your Dealer's counter

NEW CATALOGUE NOW READY.

It contains full details of all the above and also illustrations, including the following additional "Clix" products.

ACCUMULATOR KNOBS, PANEL TERMINALS, POWER PLUGS AND SOCKETS, CONNECTORS AND THE "CLIX" MULTI-PLUG AND SOCKET.

Ask your Dealer for a copy, or write to

LECTRO LINX, LTD.,
254, Vauxhall Bridge Rd., Westminster, S.W.1



SIEMENS

POPULAR TYPE

100-VOLT BATTERY

THE BEST EVER PRODUCED AT THE PRICE

The
60 volt
Battery
costs 8/-

Always ask for, and see that you get, the Battery that is
BRITISH
MADE IN EVERY
DETAIL

For the
PENTODE VALVE
Use a
SIEMENS SUPER RADIO BATTERY
25/-
50 volts.

SIEMENS BROTHERS & CO., LTD.,
WOOLWICH, S.E.18.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 570.)

that evening we decided to run a temporary wire from the set out to the aerial, and to our surprise no sooner was this put on than, although it came in straight through the window and was only hurriedly put up, we found it was much stronger than the ordinary way. In fact, it is so good that we shall not put it back again, but are going to arrange the wire like the one at present.

"How is it that this gives much better and powerful results than we were able to get before, although the wire is not so good?"

The reason that you are getting better results with the spaced-out wire is that formerly a certain amount of the energy that was passing along the lead-in used to leak away to earth before it reached the set. Although you used insulated wire, the fact that it ran close to a wall set up a kind of condenser effect between the wire and the earth. A certain amount of the high-frequency energy passed across this condenser, and found its way via this short cut to earth, without helping to strengthen the input to the telephones.

By taking the lead away from the wall you prevented this short-cut effect taking place, and you have compelled all the current flowing in the aerial to pass properly down the lead-in through the set to earth.

It is because of such condenser effects between the wire itself and any neighbouring surfaces such as walls, gutter pipes, etc., that it is inadvisable to run the lead-in near walls, etc. Never have a long lead-in if a short one will do. We certainly recommend you to keep it well spaced out from the wall or ceiling, if necessary using insulating arms or wooden supports to ensure it is sufficiently spaced.

LONG-DISTANCE FADING.

L. B. D. (Chesham, Bucks).—"Although it is only two valves, I can get many foreign stations quite well, but what I cannot understand is the fading. For instance, if I tune in Berlin, sometimes it seems as loud as London

for a few minutes, and then without anything being touched it seems to fade away and gets weaker until presently I can hardly hear it.

"Nothing I can do seems to make much difference, but later it will come in again just as strong as ever. How can this be prevented?"

A GREAT GIFT

To all readers of

The WIRELESS CONSTRUCTOR

is being presented with the
DECEMBER ISSUE
which is NOW ON SALE.

It consists of a fine book of practical
wireless wisdom entitled

31 MORE TESTED CIRCUITS

Compiled by
PERCY W. HARRIS, M.I.R.E.

It is sure to be in huge demand,
as the cost of

The WIRELESS CONSTRUCTOR

is not advanced, but remains at the
USUAL PRICE, 6d.

GET YOUR COPY TO-DAY

It cannot! Long-distance fading is one of the peculiarities of wireless for which there is no cure, it being caused not by a fault in the receiving set but by some peculiarity in the mysterious medium which transmits the broadcast energy from the distant station to your aerial.

Fortunately it is only long-distance stations which suffer in this way, so that the main purpose of wireless—entertainment from the local station—is in no way affected by this strange phenomenon.

FITTING A PICK-UP.

A. V. L. (Worthing, Sussex).—"If I buy a pick-up for fitting to the gramophone, can this be plugged into the detector stage or must it be into one of the L.F. amplifiers (the set is a Det., 2 L.F.)?"

A gramophone pick-up can be used either in the detector or in any L.F. amplifying valve merely by removing the valve in question, plugging in the pick-up and replacing the valve in the holder incorporated in this.

REPAIRING AN ACCUMULATOR CASE.

C. H. (Malmesbury, Wilts).—"Some time ago I saw an account of how a small hole in a celluloid accumulator could be filled up, but I have mislaid the particulars and should be glad to note how this can be done if you can tell me?"

Such a repair can easily be effected by means of a small strip of celluloid dissolved in a little amyl-acetate. A small quantity of this can be obtained from any chemist, and may be used to form a paste which can be used to fill the small holes or cracks in the case.

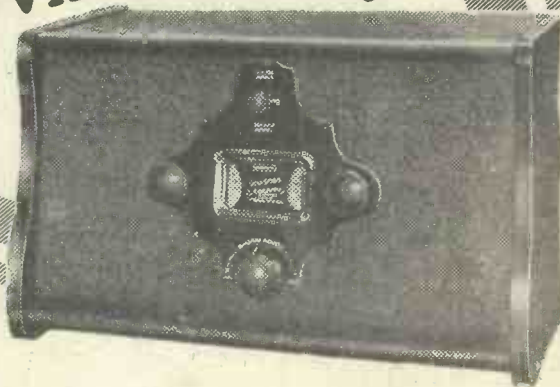
THE "P.W." STANDARD LOADING COIL.

W. H. E. (Larne).—"I should like to make up a Standard loading coil for myself, using material already on hand, if possible. Is it very critical, and what are the details and chief points to bear in mind?"

There is nothing very critical about it, and any scheme which suits the convenience of the individual constructor or manufacturer will serve the purpose.

(Continued on page 574.)

**20 TO 25
STATIONS ON THIS
THREE-VALVE SET!**



Three valves—including screened grid and pentode.

Easy to operate—two dials.

20-25 stations at full loud-speaker volume.

Excellent quality of reproduction.

Range: 210-550 and 650-2,100 metres. No coils to change.

**THE
BURNDEPT
SCREENED ETHOPHONE**

PRICE: including valves and royalty.

£12 - 7 - 0.

"PRETTY good" you say with admirable caution. It is good. It's because the BURNDEPT Screened Ethophone gives results equal to sets with five ordinary valves. That's why, at the price of a three-valve set, the Screened Ethophone is such outstanding value among up-to-date radio receivers. This BURNDEPT set has become enormously popular. Go and hear it at your local radio dealer's to-day.

BURNDEPT Receivers are supplied on Hire Purchase Terms. Write for full particulars.

BURNDEPT

Wireless (1928) Limited.

BLACKHEATH, LONDON, S.E.3.
Showrooms: 15, Bedford St., STRAND, W.C.2.

THE NEW LOUDSPEAKER

ALL THE MOVING COIL REFINEMENTS ARE EMBODIED IN IT

YOU LIKE GOOD MUSIC!!

The greatest artists, the finest orchestras are yours, right at your fireside. Now why not enjoy them to the full? Scrap that old-fashioned Horn that you have.

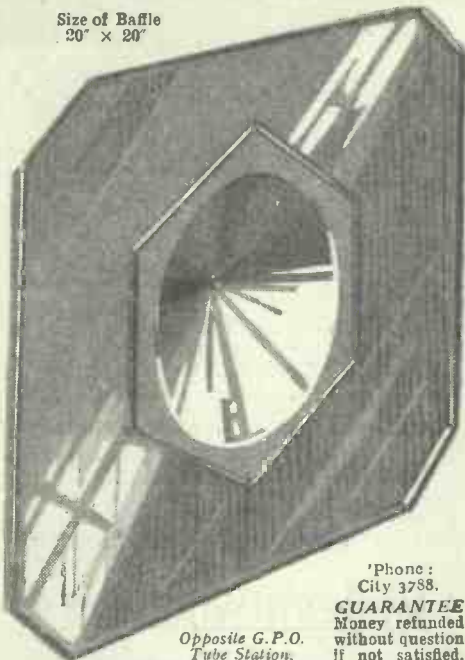
The "P.R." Speaker will reproduce every note clear as a bell—the full depth of the big drum to the harmonics of the violin—the reality of the performance will surprise you. Try one—give your set a chance to show what it can do.

THE "P.R." SPEAKER IS SUPERIOR IN TONE VOLUME

BECAUSE it is not hampered by "Cabinet" resonance. It is driven by a delicate fully balanced armature unit that is hermetically sealed and absolutely fool proof. The Cone is free to swing to the weakest impulse—the Baffle clears the treble notes and brings out the rich double bass of the organ. It is fitted with a simple tonal adjustment that "stays put." It is the most powerful reproducer on the market. Full strength from a two-valve set!! It is simple—no extra H.T. or other gadgets required, just connect it to your set—that is all.

SPECIFICATION. The P.R. Speaker is driven by a full balanced electro-magnetic armature under the influence of powerful cobalt steel permanent magnets. Adjustment is easily made by lever control which once set—"stays put."

Size of Baffle
20" x 20"



Opposite G.P.O.
Tube Station.

Phone:
City 3788
GUARANTEE
Money refunded
without question
if not satisfied.


NEW
P.R.
SPEAKER
FOR ONLY
29/9

CARR. PAID. PAY C.O.D. (3/- extra).

P.R. Loudspeaker Unit alone, 12/6
Post Free.

The special fabric Cone is supported to the baffle by a flexible non-resonant diaphragm—the baffle itself being of oak heavily reinforced by a special frame designed to prevent sympathetic resonance. The whole is finished in highly French polished natural oak, the cone and surround being given a pleasing contrasting metallic tint.

P.R. PRODUCTS, 17, PATERNOSTER SQUARE, LONDON, E.C.4




BUILD YOUR OWN H.T. UNIT
—with "Goltone" Parts

For A.C. & D.C. Mains.

Complete Kits from
£3 : 5 : 6

Full particulars on request.

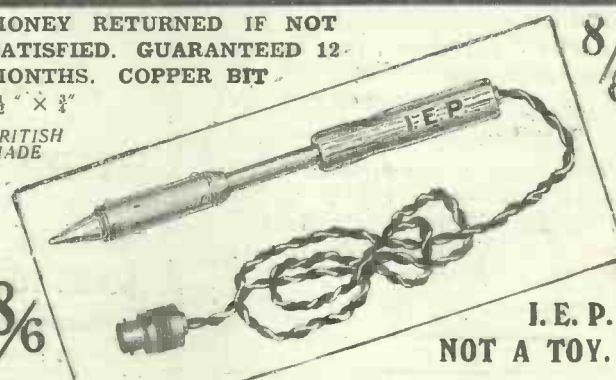
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5 & 6, EDEN ST., HAMPSTEAD ROAD, N.W.



MONEY RETURNED IF NOT SATISFIED. GUARANTEED 12 MONTHS. COPPER BIT

1½" x 1"

BRITISH MADE




8/6

I. E. P. NOT A TOY.

Ilford Electrical Products Co.,
907, Romford Road, Manor Park, LONDON, E.12.

Phone:
ILFORD 0868.

Build a COMPLETELY SCREENED Set.



"Screened Grid"

NO COIL CHANGING

From **HIGH WAVE** to **LOW WAVE** on a push-pull switch.

An amazingly simple Set to construct and operate.

Obtain a Broadsheet from your dealer and read why you should:—
COMPLETELY SCREEN THE GRID.



Send Post Card for **FREE FULL SIZE LAY-OUT PLAN & WIRING INSTRUCTIONS.**

THE FORMO CO., Crown Works, Cricklewood Lane, London, N.W.2



See how cleanly "Resiston" can be cut—no crumbling or cracking — a clean edge every time

take no chances with your panel

The most expensive cabinet will be marred by the choice of an inferior panel, whilst a superb panel—such as "Resiston"—will enhance the appearance of even the most modest cabinet.

A cheap panel loses colour very rapidly. It does not cut readily. And, finally, its electrical efficiency is so low that serious leakage may be set up and the efficiency of the receiving set considerably impaired.

"Resiston" panels retain their deep lustrous black—they can be drilled, sawn, or cut with ease. Low dielectric loss is a chief feature. To be quite safe ask for "Resiston."

Send for new booklet, free.

Please send me, free, a copy of your new booklet, "The Panel Makes all the Difference." "P.W." Nov. 17.

NAME.....

ADDRESS.....



for Perfect Sets

0368

American Hard Rubber Co., Ltd., 132, Fore St., E.C.2

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 572.)

within the following limitations: the overall diameter should not exceed 3 in., nor the length 2 in.

The method of winding should be of a type giving fairly low self-capacity and reasonably low high-frequency resistance, and, obviously, it should be of one of the "concentrated" types to enable a reasonably stout gauge of wire to be used and yet maintain the necessary compactness.

It has not been found satisfactory to use a plain single-layer winding of the very fine wire often used for long-wave coils; to compress the coil within the desired limits it would be necessary to use so fine a gauge that the H.F. resistance would be too high. Actually, it has been found that a satisfactory coil can be produced by the use of No. 26 gauge D.S.C. wire.

The coils are constructed as follows: The former is a piece of ribbed tube, with an outside diameter of 3 in., and a length of 17 in., with six ribs. In each of these ribs eight slots are cut, down to the full depth of the rib, about 1/8 in. wide, and with a space of 1/4 in. between the cuts.

There are thus eight slots to accommodate the winding, which is of the simple section type, the turns being run into each slot in turn.

In each slot there are 27 turns of No. 26 D.S.C. wire, giving a total of 216 turns. (The desired inductance is roughly 3,000 microhenries.)

DON'T FORGET

that when the NOVEMBER ISSUE of

MODERN WIRELESS

is sold out you will have lost

YOUR LAST CHANCE

of securing the great

FREE GIFT BOOK

presented to every reader THIS MONTH.

It contains full details of

SETS FOR EVERY POCKET

and is enclosed in an unusually large and attractive number all for the USUAL PRICE of 1/-.

SECURE YOUR COPY TO-DAY

Tappings are made at the 25th, 60th, and 80th turns, and these have been found to cover all the requirements of the usual circuits.

The total inductance and position of the windings in proportion to the total number of turns are the chief data needed by the constructor, the practical details being left to his own discretion, subject to the requirements laid down as to self-capacity and H.F. resistance.

Of course, if the constructor has any doubts as to his ability to make a good job of it, a professionally-wound and efficient coil can be obtained from one of the firms specialising in its production, i.e. "Lewcos," Burne-Jones, E. Paroussi, and Wright & Weaire.

Winding of Home Made Coil.

P. W. (Durham).—"The set seems to work all right as far as oscillation goes, etc., but I cannot get the wave-length right, and I think I have done wrong with the coils. As there was not quite room on the former, instead of winding it in one continuous winding, like the book says, I had to stop about 15 turns from the end, and then wind back on itself, so that that part of the winding is doubled. Do you think this would affect the wave-length?"

It certainly would affect the wave-length of a coil in the way you describe, for if the winding is

(Continued on page 576.)



LET ME BE YOUR FATHER.

I have acted as father and adviser to thousands of others. I give advice free, and when I do so I feel the responsibility of a father, either in advising a career or in guiding our students to success.

Having been the self-consulted father and adviser to thousands of others, it is possible I may be able to help you

and guide your footsteps so that you may make a success of your life.

THE MOST SUCCESSFUL AND MOST PROGRESSIVE CORRESPONDENCE COLLEGE IN THE WORLD.

IT IS QUITE TRUE

and I state most emphatically that there are thousands of men earning less than half of what they could earn simply because they do not know where the demand exceeds the supply. Thousands of people think they are in a rut simply because they cannot see the way to progress. This applies particularly to Clerks, Book-keepers, Engineers, Electricians, Builders, Joiners, etc. They do not realise that in these particular departments the demand for the well trained exceeds the supply. In Technical trades and in the professions employers are frequently asking us if we can put them in touch with well trained men. Of course, we never act as an employment agency, but it shows us where the shortage is. In nearly every trade or profession there is some qualifying examination, some hall-mark of efficiency. If you have any desire to make progress, to make a success of your career, my advice is free; simply tell me your age, your employment, and what you are interested in, and I will advise you free of charge. If you do not wish to take that advice, you are under no obligation whatever. We teach all the professions and trades by post in all parts of the world, and specialise in preparation for the examinations. Our fees are payable monthly. Write to me privately at this address, The Bennett College, Dept. 106, Sheffield.

J.W. Bennett

Note Address: Dept. 106,

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Solve all H.T. Troubles.

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JARS (waxed) 2 1/2" x 1 1/2" sq. 1/3 doz.

ZINCS, new type 1 1/4 doz. SACS 1/2 doz.

Sample doz. (18 volts), complete with

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Sample unit, 6d. Illus. booklet free.

Bargain list free.

AMPLIFIERS 30/. 2-VALVE SET 24/.

P. TAYLOR, 57, Studley Road, STOCKWELL, LONDON.

CABINETS HALF PRICE!

Solid Oak, 20" x 12", beautifully finished, with hinged lid, 18" x 8" Panel included, 10" Base-board, only 8/9. Per C.O.D., post 1/3. Worth double. Fancy Aluminium Panels, 18" x 8", 3/9. Pedestal Cabinets from 12/6. Trade supplied. List, stamp, please, J. TEAGLE, WOBURN, BLETCHLEY.



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AERMONIC Safety Earthing Switch

Scientifically designed to adequately protect your set in all conditions. Has a fuse between the aerial and the set, thus giving security from lightning even if the set is left connected. Soundedly made with Bakelite cover to keep it waterproof. Price 4/6.

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THE introduction of the B.T.H. Gramophone Pick-up marks a very definite step towards fidelity in sound reproduction. It is a thoroughly reliable instrument of extreme sensitivity and is capable of translating the impressions on the gramophone record into electrical impulses over an exceptionally wide range of frequencies. A wonderfully designed balanced tone arm ensures correct needle weight, thus minimising wear on the record. Used in conjunction with the new B.T.H. Pick-up amplifier, and a moving-coil loud speaker, a most remarkable degree of tonal purity is obtained.

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The B.T.H. Pick-up Amplifier

This instrument will appeal to those who have their own power amplifiers, but require a further stage. In addition to the one stage of amplification, this instrument embodies a scratch eliminator and volume control.

Price £3 : 7 : 6



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THE ONLY BRITISH VALVE WITH A WRITTEN GUARANTEE AS TO PERFORMANCE AND LIFE.

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WHAT OTHERS SAY of P.R. VALVES

NOW ONLY **3/6** C.O.D. Phon. City 3783 Post 4d

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Tell us your set—we will send correct Valves.

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30/- Oak, 33/- Mahogany
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C.O.D. Orders despatched as soon as possible. Send ORDER with instructions and pay Postman. C.O.D. APPLIES TO UNITED KINGDOM ONLY.

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Hours 9 a.m. to 8 p.m.
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Ebonite cut while you wait at 1d. square inch also 1 in. at 1d. Only the best supplied. Drilled Panels for all Circuits.

C.O.D. orders must be over 5/-

We stock Igranite, Ollmax, Ever Ready, Hellesen, Siemens, Formo, Ferranti, Wearite, Ormond, J.B., Benjamin, Lotus, Mullard, Dubilier, Lissen, Leweos, Utility, Magnum, Peto-Scott, Peerless, Burndept, Pye, Marconi, McMichael, Cosmos, Carborundum, E.F. Varley, Gambrell, Brown's, Sterling, Amplions—in fact, everything it is possible to stock.

KITS of parts for all Circuits. Make out LIST for keen quotation. DON'T worry, if it's Wireless WEHAVEIT.

COSSOR NEW MELODY
Spares for Same—separately (post extra).

2 Ormond -0005 Log at 6/- each; 2 Cossor pattern S.M. Dials at 3/9 each; Ormond Reaction -0001 (bushed), 4/-; Ormond P.F. Switch, 1/3; 6-ohm Rheostat, 2/- (all knobs to match cabinet); 5 Lotus new type Valve Holders at 1/3; 1 Wearite H.F. Choke, 6/6; 3 T.O.C. Condensers, 2 mid., 3/10; S.P. -0001, 2/4; 1, 1/10; Dubilier 3 meg. 2/6; 3 to 1 L.F. 15/- (compact well-known British make); 2 Wound Coils, 12/6. B.B.C.

Total List £3 : 17 : 6

SENT POST FREE FOR £3 : 10 : 0 nett.

CABINETS WITH SCREEN 17/6 Post 1/-

5XX COILS 15/- pr.

COUPON No. 15

ONLY ONE COUPON - ANYONE ORDER IF YOU SPEND 25/- OR MORE YOU CAN BUY FOR 3d. ONE (ONLY) OF THE FOLLOWING:

S.M. Dial, Permanent Detector, 100 ft. 7/22, 12 Nickel Terminals, Battery Switch, Indoor Aerial, 60X Coil, -0003 and 2 meg., 12 yds. Lead-in. H.F. Choke, 9-volt Grid Bias, 6-pin Coil Base, Fuse Bulb and Holder Pair Panel Brackets, 12 yds. Twin Flex, Loud Speaker Cord.

ONE OF ABOVE, 3d. WITH 25/- ORDER.

MULLARD MASTER 3*

This new and wonderful set must appeal to young and old, amateur or experimenter—in fact, EVERYBODY.

YOU CAN PURCHASE

ANY ITEM SEPARATELY (OR A KIT OF PARTS).

Every component is available at short notice. This list is strictly to Mullard specification. 3 Valve Holders, Lotus, at 1/3; Cossor Combined Wave Coil, 17/6; Permacore Transformer, 25/-; Climax "LFA" Transformer, 25/-; Climax H.F. Choke, 7/6; Benjamin Battery Switch, 1/3; J.B. -0005 Log, 11/6; -0005 10/6; Mullard -0003 and meg. 5/-; Magnum Panel Brackets, 2/6; Mullard -0001 Fixed, 2/6.

Total £5 : 12 : 6

VALVES, 2 at 10/6.
Power, 12/6.

Please add 3/6 to above price (total £5/16/0) and I will include: 2 Handsome S.M. Dials, Set of Connecting Links, 8 Plugs, 2 Spades, 4 Engraved Terminals, 2 Ebonite Strips, Twin Flex, Splendid Aluminium Panel, 18 x 7, drilled ready for use, 9-volt Grid Bias, Base-board, Carriage Paid.

DAK CABINET, hinged lid, 12/6. Carriage 2/-.

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MULLARD VALVES
SIX-SIXTY VALVES
B.H. VALVES
EDISWAN VALVES
MARCONI VALVES

H.F. L.F. R.O. 10/6.
Power, 12/6. Super Power, 15/-, Screen-Grid, 22/6. Pentodes, 25/-.

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; Lissenols, 13/6; L.F. Transformers, 8/6; Coils, 60 X, 6/4; 250 X, 9/9; 60 X H.T., 7/11; 100 X, 12/11; Super 60 X, 13/6; Grid Bias, 1/6; 4-5, 5d.; Super L.F., 19/-; Variable -0003, 6/-; -0005, 6/6.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 574.)

continuous in the same clockwise (or anti-clockwise) movement, but is returned back upon itself it will have the same effect as though the direction of winding had been reversed. Consequently the coil will be non-inductive, at the overlap, and this will have the effect of shortening the wave-length and destroying the effect of the last thirty turns or so, so that this would account for your poor results, and it will be necessary to rewind your coil upon a longer former, or to rearrange the portion which is now non-inductive.

A BURBLING FAULT.

G. B. W. (Southend-on-Sea).—"What I cannot understand is this. With the old valve the set is not very strong, but it is moderately clear and worth listening to. As soon as the new valves are plugged in it becomes very much louder, but harsh and distorted, and in other words, the new valves spoil the effect completely. Why is this?"

A MAGNIFICENT BOOK

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The WIRELESS CONSTRUCTOR

NOW ON SALE.

It is Entitled

31 MORE TESTED CIRCUITS

and was specially compiled by P. W. HARRIS, M.I.R.E.

YOU CANNOT AFFORD TO MISS

THIS GIFT if you are interested in radio.

GET YOUR COPY TO-DAY.

The WIRELESS CONSTRUCTOR

PRICE 6d.

NOW ON SALE.

The probability is that with a set of this old-fashioned type the wiring of the grid leads is unnecessarily long, and there is a certain amount of feed-back between plate and grid, i.e. internal reaction.

In a set using old-fashioned valves the magnification of the valve itself is not very high, and this internal reaction was evidently not producing much effect. In fact, it was probably making the set a good deal more sensitive than it would otherwise have been, without bringing it too near the oscillation point; but when more up-to-date and efficient valves are in circuit the feed-back effect of this wiring is amplified. In other words, the internal reaction effect became excessive and the results show the usual distortion, etc., which is associated with too much reaction.

To overcome this and to retain the efficient new valves you will need to overhaul the wiring and modernise this too. Probably all that is necessary is to re-space and, if possible, to shorten the grid-circuit wiring, making sure that this does not run close to or parallel with any of the plate leads.

A CORRECTION.

A printer's error occurred in E. Paroussi's advertisement on page 117 of our Sept. 22nd issue. The price of the Aerial and Intervale Coils for the "P.W." "Olympia" Four was given as 6s. 6d. each. This should have been 8s. 6d.

100% ELIMINATOR EFFICIENCY

with the



ELIMETER

Designs specially for Elimination of the "Eliminator" represent the ideal instrument on the market or this class of work. It accurately indicates both total voltage and all intermediate tapings, and has a resistance of 100,000 ohms. Exceptionally handsome appearance, guaranteed dead accuracy. One of the famous Sifam range of instruments and within everybody's reach. Ask your dealer or write for particulars.

PRICE 30/-

Handsome metal Dial calibrated to 220 volts 100,000 Ohms R.E. Heavy Nickel Plated finish.

Send for free leaflet, "What Simple Meters Can Show You" to Dept. P.W.

SIFAM ELECTRICAL INSTRUMENT CO.
RADIOSET HEADQUARTERS
BUSH HOUSE, ALDWYCH, W.C.2.



OAK CABINETS.—Mystery 660, 17/6; Master 3 15/-; Melody Maker, 15/-; Baseboards included. New Cossor, including polished panel and 5-ply baseboard, Oak, 15/-; Oak Walnut, or Mahogany finish, 10/6. Hand-made and French polished. Rubber feet. Crated and carriage paid. Send for list. GILBERT, Cabinet Maker, SWINDON.



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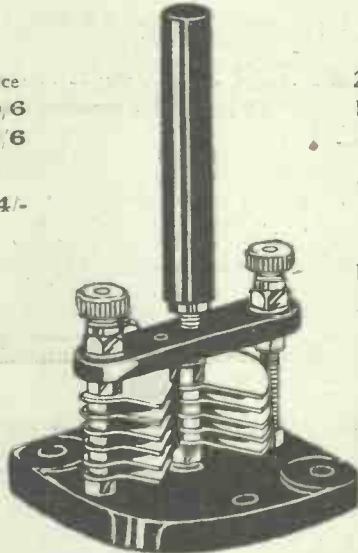
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| 3 "LOKVANE" variable | Price |
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This Neutralising Condenser eliminates self-oscillation and is a most essential component for good Radio.

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| 1 Single Filament Lighting Jack | 3/9 |
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THE ALL BRITISH

MOVING COIL

LOUD SPEAKER

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Pot Magnet wound for D.C. Mains. 12/6 Extra.
The Steel Pot Magnet, wound for 2, 4 or 6 volts, requires only 3 to 4 watts. At 6 volts the current is between '5 and '75 amps.

The Moving Coil has a large tapered flange at one end which makes certain of the coil keeping its shape. Our cone is made up with three-ply paper. This has entirely got over the objectionable hissiness to be heard from some moving coil speakers. All over-tones are reproduced. Nothing is lost.

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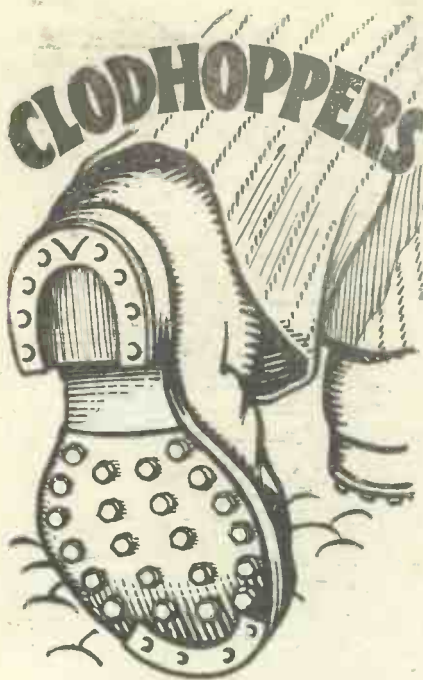
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THAT'S precisely what it does sound like when someone blunders across the room and all you hear from the Loudspeaker is a wail. . . . Clodhoppers. You don't need to worry about that thump if you have W. B. Anti-phonic Valve-holders in your set. Micro-phonic noises disappear altogether.

Ask your dealer to show you these valve-holders which were included in the famous "Cossor Melody Maker." The price is 1/6 complete with terminals, or 1/3 without terminals.

Write to us also for our catalogue showing a complete range of Radio products, including the famous Whiteley-Boneham Loudspeakers.



ANTI-PHONIC VALVE HOLDER

WHITELEY, BONEHAM & CO., LTD.,
Nottingham Road,
Mansfield, Notts.

TELEVISION AND THE CRITICS

IN the November issue of our contemporary, "Television," Mr. Sydney J. Moseley refers to POPULAR WIRELESS in one of his articles. As there are certain inaccuracies in this article, which may have come to the notice of our readers, we will briefly correct them.

Over a month ago the Editor met Mr. Moseley for an informal discussion about television. Mr. Moseley suggested that he would like to arrange a special demonstration in Mr. Baird's laboratories, and the Editor cordially agreed, and expressed his willingness to attend. Although Mr. Moseley has been asked since when this demonstration is to be arranged, nothing further has been heard about the special demonstration for the benefit of the Editor of this journal.

The Editor has, however, witnessed a demonstration at Olympia, which was, of course, television by wire, and so have other members of the "P.W." technical staff.

Olympia Demonstrations.

Mr. Moseley did not give the Editor of POPULAR WIRELESS one of the earliest opportunities to "realise the error into which he was being led by his advisers regarding the latest developments of television."

Apart from the fact that Mr. Moseley is not technically competent to do so, Mr. Moseley only made himself known to the Editor within the last month. It is also reported in Mr. Moseley's article that the contributors to "P.W." on the question of television have based their data on what they have seen of the Baird television system eighteen months or two years ago.

This is again inaccurate, as there are many gentlemen in touch with the Editor who are absolutely *au fait* with the latest technical developments of the Baird system—probably more so than Mr. Moseley—and several members of the POPULAR WIRELESS staff have seen the demonstrations of the Baird system at Olympia.

Still Experimental.

With regard to the argument concerning the practical utility capabilities of television, POPULAR WIRELESS is still open to conviction; its technical experts clearly realise that Mr. Baird's system is capable of televising by wire a "recognisable" image and, by wireless, *sometimes* a recognisable image, to be viewed on a screen measuring perhaps 3 in. by 2½ in., and, as we have stated more than once, we congratulate Mr. Baird on this achievement. As an experimental advance we regard it as very meritorious, and no technical expert who has written for this journal has deliberately scorned this experimental work.

Where we fail to agree, and obviously where the B.B.C. fails to agree with the Baird Co. and their supporters, is on the suitability of the Baird system in its present stage of development for adoption by the B.B.C. as a means of giving an entertainment by radio. Further, there is still no definite

(Continued on next page.)

Finished in black or beautifully grained mahogany.



neat-accurate and inexpensive

Watch for Brownie's latest triumph in artistic moulded Bakelite—"The Dominion Vernier Dial." Special non back lash slow motion drive gives very accurate tuning, while the action will fit any condenser and the new design of the dial will enhance the appearance of every set. See this latest Brownie production at your nearest Radio dealer.

BROWNIE WIRELESS

"DOMINION" VERNIER DIAL
The BROWNIE WIRELESS COMPANY (G.B.) LTD.
MORNINGTON CRESCENT LONDON, N.W.1.

MELODY MAKER Kit 20/-, Completed 22/6, Balance Easy Payments Or any other set completed or parts. Cash or deferred. Send your list of requirements to-day for estimate.

BUILD the MONOTUNE THREE The 40 station, single tuning receiver by Allinson. Constructional envelope, marvel of completeness and Clarity 1/2. Particulars free. Traders say "The best 3."

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Over 3,000 delighted clients. From £5-5-0. Cash or EASY PAYMENTS. Full particulars FREE.

PICKETT'S CABINETS



In many sizes. P.W. WORKS, BEXLEY HEATH, KENT.

EASY PAYMENTS

LOUD-SPEAKERS, HEADPHONES, H.T. ACCUMULATORS. Anything Wireless

Send a list of the parts you are requiring and we will send you a quotation on monthly payments. H. W. HOLMES, 29, FOLEY STREET, 'Phone: Museum 1411. Gt. Portland St., W.1.

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The New Eton 45 fitted in "Eto-box" S2 Type, ready for use . . . 16/6 S1 Type, large capacity . . . 19/6 P1 Porous Pot . . . £12/6 "Eton" 1928 De Luxe 120. The finest yet produced. All parts for the Home Constructors. Send 1d. stamp for Booklet, etc. **ETON GLASS BATTERY CO** 46, ST. MARY'S ROAD, LEYTON, E.10. "ETON WORKS," GRANGE ROAD, LEYTON. Ask about the New Wet Cell Valve.

TELEVISION AND THE CRITICS.

(Continued from previous page.)

proof—certainly the B.B.C. have not been convinced—that television by wireless by the Baird system does not require a wide wave-band, and that interference on other wave-lengths than that specifically given for television broadcasts would be inevitable.

Although Mr. Moseley may have kicks against the critics generally because, as he states (quite inaccurately) they are almost without exception armchair critics, and although Mr. Moseley has the temerity to criticise scientists of the calibre of Mr. Campbell-Swinton, we can appreciate that now that he is associated in an official capacity with the Television Press, he must feel, perhaps, annoyed that there are still some people left who have the courage of their convictions with regard to television in its present state of development, despite the flood of eulogistic propaganda which has undoubtedly influenced a considerable number of people and made them believe that television is even comparable in efficiency to the early cinematograph.

Completely Unbiased.

But we feel convinced that readers of POPULAR WIRELESS, and every other sensible student of broadcasting, will realise that when the engineering experts of the B.B.C.—experts who have given this country the finest broadcasting service in the world—when those experts, who have absolutely no axe to grind (and who are, in fact, only too anxious to be able to enlist the aid of new developments, such as television); when they, after a special demonstration given by Mr. Baird himself, return to Savoy Hill and hand in their report to the Governors, with the result that the B.B.C. definitely announces its conviction that television is not in a state which would warrant its association with the B.B.C., the matter becomes an argument between eulogistic followers and sympathisers of the inventor, and those whose duty it is, however unpleasant, to report plain facts free from pious optimism.

Solid Mahogany Cabinet

Hand french polished, satin finish, hinged lids. Will take any set or panel up to 20" x 10", and battery compartment 20" long, 11" high, and 12" deep. The overall size is 34" high, 23" wide, 14" deep.



Delivered free England & Wales

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USE ELEX

TREBLE DUTY TERMINALS

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ELEX HOUSE, BUNHILL ROW, LONDON, E.C.1

RECHARGES ITSELF WHILST YOU SLEEP

BETTER FASTER CLEARER EXCELLENT EVERY GO

YOUR 81 DOWN

96-Volt Cabinet or 226/5 monthly charges ready to supply on terms as we do.

"Unibloc" Cash, five or 8/1 down and No reference to deposit. Assembled complete. Halford's Stores. Curry's Stores, and all radio dealers can supply on exactly the same cash or deferred terms as we do.

SHUT your eyes and ask yourself this question. "To-morrow I shall buy a new H.T. Battery. In a few months from now, shall I need to repeat the process all over again?" You are not alone—Smith, Jones, Brown—they all do it. Yet for 8/1 down, permanent, economical and trouble-free H.T. supply can be yours—and not only permanent—but smoother, better, non-fluctuating H.T. that will infuse a thrillingly magical "difference" into your reception! Install the amazing Standard Wet H.T. Battery and solve H.T. worries for ever. Over a hundred thousand satisfied users have proved this up to the hilt. Why be put off with out-of-date forms of H.T. supply, when this super-efficient and money-saving battery brings permanent power at low cost to all. Send now for free booklet which explains all you want to know.

THE STANDARD WET BATTERY CO. (The Wet H.T. Battery Co.), Dept. P.W., Head Offices, Showrooms, and Warehouse, 124-125, Shaftesbury Avenue, London. W.C.2. (Near New Oxford Street end.)

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PERMANENT HT SUPPLY

M.B.

HEADPHONES REPAIRED 4/-
Transformers 5/- Loudspeakers 4/- All repairs remagnetised free. Tested, guaranteed and ready for delivery in 24 hours.
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REGISTERED TRADE MARK

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| 7x 6, 1/3 | 9 x 6, 1/7 |
| 8x 6, 1/4 | 11x 8, 2/3 |
| 10x 8, 2/1 | 12x 8, 2/6 |
| 10x 9, 2/4 | 12x 9, 2/10 |
| 12x 10, 3/1 | 14x 10, 3/5 |
| 14x 12, 4/- | 16x 9, 3/6 |
| 14x 7, 2/7 | 21x 7, 3/7 |
| 16x 8, 3/2 | 24x 7, 4/- |
| 18x 7, 3/2 | 3 in. thick |

Post Free. Thoroughly Money back Guaranteed Recommended for the Cossor "Melody Maker" (21" x 7" Panel, 3/7). Megger Test Infinity to any size. Call, write, or phone Panels cut to any size. Call, write, or phone Clerkewell 7855 for quotations. Samples and prices post free to Trade. **BRITISH AND BEST CROXSONIA CO.** (Dept. P), 10, South St., Moorgate, E.C.2

Agents:—John Henry Smith, 139, Anlaby Rd., Hull
L. H. Helyar, 82, Chamberlin Rd., Norwich, A.
Stredwick & Co., 27, The Mt., Chatham; Boynton & Co., Ltd., 75, Stafford St., B'ham.

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STANDARD LOADING COILS, 7/6 each

LONG WAVE COILS for New Cossor Melody Maker, 15/- per pair.

COILS FOR ALL "P.W." CIRCUITS SUPPLIED. Sent Post Free.

QUOTATIONS for any Wireless Receiver or Components (New Cossor Melody Maker, Mullard Master 3 Star, etc., etc.)

Sent by return. Orders executed promptly. Write or call.

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Terms to Trade.

TRANSFORMER REPAIR CO.
"Repairs" Dept.,
214, High Street, Colliers Wood, London, S.W.19.

TECHNICAL NOTES.

(Continued from page 554.)

The result is a valve with an amplification factor considerably higher than the normal type and yet able to provide the low-frequency output required.

The grid and anode pins are in their usual positions and the screen grid is connected to a terminal at the side of the valve base. The valve is, therefore, connected in the usual manner, whilst the side terminal is connected to apply a suitable value of positive H.T. voltage to the screen just as with the ordinary tetrode.

Receiver Design.

The enlargement of the sphere of usefulness of the screen-grid valve in this way means that it is possible to obtain with three valves results which hitherto were only obtainable with five and, notwithstanding the present much higher cost of these new valves, there is no doubt that their introduction marks an important step forward both in valve and in receiver design.

During November and December ten of the relay stations will take the national wave-length of 288.5 metres in place of the international frequencies which they have been sharing with certain stations abroad.

Of course, the change will necessarily have to be introduced gradually as considerations of additional plant permit.

As most of you are aware, a great deal of heterodyne interference has been occurring on the international common frequencies, and this has been so serious that in some cases the reasonable service area of some relay stations, more particularly during the evening hours, has been reduced to as little as 2 miles radius.

The system of single-wave-length working is expected to improve the reception conditions, especially in densely populated areas such as Dundee, Bradford, Sheffield, Hull, Liverpool, Swansea and Plymouth.

HANDLING A MILLION PICTURES.

HOW "I SEE ALL" WAS MADE.

THINK for a moment what the collection of a hundred thousand pictures means. It means that at the very least a million pictures must be looked at and considered, and altogether the production of I SEE ALL has meant the handling of this vast range of material about six times. That is six million handlings of pictures.

Perhaps the greatest miracle of all is that when all the work is done, when all the million pictures have been handled six times over, when all the searching and toiling, all the photographing, and drawing, and painting is over, the hundred thousand chosen pictures lie together in the pages of I SEE ALL, looking as simple as a set of dominoes fitted together.

There has never been a book printed more fascinating to run through. It is like a game which grows on you to follow this wonderful picture alphabet, and see everything bobbing up in its place. It is the simplicity of it all which makes I SEE ALL what it is, for any child can find the thing he wants. Who can wonder that such a book, sold only at 1s. 6d. a fortnight, is captivating all who see it.

Focussing Arc Lamps, as 5' Handle racks, 60/-. Powerful Projectors with lenses and fitted 100-watt gas-filled focus lamp, as illus., 39/6. 24x2 1/2 in. Telescopes, Navy type, cost £20; 17/6. Torpedo Spring-driven Gyroscopes, 15/-. Neon Tubes, 2/6. Holders, 8d. Osram B.E. Power Valves, for Eliminators, 4/6. Selenium Cells up to 200 v., ratio 30-1, 15/-. Double Scale Taylor-Hobson Projectors, double arm, 5/6. Radio Picture 2-valve Amplifiers, 40/-. A.C. or D.C. Motors for Drive, 35/-. Wonderful 200-watt Alternators, Watford A.C. self-exciting, cost £30; great bargain, £3. Porcelain encls. 250 v. Fuses 3a, to protect mains sets, 3d. each.



THE RECOGNISED RADIO STANDARD.

Highest Grade and Lowest Price.

The DIX-ONEMETER will measure signals on a Crystal Set, Grid Valve Current or large Battery Current with equal ease and accuracy. E.M.F. from a millivolt to 2,000 volts or the values of Resistances between 50 ohms and 50 megohms can easily be read.

Clear scale with fine knife-edge pointer and reflecting mirror. The resistance per volt can be 500 or 2,500 ohms at will, as nearly electrostatic as a moving-coil instrument can be. The ingenious system of Multipliers at 6/6 enables full scale readings of any value to be made over an enormous range.

Write for particulars and Free Booklet.

MICRO. AMPS. TO 20 AMPS
MILLIVOLT TO 2,000 VOLTS
50 OHMS TO 50 MEGOHMS
WITH ONE METER.



Panel Moving-Coil Meters from 12/6.

100 MICRO-AMMETERS. Vert. pattern, 3 range for signal strength or grid zero measurement, 1 to 500 micro-amps. Cost £10. New, £3.

Transmitters know that Electradix Valves are bargains. We offer Cossor 25s. Rectifying Valves to cost you 8s. 6d. each. Specifications: Fil. volts 6, plate volts 1,000 with an output of 50 m.a. Guaranteed good life. A.C. to D.C. chargers, not the feeble Trickle type. List £5. Output 6 volts 6 amps. Sale 5/1. All new.

Capacity Meters, £8. Wheatstone Recorders, £12. Multi Milliammeters, 60/-. Res. Boxes, 17/6. Hydrometers, 1/6. Picture Machine Relays, 6/6 and Remote Switches, 15/-. Transmitting Sets and Wavemeters, £2. Loewe Valves, 38/-. Cabinet Violina Speakers, 25/-. Brown's "A" Phones, 30/-. Sullivans, 3/-. GRAMO PICK-UPS Magnetic Ear-piece Units for making your own 40/- reproducer. Adapted with a little work, 1/2 each. Sullivans are the smallest and have aluminium case, 1/6 each. Adapted Brown "A" pick-ups, 17/6. Electradix, 25/-. Complete outfit, £5 10s.

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ELECTRADIX RADIOS,
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THE WIRELESS LEAGUE

Notice is hereby given that the ANNUAL GENERAL MEETING of Members of the Wireless League will be held in the Committee Room of the ROYAL AUTOMOBILE CLUB, PALL MALL, S.W., on Friday, 23rd November next, at 3 p.m., for the transaction of the following business:—

1. Annual Report and Accounts.
2. Election of Committee.
3. General Business.

Signed,

ARTHUR STANLEY,
Dated 15th Nov., 1923. Chairman.

MEMBERS' SUBSCRIPTIONS ARE NOW DUE. PLEASE REMIT TO '19, BERKELEY STREET, LONDON, W.1.



PRICE 16/-

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NEW COSSOR "MELODY MAKER"

Made of stout metal and beautifully finished in antique silver or gold including baseboard and screen. A really good finished article. S. MARKS & SON, 15, PARK STREET, LONDON, N.W.1. Tel.: Hampstead 8683.

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UNTARNISHABLE SCREENS

The "Pentode" 3 highly polished and mottled Standard Perforated Screen - - - - - 4/6
Six-pin Base - - - - - 1/6
Standard Loading Coils for "P.W." circuits - each 7/6
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THE FAMOUS W.C.R.S. Log Line Condenser, BALL RACE, WITH ALUMINIUM END PLATES AND 1" SPINDLE TESTED AND GUARANTEED. -0003, -0005, 3/11 each, post free.
SLOW MOTION VERNIER DIALS. Best Finish. Smooth Action. No Backlash. 3-inch and 4-inch, 3/3 each, post free.
SPECIAL BARGAIN - W.C.R.S. REACTION CONDENSER, -0001, TESTED AND GUARANTEED. 3/6 each, post free.
For further Bargains send for Bargain List. West Central Radio Supplies, 259, Gray's Inn Road, King's Cross, London, W.C.1.

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ONE SET AND WIRELESS IN EVERY ROOM



Your present wireless set will provide you with reception in *any number of rooms* with independent control and without loss of volume if you instal a Lotus Remote Control.

This simple component is easily installed and is invaluable where reception is required in more than one room at the same time. Each room contains a wall plug which is put in or withdrawn as reception is required. No interference can take place and the set is automatically switched off upon the withdrawal of the last plug.

Ask any wireless retailer to demonstrate it and supply you with the easy-to-read blue prints free.

LOTUS REMOTE CONTROLS

Made by the Makers of Lotus Sets and Lotus Components,

GARNETT, WHITELEY & CO., LTD.,
Broadgreen Road, Liverpool.

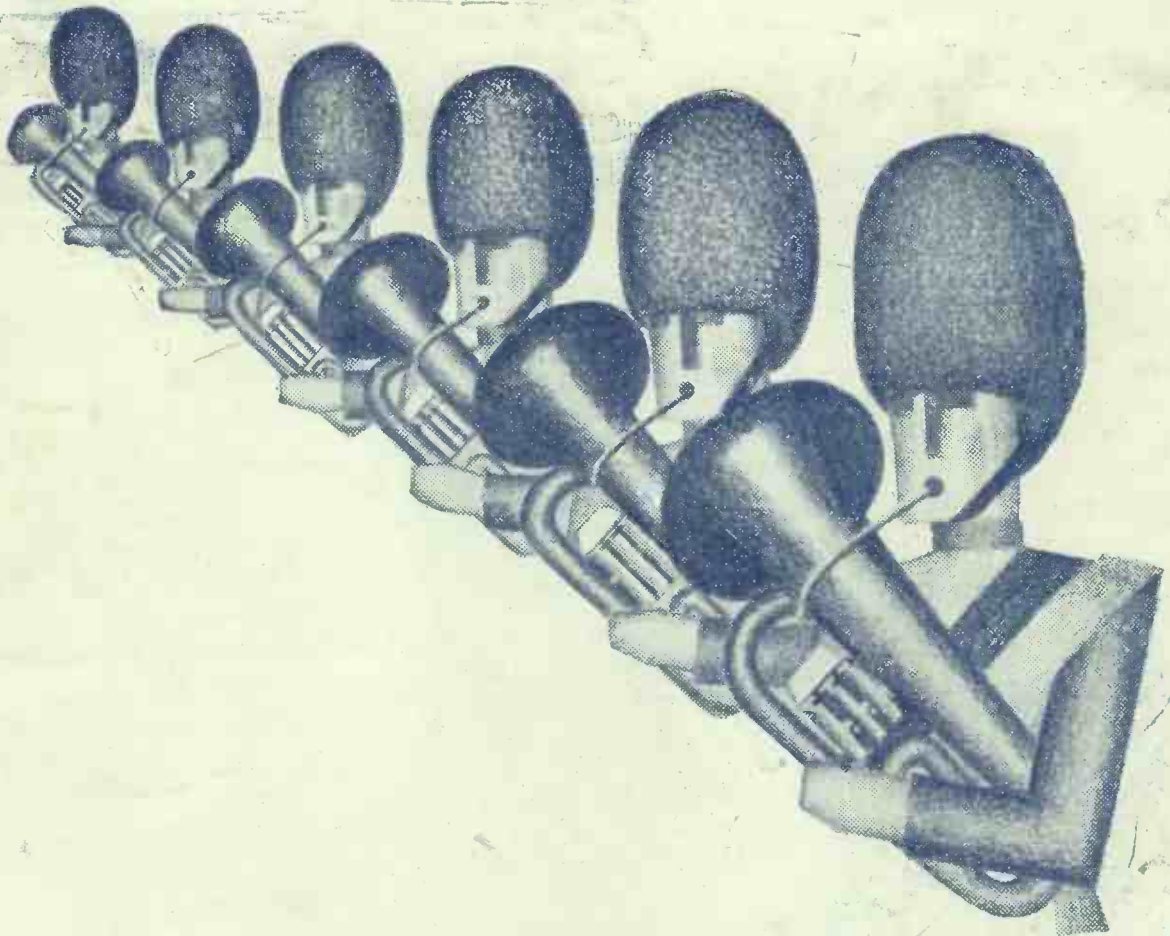
Prices:

Complete outfit for 2 rooms for a set using L.T. Accumulator and H.T. Battery, including 1 Lotus Relay, 2 Filament Control Wall Jacks, 2 Jack Plugs and 21 yards special 4-strand wire .. **30/-**

Complete outfit for 2 rooms for set using L.T. Accumulator and H.T. Eliminator .. **45/-**

Complete outfit for 2 rooms for any make of circuit using All from the Mains **47/6**

In each case, each additional room, 7/6 extra.



VOLUME

Tone—Volume—Distance, these are the three essential qualities which Mullard valves impart to radio reception.

The margin of advantage held by those who to-day buy 1929 Mullard P.M. Filament Valves is greater even than the advantage enjoyed by the thousands who changed over to Mullard four years ago.

When the Mullard P.M. Filament was first introduced those who had radio receivers promptly changed to Mullard, and all new-comers to radio automatically buy Mullard valves.

Universal popularity is the soundest guarantee of efficiency. Get Mullard valves—now.

They make an old set modern.
They make a modern set perfect.



STONE
VOLUME
DISTANCE

Mullard

THE · MASTER · VALVE

ADVT. THE MULLARD WIRELESS SERVICE CO. LTD., MULLARD HOUSE, DENMARK STREET, LONDON, W.C.2.

Art. 1

THE "CRYSTA-VALVE" TWO (See Pa 601)

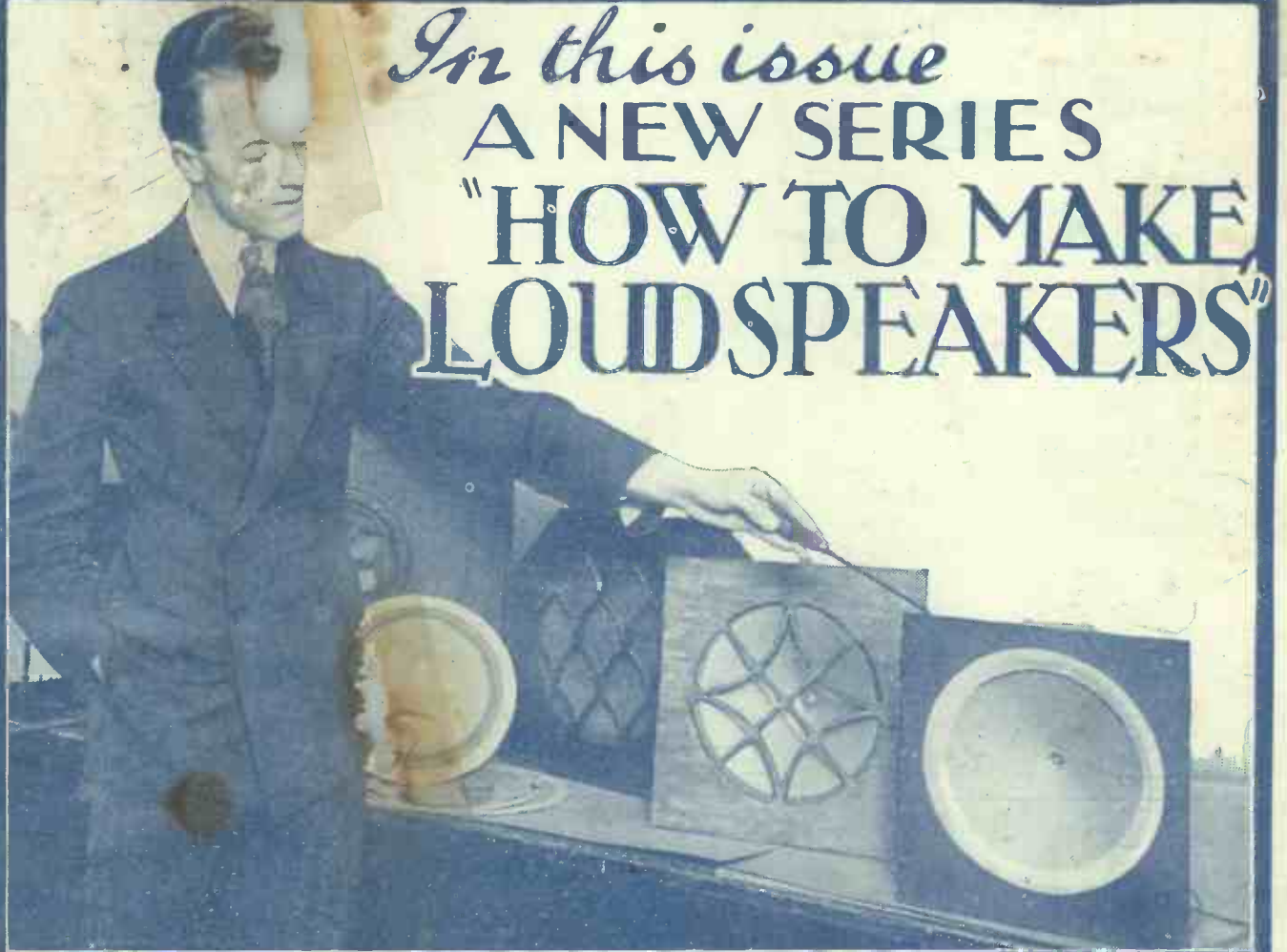
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Every Thursday
PRICE
3d.

No. 338. Vol. XIV.

INCORPORATING "WIRELESS"

November 24th, 1928.



In this issue
A NEW SERIES
"HOW TO MAKE
LOUDSPEAKERS"

SPECIAL FEATURES.

Judging Your Speaker.—By Percy W. Harris, M.I.R.E.
Resistance Reaction. Detecting Distortion. Echoing Signals
THE "FANFARE" FIVE
Operating The "Pentode" Three. The Paris Radio Show.

A member of the "P.W." Technical Staff is shown in the above photo pointing to the simple and inexpensive Cone Loud Speaker which is fully described in this issue. It is an instrument any one can assemble for very little cost, and which gives remarkably realistic results.

It's the condenser that counts—



DUBILIER CONDENSERS

If unobtainable from your dealer, write direct to us, mentioning your dealer's name and address.

© 190

Dubilier Condenser Co. (1925) Ltd.,
Ducon Works, Victoria Road,
North Acton, London, W.3.



The Public's Choice at Olympia!

The result of the Ballot arranged by the Wireless World in connection with the Olympia Radio Show placed
MET-VICK PRODUCTS FIRST
 IN CLASSES 4 and 7.

The items chosen for first place were respectively, the 'Met-Vick' Model 'B' combined L.T., H.T. & G.B. Eliminator and the 'Met-Vick' Elastic Aerial Unit.

CLASS 4
MET-VICK MODEL 'B' L.T., H.T.
and G.B. ELIMINATOR.



Connected to a wall plug or lamp socket, the model "B" provides heater current for A.C. valve filaments, 5 tappings for the H.T. supply and automatically regulated grid bias taps for the last stage.
 Price complete with S.P. 41/U }
 rectifying valve 100-110 volts or } £8 0 0
 200-250 volts, 40-100 periods }
 Ask your dealer or send for Leaflet M.S. 4745.

CLASS 7
MET-VICK ELASTIC AERIAL
UNIT



This unit enables you, in effect to vary your aerial backwards and forwards to any desired length from maximum to zero. It is as though you had a thousand aerials, and gives utmost selectivity combined with signal strength for any station.
 Prices for complete unit varies accord- } 12/6 to
 ing to type of set and wavelength } 17/-
 Ask your dealer or send for Leaflet M.S. 4764.

at Manchester too!

At the Manchester Radio Show, in the Open Class Competition, the winner of the 1st prize Mr. Symes, used in his Complete Mains Operated Set, the MET-VICK Components listed in the adjoining panel. The winner of the 2nd prize also used three COSMOS A.C. Valves.

MET-VICK COMPONENTS
used in the winning set:—

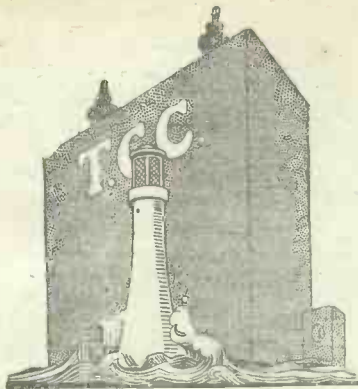
- Three AC/G Valves and Holders.
- Two AC/R Valves and Holders.
- Two Tuning Condensers.
- Permacon Condensers.
- Moulded Resistances.
- Type "AB" Mains Transformer.
- Three Eliminator Chokes.
- One SP/42U Rectifying Valve and Holder.

FOR SIMILAR SATISFACTORY RESULTS USE—

MET-VICK

COMPONENTS, VALVES and SETS

Metro-Vick Supplies Ltd., 155 Charing Cross Road, London, W.C.2.



Safeguards

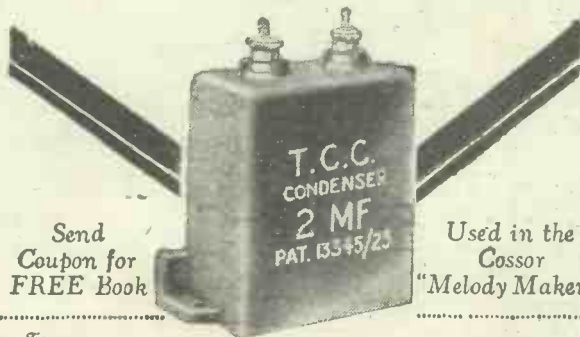
Just as a lighthouse safeguards ships at sea so do the letters T.C.C. safeguard you against faulty condensers.

THE letters "T.C.C." on a condenser are a hall-mark. For nearly a quarter of a century "T.C.C." has been synonymous with accuracy, durability and dependability.

"T.C.C." Condensers are guaranteed. Everyone is individually tested before leaving the factory. You have never known a faulty "T.C.C." because such cannot pass the test-bench.

Look for "T.C.C." on the next condenser you buy. It is your safeguard.

T.C.C.



Send
Coupon for
FREE Book

Used in the
Cossor
"Melody Maker"

To
Telegraph Condenser Co., Ltd., Wales-Farm Rd., N. Acton, London, W.3.

I enclose 1d. stamp. Please send me your book showing how to build Eliminators—H.T. or L.T.

Name.....

Address

P. W. 24/11/28

6479



Short Wave Success— depends upon the Coils!

If you want the best reception on the short waves, fit LEWCOS short wave Coils! They make success certain because they are manufactured from the finest quality materials, tested in every detail of their construction by experts of 50 years experience in high-grade wire production.

LEWCOS

(REGD.)

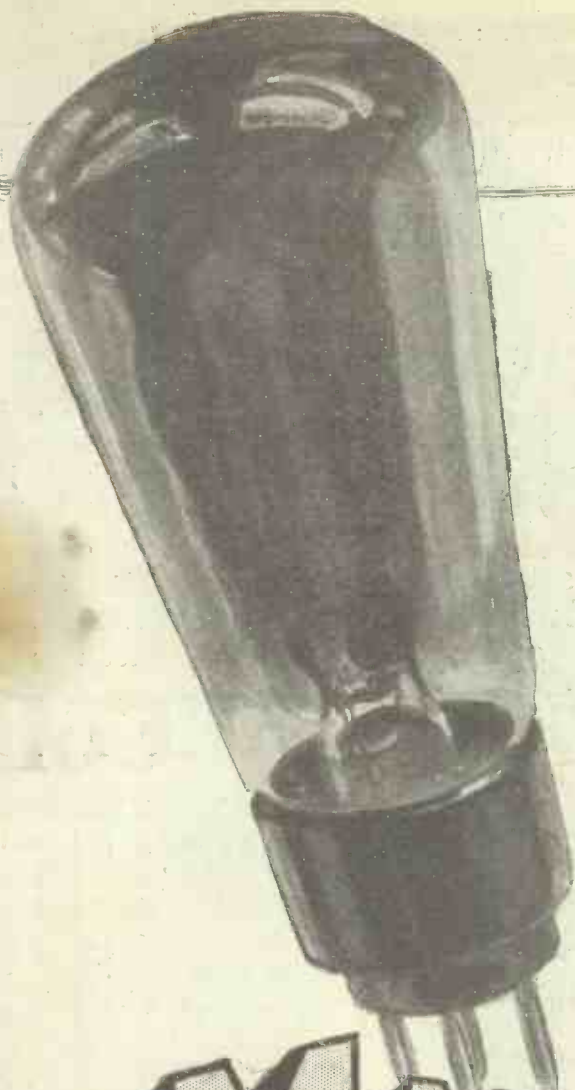
SHORT WAVE COILS

THE "LEWCOS" STANDARD LOADING COIL can be purchased through all Radio Dealers. Suitable for use in all circuits in "Popular Wireless" where standard loading coil is specified.

Price 7/6 retail.

THE LONDON ELECTRIC WIRE COMPANY
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MAZDA VALVES ARE THE WORLD'S LATEST & BEST**

ALL ABOUT HOME CONSTRUCTION

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THE DECEMBER ISSUE OF

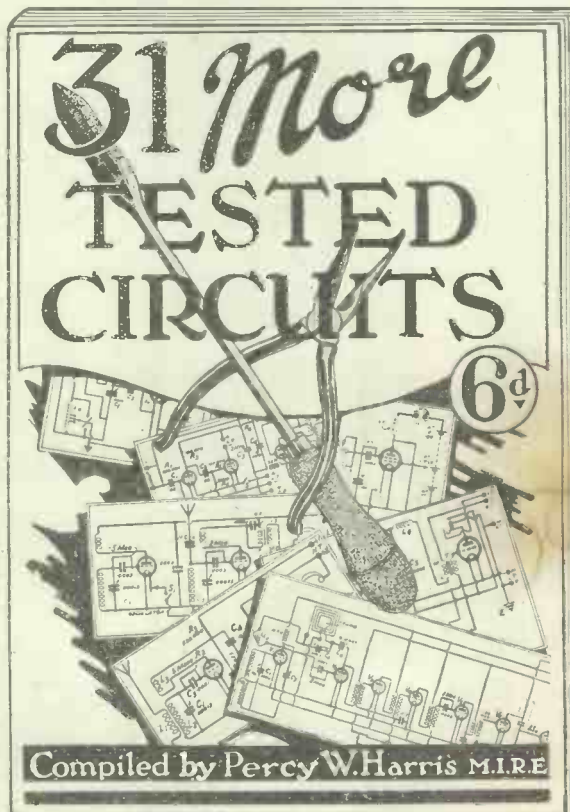
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the usual how-to-make features,
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Real Radio
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The very complete range of Edison Valves includes Screen Grid, Pentodes and A.C. Mains Types.

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To The EDISON SWAN ELECTRIC Co., Ltd.
(Publicity Dept.), 123/5, Queen Victoria Street,
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Please send FREE Paper model and instruction
Book as selected.

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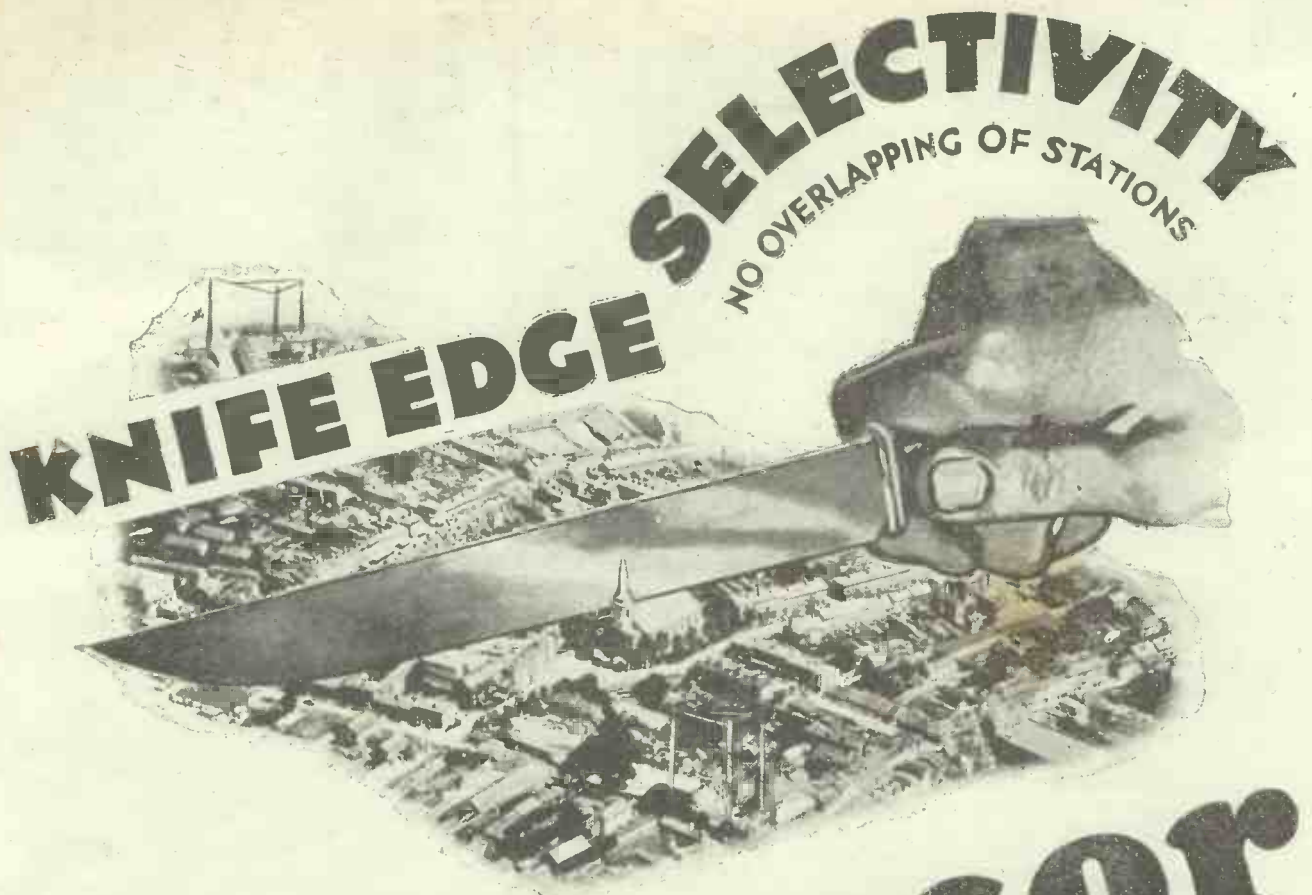
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Please cross against model required.

R/3. Three valve Resistance Capacity coupled throughout.
R/3T. Three valve, with Transformer Coupling in the last stage.

EDISWAN
R.C. THREESOME 1929 CIRCUITS.

Ediswan valves maintain their full emission throughout life.



THE WONDERFUL NEW

COSSOR Melody Maker

BUILT BY ANYONE IN 90 MINUTES

THE wonderful new Cossor Melody Maker has knife-edge selectivity. It will cut out your local station like magic. It is amazingly sensitive. You do not have to spend a long time searching for the desired programme. Just turn the dials a few degrees and the station you want comes in with enormous volume. It's as simple to work as a gramophone—to change your programme with the New Cossor Melody Maker is easier than changing a record. Anyone can build this remarkable Receiver in 90 minutes. It's as simple as Meccano. All the parts for the New Cossor Melody Maker—the valves, the wire and even the simple tools necessary are sold in a sealed box ready for you to start assembly. Get full particulars of this wonderful new Set

Fill in the coupon NOW!

Please send me free of charge one of your Constructor Envelopes which tells me how to build the new Cossor "Melody Maker."

Name.....

Address.....

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"P.W." 24 11/28

Popular Wireless



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RADIO NOTES AND NEWS.

A Lofty Radio Station—"She Sells Seychelles"—DX on Ten Metres—Another Record—Whistling on Cardiff—Hilversum Sunday Concerts.

The Professor Drops a Brick.

THE naughty Aurora Borealis has been interfering with the transatlantic wireless telephone service, a propos of which, Prof. A. M. Low is reported to have said that such occurrences "make us scientists very humble, and show that wireless, after all, is still only in its infancy." What a funny professor! The cultivation of the soil and the breeding of cattle are arts which date back thousands of years, yet, even now, sometimes nature ruins the crops and sometimes a cow dies. Still, it is good to know that it takes an Aurora to make Prof. Low feel humble. What a stout fellow!

Not Guilty.

BUT I am not convinced of the guilt of the Aurora yet. How does Prof. Low know that the Aurora did it? Did he see it? If so, surely he saw a very unusual phenomenon for these latitudes. Or did they see it in New York? I have had many letters during the past ten years which bear witness to the fact that the auroral displays, both Arctic and Antarctic, have no appreciable effect upon radio reception. In fact, I understand that the Polar regions are tophole for reception. Perhaps some readers will let me hear more of this.

Sandra Singing Spirituels.

I HEAR that Madame Marie Sandra, a talented lyric soprano, well known to Albert Hall and Queen's Hall audiences, is broadcasting from London for the first time on November 22nd. A programme of four negro spirituels has been arranged by Lawrence Brown, the chosen titles being—

- "I know de Lord's laid hands on me."
- "I got a home inna dat rock."
- "Swing low, sweet Chariot."
- "Every time I feel the Spirit."

Commercial Notes.

MR. W. W. BURNHAM, late managing-director of Burndept, Ltd., is now general manager of Ediswan's Wireless Department. Ediswan Electric Co., the British Thomson-Houston Co., the Metropolitan-Vickers Electrical Co. and Messrs. Ferguson, Pailin, Ltd., have combined. There is to be a radio section of

the Annual Belgian Motor Show, to be held in Brussels, December 8th to 19th.

Lofty Radio Station.

ON October 22nd there was opened what is said to be the most powerful radio broadcasting station in the Empire, Britain excepted. It is in South Africa, on the highest point of the Witwatersrand, a mere 6,000 feet up. It is intended to minister unto the Union of Rhodesia, and if Great Britain beats it in power we certainly must "give it best" as regards altitude, for 6,000 feet is quite a sana-

copperhead. The doctor develops ghastly symptoms and is tackled by the ship's surgeons. A little bit "at sea" with snake-bites, they wirelessed to New York for an O.K. to their treatment. Got it. Cured the Doc.

Introducing Dr. Loewe.

I DARE say that some of you will like to know more about this Loewe, who puts three valves into one tube. Dr. Sigismund Loewe was born in Berlin in 1885. Aged sixteen, he studied radio under Staley, a man well known to wireless scientists. He was employed by the Telefunken Company in 1905. His idea of the multiple valve came from the ambition to create a receiver within the means of small purses. His firm, which in 1924 employed only 100 people, now has 2,000 hands, and his factory is said to be the largest specialised one for radio apparatus in the world.

A HIGH ADVENTURE.



The man with his arm in a sling is the wireless operator of Graf Zeppelin, who was hurt whilst climbing out to repair a broken fin during the airship's memorable voyage to New York.

torium level. I hope the tenors will be careful, for at that height anything might happen to the bellows.

Sea Snakes.

I DO not refer to the sea-serpent. Scene: The "Berengaria." Enter Dr. Shiffman with a box of snakes, assorted, poisonous. One of them croaks and the doctor, all on fire to conduct a post-mortem, puts his hand into the box to get the deceased and is efficiently bitten by a

ing. I believe he imagined he had met the Wicked Dog his mother used to tell him about.

Kennel Note.

A FEW weeks ago I acquired a kennel-reared fox-terrier of solemn countenance, whose first introduction to indoor domestic life was his irruption into my house. Last night he was allowed to occupy a mat in my room. I turned on the loud speaker and produced a tremendous, four-valve finale by some hefty brass band. The pup took one horrified look round and then projected himself like a bullet to the uttermost corner of the house, where he lay shaking. I believe he imagined he had met the Wicked Dog his mother used to tell him about.

"She Sells Seychelles."

"SHE" is the Admiralty, which wants to sell Seychelles radio station, lock, stock and barrel (if any). Built for war service, this station is now one of no particular use, and you can have it for a song, though it is of no use your
 (Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

offering a Highland fling instead, as the Scots did. What an opportunity for Dr. Mansfield Robinson! He could bask in the sun and send his love to Mars till he was blue in the face—and the Post Office would not charge him a penny.

Those "Fill-ups."

A CONTROLLING ANNOUNCER has been appointed by the B.B.C. This Civil Servant is to sit apart and chivy the world's workers in the studios in order to keep the service running smoothly. One of his jobs—and this appealed to me enormously—is to supply stop-gaps should any items finish sooner than was expected. Now, perhaps we shall get something more interesting than a few notes of high-brow piano music played by some unknown, who says: "That was," etc., in a timid but charming voice.

Don't You Believe It.

IF any of you are lying sleepless because you have been led to believe that the "Ekco" Works are now in cinders, be comforted. The report is exaggerated "something horrid." Messrs. E. K. Cole, Ltd., say so.

I am glad. They say that the fire was confined to their Service Dept. Sorry they had a fire; glad it was confined to something. Orders awaited as usual.

DX on Ten Metres.

ALL the elite amongst amateur transmitters are now working on a frequency of 30 million. Sounds terrific, doesn't it? Call it a wave-length of 10 metres and it sounds fairly short. Our demon DX'er, Mr. E. J. Simmonds, of West Drayton, has succeeded in doing two-way working on 10.5 metres with a fellow in Maine, U.S.A. His signals were logged also by amateurs in Georgia and California. Osram valves were used by Mr. Simmonds for this notable feat. If you should read Morse and should hear the call G 2 0 D—that's Simmonds.

Another Record.

AND talking of big distances, what about the news received by the R.A.F.? A Vickers-Rolls-Royce air liner, rollicking about over England and pushing out talk on short waves, was heard distinctly in Cairo.

This is a world-beater for telephony transmission from an aeroplane in flight, and is the more remarkable in that the power used was only enough to light an ordinary electric lamp.

The Whistling on Cardiff.

REFERRING to my Note a week or so back about the whistling which is so often heard on Cardiff's wave-length a reader accuses me, quite justly, of not having read "World Radio," because, he says, had I read it I would know that the cause of the trouble is an Algiers station. I am not surprised to learn that it is Algiers. "There must be something in the air there which makes 'em do it for I well remember how nearly twenty years ago Algiers on Morse was the pest of the ether.

That Musical Shunter.

MR. STOBART'S railway shunter who shunted while he sang highbrow music is relegated to a back seat by Mr. H. Melaney, the singing fireman of the Northern Pacific Railway, U.S.A. This servant of the "iron road" used to sing as he oiled the engine, thus reversing the usual custom of singers which is to sing first and oil up afterwards.

Someone heard him, and instead of talking about the value of broadcasting classical music—gave him an audition. And now he sings all over the States, travelling 4,000 miles a week. I'm going down to the siding, complete with red tie and Union card, to sing bits of hopra!

Radio the Essential.

IT speaks volumes for the absolute necessity for radio apparatus to be carried on long flights when that brave man, Colonel Fitzmaurice, who accompanied the two German airmen on the first east to west

SHORT WAVES.

A writer in one of the London dailies opines that every man should have at least one hobby of absorbing interest.

Well, wireless absorbs all sorts of things—time, money, and patience.

A suitable Christmas present for the gentleman who gives us our weather reports might take the form of a cloud with a silver lining.—"Help Yourself."

IN STRICT CONFIDENCE.

Visitor: "And what became of the radio set you had?"

Hostess: "Oh, it didn't work right: so I got rid of it."

Visitor: "I couldn't meet my payments, either."—"Radio News."

Much controversy arose in radio circles when the B.B.C. failed to re-broadcast 3 L O's special short-wave programme, though many British amateurs reported strong reception. Strained RELAYtions.—"Pop. Radio Weekly."

"Static in radio reception is like a mother-in-law in married life."

"Sterling Power *Outfit* transformer, \$2.94." we read in an American journal.

Just what we want for changing our three-valver into a super-hot.

BY RADIO.

The spot where I would like to be,
Is far away by a tropic sea,
While all you artists played for me
By Radio.

I'd bask all day in the banyan shade,
As the natives danced and the monkeys played,
Just drinking in your serenade,
By Radio.

And when the long bright day was done,
And the tropic moon relieved the sun,
I'd still loaf on and enjoy your fun,
By Radio.

In fact, 't would be my chief delight,
To stick around in the pale moonlight,
'Til the last of you had said: "Good night,"
By Radio.

"Radio News."

Atlantic flight, says that never again would he fly the Atlantic without wireless. Let us hope that the means will be found to make it compulsory to carry radio on aircraft as on ships.

The Voice of M'barara.

A STOUT gold-digging "P.W." reader from—er—that place, which is in Uganda, has a suggestion to offer to the B.B.C. about 5 SW, which station he eulogises in a manner which would make

P. P. Eckersley break down and sob if he saw the letter. G. A. B., of—er—Mb something, wants the B.B.C. to switch 5 SW over from station to station, for, as he pregnantly remarks, "We are not all Londoners out here." I applaud the notion, though it lends itself to the perpetration of a joke about Aberdeen and gold-digging. By a superhuman effort I refrain.

Travelling Radio Show.

THE latest idea of that enterprising firm of Philips Lamps, Ltd., is their van. Not a "plain van" but a bright blue vehicle with two loud speakers on the roof. It is now on tour, full of Philips products, radio and otherwise. Various radio programmes will be picked up *en route*, and shot out of the loud speakers. I may say, without favouritism, "Philips goods are 'in the van,' not in the cart," a slogan I will present to those concerned absolutely free of all charge.

Holland Very Much Alive.

HAVE you noticed how Holland, our ancient friendly enemy in the way of navigation, colonisation, and trade, is coming to the front in radio? PCJJJ is a pioneer station. Dr. de Groot is well remembered for his scientific work on radio in Java, and the services between that island and Holland, telegraphy and telephony, are well known. Mr. Philips is a live wire where radio is concerned and is spreading his own particular light all over the world. Mr. Baird has, I understand, appealed, and not in vain, to Holland. And Holland has got the ex-Kaiser. Well, we owe the Dutch William of Orange, besides those cheeses, so more power to them. (And I almost forgot De Groot, late of the Piccadilly.)

Hilversum Sunday Concerts.

WHILST on the subject of the Pays Bas I may mention that the Sunday 5.40 p.m. to 7.10 p.m. concerts from Hilversum on 1,071 metres, arranged by Brandes, Ltd., have so far proved a howling success. Not "howling." Brandes' have been inundated with letters of appreciation, Amsterdam contributing no less than 800. Mind you listen for Hugo de Groot and the pick of the continental musicians.

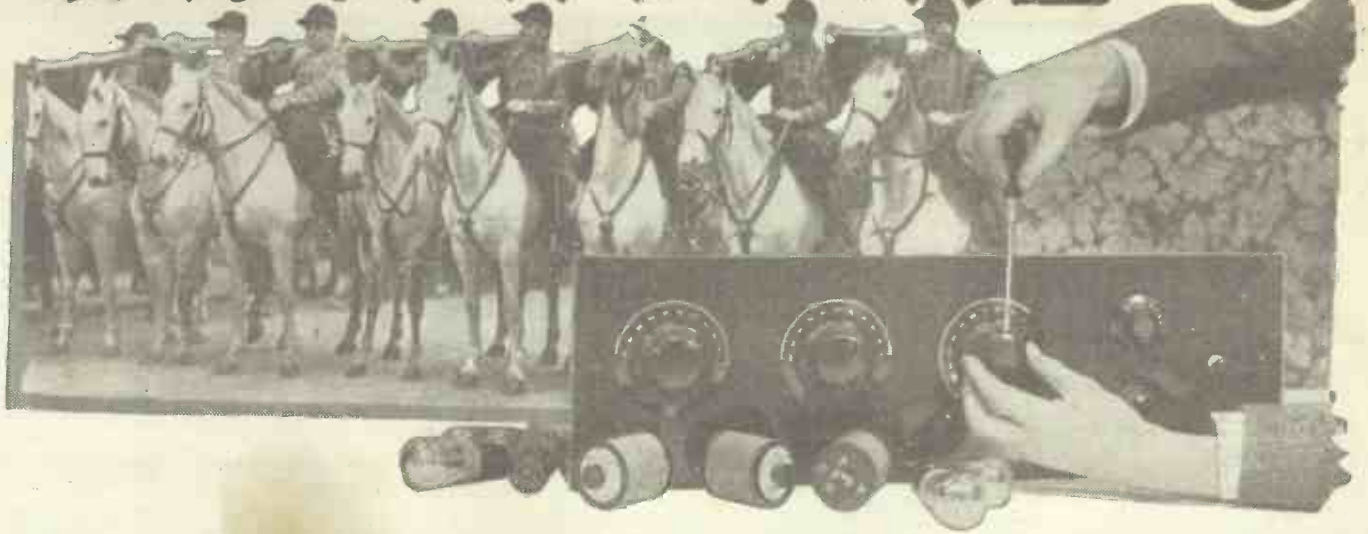
The Lure of the Pipe.

INTOXICATED by the witchery of pipery as set forth in these Notes, B. W. writes to say that during the course of his pipe researches he found that if two different "earths" are connected, one to the "E" terminal of the set and the other to the "A" terminal he can dispense with an aerial. He can receive 2 L O on a crystal set, using the gaspipes and waterpipes as aerial and earth. Hist! Keep it dark, for that is the way "pirates" are made, B. W. Besides, the companies will want to charge more all round.

Those Artful Uncles.

A PROPOS the famous grape vine in the conservatory of the Clapham house used by the B.B.C. for research, there is a yarn going round to the effect that visitors are warned off the grapes by shouts of, "They're poisoned." The explanation given is that the fruit has absorbed H₂SO₄ from the accumulators. Upon my Sam! that ruse ought not to deceive a baby, but if by some chance the thing is true, why then the men who would pollute an old vine with acid fumes deserve to go "dry" for the rest of their days. ARIEL.

The "FANFARE" 5



A powerful multi-valve set which uses ordinary valves and standard parts throughout. It is easy-to-build, and its initial and running costs are comparatively low. It is just the set you want for reliable, effortless, long-distance loud-speaker results.

Designed and described by the "P.W." RESEARCH DEPARTMENT.

THIS set is the realisation of an ambition long cherished in the Research Department to build a set with two H.F. stages and a system of screening which we have all along suspected was capable of extraordinary efficiency.

An opportunity has at length arrived to test our theory, the set has been built, and within ten minutes of its being connected up to the aerial we had realised that our expectations were being fulfilled in overflowing measure. Everyone who has handled the set since has become enthusiastic over its remarkable sensitivity, extreme selectivity and general "thoroughbred" performance, and it is the general opinion that it well deserves the flourish of trumpets so cunningly suggested by our artist at the head of this page.

However, let us begin at the beginning. Well, it all began last spring when we produced for "Modern Wireless" a three-valve "Solodyne" receiver which had a single H.F. stage incorporating a novel method of coil mounting and screening which we found to be of quite surprising merit.

The Secret of Success:

It was cheap, easy for the constructor, and highly efficient, the set being probably the most sensitive and selective one of its kind produced this year.

The essence of the scheme was the use in a special way of a single metal screen running across the baseboard from back to front, the grid and plate circuits of the H.F. valve being arranged on either side. This, of course, is quite a common scheme, but the

special device which made it so much more efficient than usual was the method of placing the coils so that all those portions of their fields which generally stray about and cause trouble were definitely cut off.

The coils were of the standard six-pin type, which are of quite good efficiency if you choose a good make (preferably one of those wound with "Litz" wire) and do not use the older type of close-fitting cylindrical screens (sometimes flippantly described as "tin hats"). These coils, of course, are of the solenoid type, i.e. they are single-layer windings on an insulating tube. The usual method of mounting them is to screw their sockets down on the baseboard so that the coils are placed in an upright position.

(Continued on next page.)

COMPONENTS AND MATERIALS REQUIRED.

- | | | |
|---|--|--|
| <p>1 Panel, 26 in. x 8 in. x $\frac{1}{4}$ in. (26 in. x 7 in. will also suit, but is not so easy to obtain). (Any good branded material, Resiston, Red Seal, Becol, "Kay Ray," Trelleborg, Ebonart, etc.)</p> <p>1 Cabinet to fit, with baseboard 10 in. deep (pair of panel brackets also desirable). (Camco, Raymond, Pickett, Bond, Gilbert, Makerimport, Lock, Caxton, Artercraft, etc.)</p> <p>3 .0005-mfd. variable condensers, with slow-motion drive or vernier dials (Dubilier, Lissen, Cyldon, Igranic, Raymond, Brandes, J.B., Bowyer-Lowe, Formo, Gecophone, Ormond, Colvern, Peto-Scott, etc.)</p> <p>1 .0001 or .00015-mfd. reaction condenser (Cyldon, J.B., Peto-Scott, Dubilier, Ormond, Igranic, Bowyer-Lowe, etc.)</p> <p>1 On-off switch (Lotus, Lissen, Ben-</p> | <p>jamin, Igranic, Peto-Scott, Burne-Jones, etc.)</p> <p>1 Potentiometer-type volume control, 1 or 2 megohms (Burne-Jones, Gecophone, Gambrell, Igranic etc.)</p> <p>5 Sprung valve sockets (Igranic, Lotus, Benjamin, W.B., Burndsept, Ashley, Pye, B.T.H., Redfern, Bowyer-Lowe, Marconiphone, Burne-Jones, Formo, Wearite, etc.)</p> <p>2 Baseboard-mounting neutralising condensers (Gambrell, Bowyer-Lowe, Igranic, Burne-Jones, Peto-Scott, etc.)</p> <p>3 6-pin coil sockets, unscreened type (Lewcos, Bowyer-Lowe, Burne-Jones, Colvern, Peto-Scott, etc.)</p> <p>1 H.T. fuse and holder (Burne-Jones or similar type)</p> <p>1 250,000-ohms anode resistance and holder (Lissen, Mullard, R.I.-Varley, Dubilier, Igranic, etc.)</p> | <p>1 L.F. transformer, fairly low ratio type (Ferranti, R.I.-Varley, Igranic, Lissen, Marconiphone, Mullard, Brown, Philips, etc.)</p> <p>1 H.F. choke (Lissen, Igranic, Lewcos, R.I.-Varley, Cosmos, Colvern, Bowyer-Lowe, Dubilier, Burne-Jones, Climax, Peto-Scott, etc.)</p> <p>Fixed condensers of .0002, .0003, and .001 and .01 mfd. (one of each) (Dubilier, Lissen, Mullard, T.C.C., Igranic, Clarke, Mullard, Burne-Jones, etc.)</p> <p>1 2-meg. grid leak and one of .25 meg., with holders (Lissen, Igranic, Dubilier, Mullard, etc.)</p> <p>3 Standard screens, 10 in. x 6 in. (Burne-Jones, Paroussi, etc.)</p> <p>1 Terminal strip, 24 in. x 2 in. x $\frac{1}{4}$ in.</p> <p>11 Terminals (Eelex, Igranic, Belling-Lee, etc.)</p> <p>Wire, screws, G.B. plugs, etc.</p> |
|---|--|--|

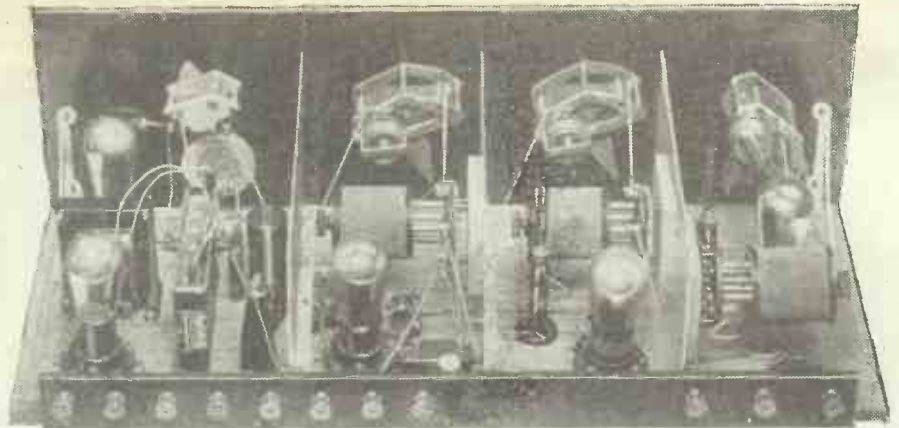
THE "FANFARE" FIVE.

(Continued from previous page.)

Now, when this is done there is a considerable tendency for the field of each coil to extend upwards and spread outwards, so that it may interact with the field of another coil nearby, even when there is a metal screen actually between them. (This is known technically as "kissing over the garden wall.")

How It Is Done.

In our special method of mounting, the coil sockets are attached to small square blocks of wood, which are in turn screwed to the screening partition itself, so that the coils are placed horizontally, and those parts of their fields which would otherwise spread out and perhaps go a-visiting in



Here you see very clearly the special method of coil mounting and screening which gives the set its remarkable efficiency.

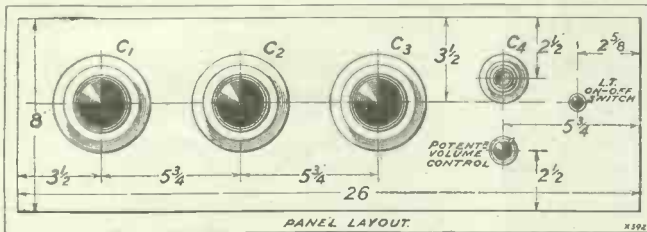
The efficiency of the screening which results is really surprising, and the final product is a set very much above the average in selectivity and stability, which is very easy to neutralise perfectly, holds its neutralising adjustment with great constancy over the whole tuning range, and enables us to get much better amplification than usual. The actual results given by the three-valve set to which we have referred were

so extremely good that, as we have said, the research department has ever since cherished an ambition to build a receiver with two H.F. stages on the same lines.

Some Sterling Qualities.

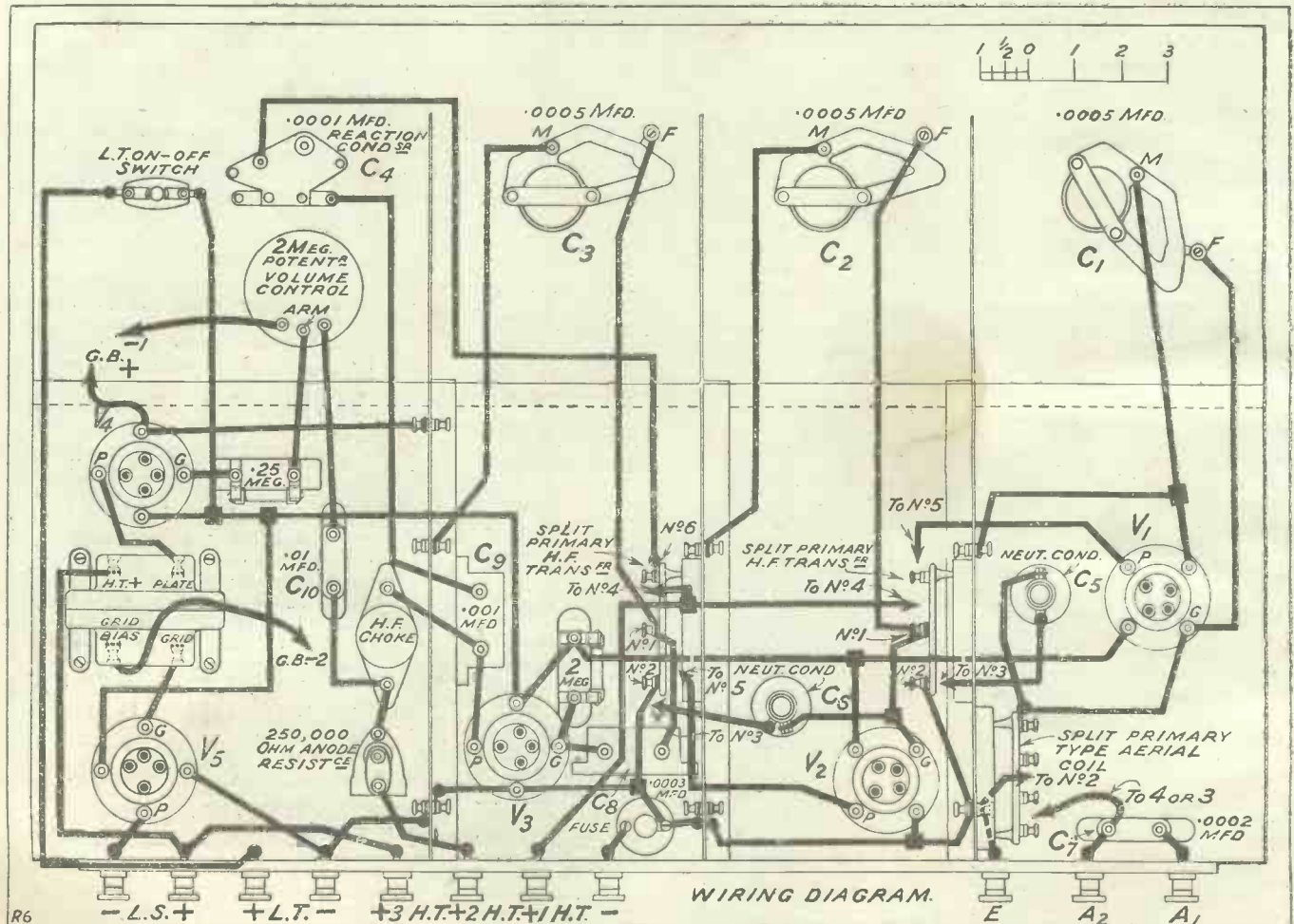
The "Fanfare" Five is the result, and we want to say right away that it has exceeded our most sanguine expectations. It is a truly exceptional set, with a superlative performance in all the things which matter—selectivity, real power and "punch" on distant stations, quality of reproduction and perfect stability once it is correctly neutralised. Above all, it is not critical as to

(Continued on next page.)



places where they are not wanted are definitely cut off by the screen.

usual. The actual results given by the three-valve set to which we have referred were



THE "FANFARE" FIVE.

(Continued from previous page.)

valves (it works well with the modern improved 2-volters) and does its work with the effortless ease, pleasant handling, and smooth responsiveness of the real thoroughbred.

unfavourable in order to offset as far as possible the effect of the skill of the operator. They were actually so bad that we believe that the results obtained were a good deal worse than will be got by any reader who has had even a little previous experience in handling multi-valve sets.

The aerial was only 30 ft. long (single wire), about 18 ft. high (only 8 ft. above the set itself), and was heavily screened by trees or buildings on every side. The only good feature was the earth connection, which

critical circuit. The two H.F. stages are coupled with ordinary 6-pin split-primary transformers, and are, of course, neutralised, since the set is designed for the man who wants super results with ordinary valves.

The detector valve is of the standard grid condenser and leak type, with Reinartz reaction, and after this comes a resistance-capacity-coupled stage of L.F. At this point we have worked in a volume control of the efficient high-resistance potentiometer variety, which enables the volume to be adjusted without affecting the quality. Following after the resistance-coupled stage an L.F. transformer, which feeds the "sigs." on to the last valve, which will, of course, be a power type for working a loud speaker.

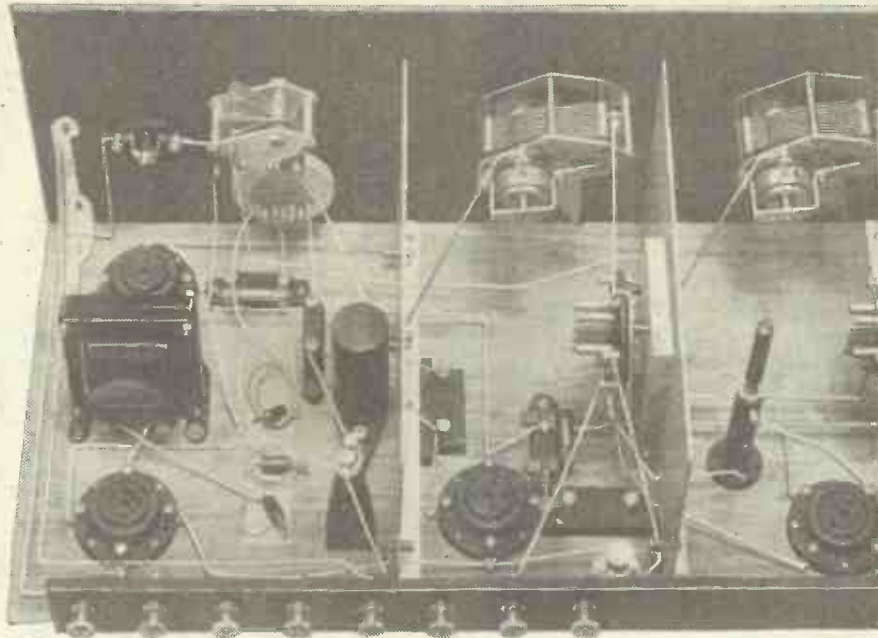
Plain Output and the Reason.

By the way, no output filter is provided on the last stage—the output going straight to the L.S. terminals. This was done because we felt that this set will appeal chiefly to the reader with a certain amount of experience, who is likely to possess an output filter as a separate unit, and will not wish to duplicate it in the new set. A filter should, of course, always be used where the last valve is a large one, taking more than, say, 7 or 8 milliamps anode current. (A suitable unit was described in "P.W." No. 335.)

Turning now to questions of practical layout and construction, let us look first at the panel. The three large dials are those of the aerial (more correctly, the aerial secondary) and the two H.F. circuits, and to the right of these there are two smaller knobs, one above the other. Of these, the upper one is the reaction condenser (one of the miniature type) and the lower is the knob of the volume control. The single knob to the right again is the L.T. on-off switch.

The constructional work will take you some time, for it is a big set, but there are no points of special difficulty, and, indeed, the "Fanfare" Five can truthfully be described as a very 'easy set to build, as

(Continued on page 626.)



Note the colled-up grid-bias leads at the L.F. end. There is just room here for a 9-volt G.B. battery.

We do not believe very greatly in the publication of detailed test reports with long lists of stations, since they are apt to mislead the reader who does not realise that they are compiled by a highly skilled operator, using an accurate wave-meter for rapid identification of stations, and possibly working on a particularly good aerial.

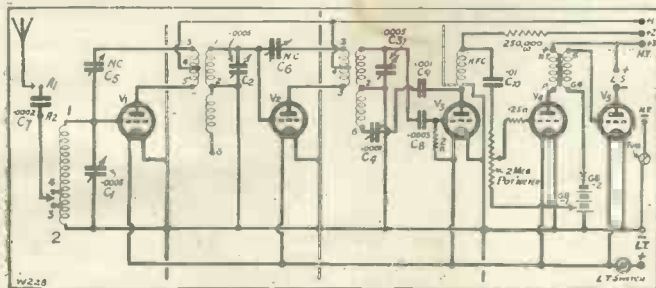
A Week's Log.

However, in the case of a set like this, for which such high claims are being made, the reader will probably like to get a more

was an efficient one. In spite of all this, we succeeded in logging no less than forty-two distant stations on the loud speaker!

This figure includes both long- and short-wave stations, but does not take into account those heard loudly but rendered unintelligible by heterodyning. Now for some general details.

The circuit is a particularly plain and straightforward one,

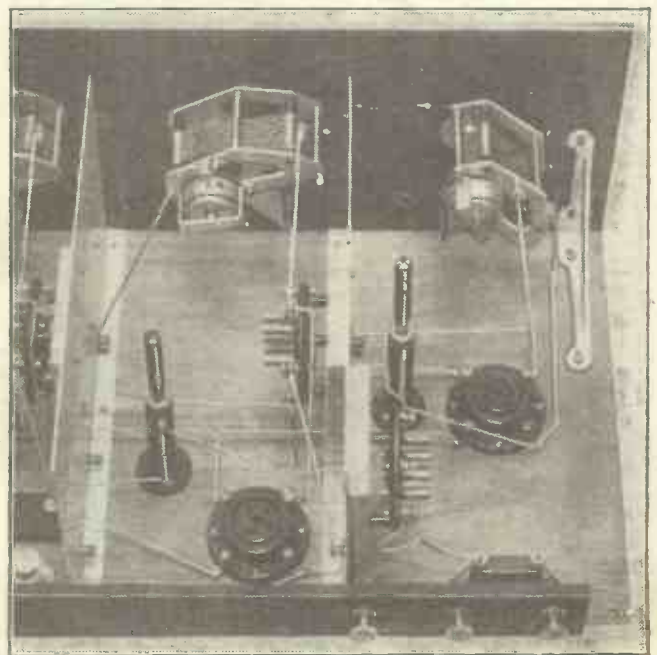


The vertical double lines denote earthed screens.

definite idea of its powers than he can derive from our usual general description of performance, based on a series of careful tests under various conditions.

Accordingly we have kept the set at work for a period of a little over a week in one particular set of conditions, and we will detail its performance during this test. The conditions were deliberately made very

since it will be understood that the exceptional results obtained are due entirely to the highly efficient system of screening and layout on the H.F. side, and not to any freakish and



The wiring of each H.F. compartment is surprisingly simple for so big a set, and it is easy to get good spacing of the leads.

LATEST BROADCASTING NEWS.

A CLOSE SHAVE.

**THE B.B.C. OPEN HOUSE—
BROADCASTING A THEATRICAL REHEARSAL—WELSH WIZARD ON THE AIR—
Dr. HADEN GUEST v. Mr. ROSSLYN MITCHELL—ORGAN MUSIC FROM LIVERPOOL CATHEDRAL—
POUSHNOFF AT MANCHESTER—A SCOTTISH EXPERIMENT.**

A Close Shave.]

IT would have been mightily interesting if the B.B.C. had gone ahead with the debate on book censorship planned for November 12th. It so happened that an action in connection with "The Well of Loneliness" was still *sub judice*. Mr. James Douglas or his antagonist in the debate would most certainly have brought into the argument something which might have been interpreted as comment on an aspect of the case pending.

Then the B.B.C. would have been liable for contempt of Court. One wonders what form the penalty would have taken if exacted. Probably a substantial fine on the Corporation, followed by wholesale dismissals of staff. Or it might have been necessary for the Board of Governors to show cause why they should not be committed for trial!

The B.B.C. Open House.

Twenty-one, Thurloe Square, the town residence of Mr. Roger Eckersley, is now the recognised centre of B.B.C. social activities. Captain Eckersley's charming brother, ably supported by a wife who is one of Society's leading hostesses, deals with a regular succession of brilliant gatherings throughout the winter. Mr. Cecil Lewis, back on holiday from Italy, is making his home at Thurloe Square, adding to the brightness and variety of the breakfast conversation there.

Broadcasting a Theatrical Rehearsal.

The B.B.C. has broadcast many novel productions from the theatre stages of London, including excerpts from a first night.

It has, however, never broadcast a theatrical audition such as has been arranged for Friday, November 30th, when between 8.40 and 9 p.m. listeners to London and other stations will hear a part of the rehearsal of the chorus for No. 1 Touring Company of "Virginia," the new musical piece which has now every appearance of a good run at the Palace Theatre.

The audition will be in charge of Herbert Clayton, Jack Waller, William Mollison and Ralph Reader, whose comments on the work of the Chorus are expected to be readied.

Welsh Wizard on the Air.

Speeches by the Right Hon. David Lloyd George, M.P., and the Rev. J. D. Jones in connection with the Bunyan Tercentenary

Celebration at the City Temple will be broadcast to 5 G B-listeners between 7 and 7.30 on Friday, November 30th.

Dr. Haden Guest versus Mr. Rosslyn Mitchell.

Dr. Haden Guest, the former Labour M.P. for North Southwark, whose secession to the Conservative party created a stir in the political dove-cotes some time ago, is debating a topic which is very much in the air just now (on whether the best career is to be found at home or abroad), during the evening programme from London on Wednesday, December 5th.

His opponent will be Mr. Rosslyn Mitchell, M.P. for the Paisley Division, the winning of which secured him immediate Parliamentary distinction, since his opponent, it will be remembered, was the late Lord Oxford and Asquith.

B.B.C.'s PICTURE BROADCAST.



This cartoon was one of the first three "still" pictures (Fultograph system) broadcast from 5 X X.

Organ Music from Liverpool Cathedral.

Lovers of organ music—and they are numbered by the thousand in the post-bag of the B.B.C.—will be pleased to learn that arrangements have been made to broadcast a recital from Liverpool Cathedral through London, Daventry and other stations on Friday evening, December 7th.

The cathedral organist, Mr. H. Goss Custard, has chosen a programme of works which include compositions by Purcell, Franck, Bach and Karg-Elert, which should amply demonstrate the wonderful capabilities of the largest and most complete cathedral organ in the world.

The instrument has five manuals and 163 speaking stops, and requires three electrical motors with an output of thirty-two horse power to work its three rotary blower sets.

Pouishnoff at Manchester.

Pouishnoff, the famous pianist whose first broadcast some years ago created a first-class "wireless mystery" because he and the B.B.C. were compelled by force of circumstances to withhold his identity, is taking part in an orchestral programme to be given by the Northern Wireless Orchestra under the conductorship of Sir Henry Wood in the Manchester Studio on Sunday evening, December 2nd. His most important item will be the latest of Rachmaninoff's Concertos—No. 4 in G.

A Scottish Experiment.

An ambitious, not to say daring, experiment has been devised by Glasgow station in arranging a mystery series of talks to be broadcast on the first four Saturdays of December.

The talks, which have the general title of Tributaries to Scottish Temperament, will be given by people whose names will be kept secret until after the broadcast, which it is believed will have the effect of adding considerably to their interest. The first speaker will be a Scotsman, well-known both in political and social circles.

TECHNICAL NOTES.

By Dr. J. H. T. ROBERTS. F.Inst.P.

TRANSFORMER IMPROVEMENTS

OSCILLATION—AND THE CURE, Etc., Etc.

Transformer Improvements.

IT is curious how sometimes, when an instrument or apparatus is improved, the advantages obtained bring with them corresponding fresh disadvantages. I am thinking in particular of the improvements which have taken place, especially during the past year or so, in low-frequency transformers. There is no doubt that the present-day standard in low-frequency transformer design bears no comparison with that of three or four years ago.

I have a letter from a reader in which he mentions a little difficulty with modern transformers and I am sure this experience will be shared by a great many others.

Oscillation.

The trouble in question is due to oscillation setting in with one of the more modern transformers, whereas with a transformer

of the older kind the set operated perfectly satisfactorily. The oscillation makes itself apparent by the production of a very high-pitched whistling sound.

As a matter of fact the reason is that the sensitivity and general efficiency of the modern low-frequency transformer have been so improved that it becomes more and more necessary to match the impedance of the amplifying valve to that of the transformer. I think you will find that in cases where the valves have been carefully chosen so that their impedance matches as nearly as possible the impedance of the transformer, this tendency to oscillation will not arise.

And the Cure.

This is the correct way of dealing with the matter; but, in case it should not be
(Continued on page 630.)



JUDGING YOUR SPEAKER

Is your loud speaker working properly, has it developed an annoying chatter, or does it dither? If you are doubtful of your reproduction, test your speaker by the tests given below.

By PERCY W. HARRIS, M.I.R.E.

NO matter how good your set may be, it is the loud speaker which ultimately governs the reproduction, so that it is well that every listener should know how to test his loud speaker on those occasions when it seems to have developed a fault.

Now, the complete and thoroughly scientific test of a loud speaker is a task beyond the scope of any but a well-equipped laboratory, but if we pay attention to certain fundamental facts it is quite easy, with the apparatus at the disposal of almost every listener, to find out some very important facts. If, too, a second loud speaker is available either as a permanent acquisition or borrowed for the evening from a friend, then the test can be made still more complete and satisfying.

"Falling-off."

Assuming that you have purchased a good loud speaker and have, in the past, been satisfied with its reproduction, then the falling-off in quality can arise from three sources. The first is from some source prior to the entry of the signal into the receiver, the second is from the receiver itself (including under this heading valves and batteries), and the third is from the loud speaker.

Only too often a sudden or slow falling-off in quality of reproduction is blamed to the loud speaker whereas it arises from some source under heading 1 or 2. If another loud speaker, preferably of the same make and type is available, the first thing to do is to substitute the other loud speaker for your own, whereupon if the cause is exterior to the loud speaker the same faulty reproduction will be heard in both instruments.

Loud speakers may be divided under the two headings of "moving iron" and "moving coil." In the first classification come those loud speakers in which we have an electro-magnet which exerts a varying attraction upon a diaphragm, armature, or a reed according to the varying strength of the incoming signal.

The diaphragm, armature, or reed communicates the motion so set up in it to a cone of paper, fabric, or some suitable material which in turn moves the surrounding air, or in another type sets in motion an air column inside a horn.

L.S. Adjustment.

In the second classification the currents from the receiver pass through a coil which is suspended in an intense magnetic field, the varying current, passing through the

coil and not through the electro-magnet, causing a variation in position of this coil in the field. As the coil is itself rigidly attached to some form of diaphragm, the diaphragm is moved and impulses are communicated to the surrounding air. As the vast majority of loud speakers now in use fall under the first heading, we will deal with faults in these before the others.

Taking first the horn type, in the majority of these a stallo diaphragm, circular in form and varying in diameter from that of the diaphragm used in headphones to several inches across, is rigidly held at its periphery above the pole pieces of the electro-magnet in the windings of which the currents from the receiver circulate.

The sensitivity of this device will be largely dependent upon the air gap between the pole pieces and the diaphragm, the smaller the gap the greater the sensitivity of the instrument. Obviously, there are limits here, for the diaphragm has to move with varying attractions of the electro-magnet, and if we make the gap too small then a strong signal will draw the diaphragm down so much that it will touch the pole pieces.

In order that one may suitably adjust the gap a screw or lever is fitted to most loud speakers of this type, the adjustment being such that either the diaphragm is moved nearer to or farther away from the magnet, or the whole magnet itself is moved, the latter being the more general practice.

Sometimes one may adjust a loud speaker of this type to give maximum sensitivity without the diaphragm coming in contact with the pole pieces, even with the strongest signal, and then on leaving the set for a day or two we may find that even a weak signal makes the diaphragm touch. This is due in many cases to variations in temperature of the metal, for metal expands and contracts with changes in the room temperature, and these may arise from an alteration in the weather, or the lighting of a fire.

Only a few days ago I was called into the house of a friend who had recently installed a wireless set to advise them what had gone wrong with their receiver. They assured

me that it had not been touched since the previous day, but on switching it on that day they had found that the reproduction was "horrible, weak, thin and rattley." Assuming that the accumulator had run down, they had obtained another, but the results were just the same. On testing the set, I recognised at once the symptoms of the diaphragm touching the magnet and, on adjusting the screw, the trouble was cured at once.

Effect of Plate Current.

In many receivers loud-speaker windings are included in the plate circuit of the last valve, and when this is of the super-power variety quite a considerable direct current will flow through the windings in addition to the variations set up by the signals. This steady direct current would exert a continuous pull upon the diaphragm if the direction of current is such that it tends to accentuate the field of the permanent magnet.

On the other hand, if it is the opposite direction it will reduce the pull of the permanent magnet around the pole pieces

TEST TEAM "TEST."



Mr. A. P. F. Chapman, captain of the M.C.C. team now on tour in Australia, choosing a portable to take with him on the trip.

of which electro-magnetic windings are wound. There is thus a right and a wrong way of connecting a loud speaker in sets where the loud-speaker windings are directly in the plate of the last valve.

With the right way one not only obtains the best sensitivity, but the steady current
(Continued on next page.)

JUDGING YOUR SPEAKER

(Continued from previous page.)

tends to prolong the magnetism of the permanent magnet, whereas when connection is made in the opposite direction this steady current is tending all the time to demagnetise your loud-speaker magnet and reduce its sensitivity.

For this reason many makes of loud speaker are marked with positive or negative leads or terminals, the former using red and black tips, or else the positive lead has a coloured thread wound into its insulation. Some speakers, indeed, are marked positive and negative by the conventional cross and dash. Not all speakers are so marked; however, for there is a particular form of magnet which is not appreciably influenced so far as its life is concerned, but in all cases it is just as well to keep the windings to the correct polarity.

Testing Polarity.

If your loud-speaker leads are not marked for polarity, or what is just as important, if the loud-speaker terminals of your set give no indication of which is the positive and which is the negative, here is the way to proceed.

Connect up your receiver, switch on the loud speaker and carefully adjust the speaker screw or lever until you can hear the rattling which indicates that the diaphragm is touching the magnets. Now carefully and delicately alter the adjustment so that the diaphragm just clears the magnet and does not touch even with quite a strong signal.

Next, without altering anything else, reverse the loud-speaker leads and one of two things will happen. Either the reproduction will sound just as good (or possibly weaker to some degree) or you will once again hear the rattling noise showing that the diaphragm and magnets are touching each other.

Making Sure.

If you do hear this, then the connection you have at that time is the correct one, for it shows that in the way you have just joined up the leads the steady current is tending to accentuate the magnetism and, therefore, is exerting a greater attraction, which is what you want it to do. All you need now do is to readjust your diaphragm so that it is cleared once more, and you will be sure that your connection is right for this particular loud speaker.

If, however, as first mentioned, reproduction sounds practically the same, then it is probable that your first adjustment is the correct one, but to check this readjust the loud-speaker diaphragm until it just touches once more, and then set it back to

just clear again. Now reverse to the original loud-speaker connections and you will get the rattling noise referred to, confirming that the first connection was the correct one.

In the case of loud speakers which incorporate some output device such as an output choke or an output filter, which prevent any direct current flowing through the loud speaker winding, then it does not matter which way round you connect your loud speaker, because there is no direct current to do harm. Furthermore, the direct current being absent you will not find any difference in attraction one way or the other.

Use Filter Output.

It is a distinct advantage for two reasons to have some form of output device of good quality. The first and most important is, not that the direct current is kept out of the loud-speaker windings, as so many people think, but that the resistance of the output device (if it is properly chosen) is much lower than that of the loud speaker, and, therefore, you do not lose voltage in the comparatively high resistance of the loud-speaker windings.

This is of great importance with modern valves and, in fact, the latest super-power valves are practically useless without some

BRIGHTER BOXING.



"Newsboy" Brown, the American boxer (top left), is a keen radio fan, and is here seen listening to 2 L O via a portable set at Windsor.

form of output device. To illustrate this let us imagine we have a loud speaker with a resistance of 2,000 ohms—quite a common figure—and a super-power valve with a 4,000-ohm resistance (not impedance).

If, now we apply 120 volts to the H.T. positive terminals, then the voltage applied to the valve itself will not be 120, but approximately 80! By using an output device of suitable impedance, but of low D.C. resistance, we can see to it that the plate of the valve has nearly the full voltage applied to it by the battery.

The correct use of super-power valves, however, needs a special article, and, as we are dealing here solely with loud speakers, we must next consider troubles that may arise with the cone type. In a number of these the type of movement known as the balanced-armature movement is used, no adjusting screw of the type used with the horn loud speakers being provided.

In most cases, however, an examination

of the cone loud speaker will show that a suitable adjusting screw is provided, and in loud speakers which operate on a principle similar to that described for the horn speakers, an alteration of this adjusting screw will have the same effect as that described above, and the correct way round can be found by the same method.

A few types of loud speaker have no adjusting screw of the ordinary type, but have a tiny screw which locks the rod attached to the centre of the cone. The B.S.A., General Electric and Burndept cones, for example, have this small screw,

In many cases an output filter is essential for successful loud-speaker reproduction of broadcast music.

and when it is released the small rod attached to the actuating mechanism can move in and out of the central hole without actuating the diaphragm. The sound given when this is occurring is similar to that when the loud-speaker diaphragm is touching the magnet, but is much weaker.

On some types of speaker this screw needs quite frequent adjustment, for the material of which the cone is made may be susceptible to changes in humidity and temperature, so that it is just as well with this type before starting the evening's entertainment to release the screw for a moment and tighten it up again, so as to relieve any tension that has been set up by atmospheric changes. A loose screw in such a loud speaker is, therefore, one of the faults to look for when you are getting bad reproduction.

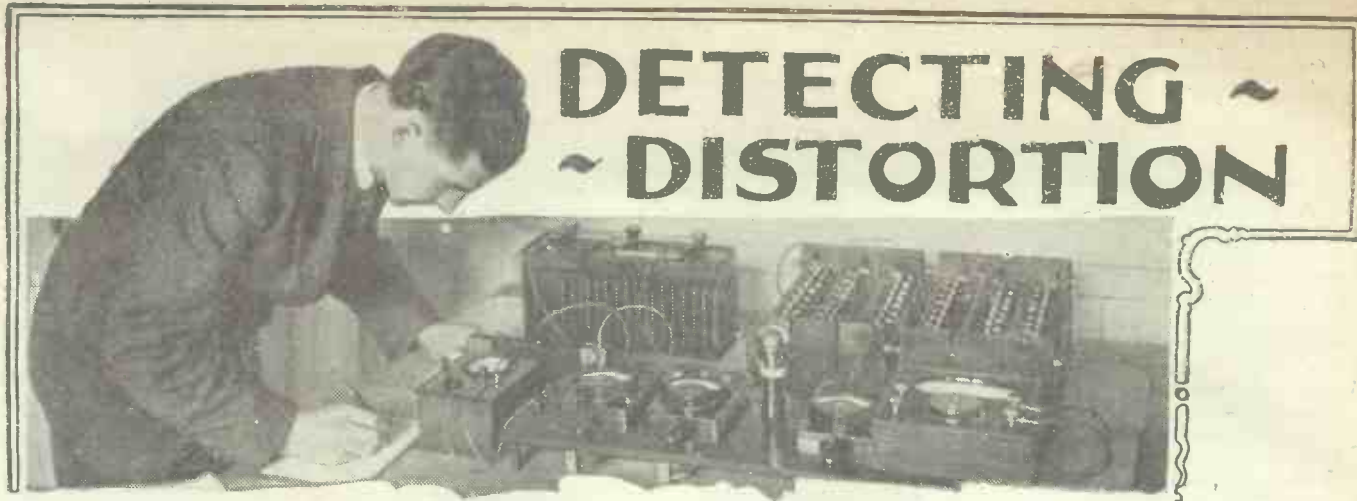
Crackling Noises.

Loud crackling noises in any type of loud speaker, with, perhaps, periodical cessation of signals, generally arise from a faulty winding. I am assuming, of course, that you have tried another loud speaker, and discovered that this fault is not in the set or previous to it. The wire used to wind the electro-magnets in loud speakers is extremely fine, in order that a sufficient number of turns may be wound into the small space available and if, during the winding process, a drop of moisture such as can arise from perspiration finds its way into the winding, the acidity may set up corrosion which, in course of time, will eat right through the wire.

If you have had your loud speaker for a few years and it has been very gradually falling off in strength, it is probable that the permanent magnets have lost some of their strength. This may occur even when the loud speaker has been correctly connected, and the trouble will be accentuated, of course, when you have used it incorrectly joined up. Re-magnetising permanent magnets of loud speakers is carried out by a number of firms for a very small charge and will give new life to many an old instrument.

Contrary to a common belief, very few loud speakers give blasting through loud-speaker overloading. One often hears it said that a certain loud speaker is very good, but "cannot stand strong signals."

Nearly all cases of so-called loud speaker overloading are due to output valve overloading, as has been frequently explained in this journal.



DETECTING ~ DISTORTION

The first thing is to decide exactly the kind of distortion you are searching for and then you can proceed to cure the trouble. Mr. Field again gives an all-in-a-nutshell treatise in the form of a really readable article.

By C. E. FIELD, B.Sc.

THERE are many types of wireless enthusiasts, even if we consider only those whose interest is confined to the reception of broadcast programmes.

For instance, there is the very critical listener who is absolutely miserable if he knows that his receiver is not reproducing the bottom few notes of the piano, or that a milliammeter in the plate circuit of his last valve occasionally flickers, or that his cone speaker is not up to moving-coil standard. He recognises defects which nobody else can, and derives much more pleasure from striving after ideal reception than from listening to it.

Then there is the man who is unmusical, uncritical, and untechnical. This man is not to be disparaged. On the contrary, he probably enjoys an evening's entertainment more than his critical neighbour who unconsciously and unavoidably listens chiefly for flaws in his reception.

He is content with his old set and horn loud speaker, and cannot see the point of much that is written about "reproduction of low tones," "unwanted resonance," and so forth.

Is This You?

Thirdly, there is the man who belongs to the very large class of listeners who want to obtain as good results as are reasonably possible. He knows that his set is not quite perfect, and would like to improve it if he could, but technical articles on the subject leave him rather cold. He is not in a position to check the design of a transformer or measure his received signal strength. In fact,

he finds it difficult even to describe in what way he is dissatisfied with his reception.

Do you belong to this class? If so, these remarks are intended for you.

Broken Notes!

Let us assume that as you sit back and listen to your speaker, you enjoy the results. You hear every word of the speech, you can recognise musical instruments, and you seem to hear every note that is played on the piano, and yet you feel that your results are very different from the real thing, without knowing wherein the difference lies. Well, first of all, listen to the culmination of a soprano solo, or any particularly loud passages on a high note.

Do they sound the least bit harsh, as if any further increase in volume would make

them unpleasant? If they do not, and if you feel (it is almost a matter of instinct) that the singer could shout at the top of her voice into the microphone, and your results would not be at all harsh, well and good. But if there is the slightest roughness which is obviously dependent on the loud volume, then something is wrong.

Assuming that this is the case, now listen to a pianoforte solo. Do some notes sound just a little as if the clamps holding the wires are loose, giving a very slight "tin-can" effect? This would be a corroboration that the same fault existed.

This evidence points to over-running somewhere. That is to say, a valve in your set is being given too much input from a preceding valve, or else the grid bias or high-tension voltage on one of the valves is insufficient.

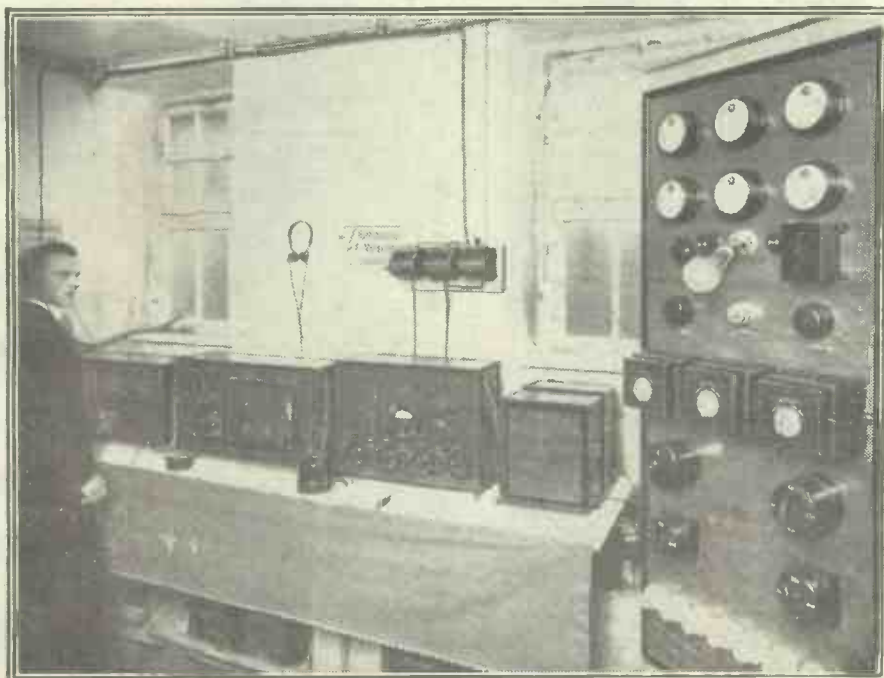
The remedy, of course, is to check your circuit and make sure that all valves are being operated under the conditions specified by the maker, and to make sure that your high-tension and grid-bias batteries are actually supplying the voltage which you imagine them to be.

The Speaker.

If everything appears in order, probably the next step is to borrow a larger valve from a friend for trial in the last stage, as it is generally here that over-running occurs.

The trouble may, however, be due to the loud speaker. If adjustment of the movement fails to improve

THE GIANT OF THE BALTIC.



The radio receiving outfit used at a pleasure resort on the coast of the Baltic Sea, which operates twenty large loud speakers distributed among bandstands, concert-rooms, cafés and bathing stations.

(Continued on next page.)

DETECTING DISTORTION.

(Continued from previous page.)

matters, here again a speaker should be borrowed, if possible. This should preferably be a high-class cone type of speaker known to be capable of reproducing considerable volume without overloading. If the fault lies in the set itself, it will be more noticeable with a good speaker than with a poor one.

We will suppose now that this fault, if it existed, has been traced and cured and that you once more listen to your reception, which still does not sound quite right. Here we will rule horn-type speakers out of the discussion, for if there is no overloading the speaker will determine the quality of reproduction by its inherent characteristics and may, in fact, easily make a poor set sound better than a good one.

Wait now until an announcement of some length, or a talk, is being broadcast (you will probably not have long to wait!). If, by any chance, you have fondly imagined

are almost entirely absent, and that you have been used to supplying them from your imagination. It is more likely, however, that you will find them reproduced as sort of blowing, breathy sounds, which are certainly not sibilants, although they serve the purpose tolerably well.

If these sounds are badly reproduced, listen to a violin solo, and if you are at all musical you will notice that the music lacks the distinctive tone which is associated with the violin, and sounds more as if it emanated from a wind instrument.

On the H.F. Side.

The reproduction of speech and music, taken as a whole, tends to sound muffled, as if it were being heard through a blanket. From a distance, the speech sounds boomy, without being rich by reason of strong bass notes.

As in all cases of poor-quality reproduction, the fault may be inherent and unavoidable in the type of speaker employed, or it may be due to bad design of the receiving set.

Unless your speaker is of the moving-coil

reproduction of very high notes (these may be above the ordinary musical range), may be produced by very high coupling resistances or grid leaks, or by the use of too large a condenser in parallel with the resistance in the plate circuit of a rectifying valve.

There is another form of distortion which may be present in your receiver, and which is unfortunately present to some extent in almost all equipments except a very carefully designed amplifier employing a coil-driven loud speaker.

This is the poor reproduction of bass notes.

The absence of a strong bass register is not so obvious as it might appear, and it is a very common error to suppose that a low-pitched, muffled speaker (sometimes alleged to be "mellow"!) is reproducing low notes well, whereas in reality it is simply *not* reproducing high notes, and the balance of the music is thus partly retained.

Listen to the Drums.

Try listening to the broadcast of an orchestra, or better still a military band, and pay special attention to the drums. You will probably hear them quite well, but do they really boom as they should do, or do they sound a little bit like bucket bottoms? Remember that, because you can hear a low note quite loudly, it does not follow that your set and speaker are reproducing that note at all faithfully. Probably you are only hearing a part of the note, which could have been produced almost as well by a higher pitched instrument.

Now listen carefully to a pianoforte solo. Even if this sounds very pleasing, and does not suffer from the defects mentioned earlier in this article, are the bass notes *really* bass notes, or are they high-pitched shadows without a body to back them up? If you have a piano in the house, place your speaker on the top of it, and play some low notes while the speaker is reproducing piano music.

You will probably realise how unlike the real thing your piano reproduction actually is. The fault will lie partly in the speaker, unless it is of the moving-coil type (for this is the only type capable of reproducing the lowest audible notes), although very satisfactory results in this respect are given by one or two of the more expensive cone speakers.

Other Factors.

If your set employs transformers in the low-frequency stages, unless these are of recent manufacture and are in a suitable circuit, they will probably be causing much of the trouble.

Other factors may be too small a valve in the last stage (i.e. a valve with a much higher impedance than that of the speaker) or in the use of a transformer after a high-impedance detector valve.

If either resistance or choke coupling is employed between valves, or in the output circuit, the coupling condenser may be of too small a capacity, or the inductance of the choke may be too low.

These three faults—over-running, high note loss, and low note loss—constitute the majority of the distortion which you are likely to encounter, and if you make a critical analysis of your reception on the lines indicated above, curing each fault as it is diagnosed, you will probably bring about a vast improvement in your results.

A PEEP AT A PARIS STUDIO.



A general view of the new studio at the Radio-Paris broadcasting station. Note the Reiss microphone suspended in front of the conductor's chair, and, behind, the entrance to the cabinet used by the announcer, who controls "Mike." Radio-Paris is the long-waver which provides so many English listeners with enjoyable "lunch-time" music on Sundays.

that your speaker reproduces speech naturally, go upstairs, or into another room, or, better still, leave the house for five minutes and re-enter it with the idea of being "caught unawares" by the speaker, and see if you could truthfully say that it would be possible to think that a man was actually speaking in the house.

Sibilant Sounds.

You may be struck with the fact that yours is an excellent loud speaker, but, in all probability, it will be very evident that it is a loud speaker.

Now listen critically to the talk, and pay special attention to words containing *s*, *z*, *sh*, or *th*. You may find that the sounds are fairly natural, or you may find that they

type, the first step is once more to borrow a high-class cone speaker and compare it with your own, paying attention for the moment only to those features just dealt with.

Assuming that a change of speaker makes no difference, indicating a fault in the receiver, there are several possible causes of the trouble.

On the high-frequency side, it may be due to excessive use of reaction, or unneutralised circuits, or any other factor which would cause the tuning of the set to be extremely sharp.

If your set is flatly tuned, turn your attention to the low-frequency side. Here you may have a badly-designed transformer, or an unsuitable resistance-coupling circuit. The fault, which is due to poor



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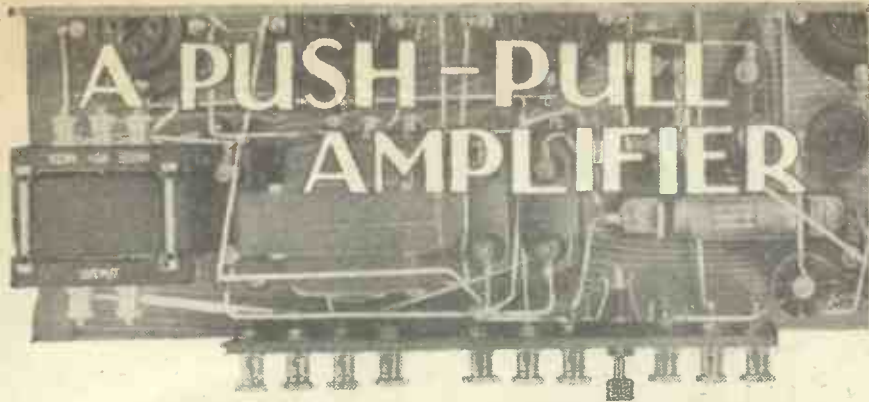
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How the constructor can build a stage into an existing set.

By A. S. CLARK.

"SHALL I get better results if I use a push-pull stage?" This is a question which is frequently being asked. A short article on when to use a push-pull stage, and how to insert it, will therefore not be out of place, and should be of some value to amateurs interested in this method of L.F. amplification.

There is at least one case in which there is absolutely no point in using the above "type of amplification," and that is when only small loud speaking is required. In such cases a small power valve by itself will be ample. The time to consider "push-pull" is when you require a really large output, such as when great volume is

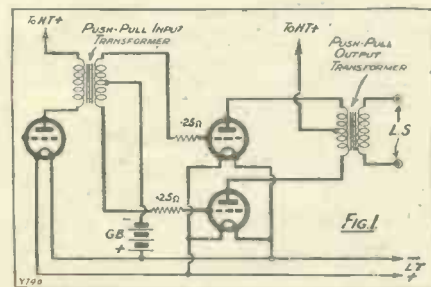
required since there is very little alteration to the wiring to be made. The circuit given in Fig. 1 shows a push-pull stage following another L.F. valve. Up to this preceding valve the set will remain exactly as before.

In Fig. 2 will be found a sketch of the new components and the necessary wiring. This will be found useful by those who are not particularly skilled at following theoretical circuit diagrams.

We will assume first of all that the last valve in your set is coupled to the preceding one by an L.F. transformer. The first step in the alteration is to remove the following connections; from the plate of the last valve but one to the L.F. transformer, and all other wires to this transformer. Also disconnect the wires from the two L.S. terminals. The wires to remove are shown dotted in Fig. 3. If the coupling is by means of an R.C.C. unit, the lead from the plate of the last valve but one to the unit must be removed and all other wires to the coupling device. Having carried out the above, the L.F. transformer must be removed from the set.

Extra Components Required.

It should be pointed out here, that if the same baseboard is to be employed, there must be room to insert an extra valve holder and transformer. It is advis-



required or a moving-coil loud speaker is to be employed. Even then push-pull amplification will not necessarily give you better results than an ordinary straight L.F. circuit, and many consider its advantages doubtful.

If you have ample H.T. voltage and current available, or in other words, if you have electric-light mains and can work a large eliminator, you will often be able to get just as good or even better results without push-pull amplification, the reason being that you will be able to run a power valve sufficiently large to handle the required volume without distortion. The time when you may like to try the type of amplification under consideration is when you have a limited H.T. voltage available, and economy in current compensation is necessary.

The Necessary Alterations.

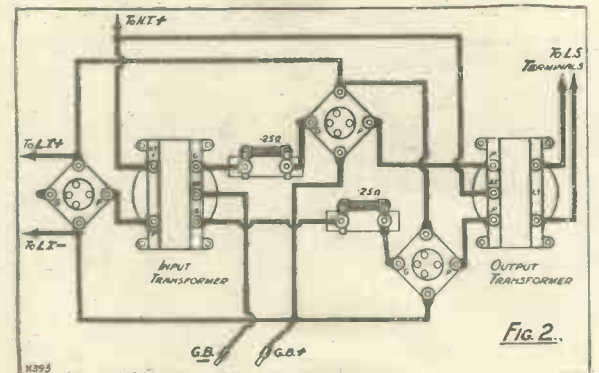
Having, therefore, with the help of the foregoing decided whether or not you would like to try "push-pull," we may turn our attention to the alterations which would be necessary. This will not prove very diffi-

able to keep the transformers as far apart as possible, and with their cores at right angles. Where transformers of the shrouded type which are provided with earthing terminals are utilised, advantage should be taken of these terminals.

The next step is to screw another valve holder to the baseboard near to the last one at present in the set. The two filament contacts of the new holder can be joined directly to those of the original last valve. If a fixed resistor is provided to the latter it may need to be replaced by another one with suitably lower resistance to suit the valves employed. The input push-pull transformer should be placed between these last two valve holders and the preceding one. The output transformer is naturally placed, if possible, between the paralleled valve holders and the L.S. terminals.

Some Final Hints.

The fresh components may now be wired up, either from the circuit of Fig. 1 or diagram of Fig. 2, whichever the reader prefers to follow. Needless to say, in spite of the fact that you are using "push-pull" it is advisable to use as high an H.T. voltage as possible. Also use batteries of double or triple capacity if you intend to work

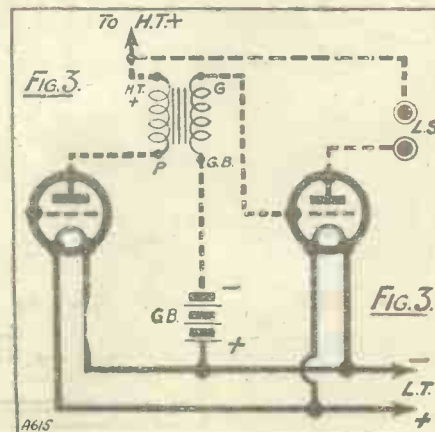


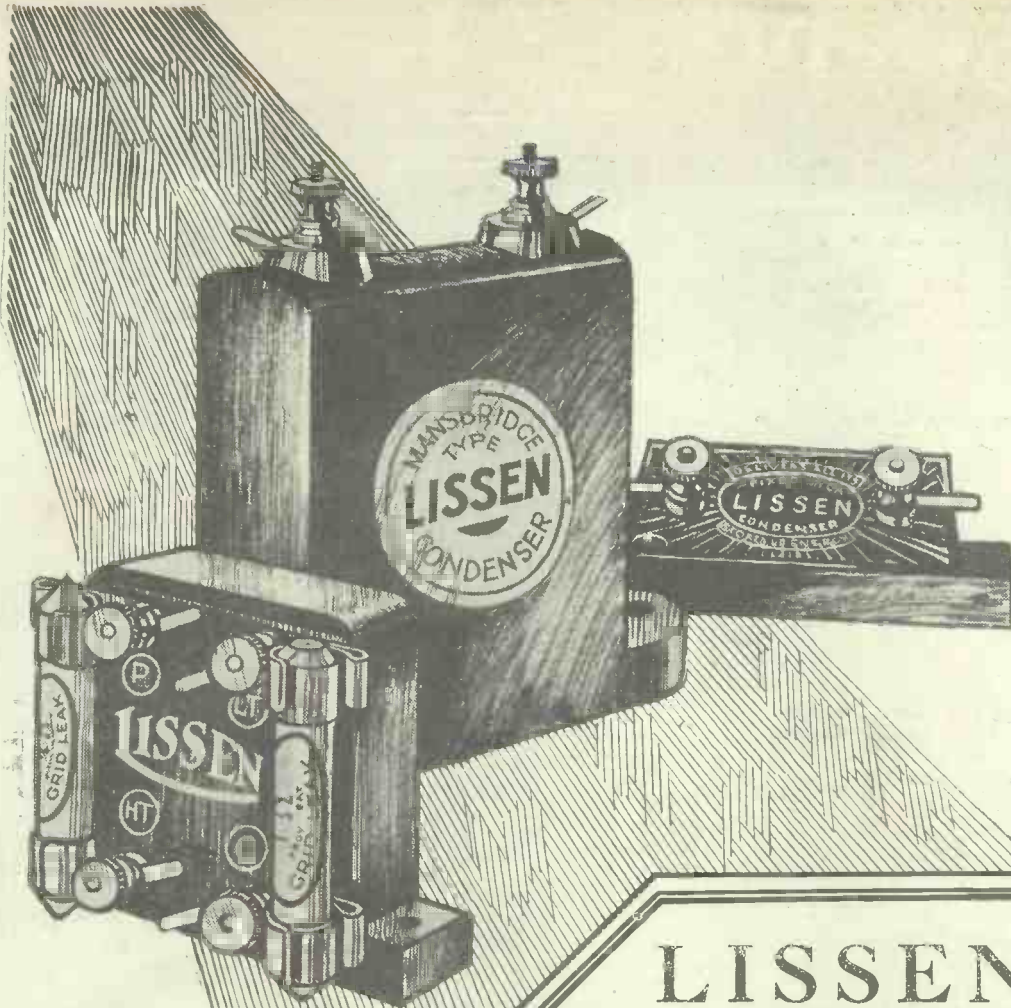
from dry cells. Two small power type valves will be found satisfactory. Make sure, however, that you use sufficient grid bias, as otherwise you may waste H.T. current and get distortion at the same time.

Power valves with a fairly high magnification factor should be chosen, even if this does mean using valves with a somewhat smaller permissible grid-swing. The latter is not generally a serious drawback since the transformer's output will be divided between the two valves.

The approximate grid bias required may be obtained from the makers' details, but if specially matched valves are not employed, one valve may require 1½ volts or so more grid bias than the other. A scheme for doing this, which the writer has not seen published before, but which is worthy of being experimented upon, is to insert 1½ or 3 volts in the grid lead to the valve requiring the higher voltage of grid bias. The use of a milliammeter inserted in the plate lead of the push-pull valves will indicate if the above is desirable. The .25 meg. grid leaks in the grid leads of the push-pull valves will sometimes be found useful, and it is advisable to try them.

If you are limited as to H.T. supply, and are not satisfied with your present quality, "push-pull" is certainly worth a trial, providing you desire to have large volume.





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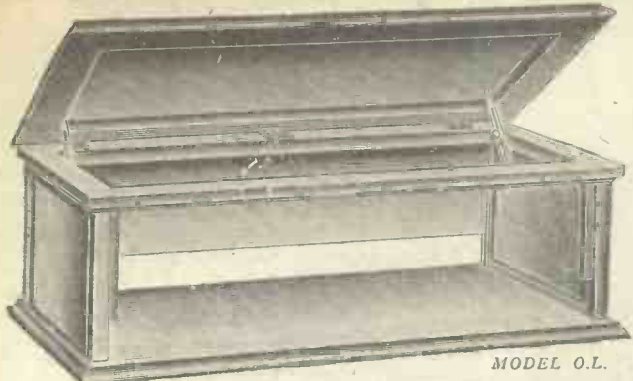
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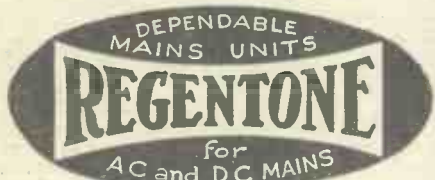
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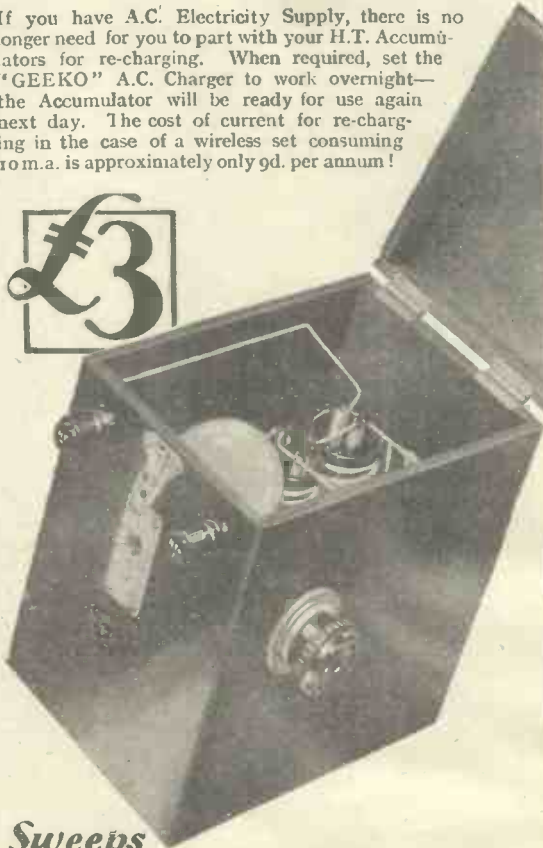
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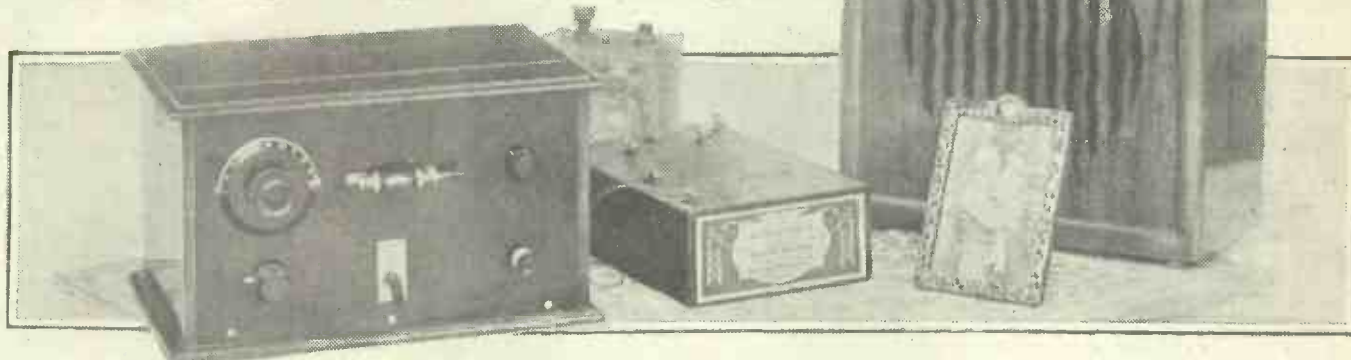


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THE 'CRYSTA-VALVE' TWO



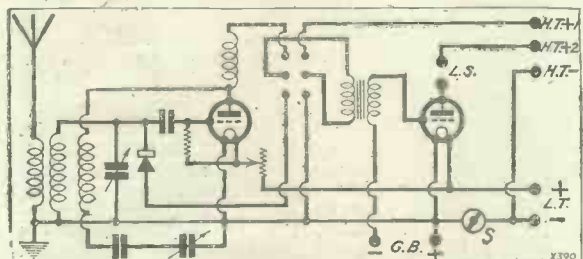
YOU may, perhaps, have wished that you could obtain results, which, although not sufficiently strong for loud-speaker reception, should yet be sufficient volume to give clear headphone signals under any probable conditions without the necessity for strain. Within a moderate range of a main station, a two-valve set, on a good aerial, will give ample

Some people like a crystal detector, others prefer a valve—this little set gives you either, by a touch of the switch!

It is easy to make, pleasing to handle, delightful to listen to, and very economical to run. Why not give the family a treat and build The "Crysta-Valve" Two?

By J. R. WHEATLEY.

("P.W." Staff.)



Here is the circuit, which shows how the switch connects either the crystal detector or the first valve to the transformer, which then hands its output to the second valve for amplification.

fairly good loud-speaker reception, so that the two valves need only be used for 5 G B, or the reception of other than the local station.

High Selectivity.

When the two valves are in use, the aperiodic aerial circuit will provide a fairly high degree of selectivity. Reinartz reaction is also available if desired to boost up the received signals.

The detector valve has been fitted

reasonably good crystal detector may be incorporated. The switch in the original set was of the Dubilier Minicap type, but providing the switch used is capable of making good contact, and has a fairly wide space between the contacts, trouble need not be feared in this direction.

As to the actual construction of

(Continued on next page.)

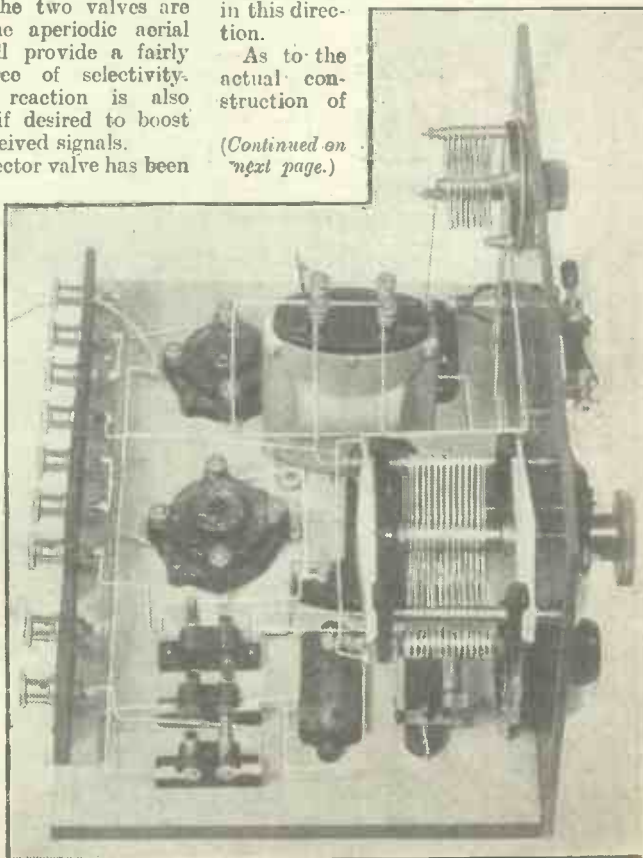
volume for ordinary domestic loud-speaker reception, plus the possibility of receiving other stations on headphones, or if careful tuning is carried out on the loud speaker when conditions are good. Again, a single-valve will often give all that is needed for headphone work, but there are "dud" reception spots when a single-valve set means a certain amount of strain in listening, a crystal and valve combination would then solve the difficulty.

Loud-Speaker Results.

The "Crysta-Valve" Two has been designed with these objects in view, and consists of a straight two-valve set capable of giving loud-speaker reception up to 10-15 miles on a fairly good aerial. By the movement

with a 30-ohm rheostat, which also acts as an "off" switch when the detector valve is cut out and the crystal-valve combination is in use. Thus, it will be seen that this component fulfils a double purpose and should not be omitted, even although 2-volt valves and a 2-volt accumulator may be employed. It is, of course, often useful also in getting smooth reaction.

The low-frequency stage is of the transformer-coupled type, and the coupling unit may be of any of the well-known makes, further details of which will be found in the list of components. The crystal is of the semi-permanent enclosed type, but here again any



This view of the baseboard taken from the aerial end shows that there is nothing for even a novice to be frightened of in the wiring of the "Crysta-Valve Two."

CAN YOU BEAT IT?

This set has a "Factor of Safety," for if the programme is not quite loud enough on crystal and amplifier you can go over to two valves. Similarly if the "local" programme bores you, you can easily switch over and try for the Continent.

of a simple switch the first valve can be cut out, and in its place a crystal employed, giving a crystal plus one stage of low frequency. At four to five miles from the local station this combination will often give

THE "CRYSTA-VALVE" SET.

(Continued from previous page.)

the set, there are several small points which must be carefully followed or difficulty may be experienced in wiring. The panel should first be drilled, care being taken that where alternative components are to be used due care is taken in balancing up the panel, etc.

The Change-over Switch.

When cutting the slot for the change-over switch it is advisable to employ a fret saw, or to drill a series of holes round the space to be cut for the switch, and then to finish off with a small, flat file. After mounting the components on the panel, it is advisable to carry out as much of the wiring to these components as is practicable, before starting on the baseboard.

Attach the panel to the baseboard and fix by means of three countersunk screws along the front. Screw down the terminal strips or strip, and then try the panel and baseboard in the cabinet, thus making sure

that when completed the set will slide easily into the cabinet. Then remove the set from the cabinet and mount the rest of the components in place.

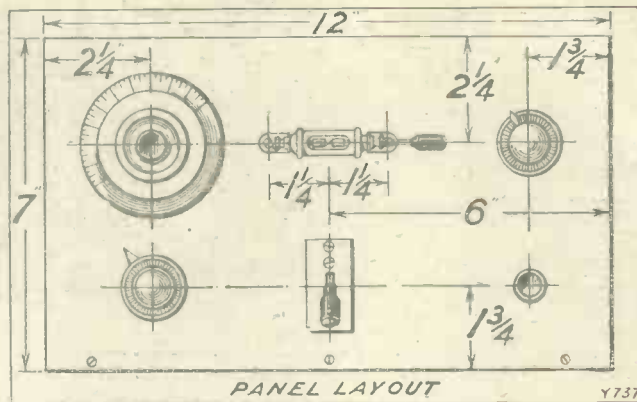
Look over the set, making sure that the condenser vanes will miss the high-frequency choke, and that the coil holders have been

of the switch. As the holes for the screws have already been made in the baseboard, these components may at the correct time be easily replaced, and fixed without spoiling the wiring already carried out.

Further to simplify the wiring, certain leads have been taken under the baseboard and are shown dotted in the wiring diagram, and these wires should preferably be placed in position first as follows. Drill a small hole, a little larger than the wire to be used, near to the soldering tag of the particular component in question, say the low-tension switch.

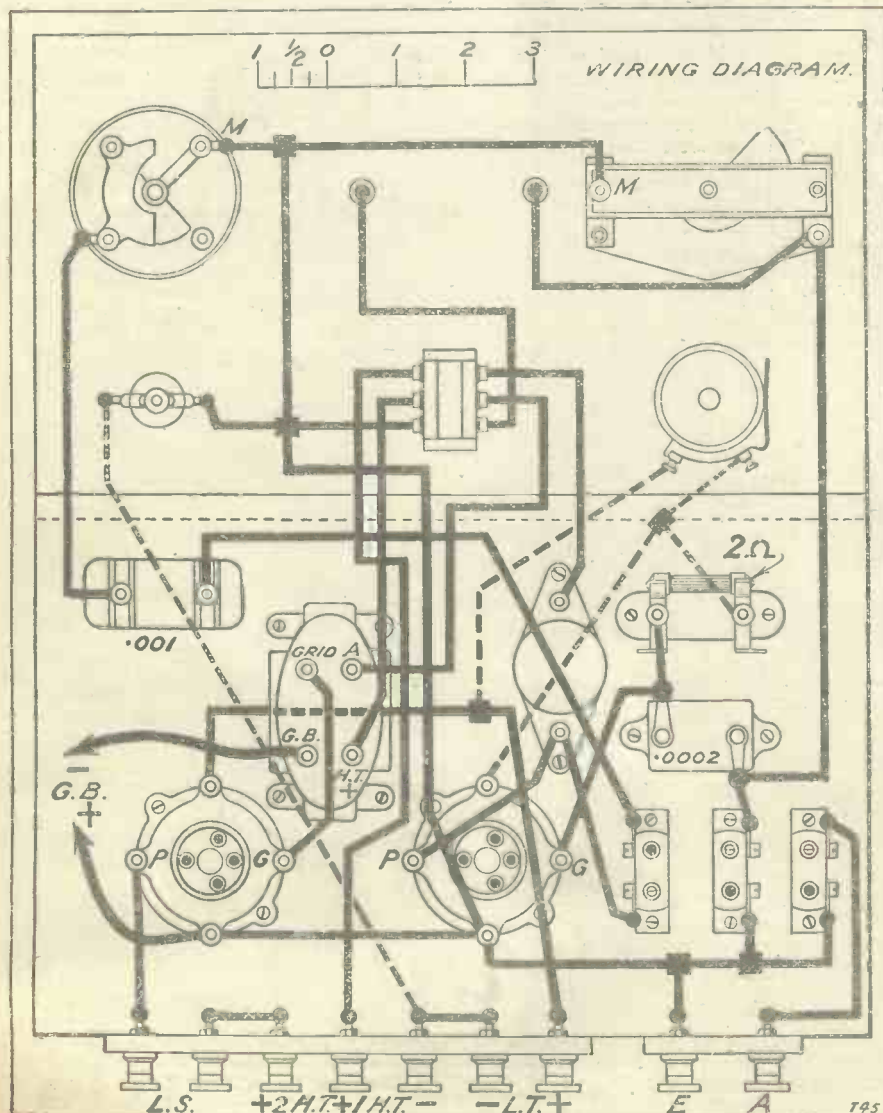
Now cut two parallel grooves in the underside of the baseboard with a sharp knife (for this operation a little assistance simplifies matters) between the hole drilled and a further hole drilled at a convenient point near to the low-tension negative terminal. With the point of the knife it is then a simple matter to remove the wood between the two grooves, leaving a shallow channel in which the wire is to lie.

(Continued on page 605.)



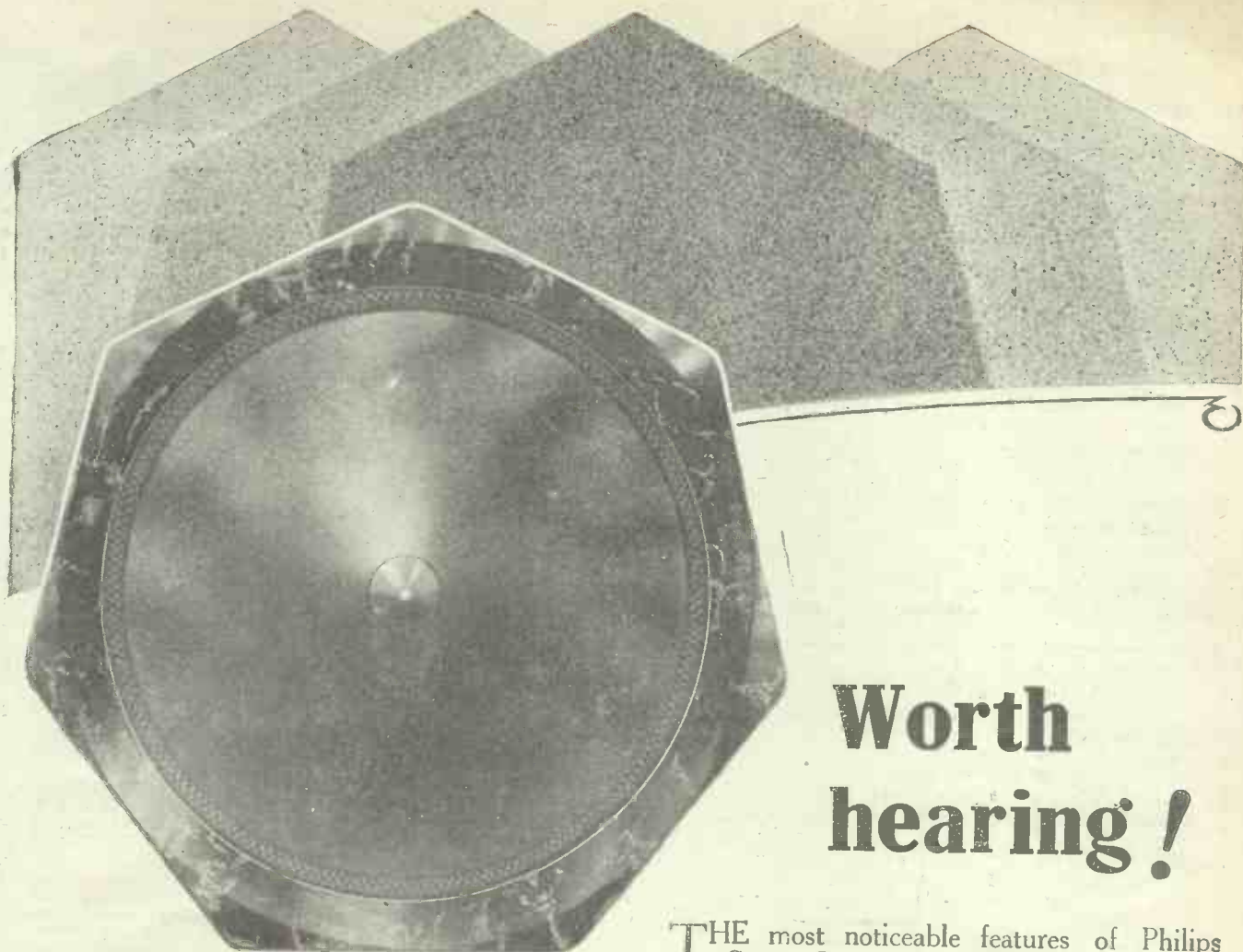
placed sufficiently far apart to allow for the use of your largest coil. Everything being O.K., remove the low-frequency transformer and the high-frequency choke from the set, this is to allow for easy wiring

placed sufficiently far apart to allow for the use of your largest coil. Everything being O.K., remove the low-frequency transformer and the high-frequency choke from the set, this is to allow for easy wiring



LIST OF COMPONENTS.

- 1 Panel, 12 in. × 7 in. (Radion, "Kay Ray," Ebonart, Becol, Trelleborg ebonite, Red Seal, etc.).
- 1 Cabinet to fit, with baseboard, 8 in. deep (Raymond, Arterraft, Caxton, Camco, Gilbert, Bond, Makerimport, Pickett, Lock, etc.).
- 1 .0005 variable condenser (Bowyer-Lowe Popular in set. Any good make, Igranic, Cyldon, J.B., Raymond, Peto-Scott, Burton, etc.).
- 1 Reaction condenser (Peto-Scott, Dubilier, J.B., Cyldon, Igranic, Ormond, Bowyer-Lowe, etc.).
- 3 Baseboard-mounting coil holders (Lissen, Lotus, Peto-Scott, etc.).
- 1 30-ohm rheostat (Lissen, Igranic, etc.).
- 1 Crystal detector (Brownie, R.I.-Varley, etc.).
- 2 Valve holders (Igranic, Lotus, Burne-Jones, Benjamin, Ashley, B.T.H., Pye, Redfern, Bowyer-Lowe, Wearite, Marconiphone, Burne-Jones, Formo, etc.).
- 1 .0002 fixed condenser (Dubilier, Lissen, Igranic, Mullard, T.C.C., Atlas, Magnum, etc.).
- 1 .001 fixed condenser (Dubilier, Lissen, Igranic, Mullard, T.C.C., Atlas, Magnum, etc.).
- 1 2-meg. grid leak and holder (Lissen, Dubilier, Mullard, Igranic, Pye, etc.).
- 1 H.F. choke (Lissen, R.I.-Varley, Lewcos, Cosmos, Climax, Colvern, Burne-Jones, Marconiphone, Bowyer-Lowe, Dubilier, etc.).
- 1 D.P.D.T. switch (Dubilier Minicap or similar type).
- 1 L.T. switch (Lotus, Benjamin, Lissen, Peto-Scott, Igranic, etc.).
- 1 L.F. transformer (R.I. general purpose in set. Any good make: Ferranti, Igranic, Lissen, Mullard, Marconiphone, Brown, Philips, etc.).
- 2 Strips and 9 engraved terminals (Eelox, Igranic, Belling & Lee, etc.).



Worth hearing!

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When you build the Lissen S.G.3 Receiver, at once you enter into a new realm of radio. With this screened-grid circuit you have all the continental broadcast stations available at any time of the day and night; and this development of radio Lissen has put within the reach of all by publishing a STEP-BY-STEP Chart and Wiring Diagrams which for sheer simplicity have never been approached. You will *not* make this Lissen S.G.3 Receiver in five minutes—but you *will* make it without possibility of failure, and when you have made it you will have a receiver that will give you

DANCE MUSIC ON SUNDAY IF YOU WANT IT!

You can range the continental stations in search of the kind of entertainment to suit your mood. Because until you build this new Lissen Receiver you have never known what selectivity means. Stations come in clear, distortionless, loud at almost every degree of the dials; yet there is no interference of one station with another, no critical or difficult tuning. Lissen show you how to make this set—Lissen supply you with *all* the components—yet Lissen do not tie you down to buying any complete "kit of parts." If you follow the directions, you will have a radio set of which you will be proud to say "I made it myself."

A HANDSOME CABINET OF WOOD!

Lissen do not tie you to a cabinet of tin, because iron (*i.e.*, tin) in a tuning circuit damps the tuning and reduces selectivity. So Lissen suggest you should choose a cabinet of polished wood, and make the receiver a handsome piece of furniture.

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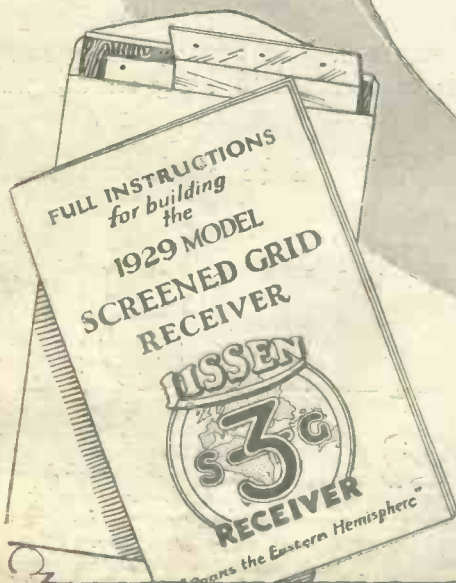
10,000 radio dealers sell Lissen components. From any one of them you can get the parts you need for this receiver. Your nearest Lissen dealer will help you with it and advise you. You can buy the parts by instalments or all at once, just as you like.

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You can obtain from any radio dealer or direct from factory (by using the coupon below) a FREE STEP-BY-STEP chart and Wiring Diagram for the Lissen S.G.3. Lissen have simplified the building of it, firstly by using standard Lissen parts throughout; secondly by supplying a ready-drilled panel, a baseboard with component layout marked, aluminium screens all ready to erect.

You have not got to buy any particular make of valve; you choose whatever make you like. You have not got to buy a particular cabinet—you can choose one for yourself. And you have not got to buy a complete kit of parts, because Lissen know you probably have many Lissen parts already in use in an old receiver.



THE "CRYSTA-VALVE" SET.

(Continued from page 602.)

Over the wire from the filament terminal of the second valve joined to low-tension plus, a piece of Systoflex should be slipped to prevent the transformer core from shorting to this.

When the wiring is nearly completed, insert the high-frequency choke and wire

coil. For the first valve holder a high-frequency valve is required, and may be either of the 2- or 6-volt type.

The valve makers' characteristics should be examined, and it will be seen that for the first valve, i.e. the high-frequency type, the high-tension specified will be between rather wide limits. As the low-frequency stage is transformer coupled, it is fairly safe to assume that approximately two-thirds of the maximum voltage specified for this particular valve is correct, although actually it is a far better scheme to try various voltages until the maximum results are obtained without any tendency for the reaction control to be ploppy.

In the second stage a low-frequency type of valve is necessary, or if for loud-speaker reception a small power valve. The high tension applied to this stage should be, if possible, the maximum recommended by the manufacturers for this valve. Grid bias should be applied in accordance with the makers' instructions.

Place the change-over switch in the "down" position, connect up loud speaker and low-tension battery, etc., and pull out the low-tension switch on the right-hand side of the panel.

Crystal and L.F.

The rheostat is now rotated until the valve is functioning. Rotate the aerial condenser until signals are heard, and by means of the reaction condenser increase until the desired

volume is obtained. To employ the crystal as the detector, place the change-over switch in the "up" position and rotate the rheostat until the off position is reached; adjust the crystal detector and if necessary slightly retune. With this arrangement do not forget that varying the reaction condenser will have no effect.

It is interesting to note that although the crystal detector and one side of the grid condenser are common, it is possible when using the valve as the detector to vary the crystal without in any way affecting results.

This small point indicates that whereas with usual methods of obtaining an alternative detector arrangement, both sides of the crystal are switched, providing

that a suitable circuit is employed and the use of correct components, especially the switch, it is possible to obtain the desired results without this more complicated type of switching.

Efficient Results.

The actual results do not appear to have been affected in any way, either in the crystal and low-frequency or the detector and low-frequency circuits, by the addition of the switching scheme. On a microammeter test, taken with the crystal circuit as a separate "hook-up" and then from the set, it was not possible to detect any loss which could not have been accounted for in other ways.

BY THE WAY—

A good rough and ready rule for calculating grid bias is to multiply the amplification factor of the valve by two and divide this figure into the high-tension voltage required by that particular valve.

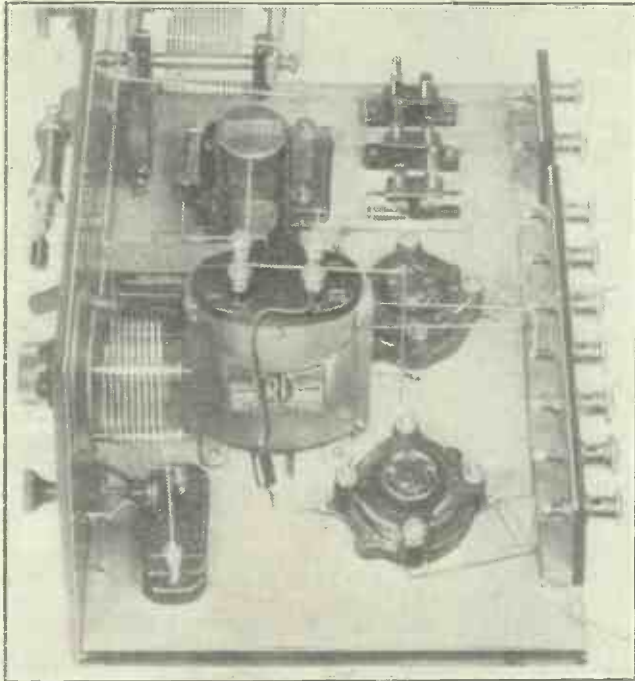
When adjusting your H.T. plugs do not forget that the voltage on the plate of the valve will be considerably less than indicated by the plug on the H.T. battery, because of the voltage drop through the loud speaker or coupling device.

Splendid results can be obtained with a gramophone pick-up provided that the motor and tone-arm used are in good order, and there are no mechanical weaknesses.

If your aerial is of the outdoor type of about average length it will have a capacity approximately equal to a .0002 mfd. condenser.

Highly-polished ebonite panels which are in need of renovating will receive a new lease of life if treated with Karpol, as used for polishing motor-car body-work.

If you are troubled with a regular humming noise and your set employs a low-frequency transformer, try changing over the leads to the primary, or those to the secondary.



Here you see how the components are arranged upon the baseboard. Note the negative grid-bias plug at the end of the flexible lead which comes from the L.F. transformer.

this component in circuit, then the low-frequency transformer, which will be seen is across the length of Systoflex already in position. The space between the second valve holder and the edge of the baseboard should be kept free from wires, for in this

WHEN YOU BUILD A "P.W." SET

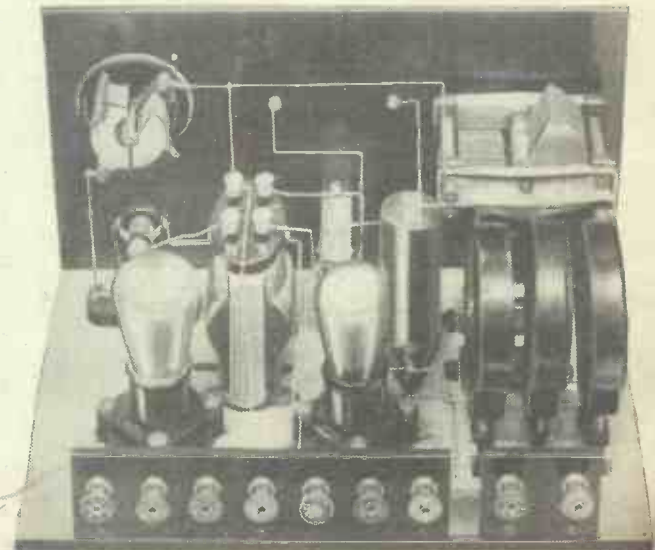
You know that if you should be unlucky with your components, or get into any kind of radio trouble, you can always rely upon the "P.W." Technical Query Department to help you out.

space the grid-bias battery is mounted. To allow for suitable grid bias to be applied to the low-frequency valve, flexible leads are taken from low-tension negative and the grid-bias terminal of the transformer.

Check Your Wiring.

Then check over the wiring, examining each joint in turn for a possible dry joint or for a short between adjacent wires, taking particular care that the switch contacts are free from small blobs of solder which may have been dropped from the soldering-iron.

To operate the set place in the first coil holder a 25 or 35, in the middle holder a 50 or 60, and in the third holder a 50-turn



The coils and the valves are shown in position in this photograph, and it will be seen that there is ample room for every component to do itself justice.

"RESISTANCE" REACTION

A new method of controlling reaction which the author claims to be the most efficient he has ever used.

By C. P. ALLINSON, F.Inst.P.Inc., A.M.I.R.E.

If anybody had said to me a week ago "Can you tell me a new way of controlling reaction?" I should probably have said, "I don't think there is one left; they have all been used."

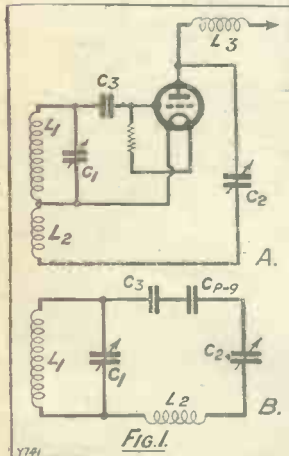
And yet within the week, being up against it in a job I was working at, I had done this very thing.

The increasing use I am making of metal panels in the construction of my experimental receivers, necessitated by the use of screened-grid valves, etc., frequently sets me problems to solve which are rather unexpected, which therefore usually result in novel solutions.

The usual methods of controlling reaction all have their several drawbacks. Thus Reinartz reaction may give rise to hand-capacity effects, and when the condenser is connected on the earth side of the reaction winding the efficiency of the system is not always, for some unexplained reason, so great. This drop in efficiency is due, I think, to the greater capacity, which is introduced by the configuration of the circuit, between the anode of the detector

valve and earth. (This explanation is possibly wrong!)

Magnetic reaction is accompanied by mechanical backlash in most cases, while throttle controlled reaction, which, though it combines the advantages of magnetic and capacity reaction, suffers from



a fault common to all capacity-reaction circuits.

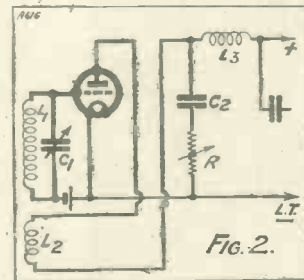
Alterations in Tuning.

This fault (Mr. Kendall really drew my attention to it in the first place) is owing to the fact that the reaction circuit is more or less shunted across the detector tuned circuit. Fig. 1 shows a typical detector with a reaction circuit at A, while at B the circuit is redrawn showing how the reaction circuit is shunted across the tuned circuit. Cp-g is the plate-grid capacity of the valve.

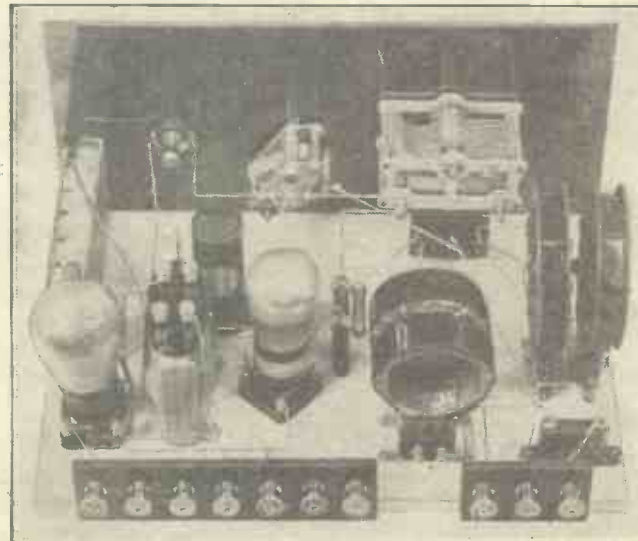
When the reaction coil is small and condenser large (conditions which give the most constant reaction), the impedance of the circuit $L_2 C_2$ is least. Any adjustment

of C_2 will therefore produce the greatest amount of interaction with the tuning condenser C_1 , quite apart from any other effects that may result in a loss of efficiency. With a very large coil and a small condenser, which should give a high impedance circuit, the control of reaction becomes exceedingly tricky.

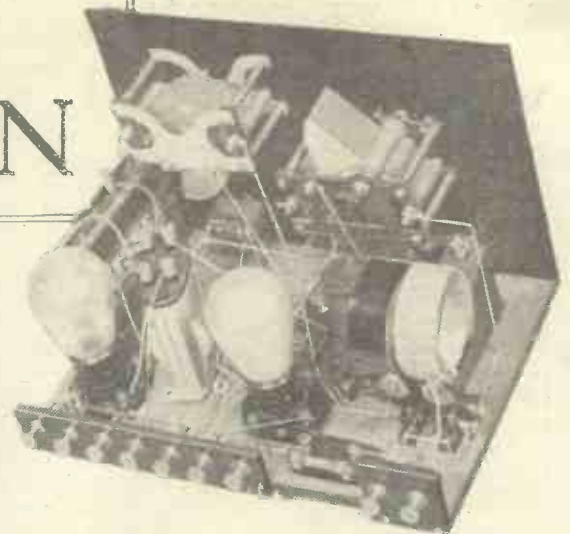
What we want, therefore, is a method of controlling reaction that will enable us to increase the impedance of the reaction circuit without making the control in any way critical. The method I have found of accomplishing this was originally tried out in the course of some experiments where I had to get a reaction control on to a metal panel with only about 1½ square inches to spare. Also the leads to this control had to come through an L.F. amplifier, and I wanted it therefore to carry as little H.F. as possible.



Smooth and Noiseless Control. How I achieved this object is shown in Fig. 2. The fundamental scheme used is



"Reinartz reaction may give rise to hand-capacity effects, and where the condenser is connected to the earth side of the reaction winding the efficiency of the system is not always, for some unexplained reason, so great."



throttle control. I had to use magnetic reaction because I was using a high- μ valve followed by R.C. coupling with a highish value of coupling resistance, and my experience has shown that Reinartz reaction is not satisfactory under these conditions.

Easy to Instal.

The reaction condenser at C_2 is one of the semi-fixed type having a capacity range between .0003 and .001. In series with this is a variable high resistance R having a value of 0 to 6 megohms. As the value of the resistance is increased, the amount of reaction is decreased. The control is smooth, progressive, and noiseless. Since the condenser is set to have a fairly low value, the H.F. potential across the resistance will be low when reaction is being used.

Also, look at Fig. 1 (B) and imagine a high resistance connected in series with the reaction circuit $L_2 C_2$, and you will see how the impedance of the whole goes up—and it does go up—three or four times.

I consider this reaction circuit to be one of the most efficient, if not the most efficient, I have ever used in actual practice.

No hand-capacity effects whatever are experienced, the reaction condenser being enclosed cannot get dusty and noisy; several turns of the knob, with the compression type of resistance, are required to give the whole range of reaction control, which is smooth and has little effect on the tuning.

It does not matter much where you mount this resistance, only one long lead will be necessary in any case, for one side goes to the nearest L.T. lead, and this lead will not give rise to trouble even if carried through the heart of the L.F. side of the receiver.



HOW TO MAKE LOUD SPEAKERS

I. A SIMPLE & INEXPENSIVE CONE.

The first of a series of articles specially prepared and written for the home constructor. You do not have to be a skilled mechanic to assemble these new "P.W." loud speakers—anyone who can handle the simplest tools can build them. And as to results, hearing is believing—build one and judge for yourself!

By the "P.W." RESEARCH AND CONSTRUCTION DEPARTMENT.

NOW what about you headphone users who believe that loud speakers are things which cost sums best reckoned in guineas? They really can be made at home, you know, and you need have no fear that just because they are then so cheap, they must be imperfect.

And they really are cheap, for there are now quite a range of cone units on the market at all sorts of prices, some so low that you can assemble a surprisingly good speaker for as little as about 17s. 6d. The reproduction from such an instrument will be equal to many of the commercial ones, and it will only fall noticeably short in appearance; for, of course, the price mentioned could hardly include a cabinet.

For such a figure you can assemble a speaker which will consist of a simple wooden frame, a cone suspended semi-freely at the edge, and a cone unit such as the Lissen, which costs only 13s. 6d. Its appearance will be perfectly plain and unpretentious, but it will do its job, and well at that.

Having built such a speaker and found it capable of serving your purpose, you can then think about making it more presentable to look at, which you will not find too difficult. The simplest way is the obvious one of buying a cone cabinet from one of the cabinet-makers advertising in "P.W." (cost, roughly, 20s. to 25s.), and fit the speaker therein. Again, you could make a grille front and a stand of some sort, if you are good at fretwork, or utilise some existing box or cabinet.

Why Not Try It?

The main thing which we want you to realise is that it is really and truly neither an expensive nor a difficult business to make for yourself a little cone type speaker of quite good performance. Matters of appearance can be left to the constructor's own ingenuity, since we are concerned in this article (the first of a series describing home-made cone speakers of progressively advancing design) with just the essential parts only.

We have taken pains in working out this simple little design to make it particularly easy to put together, with materials which you can be sure of getting anywhere. By so doing we hope to convert all those readers who have so far hung back under the impression that a home-made cone is

(a) expensive, (b) difficult to make, and (c) unsatisfactory when made; for we believe that if they can once be persuaded to try, they will be grateful to us for quite a long time afterwards.

First Steps.

This first design of the series is rather similar to the cone speaker we produced during the summer for the "Traveller's Three," with certain modifications and improvements which will make it more suitable for fitting into a cabinet at a later date, and benefit the tone considerably.

The basis is a square wooden front with a large, circular hole, a simple three-piece frame, a Lissenola unit, and a semi-floating paper cone with a special method of suspension which we have found very good.

Starting on the constructional work, the first part to be taken in hand is the wooden front, which can be of ply-wood or hard

wood of about $\frac{1}{4}$ in. thickness. (Heavier material makes a more substantial job, but increases the labour of cutting the circular hole.) This front should be about 12 in. square, and in the middle a circular hole of 10 in. diameter is to be cut.

If you first lay this out with a pair of compasses, you will find it quite easy to cut out with a fret saw (one of the small hand type will do) or a key-hole saw, first drilling a small hole just inside the circle to get a start. Alternatively, of course, you can easily get the local joiner to cut it for you for a very small sum.

Fixing the Unit.

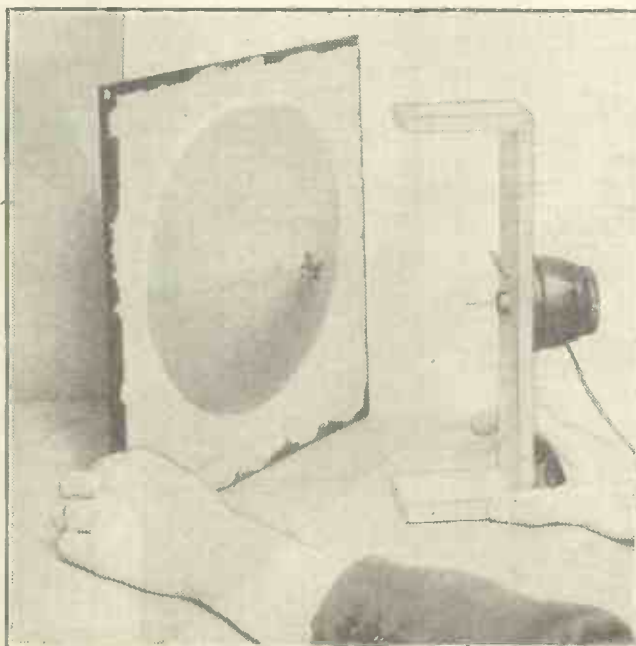
The wooden frame consists of two side-pieces, $3\frac{1}{2}$ in. long and about $2\frac{3}{4}$ in. wide by $\frac{3}{8}$ or $\frac{1}{2}$ in. thick. The long strip across the back in which the unit is mounted is $11\frac{3}{8}$ in. long, and of the same breadth and thickness as the other two pieces. Just how they are screwed together, and to the wooden front, you will be able to make out quite clearly from the photos.

Attaching the cone unit to the cross-piece may look a little difficult at first, but there is an easy way out. Simply bore a hole in the centre of the cross-piece in which the neck of the unit is a tight fit and push it in. It does not require to be very firmly held, but if you find your hole was not exactly the right size, so that it fits rather loosely, a little seccotine will soon produce a very firm job.

The Suspension.

Now, having assembled the frame and unit, and made sure all is well, remove them from the front piece and proceed with the cone and its suspension. For this latter we have used flannel,

(Continued on next page.)



Here you can see the whole construction of the inexpensive cone loud speaker. A large semi-free-edged diaphragm is suspended on the simple front, an equally simple wooden frame holding the driving unit in its correct position.

HOW TO MAKE LOUD SPEAKERS.

(Continued from previous page.)

and find it answers the purpose very well indeed; for it seems to have just the right kind of semi-elasticity for the job.

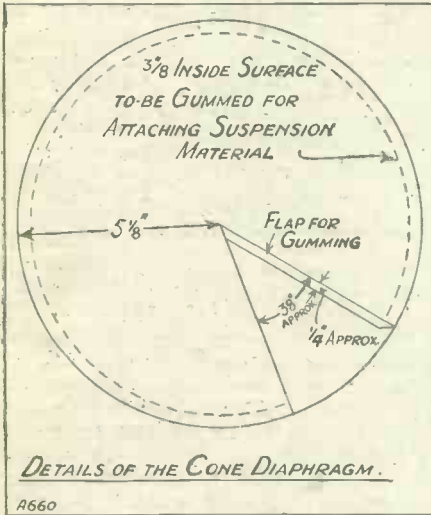
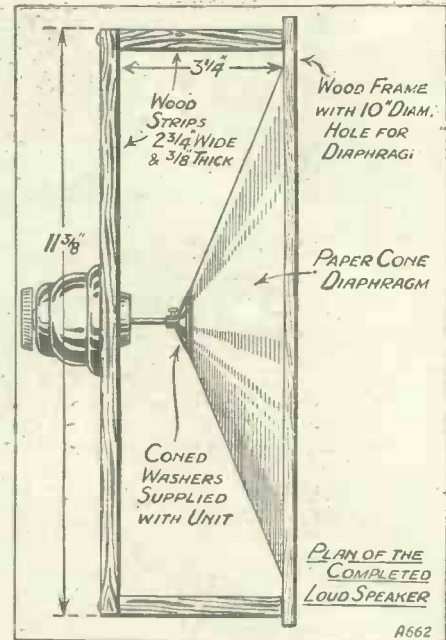
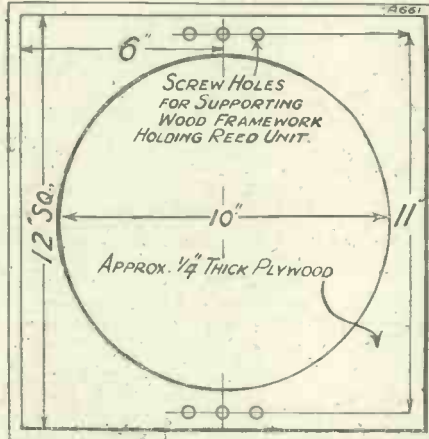
Cut a piece of flannel to a size just a little smaller than the wooden front, and then proceed to stick it on all over the back thereof with secotine, or some similar good adhesive. In doing so, be careful to stretch it out evenly and smoothly, so that it shall be free from wrinkles; but do not stretch it tightly.

Put this part aside in a warm place to dry—preferably overnight—and turn your attention to the cone. This is to be made of paper, and we must tell you

suspension proper, to which the cone is to be gummed all round.

Fit the cone on from behind, so that the suspension material is in front of it, and press the flannel evenly on to it all

the cone so that the driving rod of the unit can pass through, and put the whole assembly together, fitting the coned washers and securing nuts of the unit to the point of the cone as you go. (You will see how they go quite easily when you have them



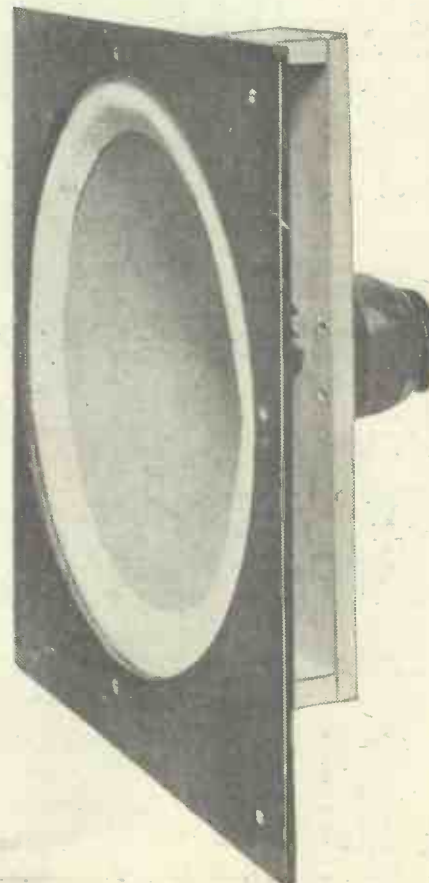
round with a good supply of secotine. The material is slightly elastic, so that you will find it quite easy to work it round evenly and make a sound job of it. Just one point wants watching as you go, and that is to see that you get the paper cone fairly well centred in the front.

The Final Assembling.

Leave the assembly for a while to dry, and then you can put everything together for the last time. Cut off the very tip of

in your hand.) By the way, it is sometimes wise to cut two little flannel washers and fit them between the coned metal washers and the paper at the point of attachment to the cone, to stop all possibility of rattles.

There, that finishes the speaker, and all that remains is to try it out. Not so very difficult, after all, was it?



Here is the completed cone. It can be used just as it is, or can be fitted into an ornamental cabinet or into a portable set. The results given by this speaker are of excellent quality—miles above what its low cost would suggest.

frankly that the actual kind of paper used has a considerable influence on the particular kind of reproduction you will get. Hence it is impossible to say definitely that one kind of paper is the best and should be used, because a style of reproduction which pleases one person will not appeal to another.

For example, if you like a bright, rather high quality, you should try a light grade of drawing paper; while if your taste lies in the direction of "mellowness" and rather a boomy over-emphasis of certain of the low notes, you should use the heaviest grade of "Kraft" paper. We ourselves decided that a good compromise could be obtained with the lighter grade of Kraft, and finally used this paper in the speaker you see in the photos.

Mounting the Cone.

Whatever paper you decide upon (it is not difficult to try several, by the way), you should cut out your cone to the dimensions given in the diagram, then overlap the two straight edges for about 1/8 in., with gum between, so forming the actual cone, and leave it to dry.

While this is going on, you can return to the suspension material, and cut out from the centre of this a circular piece about 7 1/2 in. in diameter. This leaves a frill a little over an inch wide all round inside the hole in the wooden front, this being the

Radio Reminders.

"Beat frequency" or "heterodyning" is the third frequency which arises when two other frequencies are superimposed, one upon the other, so that at regular intervals they "peak" together, and "fall into step," thus giving rise to the third, or beat, frequency.

The provision of grid bias means that a battery or other source of electrical pressure is inserted in the grid-filament circuit in addition to the tuning coil, transformer secondary, or other circuit apparatus, in such a way as to permanently alter the balance between the grid and filament. Normally no difference would exist when no signals are being received, because these points are connected together by the circuit leads.

Binocular coils are those of the double-winding type so arranged that the magnetic field of one half of the coil tends to oppose the magnetic field of the remaining half, with the effect that, magnetically speaking, the coil is rendered compact and comparatively incapable of setting up unwanted coupling.

**THE ROYAL ROAD TO
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CLARKE'S ATLAS
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CLARKE'S ATLAS
BATTERY ELIMINATORS

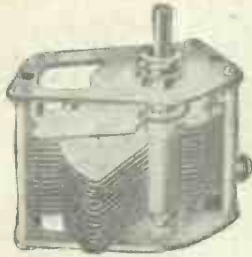
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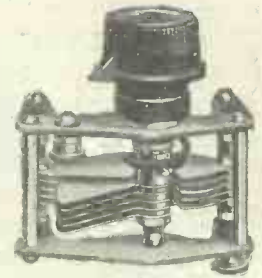
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OBTAINABLE
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FIXING NUTS
AND WASHERS.

These Condensers are specially suited for use with the popular screened grid sets using metal panels.



No. 3 ·0005 **5/9** **Volcon** ·0001 **5/6**

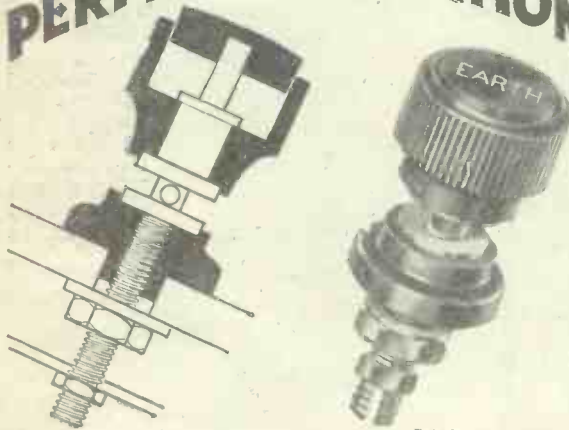
With ebonite nut and washer 6d. extra. Phosphor bronze balls for short wave work 3d. extra.

Including ebonite nut and washer and phosphor bronze balls. As used in 1929 Corsor Melody Maker.

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Patent.

Modern radio apparatus using electric mains or high voltages, demands the exclusive use of insulated terminals if only on the score of danger. Severe shocks, even fire, may result in the use of non-insulated terminals. Fit Belling & Lee and be safe. Let this be your motto, and go to-day to your dealer and ask for a supply of Belling-Lee insulated terminals.

Prices :

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**BELLING-LEE
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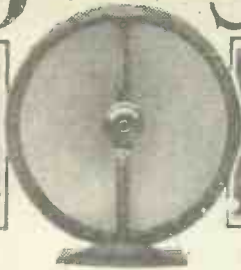


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BUY A
BETTER
VALVE**

POWER VALVE 76

**TRIO RON
VALVES**

THE PARIS RADIO SHOW



A short and interesting critique of the exhibits at the Paris Radio Exhibition. Above is shown some of the apparatus exhibited, which, as will be noted, included combined radio and gramophone outfits, and many sets having drum-drive tuning controls.

By OUR OWN SPECIAL CORRESPONDENT.

THE fifth French radio show, organised by the French Association of Radio Manufacturers, was crowded from morning until night.

On the whole, and while there is no sensational new development, the general trend is towards refinement and towards the generalisation of complete receiving sets ready to use. Steadily for the past four years the percentage of space occupied by the manufacturers of radio parts as such has been declining, until this year less than 10 per cent of the exhibits specialise on them.



The new Radiola Speaker, presented in a tessellated cabinet.

Another development is what might well be termed the Americanisation of design of receivers. From year to year the number of buttons and gadgets on receiving sets has been diminishing in the proportion that

radio listeners have been less and less restricted to the technically minded, and needed corresponding simplification.

This year the trend was away from buttons and dials, and leant to the American presentation in the form of drums whose edges project through the front panels of the receivers. This arrangement is much easier to handle and allows for infinitely neater appearance, though it is restricted to manufacturers whose technical equipment is sufficient to allow of large production.

A Cheap Super-Het.

Among the prominent stands were those of the leaders of the industry, the French Radio Trust, which is a branch of the still bigger international firm under the trade mark of Radiola. Here was shown a six-valve super-heterodyne receiver, presented in a very fine mahogany box, with drum controls grouped attractively on the front panel, and which retails for seven hundred francs. (This is well under £6.)

In order to be able to produce at this price such a fine piece of workmanship, it

must have been necessary to cut costs to the bone and, furthermore, start manufacture in very large quantities. The necessary accessories, such as loud speaker, valves, frame aerial, and batteries, cost about one and a half times as much as the receiver proper.

Another great effort is shown at the stand of Radio L.L., inventor of the super-heterodyne, which produced "Synchrodyne," or single-control receivers. Here the price was considerably higher, but another line of cheaply priced receivers, ranging from 700 to 3,000 francs completely equipped, was also on show.

An All-Steel Set.

The firm of Vitus, which operates the Montmartre sending station, is the first big firm in France to put out an all-steel receiver. Its "Mondial Six" is in appearance an almost exact replica of the Atwater-Kent set so well known in the United States; but the principle is that of the super-heterodyne, and the price, without tubes, 1,600 francs.

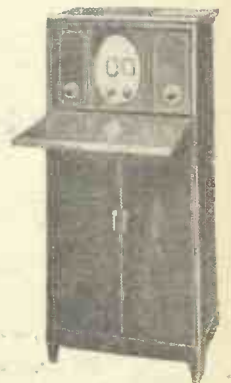
A great number of portable receivers were also on exhibition, most of them in

the form of a suit-case of more or less great dimensions and weight, the average size being about 2 ft. square, 10 in. thick, and weighing about forty-five pounds.

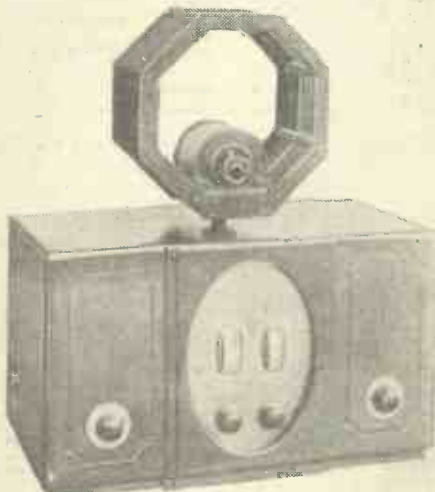
A Useful Portable.

An original all-metal portable receiver, which weighs only fifteen pounds and looks like a doctor's instrument case, is on view at five stands. It is specially constructed so as to fit easily in any automobile without taking up valuable space, and reception of all European stations is claimed.

In the realm of accessories the biggest exhibits were those of the manufacturers of valves and loud speakers. In both directions much progress has been accomplished, the valves having longer life and much greater activity than before, and the speakers much more extended tuning ranges. The "dynamic" style of speaker, in which the coil of wire actuated by the current from the set is fastened on the sound-producing cone itself, has not yet made a generalised appearance, there being only one firm to offer it.



A complete "mains-drive" set, embodying a frame aerial, which was shown.



A luxurious 7-valve set shown by the Société Française Radio Electrique. Abnormal sensitivity and parity of results are claimed for this receiver.

The Great Question.

Almost all the stands were much better presented than at the preceding shows, and it seems evident that the industry is getting ahead fast despite the apathy shown towards radio broadcasting by the Government. The great question now seems to be how to get enough space in the Grand Palais for next year, since all the balconies, which represent every bit of space available for radio (if the cycle industry takes up, as it always has, the ground floor), are contracted for, and the inevitable expansion of the next-exhibition will be a problem.

OPERATING THE "PENTODE" THREE.

Final details of the magnificent set described in last week's "P.W."
By THE "P.W." RESEARCH DEPARTMENT.

WE concluded our notes last week with some hints as to the adjustment of the aerial tap on the three alternative terminals on the coil socket, and it will perhaps be as well to go into this point in a little greater detail.

With the lead on terminal No. 3 you have the highest selectivity adjustment, and this is desirable close up to a main station or on a large aerial. Terminal No. 4 gives a good average adjustment for general purposes, while No. 5 is generally best on small aeri-als, or where great selectivity is not required. With a full-sized aerial, however, you will probably find that No. 5 is not very good for stations near the bottom of the tuning range, for which 3 or 4 will be better.

Real Flexibility.

The main adjustment of selectivity, of course, is by means of the interchangeable primary on the H.F. transformer unit. We have found that for general purposes a primary of the size rated as P.10 by the makers (London Electric Wire Co.) is good, giving high amplification and a medium amount of selectivity.

Where higher selectivity is needed a P.8 should be used, while in the real "agony area" quite close to the local station you should use a P.6 except for stations of wave-lengths well separated from the local, on which the larger primary (P.8) will give rather better amplification.

For the long waves you will, of course, require to replace the aerial and transformer units with a pair of the correct long-wave size, and a good general-purpose primary size here is P.18, with P.16 for use in localities where interference from 5 X X is difficult to get rid of.

By the way, the reference numbers of these new "Lewcos" coil units are as follows: Aerial coil, C.A.C.5 (250-550 metres) and C.A.C.20 (1,000-2,000 metres), H.F. transformer, C.S.P.5 (250-550 metres) and C.S.P.20 (1,000-2,000 metres).

Working Details.

Just one other point about these coils: you will find that the aerial unit has three pins on the side for the attachment of the same interchangeable coils as the H.F. transformer, but this scheme is intended for another type of circuit, and need not be considered in connection with the "Pentode" Three. Simply disregard these pins.

Now about valves and voltages. The set is definitely intended for the 2-volt types, and all our tests were conducted with them. The H.F. valve is, of course, of the screened-grid type of the upright pattern, with a terminal mounted on a cap on top of the bulb.

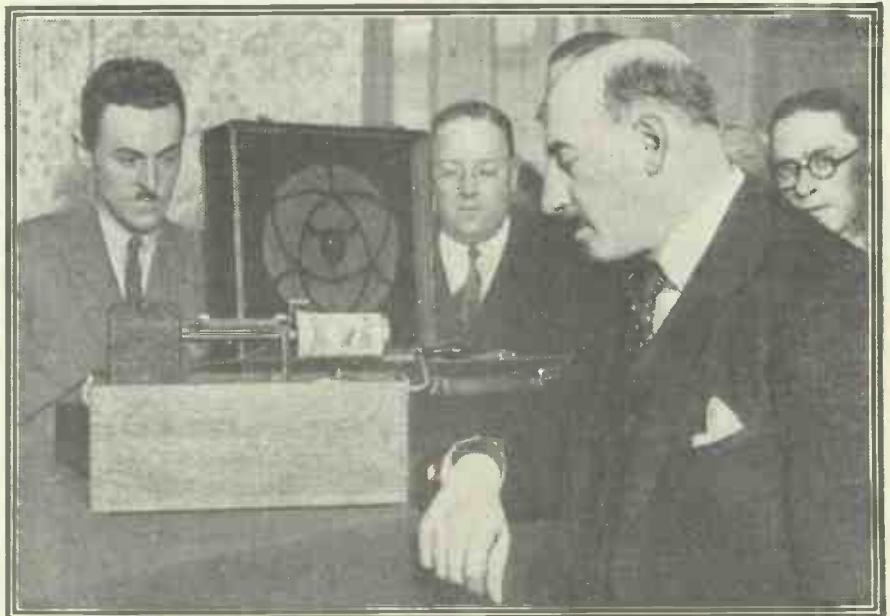
Such valves are produced by Messrs. Ediswan, Mullard, Cossor, Marconi and Osram, B.T.H., Six-Sixty, etc., and all give good results. The different makes are quite interchangeable in this design.

For the detector you require one of the

H.F. type with an impedance of from, say, 20,000 to 30,000 ohms, just a few examples being these: Marconi and Osram, H.L.210; Cossor, 210 H.F.; Ediswan, H.F. 210; Mullard, P.M.1 H.F.; Mazda, H.F. 210, etc.

For the third socket, of course, you require a "Pentode" valve, and this, again, can be of any of the makes now just appearing on the market. For our tests we used the Mullard type, which is called by the makers a "Pentone," and given by them the reference number P.M.22.

FULTON AND HIS FULTOGRAPH.



Captain Fulton examines one of his picture-receiving instruments in operation. The transmissions by 5 X X station have so far proved satisfactory, but there is a scarcity of Fultographs.

WORLD PROGRAMMES FROM GERMANY.

IT is reported that the German Post Office is going to build a high-power short-wave transmitter near Koenigswusterhausen, from which will be broadcast, starting next February, "World Programmes."

It appears that the policy behind this station is that of a desire to serve the cause of international understanding, spread German culture over the frontiers, and thus enable Germans living abroad to keep in touch with the homeland by means of relatively simple receiving sets.

The new station will thus bring Germany into the field of international application of broadcast news. Every important transmission from Berlin will be relayed through this new short-wave station, which

will also send out a special "World Programme" on a 20- or 30-metre wave-length between 2 and 4 a.m. (8 and 10 p.m. American time).

Rugby's Future.

Following on this news, it is reported that the Rugby wireless station is to be enlarged very considerably and, in fact, before another two years have passed it will be exactly four times as big. The idea is that Rugby shall be the speaking centre of the world, and although that station is now very far ahead in size and importance, and value, than any other wireless station in the world, it will be in its revised form the Colossus of all wireless stations.

When the new station is complete there will not be a part of the world to which Rugby will not be able to speak by telephony direct. The day is obviously not far distant when from our own homes we shall be able to ring up friends in any part of the globe via the Rugby wireless station.

BUILD FOR YOURSELF A FERRANTI H.T. SUPPLY UNIT

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ECHOING SIGNALS.

Television Questions in Parliament—Are Radio Signals Echoed Back from Space?—British Engineers Puzzled.

By THE EDITOR.

IN the House of Commons the other day Commander Kenworthy asked the Postmaster-General if he knew of a television system capable of transmitting moving pictures of actual events for satisfactory reception by wireless listeners, and whether he was aware that the Baird Company had recently been refused assistance by the B.B.C.

In a written reply, the Postmaster General said: "I know of no system which is at present capable of transmitting moving pictures of actual events for satisfactory reception by wireless listeners. I have not refused permission for the use of the B.B.C. stations for television tests."

"The Governors of the Corporation decided, in the exercise of the discretion vested in them, after a demonstration by the Baird Company, who hold an experimental licence, that the system did not at present fulfil conditions which would justify a public trial through one of their stations. I have recently received an application from the Baird Company for further facilities.

"This application is at present under consideration, and I am not yet in a position to say anything further."

Further Questions.

We understand that further questions will probably be asked in the House of Commons relative to the rumours which are being spoken of lately in connection with an alternative British broadcasting service given from a foreign transmitting station, with which would also be sent television.

There is, of course, nothing illegal in competing with the B.B.C. outside this country, but it may yet turn out to be a question for Government interference should any alternative programme service or television service be given from a station hired in a friendly country using a wave-length which would interfere with those of the B.B.C. and also should wave-lengths be used which would cause interference on government, naval or military, or commercial wave-lengths.

It would probably be a question for the British Government to take up with the Government of the country in which the station was operating. Or it might, if not sufficiently important, be a question for the International Radiophone Bureau to take up on behalf of the broadcasting concerns subscribing to its rules and conditions.

However, it is said that no such service can be given before February, and at the moment of writing there is no fresh information available which would suggest developments which need be recorded at any length in this journal.

Echoed Radio Waves.

It was reported in the "Daily Mail" the other day that Professor Stormer, of Oslo, stated in the course of a lecture before the Academy of Science that he had proved by experiments that wireless signals were

echoed back from outer space to the earth from distances up to 1,584,000 miles. In other words, the Professor says that he can get wireless echoes from space beyond the Moon; for, as was pointed out, the echoes could not have been from the Moon, for that heavenly body is only 239,000 miles from the earth.

And, furthermore, they certainly could not have been from the planets, the nearest of which is 25,000,000 miles away.

Interesting Experiments.

It appears that an engineer at Oslo had observed that echoes from the transmissions of the Dutch station at Eindhoven acted upon his receiving set up to three seconds after the signals themselves had been received, and as it is a definite fact that wireless waves have a speed of 186,000 miles a second, the echo must have been thrown back from a point in space 279,000 miles away from the earth.

In collaboration with Professor Stormer, the engineer conducted a series of experiments. An agreed signal was sent out from

thus been thrown back from points distant from the earth as follows:

279,000, 317,000, 434,000, 745,000, 1,211,000, 1,398,000, 1,584,000 miles.

Long Period of Time.

Journalists in Norway asked Professor Pedersen, another well-known scientific authority, whether there was anything in his opinion which would hinder communication through space, provided there was someone who could send an answer. Professor Pedersen thought there was nothing which would stop this long-distance communication; supposing, of course, there was somebody at a distant point in space to answer with the necessary apparatus, but he did not think it could be obtained with the use of long wave-lengths. Ultra short ones would be necessary, in order to penetrate the Heaviside Layer.

However, Professor Stormer's experiment has provided a good deal of puzzlement among British physicists, and one wireless engineer has quite correctly pointed out that the explanation of the reception of an echo so late as seventeen seconds is very difficult to give, for the simple reason that it takes a wireless wave only a seventh of a second to travel round the world, and German engineers have recorded three recurring wireless echoes, each fainter and each one-seventh of a second later as the wave passed back from its round-the-world journey three times.

Furthermore, it is a generally accepted fact that only a very small wave, about one

CHECKING THE RADIO PICTURES.



This is the receiving apparatus installed at Savoy Hill to check the pictures broadcast by Daventry (5XX) 76 miles distant.

the transmitting station, and heard on the receiver, and afterwards they received the echo, weaker but distinct, and those present recognised the signals as those sent out from Eindhoven. Professor Stormer mentioned the following times as having been noted as having elapsed between the sending out of the signals and the echo: 3, 4½, 5, 8, 13, 15, and 17 seconds.

Consequently, the signals must have

or two metres in length, could succeed in passing through the Heaviside Layer—which is, of course, made up of ionised particles, and which are thought to lie at about 100 to 200 miles above the surface of the earth.

However, perhaps Professor Stormer's experiment will be repeated and a more scientific explanation of the phenomenon worked out.

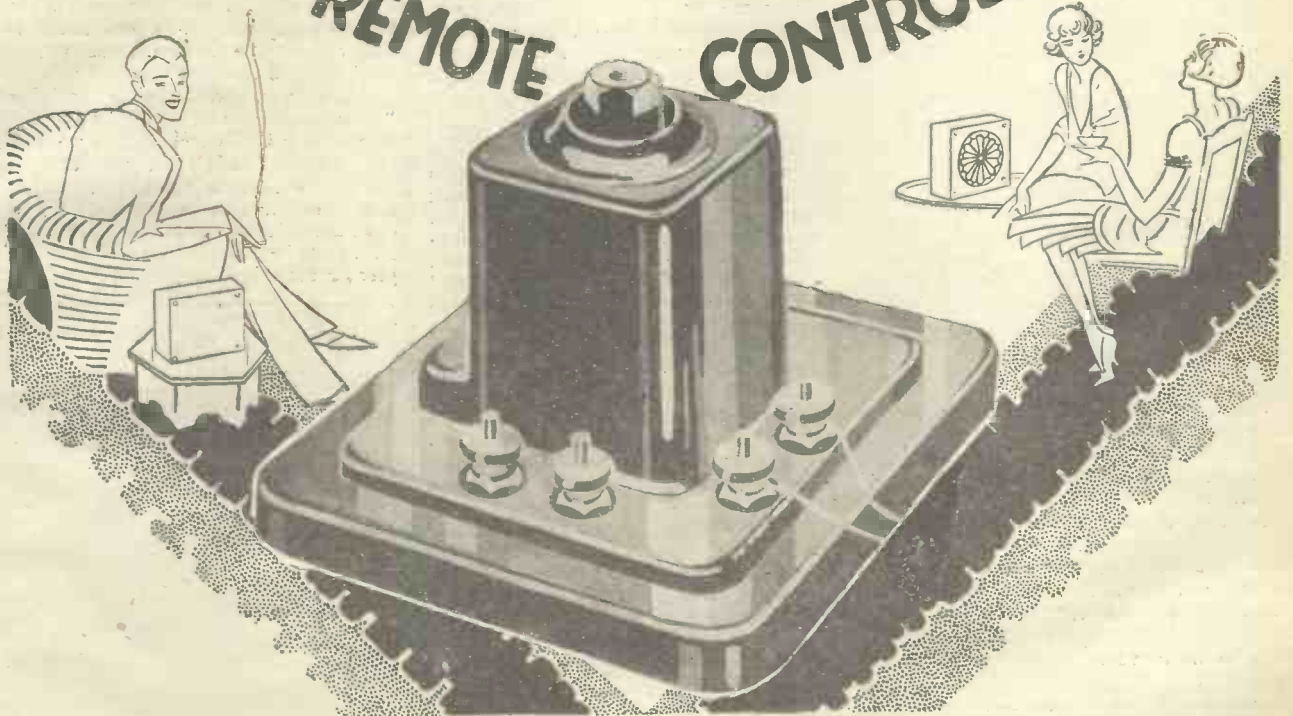
RECEPTION in ONE ROOM is NOT SUFFICIENT NOW!

With your wireless set out of sight in attic or kitchen, you may have reception at the insertion of a plug in every room in the house if you instal the simple and inexpensive Lotus Remote Control system.

Any number of rooms may listen in simultaneously and without interference. The first plug inserted switches on the set, the last plug withdrawn switches it off. You can fix it easily yourself. Any retailer will demonstrate it and supply free instructions.

Made by the makers of Lotus Sets and Lotus Components.

LOTUS REMOTE CONTROLS



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Causton

FROM THE TECHNICAL EDITORS NOTE BOOK



PHILIPS' LOUD SPEAKER.

I have recently had one of the Philips' seven-cornered loud speakers in operation. It has a balanced-armature movement, and a switch is provided which enables a volume and tone adjustment to be made. The speaker can be hung on a wall or stood on the table.

I was particularly interested in the cone. It is comparatively large, and occupies practically the whole of the area of the speaker, the surrounding frame, which is artistic in appearance, being of a slender character. The cone is made of a peculiar kind of substance somewhat similar in appearance and texture to leather. As a matter of fact, I pre-supposed insensitivity with, perhaps, some boominess. On the contrary, the reproduction is distinctly bright and faithful. Speech is clean and natural, there is good bass and, in general, the response is remarkably even. In my opinion, the Philips' loud speaker gives a performance very close to that of a moving-coil loud speaker. Its price, only 50s., is one of its most surprising features.

T.C.C. ELECTROLYTIC CONDENSERS.

Before the arrival of the electrolytic condenser to speak of thousands of microfarads would be to conjure up visions of condensers as big as pianos. The T.C.C. electrolytic condenser of 1,500 mfd. capacity is only 2 in. square and 5 in. high!



These T.C.C. Electrolytic Condensers have capacities each exceeding 1,500 mfd.

Contained in the familiar green-coloured metal case, it has two stout terminals. By no means all the electrolytic condensers so far produced have proved satisfactory, but the T.C.C. appears to be perfectly sound.

These high-capacity fixed condensers are used only in L.T. mains units, for their maximum working voltages are in the neighbourhood of but 12 volts. If this is exceeded the component "breaks down."

The T.C.C. Electrolytic Condenser conforming to the above details sells at 15s.

"INDISPENSO" DE-LUXE CHARGER.

Readers having D.C. mains should be interested in the "Indispenso" battery charger

produced by Ward & Goldstone Ltd., of Manchester. This neat device facilitates charging up to 1 amp. and is particularly suitable for high-tension batteries. The De-Luxe pattern, which sells at 24s. 6d., consists of a small stand on which is a lamp-holder and ammeter. A flexible lead with adaptor and leads having terminals for connection to the accumulator are supplied.



The "Indispenso" Charger.

with individual requirements. The operating instructions provided with the charger give full directions for its use.

SOME BOOKS RECEIVED.

The writer of a book about radio is always faced with the unhappy fact that his work will be "dated" the moment it is published, for every few months sees further developments in the art of wireless. However, "Dictron," in his "Wireless, Step by Step," published by Newnes at 2s. 6d., was able to cover the screened-grid valve. Indeed, the book is a comprehensive one and is, moreover, brightly and accurately written. It deals with the theory of wireless, more particularly in reference to reception, in a manner which should ensure its popularity.

Of a somewhat different character is "A Handbook For Wireless Telegraph Operators Working Installations Licensed By His Majesty's Postmaster-General," published by His Majesty's Stationery Office at 6d. Here are some hundred or so pages of matter which should prove of great help and interest to amateur transmitters and those experimenters who are able to read Morse.

The "A.B.C. of Broadcast Reception," by Ronald F. Tiltman (Henry J. Drane. 1s.), is a reprint in book form of thirty-two rather sketchy and somewhat discontinuous

articles on radio published by the "Daily Mail."

ANOTHER "M.P.A." LOUD SPEAKER.

Some few weeks ago I dealt with the popular M.P.A. loud speaker. Recently I received a De-Luxe plaque type M.P.A., the retail price of which is 47s. 6d. This is modelled on somewhat similar lines to the Popular in that it has a gold-coloured cone mounted behind and on an artistic wooden grill. The adjustment knob projects from the front. But a superior reproducing element seems to have been incorporated and the wooden framework is larger and has a somewhat better finish.

Also, the instrument stands on two gracefully shaped wooden supports instead of the metal stand which figures in the popular model. Altogether it is a very handsome affair built on effective lines. It gave good results on test, its reproduction being equal if not superior to some cones costing appreciably more. As with its younger brother it seems to be distinctly good on speech and the projection is crisp and clean.

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

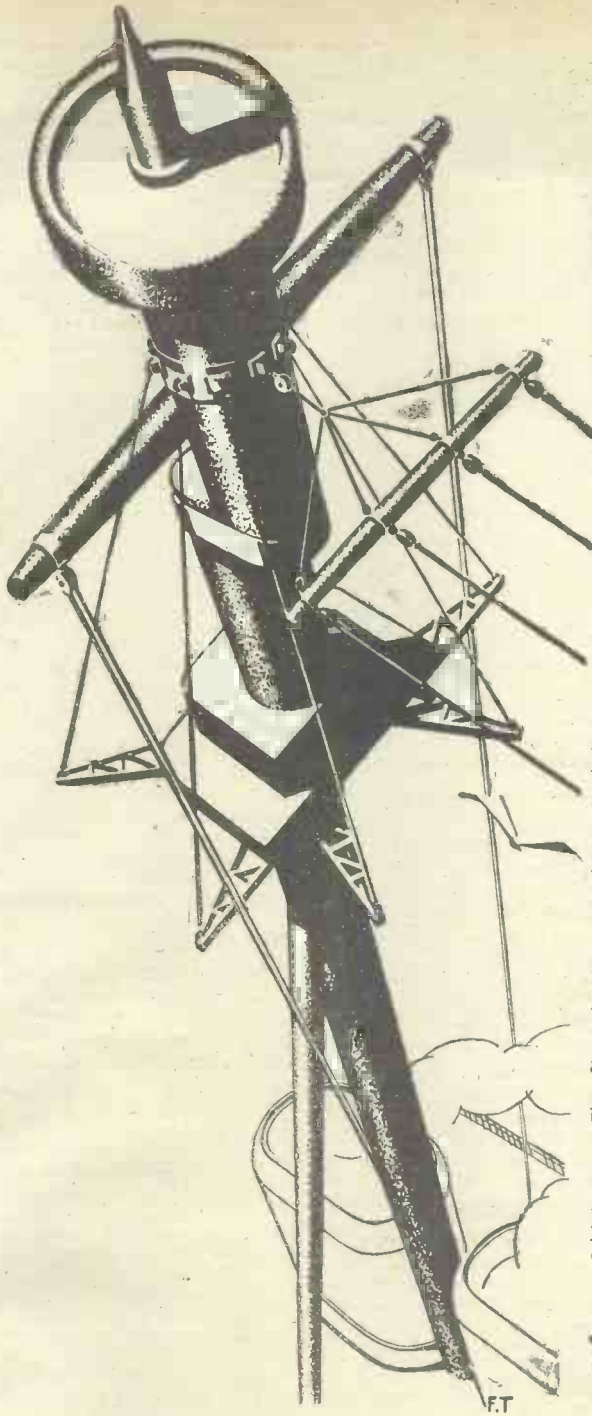
BROWN L.F. TRANSFORMER.

The "type A" Brown L.F. Transformer has a curve which, two or three years ago, we could only dream about and, even now, frankly, I must say that I am amazed that such a fine standard should have been attained. Whereas a year or two ago even the best of L.F. transformers showed an almost complete cut-off not much below 200 cycles, the Brown runs, practically straight, into the tens.

And all it says on the box is "sealed case," "damp-proof" and "a great advance." It certainly is the last! The price is 30s. and, after carefully testing the component, the figure fails to shock me. With the Brown one approaches very closely to the even amplification of scientifically arranged R.C. coupling with the added advantage of greater amplification.



The Brown Type "A" L.F. Transformer.



MASTS AND MASTERPIECES

Exide Batteries are specified for the wireless equipment of *nine out of every ten British ships that sail the seas*. You who use wireless only for the amusement of the fireside will find that this eminent battery to which is entrusted the issues of life and loss at sea, is for your purposes also the most reliable and the best.

* For clear reception, free from hum and crackle, you should use Exide W.H.10 volt unit Batteries for high tension. At their reduced price they will give you the most economical high tension supply obtainable. Price 6/3 per 10 volt unit.

Exide

BATTERIES FOR WIRELESS

Obtainable from your local garage or Exide Service Agent.

Motor owners will be interested to know of the recent important price reduction in Exide Starting and Lighting Batteries.

EXIDE BATTERIES, CLIFTON JUNCTION, N^r. MANCHESTER

WIRELESS BY POST FROM YOUNG'S



1929 COSSOR MELODY MAKER

Complete Kit with 3 Cossor Valves in Sealed Cartons **£7. 15. 0**

YOUNG'S 1929 KIT

All Parts necessary for mounting **£2. 17. 6**

Or the Set completely constructed with all Valves including screen grid valve, accumulator and everything necessary fitted free **£6. 12. 6**

COSSOR VALVES for the above

Screened Grid, 2-volt **22/6**
R.C. 210 .. 10/6 | 220 P. .. **12 6**

Metal Cabinets for Cossor, 10/6.
Coils for the Cossor, 10/- per pair,
5 X X High Wave, 15/- per pair.



MULLARD MASTER 3 ★ STAR ★

Components as specified by Mullard:—3 Lotus Valveholders 2/9, Colvern Combined Wave Coil 12/6, Permacore Transformer 25/-, Climax L.F.A. Transformer 25/-, Climax H.F. Choke 7/6, Benjamin Battery Switch 1/3, '0005 Ormond Log Condenser-6/-, '00035 5/9, 2 Slow Motion Dials 10/-, Mullard '0003 and 2 Meg. 5/-, Panel Brackets 6d, Mullard '0001 Fixed 2/6.

Young's Special Price, **£5-9-9**

MULLARD VALVES for the above

P.M.1., H.F. 10/6 | P.M.1., L.F., 10/6
P.M.2., Power, 12/6

Q Coils: Finston 17/6, Lewcos 21/-,
Colvern all-wave 17/6.

Write us for quotations.

66-VOLT H.T. BATTERIES, 3/11
Postage 1/- extra.

C.O.D. Send us a note of your requirements and goods will be dispatched per return of post.—You pay the postman.—
No Extra Charge.

YOUNG'S

Note Our Only Addresses:
**40 & 41 STOCKWELL ST.
GLASGOW**

Telephone, Bell 2419
Telegrams, "AERIAL," GLASGOW



RADIOTORIAL

All Editorial Communications to be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. The 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.

THE AERIAL WIRE.

A. T. (Waterford).—"Is copper wire better than iron for an aerial?"

Yes, copper wire has a higher conductivity than iron and therefore is more suitable for aerial wire.

LOUD-SPEAKER CONNECTIONS.

R. S. E. (Banbury, Oxon).—"It is a French loud speaker, and the only thing I do not understand is that instead of the terminals being marked plus and minus as they are in this country one of them is red and the other is blue. Which is the plus and which is the minus?"

The red one is the positive and this should be connected towards the H.T. positive, the other winding being connected to that L.S. terminal which carries the lead to the plate of the valve.

CHEAP AND EFFICIENT COILS.

F. P. T. (Chepstow).—"It is to be a sort of emergency one-valve set, and I should like to make it on the lines of the 'Worth-While' One, which gave me great satisfaction at the time it was published. I have, however, forgotten the details for the coils for this, and I should like to repeat them.

"I remember that they were basket coils wound on the usual flat formers, but should be glad to know the number of turns respectively for the ordinary tuning coil and for the reaction."

The tuning coil consisted of 55 turns of No. 28 D.C.C. wound upon the ordinary basket coil former. The reaction coil, which was also wound upon a similar former, consisted of 50 turns of the same wire. In the case of the "Worth-While" One, one coil was fixed to the baseboard whilst the other was fixed on to a pivoted arm made of wood, arranged so that the coil could rest over the tuning coil or could be slid across this and so away from it. The coils can, of course, be mounted in a coil holder if desired. Incidentally, the tuning coil was tapped to take the aerial connections to give varying degrees of selectivity, the tapping points being at the 15th, 20th, and 25th turns.

LOSS IN THE LOUD SPEAKER.

M. F. (Dublin).—"When my friend's loud speaker was tried results were just as good as ever they had been, so I took the loud speaker along to the dealer, and he says it is demagnetised. What does that mean? Is there any way of putting it right or of preventing the same thing happening again?"

Probably the cause of this trouble is that the loud speaker has been connected in circuit the wrong way round. That is to say, its positive terminal has been connected to the negative of the set and its negative towards the H.T. positive.

When this is done the steady current running through the loud speaker tends to destroy the permanent magnetism inside the loud speaker. Generally this takes a fairly long time—several months in many cases—but if the connections are not corrected the permanent magnet of the speaker becomes almost useless and inoperative. Fortunately the makers of the instrument will generally put it right for you for a small charge, but failing this it can be re-magnetised by one of the firms specialising in that class of work. (See adverts. in "P.W.")

ADDING AN R.C.C. STAGE.

P. R. W. (Nuneaton, Worcs.).—"It is a two-valver, Det., L.F., with a transformer, and I am told it would be a very easy matter to add a resistance stage, and should like to use the following parts which I have on hand. One 100,000-ohms anode resistance, grid leak $\frac{1}{2}$ megohm, .2 mfd. fixed condenser, valve

"P.W." 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," The 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.

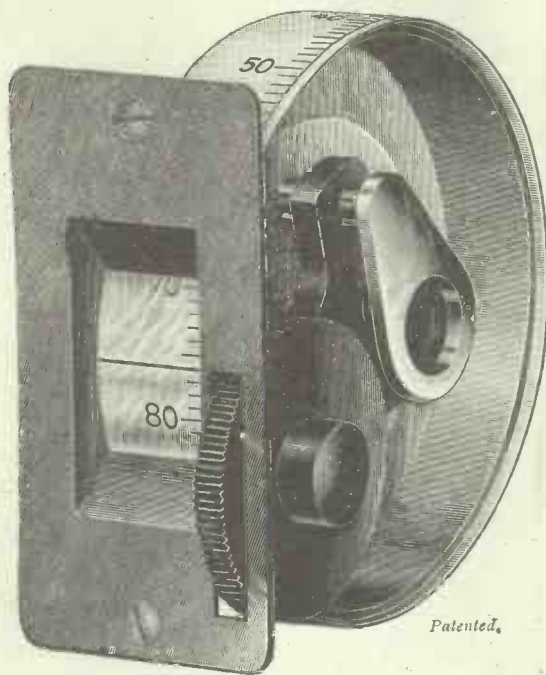
holder, rheostat, terminals, etc. Please tell me what the connections should be to alter the wiring of the present set as little as possible."

You need not alter the wiring of the present set in any way at all, but simply add the extra stage on a separate board as convenient, taking the connections as follows. First place the 100,000-ohms resistance across the loud-speaker terminals of the set.

Then connect that end of this resistance which is now joined internally to the plate of the last valve of the old set to one side of the .2 mfd. condenser,

(Continued on page 620.)

ORMOND SLOW MOTION DRUM DIAL



ACTUAL SIZE.

This dial is of extremely attractive appearance, -designed for simplicity and ease of attachment.

It is provided with a bakelite window and a special triangular mounting bracket, to ensure easy mounting of either Logarithmic or S.L.F. condensers.

The movement is similar to the popular Slow Motion Dual Indicator Dial, with a reduction ratio of approximately 10 to 1.

The drum moves in the same direction as the driving wheel.

Cat. No. R/321

Price **5/-**

Leaflets and Booklets on request.



The **ORMOND ENGINEERING COMPANY, LIMITED**
199-205, PENTONVILLE ROAD, KING'S CROSS, LONDON, N.1.

Telephone—Clerkenwell 9344-5-6.

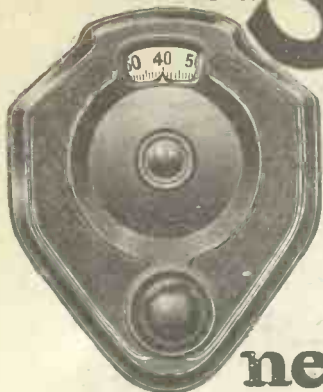
Telegrams—"Ormondengi, Kingcross."

Factories—Whiskin Street and Hardwick Street, Clerkenwell, E.C.1.

Continental Agents—Messrs. Pettigrew & Merriman, Ltd.

"Phonos House," 2 & 4, Bucknall Street, New Oxford Street, London, W.C.1.

Finished in black or beautifully grained mahogany.



neat-accurate and inexpensive

Watch for Brownie's latest triumph in artistic moulded Bakelite—"The Dominion Vernier Dial." Special non back lash slow motion drive gives very accurate tuning, while the action will fit any condenser and the new design of the dial will enhance the appearance of every set. See this latest Brownie production at your nearest Radio dealer.

BROWNIE
WIRELESS

"DOMINION" VERNIER DIAL
The BROWNIE WIRELESS COMPANY (G.B.) Ltd.,
MORNINGTON CRESCENT, LONDON, N.W.1.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 618.)

The remaining side of the condenser goes to the grid of the new valve holder and to one side of the grid-leak holder.

The remaining side of the grid-leak holder is joined by a flexible lead to the negative grid-bias battery. (If this battery was not provided with the old set you will need a 41-volt battery the positive of which is joined to L.T. negative on the old set.)

One of the filament terminals of the new valve holder should be taken to the L.T. negative terminal, the other filament terminal on the new valve holder should go to the rheostat, the other side of which goes to the L.T. positive terminal on the old set.

Finally the plate terminal on the new valve holder should be joined to one of the new loud-speaker terminals, the other one being connected to maximum H.T. positive by means of a flexible lead and plug. This completes the wiring.

THE "PENTODE" THREE.

It was stated last week that it was possible to use an ordinary power valve in place of the last (Pentode) valve in the "Pentode" Three. This is quite a simple matter, and all that is really needed when replacing the valve is to alter the connections to the output transformer.

Instead of connecting to P₁ and to P₂, for an ordinary valve it is necessary to join up P₁ and P₂ in the anode circuit. The flex lead normally connected to the terminal on the base of the Pentode should just be left free, as this is not needed with an ordinary valve.

AUSTRALIA ON AN ORDINARY SET.

D. G. S. (Aylesbury, Bucks).—"Is it right that by means of 'P.W.' Adaptor I can get Australia on an ordinary broadcast set which at present only tunes to London, 5 G B., etc. I do not understand how it is possible to later the coils for short waves, as I understand coils

have to be very small indeed for this. If, however, you recommend me to have a try, where can I get the details, etc.?"

It is quite correct that you can make an "adaptor" to enable your ordinary broadcast receiver to tune to very short wave-lengths, upon which American and even Australian stations can easily be picked up. The adaptor does not so much change your present coils, as render them unnecessary, for by means of an ingenious switching system it cuts out all your present tuning arrangements and substitutes another, using special short-wave coils.

YOUR LAST CHANCE

of obtaining the
SPECIAL FREE GIFT
issue of

MODERN WIRELESS

will be gone when the
NOVEMBER ISSUE
is out of print.

PROCURE A COPY TO-DAY
(usual price, 1/-) and make sure
of obtaining the

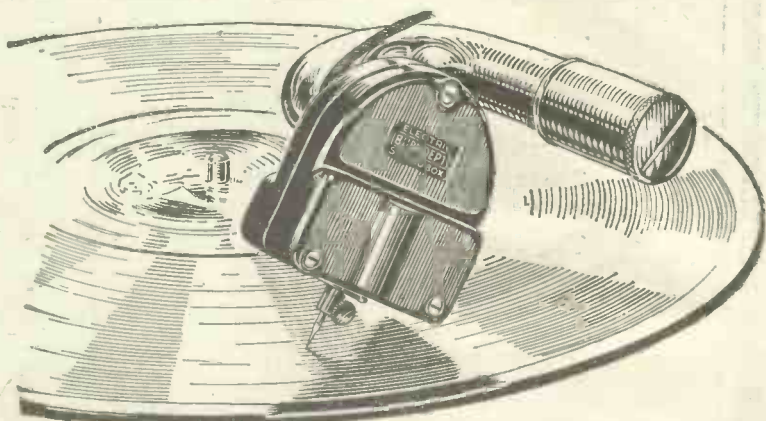
GREAT GIFT BOOK
describing

SETS FOR EVERY POCKET

The change over from the ordinary set to the "Antipodes Adaptor," as it is called, is made by pulling out the detector valve on the set, and pushing in a valve plug which fits into the detector socket, and all that then remains to do is to replace the detector valve in the valve holder in the "Antipodes Adaptor." The whole operation only takes a couple of moments, and full details of how to make the "Antipodes Adaptor" are given on "P.W." Blue Print Circuit No. 49.

(Continued on page 622.)

New Gramophones for Old



No surface noise.

Perfect tonal quality of reproduction.

Brings out hidden beauties of the records in a way that must be heard to be appreciated.

Price £1, which is very low for such a scientifically and mechanically sound instrument.

Even if your gramophone is one of the early models, you can bring it right up-to-date with the BURNDEPT Electric Soundbox; and with a modern instrument this device will wonderfully improve the reproduction. Substitute the Electric Soundbox for the ordinary soundbox and connect to your radio receiver—that is all you have to do, and you will be most agreeably surprised with the results. Ask to hear this inexpensive pick-up at your radio dealer's TO-DAY.

Burndept Electric Soundbox, Price £1

Adaptor

For plugging-in to any wireless receiver. With 9 ft. twin flexible wire. **Price 4/-**

Volume Control

with 2 ft. twin flexible wire for connecting to Soundbox. **Price 8/6**

BURNDEPT

Wireless — (1928) — Limited
BLACKHEATH, LONDON, S.E.3
Showrooms: 15 Bedford Street, Strand, W.C.2

MARCONIPHONE LOUD SPEAKERS

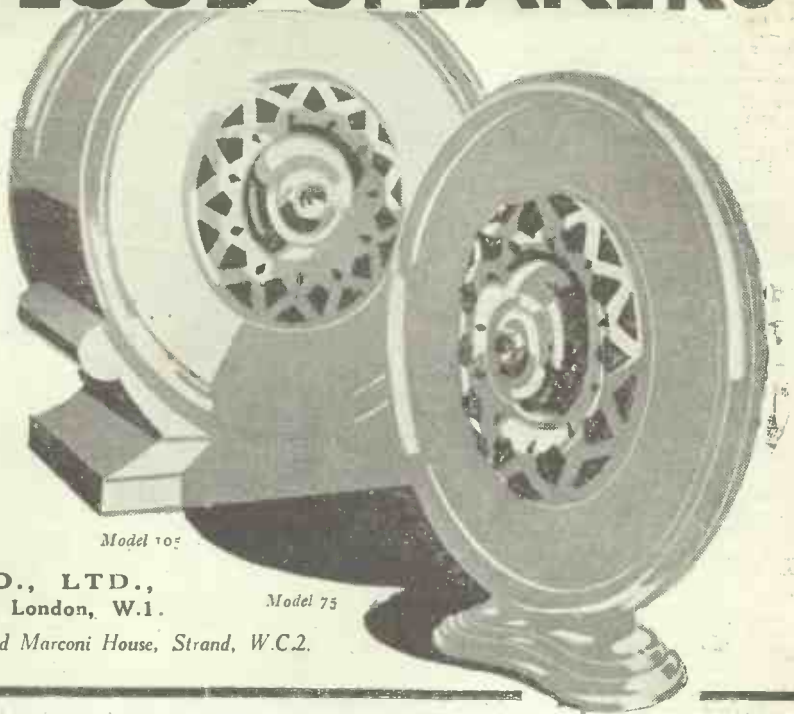
Listen to a Marconiphone Cone Speaker. Your ear tells you it's an exceptional performance. No imagination needed—you really hear the rich, incisive, commanding high tones, the satisfying notes of the bass. Everything is there—every note in its true relation to every other.

Marconiphone gives you this perfection of reproduction in two speakers:—

Cone Speaker Model 75, price 75/- and Model 105 Cabinet Cone, price 105/-



If you decide upon the horn type, choose the acknowledged leader, Sterling "Type 33." Now reduced to four guineas and complete with connecting cord. Supplied in either Walnut or Mahogany Speaker.



THE MARCONIPHONE CO., LTD.,
(Dept. P.), 210-212, Tottenham Court Road, London, W.1.

Showrooms: 210-212, Tottenham Court Road, W.1, and Marconi House, Strand, W.C.2.

**75000 SWITCHES
ALREADY IN USE**

LOW PRICE



HIGH EFFICIENCY

YOU know the price of the Benjamin switch, but do you realise what you are getting for your 1/3? You are obtaining the component which Mullard chose from the whole field of radio switches for use in the Mullard Master Three Star.

That is your guarantee of efficiency. The Benjamin switch has a double contact which gives a definite snap action, while terminals are provided for ease of wiring.

This switch is supplied 1/- without terminals. Price 1/-

1'3

BENJAMIN

ELECTRIC LIMITED,
Brantwood Works, Tottenham, London.

**WISE
WOMEN
MAKE
MEN
MEND
WITH
FLUXITE**



—it simplifies all soldering

FLUXITE is sold in tins, price 8d., 1/4 and 2/8. Another use for Fluxite: Hardening Tools and Case Hardening. Ask for leaflet on improved methods.

FLUXITE LTD.
(Dept. 324),
Rotherhithe,
S.E.16.

SOLDERING SET COMPLETE 7/6

or LAMP only, 2/6



K. RAYMOND

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

Come to LEICESTER SQUARE TUBE.
This address is at the back of Daly's Theatre. Phones: Gerrard 4637 and 2821

C.O.D. All orders executed in rotation. Send ORDER with instructions and pay Postman. C.O.D APPLIES TO UNITED KINGDOM ONLY.

WE ARE OPEN
ALL DAY SATURDAY
ALL DAY THURSDAY
ALL DAY EVERY DAY
Hours 9 a.m. to 8 p.m.
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Sunday morning 11-1

Ebonite cut white you wait at 1/4 in. square inch also 1/2 in. at 1/4. Only the best supplied. Drilled Panels for all Circuits.

C.O.D. orders must be over 5/-



SCOTT'S ALL-WAVE EBONITE TUNER 13/6 Post Free

A.W. P.W. M.W.
STANDARD LOADING COILS
WEARITE LEWCOS MAGNUM
all 7/6 each
BLUE SPOT 66K (101) BALANCED 25/- ARMATURE

We stock Igranio, Climax, Ever Ready, Hellesen, Siemens, Formo, Ferranti, Wearite, Ormond, J.B., Benjamin, Lotus, Mullard, Dublier, 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.

COUPON No. 18

ONLY ONE COUPON ON ANY ONE ORDER
IF YOU SPEND 25/- OR MORE YOU CAN BUY FOR 3d. EXTRA ONE (ONLY) OF THE FOLLOWING:

- S.M. Dial. Permanent Detector. 100 ft. 7/22. 12 Nickel Terminals. Battery Switch. Indoor Aerial. 60K Coil. .0003 and 2 meg. 12 yds. Lead-in. H.F. Choke. 9-volt Grid Bias. 6-pin Coil. Base. Fuse Bulb and Holder. Pair Panel Brackets. 12 yds. Twin Flex. Loud Speaker Cord.

ONE OF ABOVE, 3d. WITH 25/- ORDER.

KITS of parts for all Circuits.
Make out LIST for keen quotation.
DON'T worry, if it's Wireless WEHAVEIT.

COSSOR NEW MELODY
Spares for Same—separately (post extra)
2 Ormond .0005 Log at 6/- each; 2 Cossor pattern S.M. Dials at 3/9 each; Ormond Reaction .0001 (bushed) 4/-; Ormond P.P. Switch, 1/3; 6-ohm Rheostat, 2/- (all knobs to match cabinet); 5 Lotus new type Valve Holders at 1/3; 1 Wearite H.F. Choke, 6/9; 5 T.C.C. Condensers, 2 mid., 3/10; S.P. .0001, 2/-; 1 1/10; Dublier 3 meg., 2/6; 3 to 1 L.F., 15/- (compact, well-known British make); 2 Wound Coils, 12/6, B.B.C.

Total List £3 : 17 : 6

SENT POST FREE FOR £3 : 10 : 0 nett.

CABINETS WITH SCREEN, 17/6 Post 1/-

5XX COILS 15/- pr

MULLARD MASTER 3*

This new and wonderful set must appeal to young and old, amateur or experimenter—in fact, EVERYBODY!

YOU CAN PURCHASE

ANY ITEM SEPARATELY (OR A KIT OF PARTS). Every component is available at short notice. This list is strictly to Mullard specification.
3 Valve Holders, Lotus, at 1/3. Colvern Combined Wave Coil, 17/6. Permacore Transformer, 25/-. Climax L.F.A. Transformer, 25/-. Climax H.F. Choke, 7/6. Benjamin Battery Switch, 1/3. J.B. .0005 Log, 11/6; .00035, 10/6. Mullard .0003 and 2 meg. 5/-. Magnum Panel Brackets, 2/6. Mullard .0001 Fixed, 2/6.

Total £5 : 12 : 6 Carriage Paid

LATEST MODEL AMERICAN TYPE OAK CABINETS, MAGNIFICENT QUALITY.
18 x 7 x 10,
16 1/2, carr. 1/-.

MULLARD VALVES.
2 at 10/6. 1 at 12/6.
(Super Power, 15/-).

Please add 3/6 to above price (total £5 16/0) and I will include: 2 Handsome S.M. Dials, Set of Connecting Links, 8 Plugs, 2 Spades, 4 Engraved Terminals, 2 Ebonite Strips, Twin Fix. Splendid Aluminium Panel, 18 x 7, drilled ready for use, 9-volt Grid Bias; Base-board. Carriage Paid.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 620.)

THE "P.W." STANDARD LOADING COIL.

E. P. T. (Southend-on-Sea).—"So now I am going to try for the long waves, and I want to use the 'P.W.' Standard Loading Coil. Can you give me the names of makers who supply this?"

The "P.W." Standard Loading Coil can be obtained from Messrs. Burne-Jones, Paroussi, "Lewcos," and Wright & Weaire.

WHAT HAD HAPPENED?

E. JACKSON.—"I have recently gone on to the electric-light mains for H.T. and put in an eliminator. This is connected with an adaptor to a lamp holder in the next room.

"The set had been running for a short time and was switched off at the set. The adaptor was not removed or switched off, but later a

EVERY CONSTRUCTOR

should be sure to secure a copy of the DECEMBER issue of

The WIRELESS CONSTRUCTOR

NOW ON SALE (at the usual price, 6d.)

It contains a great

FREE GIFT BOOK

compiled by PERCY W. HARRIS, M.I.R.E. and describing

31 MORE TESTED CIRCUITS

Full of practical information of value to every home constructor.

NOW ON SALE

smell of burning was noticed in the room near where the set was, and upon investigating this a light was seen from a crack in the cupboard where the set was.

"Then one of the coils was found to be on fire and partly destroyed! What had happened?"

Apparently what was happening in your case was faulty insulation of the aerial system. You do not state what type of eliminator was in use, but in all probability it was one of the type in which a large fixed condenser is connected between the H.T. negative terminal on the eliminator and the earth terminal.

Most eliminators have this precaution in order to ensure that the eliminator is properly insulated from the earth, owing to the fact that many power and lighting systems earth the positive main of the supply which in effect means that all the set's H.T. negative connections must be carefully insulated from the earth.

The large condenser which is in the eliminator ensures this, if the aerial is properly insulated, but if there is a switch through which it leaks, or any means by which the aerial, lead-in or other point connected to the aerial wiring, is connected to earth outside the house, the mains will be partially shorted through the aerial coil and a heavy current will flow, in time heating up the coil, thus destroying it in the way you mention.

If you cannot trace how the trouble arose send a sketch to the Query Department showing them

(Continued on page 624.)

"MICROMETER-LIKE ADJUSTMENT"



2 to 38 M/MFDS.

The ease and accuracy with which you can adjust the Gambrell Neutrovernia makes it a perfect means of controlling the High Frequency side of your receiver, enabling you to get greater selectivity and easier tuning.

Practically every known set designer has used and recommended this condenser, which can be used as either a Balancing, Neutralising, or Capacity Reaction Condenser (Capacity 2/38 mfd.). Tens of thousands already sold.

From all dealers.

"NEUTROVERNIA"
PRICE 5/6 EACH

Write for Illustrated "Components Leaflet P."

GAMBRELL RADIO, LTD.
6, Buckingham Street, Strand, W.C.2.

BUILD THE MULLARD MASTER 5 PORTABLE
Complete Set of Parts including Cabinet, Loudspeaker, Batteries, Valves, etc., strictly to Mullard Specification, £16. Equal in performance and appearance to any £30 set.
MANVILLE, 15a, Brecknock Rd., London, N.7

"DARIO"
KEEPS EVERY SET "In Training"

(See page 625).

RELIABILITY WIRELESS GUIDE
Send for New Edition No. T999. It's FREE. Packed full of good things at keen prices for Wireless Constructors. Trade Enquiries Invited.
J. H. TAYLOR & CO.
4 RADIO HOUSE
MACAULAY ST. HUDDERSFIELD

HEADPHONES REPAIRED 4/-
Transformers 5/-. Loudspeakers 4/-. All repairs remagnetised free. Tested, guaranteed and ready for delivery in 24 hours.
Discount for Trade. Clerkwell 1795.
MASON & CO. 44 East Rd., City Ed., N.1

PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS

DX the most famous coils in Radio
Write for leaflets to:
DX COILS LTD · LONDON · E.8

THE GREAT NEW SPEAKER WHICH DESTROYS COMPLETELY UNREALITY

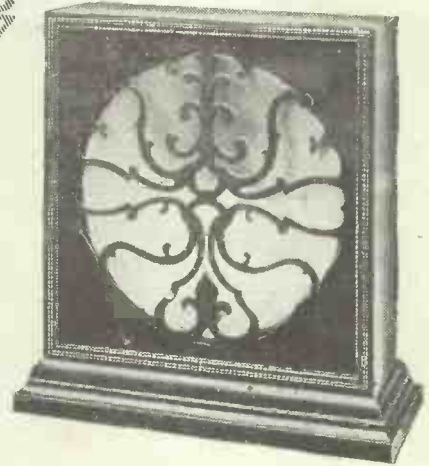
THE M.P.A. DUAL INDUCTANCE is a Moving Coil Speaker built on an entirely new principle exclusive to M.P.A. Although self-energising, it requires neither accumulators, mains connections, special valves, nor transformers; and it undoubtedly represents the greatest value in popular-priced reproduction to date. Hear it at your dealer's! Note its amazing volume, its clarity, and exceedingly mellow beauty of tone! "IT GETS THE BEST FROM YOUR SET," any set—even a 2-valve receiver.

Its price 7 guineas.

* * * * *

Other M.P.A. Models include the Popular Plaque, 29/6; De Luxe Plaque, 47/6; Table Grand Speaker, 5 guineas; Table Cabinet Speaker, 44/7/6; Moving Coil Speakers, from 10 guineas; and the "Octrode" 8 Electrode Self-Contained Stationary Set, 12 and 17 guineas. For Irish Free State prices write Brown Bros. (Ireland), Lower Abbey Street, Dublin, C.8. All Wireless Dealers stock M.P.A. Products.

THE M.P.A. WAY
Products to the value
of £5 or over can be
obtained on Hire
Purchase Terms for
£t down.



Streets

DEPT. 3, M.P.A. WIRELESS LTD., 62, CONDUIT ST., LONDON, W.1. TEL.: GERR. 6844-8

WEARITE COMPONENTS

STANDARD Loading Coil - - 7/6

" " Unwound 5/-

COSSOR MELODY MAKER

Aerial Coil BBC. - - - - 7/6

" " 5XX - - - - 8/6

Anode " " - 8/6

" " BBC. - 7/6

H. F. CHOKE (Standard) 6/6

do. (Short Wave) 4/6

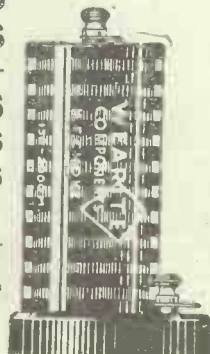
do. (Combined) 9/6

Push-Pull Switch - - - 1/-

WRIGHT & WEAIRE LTD.

740, HIGH ROAD, TOTTENHAM, N.17

Telephone: Tottenham 3847-3848.



SHEER VALVE VALUE



If you can buy a valve that gives you the same service for the same length of time as a valve costing treble the money, it is obvious economy. A Frelat Valve costs 6/6. It has a short price—but a long life. It means cheaper as well as better radio. It means cutting valve costs by one third. It is not coming to you without a good reputation. The Frelat is

famous already. And there are six types all costing the same price—all capable of the same trustworthy performance. We could continue telling you about Frelat Valves, but that would not be doing them full justice. We want you to test them in your set, give them a chance to show what a really low-priced valve can really do.

6 TYPES 6/6
1 PRICE 6/6

207G 2v .07 Gen. Pur.
407G 4v .07 " "
210NP 2v .1 Power "
410NP 4v .1 " "
207RH 2v .07 R.C. & H.F.
407RH 4v .07 " " "

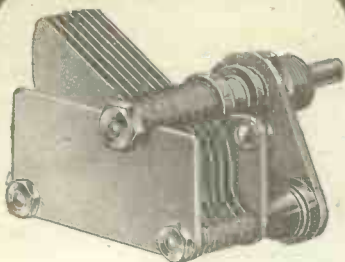
Frelat Valves

DARK EMITTER

Importers: Samden Wireless Co., Ltd., 102/4, Shudehill, Manchester.
Continental Radio Import Co., Ltd., 8, Spital Square Bishopgate, E.1.
Manufacturers: N. V. Frelat, Amsterdam, Keizersgracht 77.

SELLS

**"UTILITY"
BABY CONDENSER**



*Space...
and to spare*

In the construction of small and portable sets the same problem—how to obviate the crowding of components—confronts expert and amateur alike. It will help a lot if you use the small "Utility" Condenser illustrated—this, and also a small anti-capacity switch, have been specially designed for the purpose. Neither has anything freakish in its design; the Condenser follows the lines of our popular standard models, has marked low-loss, ball-bearing spindle and is perfectly made through-out.

**BIG DEMAND
REDUCES PRICE!**

We are enjoying splendid success with this new line. Bigger demand has effected reductions in our costs, and we are passing the difference to you via lowered prices, as follow:—

| Capacity | With Dial | Less Dial | Vernier |
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| ·0005 | 7/6 | 6/6 | 10/- |
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Ask your local Dealer to show you "Utility" Components, and particularly the new Condensers and Dials with Thumb Control. List may be had on request.

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Made and Guaranteed by
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"Utility" Works,
HOLYHEAD ROAD,
BIRMINGHAM
and Sold by Good Wireless
Dealers Everywhere.

**RADIOTORIAL
QUESTIONS AND ANSWERS**

(Continued from page 622.)

exactly what kind of earth arrangement you use, and the type of switch employed, and they will be able to instruct you how to overcome this difficulty and remove the danger.

COILS FOR THE "OLYMPIA" FOUR.

H. R. J. (Essex).—"Would you please give me details of the windings for the 'Quick-Change' type coils for the 'Olympia' Four?"

The coils are exactly the same as those used in the "Quick-Change" Four, and you will find they can be bought ready made if desired. To make them yourself, you will need two pieces of good insulating material, 3 in. in diameter and 3½ in. long. (Pirtoid tubes were used in the original set. See "P.W." June 9th, No. 314.)

The aerial unit carries the main winding of 60 turns of No. 24 D.C.C. wire, and over the top of this is the aerial winding consisting of 24 turns of the same wire in same direction, with tapings at the 10th, 15th and 20th turns.

This winding is placed over one end of the secondary and is spaced off it by placing 6 or 7 pieces of wooden rod of about ¼-in. diameter between them in the usual way. If you cut these pieces of rod about 1½ in. long, and secure them in place with a rubber band, you will find it is quite easy to put the winding on and to remove the band. (The sticks from packets of Glazite provided the wooden rod in the original coils.)

A FREE BOOK

is one of the outstanding attractions of the issue of

**The WIRELESS
CONSTRUCTOR**

now on sale at all news-agents and bookstalls.

Details are given of
**31 MORE
TESTED CIRCUITS**

this book is one that will prove invaluable to experimenter and home constructor alike.

**HAVE YOU SECURED
YOUR COPY?**

Leave all the ends free when you finish them off, with about an inch projecting, and then start the next coil. This is the detector and grid circuit coil which is wound on a similar tube and consists of a plain winding of 60 turns of No. 24 D.C.C. wire, with tapings taken at the 10th, 15th, 20th, 25th and 30th turns.

Against the end of the coil nearest to these tapings is wound on in a single layer 30 turns of No. 34 D.S.C. wire. Wind in the same direction as the main winding, this being the Reinartz reaction winding for shorter waves.

The method of mounting the coils in the necessary horizontal position is very simple. To each of the tubes a little piece of wood is secured with a brass screw passing outwards through a hole in the wall of the tube, and these wooden blocks are in turn secured to the baseboard. This is easily done by passing screws through them into the baseboard. The height of these pillars should be about 1½ in.

THE "100 PER CENT" CRYSTAL SET.

"100 Per Cent" (Barnet).—"It is called the '100 Per Cent' Crystal Set, and I should like to know where I can get details, as apparently it was better than any other crystal set he had tried."

Full details for building the "100 Per Cent" Crystal Set were given in "P.W." 325, August 26th issue.

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 ■ NEW COSSOR MELODY MAKER;
 ■ NEW MASTER THREE*;
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 Two required for each hole.
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CONE UNIT

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Full constructional details with each Unit.

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Reduced from 32/6 to 15/- solely as an advertisement for the famous Bullphone Nightingale Loud-Speakers. Cobalt Magnet guaranteed for all time.

With 4-inch Diaphragm.

Instantly converts your own Gramophone into a full power Loud-speaker, giving a wealth of pure undistorted volume which must be heard to be believed.



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50/- cash, or 5/- deposit and 11 monthly payments of 5/-

21 in. high with 14 in. Bell, Mahogany finished with plated arm & stand.

5/- Secures this Speaker



BAKELITE
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26" HIGH BELL, BELLHORN 14 1/2" FINISHED IN MAHOGANY

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Guaranteed free from metallic resonance.

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—AND THE CHEAPEST WAY, TOO,

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MOVING COIL REPRODUCTION FOR ALL



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The LASSOPHONE TRIANGLE DOUBLE REED FORK CONE UNIT

that works like a moving coil speaker. Will work on any set without any alteration or extra current. MFD. BY

17/6 H. H. LASSMAN, P.R.A., A.M.I.R.E.
British made 429 Barking Road, E.6.

M.S.

MELODY MAKER COILS
Radiax—the finest coil made: £25/600, 15/- pr. Long Wave 17/- pr.

Mullard Master 3, all ranges, short to a 1000 7/6 ea. 1000/2000 3/6 ea. circular or cross-pin. Melody Maker sets 20/- down, balance monthly. Quick delivery.

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THE WET H.T. No Extras. Carriage Paid. Small SACS 1/4 ZINCS 8s. doz. Large SACS 2/2 ZINCS 10s. doz. JARS (for either size) 1/1 doz. Improved types. Postage extra. Send 11d. stamp for booklet, 1d. a copy, 1/- for full range of samples. Dept. W., TROMBA ELECTRICAL Co., 51, Chalk Farm Rd Camden Tn., N.W.1

Important to Advertisers.

OUR ISSUE for **DECEMBER 8th** Will be the specially enlarged

XMAS NUMBER

With charming cover in full colours.
Large increase in sales.
No increase in Advt. rate.
Price **THREEPENCE** as usual.

THE "FANFARE" FIVE.

(Continued from page 501.)

compared with other fives in which a good deal of screening is used. The first point to note is that standard partition screens are used, which are supplied quite cheaply ready cut to size and drilled ready for screwing down.

Further, they are provided with a row of perforations running right across the lower edge, so that you will not have to drill any holes for connections to pass through. (By the way, don't forget to use insulated wire for all these leads.)

Placing the Coil Holders.

The only drilling you will have to do is for the small brass screws which hold in place the three square blocks of wood on which the 6-pin sockets for the coils are mounted. These blocks are about 3 in. square by 1/2 or 3/8 in. thick.

It is a very simple matter to drill the necessary holes, for the metal is very soft and the positions need not be judged very accurately. (The photos and wiring diagram will show you where to attach the blocks and bases to the screens.)

To get the best and simplest wiring it is necessary to attach the coil sockets as it was done in the original, and this may not be quite clear unless it is given in words. The aerial coil holder is placed so that the longest row of sockets is horizontal, with No. 1 socket nearest the first valve. The other two holders are placed so that the main row of sockets is vertical, with No. 1 at the top.

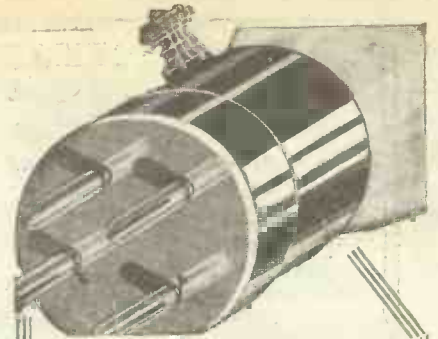
Test that Fuse.

Just one other tip about this stage of the work: Before you fit the H.T. fuse in place test it for continuity in the ordinary way with 'phones and dry cell. They sometimes arrive with broken filaments, and can then produce a very puzzling absence of signals!

The wiring up you will not find difficult, in spite of the presence of the screens, if you do not rush it, but patiently work over the wiring diagram, referring to the photos for guidance wherever possible. A fairly good copy of the original is desirable in any big and sensitive set, of course. By the way, it is best to do the wiring of the volume control and all the parts round about before you fit the reaction condenser in place.

Drill the hole for this, therefore, and see that it fits properly; then take it off again and fit it only as the last step in the construction when all the other wiring is done.

There we must leave you for this week, but we shall be giving further practical notes in the next issue.



A.P. 4-ELECTRODE

The wonderful new valves for your set which only require half the usual H.T. yet give better selectivity and purer reproduction. They are sent on 3 clear days' approval against cash order.

The range also includes special patent 5-pin and 4-pin dull-emitter low-consumption valves for H.T.-less circuits. History and data of the A.P. family, together with reports by "Popular Wireless," "Amateur Wireless," etc., will be promptly sent upon receipt of your postcard.

ANELOY PRODUCTS.

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The Picture Paper with the **MOST News**
—SUNDAY GRAPHIC—

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Send us your requirements,
T. A. HARRIS, Reliable Radio Supplies,
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Provident Cheques Taken.

YOUR LAST CHANCE!

All over the country "sold out" reports are being received concerning the special gift number of "Modern Wireless." If you see a copy of this November number **BUY IT IMMEDIATELY.**

FERRANTI

Circuits for simple 2-Valve and 3-Valve Receivers

Full-sized charts are now available and may be obtained from your dealer or from us on request.

*No Radio knowledge required.
No soldering necessary.*

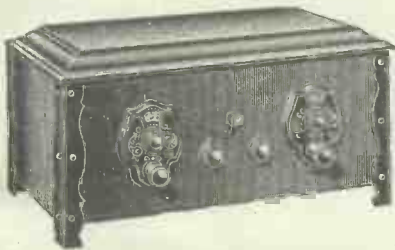
Performance : These receivers are capable of giving good reproduction from the local station and Daventry 5XX. Other stations may be received at various strengths according to the situation of the listener.

FERRANTI LTD. HOLLINWOOD LANCASHIRE



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YOURS FOR 20/- WITH ORDER



GENUINE COSSOR PARTS ONLY SUPPLIED

SET A.—The New Cossor Melody Maker Kit in Sealed Carton, complete with every component, including valves for making the above three-valve screened-grid set (for further description send for Maker's pamphlet). CASH £7 : 15 : 0

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SET B.—The New Cossor Melody Maker Kit complete as above, and with M.P.A. Cone Loud Speaker, EXIDE or HART 2-volt L.T. Accumulator and 2 60-volt H.T. Batteries. CASH £10 : 10 : 0

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LANG & SQUIRE THE ALL BRITISH MOVING COIL LOUD SPEAKER

£3 : 15 : 0 £4

Set of Parts less Stand. With Stand.
Pot Magnet wound for D.C. Mains. 12/6 Extra.

The Steel Pot Magnet, wound for 2, 4 or 6 volts, requires only 3 to 4 watts. At 6 volts the current is between '5 and '75 amps.

The Moving Coil has a large tapered flange at one end which makes certain of the coil keeping its shape. Our cone is made up with three-ply paper. This has entirely got over the objectionable hissiness to be heard from some moving coil speakers. All over-tones are reproduced. Nothing is lost.

LANG & SQUIRE, LTD., WALES FARM ROAD, ACTON, W.3.



SCOTT'S ALL-WAVE EBONITE TUNER Price Now ONLY 13/6 Post Paid

"P.W." Test Report, May 12th. On test we found this unit covered the wave-length range claimed—i.e. 180-2,000 metres—reaction control being quite satisfactory throughout. It is nicely made, more robust than the majority, and can only be regarded as an economical proposition at 15/-." A similar report was published by "Amateur Wireless," June 15th and "Wireless World," Oct. 10th.

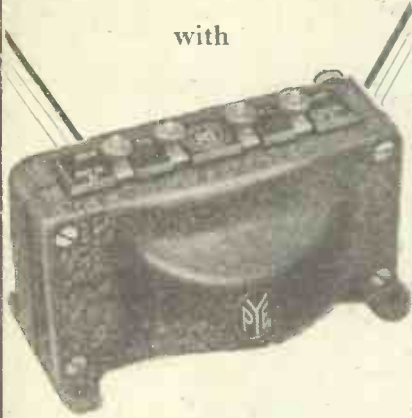


Constructional Details. Wound with green silk wire on a polished ebonite tube; switch and variable reaction combined; nickel-plated parts. Size, 4 1/2 ins. x 5 1/2 ins. Supplied with wiring diagram, drilling template and instructions. If your dealer does not stock this Tuner, send direct to the manufacturers. Cash with order or C.O.D. All orders despatched same day as received.

S. W. SCOTT & CO., 67a, Lothian Road, London, S. W.9.
TRADE SUPPLIED. Phone: Brixton 1509.

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with



PYE L.F. TRANSFORMERS

Make perfect reproduction certain by insisting on Pye L.F. Transformers. The high standard set by this ideal form of interval coupling remains supreme. Compact, efficient in action, and robust. Entire absence of noise and crackling. Tested by actual measurement of amplification, and guaranteed. Terminals and soldering tags provided.

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| Ratio 2:5 : 1 . . . | 17.6 |
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| .25 megohm . . 1/- | 1.5 megohm . . 1/- |
| .5 " . . . 1/- | 2. " . . . 1/- |
| 1.0 " . . . 1/- | 2.5 " . . . 1/- |
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EVERYWHERE.

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MORE ABOUT THE "D.C." THREE.

By C. P. ALLINSON, F.Inst.P.Inc.,
A.M.I.R.E.

THE operation of the "D.C." Three is simplicity itself, yet there are one or two points that will enable a better performance to be obtained.

One of the most important is that relating to the adjustment of grid bias.

Grid bias is obtained for the first and second L.F. valves by means of the two potentiometers R_5 and R_6 respectively. R_5 feeds the first L.F. valve, and the slider should be set only about one-sixth of the way round from the left-hand end of the winding (looking at the set from the front) when a general-purpose valve is used for V_2 . You will find in practice that its adjustment is by no means critical, and this is peculiar to the circuit used.

Setting Grid Bias.

If you wish to use an H.F. valve, less bias will be required, but the valve will be more easily overloaded. If you only do long-distance work—perhaps you are 50 miles or more from the nearest station—then this type of valve can be used.

If you happen to have a small power valve handy, such as the P.M.6 or the like, and want to make use of it, you can do so, of course. Care must be taken in this case to keep the plate current down by using more bias, otherwise too heavy a current will be passed through the primary of the L.F. transformer.

It will also be found that the setting of the slider on the potentiometer R_5 , more than R_6 , has an effect on the amount of hum resulting. By using a little more bias than you might at first think right, you can nearly completely cut out the hum.

The last valve, if a super-power, will need to have about 20 volts grid bias, and this can be obtained by placing the slider of R_6 at the centre of the winding. Here, again, you will find it possible slightly to over-bias the valve, with a resulting improvement in background. This adjustment should be made in each case on full load, for too much bias will cut down the signal strength on a strong signal and not a weak one, though; owing to the self-regulating action of the circuit, it will not introduce much distortion.

Eliminating Hum.

The setting of R_4 should also be done with a little care. As the slider is moved in an anti-clockwise direction the negative bias on the grid of the detector is increased and, up to a point, the efficiency of rectification is increased. At the same time, however, reaction tends to be floppy and more difficult to control, and, if carried too far, it may be found that the set cannot be made to oscillate at all.

The resistance R_{11} should be chosen with care. Its function is to prevent hum being introduced in the detector circuit.

The value will depend to a certain extent on your mains supply. If it is very noisy a higher value will be needed than with a good supply, but as a rule it will be between 20,000 and 50,000 ohms.

YOU CAN BANISH BATTERY TROUBLES—FOREVER.



HIGH TENSION AT EVEN TENSION

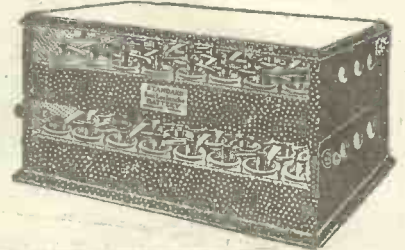
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ASK any Standard Wet H.T. Battery user. He will tell you the parity of tone and complete absence of background noise is astonishing. Yet the explanation is simple. The flow of current from this highly efficient battery is absolutely steady, smooth and uniform. Hours of daily service for months on end does not show any violent variation in voltage. The secret is—it recharges itself overnight. Get YOUR Copy of this FREE BOOK. Take the first step by sending for FREE booklet describing every detail for installing and maintaining this super-efficient and money-saving battery.

8/1 96-volt "Unibloc" Cabinet completely assembled, ready for despatch, as illustrated. 8/1 down and 5 monthly payments of 8/1. Cash £2-6-5. No refs. No deposit. Halfords Stores, DOWN Curry's Stores and all radio dealers can supply on the same cash or deferred terms as we do. SEND FOR FREE BOOK.

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AN XMAS HINT: Every "Receiver" says "DARIO"

(See page 625.)



Make or Buy a Gramophone or Cabinets only for Wireless at a quarter shop prices. Size 32 x 30 x 16, with double spring motor, 12 in. Velvet table, swan tone-arm, soundbox, horn, cups, £5, carriage paid. All the above fittings less Cabinet, £1 18s. 6d. Motors 9s. Accessories. List Price: 64-pp. Drawing and How to make Gramophone, 3d.

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Here is a really genuine chance for making money in your spare hours which you must not miss. It is quite dissimilar to all other money-making schemes. Seriously and genuinely, a Golden Opportunity is now knocking at your door. The Coupon below is the latchkey which will open the door for you. Use it to-day.

In the hours you now spend just "passing the time away" you could be making money, producing a patented article for which there is a constant demand. No cumbersome "plant" is necessary. Your own Kitchen Table can be your factory. Only a few simple tools which you can make are required. The work is simple and easy—even the children can help.

Up to £300 a YEAR Earned!

Think of the luxuries and comfort you could enjoy with £300 a year extra! Then send the Coupon below to-day for full particulars. Only a restricted number of persons are allowed to manufacture under my Royal Letters Patent. This protection ensures a fair market for all.

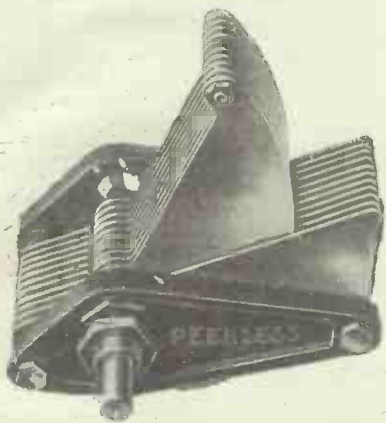
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Seize your opportunity NOW. Don't say "I'll do it to-morrow"—for to-morrow never comes. The man who "wits" is a man of action—so "act" now. The posting of this Coupon is the first swing of the pendulum—the starting of the clock, ticking away, not WASTED HOURS, but GOLDEN HOURS—for YOU!

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 Sir,—Please send me at once, and FREE, full details as to how I can Make Money at Home in my spare time. I enclose 2d. stamp for postage.
 Print your name and address boldly in capital letters on a plain sheet of paper and pin this Coupon to it.
 "Popular Wireless," 24/11/28.

MOVE WITH THE TIMES!



Are you a short-wave "fan"? If not, try building your own set and be sure you incorporate a "Peerless" Junior Condenser, S.L.F. type, which gives high maximum and low minimum capacity with true S.L.F. readings throughout the 180 degrees scale.

•0002, •0003, •0005, 5/6 each.
 4" plain dials, 2/- each.

SPECIALLY SUITED FOR SHORT-WAVE WORK.
 Send for New Illustrated Catalogue.

THE BEDFORD ELECTRICAL & RADIO CO. LTD.
 22, CAMPBELL ROAD, BEDFORD.

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Bring your "Cossor Melody Maker" up-to-date by adding the KEYSTONE H.F. UNIT

Read what others say about it.

.... more than a success. Dozens of stations simply roared out.
 (Signed) J.H.D.
 Ilfracombe.

I have obtained wonderful results. I live close to Liverpool station but I can now cut Liverpool out.
 (Signed) W.E.C.
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Report on your H.F. Unit. (Here follows list of stations) making a grand total of 43. Selectivity is excellent.
 (Signed) A.H.L.
 Burnham-on-Sea.

BRING your old Cossor Melody Maker up-to-date with this Keystone H.F. Unit. You will be amazed at the increased range, improved selectivity and greater volume. Stations well out of reach of your set will come winging in at full strength immediately you fit the Keystone H.F. Unit.

This H.F. Unit is simplicity itself to build. The clear, easy-to-follow instructions are so concise and non-technical that you cannot go wrong. No previous wireless knowledge is necessary. Anyone can build the Keystone H.F. Unit in an evening, using ordinary household tools.

The Keystone H.F. Unit can be added to almost any other receiver, greatly increasing range, selectivity and volume.

Send to-day for a copy of "Seven League Books for your Cossor Melody Maker."



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POST THIS COUPON TO-DAY



To The Peto-Scott Co., Ltd., 77, City Road, London, E.C.1
 Please send me free of charge, your Constructional Chart, which shows how to build an H.F. Unit for the Cossor Melody Maker.
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TECHNICAL NOTES.

(Continued from page 592.)

possible to match the impedance, something can often be done by the more ordinary expedient of reducing the anode voltage on the detector valve. This, of course, as everybody knows, is a very common way of eliminating oscillation, but it must be regarded, in the present case, as a rather poor substitute for the correct method.

Valve Specifications.

As regards the impedance of the valves and the transformer, these are now almost invariably specified by the manufacturers. In the case of the transformer, if of a first-class make, you can fairly well rely upon the rated impedance, but with valves this is not so often the case, and it is hardly sufficient to choose a valve the rated impedance of which appears to be reasonably correct. It is my experience that valves

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of the same impedance rating vary quite considerably amongst themselves. This does not apply so much to the really high-class makes of valve as to the other kinds.

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(See page 625).

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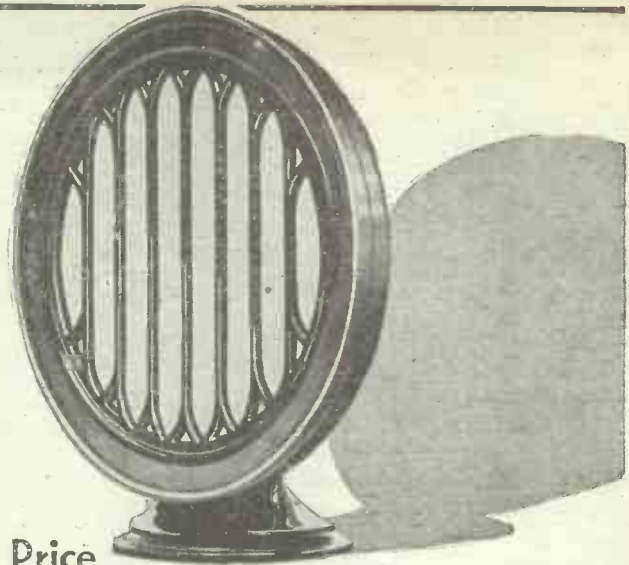
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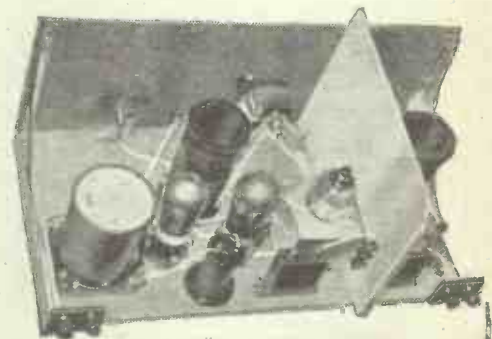
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SHORT-WAVE NOTES.

By W. L. S.

THERE is another "big noise" to report this week in the shape of a new station working on 38.55 metres. P.C.L.L. is the call-sign, and I believe he is located at Amsterdam. When I first heard him he had a steady wave-carrier switched on which just about succeeded in paralysing my receiver, since it was impossible to oscillate for about a metre on either side of him!

Then he came on telephony and made announcements in several languages, and a few evenings later he was transmitting gramophone records. I should rather like to know the power used, as on my own receiver, his music is audible when the set is not oscillating from 30 to 65 metres! The quality is extremely good in spite of the high degree of modulation.

Plenty of Programmes.

Personally, I find nowadays that a respectable short-wave receiver will give one rather more alternatives of programme than the average three or four-valve broadcast set. I can count for a certainty on eight programmes nowadays, and with my new receiver at present on the way, consisting of a screened-grid H.F. stage, detector and pentode, I have hopes of many more!

In any case, when we look back at copies of "M.W." and other papers two years old, we can see clearly the wonderful rise in popularity of this branch of radio.

I make no apology for returning to the subject of "threshold howl," since I have collected some more observations on the subject. I am in the awkward position of never having been severely troubled by this myself, but from day to day I meet people who consider it such a national calamity that it has made them give up short waves as a bad job.

Threshold Howl Again.

The most interesting point I have found is this: in some short-wave sets using Reinartz reaction, as we swing the reaction condenser in from the zero position, the set starts oscillating, with a severe threshold howl. If this condenser is fairly large (say, .0005) and we turn it in still further, we shall generally find a point at which the set stops oscillating again. This time it will do so without a trace of howl.

I have produced this effect myself in several different sets and it seems to be infallible—when you stop the set oscillating by increasing the capacity of the reaction condenser you will have no trouble with the howl. Of course, this cannot be done in cases where "throttle control" or similar schemes are used, since increasing the size of the reaction condenser will only make the set oscillate still harder.

The effect in a Reinartz circuit is due to the tuning of the reaction circuit being removed from the wave-length on which the set is operating to such an extent that the receiver goes out of oscillation again. At least, that is what I make of it. Any criticisms, please?

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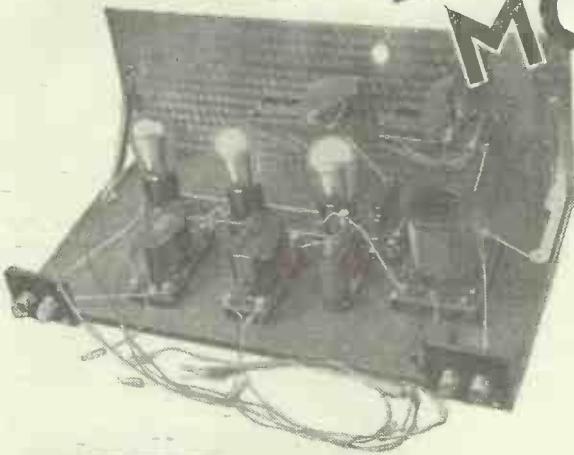
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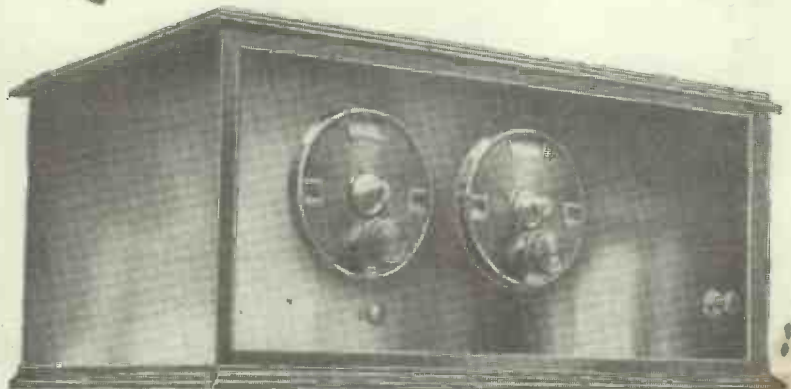
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