

THE "VANGUARD" AMPLIFIER

Popular Wireless

Every Thursday
PRICE
3d.

No. 386. Vol. XVI.

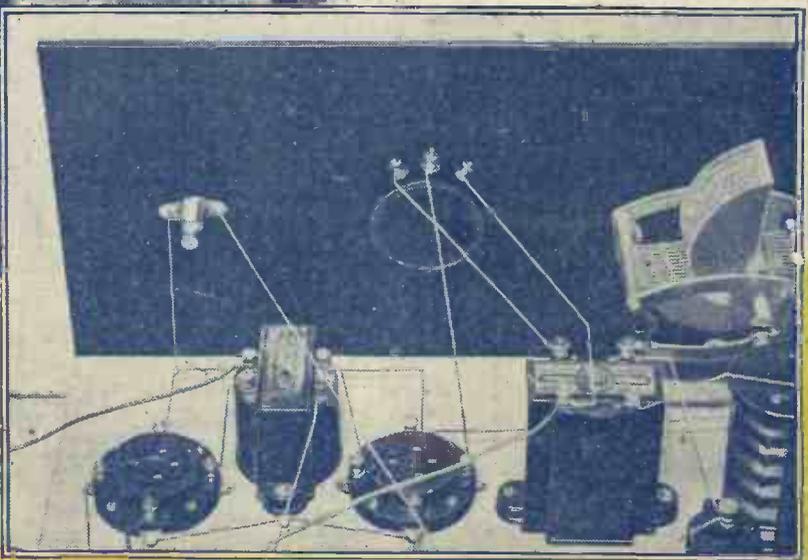
INCORPORATING "WIRELESS"

October 26th, 1929.



REFINEMENTS FOR THE "MAGIC" THREE

*See
Inside!*



SPECIAL FEATURES THIS WEEK

- Capt. ECKERSLEY'S QUERY CORNER
- THE MANCHESTER EXHIBITION
- HOW ANTI-MOBOS WORK
- A SURVEY OF THE B.B.C.
- etc., etc.

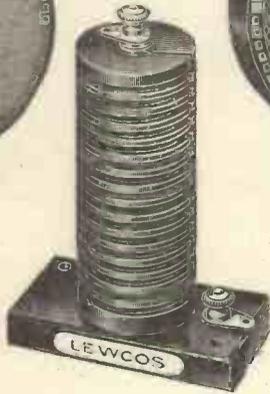
You'll need Greater Selectivity

to get distant stations
when the new Brookman's
Park Station is operating

Get it with



LEWCOS
Centre Tapped
Coil
C.T. 25-75 - 3/6
C.T. 100-300 - 4/6



LEWCOS
H.F. CHOKE
Price 7/9



LEWCOS
"X" COIL
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LEWCOS-

the name that stands
for superiority in
Radio Coils.

With Lewcos Coils
in your receiver you
can be sure of Selectivity.

The Lewcos components illustrated
can be used in The
"Magic" Three.

Descriptive leaflets
will be sent on
request.

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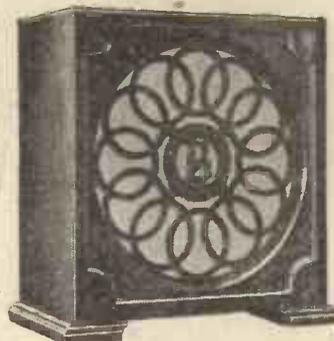
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COILS

THE LONDON ELECTRIC
WIRE COMPANY and
SMITHS, LIMITED,
Church Road, Leyton,
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FOUND!



THE REST OF THE ORCHESTRA



HERE, at last, is a loud speaker that does not cheat you of half the broadcast! It finds the missing artistes! It reveals instruments hitherto silent. It gives you notes you've never heard before. It is the new Brown Duplex Loud Speaker.

Because it incorporates the latest Brown improvements in design—the wonderful "Vee" movement and the new Duplex cone—this latest Brown triumph gives far more realistic reproduction than any heard before. Every instrument and every note—high and low—is reproduced *true-to-life*. Its tone is sweeter and more mellow. Its volume is richer and more magnificent. In short, if you buy a Brown Duplex Loud Speaker you hear the broadcast in your home as it is played in the studio. Ask your Wireless Dealer.

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Design as illustrated. Mahogany or Oak.

V10 £5 10s. Od. V12 £7 10s. Od. V15 £12 10s. Od.

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BY THE
WONDERFUL

Brown

DUPLEX LOUD SPEAKER

They must be good - 3,000,000 Valveholders already sold!

CLEARER-TONE VALVEHOLDER



The original Clearer-Tone Valveholder, in face of considerable low price competition, has more than held its own and will be continued at

2'-

VIBROOLDER



The Benjamin Vibroolder was last season's most successful accessory, the self-aligning feature ensuring positive contact with all types of English 4-pin valves.

1'6

5-PIN VALVEHOLDER



Designed for use with the new 5-pin valve with centre leg. The Benjamin anti-microphonic feature is incorporated, and also patented contact, which ensures perfect contact when using either solid or split pin valves.

1'9



Seen the new Switch ?

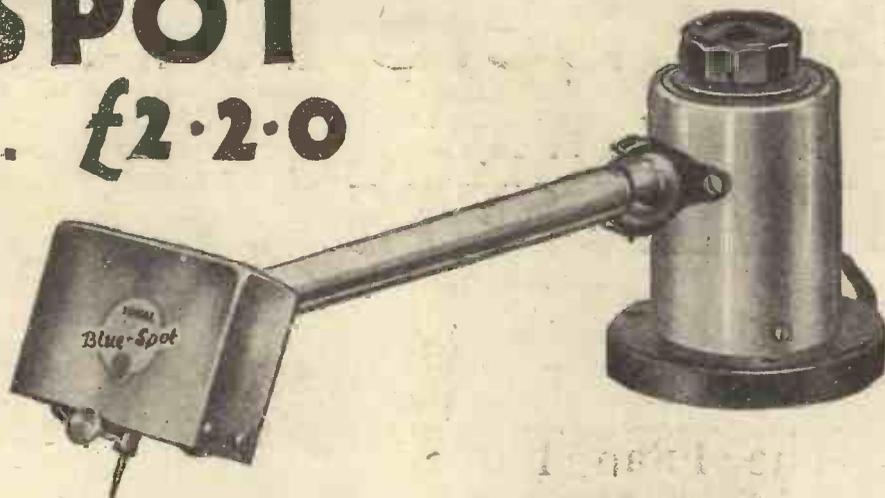
Some people say "Turn off the wireless"—and that's just what you do with this rotary switch. It's an attractive alternative to the usual pull and push type. All insulated, with indicating "On" or "Off" dial, pointer knob, terminals, and double contact. Suitable for use with panels up to $\frac{3}{8}$ -inch thickness. Quick make and break action **1'9**

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RADIO PRODUCTS

THE BENJAMIN ELECTRIC LTD., BRANTWOOD WORKS,
TOTTENHAM, LONDON, N. 17

BLUE SPOT PICK-UP .. £2.2.0



PERFECT TONE WITHOUT CHATTER

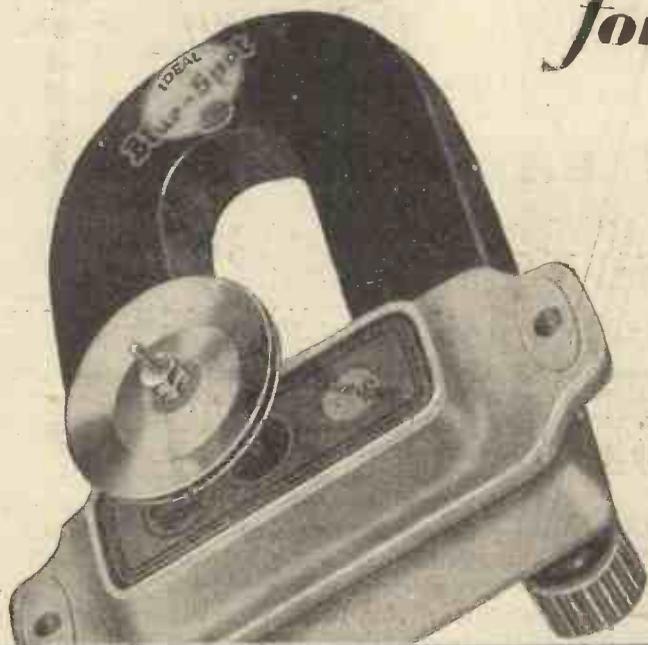
The Blue Spot Pick-up will discover new tone altogether in your records. It gives notes you hadn't realised were there and gives all tones their true value. You can have music from a whisper to full orchestra with the Blue Spot—a volume control is contained in the base . . . silent and smooth in action.

Your nearest dealer will demonstrate.
Price £2 : 2 : 0

BLUE SPOT 66K UNIT

for

PERFECT REPRODUCTION



You will want a perfect speaker with such a good pick-up as the Blue Spot.

What better than the Blue Spot unit . . . acknowledged by trade and public alike to be the finest loudspeaker unit yet produced.

Make up your own speaker with the 66K unit, sold by all dealers (price 25/-, sold under guarantee in special carton), and the Blue Spot Metal Chassis, specially designed for the 66K Unit. Both are Blue Spot all through—so you *know* the results will be good.

Price of "Major" Chassis with 13" cone 15/-
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“Best Way” TITAN SETS

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- The Titan Two
- The Titan Three
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are profusely illustrated with full diagrams and instructions for building in the “BEST WAY” BOOK NO. 350.

The reader has the choice of anything from a simple one-valver to a de-luxe 4-valve set with built-in wave-trap and wonderful long-distance loud-speaker performance.



6^D.
Everywhere.



6^D.
Everywhere.

“Best Way” RADIO-GRAMAPHONE SETS

“BEST WAY” BOOK NO. 349.

Explains how to use your radio set as an Electric Gramophone. Here, for the first time, are given full details for the electrical reproduction of your favourite records.

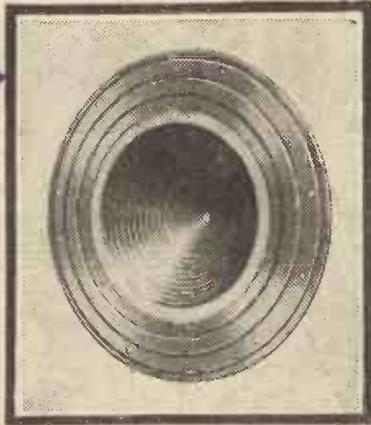
Gramophone Pick-ups and how to use them; Valves for your Radiogram Receiver; and Operating your Electric Gramophone are explained in detail, and in addition there are complete instructions for making the “Best Way” RADIOGRAM FOUR—a splendid set designed for use with a pick-up as well as for Radio Reception.

You can easily build them

easy...

for the amateur
to build his own
**Super
Loudspeaker**

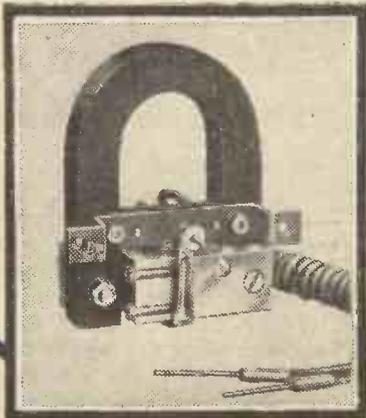
This cone unit and assembly now permits the amateur designer to construct a super-sensitive loudspeaker which is cheaper than a factory built model whilst at the same time allowing him to use his own ideas as to the type of cabinet or baffle to be used.



Assembly—Price 12/6

For the small sum of 15/- for the cone unit and 12/6 for the assembly he can build a loudspeaker unequalled in its class for volume, tone and sensitivity.

Like all Ediswan products this unit and assembly combine typically British quality with life-long dependability.

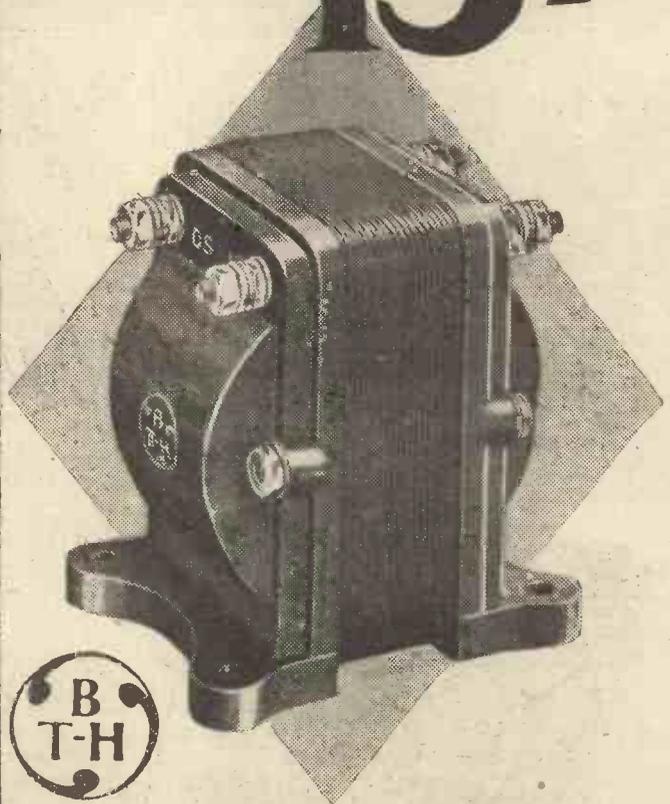


Cone Unit—Price 15/-

with this **EDISWAN CONE UNIT & ASSEMBLY**

A guaranteed L.F. TRANSFORMER

for 15!



For 15/- you can buy a guaranteed transformer of first-class design—a transformer that is used in some of the finest Cinema and public address equipments in the world.

The windings are so designed that screening is quite unnecessary and breakdown impossible under normal conditions.

The core is of ample cross sectional area and has a very high saturation point.

Put one in your set and note the improvement in quality.

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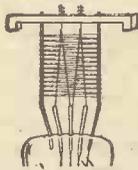
1a, NEWMAN STREET, OXFORD STREET, W.1.

Phone: Museum 9801.

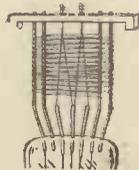
SHOWROOMS IN ALL THE PRINCIPAL TOWNS.

W 35b

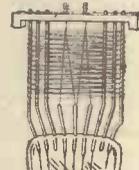
THAT'S ↓ THAT!



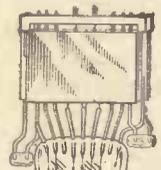
1. This is the first Grid and the double length Cossor filament. Note the seonite bridge piece.



2. Now comes the second grid locked securely in position. Every joint in this wonderful Valve is electrically welded.



3. And this shows the third grid automatically spaced at its correct distance by the seonite insulator.



4. Finally, the Anode completes the assembly and interlocks the whole unit immovable and rigid.



In two types :

Cossor 230 P.T. (2 volts, -3 amp.) and 415 P.T. (4 volts, -15 amp.) Amplification Factor 40. Impedance 20,000 Anode Volts 100 - 180.

Price . . . **25/-**
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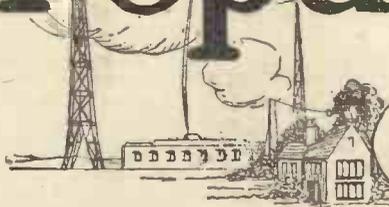
INTERLOCKED for safety—for rigidity and for long life!

The wonderful *NEW* Cossor Pentode is the most powerful L.F. Valve you can use—it gives enormous volume—equal to the output of two ordinary valves. And because it uses the exclusive Cossor system of Interlocked Construction it has exceptional strength. Its elements are rigidly braced together—proof against shocks, noises and breakage. No other Pentode Valve has this unique system of Interlocked Construction.

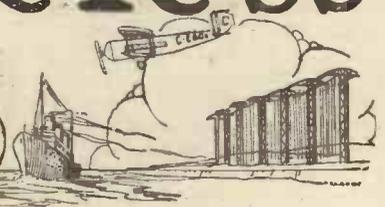
The NEW COSSOR PENTODE

The only Pentode Valve with Interlocked Construction.

Popular Wireless



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IN A BROWN STUDY-O
 —BROADCASTING
 EXTRAORDINARY
 —MORE HOWLERS—
 —THE WOMAN'S WAY

RADIO NOTES & NEWS

100% CRYSTAL SET—
 BACK TO EARTH—
 NEWS FROM SIAM—
 BUILT IN AERIALS

Pop Goes the Parson.

IT is related of the German village of Kleinow that it is about to dismiss its pastor, as a measure of economy, and to replace him by a radio receiver which will deliver sermons broadcast from Berlin. This seems to me one of the most cold-blooded and mischievous things ever conceived in the sacred name of saving money. How psychologically wrong it is time must teach that frowny flock.

In a Brown Study-O.

IT is being borne in on me that a broadcasting company is the concentration point of every kind of crank on the market, and every rummy notion evolved by Peculiar People. Just think! Some Continental stations are said to be experimenting in the use of colour for the creation of "radio-finesse"! The theory is that a certain colour produces a certain emotional response. Even the B.B.C. has been infected with the mania. Oh, dear! Can't a man get up and sing a song without all this flap-doodlery?

Broadcasting Extraordinary.

PROF. A. M. LOW is still trying to impress the untutored with the wonderful possibilities and probabilities of broadcasting, but either his proofs are corrected by an unscientific "sub" or else he has been dictating too hurriedly. In the "Sunday Graphic" he says in effect that if the action of the brain is electrical taste can be broadcast. He then says, "Thought is considered to be a mechanical process." But if thought is mechanical the action of the brain cannot be electrical, and therefore the taste-broadcasting idea goes up the spout.

Wave-trap for the Unwary.

I. C. (Upton Park) reveals his little secret for cutting out Brookman's Park locally, without the aid of special gadgets. His method is to disconnect the H.T. negative, and he offers to pay £100 to a local hospital if any reader fails to make this trick work. I am of opinion that my method is superior. Here it is: Take a cubic inch of well-dried air and connect it in series with the lead from the L.T. positive terminal on the set to the accumulator, preferably near the set, but not less than 2 in. from it. This gives a perfectly clear background.

More "Howlers."

WRITING of wireless a schoolboy gave the following definitions: "Atoms are what Sir Lodge talks about on crystal set, and are smaller than molly-coddles." "Induction is what they do to curates." "Resistance is three kinds—passive, negative and leased. Leased resistance is a line leading to a thing the easiest weigh." "Oscillation is something going to and throw. If it goes too fast it whistles and thus jabs the B.B.C." Nearer the truth than he imagines!

The Aussies Are For It!

AS a result of Mme. Sonya Michell's shot at Beethoven and Chopin, mentioned in these columns, a Mr. R. Agnew is bounding on the Australian broadcasting people to drop the good old stuff and give a lot of Bela Bartok, Ravel, Scriabine, and other composers who revel in "futuristic" effects. Pity he didn't include Ole Man Honegger and make the galaxy complete. Let Australia be warned by the agonies we have suffered—and stop this awful thing before it starts, so to speak.

Woman's Way Is Best!

A STUDENT of the radio trade has recently pointed out that only a small percentage of its customers are women, and he makes the suggestion that a special line of goods with a feminine appeal should be marketed. Precisely what constitutes feminine appeal in a radio set is hard to conceive; ornamentation, mostly, I presume. But the root of the matter is probably the fact that men, being more adventurous than women, have in most families got ahead of the girls and made or bought a set long ago—and one set per house is sufficient.

The "100 Per Cent" Crystal Set.

C. E. V. (Oxford) has good words to say for this "P.W." receiver, of which he has made three models. He also uses a one-valve "P.W." Plus-Former Amplifier, which when connected (in London) to a one-valve "Titan" gives him thirty-six stations. A cheap and useful team! The crystal set dies hard, indeed, but I do not think that in the matter of purity of results it now enjoys that measure of superiority over the valve which once it did.

SINGING IN SING-SING.



One of the most interesting wireless installations in America is that in Sing-Sing Prison. It consists of a set constructed by a convict, and operates a pair of 'phones in every cell besides 21 loud speakers.

Praise for the B.B.C.

WHEN I find anything praiseworthy about the B.B.C.'s activities I generally give the Corporation full measure, as an offset to the other kind of medicine. Now, I do think that they attend to their correspondence well—and they must get some ghastly queries, for I have written to them on a number of occasions. Last week I set them a poser. Something to do with times and one movement of sonata. In three days they replied, quite correctly, and without wasting a word. Good lads! Take a bun!

A Big British Enterprise.

AS is usual with us fool Britishers, the great communications enterprise, Imperial and International Communications, Ltd., took over the Beam

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

Services of the Post Office at the end of September and carried on without a hitch, but without any particular fuss beyond a few formal Press notices. One of the biggest firms of its kind in the world, if not the biggest, I. and L.C. controls, under the Government, the vital communications, both cable and wireless, of the Empire, and is going ahead to develop them. The Americans have set up a scream loud enough to be heard by Com. Byrd in the Antarctic, but it cannot abolish the fact that once more the old lion has made good use of the one eye it keeps open whilst "asleep."

Something Attempted, Something Done.

I PICKED this one up at the Radio Show. A man went away for some months, leaving his set in the care of a friend. On his return the friend gave an account of his stewardship, thus: "Well, old man, I'm sorry to say I've broken the valves and jammed three switches, besides cracking the panel. Still, I've one bit of good news. You know that your accumulator used to bubble when it was charged? Well, I've stopped that!"

Brand New Suggestion.

NOW let's be serious! T. J. (Norwich), who apparently reads nothing but "P.W." and the parish magazine, weighs in with one of those suggestions which astonish by their daring and originality. He says: "Would it not be excellent if we had a multitude of stations run as advertisements as in America? No licence to pay and crystal users could get any amount of stations." Yes, any amount—and all at once. Well, this revolutionary idea will be submitted to the B.B.C. with the request that they give it their sympathetic consideration. It ought to paralyse their power of pronunciation for six weeks at least.

"Back to Earth."

A READER from the London, S.E.4 district says that he does not believe that Mr. F. E. Stock (Brockley) picked up the "Bremen" at full loud-speaker strength, as reported on page 108 of "P.W.," September 21st. Both readers, I note, live in the S.E.4 district, so I hope that somehow they will arrange to meet and "have it out," though F. E. S. will have a difficult job to produce satisfactory evidence. I myself believe that with the "Sydney" Two the feat is quite within the bounds of possibility, under certain conditions.

"Do Accumulators Accumulate?"

I REGRET that by a mischance I missed "Detector's" letter on this subject in "P.W.," page 106, September 21st. Please turn to it. You see, he abolishes me in slashing style, but I stick to my point, and I repeat that accumulators do accumulate. But nobody said that they accumulate *electricity*, and if people think that they do, it is not my fault. When, however, I say that they accumulate chemical energy, and "Detector" replies "Nothing could be further from the truth," I can only ask him by what authority he says that,

"Ariel" Meets the Challenge.

"DETECTOR" challenges me to prove that an accumulator does any accumulating at all. Done! When the cell is discharged you can get no "work" out of it. When it is charged, it can be made to furnish "work." Obviously that "work" must have been delivered to it by the charging dynamo. Does "Detector" still say in the face of this that no energy is stored in the cell by charging it? Students of physics are taught that when "work" is done energy is transformed from one kind to another. So, when the cell gives "work" energy is being transformed. Where does the energy come from, "Detector"?

Sir A. Fleming Settles It.

SINCE "Detector" quotes books at me, I will give him a quotation which may, or should, command his respect. Sir Ambrose Fleming, F.R.S., the Grand Old Man of electrical engineering in this

SHORT WAVES.

Radio for Schools—Wirelessness.—"Daily Mirror."

Why is it that "Popular Wireless" doesn't need wheels to run on?
Because it is sure of its circulation.

"The new broadcasting station in Norway is to be re-equipped for long wave transmission," we read in a daily paper.
Out-of-work hairdressers, please note.

"Wireless for infirmity. Brightening the lives of sufferers," run headlines in the "Warrington Guardian."
But perhaps that's what they're suffering from.

UNUSUAL MODESTY OF A MICROPHONE ARTISTE.

Voice of Announcer (from loud speaker): "This is Station W.L.L.L. broadcasting."
Small Boy (who is quick at spelling): "Hey, pa, why doesn't that fellow give his full name?"—"Radio News."

"At present there is only one place where I can secure absolute privacy. That is in my bath. I view with some trepidation the coming of the day when, by television, my morning ablutions at St. Albans will be reflected on a screen in New York for the entertainment of the American cinema public." Dr. Furse, Bishop of St. Albans.—"Daily Mail."

"Chinese find wireless dull," we read in a contemporary. That's probably why they've started those matrimonial broadcasts we read so much about.

country, says in his "Wireless Telegraphist's Pocket Book," (p. 260): "In charging the cell we have to put into it a certain quantity of electricity and a certain energy. . . ." And also (p. 260): "This process is called charging the cell. It results in giving back energy to the cell, which can then be recovered in part as discharge current." If "Detector" now wishes to challenge Sir Ambrose he can confidently expect a much-needed lesson in physics.

Broadcast Broadcasting.

C. L. S. (Lewes) obliges with an interesting account of his reception of a concert in which each player was in a different country, namely, first violin in Milan, second violin in Paris, oboe in London, harpsichord in Berlin, and 'cello in Zurich. After a time there was a sort of "family coach" business and the first violin played from Zurich and so on. The time was kept

splendidly, each player being called in turn; then, a tap with the baton and the piece began. Quite a merry little stunt, but I see little future for that kind of performance.

News From Siam.

ANOTHER letter from Mr. P. Aram, radio engineer of the Siamese Posts and Telegraphs, contains a few alterations to the data given in these Notes for October 5th, H S 1 P J, 16.9 metres, transmits on Sundays from 12.00 to 14.30 and from 18.00 to 20.00. H S 4 P J sends on 37 metres; Tuesdays, 13.00 to 15.00 and 18.00 to 20.00; Fridays, 13.00 to 15.00. All G.M.T. Announcements in English, French, German and Siamese. Reports welcomed. Address: Radio Chief, Bangkok, Siam.

I Buy a Gramophone.

AFTER holding out for years, I have succumbed to pressure—exerted at every mealtime by "the family"—and have bought a wax-scratcher. "The family" argued that I could buy also all the pieces I have admired whilst listening-in, and thus enjoy any of them whilst the B.B.C. is handing out talks on the history of Cambodia, etc. I compute my favourite pieces at about 967, so I shall have to start saving pennies. Meantime I'll keep 'em busy with "Ol' Man River." What a blessing it is that one does not have to crank up a radio set!

Built-in Aerials.

I SEE that on a Long Island (N.Y.) estate houses are being built round aerials to avoid the erection of poles. Insulated wire, covered by moulding, is extended round the cornice of the roof and led-in down one corner of the house. The outlets are plugs one foot from the floor, these plugs also giving connection to mains current. In America, where nothing under five valves is tolerated, this type of aerial may be suitable, but I do not think that it would please the majority of set-owners here.

Wireless the Scapegoat.

AGES ago, when things went wrong, our ancestors generally put the blame either on one of their numerous deities or the family priest. Nowadays, their posterity in a direct line blame wireless waves. The latest crime attributed to radio is that it has caused many racing pigeons to lose their way. Professor Low is reported to have said that pigeons lose their sense of direction when flying near broadcasting stations. There are no more broadcasting stations in Britain now than last year, broadly speaking; yet the unusual losses have occurred this year. I say no more.

A Plea for Birmingham.

DO we not all agree that the Birmingham Studio Orchestra is one of the hardest-working and most welcome "turns" with which the B.B.C. favours us? Then are we not dismayed, for ourselves and for those artistes, that the B.B.C. is planning to reduce its numbers? The execution of this design will fall hard upon some people who have given us innumerable hours of jolly good music and won a place on our private honours list. Let not the blow fall, O Lord High Executioner!

ARIEL.

HOW "ANTI-MOBOS" WORK

A practical article about useful and interesting devices.

By H. A. R. BAXTER.

IN the usual way an anti-mobo arrangement is introduced into an L.F. stage on the lines of Fig. 1. A small non-inductive resistance is connected in series with the anode circuit of the valve being dealt with, and a moderately high-capacity condenser is taken to earth as shown. The direct purpose of the added devices is to prevent the circuit in which these are included from becoming coupled with any other anode circuit in the set through the common resistance of the H.T. supply.

The resistance of a brand new H.T. battery of the ordinary dry type, having a voltage round about 100, will be at least 50 ohms, and were it 300 ohms you could not call the battery a "dud." And after the battery has been in use some time its resistance will increase, as indeed it goes on increasing the whole time it is in service.

These hundreds of ohms of common resistance are capable of forming quite an appreciable coupling. There are two circuits included in the Fig. 1A Diagram, and these are coupled by the common resistance R. It matters little what constitutes these circuits; for instance, the one comprises an inductance L_1 and a capacity C_1 , and, of course, the resistance R. The other circuit includes a resistance R_1 , an inductance L_2 , and that same resistance R.

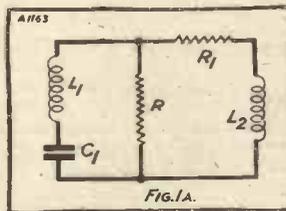
Not Strictly True

If an alternating current flows through either circuit, it will set up an alternating current in the other, and the amount of energy which is passed on in this way will depend upon, amongst other things, the resistance of that factor R.

In describing an anti-mobo device, it is frequently said that the "decoupling resistance" offers a barrier to the energy, while an easy path is afforded through the fixed condenser. This is not strictly true.

But you can, if you like, regard the large fixed condenser as a low resistance bypass path. This path falls across the anti-mobo or "decoupling" resistance as it is sometimes called, and the resistance of the H.T. battery. The resistance of the decoupling component is purely ohmic and, from an A.C. point of

view, it can stand at its specified value for our purposes. The same thing applies to the internal resistance of the H.T. battery, although the self-capacity of this tends to render it a less potent coupling factor than its same figure of ohms would sometimes seem to indicate.



The mere paralleling of 100 ohms across that common resistance in the form of the H.T. battery, does not constitute a completely satisfactory bypass. And regarded in that light, the anti-mobo resistance itself does nothing but lift the effective resistance a trifle. Actually the work of the anti-mobo goes much deeper for it sets up an intermediate circuit, a buffer circuit if you like, between the anode circuit in which it is incorporated, and any other anode circuit.

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An Unsatisfactory Bypass

The 2-mfd. fixed condenser completes an A.C. circuit in conjunction with the valve and the primary winding of the L.F. transformer as at A in Fig. 3. Then comes an intermediate circuit, B, embodying the anti-mobo resistance, the fixed condenser, and the H.T. battery which is shown in the form of a resistance. Coupled to this is circuit C, which can be any other anode circuit.

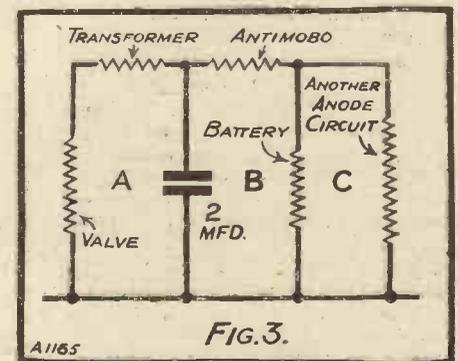
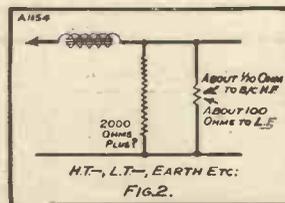
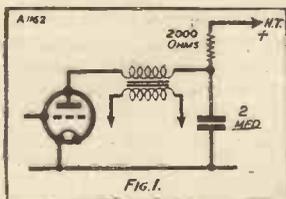
In order for any of the energy that may

be generated in circuit C, to be passed back to circuit A, the following process has to be gone through. The energy is passed on from circuit B to circuit C through the common-resistance coupling that the battery forms. The amount of energy that gets through will depend upon, firstly, the initial energy in circuit B, and then the relation of the resistance of the common resistance (battery) to that of the resistance of the anti-mobo plus that of the fixed condenser.

The greater the value of the anti-mobo resistance in relation to the resistance of the battery the less the energy passed on. You can look at it from the potentiometer point of view. The coupling is a weak one, because the resistance of the battery will be only of the order of a few hundred ohms while that of the anti-mobo resistance will range into thousands of ohms. The next step is the passing of energy from B to A, although there will not now be very much energy to pass on.

Very Weak Couplings

The coupling between the circuits B and A is the fixed condenser, 2 mfd. in value, and again the effectiveness of this coupling will depend upon the relation of the A.C. resistance of the fixed condenser to the resistance of the rest of the circuit, and this embodies the valve and the transformer winding. As you can see, this coupling will be a remarkably weak one, for the resistance to ordinary L.F. impulses of the fixed condenser will be only at the most a hundred or so ohms, while the valve and transformer together will have a resistance of many thousands of ohms.



LATEST BROADCASTING NEWS.

ARMISTICE APPEALS.

FORTHCOMING TALKS—NEW TALKS SERIES—"ONE UP" FOR SCOTLAND—THE PICK OF THE PROGRAMMES.

LADY HAIG will be heard by listeners on Sunday evening, November 3rd, when she broadcasts an appeal on behalf of the three ex-Servicemen's factories in Scotland, in one of which, at Edinburgh, the famous Flanders' Poppies are made. An appeal will also be made on behalf of the Lord Roberts' Memorial Workshops in Edinburgh, where ex-Servicemen are engaged in the manufacture of brushes, a cabinet factory at Dundee, and other workshops at Inverness, where disabled soldiers make wooden household goods and farm fittings.

The object of the appeal is to call attention to the productions of these factories as well as for financial assistance to enable their work to be extended. Another notable personality who is to appear before the microphone is Viscount Allenby. He will be heard on Sunday, November 17th, when he speaks to London and 5 X X listeners on behalf of the Crippled Boys' Home.

Admiral Jellicoe will broadcast a general appeal for the British Legion from a London studio on Saturday, November 7th. This is understood to be arranged specially to meet the wishes of the Prince of Wales, who did not desire to have his speech broadcast from the Royal Albert Hall on November 11th.

Forthcoming Talks.

The series of talks entitled "Points of View," to which many well-known people have contributed, will be summed up by Mr. Lowes Dickinson at 9.15 p.m., on Monday, November 4th. Earlier the same day, Mrs. Winifred Spielman Raphael will give the last of her series of talks on "Commonsense in Household Work," in which she will reply to some of the questions put by listeners as a result of previous talks in the same series.

Tuesday, November 5th, brings one of the first intimations of the rapid approach of the festive season, "Early Preparations for Christmas" being the title of a few hints which Mrs. Edith Martenek is to give to housewives, mainly in the direction of food. Another talk worthy of mention is the fourth in the series of talks of special interest for motorists, when Mr. H. C. Lafone, who is associated with the "Autocar," will speak on "Some Automobile Reminiscences—Grave and Gay." Mr. Lafone is due to speak in the London studio at 7 p.m., on Tuesday, November 5th.

New Talks Series.

Mrs. Mary Agnes Hamilton, M.P. for Blackburn, is inaugurating a new series of talks in the London studio on Wednesday morning, November 6th, when she will speak under the general head of "The Week in Parliament." This series, to which various M.P.'s will contribute, will go on

weekly during the Parliamentary Session, the second talk being by Her Grace the Duchess of Atholl.

"One Up" For Scotland.

Once again have the officials in charge of Scottish broadcasting beaten their English colleagues in arranging several running commentaries on both Rugby and Association football matches during the present season. The blame for this may not rest entirely with the people at Savoy Hill, but listeners on the south of the Tweed will certainly be envious to know that among the games to be described to Scottish listeners is that between Motherwell and Celtic, which is to be played on Saturday, November 9th.

The Pick of the Programmes.

There are many things in forthcoming programmes from London. Daventry (5 X X) and 5 G B, that are far too good to omit from these notes.

There is, for instance, the Hallé Concert, on Thursday, October 31st, which Sir Hamilton Harty is to conduct. The programme includes Liszt's symphonic poem "Mazepa," and the Sibelius "Concerto for Violin, opus 47," the solo part of which

will be played by Arthur Catterall. Julian Rose, the Hebrew comedian, pays another visit to the London studio, on Saturday, November 2nd, to take part in a revue called "Ikey Gets His." It should be a good show. So should the entertainment by Clapham and Dwyer's 1929 Concert Party, which is to broadcast from 5 G B, on Wednesday, November 6th. This party had a wonderful season at various seaside resorts during the

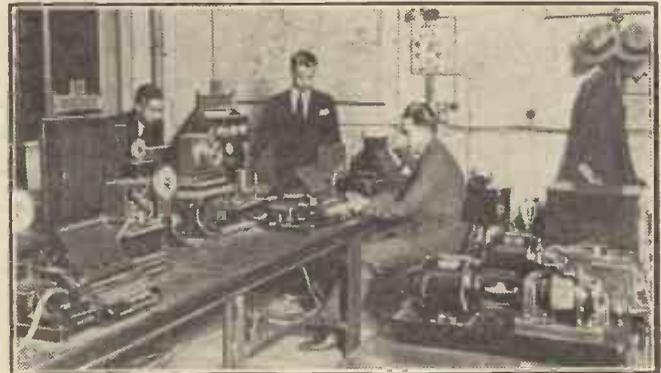
summer. On the same evening, Compton Mackenzie's "Carnival," adapted for the microphone by Holt Marvell, will be repeated for London and 5 X X listeners.

Birmingham offers a new musical comedy called "Mayneshah, a Salty Tale of the East," on Thursday, November 7th. The characters include tons of Oriental big bugs—a Sultan, a princess, a duke, a prince—and plenty of sparkling music. On the same evening London listeners will hear music, singing, and dancing relayed from a real Russian cabaret.

Tommy Handley, Helen Alston, Jack Richards, and Winifred Durk, with the D'Alton Quartet (members of a Northampton family who frequently appear with Mario de Pietro's mandoline and guitar orchestra), are in a vaudeville show from 5 G B on Friday, November 8th, and the week finishes with a production of Harold Chapin's London drama, "The Dumb and the Blind," described as the author's best play.

Looking even further ahead, there is a very interesting broadcast from the Odd-fellows' Concert at the Queen's Hall on Saturday, November 16th, when Mr. B. Walton O'Donnell will conduct the Wireless Military Band.

SIGNALLING AT THE SENATE.



This is the radio installation in the Madrid Senate House, used in connection with the Society of Nations.

TECHNICAL NOTES.

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

ABSORPTION OF RADIO WAVES

DETAILS OF SOME INTERESTING EXPERIMENTS IN THE UNDERGROUND RECEPTION OF BROADCASTING.

SOME very interesting experiments have been made by Professor A. S. Eve, of McGill University, Montreal, on the question of passing radio waves through earth matter such as rock, limestone, sandstone, and so on. These experiments have shown that radio waves of the ordinary broadcast wave-length can pass through at least 300 ft. of rock.

In some tunnel experiments he found that the broadcast waves could be heard through the entire length of the tunnel, which was three and a half miles, but short waves of about 40 metres could not be detected more than a few hundred feet from either end of the tunnel.

The problem was to find out how the waves entered the tunnel. One idea was that they penetrated the rock, another was

that they came in through the entrance, whilst a third was that they were conducted along the rails and electric wires. Professor Eve believes, as a matter of fact, that all these three methods play a part.

By carrying out experiments in caves, where there were no metallic conductors and where tortuous passages effectually sealed off the entrance, it was found that the broadcasting was received through 75 ft. of rock on a loop aerial, whilst with an extended aerial signals were received through 300 ft. of rock.

Extremely Interesting Results.

Then a coil of wire, 100 ft. in diameter, was laid on the ground above and excited by an oscillating current. These waves

(Continued on page 411.)



L.S. Extension Wires.

J. M. (Barnstaple).—"I am going to run some loud-speaker extension wires from my set to a room upstairs, and have been told that it is advisable to isolate them from the H.T. Would you advise the use of an output filter or an output transformer, and what are the advantages of each?"

Personally, I should use an output transformer if the self-capacity of the leads is likely to be high. Then one uses a second transformer at the loud speaker and the solution is complete, because by stepping down to the cable and up again to the loud speaker, one can disregard the cable self-capacity in a simple way.

If the self-capacity of the cable is not likely to be serious, I suggest that comparative cost is the only factor—a good transformer versus a good filter. In any case, don't have H.T. running about the house.

A Constant Howl.

L. M. N. (Hull).—"Every time I switch on my receiver a howl occurs which gradually builds up in strength. The howl is of one constant frequency and is unaffected by variation of the tuning controls.

"I notice, however, that the trouble is not so bad when I move the loud speaker away from the set. Can you explain this trouble, and suggest how best it can be cured?"

If you strike one of your valves with your finger nail, the set being switched on, your loud speaker will go "pong." But if your loud speaker makes a big "pong," this will shake the valve like it was shaken by your finger nail, and make the valve go "pong"—which makes the loud speaker go pong, which makes the valve go *poong!*

The cure is obvious. Better lid to the set; stand loud speaker on soft material; turn the speaker away from the set; cover the set up, etc., etc.

Valves For Push-Pull.

G. L. D. (North Foreland).—"Is it necessary to employ similar valves in the

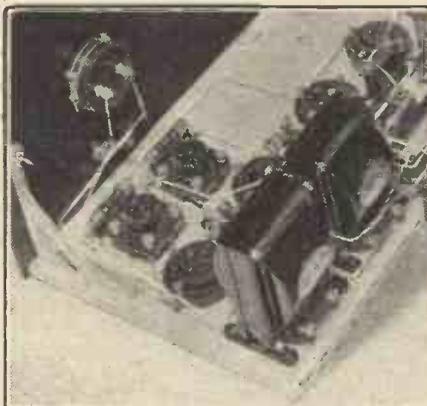
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Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those coming to the Query Department in the ordinary way will be dealt with by him.

* * * * *

output stage of a push-pull amplifier? If this is so, would it not be better to employ matched valves?"

Certainly the valves must be similar, but any two of the same type of valves manufactured by a reputable manufacturer will match near enough.



The push-pull stage of a typical amplifier, such as is discussed above.

Curing Distortion.

J. S. K. (London, S.E.).—"I have a Det. and 2 L.F. receiver, the L.F. side being transformer coupled, and I find that there is a tendency for distortion to occur unless a '25-meg. resistance is connected across the secondary of the second transformer.

Is this method of producing stability a satisfactory one?"

The connecting of a resistance across a transformer is such a universal palliative for reproduction troubles that I should hesitate to condemn it out of hand.

It is not very scientific, and if the set was properly designed from end to end it could either be necessary or not depending on the design. My advice is to leave well alone, and if you are satisfied to leave the transformer shunted it may be doing just the right thing.

Why Signals Are Stronger At Night.

E. A. (Sittingbourne).—"I am getting very good results from my four-valve set, which seems to be very sensitive and satisfactory for bringing in Continental stations.

"I notice, however, that all my best results are obtained at night. In daylight it is practically impossible to tune in any distant broadcasts. Why is this?"

Distant reception owes its efficiency to the action of a layer of ionised gas said to hang like a cloud some sixty miles above the Earth's surface.

The direct or ground waves from a station friter themselves away in contact with the earth, but waves radiated upwards from the transmitter hit the inner side of the ionised layer (called after the name of the man who originally postulated its existence the Heavyside layer) and are reflected down on to the earth again, where they can be picked up at surprising distances, even though they fade due to the inconstant nature of the upper layer.

This layer is only effective in reflecting waves of the length used in broadcasting at night, hence distant reception of broadcasting stations is in general only possible at night. Very short waves are reflected during the day as well, if their length is adjusted to suit the world path and the state of darkness and light, etc. Hence the beam system, by choosing proper waves, can work over 24 hours.

B.B.C. EXPENSES.

The likelihood of the B.B.C. requesting more of the licence money to defray the cost of the new stations and Broadcasting House is discussed

By THE EDITOR.

AS we reported exclusively in a recent issue of POPULAR WIRELESS, it is likely that, in view of the considerable expense which the B.B.C. has entailed in connection with the building of the Regional Scheme stations, and the new headquarters in Portland Place, representations will be made to the Postmaster-General for a larger share in the broadcasting licence revenue.

Balance Deficit.

Our readers will remember that when Sir William Mitchell Thomson was Postmaster-General he referred to 1929 as the possible date on which the B.B.C. might be allowed to have a larger proportion of the licence revenue if the financial situation warranted it. It is interesting to note that in the financial year of 1928 the share of licence revenue of the B.B.C. fell short of revenue expenditure by £7,560, although in the previous year there had been a credit balance of £27,669.

The income for 1928 was derived as follows:

Licences	£871,763
Publications	£120,635
Interest on sundry receipts	£10,107

Making a Total of £1,002,505

The principal items of expenditure were:

Programmes	£538,990
Plant, Power, etc.	£160,455
Rent, Rates and Taxes	£77,999
Administration and salaries	£56,211

the total expenditure amounting to: £879,324

If the B.B.C. decides that it wants more money, the claim would be a just one. However, whether the Post Office will be induced to part with its "rake off" from wireless licences remains to be seen. If the B.B.C. experience any difficulty in receiving further sums of money which they are entitled to, there is no doubt that the Post Office's refusal to acquiesce to the B.B.C.'s demand will result in a first-class public controversy.

Too Much Deducted.

There has always been a good deal of resentment because of the Post Office's deduction from the income from wireless licences, and we should welcome an opportunity which would enable the situation to be cleared up once and for all. As far as we know, there is no law in existence which empowers the Post Office to deduct such a large percentage as 12½ from the gross wireless licence income.

Certain it is that expenses are more than covered by this 12½ per cent reduction, and there must be a very large sum of money retained by the Exchequer which should by rights be in the coffers of the B.B.C. for expenditure on programmes and other branches of the broadcasting administration.

Our readers will remember that some months ago the B.B.C. decided not to broadcast the titles of dance tunes. The B.B.C. gave it as a reason that the announcing of dance titles caused friction which nearly developed into a scandal because of song plugging.

Titles To Be Given.

In other words, the B.B.C. found out that its arrangement for the broadcasting of dance tunes was being made use of in the extensive way of song plugging, that is dinning in the titles of songs and tunes so that listeners were more or less at the mercy of an unpleasant system of advertising; at the same time some of the best song and dance tunes were ignored because of this system.

In 1927 it was found that certain music publishers were getting unfair publicity

THE "MAGIC" THREE.

The Editor, "Popular Wireless."

Dear Sirs,—This is the first time I have ever written an appreciation of any set, but I must say that the "Magic" Three is all you claim for it. I got "P.W." on the Thursday, and was favourably struck with the circuit so decided to pull my set down and build the "M.T."

I finished it on Saturday, having to wait until pay-day to get a couple of odds and ends, but had it going O.K. by 8 p.m., stations rolling in on the medium range. The volume is quite surprising on Continentals, quite as loud as 2 L.O. and so easy to tune in; in fact, you cannot help but get them. I am not used to potentiometer control yet, but guess I have found it all right and also found the set all right.

It is wonderful for just a Det. and 2 L.F. It seems unbeatable, and I cannot see it even being improved much. Thanks for a real set for a person with a limited purse. There is no need to pay fancy prices.

Yours faithfully,
F. J. RADFORD.

West Ham, E.15.

for their particular numbers because of secret arrangements with orchestra leaders, while other music publishers who did not negotiate on these lines were found to be justified in complaining that even when they brought out first-class popular numbers, for which there was a large public demand, orchestras refused to play them, and consequently B.B.C. listeners never heard them.

The B.B.C. have since tried to solve this problem of plugging by having an arrangement with one particular music publisher, but it appears that this attempted solution has not proved satisfactory. Certain it is that when the B.B.C. stopped announcing dance tunes, listeners wrote in in their thousands demanding to know the reason why. Publishers were also worried, and fresh negotiations were started between them and the B.B.C. which have resulted in the B.B.C. announcing that, as from November 1st, titles of dance tunes will again be broadcast.

It is to be hoped that this pernicious system of plugging will not be continued. If it is, the only remedy for the B.B.C. is to cut out all outside dance bands and rely on its own very excellent dance band under the able leadership of Jack Payne.

The Dramatic Criticisms.

The following letter was sent out with tickets for the first performance at the St. James's Theatre of Mr. Roland Pertwee's new play, "Heat Wave":

"The management of the St. James's Theatre will be obliged if you will kindly co-operate with them in safeguarding this invitation from being used for the purpose of broadcasting a notice of the play from any station of the British Broadcasting Corporation. The invitation is intended to meet the convenience of legitimate journalism, exclusive of broadcasting."

As a result of a recent broadcast dramatic criticism theatre-managers are—with the exception of Mr. Cochran and one or two others—dead against the B.B.C.'s policy of "reviewing" plays by radio, and the above letter is a good indication of how the theatre managers feel about the matter.

Mr. Horace Collins, secretary of the Society of West End Managers, stated the other day:

"All our members have been consulted in the matter, and I think the objection to criticisms of new plays being broadcast will be solid.

"So far, 75 per cent. of members have replied, and all of them are against the practice."

B.B.C.'s Reply.

A B.B.C. official said:

"We have stated our attitude in the matter several times. We employ a competent critic, in whom we have full confidence, to criticise plays for the benefit of listeners.

"We have never sought permission to attend a public performance and we do not intend to do so."

We understand the B.B.C. will, in future, purchase first-night tickets for its dramatic critic, and that broadcast criticisms of plays will be continued. So that's that!

INTERESTING ITEMS

Whistling and howling noises may be due to bad spacing between your components or to badly-spaced wiring, particularly if the spacing between grid and plate circuit is inadequate.

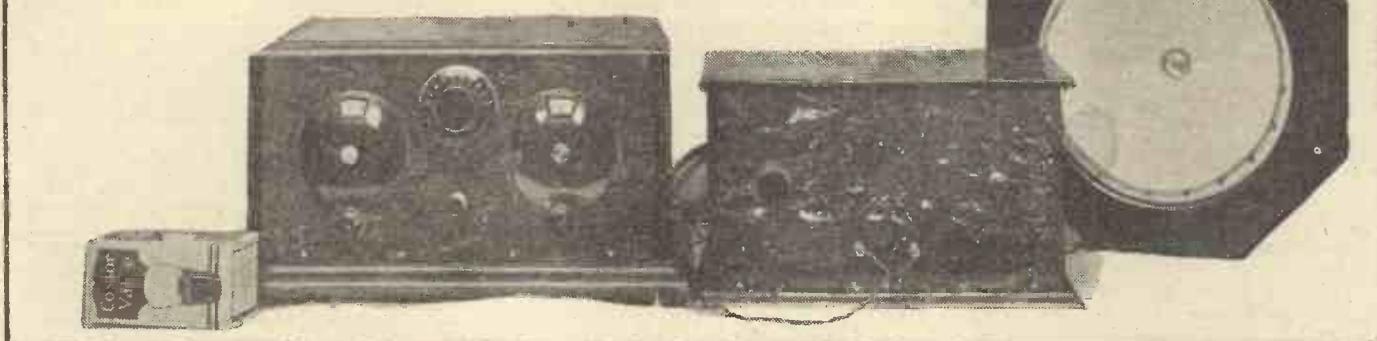
Flat tuning is sometimes due to a leak across a panel, condenser end plate, or similar insulating surface.

In general an L.F. valve should be given as much high tension as its makers specify, with the correct grid bias for that anode voltage, as this is a great aid to pure reception.

Do not forget that an earthing switch or lighting arrester should be protected from the weather, if possible, and in any case should receive an occasional overhaul.

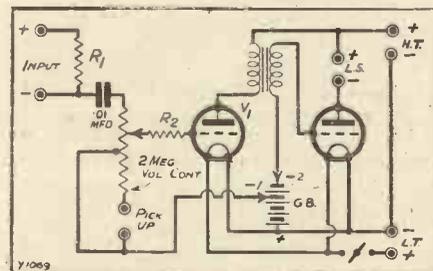
Disconnecting the aerial wire from the set to see whether this has any effect upon interfering noises is a very good rough-and-ready test, when it is uncertain whether the interference is atmospheric or due to trouble in the set itself.

THE "VANGUARD" AMPLIFIER



IN describing the "Vanguard" Two recently, we explained a pet theory of ours to the effect that one of the best ways for anyone to progress from a small set to a comparatively large one was to do it in two stages.

We suggested that anyone thinking of taking this step should build first of all a two-valve unit consisting of one high-frequency stage and a detector, and thus quickly get some sort of outfit working again, after which he could at leisure build a low-frequency amplifier and so obtain the desired complete powerful loud-speaking outfit. We have already given you a carefully worked-out design for the H.F. and detector portion of such an outfit, in the form of the "Vanguard" Two and now follows the amplifier.



We have tried to make this design a particularly useful and universal one. Not merely does it suit particularly well the "Vanguard" Two, with which it matches up very nicely in appearance and panel layout, but you will find it can be regarded as a good standard design for all sorts of purposes. We have spent a good deal of time on this aspect of the design, and as a result you will find that it can be used with practically any set which requires L.F. amplification to bring the signals up to loud-speaker strength.

Ideal For General Purposes.

For example, this is an ideal amplifier for anyone who possesses a single-valve or crystal set, and wants to change over to loud-speaker reception, and it is also a very useful outfit for gramophone reproduction, for which purpose it possesses certain rather useful special features.

We should like to stress this point a little because we do not want the reader to imagine that because this amplifier was originally intended to form part of the "Vanguard" outfit, it is not equally suitable for all sorts of odd purposes. It can be added, as a matter of fact, to

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Here is the companion unit to the "Vanguard" Two, in the form of a neatly-designed and efficient two-stage amplifier with several special features.

By THE "P.W." RESEARCH DEPARTMENT.

* * * * *

practically any small set, and it does not even matter whether H.T.— is connected to L.T.— or +, in the set, so long as you follow out carefully the instructions we shall be giving you later in regard to battery connections to the amplifier.

How Much Magnification?

If you take a look at the diagrams and photographs you will see that the main portion of the amplifier is quite straightforward, consisting of that well-tried arrangement, one resistance and one transformer-coupled stage. This combination gives good amplification, and is a very desirable one for use in any universal type of amplifier such as this. Higher magnification could be obtained, of course, by using two transformers in the modern fashion with anti-battery coupling devices, but such an amplifier cannot be expected to suit any and every set in the way that the present one does.

For example, if a two-transformer type of amplifier with its very high power were added to the "Vanguard" Two, we should find that we were getting decidedly too much amplification, because we already have a good H.F. stage at work, and so all the signals fed into the L.F. amplifier are moderately strong ones. As a result, the last valve would be tending to overload all the time, and hence our choice of a more moderate degree of amplification for the "Vanguard" Amplifier.

The regular reader may wonder how we can reconcile this statement with our recent use of two transformer-

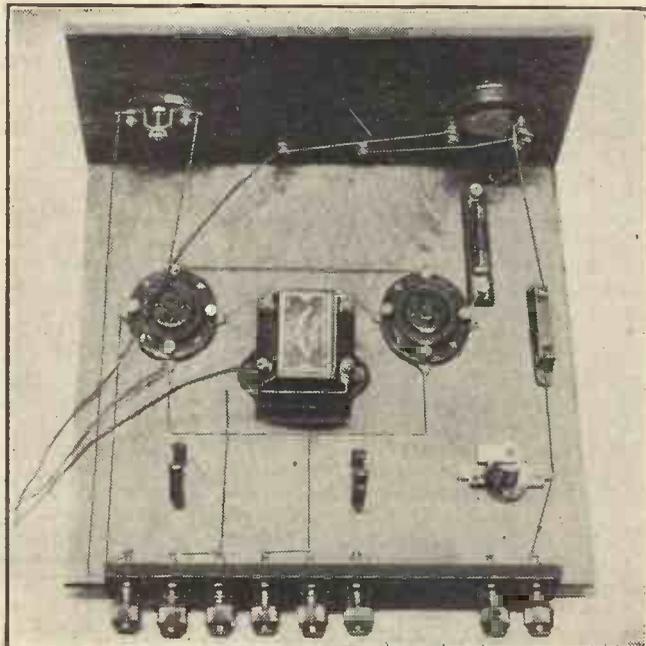
coupled L.F. stages in the "P.W." Four, which also contained a stage of screened-grid H.F. amplification, and perhaps we had better explain this point. The fact is that the "P.W." Four is a rather unusual type of receiver, in that, although we have a screened-grid H.F. stage, that stage is arranged to give very high selectivity rather than the maximum possible magnification. As a result, the output from the detector valve is not so strong as to cause these overloading troubles.

Simplicity and Economy.

Actually, we provided this powerful L.F. circuit in the case of the "P.W." Four in order to take the medium-strength signals from the detector and build them up to the full-strength output required in a modern four-valver. It was a case of getting high selectivity and moderate magnification from the H.F. stage, and then relying upon a very powerful L.F. side to bring up the overall performance of the set to the desired level.

An incidental advantage of the use of the more moderate magnification arrangement of one transformer and one resistance stage is to be found in the simplicity (and hence economy) of the practical layout of the

(Continued on next page.)



The layout permits very neat and direct wiring to be achieved quite easily.

THE "VANGUARD" AMPLIFIER.

(Continued from previous page.)

amplifier. Such an arrangement does not, as a rule, require anti-battery-coupling devices to make it stable and you will note that there is no anti-motor-boating filter on the amplifier, and not even an output filter for the loud-speaker connections.

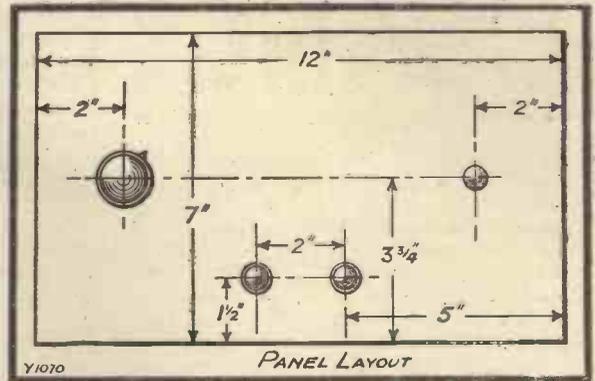
When to Add a Filter.

This last, of course, is something of an optional point, because, although it may not be needed to prevent battery coupling in the great majority of cases, yet if you use a super-power valve in the last stage it is then rather a desirable fitting, in order to prevent the loud speaker being connected directly in the anode circuit of the valve.

If you desire to use a super-power valve,

therefore, we would certainly advise you to incorporate an output filter actually in the design, unless you possess one which can be joined up as a separate unit, and this is how you can do it. You will require two additional parts, namely a 2-mfd. condenser and an output-filter choke of something like 20 henries inductance, and a D.C. resistance of not more than 500 ohms and preferably rather less.

Here are the necessary modifications. You will find that you can mount the parts in the rear corner of the set, at the left-hand end (looking at the amplifier from the back). In order to get enough room, you may find it necessary to move the grid-bias battery clips over towards the right a little bit, or even, if your L.F. choke is a very large one, to transfer the battery



to a position on the inside of the cabinet at the back.

These are the alterations in connections required. First of all note that there is a lead from H.T. + to L.S. + on the terminal strip. Remove this and instead connect H.T. + to one side of your output choke. Note also the wire from the plate of the last valve to the L.S. - terminal. Remove this and instead wire the plate of the valve to the remaining side of the output-filter choke and to one side of the 2-mfd. condenser. Wire the remaining side of the condenser to the L.S. - terminal. Wire the L.S. + terminal to H.T. - and the job is complete. When this is done, by the way, the loud-speaker terminals no longer have any polarity, since there is no direct current passing through them, and so it does not matter which way up you connect your loud speaker.

Stopping H.F. Currents.

There are just two special features of the amplifier which we ought to explain before we go any further, and these are first of all the H.F. stopping resistance R_2 in series with the grid leak of the first valve. This is intended to prevent ill-effects arising from H.F. currents making their way into the amplifying circuits, and the resistance can be of any value from about 100,000 ohms up to a quarter megohm. Something of the anode resistance or grid-leak type will suit here.

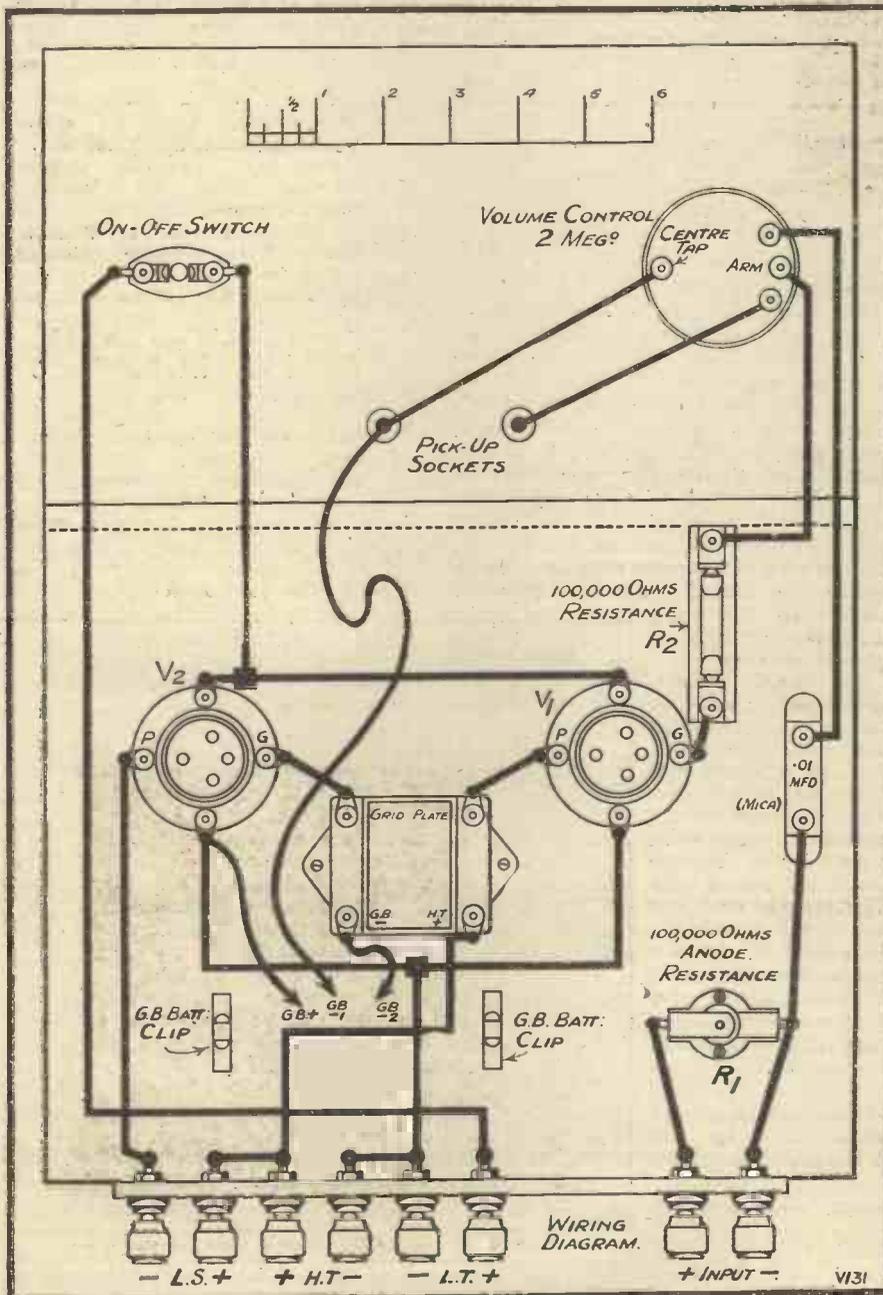
The other feature is the use of a special "fader" volume control, which combines the function of a volume control and a change-over switch for going over from radio reception to a gramophone pick-up. This is a rather attractive little device, because it enables you to fade down the radio reception, pass through a silent point, and then fade up on the other side into gramophone reproduction quite smoothly and progressively and without any click at the moment of changing over. Quite useful for impressing non-technical listeners!

The Special Volume Control.

The required control is simply an ordinary type of volume control with an extra tapping point on the resistance element, which is shown as a centre tap on the wiring diagram. Besides its "stunt" value, this arrangement is a genuine convenience in operation, and, of course, simplifies matters somewhat by replacing two separate components, namely, the usual volume control and a change-over switch.

Two small sockets are provided on the panel for the connections from the pick-up, and the idea is that the pick-up leads shall

(Continued on next page.)



THE "VANGUARD" AMPLIFIER.

(Continued from previous page.)

be furnished with two small plugs at their ends so that they can be inserted in the sockets. This, you will find, is rather a convenience in use, since it means that you can disconnect the pick-up leads in a moment and so are not obliged to have a permanent long trailing lead from the gramophone.

Now, just a word about the value of the coupling resistance in the R.C. stage. This is actually of only 100,000 ohms, and you may wonder why so low a value should be chosen, since it will presumably follow a



The dimensions and panel layout of the amplifier have been arranged to make it match up nicely with the companion unit.

detector valve. Well, the point is that we have found that with the more modern types of detector valves, with their somewhat lower impedance, the 100,000-ohm resistance gives ample magnification and permits somewhat better reaction control to be obtained on the preceding detector stage than the more conventional value of 250,000 ohms. This value of 100,000 ohms is therefore becoming a standard in POPULAR WIRELESS sets.

Constructional Hints.

Now, there are two points about the construction of the amplifier which we should like to give you. It is a pretty straightforward job, and there are no special dodges about the assembly and wiring-up, but there are just a few minor details requiring explanation. First of all, about the grid-bias battery. You will see in the photographs how it was mounted in the original amplifier, and you will note that certain leads run underneath it on the baseboard. These leads should obviously be insulated ones, and you can make your choice of bare wire covered with Systoflex sleeving or one of the special covered materials like Glazite.

It certainly is not advisable to leave these leads bare, because you may get partial short-circuits developing if the grid-bias battery becomes a trifle damp. If you like to make doubly sure on this point, you could quite well avoid taking the two wires in question under the grid-bias battery, and run them by slightly longer routes round its two ends. They are not critical wires, and it will not matter in the least if you make them a little longer than you see them on the original design.

The practice of providing an earthing

point on the frame or core of L.F. transformers appears to be coming into favour again among manufacturers, and if the specimen you use is so provided by all means make use of it. Connect up this point to any convenient spot on the filament circuit. This generally provides a slight extra degree of stability, and although there is not much need to worry about stability in an amplifier of this type, it is just as well to be on the safe side.

Now for connecting up the finished amplifier. First of all, join up the positive and negative input terminals to the telephone terminals on the receiving set, and be careful to see that you get them the right way round. The one marked + should be joined to that telephone terminal which is wired inside the receiving set proper to H.T.+, and the negative input terminal should go to the telephone terminal which is wired to the plate or H.F. choke of the detector valve.

Easily Checked.

If you cannot quite make out which is which of your telephone terminals, it is quite a simple matter to find out by test. Connect up the input terminals either way round, and note whether the amplifier works. If it does not, reverse the leads.

Your loud speaker is, of course, to be joined up to the L.S. terminals on the amplifier, and an accumulator of suitable voltage to the low-tension positive and negative terminals.

Now comes the important point. If you are using the same batteries for the set and for the amplifier, do not on any account make any connection to the H.T. - terminal on the amplifier. Leave this terminal entirely blank and merely connect the H.T. + terminal on the amplifier to a suitable positive point on the H.T. battery. Normally, of course, this should be the highest positive point available.

The pick-up connections we have already dealt with, and we can go on now to the choice of suitable valves and to battery voltages. Voltages are simple. The L.T. battery will normally be the same one which runs your set, and you will choose valves of a suitable filament rating to work thereon.

The H.T. voltage should not really be less than 120 volts for best results, but, at a pinch, you can use only 100 providing you remember that you will not now be able to handle quite such powerful signals without distortion. Preferably, however, use a full 120 volts, or even 140 or so if your valves are rated to stand this higher figure.

The valve types should be these. For V1 you want a valve of the H.F. type with an impedance of round about 20,000 ohms, any figure from, per-

haps, 18,000 to 30,000 being quite suitable. In the second stage (V2) you want either a power or super-power valve, and the reader will no doubt understand how the choice is made here.

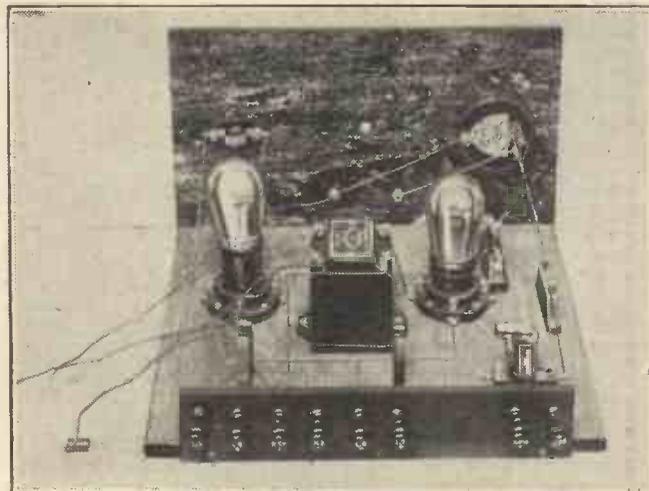
Grid Bias Adjustments.

Grid-bias voltages will be somewhat as follows: G.B.—1 is for the first valve, and the usual figure of 1½ to 3 volts should be applied to this plug. (Insert the G.B. positive plug in the positive socket of your grid-bias battery and place G.B.—1 in the

COMPONENTS REQUIRED.

- 1 Panel, 12 in. x 7 in. (Radion, Becol, Kay Ray, Goltone, Ripault, Paxolin, Trelleborg, etc.).
- 1 Cabinet and baseboard, 10 in. deep (Raymond, Pickett, Osborn, Camco, Ready Radio, etc.).
- 1 2-meg. "Fader" volume control (Magnum, Centralab).
- 1 L.T. switch (Lotus, Lissen, Igranic, Benjamin, Bulgin, Keystone, Raymond, Ormond, Wearite, etc.).
- 2 Small sockets and plugs for pick-up leads (Clix, Eelex, etc.).
- 2 Sprung valve holders (Lotus, Benjamin, W.B., Igranic, Wearite, Formo, Bowyer-Lowe, Dario, etc.).
- 1 Low-ratio L.F. transformer (Varley, Ferranti, Brown, Lissen, R.I., Philips, Telsen, Cossor, Igranic, Lotus, etc.).
- 2 100,000-ohm resistances (Igranic, Ediswan, Lissen, R.I., Dubilier, Varley, Precision, etc.).
- 1 .01-mfd. fixed condenser (Magnum, Lissen, T.C.C., Dubilier, Goltone, Clarke, etc.).
- 2 Grid battery clips (Bulgin or similar type).
- 1 Terminal strip, 10 in. x 7 in. x ½ in.
- 8 Terminals (Belling & Lee, Eelex, Clix, Igranic, Burton, etc.).
- Wire, screws, G.B. plugs, etc.

1½ or 3-volts negative socket.) The plug G.B.—2 is the one for the second valve, and the voltage required here will obviously depend upon the particular valve you are using. With the ordinary power type about 6 or 7½ volts will usually be correct with a moderate amount of H.T., but you should really be guided by the maker's data slip which you will receive with the valve. With a super-power valve considerably more grid bias is necessary.



Finished and ready for the insertion of the grid-bias battery.

FROM THE TECHNICAL EDITOR'S NOTE BOOK

Tested and Found-?



A USEFUL INSTRUMENT.

THE Waters Panel-mounting Test-Meter will, we predict, prove very popular with constructors. With it you can measure L.T. volts up to 6, H.T. up to 150, and H.T. current, in milliamps, up to 30. It is said to be the first instrument for



The Waters Panel-mounting Test-Meter fixed on a piece of ebonite to illustrate its layout when in use.

panel mounting that measures these values on one dial.

There is a bakelite plate fitted with eight coloured, circular discs, and three two-point plugs for inserting in the centre holes in these discs. The connections necessary for giving the various indications are clearly shown on a neat ivory tablet which is placed on the panel just below the meter.

The meter connections are, of course, permanently wired up when you build the set, and you do any particular job of measurement by simply shifting the plugs. Thus you can see any time at a glance whether your L.T. and H.T. battery is in condition, or test for distortion. The use of this meter makes all the difference between the haphazard operation of a set, which is all too common, and an easy although scientific maintenance that ensures consistently good results.

The test-meter is a neat, very well made affair, and it undoubtedly adds to the panel

appearance of a set. And its price is not a matter of guineas, for it is available absolutely complete with instruction book at the remarkable price of 13s. 9d. On all three ranges it is reasonably accurate and, judging by the sample we have tested, readers need have no hesitation at all in accepting the verdicts of its readings.

EXACT TUNERS.

Two small panel holes are all that are required to fix the Exact Aerial Tuner, a product of the Exact Mfg. Co., of Croft Works, Priory Street, Coventry. The Exact tuner covers a range of from 250 to 2,000 metres and eliminates the necessity for plug-in coils or wave-change switching. It is a nice little piece of work.

There is a panel plate over which ranges a knob and pointer. In the main the device consists of two coils, one of which is tapped. The back portion is the reaction coil and swings away, the smooth control being given by the second small knob. The movement is completely even and there is no backlash whatever. Extremely close adjustments are possible. The whole occupies a very small space and is easy fitted to any panel. The price is 14s., and a very attractive figure it is, too, considering that it needs but a .0005-mfd. variable condenser in parallel to complete the reaction and tuning portion of a set, over the wave range mentioned above.

I have tested the tuner and find it functions well, the reaction being particularly smooth over the whole of the band covered. There is also the Exact Aerial and Anode Tuner outfit, which comprises all the inductances needed for an H.F. tuned-anode set. The aerial tuner portion comprises a tapped coil device, which is really the Exact Aerial Tuner above-mentioned, without the reaction adjustment. The reaction arrangement is embodied in the Exact Anode Tuner. The price of the outfit complete is 30s., and, again remembering that this covers from 250 to 2,000 metres and is the equivalent of no end of coils, it makes an attractive proposition. I fixed this Exact Anode Tuner in an H.F., Det., L.F. set, and must say the results were very good indeed. I would certainly advise "P.W." readers who are desirous of constructing a simple, compact and efficient set to acquire the details of these Exact components.

THE EASY WAY.

The Peto Scott people have issued a sumptuous catalogue giving details of all the radio gear they have available on the hire-purchase system. Sets due to all the leading makers, mains units, meters, and all sorts of things are included. Kits of the "Titan Two," "Titan Three" and

"Titan Four" are to be obtained for monthly payments from 14s. 11d. upwards.

A NEW R.I. CATALOGUE.

The general catalogue of Radio Instruments, Ltd., is printed on excellent paper, and the fine-screen half-tones well illustrate all the various R.I. productions. Full details of the R.I. All-electric Three are included.

ELLISON H.T. ELIMINATORS.

The Ellison Mfg. Co. Ltd., Dragon Works, Harrogate, have sent us one of their eliminators. It is an A.C. model (a D.C. variety is available), and it sells at £6. A

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.

valve rectifier is employed, and this goes right inside the stout metal case. There are two fixed outputs, the one giving 1½ milliamps at 65 volts for a detector, and the other, for serving amplifier valves, giving up to 40 milliamps at 120 volts.

It is by far the smallest unit giving this respectable output that we have yet seen. It is exactly the same size as the ordinary



This is the Ellison H.T. Unit.

100-volt dry battery, and it can fit snugly into the H.T. compartment of a portable set. The advantage of this is that it can be employed to drive the portable during the long winter evenings, while an inexpensive battery can take its place for the comparatively short time the portable is needed for out-of-doors work.

We carefully tested the Ellison eliminator and found its smoothing adequate. Its outputs are up to specification and, altogether, it can be considered an efficient device. Undoubtedly its compactness is an advantage which will considerably add to its popularity.

LISSEN

for

THE MAGIC 3

Make your version of the Magic 3 better than even the original designers dreamed of. Build it with Lissen, the parts that are made to pull together!

Get Lissen—the fixed condensers that deliver ALL their stored-up energy. Get Lissen—the grid leaks of precise value that never vary. Get Lissen—the Mansbridge type condenser that stands up to high pressure, the ideal condenser for H.T. filter circuits. Get Lissen—the wire-wound resistances in their most convenient form.

GET LISSEN—AND GET BEST VALUE FOR YOUR MONEY!

LISSEN FIXED GRID LEAKS

These resistances are absolutely unvarying, no matter what the conditions or the current load. All values, each **1/-**
(With terminals, 1/3 each.)

LISSEN WIRE-WOUND RESISTANCES

Suitable for use in power amplifiers—unaffected by current density or atmospheric changes.

Made in the following values:—

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

LISSEN
RESISTANCE BASES
Price 1/-

LISSEN FIXED CONDENSERS

have become the standard fixed condensers in almost every published circuit. Accuracy to within 5 per cent. of the stated capacity. .0001 to .001 mfd. each **1/-**
.002 to .006 mfd., each 1/6. .01 mfd., 2/-

LISSEN MANSBRIDGE TYPE CONDENSERS

Hermetically sealed in a non-conducting case, cannot be short-circuited on the case. Deliver all their stored-up energy and have the biggest margin of safety of any condenser made.

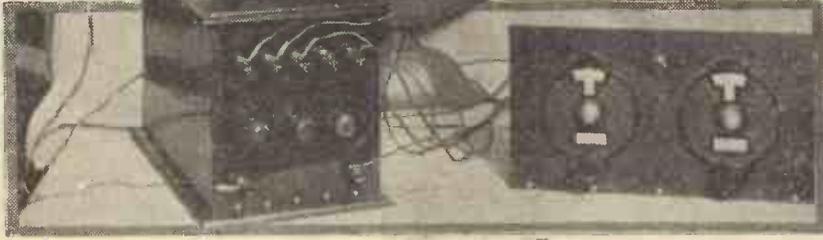
.01 to .05	1/9
.1	1/9
.25	2/-
.5	2/3
1	2/6
2	3/6
3	4/6
4	6/-



LISSEN LIMITED

WORPLE ROAD, ISLEWORTH, MIDDLESEX. Factories also at Richmond and Edmonton.
(Managing Director: Thos. N. Cole.)

INCREASING MAINS UNIT OUTPUTS



How to improve your H.T. battery eliminator, and thereby get better results from your set.

By A. S. CLARK.

THE title of this article may appear a little strange at first. How, you will ask, can the output of a unit be increased above what it is designed to give? The answer is that this article applies to home-constructed H.T. eliminators, and explains simple alterations which can be made to increase the output, and also indicates likely faults when the output is not up to what it should be.

We will consider A.C. eliminators first. To increase the voltage and current is rather an expensive business in this case, as the transformer, which is one of the most costly items, will have to be changed. Let us suppose, first of all, that it is desired merely to increase the voltage.

Increasing the Voltage.

First of all, make sure that you have a tap which has no variable resistances or fixed ones in series with it, as these would naturally reduce the voltage. If the voltage cannot be increased in this way, a new transformer with a higher H.T. voltage output must be purchased, and when ordering do not forget that a voltage drop occurs in the rectifier and smoothing chokes. The new voltage must not be too high for the rectifier, whether it be dry, electrolytic, or valve, and in the latter case the filament output from the transformer must be the same as before.

In cases where it is desired to take more milliamperes, or, in other words, to increase the current output, there are more points to consider. A new transformer is required to give the increased current, and if the rectifier is not capable of handling it, a fresh one will also be necessary. The chokes must also be considered. These, it will be found, are rated to carry a certain current. If the current taken is not within this rating, proper smoothing will not be obtained, and also an undesirable voltage drop will occur, due to the resistance of the winding. Do not forget that if a larger rectifying valve is to be used, a different filament output from the transformer may be required.

D.C. Mains Units

With D.C. eliminators, since no transformer is employed, it is absolutely impossible to increase the voltage beyond that of the mains, and actually, in practice, the maximum available will be slightly less, due to the resistance of the smoothing

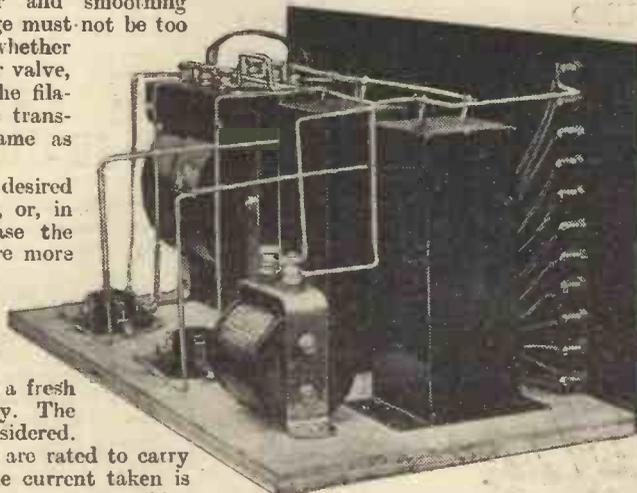
chokes. Therefore, the only thing to do if more voltage is required, is to make sure that a tap is available which is free from all series resistances.

There is no limit to the current which can be taken from a D.C. eliminator, apart from the carrying capacity of the chokes. Therefore, if you desire to use more current than the eliminator is intended to give, all you will have to do is to use larger chokes.

Now let us consider the question of eliminators which fail to give the voltage or current for which they are designed. It may be mentioned here that all H.T. voltages should be measured while the eliminator is in use, and a very high resistance voltmeter is necessary if true readings are to be obtained. One with a resistance of 1,000 ohms per volt is desirable. That is to say that if the whole scale reading is 200 volts, the resistance should be $200 \times 1,000$, which is 200,000 ohms.

Check the Components.

First of all, in the case of a home-made unit the components employed



A modern A.C. mains unit with H.T. windings for varying the anode voltages.

should be checked against those mentioned in the article describing the eliminator. If makes other than those specified are employed, make sure that the chokes are capable of carrying the desired current, and in the case of an A.C. eliminator make sure that the transformer gives the correct output voltages. Also ascertain that it has the correct input rating, not forgetting the question of the number of cycles of the mains. If the transformer is of the universal type, namely, suitable for all voltages of

mains, check over the connections to see that the right ones are in use.

The next thing to suspect is the rectifier in the case of an A.C. eliminator, and it is as well to return this to the makers for test. Assuming the rectifier is all right, we have only the resistances and fixed condensers left to suspect. In the case of variable resistances try shorting them out of circuit, and check over the values of the fixed resistances.

Testing Condensers.

The fixed condensers may be tested by being removed from the set and being charged up by an H.T. battery of not less than about 60 volts. They should then be left to stand for four or five minutes, and then shorted with a piece of wire. If a good, snappy spark is obtained, they are not faulty, but if the spark is very weak or the condenser has completely lost its charge, it is leaky and must be replaced.

If all the above tests fail to show any fault, there must be a break in the circuit somewhere, and every connection must be tested. The transformer and choke windings should be tested for continuity by means of a pair of 'phones and a battery, and the transformer should be returned to the makers for test as a last resource.

PERTINENT PARAGRAPHS.

An easy method of finding which side of the mains is earthed is to connect a lamp in series with one lead and attach this to a water-pipe or other earth conductor. If the lamp lights it indicates that this lead is NOT earthed.

One of the best methods of determining whether a soldering iron is hot enough for the work is to hold it near the face, the correct temperature being readily recognised after a little practice in this way.

It is no good complaining that a wave-trap is insufficient to cut out the local station if its condenser has not been adjusted with patience and accuracy when the wave-trap was installed.

Soldering a pigtail connection between the spindle and the appropriate terminal of a variable condenser which depends upon pressure contact to the moving vanes, will often improve efficiency greatly.

Dust is a great enemy to good reception, so keep the "works" of your set covered in.

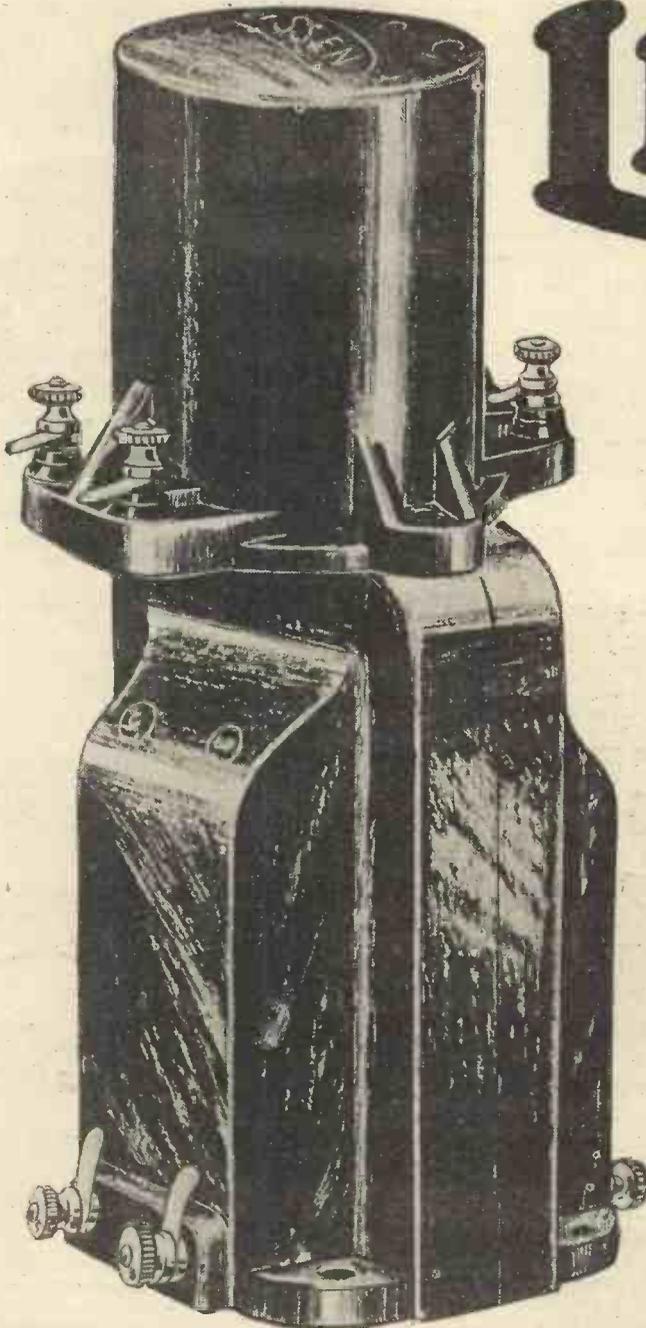
Do not use old or doubtful fixed condensers for coupling, as the slightest fault in a component used in this position will result in distortion.

TRANSFORMERS

for the
MAGIC 3

GET

LISSEN



The designers say "Two transformers of different types and different ratios." Now reason it out for yourself!

Here are two Lissen Transformers, definitely designed by Lissen to work together in just such a circuit, and absolutely "made for the job."

The Lissen 8/6 Transformer, with its 3 to 1 ratio followed by the Lissen Super Transformer, ratio $2\frac{1}{2}$ to 1—where can you find two more dissimilar transformers in type, or two transformers of any kind at all to build up so successfully this most powerful two-stage amplifier at such moderate cost?

FOR THE MAGIC 3 USE THESE TWO LISSEN TRANSFORMERS

LISSEN 8/6 TRANSFORMER—used in every circuit for years past, and universally known as the "transformer that never breaks down." Price **8/6**

Turns Ratio 3—1
Resistance Ratio 4 to 1

LISSEN SUPER TRANSFORMER—the curve of this transformer, taken with just such valves as you will use for the Magic 3, shows almost perfect amplification over the whole band of audible frequencies. A transformer whose performance has never been challenged. Price **19/-**

Ratios $3\frac{1}{2}$ —1 or $2\frac{1}{2}$ —1

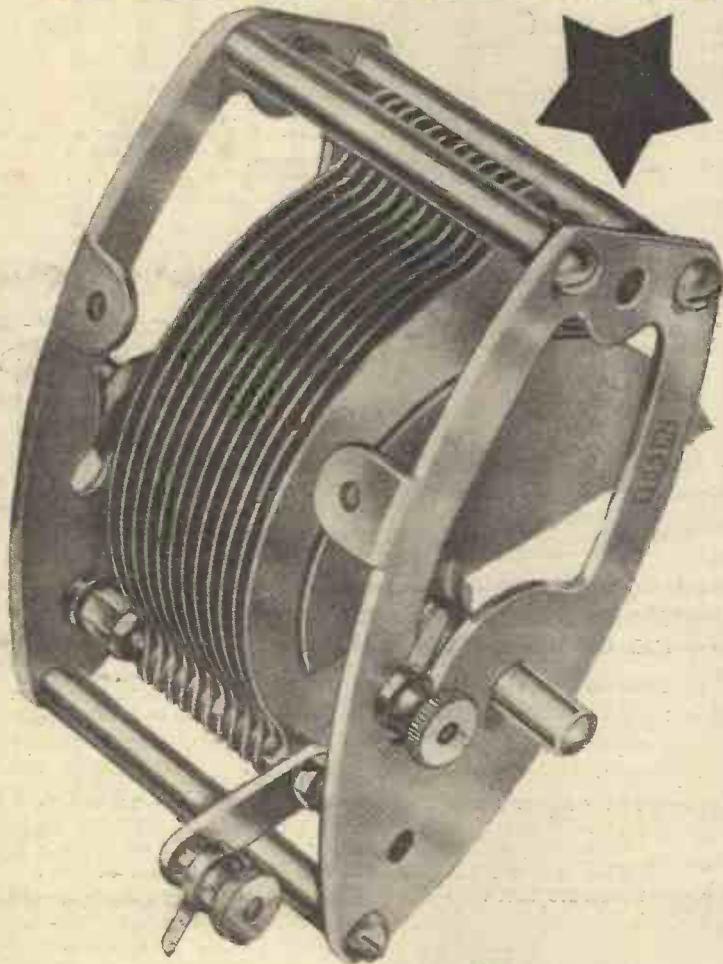
Lissen Transformers amplify a whisper to a great degree of loudness in a background of absolute silence.

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(Managing Director: Thos. N. Cole.)

CONDENSERS



★ FOR THE MAGIC 3

The designers specify Lissen Variable Condenser for the extremely sensitive tuning circuit of the Magic 3—it conserves incoming signal strength, it gives you easy separation of stations close together, and real freedom from losses in the tuning circuit. These are of first importance in this circuit, and the Lissen Variable Condenser is therefore a key component.

Use also the Lissen Neutralising Condenser as the aerial series condenser for short-wave work in this circuit, because of negligible losses, because of delicate adjustment, because of absolute accuracy.

★ GET LISSEN

LISSEN VARIABLE CONDENSER

PRICES :

0001	Mfd. capacity	5/9
0002	" "	6/-
0003	" "	6/-
00035	" "	6/3
0005	" "	6/6

LISSEN SLOW
MOTION DIAL **3/6**

LISSEN NEUTRALISING
CONDENSER - - **4/6**
Baseboard Mounting Type
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A VISIT TO THE MANCHESTER EXHIBITION

An Impartial Review of the Northern Radio Show.
FROM OUR SPECIAL CORRESPONDENT.

THE Manchester Show is very different from Olympia and, even although one has seen the London show, a visit to the North is very well worth while.

For one thing there seems to be much greater freedom of expression at the Manchester City Hall. There is a great deal to be said for organised and standardised stand decoration and such, as Olympia has proved, can be very impressive and very beautiful.

But the stand individuality at Manchester is most pleasing. It makes up in great measure for the smaller dimensions of this Exhibition. Indeed, it is no doubt due to this that the show gives one the idea that it is little, if any, smaller than Olympia.

I must say that I was greatly surprised by the whole show. This happens to have been my first visit to Britain's Northern National Radio Exhibition, and I had not expected it to be constructed on such magnificent lines.

As I have already indicated, it is most colourful. Whereas Olympia retained, throughout, dominating notes of blue and gold, here one is greeted by much more of a rainbow effect.

Nevertheless, blue is by far the strongest colour in the variegated scheme and, indeed, it would seem that everywhere blue has been adopted as a radio hue. Let us hope this is not a subtle dig at the programmes our broadcasters provide!

A Fine Concert Hall.

At the City Hall the layout is on more or less conventional lines, although there are breakaways to be noted here and there. There is first the main hall with its large stands spread around the central flooring, and with various sized booths laid around the walls.

Here and there are smaller halls, annexes and bays into which one can wander. The concert-hall is a most distinctive feature. This is domed and walled with dark and light blue draperies, and at the one end, strikingly inset, is the stage on which famous radio artistes are daily performing.

As readers will know, many of these items are being broadcast so that visitors to the exhibition have the chance to see a microphone end of the ether.

All around the main hall runs the gallery containing a varied selection of exhibitors, large and small. At the far end from the main entrance, up in the gallery, are four moving-coil loud speakers, and behind them comes the "bench of the elect."

Upstairs are also the demonstration-rooms in which radio-gram receivers are being operated. Each of the silence rooms contains a number of curtained recesses, and in each of these is a product of one or other of the firms. I suppose lack of space prohibited the assignment of a complete silence-room to each demonstrating exhibitor. However, the idea is an excellent compromise and enables visitors to hear a large number of instruments working—not all together, of course, but one at a time.

Excellent Lighting Effects.

The City Hall is a sprawling, dingy sort of a building in a very drab part of the city, but once you pass through the entrance to the Radio Exhibition you enter a new world. Here is light, colour and music that drives the Manchester fog and drizzle right away.

And, I must mention, the lighting effects are excellent. The main illuminations of the hall seem to catch up the diverse and



The City Hall, Deansgate, where the Manchester Show is being held.

striking lighting effects of the individual stands and sweep them into one brilliant and kaleidoscopic ensemble.

Mains units and receivers and radio-gram outfits seem to be the leading exhibits and the greatest attractions of the Manchester Radio Exhibition, just as they were at Olympia. But there appears to be a greater wealth of constructor's items, and here the City Hall distinctly scores over Olympia.

Probably the reason for this is to be found in the fact that the show is primarily due to the Manchester "Evening Chronicle," which always has devoted a great deal of

interest to the home constructor of radio sets. Indeed, I believe it is the only great daily in the country that runs articles in every issue intended to appeal to this class of enthusiast.

It has had its reward in this exhibition, for it is being most enthusiastically supported by both the trade and the public. At the time of writing, and as far as I personally can judge, it would seem very probable that all previous attendance figures will be beaten hollow.

Another point where the Manchester Show differs from its London predecessor is that the former does not lay down the rigid nationality bar. Undoubtedly, it gains by this and the exhibits are made much more representative.

I notice that a few of the exhibitors are duplicating their London stand layouts. Thus, the Ediswan people have their model of a home-constructor's home on view.

There are a number of local firms exhibiting which did not show up at Olympia, and some excellent gear they have displayed.

Lissen, Ltd. (whose stand numbers are 13 and 13a—they evidently are not superstitious folk) are well placed, and again they have, by cunning devices, so arranged their stands that they seem to be much larger than their floor space would indicate.

Ward and Goldstone are Mancunians, and appear to have done their utmost to "do well by their own home-town."

The Common Amplifier.

All the other well-known Manchester concerns are showing; for instance, the Chloride Electrical Storage Co., Ltd., are to be found on the ground floor displaying their famous Exides.

Our old friends Ferranti have their enthusiastic teeth well and truly into this show for, besides having a stand, it is they who designed and built the common amplifier which relays the music to all the individual exhibitors' loud speakers. Thus speakers blare away in unison and fill the hall quite completely. The distribution of sound is fine and seems to drown any peculiar acoustic effects the hall might be expected to have.

And, on the whole, the quality is of good standard. Here and there one might notice a loud speaker that was not, by any means, equal to a moving-coil type that may happen to be not far away, but the price difference completely softens the blow!

One of the most striking displays is that arranged by the Marconiphone people,
(Continued on next page.)

A VISIT TO THE MANCHESTER EXHIBITION.

(Continued from previous page.)

whose stand is distinctly colourful. They are showing a fine range of products, and their latest receivers are attracting considerable attention.

The "Safe, Silent and Sound" concern have come all the way from Leigh-on-Sea to display their "Ecko" mains units and sets to the canny northerners, and seem to be getting away with it in great style. (And this is real proof that they deliver the goods!)

The new Cossor Melody Maker is occasioning no little interest, and the crowds around the Cossor stands provide good evidence of the continuing enthusiasm of the home-builder in general and the Melody Maker fan in particular.

"High General Standard."

Now that these radio exhibitions give firms the chance to let visitors hear various instruments in action (and in this the Manchester Show led the way), concerns such as Celestions come into their own. Radio folk would always look at such

on view, including the pick-up. I found it interesting to gauge the vast superiority in numbers of loud-speaker enthusiasts by the proportion of visitors that stopped at the Blue Spot stand—a tribute too to the popularity of the accessories displayed.

I trust that by now I have conveyed the impression that the Manchester show really is a big one. It fills the three halls almost to overflowing and if, next year, the same rate of increase in exhibitors is registered, a new home will have to be found for it.

A Veteran Set.

Over forty more exhibitors had to be provided with places this year, and great credit is due to the organisers for the way the whole affair has been handled.

It is very curious for a Southerner, such as I, to hear radio interpreted all around one in the dialect of the North. As a matter of fact, I was so fascinated by this that I stopped one or two visitors and engaged them in quite lengthy conversations. You can do this sort of thing at radio exhibitions, for it is at such places that we radio folk meet on completely common ground.

One visitor I spoke to was a Preston man who had never been farther south than Birmingham. He told me that he had a "P.W." Combination set working at home. This is a design due to "P.W." that achieved enormous popularity some six or so years

ago. London except, perhaps, here the visitors are rather more searching in questions about the various sets' actual capabilities and their running costs. Whereas in London appearance and practical performance seemed to be the main requirements—that is judging by the questions asked—up here knowledge of the most intimate details is required by visitors.

"Do you find that the average visitor up here knows more about radio?" I asked him.

"On the whole, I think so," said the stand attendant, "although it is rather hard to judge, because it seems to me that some of these folk assume more than they know." And with this libel on the good people of Manchester, which I do not endorse, he turned to deal with the large group of inquirers waiting at his elbow.

Meeting a fellow scribe from London I endeavoured to add his views to my growing symposium, but he protested that he had not yet formed his opinions. "But I will tell you this," he said. "I think this is a most homely and friendly show."

An Air of Cheeriness.

And so do I. There is an air of cheeriness about it all the time and, in my opinion, no one who visits it, however far they travel to do so, will consider it anything but time very well spent. It has yet to run a few days, and I advise all who can do so to train, fly or walk to Manchester to see Britain's Northern National Radio Show.

Among the many other leading manufacturers who are represented at Manchester are the following: Belling and Lee, Ltd., Watmel Wireless Co., Ltd., Burndept Wireless (1928), Ltd., Ever Ready Co.



The Baird Television transmitter that was demonstrated during the Olympia Show. The turntable that can be seen on the left is used for supplying gramophone music to fill in intervals.

notable gear as is made by this firm, but a demonstration completes the effect.

And it means that the loud speakers at Manchester, as at Olympia, must be of a high general standard, otherwise, with such criterions at work in the same building, they might just as well pack up and go home.

Prominent radio-gram. exhibitors this year are Graham Amplion, Ltd., with their magnificent new outfits. These and the range of Amplion speakers shown have crowds around them all the time.

F. A. Hughes & Co., Ltd., have a full range of their renowned Blue Spot products

ago. The only alteration made to this veteran set since its original assembly was that the L.F. transformer had been changed. I wonder how many other "P.W." Combination sets are still in existence?

"Searching Questions."

I asked one of the stand attendants what lines were creating the greatest interest in the North, and whether he found any real difference between Olympia enthusiasts and those at the City Hall.

"On the whole," he said, "this show from my point of view is very much like

NEXT WEEK

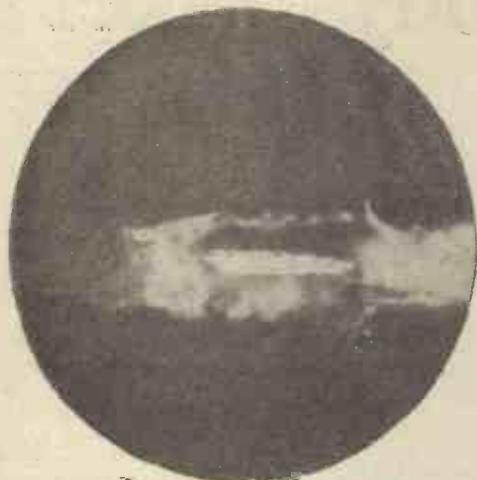
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This is, of course, by no means a complete list and gives the names merely of those exhibitors that happened to catch my eye as I wandered around the show jotting down notes in the small book I was carrying.

But it will, I trust, serve to give you some idea of the representative nature of the exhibition and, as you will also note, firms from all over the country are there to give it support.



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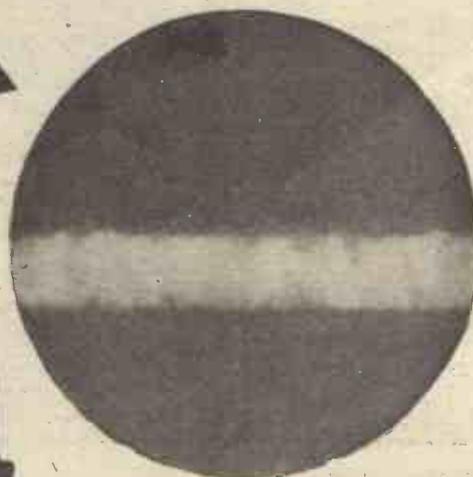
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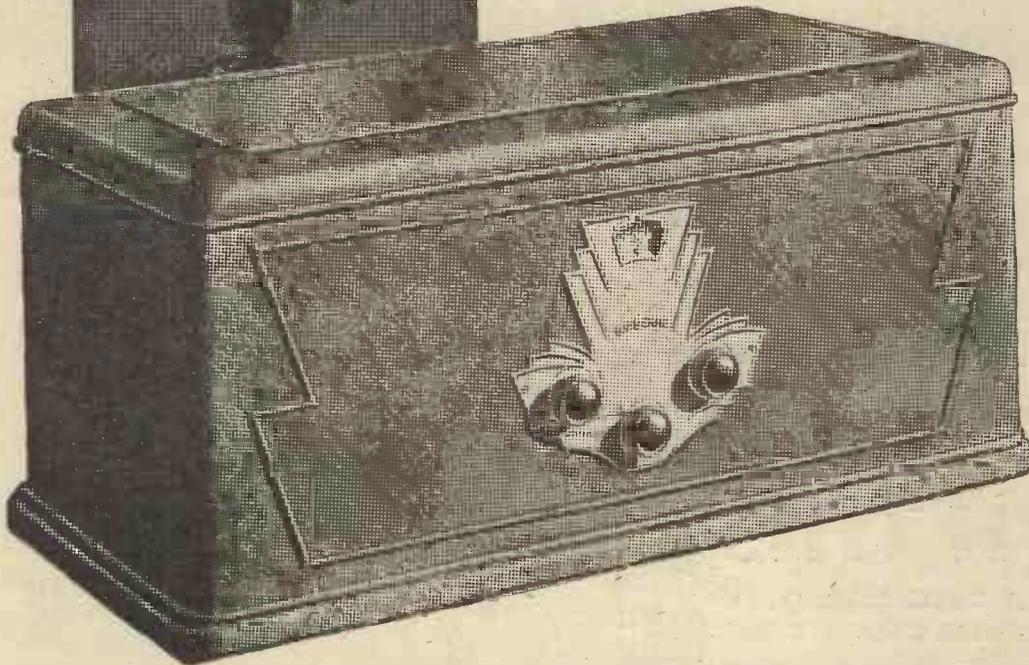
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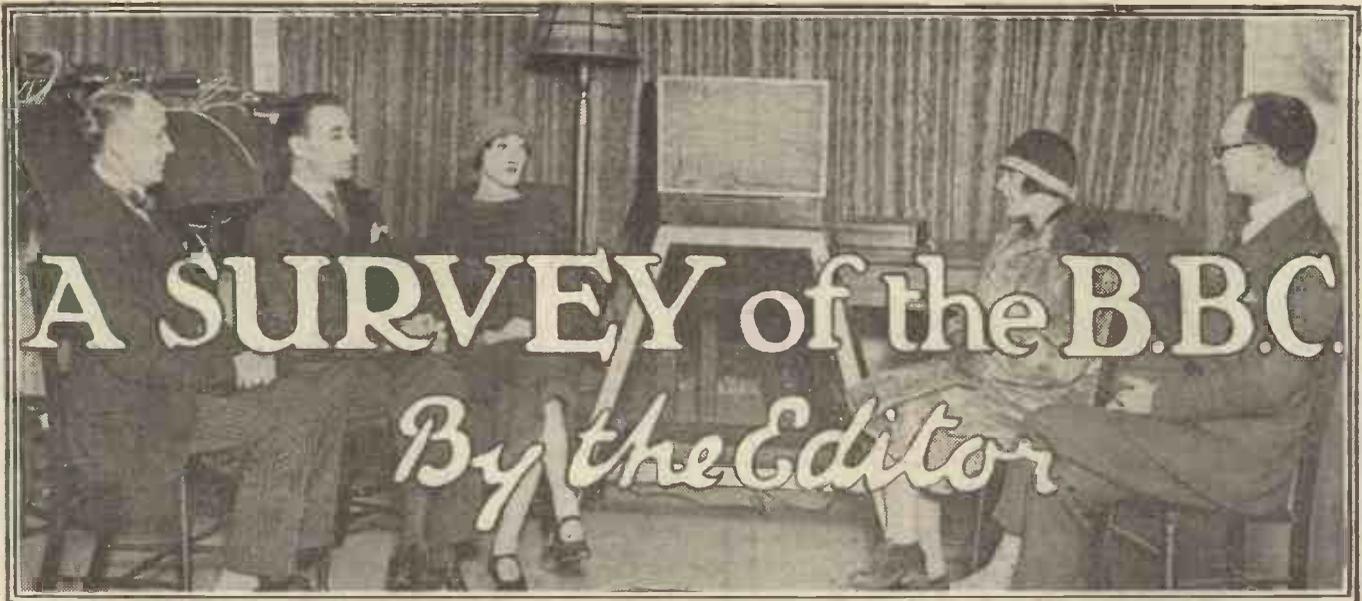
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HAVING examined the constitutional and organisation difficulties of the B.B.C., it is now possible to inquire into the product of the work of the B.B.C. with an understanding of its background.

Radio Drama in its development during the past year is undoubtedly a bright spot in the B.B.C. programmes. The reason for this is not hard to find. Mr. Val Gielgud attacked the problems of Radio Drama with a view to their solution on distinctive and original lines. He abandoned the theory that the broadcasting of drama should be and indeed must be patterned slavishly on the model of the stage. He realised that a special technique must be evolved; that, as the ear alone was the vehicle, much of the preconceptions and a great deal of the attitude of stage drama must be abandoned.

Anonymous Actors.

As an early test of faith Mr. Gielgud insisted on the anonymity of radio actors and actresses. It was objected that this would ruin the dramatic work of the B.B.C. But the result has justified the theory. The idea was that anything that detracted from dependence upon the voice was apt to prejudice the artistic effect.

The name of an actor or actress taking part in a stage play is naturally and inevitably given in the theatre programme. But the name of a radio actor or actress may divert attention through a preconception thereby vitiating the "radio effect." This lesson has been applied with excellent results. The wireless play as now evolved by the B.B.C. needs to be shorter than the average stage play and to be broken up rather more frequently.

Many Short Scenes.

The best length is between an hour-and-a-half and two hours. Unlimited by sight and the necessity for changes of scenery, it can be divided into as many scenes as the story requires, and for the sake of variety the scenes should be quite short; perhaps as many as thirty in a two hours' play. But the changes of scene must be made obvious through such devices as fading-in, music, and appropriate sound effects. Incidental music may be regarded as an essential accompaniment.

In the course of the development of the

This is the third article of a short series in which the machinery is candidly criticised. It is the best-informed series of articles that has been published and discloses behind-the-scenes details that are seldom, if ever, made known to the public.

**3. PROGRAMME DEVELOPMENT
—DRAMA AND MUSIC.**

Broadcast Play, the B.B.C. has devised two main methods of presentation. Firstly, the method in which the play is introduced by a narrator who links the various acts or divisions by explanations and description. This is proved to be the best means of adapting novels.

Secondly, the play may proceed from scene to scene fading in and out either with dialogue or with music, but without any positive breaks.

So far so good. Mr. Gielgud can be congratulated on laying excellent foundations for a real Radio Drama tradition. But I

have this criticism to make, namely, that there has been unjustifiable delay in the creation of a Radio Repertory Company. There were rumours a year ago that the policy of a Repertory Company for Radio Drama had been approved at Savoy Hill,

Much too Slow.

It was indeed a necessary corollary to the application of the new principle. Previously methods had been too haphazard, there had been the unworthy use of the publicity argument in order to attract stage artistes at less than their real value. Now that anonymity was to be applied the establishment of a permanent corps of radio actors and actresses was urgently needed. But this has not yet come to pass.

There has been much too much delay, and while I mention the subject of delay in this connection, I would emphasise that in administrative matters of this kind, the machinery of the B.B.C. works so slowly that by comparison a winged snail could win the Schneider Cup!

When I last surveyed the work of the B.B.C. in Music, I did not fail to remark upon the fact that the old Company had begun a virtual revolution in the popular attitude towards and appreciation of all kinds of music. Those who have kept an eye on the trend of public taste observed a steady improvement, the lion's share of the credit for which must be given to the B.B.C.

B.B.C.'s Musical Shortcomings.

Having said this much, it may seem ungracious to begin to qualify. But the very importance of the good work which the B.B.C. has done for Music sets out in convincingly bold relief the mistakes and shortcomings attendant upon the effort. Operas are given in plenty, symphonies are numerous and well performed; the Promenade season is a great boom; Jack Payne is a public benefactor. Chamber Music attracts the ecstasy of the few at the cost of general irritation; Sir Walford Davies remains at the old stand; of eighty-eight thousand hours of programmes in the past twelve months, no less than sixty-two thousand were of music. Truly an amazing achievement!

(Continued on page 387.)



Mr. Aylesworth, of the National Broadcasting Co. of New York, paid a special visit to England to study British Broadcasting methods.

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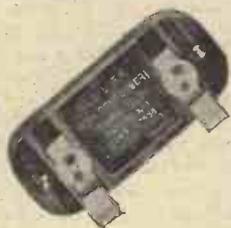
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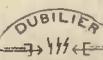
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M.B.

A SURVEY OF THE B.B.C.

(Continued from page 385.)

And yet, all is not well. Percy Scholes has gone, and this means more than the passing of an individual; it symbolises a changing attitude, a dangerous tendency to ignore human sympathetic contact with the mass of listeners. True the bands play better; the orchestra is better rehearsed; the repertoire is steadily widened. But an important ingredient of the old spirit is lacking.

Mr. Percy Scholes.

And this was best personified in Percy Scholes. It was through his influence and guidance that millions of listeners in this country were introduced to the joy and mystery of good music. He had in superb measure the quality of instructing pleasantly without being didactic or tiresome. For five years he was an important part of the B.B.C. About eighteen months ago he went away to Switzerland in a sort of premature retirement.

No attempt was made at Savoy Hill to induce him to stay. This is a very great pity. In Mr. Scholes the B.B.C. had the world's leading interpreter of music to the millions. They should have clung to him. The first thing that is wrong with B.B.C. music is its lack of just those qualities that Mr. Scholes personifies. I believe he might even now be prevailed upon to return. Anyway, I do know that broadcasting is the only thing that would bring him back to active work in this country.

The second main trouble with B.B.C. music is lack of coordinated, firm, and statesman-like direction, conscious of objectives. A scheme such as the National Orchestra is adumbrated. There is much optimistic talk about it, but it takes so long to materialise that its value is greatly depreciated.

Having decided on a definite step such as a National Orchestra, the authorities should move courageously and rapidly. Instead of this, they appear to spend months, even years, in endless quibbles, and in resolving doubts which never should have existed if the scheme was right. B.B.C. music will not go ahead without more understanding, direction and coordination.

A Great Opportunity.

Here is a great opportunity for Dr. Adrian Boult, who takes over B.B.C. music on January 1st. I am not suggesting any censure on his predecessor, Mr. Percy Pitt, whose pioneer work for broadcast music has won him richly-deserved renown and honourable retirement. But by the nature of the case, Mr. Pitt was never accorded the freedom that his successor is able to stipulate as a condition of his appointment. Without a large measure of freedom and autonomy for the chief, the

music department of the B.B.C. will not make the progress it should.

Dr. Boult is believed to be fully alive to the actualities of the position, and determined to get on with the job in the right way. It has already been suggested that one of the first acts of the new régime should be an attempt to get Percy Scholes back from Geneva, if only for a year or two. Dr. Boult and Mr. Scholes would make an ideal team not only to formulate and define a new music charter for the B.B.C., but also to carry it out with efficiency and economy.

Orchestras and the B.B.C.

There is another point about B.B.C. music policy. For some years Savoy Hill appeared to be moving in the direction of entirely separate and self-contained orchestras all over the country. This inevitably involved competition sooner or later with existing orchestras both for instrumentalists and for public support.

The B.B.C. has definitely abandoned this policy during the past year. The attitude now is to help existing musical organisations, and generally to provide nothing which can be done equally well by established local orchestras. But this attitude needs crystallising into a firm policy.



FROM THE BED OF THE THAMES.

One of the early "outside" broadcasts was a description by a diver of the bed of the River Thames.

The B.B.C. has no mandate to become a Ministry of the Fine Arts as long as the Treasury raids its funds, but it can do a great deal for good outside orchestras by prudent cooperation on a value for value basis. It is even conceivable that Dr. Boult will discover that there may be no real need for the contemplated National Orchestra, at least on the lavish scale envisaged by Sir Thomas Beecham.

The Presiding Genius.

As a footnote to this article, I would put in a plea for the continued cooperation of the B.B.C. with Sir Henry Wood in the Promenade Concerts. It was stated last year that the B.B.C. would probably withdraw from the arrangement with Sir Henry after the 1929 season. I hear now that Savoy Hill is still of the same mind, despite the overwhelming success of the 1929 season.

The attitude of the B.B.C. is that if

they do the Proms. again, they will use their own orchestra and a number of conductors, including Sir Henry, if he is willing.

Three Essentials.

This would be a mistake. The Proms. are essentially a "one-man show"; they are inconceivable without Sir Henry Wood as the sole presiding genius.

Let the B.B.C. think very seriously before they destroy a partnership which has meant so much to them, as well as to the public, in the past few years. If Savoy Hill is misguided enough to drop out of Sir Henry Wood's Promenade scheme, it will find that he will develop it under other auspices, with the result that any competitive Proms. run by the B.B.C. would be a hopeless failure.

For the present three things are essential to the ideal Proms. The first is Sir Henry Wood, the second is the B.B.C., and the third is the Queen's Hall. They are a natural alliance; let no hand be raised to disturb it.

FOR YOUR NOTEBOOK.

A good high value of grid leak is often an advantage where long-distance short-wave stations are being received, and a resistance of 5 megohms or so will generally be found satisfactory.

Never attempt to listen-in during a thunderstorm, but keep the aerial earthed until the storm has passed.

Carelessly allowing wander plugs or flex wires simultaneously to touch positive and negativeappings on a grid-bias battery is certain to damage it.

ELECTRIC LIGHT WIRING.

Always remember that great care is necessary in the handling of electric light or power wiring. It should not be undertaken by inexperienced persons.

An easy method of removing the layer of scale on a neglected soldering iron is to heat the iron until it is almost red hot and plunge it swiftly into cold water, when the deposit will flake off.

When a soldering iron has to be heated in a fire it is a good plan to place an empty tin on the fire, inserting the end of the iron into this so that it is heated without coming into actual contact with the dirty ash.

For quick soldering do not use an iron with a long and thick handle, or most of the heat will be radiated away from the copper bit by this.

TUNING YOUR SET.

If you are not quite sure of the way to tune your valve set, write to the B.B.C., 2, Savoy Hill, London, E.C.2, and ask for their free booklet on "Oscillation," which will give you many valuable hints.

Holes accidentally made in a panel need not spoil its appearance, for these can be filled up with black sealing wax, or heelball as used by shoemakers.

The small holes in accumulator vent plugs should on no account be stopped up, as by allowing the gas to escape when the accumulator is being charged they play an important part in its operation.

IN the last two issues of "P.W." we have endeavoured to give you a detailed account of the construction and use of the standard version of the "Magic" Three, and now we propose to go on to consider some of those little detailed refinements and modifications which some constructors may like to add to suit their own particular ideas.

In hopes of pleasing as many people as possible we have adopted the scheme of giving, first of all, a perfectly plain standard version, and then going on to describe all sorts of little special refinements and frills which you can add or not, just as you like.

We have tried to arrange matters as carefully as possible so that you can pick out just the particular refinements which appeal to you and add those alone, or if you

Here are some interesting suggestions for the wonderful "Magic" Three which will appeal to the constructor who likes to have every possible "gadjet" in his set.

like to make a very thorough job of it you can follow out all our suggestions and add the whole lot. Whatever you may decide to do, you may be sure that there will be no scrapping of existing parts, and any modifications which have to be made will be of a very simple and easy nature.

Controlling the Volume.

First of all, there is the question of a volume control, and this is a rather important point. The "Magic" Three is a set capable of giving very big volume indeed on the louder stations, such as your local, 5 G B, and so on, and some means of keeping the volume down to manageable limits is very desirable.

A rough-and-ready method which can be used by those who employ just the simple standard version of the "Magic" Three is to be found in the reduction of reaction to minimum and a little detuning. This method is quite effective in general, but it is

not quite ideal where one has to deal with the excessively powerful signals of a very nearby local station.

In such cases one has to detune pretty considerably, and then there is always the risk of some powerful distant station tending to come through as an annoying background to the transmission you are listening to. Some more effective volume-control scheme is, therefore, very desirable, and forms a most useful adjunct to the set. In our experience, such a volume control is decidedly worth while and makes the receiver even pleasanter to operate.

We are reproducing a diagram on these pages which shows exactly how to incorporate a volume control of the standard potentiometer type, and you will find this a very easy little modification to make. You want a volume control of the three-terminal type, sometimes described as a high-resistance potentiometer, and the resistance of this should be either half or one megohm. On no account make the mistake which we have sometimes heard of and use the ordinary type of potentiometer here. It must be of the very high-resistance type mentioned.

Improved Appearance.

This extra component can be mounted on the centre line of the panel in a position you will be able to scale off quite easily with the aid of the diagrams. This extra part just fills in the panel layout nicely and rather improves the appearance of the set than otherwise. (We had left a blank space near the middle of the set specially for it.)

The connections of the volume control are shown very clearly on the diagram referred to, but it may perhaps be helpful to give them in words as well. First of all, you remove the wire in the set between the grid of the second valve and the G. terminal on the first L.F. transformer. Instead,

Refinement for THE "MAGIC"

wire the grid of the valve to the middle terminal of the volume control. Wire the G. terminal on the L.F. transformer to one of the outside terminals on the volume control, and connect the other terminal of the control to the G.B. terminal on the transformer.

You will understand, of course, that a volume control only reduces the volume given by the set and cannot in any circumstance increase it. We mention this point because once a reader wrote to us and complained that he had fitted a volume control in his set, and it did not make signals a scrap louder!

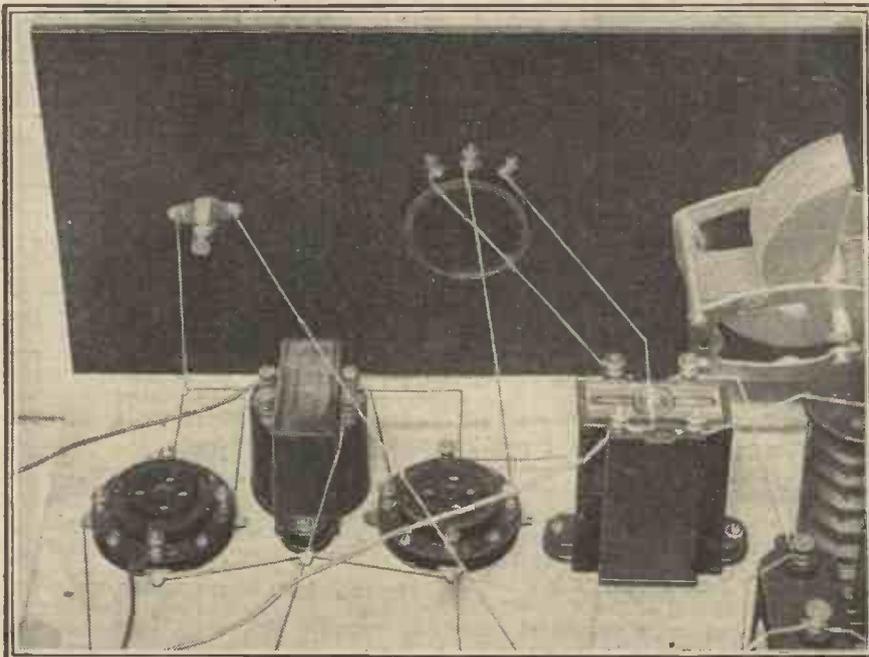
Seriously, however, we only brought in this point because we wished to explain that you can arrange the volume control in two ways, in the first of which it reduces volume when the knob is turned in one direction, and in the other direction when a different system of connections is used. With the connections shown on our diagram, the volume is reduced when the control knob is turned in a clockwise or right-handed direction.

Which Way Round?

We adopted these connections because the wiring is made a trifle neater in this way, but you can quite well adopt the opposite scheme if you like. Some people prefer to have their volume control so arranged that volume increases when the knob is turned to the right and diminishes when turned to the left, and if you wish to have this arrangement you can do it as follows. Looking at our diagram, this is what you have to do. Instead of connecting the G. terminal of the transformer to the left-hand terminal on the volume control, connect it to the right-hand one. Instead of connecting the G.B. terminal on the transformer to the right-hand terminal on the volume control, connect it to the left-hand one. That is all.

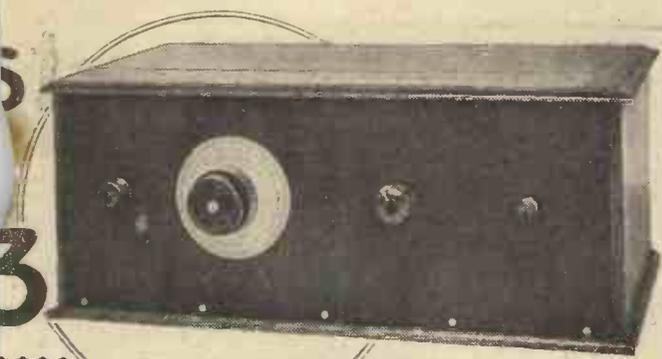
Now about that promised little device for use on short waves. We explained in our last article that the .0005-mfd. tuning condenser in the "Magic" Three standard version is not quite ideal for work on the very short wave-lengths, because it makes tuning rather sharp and critical. It is quite possible to handle it with a little care with the aid of a slow-motion dial so that one obtains good results, but the set becomes very much easier and pleasanter to handle if a little device is incorporated to open out the tuning scale a little bit on these short waves.

The original design of the "Magic" Three gave a form, and now follows some of the very easiest modifications of the "d" By The "P.W." PARTM



Adding a volume control only involves the simplest of alterations to the wiring in the first L.F. stage.

VERY EASY SHOW



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All that you require to do this is a fixed condenser of .0005 mfd. with grid-leak clips, and this is simply inserted in series in the lead which goes to the fixed plates of the tuning condenser. Then, when you have this condenser in circuit,

the effect is to reduce the total tuning capacity to a maximum value of .00025 mfd., so that short-wave tuning becomes very much easier.

You can still cover quite a wide wave-range on each set of coils, and this modification is one which we strongly recommend to those who take a keen interest in short-wave work. Of course, if your main interest is in the broadcast wave-lengths, it is hardly worth troubling about.

Since we only require this condenser on the short waves, and not on the ordinary broadcast wave-lengths, some provision has to be made for cutting it out when it is not wanted. This is where the grid-leak clips come in. In these clips you can insert a short piece of brass or copper rod or tube of about the same size as a grid leak, and the condenser is then shorted out. If you find you have not got a suitable piece of metal rod or tube, take a short piece of wood such as a piece of pencil and wrap tin foil or copper foil round it. This also makes quite a good shorting bar.

Short-Wave Hints.

To help you to check up your connections after you have made them in accordance with the diagram reproduced this week, we give the actual connections in words as follows. Looking at the original blue print or the set, you will find that a lead comes off one side of the coil L_1 , joins on to one side of the grid condenser C_1 , and then goes off to the fixed plates of the variable condenser. This lead should be cut where it leaves the fixed condenser C_1 , leaving merely the connection from C_1 to one side of L_1 . Then join this same side of C_1 to one side of the new fixed condenser. Join the remaining side of the new fixed condenser to the fixed plates of the tuning condenser, and the job is done.

Now we should like to give you one or two extra hints about operating the set on short waves for which we could not find space last week. First of all, if this is your first attempt at short-wave work, we should like to advise you to make your first trial with headphones rather than the

loud speaker. Connect up a pair of 'phones to the L.S. terminals, and set the volume control so that strength is cut down to about one half, to avoid being deafened when you accidentally tune in the very powerful Morse stations which abound on the short waves.

The best wave-band on which to make your first trial is the 20- to 40-metre one, coil sizes for which we gave you last week. Start off with the tuning condenser at the upper end of its range

and set the reaction condenser so that the set is just oscillating, and then gradually turn the tuning condenser down towards the lower readings. You will find plenty of Morse stations as you go, and probably before long you will strike a carrier-wave. As soon as you do so stop the set from oscillating, remembering that other people may be already tuned in to that station.

Avoid Oscillation.

Now proceed to work the reaction very carefully up again towards oscillation very slowly and gently, slowly turning the tuning condenser meanwhile round about the spot where you heard the carrier-wave. As you bring the set up to its most sensitive condition you will probably find the signals again, and if you think they are not going to be very loud you can turn the volume control round towards the loudest setting again.

Do not do this, however, if the carrier-wave you heard was a powerful one, for you may be suddenly deafened if the set breaks into oscillation and you find that you are actually on top of the wave again. If you are careful, of course, this will not happen, and you will bring up your signals quite easily without actually oscillating

again. Once they are properly tuned in you can turn the volume up to the desired strength and change over to the loud speaker.

If you adopt this method of searching you will be able to cover the whole-wave-band quite easily and never actually oscillate on a carrier-wave once you have found it. This is rather an important point if you wish to be considerate to your neighbours, since an oscillating set can cause interference in an extraordinarily wide area on the short waves.

Reaction Dead Spots.

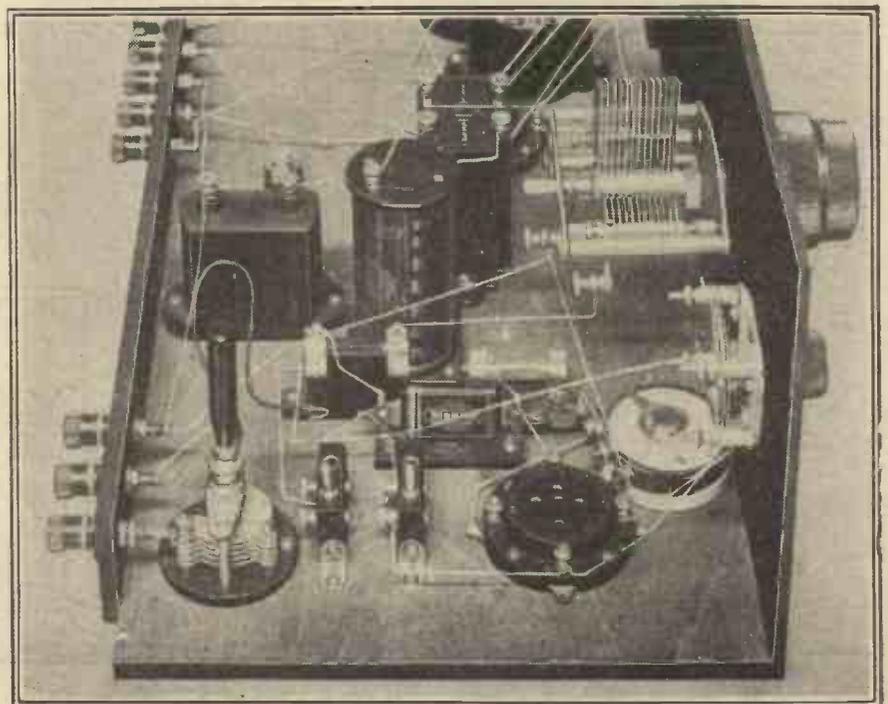
Now just a word about what is called "flat spots." These are points on the tuning range on short waves where it is found difficult to get reaction, and there is nothing abnormal about them. If you

The "Magic" Three gives wonderful results in its simplest form, and there is no need to alter a single wire unless you wish to make it a very "de luxe" outfit indeed.

strike any bad ones, simply put the aerial lead on terminal A_1 so that the series condenser C_3 is brought into circuit, and you will find that they have been removed. Very bad ones may require the series condenser to be set to some smaller reading than the usual maximum value, but this is decidedly unusual.

There are one or two points about the reaction condenser which we have not previously found space to mention, and we will take this opportunity of explaining them. First of all about its capacity. You will have noticed that it is marked .00013 mfd. on the blue print, a figure which looks so unusual that one or two readers have queried it with us.

(Continued on next page.)



Between the coil holders and the H.F. choke you will see the extra fixed condenser which makes timing easier on short waves.

SHORT-WAVE TUNING

REFINEMENTS FOR THE "MAGIC" THREE.

(Continued from previous page.)

The one actually in use in the set was of this rated capacity according to its makers, hence the reason for the figure quoted. Actually a differential condenser with a capacity anywhere from .0001 to .00015 will suit the set perfectly well, and so any of the standard makes can be used.

Another point about the reaction condenser concerns the use or omission of the usual fixed safety condenser in series therewith. In the original set we did not use such a condenser, the reason being that the differential reaction condenser we employed had thin sheets of insulating material interleaved between the plates, so that a short-circuit due to the vanes touching was practically impossible. Consequently this

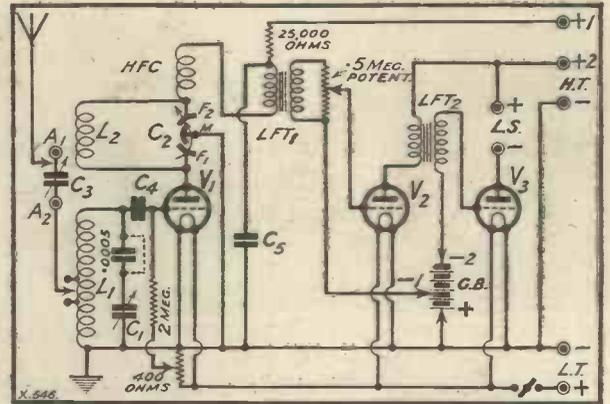
safety device was not really necessary and we omitted it.

Preventing Short Circuits.

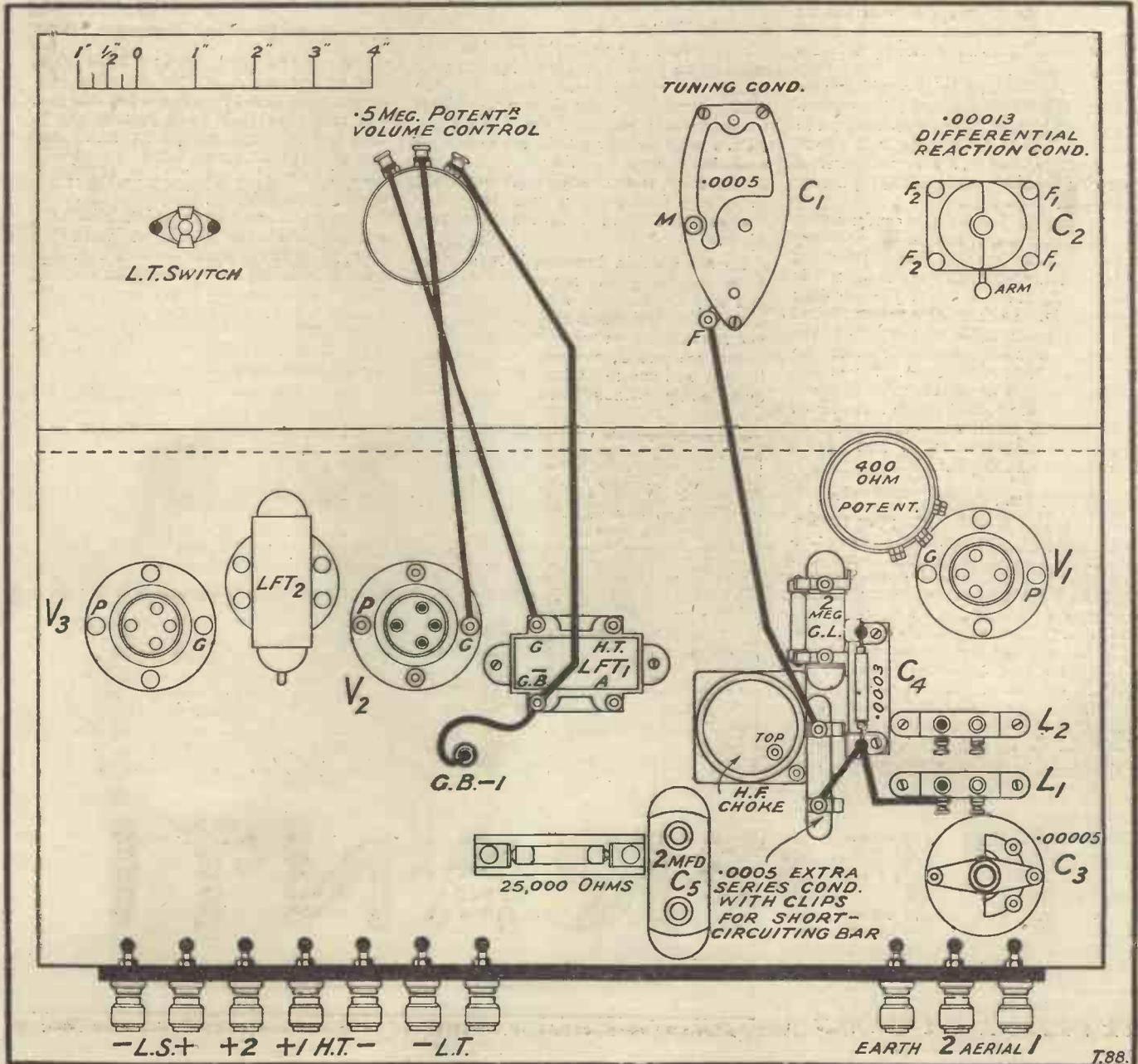
One or two makes of differential condensers, however, have the ordinary air-spacing scheme so that it is possible for the plates to become bent and touch, and if you use one of these we would suggest that you incorporate the usual stopping condenser in series with it. The risk is rather a remote one with a well-made condenser, but it is just worth taking into account.

To insert this safety condenser proceed as follows. Obtain a fixed condenser of any capacity from .001 mfd. upwards and screw it down upon the baseboard between the detector

valve and the panel or between the detector valve and the end of the baseboard. Then
(Continued on page 410.)



Here is the circuit re-drawn to show the inclusion of the volume control and the special short-wave device.



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SHORT-WAVE NOTES.

A chat about reception and receivers on the higher frequencies.

By W. L. S.

MY recent remarks on the 75-cm. wave-length band have brought forth quite a crop of enquiries from readers as to how they can "get down to it" on their ordinary receivers! The first requirement is, of course, an unquenchable optimism. The second is a considerable amount of imagination. And even then I don't think they will do it.

A very special receiver of a most uncommon design is used for work of this kind, the basic principles of most of the circuits used for this work being that the valve capacities are always arranged so as to be in series with the tuning capacities and not in parallel.

I predict, though, that before very long we shall hear of practical work being done on this wave-length, and, furthermore, I should not be surprised if H.F. amplification is possible even on this wave!

On 25 Centimetres.

Incidentally, the 75-cm. band will soon be regarded as long waves! A Russian experimenter is, according to a reliable source of information, establishing regular communication over quite long distances on a wave-length of 25 cms. or less! Are these radio waves at all?

The exact wave-length of W 2 X A F at the moment, "A.J.," is 31.48 metres. He could not be at the figure you suggest, since it is outside the band allocated for use by broadcasting stations altogether. Thanks very much for your note on the "Titan" Four as a short-waver.

G 2 C J is in trouble because he wrote to "Ariel" when he obtained his transmitting licence. "Ariel" published a note to the effect that he would like reports, and he now finds that he needs a secretary to answer them all! I expect you will find they slacken off after the first rush, G 2 C J. He says that people with crystal sets send him a card saying they have heard him, and expect by return full details of his transmitter and receiver, preferably with photographs. I am afraid I have lost trace of the other experimenter in Gloucester who is working on 10-metre reception, but if he sees this I hope he will come forward again and get into touch with G 2 C J.

H.F. in L.F. Side.

Mr. David A. Carey asks whether he qualifies for the H.A.C. Club. I am afraid it is a little doubtful, however, since his only Asiatic is a "Persian amateur, R V 9 D." I should not be surprised if this is a leg-pull, because I have only known of one Persian amateur before, using the call-sign R V I G, and he eventually proved to be in Austria! He was a gentleman with an engaged sense of humour who wanted to collect QSL cards in large numbers.

And now to get down to technicalities. The more work I do on short-waves the more I am convinced that all the troubles experienced by novices (and others) are due to the presence of H.F. in the note-

magnifiers. Therefore, I make it a matter of principle to choke, filter and bypass wherever possible, and I experience very little trouble in the way of capacity effects, instability, and threshold howling, etc. A .25-megohm "H.F. stopper" between the transformer and the grid of the L.F. valve is a material help, and if one employs a de-coupling resistance for the detector, an H.F. choke between the reaction coil and the transformer primary, even when series feed is used, large bypass condensers where-

seem to happen, and I think the priming-grid wants its own little power supply, all completely screened and filtered. In any case, I regret to report that I am losing faith in pentodes for short-wave work. I think I shall go back to resistance-coupling for a while, and try to regain that silent background that I used to treasure so much!

I think I have had a new short-waver on the bench each time I have sat down to write these notes for the last six months! They all come to pieces within a week in favour of something better, although after the first moments of enthusiasm have died away I feel that I would sooner have the old one back again.

Most Popular Set.

Thus you will understand that I am not always on the listen for new stations or changes in the old ones, and must appear

A NOTABLE SHORT-WAVER.



Here are the two 20-kw. short-wave transmitters at the Nauen station in Germany. Nauen's call-sign is A G C, and it operates on 17.20 metres.

ever they might seem to be necessary, and a .0005 condenser across the phones, I don't think there is much left to go wrong.

A useful tip, incidentally, is the use of two H.F. chokes of different sizes in series. These may be wound with quite fine wire on ordinary glass boiling-tubes or test-tubes, and one of 80 turns and another of 30 seems a good combination. Naturally, if your set is of the "all-wave" variety a choke of this nature will be of little use for the broadcast wave-length.

Noisy Pentodes.

I should be interested to hear whether any reader is using a pentode in a short-wave receiver working from an eliminator. Mine is satisfactory enough, but I have never yet succeeded in getting a really perfectly silent background. With an ordinary power valve it is easy enough provided that one uses plenty of smoothing and an H.F. choke in each H.T. lead from the eliminator.

With a pentode all sorts of funny things

sometimes as if I am not keeping pace with the times. One day, however, I shall probably find one that pleases me for a whole fortnight, and I shall have a proper feast on all the good things that are now available for short-wave listeners. Incidentally, my broadcast receiver is nearly covered with cobwebs, which is a sign of the times!

I think it would be an excellent idea to have a kind of ballot among readers to decide the most popular type of circuit with the average short-wave listener at the present moment.

Here are the types I propose to "standardise":

- No. 1. Detector and L.F.
- No. 2. Detector and 2 L.F.
- No. 3. Detector and pentode.
- No. 4. S.G., detector and L.F.
- No. 5. Detector only.
- No. 6. Super-het.

Please send in your choice to W.L.S., c/o POPULAR WIRELESS, and I will publish the result as soon as there are enough entries to form a good opinion of it.

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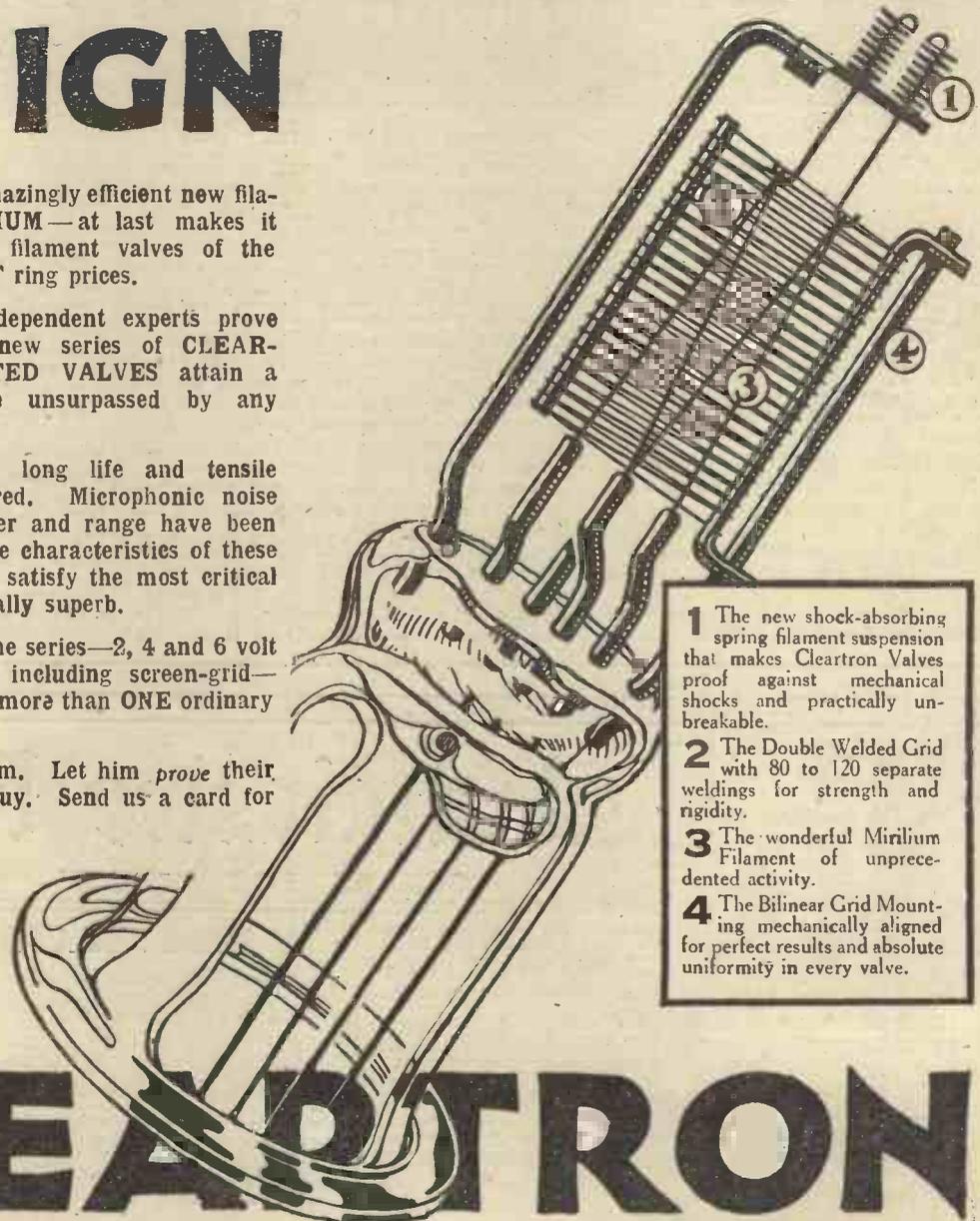
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The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of 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.

LOCATING AND CURING A HUM.

A. L. G. (Deptford)—“Being of an ambitious turn of mind, I made up my mind that I would go straight from a two-valver to a four-valve set, and have succeeded in making an excellent job of it, except for one thing. It does hum!”

“Looking through all the back numbers I could find I tackled this on Saturday, and al-

though I have not cured it I think I have made a good deal of progress. I found, for instance, that with a crystal-detector and a pair of 'phones in series there is no trace of hum in the H.F. stage, which seemed to point to the detector or the L.F. wiring. Taking out the primary of the low-frequency transformer, I discovered with the 'phones that the hum was strong at that point, thereby exonerating the last valve.

“Going a step further I joined the 'phones across H.T. positive and P. on the R.C. unit, and here again the hum was going strong. Apparently this points conclusively to the detector being the cause of the trouble (as

suggested in 'P.W.' as being likely), and I should like to know the best way of eliminating it. Do you think that the H.T. eliminator itself needs overhauling or can I put extra bypassing or smoothing into the set itself?

“If so, what type? (The insertion of the fixed condenser marked reduced the hum until it is quite bearable, but having got so far I should like to eliminate it altogether.)”

From your description we should imagine that little extra smoothing is required, and this should be inserted in the detector-valve's H.T. supply. Probably almost any L.F. choke would do the trick, and if you have an old L.F. transformer on hand we should try using this, as the current it will be carrying is quite small.

Perhaps the primary alone will be sufficient, or failing this the secondary alone, or possibly you may be able to use both these in series. It is sometimes an advantage to connect a fairly large capacity fixed condenser to L.T. neg. on one side, and on the other side either to the centre tap on the choke (the junction between primary and secondary) or to the end of it, when used in this way; and the probability is that the combination of choke and bypass inserted between the detector and the rest of the circuit will be sufficient to overcome the trouble.

CHANGING FROM REINARTZ TO SCHNELL.

W. K. R. (Sleaford).—“The set is a two-valve Reinartz, employing plug-in coils, one for aerial, one for grid and one for reaction. The only trouble with it is that there is a little hand-capacity on the reaction, which reversing the condenser leads does not seem to remove.

“I am told that I could easily alter the set to the Schnell arrangement in which hand-capacity is not troublesome, and I should be glad of details as to this if it is not a very big undertaking.”

You can very easily change over from your present system to the Schnell system of reaction control. Fundamentally the only difference is that whereas in both circuits reaction consists of a reaction condenser and coil in series between filament and plate of the detector valve, in the simplified Reinartz which you are using the reaction condenser is connected towards the plate, whilst in the Schnell circuit

(Continued on page 396.)

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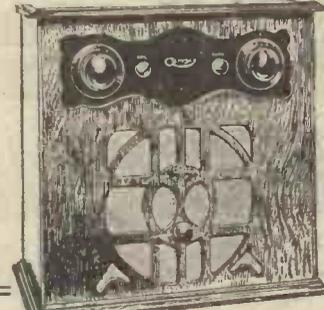
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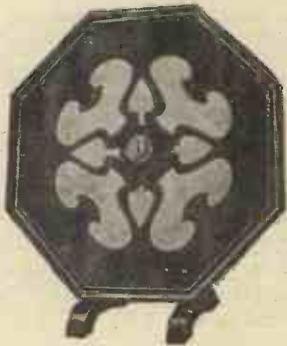
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 394.)

the coil is towards the plate, and the condenser towards filament. So all you have to do is to rewire the reaction circuit as follows:

Instead of filament to reaction coil, other side of reaction coil to reaction condenser, and other side of the condenser to the plate, join the filament to the moving vanes of the reaction condenser. The fixed vanes of this will then go to that side of the reaction coil which formerly went to filament.

The remaining side of the reaction coil will now be joined to plate (and to H.F. choke), and the alteration should remove your trouble.

INSERTING AN ANTI-MOTOR-BOATING UNIT.

D.D. (Reading).—"You sent me the anti-motor-boating details, and a diagram, but unfortunately I lost the diagram and now do not know how to connect it up. The set is a three-valver, detector and two low-frequency amplifiers (transformers).

"The unit has a fixed resistance joined to a 4-mfd. fixed condenser, so there are three terminals, No. 1 to one end of the resistance, another to the junction between the resistance and the condenser (No. 2), and one to the remaining side of the fixed condenser (No. 3). Where should these points be connected to?"

All you have to do is to break the lead which goes from the first low-frequency transformer primary to the H.T. positive terminal (possibly via other points). Terminal 1 on the unit should go towards H.T. positive terminal, and terminal 2 towards the L.F. transformer primary, thus restoring the circuit by inserting the resistance. The final connection is to join the third terminal to the L.T.—wiring, which completes the necessary alterations.

ADJUSTING A WAVE-TRAP.

S. G. N. (Croydon).—"I bought the wave-trap at the Wireless Exhibition, and although I can get it connected up O.K., I do not seem

to be able to get full results because I am not sure whether I have it adjusted properly. Sometimes I can hardly find 2 L O and at other times I have to fiddle with the wave-trap before I can shut it out. What is the proper way to adjust?"

The first thing to do is to tune down the variable condenser on the wavetraps to its minimum capacity position, and then tune in 2 L O as usual on the set itself. Then turn the aerial tuning dial upwards until you have reduced the volume by about 50 per cent. Now screw down the wave-trap condenser carefully and very slowly and note the effect.

You will soon find that the strength of 2 L O begins to diminish, and if you proceed carefully and slowly you will shortly discover a setting of the wave-trap condenser at which 2 L O signals go down to almost nothing, or vanish altogether, whilst beyond this point they come up again.

Ascertain as accurately as you can where this point of minimum strength lies, and if you lose 2 L O altogether over several degrees, strengthen him up again, slightly by turning the tuning dial a little nearer down towards the normal loudest point. This will bring in the transmission stronger, and after this you can return to the wave-trap again and readjust until you get a sharp and definite cut-out adjustment.

When once this is found the wave-trap is left alone and the set is handled in just the ordinary way, the difference being that instead of the local station trespassing half-way over the dial it will be confined to only a few degrees.

QUALIFICATIONS FOR A WIRELESS OPERATOR.

"WOULD-BE WIRELESS" (Chatham).—"I am very keen on getting abroad as a wireless operator in the Mercantile Marine. I understand I shall have to obtain a Board of Trade certificate, and undergo an examination in telegraphy etc. What kind of an examination would this be? (Having been employed on the railway I am a good telegraphist, so I do not expect that the telegraph part of it would cause me much trouble)."

Wireless telegraph operators must hold either a first-class or a second-class certificate of proficiency from the Postmaster-General, of whom full particulars can be obtained. Candidates must be able to send

on an ordinary Morse key for five consecutive minutes at a speed of not less than twenty words a minute for the first-class certificate, and correct formation of the Morse letters, correct spacing, etc., is very important.

In addition to the telegraphic tests, the candidate must be able to understand simple electric diagrams, and to explain the elementary principles of wireless telegraphy, as applied to the system in which he will be examined. The practical examination consists of connecting up the apparatus, sending on an ordinary Morse key, and receiving from double-headgear telephone as used ordinarily. Also regulating and adjusting the apparatus, altering the wave-length, reducing or increasing the power, and tracing and clearing faults in the transmitter and receiver.

In addition to this practical examination candidates must satisfy the P.M.G. in a written examination consisting of two papers of two hours each.

The scope of the examination covers elementary mathematics, elementary electricity and magnetism, and technical wireless telegraphy, and a full syllabus of the class of knowledge required is obtainable from the P.M.G. on application.

GOING OVER TO THE MAINS.

M.S. (Saltdean, Sussex).—"I am converting the set to use it from the mains for H.T. supply, and I should like to have an idea of what the approximate cost of running this will be, and what steps are necessary with regard to the electric-light company, when taking current from the mains in this way."

Unless you have a very large set indeed, or the rates of electricity supply are exceptionally high, you will find that the running cost of deriving H.T. from the mains is quite low, for the current supplied is very small, and even the pot of a moving-coil loud speaker and a really powerful receiver would not take much more current than the household lamps.

Usually an electric-light company requires that the installation of extra apparatus—wireless sets, vacuum cleaners, and of the like—should be notified, in order that a representative may call and make sure that the installation conforms to safety regulations, etc.

A GOOD AERIAL.

E. C. C. (Long Melford).—"What are the chief points to watch in putting up an aerial?"

(Continued on page 398.)

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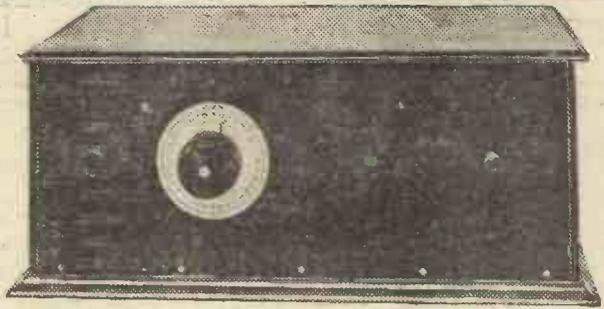
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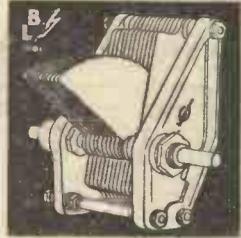
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Built with the customary Bowyer-Lowe precision. Suitable either for panel mounting with dial control or for drum control, the extended spindle passing through the end plate, enables the condenser to be ganged very easily. Bakelite end plates, ball-bearings, one piece pigtail, single hole fixing.

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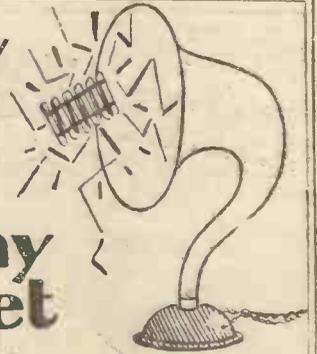
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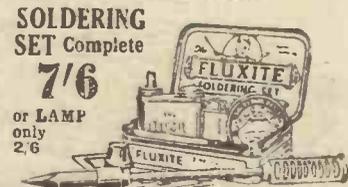
"Please solder all my joins with

FLUXITE

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SIMPLIFIES ALL SOLDERING

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 396.)

A good aerial will make an enormous difference to the quality of your reception, so we advise you to pay particular attention to making it as nearly perfect as possible, and maintain it in good condition. The ideal way is to have a good high mast, 30ft. or more, erected in such a position that not only is a long aerial available, but this in no place passes close to the sides of a roof, building, tree or similar obstruction which would "screen" the aerial and impair the results.

The total length from lead-in to the far end must not exceed 100ft., but generally a very much shorter aerial is perfectly satisfactory, and if you can raise it, say, 25 ft. or 30 ft. at the house end and run it to a mast which is about 40 ft. away, you should get excellent and satisfactory reception. We should use a single and not double wire, of stranded copper, or similar high conductive material, avoiding any breaks or joins, so that the aerial runs from the furthest insulator, right down to the lead-in without a break, if possible.

Take care not to kink the aerial when putting it up, and use an adequate number of insulators of the type that will remain dry (even under severe weather conditions) over parts of their surfaces.

If you are going to use an aerial lead-in switch (and it is advisable to do so) make sure that the contacts of this are really firm and sound, and arrange that the whole switch is covered with some protective device, such as a box, to protect it from the effects of the weather. Be particularly careful not to take the lead-in through the window close to any metal, bearing in mind that the wire itself should not be within a foot of any wall, etc., except at the point where it enters the house, and here it should be well spaced away from all conductors.

Finally, remember that in the endeavour to get a good aerial, the earth must not be neglected, as this is just as important in its effect upon reception.

CURING MOTOR-BOATING.

D. N. F. (Stafford).—"What were the parts required and the connections for the anti-motor-boating unit described in 'P.W.' some time ago?"

The unit consisted of a small wooden baseboard, a strip carrying three terminals, a 2-mfd. condenser, and an anode resistance of about 50,000 ohms. The

terminals should be marked L.T.—, H.T. 1 and H.T. 2. Only four wires are required, the connections being as follow:

H.T. 1 is joined to one side of the anode resistance holder. H.T. 2 is joined to the other side of the resistance holder, and to one side of the fixed condenser. The remaining side of the fixed condenser

"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 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.

LONDON READERS PLEASE NOTE: Applications should NOT be made in person at Fleetway House or Tallis House.

goes to the terminal marked L.T.—. In use the unit is joined up as follows:

The lead from the H.T. supply to the detector valve on the set is undone and the "valve" side is joined to the H.T. 2 terminal on the unit. H.T. 1 terminal on the unit is joined to the appropriate place on the H.T. battery or mains unit, and the L.T.— terminal from the anti-motor-boating unit is joined to the L.T.— terminal on the set. As the resistance in the anti-motor-boating filter drops the voltage on the detector valve, remember to allow for this fact, by adding a little extra H.T. positive in the detector-valve circuit.

Usually if you have been giving the detector about 60 volts and the last valve 100 or 120, you will find that the detector can now take up to 120 (which in practice is often more convenient).

SHORT-WAVE "TITAN."

R. C. A. (Headingley, Leeds).—"I was making enquiries of a friend and saying that the only disadvantage of the 'Titan' is that it will not go down to the short waves of 50 metres or so, when he told me that some time back he saw a description in 'P.W.' as to how it could be adapted for this purpose.

"If this is so can you tell me how the change over to short waves is effected, and whether it is efficient. Also what wave-lengths this would cover?"

The short-wave "Titan" referred to was described in detail in "P.W." No. 375 (August 10th, 1929, issue). The author—who believes he was the first amateur in England to hear a broadcasting station in South America, and therefore the first to hear all six Continents—designed his set originally as a short-waver; but when the "Titan" set was described in "P.W." it was adapted to that circuit by a plug-in system, the receiver thus covering the medium and long wave-bands, as well as the short waves from 13 to 70 metres.

The coils are mounted on a four-pin plug-in base, but the broadcast coils differ slightly from the standard "Titan," inasmuch as the wave-change coil is mounted on an ebonite disc screwed to one end of the loading coil. The whole unit is then mounted on a base similar to that of the short-wave coil with which it is interchangeable.

Although the set requires rather more care in construction than many of the simpler types of broadcast set, the trouble taken is well repaid by those who like long-distance short-wave reception. Full details from which any experienced set-builder will be able to make it up are given in the number of "P.W." referred to above.

The "Presto" Three.

F. M. (Letchworth).—"In what number of 'P.W.' was the 'Presto' Three described, and was it an absolutely straightforward Det.-2 L.F. receiver for full loud-speaker reception?"

(Continued on page 400.)

THE Mullard ORGOLA RECEIVER

FOR 10'6 DOWN



Here is the chance to get the greatest set of the year for the coming winter season. For an initial outlay of only 10/6d. you can get a complete kit of parts ready for construction, the purchase being completed in twelve monthly payments of the same amount. Now that dark, long evenings are with us there is no more fascinating hobby and entertainment than Radio through the great Mullard Orgola.

BRITAIN'S BIGGEST RADIO STOCKISTS

WARNER'S

12, NORTON FOLGATE, BISHOPSGATE, E.1.
Bishopsgate 8010.

MAIL THE COUPON NOW!

To WARNER'S (Dept. P.W.3), 12, Norton Folgate, Bishopsgate, E.1 BISHOPSGATE 8010.

I enclose P.O. value 10/6, this being first payment for your guaranteed Mullard "Orgola" Radio Receiver kit, and I agree to pay the balance over 12 monthly instalments of 10/6.

NAME.....

ADDRESS.....

WRITE IN BLOCK CAPITALS

P.G.5. Non-Indicating (as illustrated) 20 a.h., 2-v., 9/-
 P.G.7. Non-Indicating, 30 a.h., 2-v., 11/-
 P.G.9. Non-Indicating, 40 a.h., 2-v., 13/-
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P.G.F.5. Indicating, 20 a.h., 2-v., 11/9
 P.G.F.7. Indicating, 30 a.h., 2-v., 13/9
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Buy a Guaranteed Accumulator

EVERY P. & R. Accumulator is sold with a six months' guarantee. Yet P. & R's cost no more than ordinary batteries.

Consider the Peto and Radford P.G.5. It is a 2-volt battery of 20 ampere hours *actual* capacity, price 9/-. It embodies these features. Plates are sturdy and held in place by glass key-ways in the box. Paste is kept in by interlocking grids. Terminals have acid-proof glands and cannot be reversed. The lid is of crack-proof Dagenite, hermetically sealed at the edges. And, as we said above, it is *guaranteed for six months*.

This same battery is made with indicating floats—our patent which tells you whether cell is charged, half charged or run down—for only 2/9 extra.

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Peto & Radford, 93, Great Portland Street, London, W.1.

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POWER

W.T.4.

This announcement is issued by
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LET THE NEW BURNDIPT

MINSTREL

LOUD SPEAKER



GIVE YOU THE TRUTH — THE WHOLE TRUTH AND NOTHING BUT THE TRUTH

The "Minstrel" loud-speaker, which created such a sensation at Olympia, is of the double diaphragm type and enables every note in the scale, high and low, to be heard with a clarity of tone never before obtained. No field current supply is required, and the Speaker will reproduce a very large volume without the slightest distortion. The movement is of the balanced armature type and is adjustable.

Floor model in Oak Cabinet - - £9.0.0
 Floor model in Mahogany Cabinet £9.9.0
 Table model in Oak or Mahogany £4.4.0

Burndipt



THE NEW BURNDIPT "MINSTREL" Double Diaphragm Loud-Speaker

For full particulars and catalogue write to—
BURNDIPT WIRELESS (1928) LTD.,
 18, Eastnor House, Blackheath, S.E.3

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 398.)

The "Presto" Three was an extremely simple but highly efficient three-valver capable of giving the greatest satisfaction with a minimum of expense and trouble. (Employing pluz-in coils and covering both high and low waves). It was fully described in "P.W." No. 379, September 7th issue. Note: Where difficulty is found locally, back numbers of "P.W." can be obtained direct from The Amalgamated Press, Ltd. (Back Number Dept.), Bear Alley, Farringdon Street, E.C.4, price 4d. per copy.

BUYING A LOUD SPEAKER.

F. M. (near Dublin).—"Before deciding, I should like to raise one point that has always interested me. Why is it that certain makes of loud speaker, when reproducing the same music as other makes, give to it a sharper or "cleaner" tone, whilst other loud speakers seem to round everything off into a pleasant mellowness? Why do they not reproduce the music exactly as it is played, instead of with these differences?"

Absolute fidelity of reproduction is extremely difficult to obtain, and the reason for this cannot easily be expressed in a few words. If, however, you remember that all sound is a matter of vibration, you can understand why certain loud speakers have a sort of characteristic tone of their own as compared with certain other loud speakers.

You will already be familiar with the fact that air-containing vessels, such as large glasses, each have a characteristic frequency at which they tend to "ring" or vibrate, when a sustained note is played near to them. Again, every mechanical vibrator, such as a springy rod, has its own particular frequency, at which it is easily set in motion most easily, and tends to remain vibrating.

Consequently, the horn of a loud speaker, by naturally favouring certain frequencies, tends to emphasise a band of frequencies, and thus gives a characteristic tone to the reproduction which might not be heard upon another loud speaker. Similarly, a vibratory mechanism such as the reed of the

ordinary cone loud speaker, has a tendency to emphasise a certain part of the frequency band and appears to neglect other equally important parts, and only by the most careful design can these effects be eliminated.

In the last year or two so much progress in this respect has been made that in a very great number of cases only a well-trained or highly-critical ear can detect any peculiarity in reproduction due to the loud speaker.

FOUR OR FIVE VALVES.

J. S. (Nr. Newcastle-on-Tyne).—"I want a blue print of a four-valver—screened grid,

Full details of no less than

TWELVE FINE SETS

are given in the November

GREAT GIFT ISSUE

of

MODERN WIRELESS

ON SALE NEXT WEEK.

Don't miss this stupendous bargain!

It's sure to sell out straight away, so

ORDER YOUR COPY NOW!

12 Sets.

Price 1/-

detector, and 2 L.F. stages, for working a moving-coil loud speaker. Or else a really first-class five-valver—the sort of set that will last for years, and not be left in the cold by some new device. Can you tell me where I

can get details of these, the parts required, panel lay out, etc., so that I can decide which will be better for my purpose?"

We know how difficult it is to choose between different designs and to weigh up the respective merits. Honestly we think the best thing you can do is to wait till next week, and get the new "Modern Wireless." It contains full details of several powerful sets of the type you name, so that you should be able to choose exactly what you want. (There are full how-to-make details.)

"COME-FROM" CALL SIGNS.

"MARINER" (Belfast).—"Can you give me the list of the various countries and the call-sign letters which indicate what part of the world the signals are coming from?"

The following are the chief nationality prefixes:

CE Chile	OK Czecho-Slovakia
CR Azores	ON Belgium
CM Cuba	OZ Denmark
CT Portugal	PA Holland
CN Morocco	PK Dutch East Indies
CV Roumania	PY Brazil
CP Bolivia	RA U.S.S.R.
CX Uruguay	RV Persia
CZ Monaco	RX Panama
D Germany	RY Lithuania
EA Spain	SM Sweden
EI Irish Free State	SP Poland
EL Liberia	SU Egypt
ES Esthonia	TF Iceland
ET Ethiopia	TS Saare
F France and Colonies	UL Luxembourg
G Great Britain	UN Jungo-Slavia
HA Hungary	VO Austria
HB Switzerland	VE Canada
HC Ecuador	VK Australia
HH Hayti	VO Newfoundland
HR Honduras	VP-VS Colonies
HS Siam	VU India
I Italy and Colonies	W U.S.A.
J Japan	YI Iraq
KI Philippines	YL Latvia
K4 Porto Rico	YM Danzig
K6 Hawaii	YN Nicaragua
K7 Alaska	YS Salvador
LA Norway	YV Venezuela
LU Argentina	ZA Albania
LZ Bulgaria	ZL New Zealand
OA Peru	ZP Paraguay
OH Finland	ZS South Africa

TWO VOLTS

Universal	.1 amp.	5/6
Resistron	.1 amp.	5/6
Super H.F.	.15 amp.	5/6
Super-Power	.18 amp.	7/6
Hyper-Power	.3 amp.	9/6
Pentodion	.3 amp.	18/6

5/6 UNIVERSAL

FOUR VOLTS

Universal	.075 amp.	5/6
Resistron	.075 amp.	5/6
Super H.F.	.075 amp.	5/6
Super-Power	.1 amp.	5/6
Hyper-Power	.15 amp.	7/6
Pentodion	.15 amp.	9/6
	.15 amp.	18/6

POWER 7/6

DARIO

VALVES

From your dealer or direct:
IMPEX ELECTRICAL LTD.
 (Dept. B), 538, HIGH RD.,
 LEYTONSTONE, LONDON,
 E.11.
 WRITE FOR DARIO FOLDER!

Best Way to All Stations

The New Dario Valves are even better! New internal construction! New filaments! New prices! Longer life! Every valve guaranteed.

MANCHESTER RADIO EXHIBITION
Stand 107 (Gallery).

DOUBLE THE VOLUME OF YOUR LOUD SPEAKER

THE CONE WHICH HAS IMPROVED
SPEAKERS ALL OVER THE WORLD

Fit a P.R. Moulded Paper Cone to your speaker and you will be positively amazed at the difference. Double the volume and much greater purity in tone. All the notes come out in their correct value. No resonance—no "drumming"—just pure and real music.

THE ONLY CONE WHICH CORRECTLY
REPRODUCES THE HUMAN VOICE

The P.R. Cone is the only one which correctly reproduces the human voice as well as instrumental music. That is why it will improve any cone speaker, no matter the make or price. 11" diameter, correctly proportioned, ready to fit, complete with washers and screws. Can be adjusted instantly. No cutting, sticking or wash leather required.

3/6

Post 6d.

We cordially invite readers to visit our Showrooms in Newgate Street to hear this marvellous Cone in actual use. They will be amazed at its volume and clarity.

P.R. PRODUCTS

Send C.O.D. if desired.

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EASY TERMS

We SPECIALISE in the supply of all Good Quality Radio Sets, Components and Accessories on Easy Terms. We can give you efficient service and our terms are low. We can recommend the following:—

1930 COSSOR KIT, a great advance on last year's model, 10/- with order and 11 payments of 16/6.

1930 3-VALVE A.C. COSSOR KIT, 20/- with order and 11 payments of 28/-.

1930 2-VALVE A.C. COSSOR KIT, 15/- with order and 11 payments of 19/6.

NEW OSRAM MUSIC MAGNET, a very fine receiver, including Cabinet and Special Valves, 10/- with order and 11 payments of 19/6.

NEW MULLARD ORCOLA KIT, 7/6 with order and 11 payments of 11/9. Valves extra.

EKCO IV.20 A.C. ELIMINATOR, suitable for above receivers, 7/6 with order and 11 payments of 8/6.

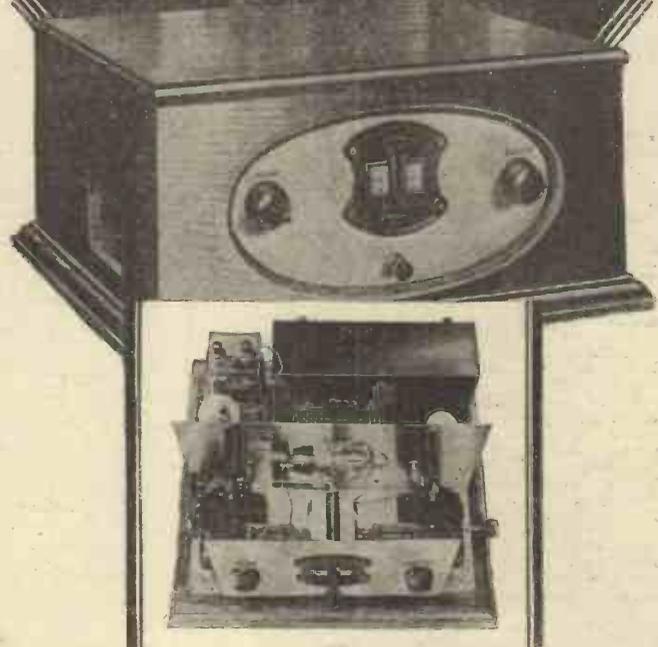
BROWN "V" UNIT and CHASSIS, fitted into our own high-grade Cabinet, equal to most expensive speaker, with the exception of moving-coil, 5/- with order and 11 payments of 5/3.

No postage or packing charges. Send us your list of requirements and a quotation will be sent by return.

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Build the LOTUS S.G.P. Set at home!



The new Lotus 3-valve S.G.P. Receiver is the season's greatest success. British and European stations come in with outstanding clarity and power. It is selective to a degree hitherto unattained.

Build this wonderful set yourself at home. You can buy the complete outfit ready to assemble from any retailer for £7/12/6.

Ask for the Lotus S.G.P. kit—full instructions are with it and the main components are already mounted.

FROM ALL RADIO DEALERS.

LOTUS

S.G.P. 3-valve Kit Set

Send to-day for full descriptions, diagrams and instructions for assembling.

Made by the makers of the famous Lotus components in one of the most modern radio factories in Great Britain by

Garnett, Whiteley & Co., Ltd.,
Lotus Works Liverpool

A "P.W." SET IN THE BUSH.

The Editor, POPULAR WIRELESS.

Dear Sir,—Since I have taken up wireless for better or worse, I have been a regular reader of your paper, and I must say that it is great.

I am writing this letter in praise of the first set I ever made—a one-valve set from one of your editions. I am 122 miles from the nearest station (6 W F), and the next nearest station is 2,000 miles away, yet I can always depend on a good programme. 6 W F I can get day or night with good volume. 6 W F Eastern States (3 L O, 3 A R, 2 F C, 5 C L, etc.) are good at night-time. I have built two or three valve sets since, but I always keep the one-valve for earphone reception. With the same set I have received Manilla, Malabar, and American stations on the short waves. As 6 W F is on the 1,000-metre band, and I have got as low as 23 metres it seems all the more remarkable. There are several sets in the district that cost from £25 to £70, and yet if there is anything particular that they want to know that has been broadcasted they phone me up and ask me to get it for them. (News items are of great interest here, as we are in the bush.) I have never managed to get up in time in the morning to get England. When I do manage I will send to you and get you to verify it.

Yours faithfully, T. PEACOCK.

P.S.—I have built two sets similar to mine for other people, and they have had the same results except they have not tried the low waves.

Boganup, W. Australia.

A QUESTION OF H.T.

The Editor, POPULAR WIRELESS.

Dear Sir,—It was with some amusement that I read in your issue of September 28th a letter from a correspondent signing himself "One of the L.S. 5 Brigade."

Although I feel completely crushed by the reference to my existing battery being very handy for grid bias, I also feel I should like to point out to your worthy correspondent one or two errors which have occurred in his interpretation of my letter of August 31st issue.

(1). I have never owned a moving-coil loud speaker, consequently I could not have joined it up the wrong way round; but I have heard several demonstrations with a view to getting one, and, as my letter stated, decided to keep to my old set as giving better and purer results.

If the speakers were correctly worked, then the sets must have been bad (if your correspondent is right) or vice versa, either of which is bad for the trade, since it has no doubt deterred others from becoming M.C. enthusiasts.

I am always open to conviction, and if your correspondent will favour me with his address I may yet avail myself of his very kind offer.

CORRESPONDENCE.

A "P.W." SET IN THE BUSH.

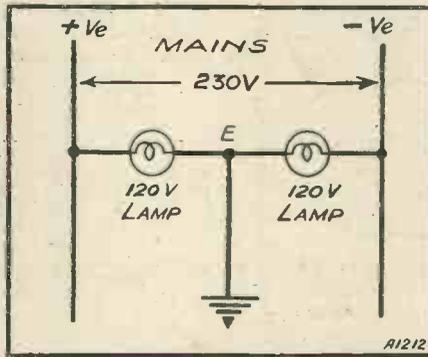
A QUESTION OF H.T.—WHICH MAIN IS EARTHED?—IS IT THE BEAM?

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.

(2). I did not say that 60 volt H.T. would drive an M.C. speaker, but simply that that voltage was sufficient for the set in question, for anyone who would be satisfied with four or five stations, etc. (See my last letter).

I can give your correspondent several years' experience in experimental work, having started seriously in 1918 when the war ended, but having dabbled and been interested in it at times since 1894 or 5, after attending lectures and demonstrations by an assistant to the now Marquis Marconi.

Though my H.T. requirement for the "Twelve-



trees" Circuit is so modest, I have quite a respectable amount at my command when required, namely a motor generator and smoothing outfit giving more than sufficient for the most extravagant M.C. speaker, and an H.T. Acc. Battery capable of supplying more modest requirements—so further comment re grid-bias batteries is necessary.

In conclusion I should like to draw your correspondent's attention to an article by G. P. Kendall, B.Sc., in the October issue of "Modern Wireless," page 325, starting at the words "It is here—"(Centre column).

Again wishing you every success,
Yours sincerely,
Invergordon. J.H.R.

WHICH MAIN IS EARTHED?

The Editor, POPULAR WIRELESS.

Dear Sir,—In a recent issue of your journal, in "Radiatorial," under the heading, "Which Main is Earthed?" you give a simple method of determining which main is earthed. This town is served with 230 v. D.C. from a private company's power station, and I tested the mains in this manner a short while ago, during some laboratory work.

To my surprise, the lamp lit, but not strongly, on both occasions, i.e. on both positive and negative. On inquiry at the power station I learned that the arrangements were as the enclosed diagram shows. Two 120-v. bulbs are connected in series, and the intermediate point earthed. Thus the supply conforms with regulations, and yet does not have to provide guard wires when crossing over P.O. lines.

I wondered if any other of your readers are served with mains of a like nature. So far, I personally have never heard of any other such mains.

Thanking you for some really fine sets and an equally fine weekly,

I remain yours faithfully,
Diss, Norfolk. W. J. HUNT.

IS IT THE BEAM?

The Editor, POPULAR WIRELESS,

Dear Sir,—With reference to the query by "Troubled" (Cardiff) in a recent issue of "P.W.," I am of opinion that he is suffering from the same trouble that is worrying a friend of mine at Clevedon, Somerset. That is, interference by the beam station at Portishead.

I was given to understand, whilst on a recent visit to Clevedon, that this station is causing a lot of trouble to local listeners, and the symptoms are exactly as "Troubled" describes.

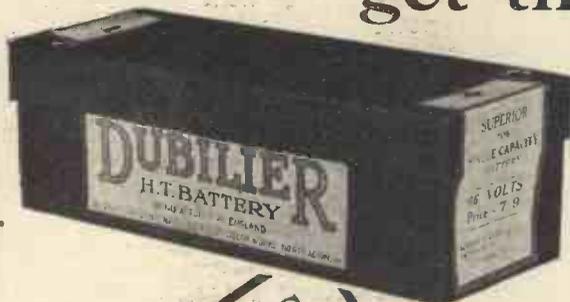
It would be interesting to learn the opinion of other listeners within a twenty-mile radius of Portishead.

Yours faithfully,
London, E.C.1. C. LONG.

For the best results

get this Dubilier made

long-life Battery



Buy one at your nearest Radio Shop to-day, fit it in your set to-night . . . and enjoy better quality reception at less cost.

66 VOLTS 7/9

SUPERIOR
(Single Capacity) 63 volts . . . 7/6
99 " (with C.B. Tappings) . . . 7/11
11/9 " 108 volts . . . 12/9

SUPREME
(Treble Capacity) 63 volts . . . 14/3
60 volts . . . 13/6
99 " 100 volts . . . 22/-

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LONGER LIFE AT LOWER COST

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To our many customers who have been kept waiting for their orders to be executed we tender our apologies for the delay.

We feel sure that it will be appreciated that the recent Radio Exhibition has resulted in an influx of orders which has necessitated the extension of our Works. Production has consequently been increased to meet the exceptional demand for the Donotone Loud Speakers and orders can now be accepted for delivery within any specified time.

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THE BEST LOUD SPEAKER

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MELTROPE—The Sound Boxes that put new life into old Gramophones!



No matter how old your Gramophone its tone can be greatly improved by fitting a MELTROPE Sound Box, which costs but 12/6

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(Regd.)

TWIN EASYFIX FLEX

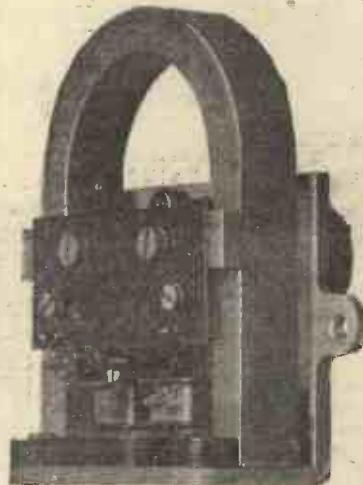
(Regd. Patent)

THE CAPACITY REDUCING FLEX FOR LOUDSPEAKER EXTENSIONS

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THE LAST WORD IN 4-POLE UNITS!

This four-pole balanced armature unit has the power, quality and tone of the best moving-coil loudspeaker.

PRICE 15/6

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L.S. EXTENSION LEADS.

Much trouble may be encountered if the long leads to a loud-speaker in another room are not properly laid. An interesting article

By N. A. STURGESS.

IN many cases a fair amount of the trouble experienced with regard to parasitic noises in radio reception may be directly traced to the faulty installation of loud-speaker lines. It must be remembered that good contact from an electrical point of view is not necessarily good contact from a "wireless" aspect, and a little care in laying loud-speaker extensions will always pay.

Avoid Twisted Flex.

In the first place, it is not a good plan to use twisted wire for extensions, as this has rather great self-capacity, and can quite easily give rise to an unpleasant hum, especially if light or power mains are to be found in the immediate vicinity.

The wire used should be of a well-covered, single type, and should naturally be of different colours, in order to distinguish the positive and negative of the loud speaker and output of the set itself.

As to the question of whether wires should be fixed away from the walls, it has been my experience that this is not really important, unless the wire runs through a kitchen or some similar place where there is

likely to be a considerable quantity of steam or moisture.

Practically any method of fastening the wire to the wall may be adopted, provided, of course, that the fastening is not actually driven through the wire; a very good method of fastening is to use the insulated staples employed by electricians in fixing bell or telephone wires.

Still further safety may be obtained by putting a small piece of wood between the wire and the wall, thus keeping the line clear of the wall. If, however, you don't mind going to a little extra expense in order to secure a perfectly trouble-free extension wire, there is a twin wire now made by a certain firm which is in every way admirable for this kind of extension work.

The Ideal Extension Lead.

It consists of two (or three) wires, untwisted, and held together by a material something like webbing, which can be obtained in a great variety of colours. Incidentally, special fastening pins are supplied with this wire, which do not damage the walls—a very important consideration when there is the possibility

that the extension may at some time have to be moved.

There are just two more points which should be noted. First, run the wires as near the ceiling as possible, because for one thing they are less noticeable, and for another they are out of harm's way.

Lastly, do not run them parallel to or near electric-light or power lines, for if you do you may get a very noticeable and annoying "ripple" the only cure for which is to move the extension or place a large fixed condenser across the L.S. output terminals, both of which courses mean trouble which would have been rendered unnecessary by a little more care in the first place.

NEXT WEEK

THE "MAGIC" TWO

Don't miss Your copy!

On Sale on Thursday, Oct. 31st.

Obtainable Everywhere.

One advantage of charging your accumulators at home is that you can be sure that the makers' instructions regarding charging rate are carried out properly.

The slightest imperfection in the insulation of a coupling condenser may result in distortion, so only mica condensers should be used for this purpose.

**MOST FAMOUS
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LOUD-SPEAKERS**

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An interesting and informative book on sound reproduction will be sent you free on request.

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If you are building the MAGIC 3 the best results will be obtained by using components as under:

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PAXOLIN PANEL, black or mahogany finish, drilled	7	9
PAXOLIN TERMINAL STRIP, drilled	2	0
H.F. CHOKE, range 30-2,000 metres	6	6
LOW LOSS COIL HOLDERS, each	1	6
VALVE SOCKETS, sprung, each	2	6
L.T. BATTERY SWITCH	1	0

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Use Wearite Titan Coil, 15/-, to ensure good reception.

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THE new Universal (No. 97 b) and the new Power Model (No. 98) fitted with 9" and 12" cones respectively will take every unit at present on the market including the new Amplion BA2 They will take yours. In each case the cradle is of aluminium, cone of the latest Vellume type and the beautifully polished octagonal front gives the speaker a really finished appearance. This is entirely in keeping with the magnificent reproduction afforded. See them at the Manchester Radio Exhibition, Stand 116 (Gallery), or drop us a postcard for a fully descriptive leaflet.

- 97b Aluminium Cradle, Enamelled and Polished, fitted with Vellume cone and octagonal front, back leg and bracket also included **15/-**
- 98 Similar in every respect to the above, Universal Fitting, etc., with 12" Vellume Cone and Octagonal Front, back legs and bracket included **18/6**

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P & T



VERNIER DIAL

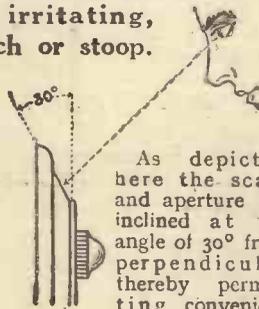
Tuning without irritating, uncomfortable crouch or stoop.

Black, **3/-** Walnut,
Brown, **3/-** Mahogany

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Centre Knob Nickel Plated.

SMALL—EXTREMELY ELEGANT—EFFICIENT



As depicted here the scale and aperture are inclined at an angle of 30° from perpendicular thereby permitting unobstructed view of scale without need to crouch or stoop.

MECHANICALLY PERFECT. POSITIVE BRASS CONTACT drive on SOLID BRASS SCALE, ensuring SMOOTH MOVEMENT with absolutely NO BACKLASH. NO SLIP. ROBUST in Construction and TROUBLE-FREE.

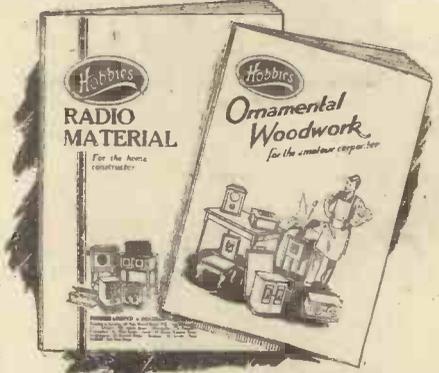
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Every wireless enthusiast should have these books. They tell you how to build mahogany cone speakers for 20/-, cabinets for 8/-, and a host of other interesting matter. Full of essential information for the home constructor. One has 20 pages and the other 12 pages—both are free on request. Just send a postcard now before you forget. Write to Dept. 69.



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OF TESTED CIRCUITS 6d. EACH

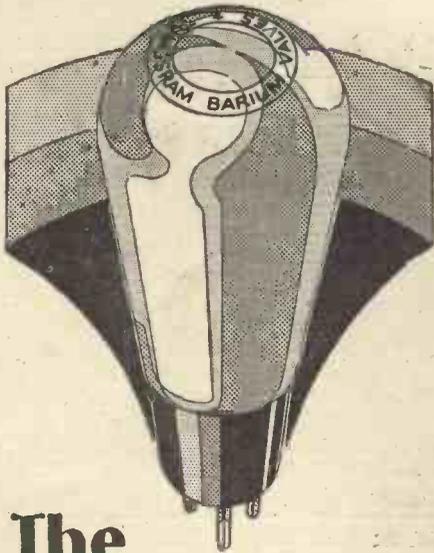
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Number

1. DETECTOR VALVE WITH REACTION.
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4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
5. H.F. (Tuned Anode) AND CRYSTAL WITH REACTION.
6. H.F. AND CRYSTAL (Transformer Coupled, without Reaction).
7. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Tuned Anode).
8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
9. H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
10. H.F. AND DETECTOR (Transformer Coupled, with Reaction).
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12. OUT OF PRINT.
13. 2-VALVE REFLEX (Employing Valve Detector).
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16. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (With Switch for Last Valve).
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33. A "KNIFE EDGE" CRYSTAL SET.
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35. THE "UNIVERSAL THREE" (Det. and 2 L.F. stages resistance-coupled).
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37. THE "LONG SHORT" CRYSTAL SET.
38. A TWO-VALVE L.F. AMPLIFIER.
39. THE "SYDNEY" TWO.
40. THE "SUPER SCREEN" THREE.
41. THIS YEAR'S "CHITOS" ONE-VALVER.
42. THE "Q AND A" THREE. A simple set (Det. and 2 L.F.).
43. THE "INEXPENSIVE FOUR."
44. THE "ECONOMY FIVE." For long-range loud-speaker work.
45. A SIMPLE A.C. H.T. UNIT.
46. THE "REGIONAL" THREE.
47. THE "WAVE-CHANGE" ONE.
48. THE "REGIONAL" CRYSTAL SET.
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The Better Valve at the lower price

It's been wanted for a long time. It was left to Tungram, a name already known all over the world for electric lamps, to produce a non-Association Radio Valve of really high quality. The strength of the Tungram valve lies in its Barium filament which will endure long after the old filament is useless. The results obtained can compare with those obtainable from any other valve. 2, 4 and 6 volt types available; the prices, 5/6 to 10/-, show a great saving over the valve - ring figures.



TUNGSRAM BARIUM VALVES

If you have any difficulty in obtaining, write direct to:—

Tungram Electric Lamp Works (Great Britain) Ltd.,

Radio Dept., 72, Oxford Street, W.1.

Branches: Belfast, Birmingham, Bristol, Cardiff, Glasgow, Leeds, Manchester, Newcastle, Nottingham.

GETTING THE MOST FROM YOUR SET

By J. H. T.

IT is always worth while introducing a milliammeter into the H.T. supply circuit and making adjustments with the grid-bias voltage until you find out what is the minimum H.T. current which will give you satisfactory reproduction. The saving in H.T. current which can be effected in this way—not only without any adverse influence upon results but even with improvement in the same—is often quite surprising to experimenters who have never taken the trouble to determine what current is passing from their H.T. battery.

I would point out that an improvement in results may be obtained (quite over and above the economy in H.T. current), because amateurs are sometimes apt to think that, whilst economy in H.T. current is obviously desirable when an H.T. dry battery is used, it is of little or no importance where a mains-supply unit is employed having ample current capacity.

It is true that the question of economy may not arise in the latter case, but it is still desirable to give careful attention to the question of correct grid bias because of the improvement which is thereby obtained in reproduction.

Gramophone Pick-ups.

A very simple indication of the advantage of the sensitive pick-up is the fact that the light and shade effects upon a gramophone record used with a pick-up are more or less faithfully reproduced from the loud speaker; if the input to the pick-up has little effect upon the final volume, the variation of light and shade in the record would be more or less smoothed out and there would be little variation in the reproduction from the loud speaker.

The very fact that the variations are more or less appropriately reproduced shows that the output volume from the speaker varies in accordance with the input to the pick-up. It follows, therefore, that a sensitive pick-up represents a direct saving in amplification. **Standardisation.**

Talking about pick-ups, it seems to me a pity that, for some aggravating reason, some manufacturers make pick-ups which lie in a plane parallel to the gramophone track, whilst in other cases the pick-ups are designed to lie roughly at right-angles to this position. The result is that with the usual type of tone-arm or pick-up arm it is very inconvenient to try different kinds of pick-up.

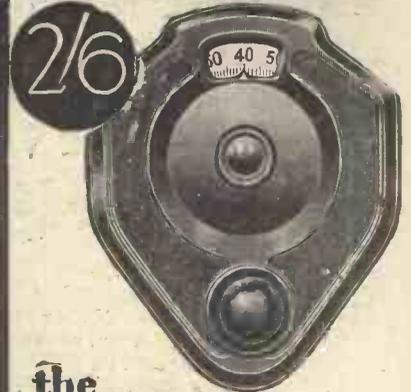
There seems to be a complete absence of standardisation in these pick-ups, as there is, incidentally, also in gramophone tone-arms. I do not know whether you have ever noticed it, but if you want to take a sound-box from one gramophone and fit it to another it is ten chances to one that it won't fit.

Comparative Tests.

I believe it has been mentioned before that the H.T. battery—especially accumulators—is unsurpassed for quality of reproduction, and, in spite of all the arguments which are raised (and will, I suppose, be

(Continued on page 408.)

Brownie



the 'DOMINION' Slow Motion Dial

A VERNIER Dial at 2/6! Bring your set up-to-date by fitting this slow-motion dial. The mechanism is of special non-backlash construction which makes very fine tuning easy. Finished in smooth black or beautifully grained mahogany bakelite, this unique dial gives high-class finish to every set in which it is included.

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Nelson Street Works,
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Panels for ORGOLA 3/6

All-Wave Tuners 7/11, Indoor Aerials 1/-, H.F. Chokes 2/-, 3/-, S.L.F. Condensers 3/3, Reaction 2/8, S.M. Dials 2/3, Cone Chassis 8/11, Titan Coils 15/-, Screens 1/6, Coils for Master 3 3/3, P.P. Switches 8/d., V.Holders 8/d., Coils for New Corsor 8/6. Everything Wireless. Stamp for list. £1 orders post paid. No rubbish supplied.

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This Cabinet soundly constructed of Oak and equipped with Baseboard Runners. Full Front, Hinged Top. Polished rich Jacobean, 36" high. For panels 45/- up to 18" wide. Also made to accommodate any Popular Set. Greatest Range of Wireless Cabinets. Illustrated Lists Free.

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HERE COMES THE BASS

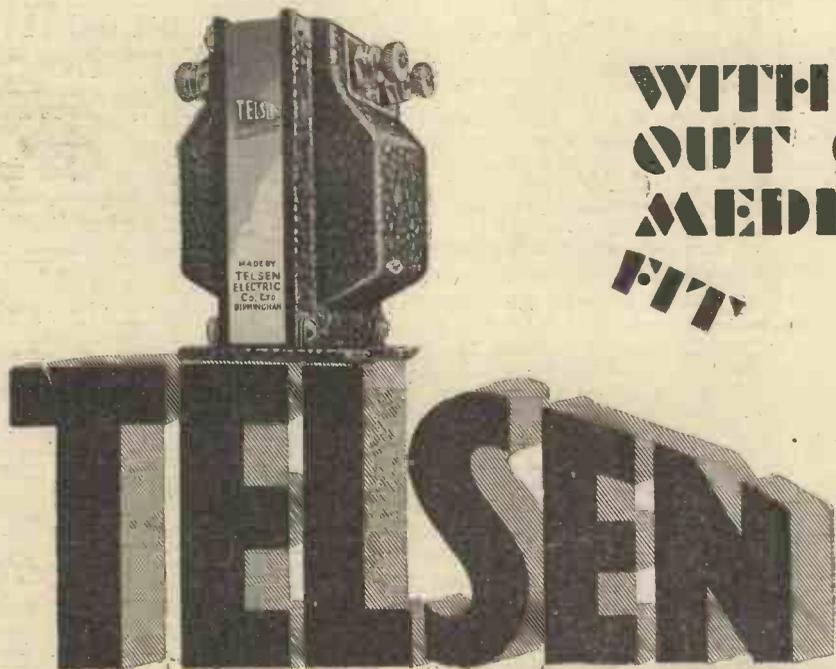


WITH MELODY OUT OF THE MEDLEY

FIT

Bass Notes—These being the most difficult notes to record correctly, it is the aim of all Transformer Manufacturers to attain perfect tonal reproduction of these notes; having attained this perfection, the High and Low Notes will also record successfully—providing the Transformer is constructed on sound Transformer Theory—here Telsen Transformers Excel—because we specialise in Transformer construction; we make nothing else; our very lives are steeped in Transformer Manufacturing. Try one now. They are entirely British.

"Radiogrand" Model	"Ace" Model
12/6	8/6
Ratios 5-1 and 3-1	Ratios 5-1 and 3-1



TRANSFORMERS

TELSEN ELECTRIC CO., LTD., MILLER STREET, BIRMINGHAM.

GETTING THE MOST FROM A SET.

(Continued from page 406.)



Patent No. 295,625.

The Speaker which created such amazing popular interest at the Show

... incorporates **the Double-diaphragm Principle** ... uniform frequency response from 60 to 10,000 cycles ... reproduces the high and the low notes faithfully.

IN ATTRACTIVE CABINETS.

Model U 12	Price	£3 19 6
Model U 14	Price	£5 5 0
Model U 18 (in oak)	Price	£11 0 0
Model U 18 (in mahogany)	Price	£11 17 6
Model U 24	Price	£16 16 0

IN CHASSIS FORM.

Type L	12" x 10" x 3 1/2"	42/-
Type K	14" x 14" x 5 1/2"	52/-
*Type F	18" x 23" x 5 1/2"	84/-
Type J	24" x 24" x 6 1/2"	105/-

*Type F is that used by Mr. Percy W. Harris in his "Wireless Constructor" All-Electric Gramophone.

ULTRA AIR CHROME

The only speaker with a published frequency response curve.

raised by these present remarks) in favour of eliminators, I still maintain that I have yet to test the mains unit which will give results really equal to those given by a first-class high-tension battery of accumulators in proper condition.

Any trouble attaching to the use of accumulators, whether high-tension or low-tension, has still further been reduced by the introduction during the past two or three years of several excellent forms of re-charging devices. The problem of re-charging was a great bugbear with the low-tension battery, whilst in the case of a battery of high-tension accumulators re-charging was practically out of the question on alternating-current mains. But now that so many inexpensive and thoroughly reliable chargers are available high-tension accumulator batteries are coming into their own, even in face of the competition of the much smaller and more compact H.T. mains units.

RADIO REMINDERS.

One of the commonest causes of "mysterious" faults is faulty contact due to a defective or broken flex lead.

Ivory labels which have become detached from panels can be secured by ordinary rubber solution as used for mending bicycle tyres.

Always switch the filaments off before altering your grid-bias negative adjustment, especially if you are using a power valve.

A large value condenser, say 1 or 2 mfd., connected across the contacts of a vibratory rectifier will very often cure sparking at this point.

If you have odd or dirty pieces of solder, these need not be thrown away, but can be placed in a suitable flat lid over a gas flame and heated. The scum can be scraped off, after which the solder should be poured on to a cold surface such as a tiled floor, when it will set immediately.

If the celluloid plugs which fill the holes at the top of your accumulator have become dislodged and lost, do not continue to run it in this condition as it is very easy to ruin the accumulator if small metallic particles find their way through the holes into the electrolyte.

To protect small drills, tools, etc., from rust and keep them in good condition, all that is necessary is to coat them with a thin coat of grease or oil.

The MAGIC of Ready Radio

SEE PAGE 397.

The REGENTONE POWER BOX

Our 12 months' GUARANTEE—given with all Regentone products—covers Westinghouse Metal Rectifier.

Comprises Westinghouse Metal Rectifier and Regentone Transformer to give H.T. Output when smoothed of 120 volts at 20 m/a or (Model No. 2) 180 volts at 30 m/a. Also equipped with two additional tappings to deliver L.T. for A.C. Valves 4 volts up to 4 amps.

When used with Regentone Filter Compact — 2 connections only—it forms a complete H.T. Unit.

A.C. Power Box, complete with Fuse, Flex, Lead and Adaptor	No. 1	£2 10 0
	No. 2	£3 10 0
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Our ART BOOKLET contains much interesting information on "Radio from the Mains." Write for free copy to-day.



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PRICE REDUCTION OF THE MULTI-RANGE DIX-ONEMETER

The extensive sale and increased use has enabled a reduced price to be offered below the already exceptionally low price.

DIX-ONEMETERS are now 50/- only, a remarkably small price for a meter worth £10 in comparison with others.

Latest Model. To 1st Grade Brit. Eng. Standard. Mirror Double Scale. Moulded Base. The finest Precision Multi-measuring instrument is the DIX-ONEMETER, the acknowledged Radio standard beloved by Expert and Amateur. Imitations of its Bakelite case and mirror scale are inferior. They lack the 50 Multiplier Ranges, the Precision, the Duplex Scales, Knife-Edge Needle, Accurate Bearings and High Figure of Merit. Remember that the DIX-ONEMETER is as nearly electro-static in its tiny load and can be used at 2,500 ohms per volt. On 100 volts the high value of 250,000 ohms can be used. Micro-Amps., Milli-Amps., and Amps. to 20A. Milli-Volts and Volts to 2000 V. Resistances from 50 ohms to 50 million ohms. All these are measured with ease on the versatile and finely made DIX-ONEMETER.

DIX-ONEMETER 50/- ONLY

Range Multipliers 6/6 each
Electrical and Radio Test Booklet Free

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PLEASE be sure to mention "POPULAR WIRELESS" when communicating with Advertisers. THANKS!

SONGS OLD AND NEW.

TONI FARRELL, the popular Wireless Syncopated pianiste and composer, has a few words to say about songs, old and new. (We shall be hearing her once again tonight (Oct. 24th) from 2L.O.)

I WAS talking to a friend of mine the other day about Wireless and the amazing strides that have been made in this and other marvels that have come to pass in our time, surely the most wonderful era that has yet been known on our old planet. We agreed as to the stupendous difference that Wireless has made in lives which, up to a little while ago, had small knowledge of the great masters of music.

I refer not so much to the people of good means, to whom concerts and theatres are everyday occurrences, but to those in wayside villages, to invalids, to the many, many souls to whom, before the coming of Wireless, music was but a name for the wailing of the village choir, or the raucous efforts of the travelling circus band.

Forgotten Favourites

"But," I said, "just one thing struck me the other day. Perhaps you will think that I want too much, but do you know, often and often, lately, I have heard on the Wireless, songs of all kinds, opera, musical comedy, ballads, etc., that I had almost forgotten, songs that brought back very early memories. In several cases I have noted down their names, and made a vow that I would get them 'for keeps' in the morning, but do you know, in hardly any case was I successful! What a pity it is, and how I wish it were possible to get some of the beloved favourites of yesterday!"

"You certainly talk like a book," said my friend with a pitying glance, "but (as I have been trying to tell you, only you would not let me interrupt your brilliant flow of language), it is true that the Radio has re-opened an interest in the old favourite songs, and it is true that the younger generation is getting to know and to love the songs that their parents sang.

A Book to be Proud of!

But it's wrong to say that you can't buy those songs now. You can! This idea that has only just struck your mighty brain, has been simmering for some time in the minds of several bright people, with the result that now we are going to have a wonderful new fortnightly part work that everyone can buy, edited by Percy Pitt, a book to be proud of, within the reach of all (at the amazingly small cost of 1s. 3d. per part), and called, of course, 'Famous Songs, Old and New.'

"Well, I am very glad to hear it," quoth I, in no wise crushed by this withering rejoinder, "and I shall be only too pleased to buy a copy, though as perhaps, owing to your zeal in describing this book to me, you are not unconnected with its publication, you will be delighted to present me with a free copy. No? Oh well, never mind, I will buy one after my next broadcast!"

The Easy Way TO PERFECT RADIO

In addition to their own extensive range **PETO SCOTT** offer **YOU** every known Radio Receiver or Component. The list given below merely illustrates our terms for a few well-known lines and we ask you to fill in the coupon or send us a list of your requirements for which we shall be pleased to quote for cash or on our famous system of

EASY TERMS with SERVICE AFTER SALES

THE NEW "TITAN" SETS. Complete kits, including the very best components, drilled panels, and polished cabinets.
"TITAN" TWO. Send only 9/9, balance in 11 monthly instalments of 9/9.
"TITAN" THREE. Send only 10/4, balance in 11 monthly instalments of 10/4.
"TITAN" FOUR. Send only 13/2, balance in 11 monthly instalments of 13/2.
THE "P.W." FOUR (as described in issue of Sept. 21st). Complete kit, including polished mahogany cabinet, panel, and all specified components. Send only 17/8, balance in 11 monthly instalments of 17/8.
THE BROOKMAN'S THREE (described in "Modern Wireless," September issue). Complete kit less valves. Send only 17/5, balance in 11 monthly instalments of 17/5.
NEW OSRAM MUSIC MAGNET. Send only 16/6, balance in 11 monthly instalments of 16/6. Valves included.
McMICHAEL SCREENED GRID THREE. Complete kit of components, excluding cabinet, valves, etc. Send only 16/3, balance in 11 monthly instalments of 16/3.

FERRANTI ELIMINATOR KIT for home construction, using Westinghouse Metal Rectifier. Output 200 volts, 100 m/a for A.C. Mains. Send only 40/-, balance in 11 monthly instalments of 22/8.
B.T.H. R.K. UNIT (for 6-volt accumulator or D.C. Mains). Send only 11/7, balance in 11 monthly instalments of 11/7.
REGENTONE W.I.B. S.G. (A.C. Mains). For S.G. and Pentode Sets. Send only 9/2, balance in 11 monthly instalments of 9/2.
EKO 3 F.20 (A.C. Mains). Also for S.G. and Pentode Sets. Send only 7/4, balance in 11 monthly instalments of 7/4.
ALL LEADING MAKERS OF ELIMINATORS from 4/7 first payment.
CELESTION C.10 LOUD SPEAKER in Oak. Send only 6/11, balance in 11 monthly instalments of 6/11. In Mahogany, 7/1.
CELESTION C.12 LOUD SPEAKER in Oak. Send only 10/4, balance in 11 monthly instalments of 10/4. In Mahogany, 10/9.
CELESTION C.20 LOUD SPEAKER in Oak. Send only 14/3, balance in 11 monthly instalments of 14/3. In Mahogany, 15/2.

THIS WEEK'S SPECIAL FEATURE THE "MAGIC" THREE. Build the wonderful set described in this and the last two issues. Complete kit of components, including cabinet and coils. Send only 15/-, balance in 11 monthly instalments of 14/-.

1930 MULLARD "ORGOLA," including cabinet and valves. Send only 20/-, balance in 11 monthly instalments of 20/-.
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THE ADAPTAGRAM converts your existing Radio Receiver to a modern Radio Gramophone. Perfectly simple. Takes practically any set. Garrard motor, R.T.H. Pick-up, Balanced Armature Loud Speaker. All fitted in a handsome polished Oak Cabinet. Send only 39/6, balance in 11 monthly instalments of 23/-.
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Your set is only as good as its Speaker!



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PRICE

4 coils, double magnets, upper adjustment for magnets, lower adjustment for armature. Works on newly discovered principle.

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REFINEMENTS FOR THE "MAGIC" THREE.

(Continued from page 390.)

cut the lead which comes off the moving vanes terminal of the differential reaction condenser (marked "Arm" on the blue print) and take the two ends so formed to the two terminals of the extra fixed condenser.

Now about the use of an output filter in the "Magic" Three. Since one of our main objects in the original design was the utmost simplicity and economy, we did not provide an output filter, and so long as you use an ordinary power valve in the last stage it is quite safe to dispense with it. If, however, you want to use either a super-power valve or a mains unit with this set it is advisable to incorporate a filter.

If you already have in your possession an output filter built up as a separate unit you can quite well use it with this set, simply connecting it up to the loud-speaker terminals, but if you desire to build a filter into the set it is quite a simple matter, and you should proceed as follows.

Fitting a Filter,

There is ample room on the baseboard near the left-hand side at the back (looking at the set from the rear), and you will require the following extra parts: One output filter choke of about 20 henries inductance and with a D.C. resistance of not more than 500 ohms. One 2-mfd. condenser will be needed in most cases, but if you are going to work the set from a D.C. mains H.T. unit you will require two or three condensers.

This is how you should proceed to wire in the output filter unit. Note that there is a wire going from the H.T. +2 terminal to the L.S. + terminal on the terminal strip. Remove this wire and instead wire H.T. +2 to one terminal of the filter choke. Next note that there is a wire going from the L.S. - terminal to the plate terminal of the third valve. Remove this wire and instead join the plate of the valve to the remaining side of your filter choke and one side of the 2-mfd. condenser.

Join the other side of the condenser to the L.S. - terminal. If the set is not to be used with a D.C. mains unit, just join the L.S. + terminal to H.T. + and the job is complete. If the set IS to be used with a D.C. mains H.T. unit, on the other hand, connect the L.S. + terminal to one side of your extra 2-mfd. condenser and join the remaining side of this condenser to H.T. -, which completes the job.

The MAGIC of Ready Radio

—SEE PAGE 397—

96 v. for 2 valves, 19/8
 115 v. for multi-valves, 27/9
TROMBA NO EXTRAS, CARR. PAID.
THE WET H.T. Postcard brings booklet, or 1/- full range of samples.
TROMBA ELECTRICAL CO. (Dept. W), 51, Chalk Farm Road, CAMDEN TOWN, N.W.1. C.O.D. Phone: Hampstead 0023.

Build your New Set NOW!

PAY AS YOU LISTEN

Why be satisfied with your old set, when for a small monthly payment you can build the very latest set yourself, or bring your old Receiver right up to date? Increase your reception 100%.

P.D.P. FOR Cash Terms

COMPLETE KITS for all Circuits supplied—see the following examples of our terms:—

MAGIC THREE KIT (including Valves, Oak Cabinet and Coils). CASH £9.2.0. Send only 16/8, bal. by 11 monthly payments of 16/8.

COSSOR 1930 KIT. CASH £8.15.0. Send only 18/-, bal. by 11 monthly payments of 18/-.

MULLARD ORGOLA KIT, including Oak Cabinet. Send only 14/3, bal. by 11 monthly payments of 14/3.

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KITS FOR THE MAGIC THREE, TITAN SETS, "P.W." FOUR, etc. Loud Speakers, H.T. Units, Accumulators, Moving Coil Speakers, Portables, etc.

Everything Wireless

ANY RECEIVER BUILT FOR 10/-

A nominal charge of 10/- only is made for building and testing any Receiver (Marconi Royalties extra).

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Call or send a list of your requirements.

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Phone: National 9846.

WIRELESS CABINET in oak 34'6

Carriage Paid, England and Wales. 2/- extra Scotland. This particularly useful little Cabinet is finished in Rich Jacobean or other shades. Will take Ebonite panel 18 in. x 7 in. across front. Large solid hinge top and 7 in. drop front as shown. Double doors with beading to cupboard in which is a loose baseboard. This is a very well made and well finished article, a really useful piece of furniture and an asset to any household.



O.C.A. FURNISHING CO. (Dept. P.W.),

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Opp. Chelsea Football Ground.

SIZE: 34 in. high x 22 in. wide x 16 in. deep. Quotations given for other sizes. Phone: Fulham 7012.

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WILL-DAY LTD. (THE BEST IN THE WEST) 10 LISSE STREET, LEICESTER SQUARE, LONDON, W.C.2. (Opposite "Flourish" sign, opposite 1922) Telephone: Dishes, Plates and Cakes. OPEN TILL 7 P.M. WRITE FOR OUR CATALOGUE POSTAGE & FEE TO COLLECT

TECHNICAL NOTES.

(Continued from page 370.)

were detected 300 ft. below. Frequencies of 20 and 30 kilocycles were much louder than those between 40 and 100 kilocycles. Very long waves, of half a kilocycle, were detected without an amplifier through 900 ft. of rock. Such tests as these are important because of the use of similar methods for finding ore deposits.

"Synthetic" Broadcast.

The well-known American radio station, KDKA, of the Westinghouse Electric & Manufacturing Company, has lately been making some experiments with building up what they describe as "synthetic sounds." Dr. Frank Conrad, assistant chief engineer of the Westinghouse Company, conceived the idea of making up artificially the sound of the chimes of Big Ben, London.

This was done by analysing the sound very carefully into its component frequencies and then making up a number of oscillators, each giving one of the required frequencies. By combining the frequencies the same signal is carried to the transmitter and sent out on the air as would be produced by sounding the bell itself before a microphone.

To ensure absolute accuracy this artificial bell is set off by means of a second's pendulum operating in a vacuum.

Although this is very ingenious and interesting scientifically, I should have thought that for the simple purpose of

Going to Build a Set?

Don't Choose Hastily!

Tell you what to do—

Wait until you see

MODERN WIRELESS

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GREAT GIFT NUMBER

with details for building

12 MAGNIFICENT SETS

of different types for all needs.

To avoid disappointment and secure this stupendous shilling's worth

ORDER YOUR COPY NOW.

reproducing the sound of Big Ben the easiest thing would have been to have made a number of gramophone records of the actual sound and to have reproduced these through the transmitter.

Research on the Electron.

I suppose every radio experimenter in these days knows about electrons, protons, atoms, and all the rest of it. The atom contains—or, to be more accurate, is partly made up of—a number of electrons. This applies to the atoms composing the metal of a valve filament just as to any other atoms. In certain circumstances some of the electrons are set free and may escape from the body of the substance.

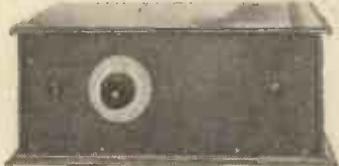
This is the way in which the electrons are released from the filament of the valve; owing to its heated condition electrons are

(Continued on next page.)

H.T. BATTERIES

H.T. BATTERIES.	EVER-READY.—60-v.
1/ P. & Post. (20/- free.)	7/-, 66-v. 7/6; 99-v.
SIEMENS.—60-v. 8/;	11/6; 120-v. 14/;
100-v. 13/; Power. 60-v.	Power. 65-v. 13/6;
13/6; 100-v. 22/6.	105-v. P. 24/; 120-v.
HERTRIX.—60-v. 8/;	2 27/6.
10-v. 13/; 120-v. 15/6;	GARNELITE.—60-v.
G.B. 1/6. Special	5/9; 100-v. 9/4. Fully
Portable Size, 9 x 5	guaranteed.
x 3, 100-v. 13/.	HELSESEN.—60-v.
Very highly recommended.	10/6; 99-v. 18/.

TALISMAN 7/6	TUNEWELL 7/9
DUAL COIL (Wearite) Magnetic Reaction	DUAL COIL 200/2000 Metres.



20 to 2,000 metres on this set. Tremendous volume and superlative quality.
KIT OF PARTS.—18 x 7 Panel, .0005 Variable S.M. Dial, Reaction (Differential), L.T. Switch, 3 Spring V.H., 2 Coil Sockets, 400-ohm B.B. Potentiometer, Neutrodyne B.B., Lewcos H.F. Choke (or R.I. Dual), Hyperin and Igranite J. NET CASH L.F.—.0005 Fixed, 2 mfd. 2 Post 1/6 U.K. meg. Leak and Holder, 25,000-ohm to 60,000-ohm Wire-wound, 16 x 2 Strip, 10 Terminals, Wire, Screws, Baseboard.

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OAK CABINET, complete with cone speaker unit, 15/11; 4-way Battery Leads, 1/8; Wander Plugs, doz. 1/1; Large Sleeting, 3 for 9d.; Best R. & B. Twinflex, 12 yds. 1/3; Stranded Rubber, 12 yds. 1/-; 7 m/m Lead-in, 3 yds. 1/3; very small Terminals, doz. 1/-; .0005, .0003 S.L.F., 2/11; Phone Cords, from 9d.; Nickel W.O. Terminals, doz. 1/-; D.O.O. Wire, 4 lb. reels, 20 8d.; 22 9d., 24 10d., etc.; 18 & 16 Round T. copper, 9d.; 30 ft. best connecting wire, 10d.; Coil Plugs, 6d.; Engraved Terminals, 3d.; Alum Screens, 8 1/2 x 6, 1/3; Copper from 2/-; H.T. 100 volts, 8/11 fully guaranteed; good Headphones, pair 3/11; grand L.F. Transformers, 5/11; .06 2-volt Fuse and Holder, 8d.; Good Speaker Cone Units, 6/11; 50 ft. Electron, 1/-; Coloured Spade Terminals, 4 for 6d.; Grid Leak Clips, 3d.; Crocodile Clips, 3 for 4d.; Dead-beat V.-meters, 4/6 (for H.T. and L.T.); L.T. only, 3/6; pretty design S.M. Dials, 1/9 each; O.K. 4.5 Battery, 6 for 2/-; Cat's-eye Bulbs, 3d.; Testers, 3d.; Insulated Aerial Wire, 100 ft., 1/3; Heavy 7/2 Stranded Copper Aerial, 100 ft., 2/2.

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2 volt or 4 volt.
Universal Resistor.
 Super H — 5/6 ea.
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Complete with Three Cossor Valves including Screened Grid, Cabinet in two-tone blue lacquer, together with silver-finished escatchoon, the kit contains everything necessary for home assembly.
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WATES' VOLTMETER (3 in 1).

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COMPLETE RECEIVER IN CABINET, as shown, S.M. Tuning, 3 Dull Emitter Valves, Battery Leads, Grid Bias and Set of Coils. 12 Equal Monthly Payments of 14/3 OR with H.T. Battery, L.T. Battery, Cone Speaker Aerial. Ready to use. Tetsed OK. 12 Monthly Payments of 17/11 Carriage extra.

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Lewcos Coils, 40 3/8, 100 4/8, 60X, 4/9, 250X, 6/6, X Set of 4 E.H.T., 10/-, X Igranite Shot, Wave, 10/- set, Mullard Power, 12/6, Det. 10/8 each, X Dairo, 7/8 & 5/8, X American Cabinets stocked, hinged lid, from 17/6.

SENSATIONAL OFFER IN LOUDSPEAKER SETS (NOT PARTS) DE LUXE MODEL



NO COILS TO CHANGE. JUST SWITCH ON—THAT'S ALL.

MULLARD MASTER 3 STAR CIRCUIT

This new and wonderful set must appeal to Young and Old, amateur and experimenter—in fact, EVERYBODY! COMPLETE as shown, in Cabinet (hinged lid), all parts enclosed, Tunewell Dual Coil 200/2000 metres, 3 Latest D.E. Valves, Grid Bias, Battery Cords, 6/0 Motion Tuning. **READY FOR USE 69/6** Packing & Carr. Pass. 7/- NOT C.O.D.

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PLEASE SEND DETAILED Orders over 25/- value will give LIST OF REQUIREMENTS, you a special quotation for each.

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Panel, Baseboard, .0005 Variable, 4 in. Dial, 0/0 Switch, Wave-change and .0001 Reaction, Titan Coil Unit, Spring V.H., .001 and .0003 Fixed, H.F. Choke, 8 x 2, Wire, Flex, Screws, Terminals.
POST FREE. CASH NOT C.O.D. 37/6

"TITAN" TWO

Special Cash Offer. S.M. Variable .0005, Reaction, 2 Switches, TITAN COIL UNIT, L.F. Transformer, 3 V. Holders, 3 Fixed Condensers, 2-meg. and Holder, 10 Named Terminals, Panel 12 x 7 Wire Screws, Flex, all Sundries, Baseboard, Wiring Diagram. NOT CABINET. **POST FREE. NOT C.O.D. 50/-**

LATEST OSRAM MUSIC MAGNET £9

includes CABINET (Oak), 3 Valves (1 S.G.), Kit of Parts, guaranteed as supplied by G.E.C. with full instructions.

OSRAM KIT EASY TERMS

12 monthly payments of **16/4** OR with H.T. Battery, L.T. Battery, Cone Speaker, Aerial, 12 monthly payments of **21/-**

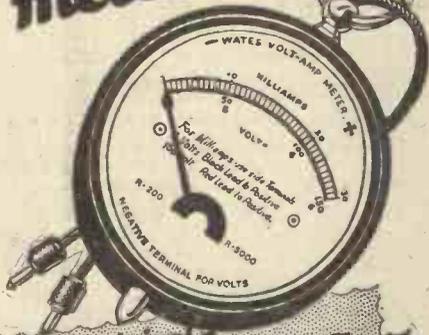
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MULLARD KIT £6 11 6
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 18/- ORGOLA CABINET FOR Specially made for this Set by us. See what you save. **£9 11 0**

Carriage and Packing, 3/6.

Owing to an error, Cabinet was included in Titan Two kit of parts for 50/-. This does NOT include Cabinet.

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pinnacle of
meter value!



The original
WATES
three in one
VOLT AMP
RADIO TEST METER

Peak Value! Three readings on one dial, volts, H.T. and L.T., and milliamps, perfect accuracy, remarkable reliability, and so useful, many listeners would pay double its price rather than be without it! A sensation on its production, the Wates Meter still leads as the original and pre-eminent 3-in-1 meter. It makes set handling a science, and gives you the true appreciation of what good reception really is.

The "Wates" Range, Standard Model illustrated. Price 8/6. Case, 2/6 extra. Panel Mounting Model, 13/6. Panel Mounting Milliammeters with Jewel Bearings, 0-50 or 0-25 M.A., 9/6.

Obtainable from Halford's Stores, Curry's Store and all Radio dealers, or direct.

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THE FAMOUS
3-in-1 METER **8/6**
M.B.

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The MAGIC of
Ready Radio

SEE PAGE 307.

TECHNICAL NOTES.

(Continued from previous page.)

released and, under the influence of the electric field maintained by the high-tension battery, these electrons pass away from the filament towards the anode and constitute what we call the anode current.

Scientists are always at work trying to elucidate still further the intricate problems connected with the atom and its constitution, and it is necessary, therefore, to keep up to date with results of their discoveries. You have heard of the simple theory that the atom consists of a central nucleus surrounded by planetary electrons.

According to more recent results the nucleus itself contains a concentrated store of force called the sub-nucleus; rotating around the sub-nucleus are very small and lightly charged particles which are kept in position under the combined influence of the attraction of the sub-nucleus and their own mutual repulsions. At further distances from the nucleus are the electrons which move around in their orbits.

Breaking Up The Atom.

Sometimes a disturbance arises in the nucleus of an atom, and one of the smaller and, as I have said, lightly charged parts is shot out of the atom at an enormous speed. This is known as an alpha particle, and may have a velocity as high as 10,000 miles per second.

The muzzle velocity of a high-speed shell from a gun is only from one to two miles per second, so you see that the alpha particle comes out of the atom at a really high speed. The speed, in fact, if it could be maintained, would take the alpha particle completely round the earth in about two and a half seconds!

Owing to this very high velocity the alpha particles are quite uncontrollable in the way in which the ordinary thermal electrons are controlled. If we could make use of the alpha particles we should then have an emission of the opposite kind from that which we use at present—that is, a positive instead of a negative emission.

Coils and Screening.

I spoke recently about the question of the design of coils and the use of so-called "fieldless" coils in lieu of screening. Of course, "fieldless" coils are not by any means true to their description, and therefore in many cases screening is really necessary.

In some cases long-wave and medium-wave transformers may be placed upon the same former, but these should be placed at least one inch apart.

At the same time you must remember that this space should, if possible, be made rather larger and a similar remark applies to the placing of the screens. There is always a certain amount of energy-loss in the screen—that is, if the screen is serving any purpose whatever—in fact the very purpose of the screen is to absorb stray energy. It follows that the heavier the work the screen is doing the greater the energy losses and, other things being equal, the lower the efficiency per stage.

Compactness and Efficiency.

The practical result of this is that too great compactness should not be aimed at if you want efficiency, and too great

(Continued on next page.)

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without absolutely any fuss or formalities, for

FOSTERS

(ACTUALLY) FINANCE THEMSELVES

A few examples of our terms:

COSSOR. 1930 Three-Valve Screened-Grid Set. 15/- with order only.

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OSRAM. Music Magnet. Three-Valve Screened-Grid Set. 15/- with order only.

AEONIC. Five-Valve Portable Sets. 20/- with order only.

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EKCO. Eliminator. Model 3F20. 7/4 with order only.

EXIDE. Wet H.T. Batteries. 120 volts. 6/11 with order only.

Send for latest Catalogue W4 and state requirements if possible to:

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74, HIGHBURY PARK, HIGHBURY BARN,
LONDON, N.5. Phone: North 4430.

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THE REPRODUCER WITH A STEREOSCOPIC EFFECT

A Linen diaphragm, steel chassis built, loud speaker kit for home construction



Constructed in half an hour with a screw-driver. Size 20" x 20". Has a double lined diaphragm and adjustable damping attachment. Will take any popular Cone Movement, "G.E.C.," "Blue Spot," "Triotron," "Hegra," "Brown," etc. Kit includes dope, brush, instructions & ornamental sides.

21/- Postage 1/3.

For best results use a TWIN CONE MOVEMENT, 15/-. Postage 6d.
Patents and Reg. Pending.

GREEN & FAULCONBRIDGE LTD
COVENTRY

TECHNICAL NOTES.

(Continued from previous page.)

reliance should not be placed upon screening. It is true that screening or shielding has made possible very much greater compactness in assembly, but the point to bear clearly in mind is that this advantage, like most other advantages, is gained at the cost of incidental disadvantages and in the result there must always be a compromise between the two.

A Curious Fault.

A reader points out a curious trouble which he has experienced which proved to be very difficult to locate and asks me to give the information in these Notes in case it may be useful to others. He finds that when working with a set using S.G. amplification, the condenser between the filament and the screen grid must be connected to the negative end of the filament the same as the other condensers. It appeared to me to be fairly obvious that oscillation trouble might be set up. Of course, the bypass condensers in the set should be connected to the same end of the filament.

A Pentode Hint.

I remarked recently on the importance of proper values of grid-bias and high-tension voltages in general, and these remarks have special significance in certain particular cases. For instance, in the case of a pentode valve, as I mentioned some little time back, the choke or other component which is in the anode circuit will have the effect of causing a reduction in the voltage which ultimately reaches the anode, and this must be allowed for.

It is desirable in some cases to introduce a resistance in the H.T. supply to the grid of the valve (the grid which receives the high-tension) and a condenser between the grid in question and the negative end of the filament, this arrangement constituting, of course, a simple form of filter.

The actual voltage on the grid in question should not differ greatly from the voltage on the anode, and therefore the value of the resistance must not be unduly high although, of course, we have to bear in mind that the current involved is very small. If the current were zero then theoretically the resistance could be infinite and the smaller the current the larger the resistance which may be used without causing an undue drop in the voltage. The condenser may be a fixed condenser of perhaps one to two microfarads, and for the resistance I should say 8,000 to 10,000 ohms.

Selectivity—

The relative importance of sensitivity and selectivity was raised and discussed in a very interesting way by a contributor in this paper a few weeks back. He pointed out that selectivity was a much misunderstood term and that lack of selectivity was often blamed for what was, in fact, neither more nor less than lack of sensitivity.

As a matter of fact, it is impossible to draw any hard and fast line as to sensitivity and selectivity. Strictly speaking, I suppose selectivity would be defined as the property of a receiving circuit to respond to a particular wave-length whilst being unresponsive to wave-lengths in the close vicinity. Selectivity, according to some such definition as

(Continued on next page.)



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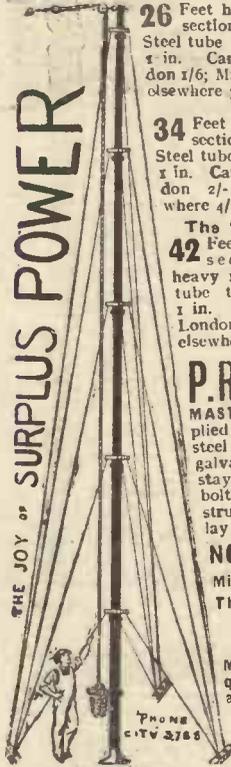
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TECHNICAL NOTES.

(Continued from previous page.)

the above, would evidently be greater the smaller the wave-length interval between the tuned-in wave-length and the nearest wave-length which could be perceptibly received.

—and Sensitivity. But you have to bear in mind that if a nearby wave-length is so faint as to be practically inaudible, and by some means you sufficiently increase the sensitivity of the set, this nearby wave-length will become audible, and therefore you will have to go to a wave-length further away from the desired wave-length in order again to reach an inaudible point. The result of all this is that, other things being equal, the selectivity will apparently become less (or the tuning will seem to become broader) as the sensitivity is increased.

You will notice I said "other things being equal," because many of you will know from your own experience that a very sensitive set may also be a very selective one, and it may at first sight seem that the above remark is contrary to ordinary experience. But if you think about it for a moment you will see that it is because of the very fact which I have mentioned above that a super-sensitive set must also be a super-selective one.

Weak Signals.

If you are receiving very weak signals (for instance, signals from a distant station), then clearly the first requirement of the set, quite apart from any question of selectivity, is a sufficient sensitivity. No amount of selectivity in the world will enable you to pick up clearly a feeble signal if the set is not sufficiently sensitive. You will often hear a person say that he cannot pick up distant signals because his set is not sufficiently selective, but, in nine cases out of ten, the real reason is that his set is not sufficiently sensitive.

It is impossible to know whether the set is also, in fact, sufficiently selective until we have settled the question of the sensitivity first. Having got the set sensitive enough to receive the required distant station, then comes the question as to whether neighbouring wave-lengths can be excluded so as not to swamp the desired signals. Here we have a clear question of selectivity, and, inasmuch as we have already presupposed that the set is extra sensitive, the need for sharp selectivity is emphasised. In this way we have come to associate together selectivity and sensitivity because the second necessarily calls for the first, and this has no doubt given rise to the mistaken notion that a set which is sensitive is automatically selective.

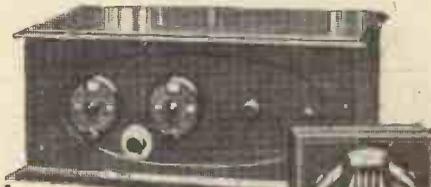
SUNRIPE COMPETITION.

Messrs. R. & J. Hill regret that they are unable to publish the names of the prize-winners of their recent Sunripe Competition in this issue. The Awards therefore will be advertised as soon as possible in a forthcoming issue.

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SEE PAGE 397.

A RAPID GUIDE TO RADIO

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IF you have got electric light laid on you will know that you buy electricity in much the same way that you buy gas. There is a meter and this registers the amount you use. And, curiously enough, electrical measurements are very similar in application to gas or water measurements.

But electrical pressure is not reckoned in pounds per square inch, but in VOLTS; these represent the Electro-Motive Force (E.M.F.) of the supply. Don't let these terms get mixed up. You will often come across Volts and E.M.F. and you must think of them coupled in this way: "There is here an E.M.F. of so-and-so-many Volts." E.M.F. (Electro-Motive Force) is the same sort of term as "A Head of Water," as used by plumbers. These people talk about "A Head of Water of so-and-so-many foot-pounds pressure."

A Complete Circuit.

I stress this point because we have several other words and abbreviations referring to electrical pressure to deal with. For instance, we often speak of *Voltage*, and again of *Potential* instead of E.M.F.

Perhaps it is better to deal with the units, and, at least for the time being, leave the broader terms to look after themselves.

To revert for a moment to our cells, which we were discussing last week, and which we shall be dallying with for yet another week or two, we found that when we joined the two plates or elements of a cell together with a piece of wire there was a flow of current, a complete circuit having been completed.

The reason why a current of electricity flowed was because the one plate or element of the cell was made deficient of electrons by a chemical action, and there was a flow of electrons through the connecting wire which attempted to restore the electron equilibrium of the plates.

Now note this point. The amount of current flowing depends upon the pressure (Voltage or E.M.F.), and the *Resistance* offered by the path the current flows through.

Explaining Resistance.

Resistance is measured in *Ohms* and is quite an easy thing to understand. There is no mechanical term that offers a close simile, but our water-pipe provides something of an illustration. Supposing all water-pipes were filled with cotton wool. A thin water-pipe with loosely-packed cotton wool in it might enable as much water to be pumped through it in a given time at a certain pressure as a bigger pipe with more tightly-packed cotton wool. In general, you would say that the thinner the pipe and the longer the pipe and the more tightly packed the cotton wool the greater the *Resistance* to water flow offered.

And so with electricity. Some metals offer less resistance to electricity than

others (copper is a much better conductor than iron), while the thicker and shorter any piece of metal is the less resistance it will offer.

Electrical RESISTANCE is measured in OHMS.

What The Ampere Is.

Current flow is reckoned in AMPERES. An AMPERE is the flowing of a certain amount of current in a certain amount of time. It is not the Unit of quantity like the gallon is in reference to water. But we will not dwell on that point. Suffice it to know for the time being that for all practical purposes the AMPERE is the Electrical Unit of dimensions of electrical current, and that the *Volt* is the unit of electrical pressure.

Prof. Ohm, a worthy electrical pioneer, evolved the law that is named after him, and Ohm's Law is with no exception the most useful bit of stuff that can be found in any electrical text-book. Ohm's Law says that it takes ONE VOLT of electrical

It is a common belief that the theory of wireless is dry-as-dust sort of stuff that concerns only the engineer and scientist. This is quite wrong, for, told in the right way, it makes fascinating reading. Further, even a superficial knowledge of the subject will prove invaluable to either listener or constructor, and make the tasks of set-building and maintenance easier and more interesting. But it should be noted that this series is not confined to theory alone. Skillfully welded into the articles will be a vast amount of information directly relative to the assembling and operation of radio receivers. Hints and tips concerning all phases of "household wireless" will be given, and it is our firm belief that every reader of "P.W." will find something in the series of individual interest.

3. SIXPENNY-WORTH OF ELECTRICITY.

pressure to drive ONE AMPERE of current through ONE OHM of Resistance.

This means that we can always wash out any one of these factors so long as we know the other two,

$$\text{for } C (\text{Current}) = \frac{V (\text{Voltage})}{R (\text{Resistance})}$$

$$\text{and } V = C \times R, \text{ and } R = \frac{V}{C}$$

Supposing you found that 2 amperes of current were flowing in one of those single-cell circuits I described last week, and that the Electrical Pressure was 2 volts. Well, Resistance equals Voltage divided by

Current, and in this case that is $\frac{2}{2}$ which is 1,

so that you know your circuit has 1 ohm of resistance.

If you knew only that the resistance were 1 ohm and the current flow 2 amperes you could quickly work out the voltage by multiplying the two figures together. Let us dash through a few examples, resistance

100 ohms, voltage 250; what is the current flow in amperes? Dividing 250 by 100

$$\frac{V}{R} \text{ we see that the answer is } 2.5.$$

The E.M.F. (or potential or voltage!) is 105 volts, and the current flow is 3 amperes; what is the resistance in ohms that is being encountered? Here we divide the voltage by the resistance, that is 105 by 3 and the result is 35.

Some Interesting Problems.

A current of half an ampere is flowing through a circuit known to have the resistance of 100 ohms; what is the pressure in volts? In this instance the two factors are multiplied together, for $V = C \times R$ remember. The answer most obviously is 50 volts.

What about a few calculations for you to do yourself and compare with the answers I shall give next week? Perhaps, you will find it interesting to take up a pencil and work out the simple problems. I assure you that it will be well worth your while, for a thorough knowledge of Ohm's Law is absolutely vital to your progress.

$R = 12$ ohms, $C = 1.5$ amperes; what is the voltage? $V = 250$ volts, $R = 1000$ ohms; what is the current? $C = 6$ amperes, $V = 12$ volts; what is the resistance? $C = 1$ ampere, $R = 6$ ohms; what is the voltage? $R = 185$ ohms, $C = \frac{1}{2}$ amp.; what is the voltage?

Before I close this week I think I had better say just a few words more about the ampere. You will by now have got a pretty fair idea of Ohm's Law and how to work out the value of the unknown factor when you know the other two, but I want to make sure that you completely grasp the significance of current.

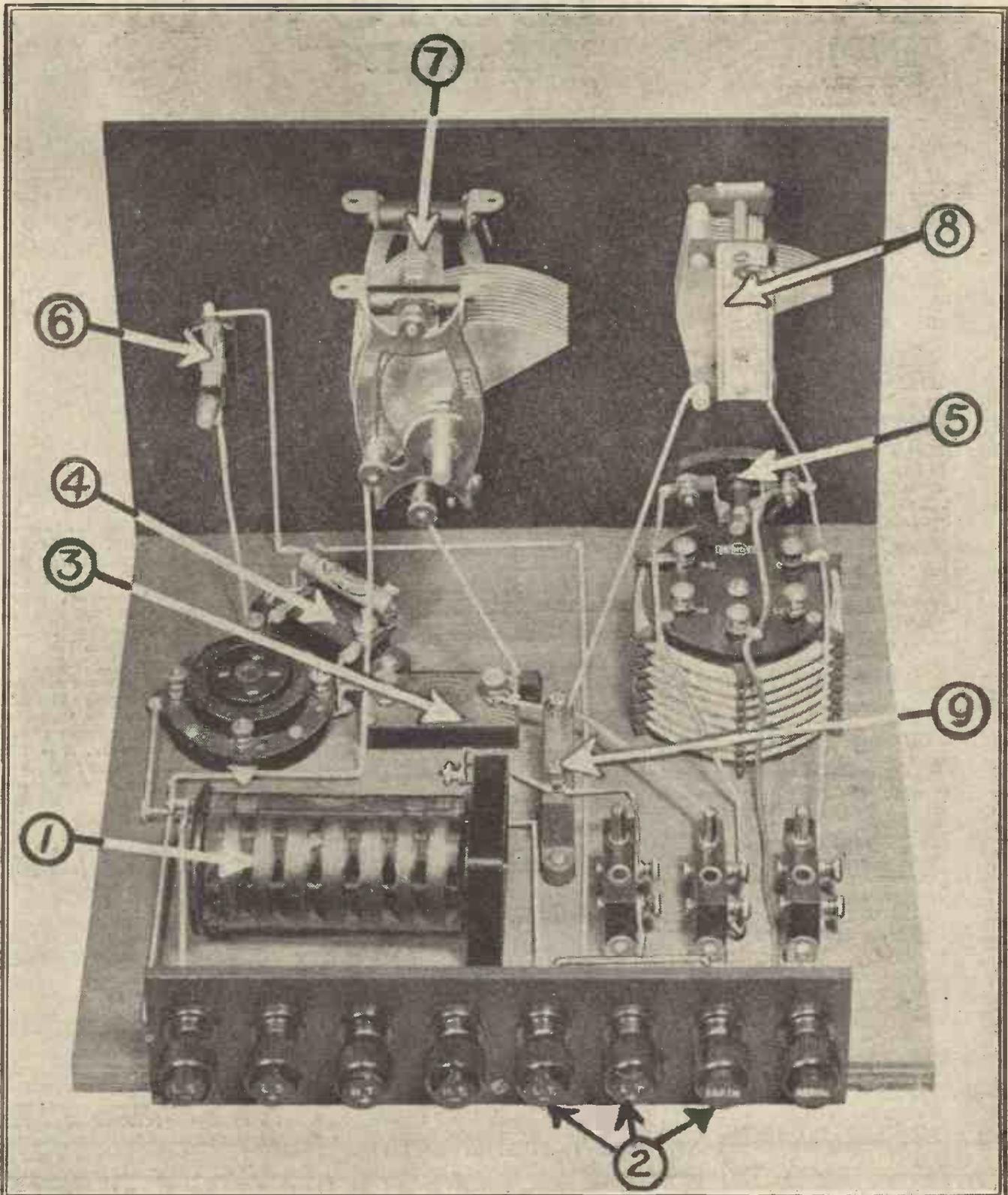
More About The Ampere.

If you do not you will meet with confusion when you come up against the use of A.C. electric-supply mains, especially in connection with rectification. But of these matters more anon. For the time being we must get back to that awkward ampere.

As I have said this is the unit of electrical current and not quantity. It represents the amount of current that flows in a certain space of time. You would speak of a water supply in terms of gallons per second, and this would form a very close analogy.

Actually the unit of quantity in electricity is the Coulomb, but this is a word you will very seldom, if ever, meet with in "P.W." Ohm's Law will fulfil all your requirements, but it is important that you should not think of the ampere as representing so many pints of electricity as it were. Bear in mind that it is the unit of electrical flow or current.

CLOSE-UPS FOR CONSTRUCTORS.—No. 3.



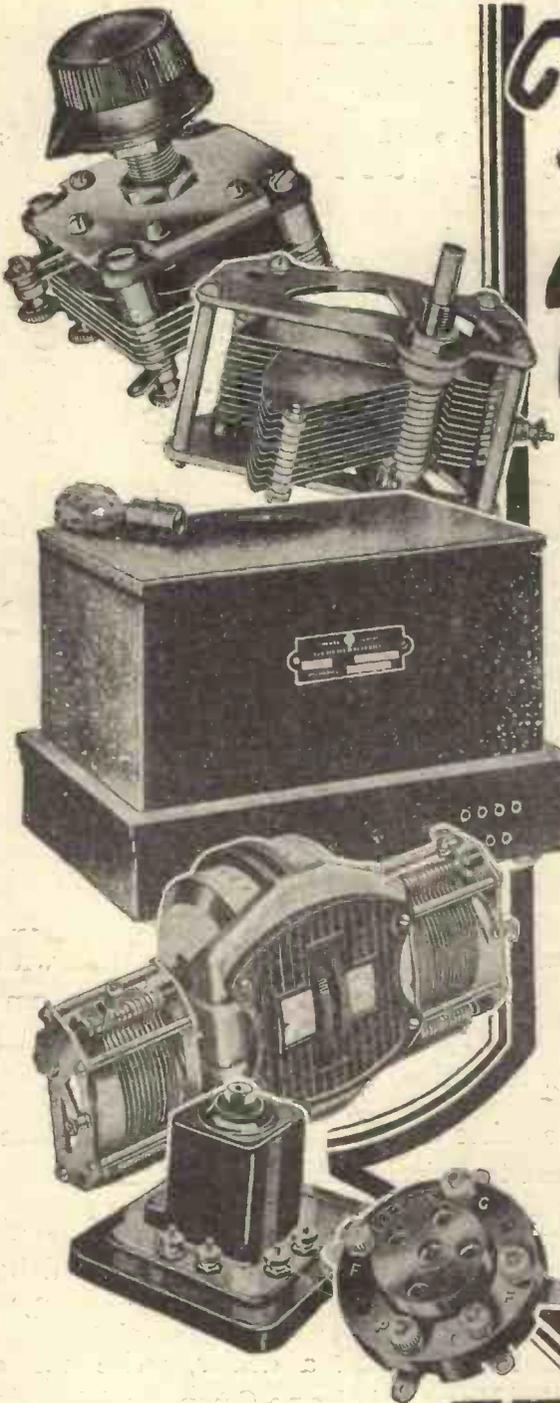
THERE are one or two points of quite exceptional interest in this simple one-valve wave-change set. You will notice at (1) that the H.F. choke has been mounted on its side to keep it out of the way so that it does not impede the operation of inserting or removing the valve and coils.

This does not affect the working of this component any more than the placing of the fixed condenser at (3) on its side has any ill-effect. This condenser can be fixed either vertically or horizontally, but the one indicated by (9) is built for vertical mounting only.

By the way, note how the grid leak at (4) is placed so as to make the grid lead as short as possible. Note also that the earth terminal at (2) is joined to L.T. — and not L.T. +; an important connection this.

At (5) and (6) you see the wave-change and the on-off switches which are of similar types, but which do totally different jobs.

In this set the reaction variable condenser at (8) is smaller in physical size than the tuning variable at (7), but it might not have been smaller in size and capacity with other makes and another circuit.



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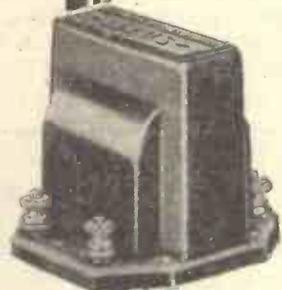
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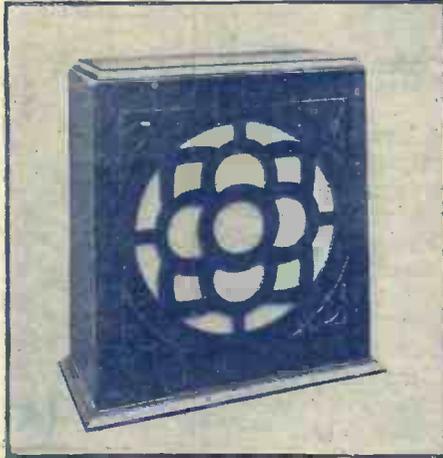


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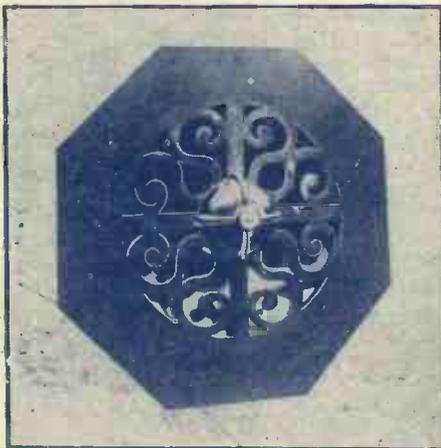


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