

BEHIND THE MICROPHONE—By CAPT. ECKERSLEY (See Page 863)

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No. 450. Vol. XVIII.

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January 17th, 1931.

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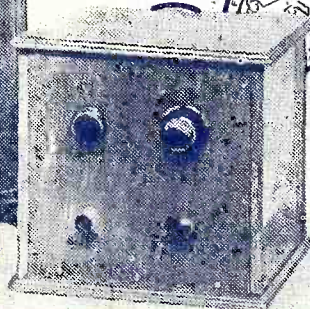
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By G. V. DOWDING, Associate I.E.E.

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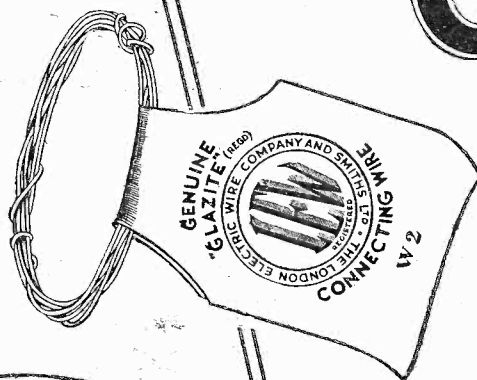
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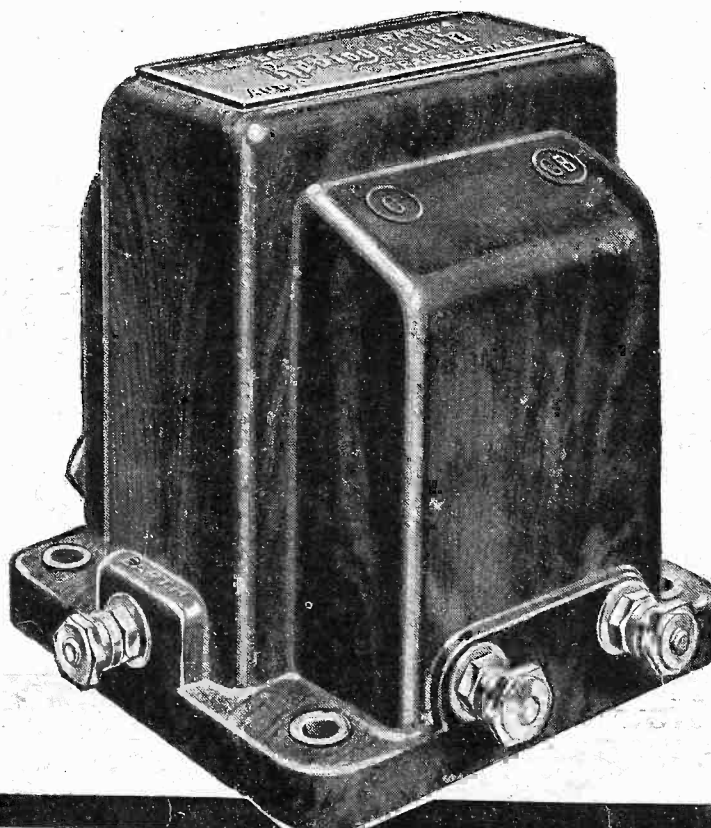
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THE FEBRUARY

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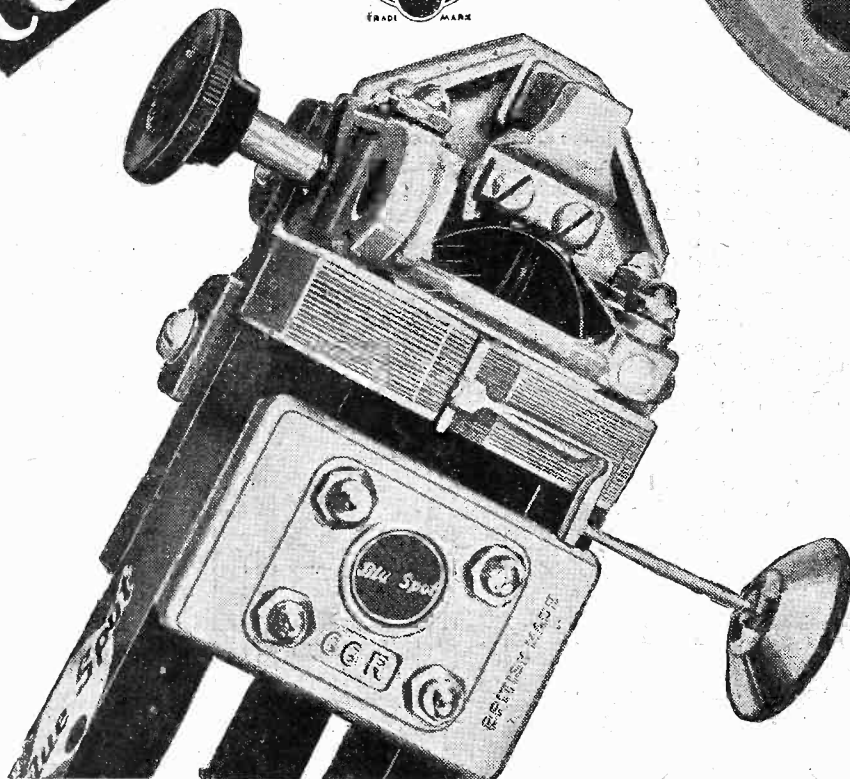
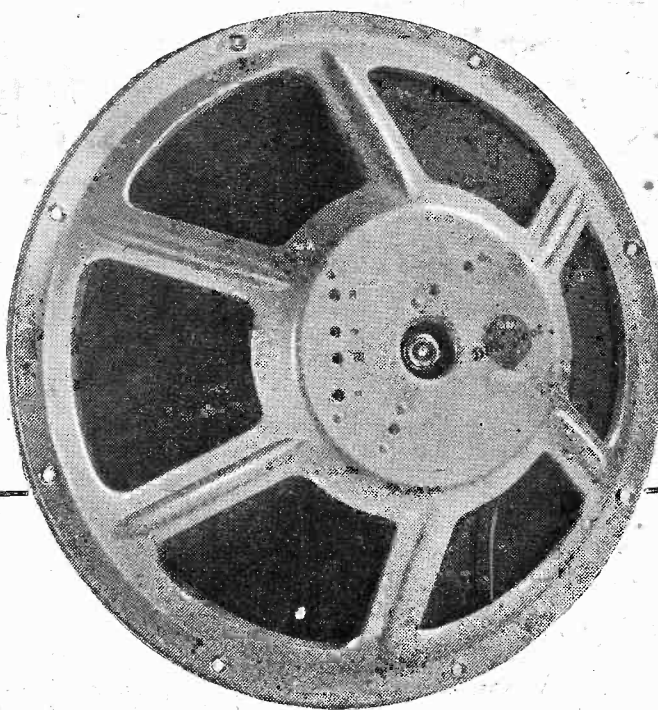
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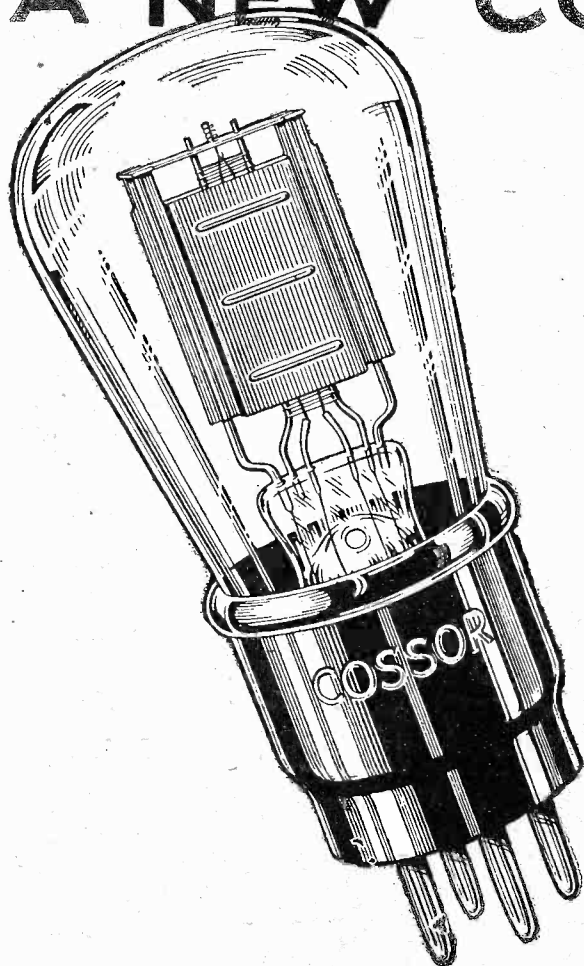
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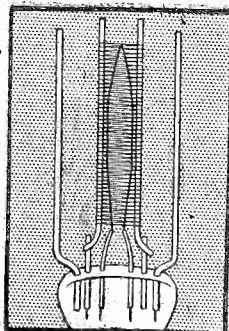
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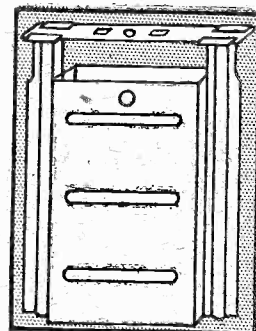


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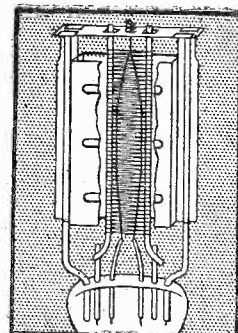
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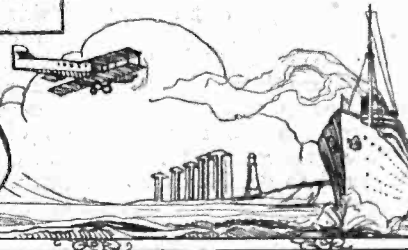
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**ARIEL'S ALMANACK
THE SCOTTISH
REGIONAL.
WELL SATISFIED.
THE INTRUDER.**

RADIO NOTES & NEWS

**RADIO SALESMEN.
DOES IT PAY?
TWO NEW ONES.
ON PROBATION.**

I Am Deserted.

RADIO and I have in my house always been lone dogs. The Girl Person's interest in radio has been limited to an occasional grunt of satisfaction at a piece of music. The Lady Person is in another world so far as the technique goes; radio is music and suchlike diversions made by a box of lamps. Only the Boy has stood by me and searched Europe by dial—and now Christmas has won over his allegiance to chemistry and I am being cornered on every possible occasion so that I may explain the secrets of copper sulphate or other lump of nastiness.

"Ariel's" Almanack.

JANUARY: Mr. Bach will oblige with some more cantatas.

February: Work on the foundations of music will continue, and some prehistoric semi-quavers will then be unearthed.

March: Sir J. Reith will drop a pronouncement relating to his plans for raising our mental stature.

April: Kipling will continue his non-broadcasting on "How the Army got its naughty words." Mr. Bach will cantata as before.

May: B.B.C. will broadcast interview between Carnera and Cissie. Announcer will catch his jaw on a nail whilst pronouncing Saskatchewan.

June: A well-known quintet will blossom into an octet. Sunday programmes will begin at four-thirty and Mr. Bach will protest.

More "Old Moore."

JULY: B.B.C. will subsidise Mr. Bach and pension Honegger off. Mr. Stravinsky will write to the "Daily Mail" about it.

August: Mr. Newman, the musical critic, will overhear a television test and declare it to be one of Bartok's finest pieces.

September: B.B.C. will send a mis-

sionary to Billingsgate and announce an S.B. of the Oxford Dictionary as corrected by the Head Pronouncer.

October: A careless workman will drop a crowbar through those Foundations and nobody will hear it touch bottom. B.B.C. will subsidise Scotland, to ensure bigger and better Burns.

November: A trianglist from the studio in the wine-vaults will put his wrist out of joint and get transferred to Fishing Forecast Section, sub-section Hake.

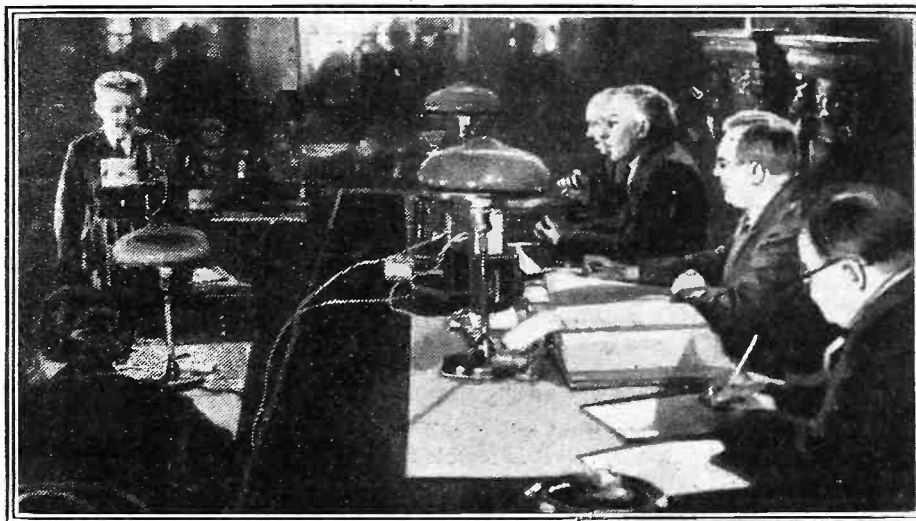
December: Death of Bach. Bartok buys bigger hat and writes a cantata.

Queries by Alf.

OUR prolific correspondent, Mr. Mann o' Middlesbro', wants to know about:

1. A station on the 60 m. band which frequently refers to "Robat" but sounds like Russian.
2. A station on 45.8 m; call-sign F.N., gives Russian speech and no music.
3. Call-letters of the Amsterdam commercial telephone station working Bandoeng on 25.6 m.
4. S. American station working Paris on 23 m. (Qy.: Rio or B. Aires? Ed.).
5. Call letters of German commercial telephone station on 18.5 m. Can anyone oblige, please?

THE MICROPHONE AT A TREASON TRIAL



Standing on the left is Professor Ramzin, the chief of the eight professors recently tried for plotting against the Soviet Government. Another microphone is shown in front of the President of the Supreme Court. (Right.)

Luck Was With Him.

A MANOR PARK reader (who forgot to sign his name) tells of a crisis and how he passed it in safety by a somewhat desperate remedy. His L.T. battery chose to run down in the middle of a programme to which extra-special visitors were listening. It was too late at night for him to get another accumulator and so, in despair, he tapped off a couple of cells from a flash-lamp battery which had already seen service elsewhere and actually got good results for one and a quarter hours. He deserved his luck for being saucy enough to tempt it.

chance your arm and go straight for the "Regional" Four? Listen to a Bradford man's unqualified approval of this set. "This set is absolutely a 'knock-out' and stands alone. Selectivity, tremendous power and pure in tone; nothing more can be desired. The set is streets ahead of anything I have listened to; it does not play at getting stations, it gets them quite as loud as the local. Kalundborg, Motala, Daventry, Paris, Huizen, and at least 35 stations on the short waves."

Now then, ye doubters! What more than that do you want?

(Continued on next page.)

The Scottish Regional.

THE B.B.C. has selected Westerglen, three miles south of Falkirk, Stirlingshire, for the site of the projected Scottish Regional station. The new station will be similar to the London and Northern Regionals and will be the third transmitter built under the B.B.C.'s Regional scheme. It will replace the low-power stations at Glasgow, Edinburgh and Dundee. Good luck tae it!

A Satisfied Constructor.

IF amongst all the circuits available you wallow in doubt as to which one to tackle, why not

RADIO NOTES AND NEWS

(Continued from previous page.)

Too Precious to Waste.

THE "Morning Post" publishes a story from someone who called at a farm in Airedale and finding the outside deserted knocked at the farmhouse door. On entering he found farmer, wife, daughter and two farm hands shrouded from head to foot in towels, all plucking Christmas geese like mad, to the accompaniment of an orchestra via radio. "Aye!" said Giles, "we used to do this in t' barn, but we've just gotten t' wireless and we couldn't let it be wasting in t' house, so we've all come inside."

Ariel at Portland Place.

REALLY, we are overwhelmed! Famous as "P.W." is in every part of the globe where radio men are found, we little expected that the spirit of "P.W." would be immortalised in sculpture. Yet that is what is being done, for there's going to be a carved figure of Ariel, representing "Wireless" on the new B.B.C. building in Portland Place. The sculptor, Mr. Eric Gill, is already busy with his mallet and chisel. I hope that he will make a better job of my classic features than does my daughter when she sketches me!

The Intruder.

THIS Stuttgart obligato to the London Regional is certainly a Number One nuisance, especially when the Stuttgartians applaud or when some Teutonic gentleman gets "all worked up" before the microphone. I stood it for about a week and then I decided to put in some fancy work on the set. Eventually I managed to reduce the interference to almost a negligible quantity by means of loosening a coupling and de-tuning slightly. Nevertheless I could cheerfully dispense with my German friend, for I can still hear his sibilants!

"Some Radio Christmases."

THANKS to those who have expressed themselves so prettily about my Christmas article. It aroused special interest at Catterick Camp amongst "Royal Signals," a push of whose members with experience of China have not known rain in the north between October and April. This was twenty years ago, and I assure W. H. P. that it rained on the coast for a week. Even in Shanghai I have known it rain at Christmas-time for days together.

The Supply of Radio Salesmen.

W. H. P. then goes on to level questions at me about radio salesmen, whom he has evidently found to be somewhat sketchy in technical knowledge. The growth of the "trade" has outstripped the supply of technically informed salesmen. That is not to be denied; but as is well recognised it is being remedied as fast as possible, notably by the Marconiphone people. The best technician is apt to be a poor salesman; pure technics do not sort very well with the commercial mind, I have found. I was trained as a technical analyst, and when, during my lean times, I tried to "travel" in hair restorers the results were zero, nil, nix. I couldn't sell a plank to a drowning man! All the best of luck to W. H. P. and the Signals.

Does Broadcasting Pay in U.S.A.?

THE radio authorities in America questioned twenty broadcasting organisations who had sought permission to increase the size of their stations. Ten disclosed an average annual profit of about £5,800 each, whilst the remainder confessed to an average annual loss of £10,800 each. It also came out that the average rate for the use of a 5-kw. station during the evening is £62 and that only 30 per cent of the time of the twenty stations was paid for; hence the desire to increase the publicity value of their broadcasts by enlarging the possible number of listeners.

Two New Ones.

LIFT these with thanks to the "Telegraph and Telephone Age." The father of six daughters, while reading a telegram announcing the arrival of a seventh girl, looked up to the top of the form and read the telegraph company's slogan,

SHORT WAVES.

"How marriage changes a man! When we were engaged Philip used to call me his little crystal set, and now he says I'm an everlasting loud speaker." "The By-stander."

"ICELAND BROADCASTS."

"Our own often leaves us cold." "Daily Mirror."

"During Sir James Jeans' talk on stars, I became so accustomed to thinking in millions and of phenomenal heat that when he finished and I found that the fire was nearly out, it seemed such an insignificant matter that I almost overlooked it," writes a contributor in the "Manchester Evening News."

THE NEW VERSIONS.

Where there's a will, there's a loud speaker.

A long talk turneth away listeners.

It is understood that a farmer has written to the B.B.C. claiming that he has a musical cow, and offering its services for broadcasting. But would listeners appreciate such sweet MOO-sic?

FURTHERING THE CAUSE.

We read in one of the Sunday newspapers that a certain gentleman recently made his wife run up and down stairs at the B.B.C. so that listeners might hear the effect of the exertion on her heart, which by means of amplifiers and a relay was made to ring an electric bell.

"MAKING WHOOPEE!" The small boy next door trying to tune-in his new wireless set.

"If you want a boy, call Western Union." Secondly: "It is reported that the crowds round the telegraph offices during the recent eclipse of the sun were Scots sending Night Letter Telegrams! (N.L.T.'s are cheap rate messages sent during the night.—Ed. "P.W.")

Explaining Away Bartok.

IN February the B.B.C. begins a series of "talks" called "New Friends in Music," which is to be an attempt to "explain" the newer school of music to what the B.B.C. admits is a body of puzzled listeners. The list of new friends who are to be explained away includes Bartok, Hindemith and Stravinsky—all names which most of us will associate with ridiculous bursts of discord and/or eccentric composition. I do not see the name of Honegger, but I have no doubt that his "explanation" will be given. Surely we do not wish music to be explained; it doesn't sound any better afterwards, does it?

The Newest Thriller.

IF you want something quite novel in the detective story department get yours by radio; on Jan. 10th the first instalment of a story which is to be written by six well-known detective story writers was read by the B.B.C. Each will write two instalments. Before leaving the subject of detection may I appeal to any sleuth who reads this to tell me why the B.B.C. announcer at ——— called "vehicle" "vaikul" the other evening?

On Probation.

LIFE for me would be duller if the Federal Radio Commission of the U.S.A. packed up. It publishes some of the most useful and amusing statistics which one could find, in addition to patrolling the American ether. Thirty-one stations were placed on probation the other day, mostly for the sin of running off their assigned wave-lengths; one got the bird for "sponsoring" cancer cures, another for putting up socialist agitations, and another for pushing monkey-gland treatment. I trust that among the cardinal sins the Commission will include the broadcasting of "That's Okay by me, Chief!"

Remote Control.

WHAT I asked for quite two years ago appears to have been worked out at last by the Radio Corporation of America, who have produced a remote control device better than any others of which I have heard. The control panel is furnished with buttons and all one has to do is to select a programme, press the proper button—the receiver does the rest. A duplicate set of buttons is fitted for control at the set. The new apparatus adds about £13 to the cost of the set, so that the extra convenience is evidently designed only to keep the "idle" rich idler.

A New Trade.

OUT of the welter of new things created and old things destroyed by radio broadcasting, there stands in bold relief the fact that the microphone is pre-eminently suited to certain types of plays. All that remains is to perfect the technique and find the playwrights who can produce matter which will "go over."

Young men who aspire to affluence, if not to fame, might do worse than try their pens in this direction, for who knows what Pinero's and H. A. Jones's may be amongst them? The field is already invaded, for during the period March, 1929 to September, 1930, about one-third of the plays broadcast by organisations belonging to the Union Internationale de Radiodiffusion were specially written for the microphone.

Amos 'n' Andy.

THE B.B.C.'s re-broadcast of these white niggers on December 31st was O.K. as regards strength, but unsatisfactory as to quality. There was a lot of "blasting" or fading, which rendered it somewhat difficult to follow. I do not think the day of transatlantic broadcasts has yet come, though I believe that by Beam wireless they would be quite good.

The National Broadcasting Co.'s New Year's message was very plain and very cousinly. The same to U.S.A., and many of 'em.

ARIEL.

BEHIND THE MICROPHONE

BY CAPT. P. P. ECKERSLEY, M.I.E.E.

Our Chief Radio Consultant tells you some of the exciting and often humorous incidents that have occurred behind the scenes of broadcasting with special reference to earlier days at Writtle, where, it can truly be said, he initiated British broadcasting. In the next few weeks further articles by Capt. Eckersley, in which he will record intimate, amusing and exciting incidents (some made public for the very first time) will appear in "P.W.," and new readers would be well advised to place an order for "P.W." so as not to miss them.



"GIVE us this day of rest that we look back upon the way we have come, and forward to the summit whither our way lies." So spoke a voice and speaks it still to 150 boys and girls every Sunday morning.

I have few days of rest, but a long train journey forbids me more normal employment, so what better than to remember some of the past and write it as it throws its pictures upon the screen of a sensitized mind?

It's a long road we have come, and past each overhanging bluff negotiated we have seen still the encumbered path leading upwards to new and more formidable difficulties.

THE "MAN IN CHARGE"



A photo of Capt. Eckersley taken while at work as Chief Engineer of the B.B.C.

The summit is lost in the mists of the future, the past already lies far below us; here clearly lit by the sunshine of memory, there half hidden in the shadows of disappointment.

And many friends have been found and lost, some fickle and tricky, eager to lead in the easy places, missing when roping together is imperative: some very true and loyal and still with us, some given up, some new ones who have quickly climbed behind us the trail we have made.

Those Golden Voices!

Back there in 1919 I recollect the milestone Chelmsford, with H. J. Round and W. T. Ditcham and Arthur Burrows, the latter having equally fine "modulating" voices. Yes, we did not so much worry about whether people came from Public

Schools in those days; it was a question of the ratio of R.M.S. value to peak in the resultant disturbance they made.

If such a ratio is expressible as directly proportional to the content of rare metals, then Ditcham and Burrows were fittingly described as having "golden" voices.

Chelmsford was really the first British station to do broadcasting. It had a power of 15 kilowatts, its aerial was carried on 500-ft. masts, and it used a wave-length to-day described as "long," so it was as effective, as to carrying power, as many existing European stations.

Where Is That Record?

A number of journalists in Rome took down an accurate record of speech radiated here in England. And that was 1919!

I hazard a guess that we in England can claim to have started high-power broadcasting before even the Americans. Dame Nellie Melba sang from the station.

A packing shed was unpacked and a piano hired, and even a carpet put down—subsequently disdained because no singer will stand on a carpet to sing. It is understood that an enthusiast in Paris made a gramophone record of the resulting reception.

It would be interesting indeed, if it had been kept, but one wonders if, being an enthusiast, the owner later destroyed it. Because, of course, quality then was not what we call quality to-day.

No negative on any grid, high-impedance valves, some soft, loud speakers which snarled rather than sang, and the high tension for reception only about 50 tired volts! But Chelmsford was the first landmark.

The P.M.G.'s Bombshell.

Unfortunately, initiative was discouraged in this country by official action, and the then Postmaster-General ordered us to close down because we were "interfering with the other services." Incidentally, I admit the indictment of being one of those who was not sorry: a strong harmonic interfered seriously with aeroplane wireless on which subject I was then chiefly engaged.

Chelmsford ceased to be a name in the world of wireless, peace fell upon the ether, all was silent except for the chirping of the c.w. birds and the faint oscillations of regenerative receivers.

The amateurs of England (to whom the workers pray?) woke us from our sleep crying "Up and onwards,

sluggards! Give us telephony, we are bored with Morse!" Their cry went up, not once but three times, and they beat with their heterodynes upon the portals of bureaucracy and these too woke crying "What is this about telephony? Why —?"

"Two Emma Tock."

But the amateurs were persuasive and at last permission was granted for the Marconi Company to start a station addressed to amateurs. This station was erected and took its more popular name from a village hard by Chelmsford, its official designation being 2MT—on which combination of letters one can weave many *jeux des mots*, but I will refrain. I was intrinsically bound up with "two emma tock Writtle," and many are the stories I could tell you. A few will surely suffice.

For instance, the opening night! I will not, I hope, be insulting the intelligence of my more technical readers by drawing attention to the fact that the values of the components of electrical circuits have a distinct bearing upon their overall performance.

There is a condenser, for example, which

(Continued on page 892.)

BRITAIN'S FIRST BIG BROADCAST



Dame Nellie Melba singing from the Chelmsford Station—an historic radio event referred to by the author.

PROGRAMME PEAKS

A review of broadcasting progress during the year 1930, with special reference to the high-lights that found most favour with the listening public.

THE year 1930 saw the production of a microphone drama which sets a definite standard for the future, "Brigade Exchange," a German war play, by Ernst Johannsen, which was produced by Howard Rose, marks the peak of dramatic accomplishment so far.

The microphone play showed signs during the year of becoming shorter in length than ever. "Brigade Exchange" and "The Flowers are Not for You to Pick," one of Tyrone Guthrie's plays specially written for broadcasting, took less than an hour each, whereas some two years ago the average time of a broadcast play was an hour and a half, as witness "Carnival" and "Lord Jim."

Vaudeville ranked among the most favoured programmes of 1930, and three such programmes were given weekly as a rule. The list of variety artists who were heard during the year included scores of names which are familiar on the stages of theatre and music-hall. Series of vaudeville acts were arranged by Albert de Courville and Philip Ridgeway.

Many Distinguished Artists.

Among many distinguished artists who have given studio recitals may be mentioned Suggia, Gerhardt, Chemet, Supervia, Pouishnoff, Solomon, Landowska, Hinnenberg-Lefebvre, Myra Hess, Marie Hall, Marcelle Moyer, Miriam Licette, and Gunther Ramin. Most of the principal European string quartets have taken part in programmes, including the London String Quartet, the Brosa, Kutcher, Stratton, and other British quartets; the Pro Arte, Kolisch, and Prague. Other ensembles that have been heard are the London Wind Quintet, the English Ensemble, the Philharmonic Trio, and the Quintet Instrumentale de Paris.

On the religious side the year has been notable for the beginning of a system of contrasting or alternative services made possible by the development of the Regional scheme in the south. From March 16th onwards it has been possible on certain Sundays to offer the listener a choice of two different types of service, one on the National wave-length and one on the Regional. Such a choice is not offered more than twice a month, since the second Sunday is still devoted to St. Martin-in-the-Fields, without alternative, and the fourth Sunday is as it has always been, shared among the stations as a National broadcast.

Sunday Appeals Success.

In connection with the Week's Good Cause appeal on Sunday evenings, the scheme by which the B.B.C. offered to act as almoners and to receive lump sum contributions to be distributed piecemeal over the year, or any period, was further developed, and the contributions were considerably extended. The B.B.C. has received over £1,000, and is now able to distribute a sum of £20 weekly to the main appeal of the week. Individual appeals resulted in the raising of generous sums from listeners, the few that can be

cited here being the following: St. David's Home for Totally Disabled Soldiers and Sailors, £1,376; St. Francis Leper Guild, £1,357; Church Army, £1,194; Metropolitan Hospital Sunday Fund, £1,122. A National Police Court Mission appeal realised a sum of £1,500, and amounts of more than £800 were received by the Kensington Council of Social Service, the Royal Association in Aid of the Deaf and Dumb, and the Heritage Craft Schools, Chailey.

Important Talks.

Although no party political talks were broadcast in 1930, several series were given on political and economic subjects. During the Imperial Conference in London, talks by the Prime Minister of Great Britain and by three of the Dominion Prime

broadcast from Geneva by British Government delegates.

Among the many series of educational talks arranged by the Central Council for Broadcast Adult Education, the following were outstanding: "Science and Religion," a symposium to which the contributors included Dean Inge, Professor Samuel Alexander, the Bishop of Birmingham, Professor Malinowski, Sir J. Arthur Thomson, and Sir Arthur Eddington; "The Stars in Their Courses," by Sir James Jeans; "The Study of the Mind" and "The Mind of a Child," by Dr. Cyril Burt; "To-day and To-morrow: A Philosophy of Freedom," by Professor John Macmurray; "The World and Ourselves," a series of international conversations in which representatives of Great Britain discussed national differences, habits, and political outlook with France, Germany, the United States of America, Russia, Turkey, and Italy; "Bird-Watching and Bird Behaviour," by Professor Julian Huxley; "The Progress of Music," by Dr. George Dyson; "The Dark Continent," a symposium on Africa; and "The Youth of Industrialism," by Mr. H. L. Beales and Mr. R. S. Lambert.

Three National lectures were broadcast in 1930: "Tendencies in the Field of Physics," by Sir J. J. Thomson; "Law, Ethics, and Legislation," by Lord Hewart of Bury; and "Monetary Policy," by Mr. Reginald McKenna.

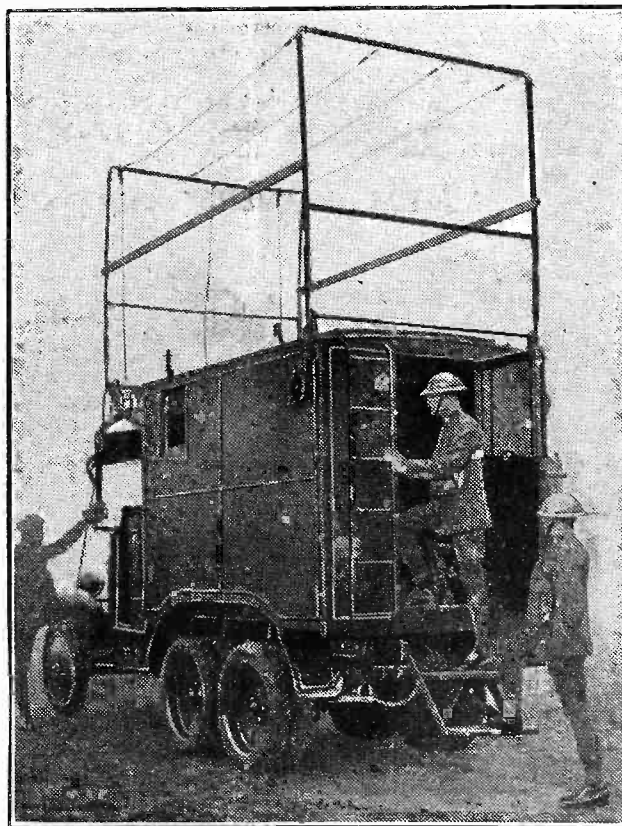
Many experiments in discussion, dialogues, and conversations have been tried, and considerable advances have been made with the technique of this part of the programme. Readings of prose and poetry have retained an important place in the programmes.

Pamphlet Popularity.

Group listening has grown steadily. During the year more than seven hundred listening groups have heard wireless talks. This extraordinary development is largely due to the co-operation of Area Councils and Local Committees. The circulation of the Programme of Broadcast Talks, which is issued three times a year, and contains details of the serial talks arranged in advance, increased enormously during 1930; in the autumn of 1929 80,000 copies were published, and in the autumn of last year 125,000 copies were needed. The Talks pamphlets' circulation

also increased from an average of 10,000 in the autumn of 1929 to 16,000 last autumn. Summer schools were held at Saltburn in association with the W.E.A., and at Harlech, at which sessions were devoted entirely to various questions of group leadership and group listening.

THE LISTENING LORRY



A scene at Aldershot when members of the wireless section of the Royal Engineers held a Field Day in which their transmitting and receiving lorries played an important part.

Ministers were broadcast. A series of talks on "Trade Within the Empire" was given, to which contributions were made by Sir Arthur Salter, Sir Basil Blackett, Mr. F. L. Macdougall, Lord Beaverbrook, and Sir William Beveridge. Two talks were given by Sir John Simon on "The Problem of India," following on the publication of the Simon Report. The Chancellor of the Exchequer gave an explanatory talk on the Budget. During the Session of the League of Nations Assembly, weekly talks were

THE COMET?

MAGIC WAVE-CHANGING

If you are the fortunate possessor of a "This Year's 'Magic' Three" set (described in "P.W.'s" March 1st and March 8th, 1930), you can now very easily introduce panel wave-changing without affecting the set's ordinary or short-wave efficiency in any way. Full details are given below by A. JOHNSON-RANDALL



THE "Magic" Three, undoubtedly one of the most popular designs evolved by the "P.W." Research Department, is very readily adaptable to wave-changing. And the great success of the "P.W." "Dual-Range" coil has brought in hundreds of requests from enthusiastic "Magic" owners asking for details of the alterations required in order to insert this coil unit into existing receivers, in place of the present plug-in coils.

A Problem Solved.

Now the "Magic" Three as it stands is suitable for any wave-length because it is a relatively simple matter to take out the plug-in coils, and to insert others of larger or smaller sizes, according to the wave-band it is desired to receive signals upon. For instance, it is easy for the "Magic" owner to experiment on the short waves by employing a set of special short-wave inductances.

It was for this reason that the extra aerial terminal, A₂, and a small neutralising-type condenser were included in the design.

If the standard "Dual-Range" coil is inserted in the "Magic" Three, the set is no longer suitable for short-wave reception, and therefore becomes a two-wave-band receiver.

A number of readers have pointed out that they do not mind this, since they use the set chiefly for reception on the medium and long wave-bands, thus they are prepared to sacrifice the short-wave advantages to obtain the benefits of wave-change switching.

There is, however, a simple solution to the difficulty, because the dual-range coil unit can be mounted upon a six-pin adapter, and plugged straight into a six-pin base.

Coil Construction Details.

Full details of this modification to the "Dual-Range" coil were given in the November 29th issue of POPULAR WIRELESS in the description of the coils for the "Interchange" Three receiver. Particulars of the construction of a suitable short-wave coil unit were also given.

Thus in the case of the "Magic" Three it was decided to employ the "Interchange" Three scheme in order to retain all the advantages of plug-in coils, giving the best and most modern type of high efficiency wave-change circuit for ordinary broadcast work, or in a few seconds, a perfectly normal short-wave arrangement, with the wave-change switch and its wiring put

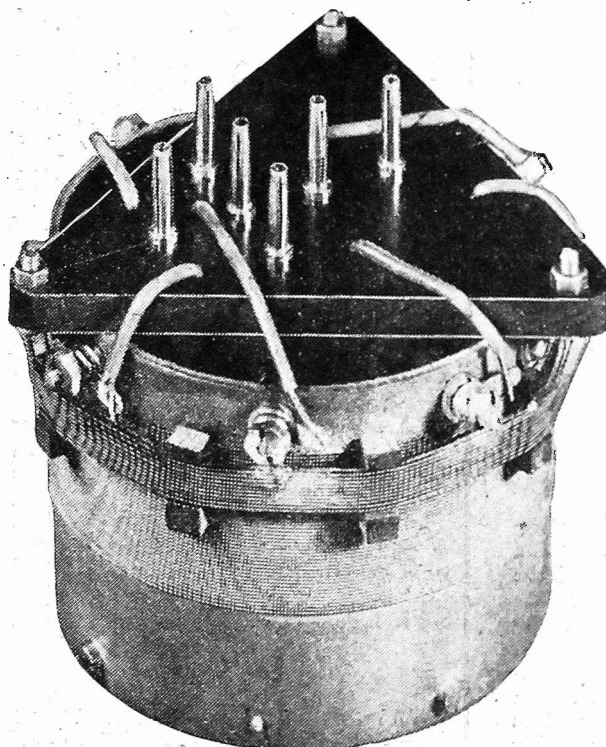
right out of circuit. Readers can obtain back numbers of the November 29th issue from the Back Number Department, Bear Alley, Farringdon Street, London, E.C.4. price 4d. post free.

Those who wish to make the dual-wave unit for themselves will find a reprint of the constructional details in the "Radiatorial" columns of the December 13th issue of POPULAR WIRELESS.

Moreover, the coils can be obtained ready wound from a number of firms which advertise in "P.W."

And now let us see what we have to do in order to bring the "Magic" Three right up to date.

SHORT-WAVERS STILL AVAILABLE



The "P.W." Dual-Coil Unit is mounted on a six-pin base, so you get panel wave-changing for the ordinary waves, and, by changing the unit, you can still go right down to the very short waves.

First of all, it is necessary to remove the two coil holders, L₂ and L₃, that is the two coil holders in which the X and reaction coils are normally inserted. Next, the panel must be drilled to take a three-contact wave-change switch of the type

used in all the "P.W." wave-change circuits employing "Dual-Range" coils.

A suitable type of wave-change switch is one with three contact springs of equal length. When the switch knob is pulled the metal contact at the end of the plunger joins all three springs together, and when the knob is pushed in the three springs are insulated from each other. The knob is pulled out for the medium waves, and pushed in for the long waves.

Placing the Switch.

Now, what about the position of the wave-change switch on the panel? This is not very critical, but appearance counts for something, and a good place for it is just below the '0005 tuning condenser C₄.

With regard to the coil unit itself, the components on the baseboard at the detector end of the "Magic" Three are not in any way crowded, and with the two coil holders removed there is a good deal of room to spare. If necessary, one or two of the components, such as grid condenser C₂, the potentiometer, the grid leak R₁, and the valve holder V₁ can be moved a little to make more room.

The Wiring.

The six-pin coil base, and the '002 compression-type variable condenser are mounted in accordance with the general scheme shown in the wiring diagram. Note particularly the alteration in the leads to the reaction condenser.

One side of the H.F. choke will now go to M on the differential condenser C₆ instead of to F₂. F₂ goes to 2 on the six-pin base or S₃ on the coil, and also to the wave-change switch, the '002 compression-type condenser and to L.T.—.

F₁ goes to pin No. 6 on the six-pin base, or to R on the coil unit.

Hence, in commencing the new wiring, the three leads from the differential condenser should be removed altogether, including the wire from the point on the F₁ lead to P on the valve holder V₁.

(Continued on next page.)

Completing the "Clear-Cut"

Here are some practical suggestions as to methods of mounting the "Clear-Cut" Cone described and hints for getting from it the best possible results.

IN our last article we told you how to make the actual chassis portion of the "Clear-Cut" cone speaker, and now we come to the question of mounting it up for use. This is decidedly important, for to get proper reproduction of the bass notes you must use it in conjunction with a baffle of suitable size and type.

By the way, the use of the free-edge principle does *not* prevent you from getting a full proportion of bass. It is sometimes thought that since with a free-edge cone you cannot get a completely soundproof joint between the cone and the baffle, there must be a serious loss of the lower frequencies.

The Free Edge.

It is true that a small gap must be allowed between cone and baffle all round the edge, since if they touch a buzzing sound is apt to result. If this gap is reasonably small, however, there is no loss of bass which can be detected by the ear.

Quite a large gap must be used before there is a falling off which can really be heard. So long as it is not more than perhaps a quarter of an inch there is no need to fear any lack of bass.

What you *will* notice with the "Clear-Cut," of course, is the lack of the dull and boomy tone so often heard from speakers of the cone type. When bass is really called for the "Clear-Cut" reproduces it, but it does not turn everything it possibly can into "imitation bass" as so many do.

Method of Mounting.

Now, about this baffle business. What you want first of all is a good solid board, not less than about $\frac{3}{4}$ in. thick, and preferably $\frac{1}{2}$ in. It's not a sounding board or anything of that sort, and it must be thick enough to be quite "dead." We ourselves used a board 1 in. thick, but this is not really necessary from the strictly practical point of view.

As to size, about 20 in. square serves the purpose excellently, although you can come down to about 14 in. square with only a slight loss of bass. The baffle you see in the photo measured 21 in. \times 23 in.

The round hole in the middle any carpenter will cut for you if you don't possess a keyhole saw. Its diameter should be $\frac{3}{8}$ in. larger than the diameter of the mouth of the front cone. There are likely to be slight variations in the cone when made up

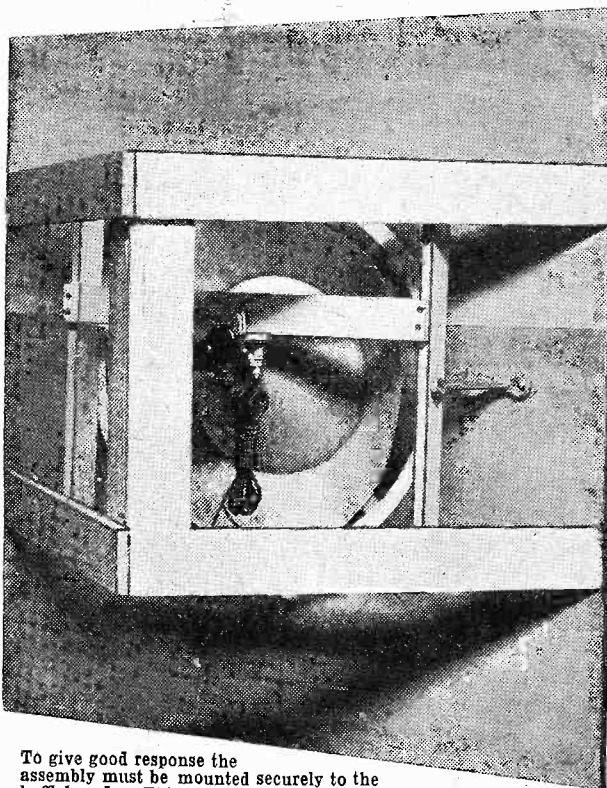
by different people, so put it mouth downwards on a flat surface, press down gently, and measure it as accurately as you can.

The dimensions given provide a gap of $\frac{3}{8}$ in. all round the cone, which we have found quite harmless. The chassis is to be so mounted to the back of the baffle that the edge of the front (main) cone comes a little way through the thickness of the baffle.

For this purpose three small panel brackets (brackets with one arm 3 in. and one 2 in. are suitable) can be used, and the photo shows one of them. Just a little care is needed in fitting these to get the cone nicely centred in the hole.

Having got the chassis on to the baffle, you have an unwieldy object which requires support. One scheme is to fit it with feet and stand it in a corner of the room, so concealing the "works" behind, and some may prefer this.

LOW AND HIGH NOTES!



To give good response the assembly must be mounted securely to the baffleboard. This picture shows how ordinary panel brackets can be used, and it also illustrates the side supporting-pieces which enable the loud speaker to fit into a corner of the room.

We rather prefer a speaker mounted a little higher, so we fitted ours up so that it could be hung in the angle of a corner from the picture rail. Behind the baffle we attached a right-angled wood framework to fit the corner of the room, and we hung the speaker by cords going up from this to hooks in the picture rail (or the wall, of course).

Fixing the Frame.

A photo shows this wooden frame pretty clearly, and you will see that it is made of six strips about $1\frac{1}{2}$ in. \times $\frac{3}{4}$ in. in section. Lengths will depend upon the size of baffle you decide upon, but it is very easy to make a full-size drawing before you start and measure the sizes off from this.

Get a sheet of paper large enough for the job (the kind the domestic authorities use for covering shelves, for example), and you will find the drawing quite easy to make if you remember that there is a right-angle at the back of the framework.

The angle at the back is stiffened up with two strips of the same wood (now you see why we mentioned six in all), but a single piece of thicker square-section wood (say, $1\frac{1}{2}$ in. \times $1\frac{1}{2}$ in.) could just as well be used. Length about 12 in., but this, again, can be altered to suit your own ideas.

Side Supports.

The four side strips, of course, must be bevelled where they are fixed to the baffle. The fixing is done with screws going through them at a bit of an angle into the baffle (a good thick baffle makes this quite easy if you drill the holes first).

Here are the sizes of the original side strips, which you may find helpful as a guide: Two $14\frac{1}{2}$ in. over all (i.e. including bevelled-off end) and two $14\frac{1}{4}$ in.

Now a final hint. The chassis can quite well be fitted into the ordinary kind of cabinet if desired. The easiest way is to cut a sort of dummy baffle to fit inside the front of the cabinet, and mount the chassis on this with panel brackets as before; then screw the baffle into the cabinet.

LATEST BROADCASTING NEWS.

THE TELEVISION POSITION

BETTER TALKS—A BOXING BROADCAST—A LONDON HIGH-LIGHT—BURNS' NIGHT PROGRAMMES.

THERE is no present intention on the part of the B.B.C. to begin a series of transmissions by the new H.M.V. process of Television. The indications are that the Baird transmissions may be rearranged so as to come on at more convenient times, and with less frequency than last year. It is believed also that the B.B.C. engineers will soon take a hand in the effort of trying to develop television, first of all by the Baird method.

Better Talks.

The struggle over talks at Savoy Hill has concluded in a way which most listeners will cordially approve. There is to be much more flexibility of arrangement in future. Also, talks will have to compete with music and drama and vaudeville in terms of genuine entertainment value.

It is not anticipated that there will be any reduction in the volume of talk or in the determination to carry on with the adult education policy; but it is hoped that many talks will be improved in "human interest" and showmanship.

Another advantage, too, will be the introduction of controversy, political and economic. It may be ungracious to criticise in the face of these far-reaching improvements, but it is perhaps a pity that the B.B.C. does not yet have the courage to allow religious controversy, and also to admit alternatives on Sundays.

A Boxing Broadcast.

Here is a piece of advance news for the sporting fraternity, the ladies as well as the men who take an interest in fisticuffs and complain that broadcasting does so little—amounting in the aggregate perhaps to almost nothing—to foster what they prefer to call "the noble art."

On Monday, February 2nd, Bert Kirby, holder of the Lonsdale Belt, is fighting Jackie Brown for the fly-weight championship of Great Britain, at Belle Vue Stadium, Manchester, and arrangements have been made to describe the fight in the form of an intermittent running commentary.

This description will be broadcast as part of the National programme, and will, of course, also be radiated from all Northern Stations. The contest, which begins at 9.45 p.m., is to go on, failing a knock-out or premature stop, for fifteen rounds, each of three minutes. It is intended to describe the preliminary scenes and the first few rounds, after which there will be music from the studio for about ten minutes, and then more details of the progress of the match and a description of the next few rounds.

This method will go on until the fight is decided, descriptions of the contest alternating with studio music. The evening will conclude with a relay of dance music from the Midland Hotel, Manchester, so that from 9.40 p.m. the whole programme will emanate from the Northern Region.

A London High Light.

Reminiscences of her girlhood days and of her life at the Imperial Ballet School, where she was for eight years, and later of her experiences as premiere danseuse at the Imperial Russian Court, will be told by Madame Karsavina in a talk in the series "Yesterday and To-day," which is to be heard by National and other listeners on Friday, January 23rd.

On the same evening Tommy Handley, who has not been heard for some time, is to make a welcome reappearance before the microphone in a vaudeville programme together with Gillie Potter, Mabel Constanduros and Michael Hogan. Joan and Nancy

NEXT WEEK:

A REGIONAL BROOKMANS REJECTOR

— ALSO —

The "Station-Change" One

—a set that switches over from one programme to another without re-tuning. Ideal for the old folks!

ALSO

AT HOME WITH TOMMY HANDLEY

Allen-Brown, Edgar Fairchild, and Robert Lindholm, the Bayan Singers, and Jack Payne and his B.B.C. Dance Orchestra.

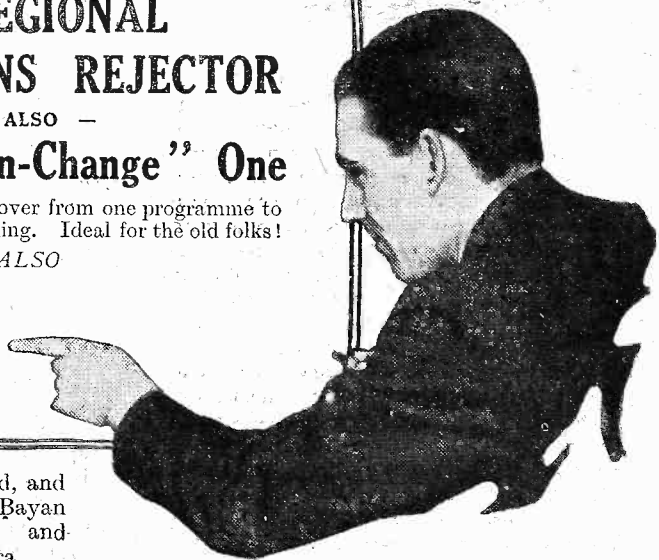
Burns' Night Programmes.

January 25th, Burns' Night, this year falls on Sunday, so that the official recognition in the broadcast programmes will take place on the night before. As usual, the

"doings" will be supplied by Scotland, but Scotsmen outside their own land will hear them via the National wave-lengths.

Dr. James Devon will preside over the special programme which he has arranged of songs, readings, comments, observations, and other things, which are to be contributed by Robert Burnett, the Scottish baritone, and David Stephen.

Burns' Night Celebrations will also be heard on Monday, January 26th, when the proceedings of the Cardiff Caledonian Society's dinner are relayed from the Cardiff City Hall. They will include speeches by the Earl of Dumfries, President of the Society, who will propose the loyal toasts, and by Mr. J. A. Hammerton, the well-known author and editor,



the guest of the evening, who will propose "The Immortal Memory." The toast of "The Lassies," proposed by Mr. Ronald Macintosh, will be responded to by Dr. Mollie Foyle Churcher.

FOR THE LISTENER

By "PHILEMON."

A critical survey of some of the recent programmes, with frank comments on the fare provided and the way it is served up.

What's in a Name?

In looking over the programme of Talks the other day it occurred to me that the B.B.C. might do worse than take a leaf out of the book of the more popular kind of journalism and try to find more attractive titles.

Presumably they wish these talks to be heard by as many as possible; but such a title as "The Enjoyment of Literary Forms" is enough to put anybody off. It did indeed put the announcer off; for he gave it as the "Enjoyment of Literature."

Anybody who knows Dr. Delisle Burns will know that some extremely interesting talks will emerge from the packet with the rather dull label, "Contacts Between Peoples of To-day." Is there really any harm in dressing the shop window?

Poetic Licence.

In Mr. J. C. Squire's first talk on the "Enjoyment, etc.," he referred to Tenny-

son's "Break, break, break," as being one of the finest lyrics in the English language, and immediately proceeded to misquote it! Oh, these literary editors!

Who Wants Broadcast Plays?

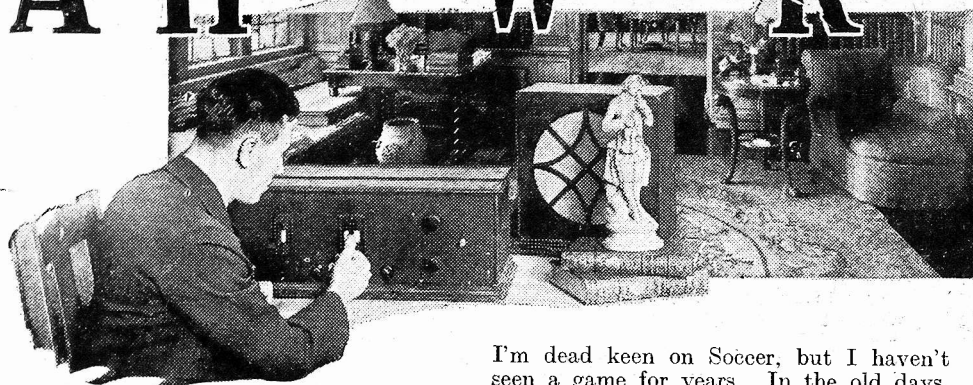
The result of a referendum in a certain popular paper on the question of what listeners like best in the programmes was that Popular Music and Vaudeville win. Classical Music and Talks are placed; while Plays and Chamber Music are among the "also ran."

I was surprised to find plays so low in the list. It cannot be that plays are not popular. It may be that the right sort of play has not yet been discovered.

Personally, I regret that so many of the plays broadcast are tragic ones; and others (like the Shakespearean plays) have to be cut down so severely that they really lose most of their character and quality.

(Continued on page 893.)

AT HOME WITH RADIO STARS



A further article in our series of exclusive and intimate sketches of famous broadcast artistes. A popular comedian tells how he discovers his humorous material

7.—LEONARD HENRY.

"WELL, here you are," said Leonard Henry. "This is what you might call my sanctum—where I work on those rare occasions when I'm at home."

"You'd better describe it for myself. I'm afraid I never look at it, personally. It's never cleaned (not by me, at least), and I generally have so much to do when I am here that I don't stop to survey the scene, as it were. You'd better describe it for yourself."

Unfortunately it is practically impossible to describe Leonard Henry's sanctum! It is all books, manuscripts and sheet music, with a certain amount of untidiness which is the natural result of the burning of much midnight oil. The *pièce de résistance* is a typewriter on which Leonard types all his own manuscripts for broadcast sketches and revues, while standing above a pile of music is a toy stuffed cat.

A Lot of Hard Work.

Cats are his mascots, as you will know if you have ever seen him on the stage.

"It's no use you asking me what I do at home," cut in Leonard before I had time to get a notebook ready, "because I just don't. Every day, Sundays included, is a twelve-hour day for me. Either it's rehearsing at the B.B.C., preparing new songs, new patter or devising new stage turns."

"I have found that since I took up broadcasting, about four years ago, my stage work has increased enormously—which, professionally speaking, isn't at all unpleasant, of course, but it means a whole lot of hard work."

"I expect you think I'm swanking when I honestly tell you I don't know what the general arrangement of my own 'den' is like. But I only come in here when I have a new tune to work out or a humorous sketch to type. Sometimes some humorous patter will suggest itself while I am coming home from a broadcast, or from a show, and then I dash in here and put it into type before it's forgotten."

No Time for Hobbies.

"And other times, when there is a special demand for something new, ideas simply just won't come, and I pace up and down tiger-like" (he demonstrated the tiger-like pace!) "scratching my pate and worrying the old brainbox until it devises something."

"So it's no use me asking if you have any hobbies," I inquired.

"No harm in you asking," said Leonard, "but the very thought makes me weep."

I'm dead keen on Soccer, but I haven't seen a game for years. In the old days, when I was with Charlot at the Prince of Wales Theatre, there were times when we didn't have Saturday matinees, and then I was able to go down and watch the Corinthians, and I'd cheer like blazes.

Listening to Others.

"But not now. In the broadcasting humour line you have to be constantly on the alert, and, as I say, I honestly haven't had a free Saturday for years: certainly not for this past year. Ah, how I'd like to go and see the Corinthians—or the Hamlets. The captain of the Hamlets is a friend of mine, and he's always begging me to see them."

"I think you can safely put me down as a 'sportist,' as the French say; but not an active sportist."

"And what about wireless," I inquired, feeling that Home and L. H. really hadn't much in common. "Have you a—"

"Have I a wireless set? Oh, how many people have told me I ought to buy a wireless set and listen-in sometimes to other

artistes, suggesting that in that way I might myself be then worth hearing! And I have to tell these rude folk that I have a wireless set: a five-valve portable."

"I bought it one time when my mother particularly wanted to hear me (she feels that way at times) and couldn't be at the studio, so she heard me on the portable: and since then she's used it a lot. But I never get time to use the thing, at least not often."

"Anyway," I suggested, "it might be interesting if you were to hear other artistes at times, particularly humorists."

"To be strictly accurate," said Leonard, "it was only a few weeks ago that I heard Clapham and Dwyer on the wireless—on this portable—although I have known them for years and have, of course, often been with them actually in the studio; and it seems strange to hear old friends on the wireless for the first time. The same applies to Stainless Stephen, whom I heard radio-ly for the first time recently, and to Mabel Constanduros."

Regarding a Rumour.

"Don't you ever listen to foreign stations?" I queried, whereupon Leonard scratched his head and shifted his pipe from one side of his mouth to the other.

"If you call Radio Paris a foreign station," he said, "then the answer is in the 'infirmary.'"

"I heard Radio Paris last week—for the first time—when they were doing some gramophone records. Poor stuff. I suppose they put over the better concerts in the evening, when I can't hear them."

"What about chemistry?" I inquired. "Is there any truth in the rumour that you started out in life as a chemist? And do you still play about with 'stinks'?"

"Now we touch on ancient history," said Leonard with a smile. "I am an old Alleynian, and in those days I studied chemistry with the idea of going in as a manufacturing chemist. I went in all right, and came out with a jerk."

How He Started.

"An impromptu explosion (I was at the bottom of it, and literally at the top of it) in the lab. one day put an end to that as a career, and I had to go away to the seaside to get over the effects."

"There I made friends with a visiting concert party, started being a 'funny man,' and now here we are. I've never turned back to the 'stinks.' The only chemical change I seek to make nowadays

(Continued on page 892.)

"UNCLE LEONARD"



A recent photograph of the famous comedian whose breezy broadcasts delight millions of listeners.

SHORT-WAVE NOTES

A page of information of particular interest to short-wave enthusiasts, in which various forthcoming organised tests are discussed.

By W. L. S.

REGARDING my none too complimentary remarks last week on the subject of 1930 and the radio conditions pertaining thereto, a member of the "P.W." staff has taken me to task for "speaking irreverently of the dead," and expressed the opinion that I shall already be unpopular with 1931. Should 1931 also prove a bad year, therefore, I am to expect all the blame to be thrown on me, as far as "P.W." is concerned. I sincerely hope that the necessity will not arise, and 1931 has already shown itself very favourably disposed.

On the first day of the New Year I logged stations in all continents, and on the third I heard several Australians (just after midday) coming over with a strength that they have not touched since 1928—at least, not while I have had the 'phones on. So hats off to 1931!

Buenos Aires Again.

"L. H. S.," of London, informs me that the reason why L I M M, the famous Italian telephony station, has been off the air is that he is now in the United States. A very good reason, too. "L. H. S." has logged V R Y, Georgetown, British Guiana, on 43.5 metres, at good strength. For the power used (200 watts) this is not bad going.

Reports of Buenos Aires telephony continue to flow in. This station has certainly made his presence felt, and the remarkable thing is that conditions have not been right for reception of South American amateurs for months. When they are right they simply pour in, and one cannot help wondering what sort of noise L S X would make then.

"S. C. G.," of Swindon, is the first to write me regarding reception of Radio Budapest on about 70 metres. He finds his strength equal to that of Rome on 80.

I fairly admit having been caught napping this time; 70 metres has never been a very lively wave, and I simply have not thought of listening there. If the programmes are as good as those on the 550-metre wave this station should be worth receiving.

British Empire Radio Week.

The Radio Society of Great Britain has arranged a "British Empire Radio Week" in February which, with the aid of decent conditions, should afford a good opportunity of logging some real DX. So keep your ears open from midnight on February 21st, until the same time on the 28th, and perhaps you will hear some parts of the British Empire that have not yet agitated your diaphragms.

A trophy is being awarded to the station in the British Empire scoring the highest number of marks during the week; the marks are awarded for the numbers of contacts with stations in various parts, and the wave-band on which the contact is made will also be taken into account. All amateur bands are open.

Following on this we have the A.R.R.L.'s Fourth International Relay Contest, run on the same lines as in previous years, affording

listeners a chance of logging unprecedented numbers of U.S.A. and Canadian stations.

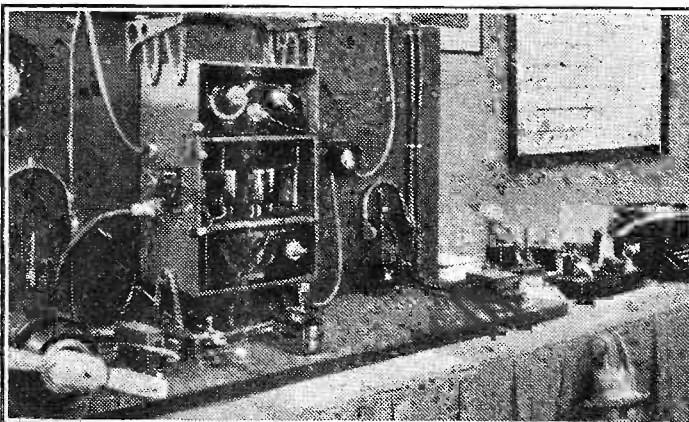
And lastly (most illogically) I will mention that the R.S.G.B. 10-metre tests are now in full swing, each Sunday during this month being occupied in this way. All records for the minimum amount of sleep will be broken, as several of the more enthusiastic entrants will keep watch for the whole twenty-four hours.

"B.B.C. Quality."

I am glad to see from the January issue of "QST" that the 160-metre 'phone man is thought quite a lot of in the States. Over here the DX merchants that never emerge above 40 metres are rather apt to belittle mere 'phone work across London, or between Yorkshire and Bedfordshire.

Many of them realise for the first time

A COMPLETE AEROPLANE INSTALLATION



This is a complete transmitter and receiver for use on aeroplanes, which was shown at a recent exhibition. The wind-driven generator can be seen on the extreme left, and it will be noted that the set itself is suspended by means of rubber bands.

when they try it out that it is just as difficult to put "B.B.C. quality" 'phone across London as it is to work Australia on the key. Vide the extraordinarily small number of really first-class 'phone stations that one hears on the amateur bands. The "second-class" variety is coming on in numbers now, and all credit to the owners, but unfortunately the majority of it is anything up (or down) to about "tenth-class" still.

In this I am being hyper-critical, but by "first-class" I mean a transmission that is literally indistinguishable from the B.B.C. transmissions, and not land-line transmissions at that!

Short-Wave Set Design.

When one takes stock of the extraordinary progress in the design of broadcast receivers during the last few years it seems rather strange that the average short-waver is not much better than its three-year-old brother. From the point of view of results I am afraid my own isn't, but it certainly is an improvement on the old one for "handlability."

I should like to see the completely screened chassis as the standard design for short-wavers, with one tuning control (ganged if necessary) and a mains plug. Then we could say that we had been doing something.

One of the chief troubles in the path of all-mains short-wavers seem to be the queer variation in the character of the mains in different parts. I have made one that has gone perfectly well at my house but has been impossible to use on account of mains hum at a friend's place at the other side of London. Likewise, I have met one that I could not get to function properly, but that someone else did.

Why Not Rome?

Given enough time to worry about with the set and get everything "just so," there is no reason why anyone should not be able to make a mains-operated short-waver eat out of his hand, but for a mass-produced article it is a very different tale.

"G. B." of Honiton, is awarded the palm for the strangest phenomenon of the week. He hears amateurs in vast numbers on the 80-metre band, but has never yet heard Rome, and is very annoyed because I keep making allusions to his great strength on this wave!

Are you sure, "G. B.," that you are not all mixed up in harmonics, and that the amateurs you heard were not on 160 metres? It seems very strange that you should hear none on 160 and lots on 80, for conditions are usually vice versa. Otherwise, I have nothing to suggest except that you are completely screened in some way from that direction.

The five weekly stations are:

H B 9 X D, Zurich, Switzerland, on 86 metres;

H R B, Honduras, on 48.62 metres (Tuesdays, Thursdays, Saturdays and Sundays);

W N C, Ocean Township, N.J., on 30.77 metres;

Z L W, Wellington, N.Z., on 27.3 metres;

and L S H, Buenos Aires, on 14.5 metres.

STATION INFORMATION

When connecting two of its transmitters by land-line the B.B.C. always employs two circuits, the better one being the music line and the other a stand-by control line.

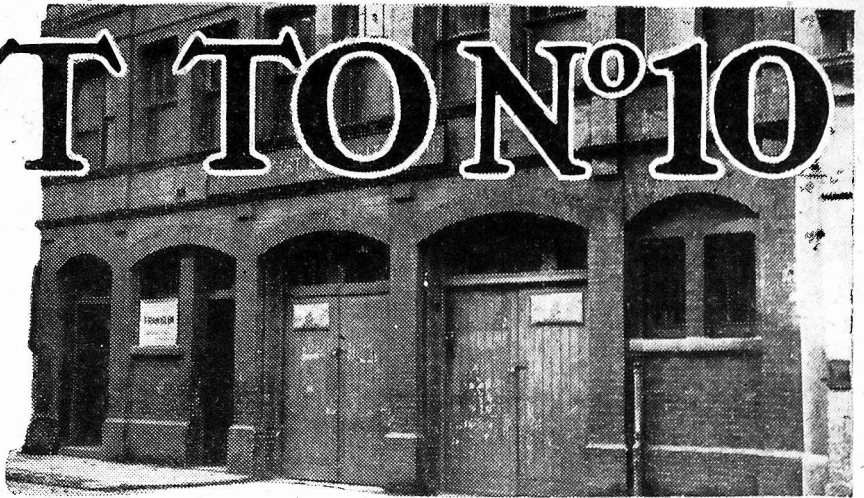
Vienna is one of the Continental stations that has been carrying out experiments with relaying foreign (including English) programmes.

If you write to the Katowice (Poland) station about their transmissions, your reply comes over the microphone in the French language.

A VISIT TO N°10

No, this is not the description of a call on the Prime Minister, but details of a "look-in" at the B.B.C.'s latest studio.

By OUR OWN CORRESPONDENT.



NO. 10 STUDIO is the converted warehouse on the South Side of the Thames, near Waterloo Bridge, which is used for the new Wireless National Orchestra. (This orchestra has so many players that no studio at Savoy Hill is large enough for it.)

It is reached via a long narrow flight of stone steps running down from Waterloo Bridge Road, and after the dingy, dark street in which the building is situated, the bright and comfortable interior of the studio comes as a pleasant surprise.

It has a colour scheme of light green and pale yellow. The brick walls are painted in the latter colour, the iron girders, woodwork, and the thick carpet which covers the floor being green.

The Soloist's Mike.

The studio is about 20 or 25 feet high, and the ceiling is draped with cloth.

The illumination is particularly good, being provided by a number of hanging bulbs with plain white fabric shades. These numerous lights, the bare girders and painted walls, all combine to give the effect of a miniature Exhibition Hall like that at Olympia.

I arrived a few minutes before one of the Sunday night programmes was due to start, and as soon as I was seated I looked round for the microphones. There were apparently only two, one suspended just above the conductor's platform, and the other on a stand a little to one side. This, I later found out, was for the purpose of "picking up" the soloist.

As zero hour arrived everyone took their places, looking perfectly calm about every-

thing, and the conductor (in evening dress) stepped to his dais. The next moment the red lights, one at each end of the studio, flashed on and off, and the announcer called, "Quiet, please!"

Now the red lights were glowing steadily, and a familiar voice began, "The first item on our programme, etc." No louder than for ordinary conversation, it was not as clear, where I was sitting, as it comes through on the loud speaker.

Without any fuss the concert was in full swing, and I was making comparisons with the same orchestra coming over on my loud speaker. What conclusion did I come to, you ask?

Well, personally, I do not think the effect from a good loud speaker on a good set is much inferior to the reality. The instrument which seemed to me to be most different was the flute, and naturally we can do with more power on the very low and extra high notes. Still, the difference is nowhere so great as some would have us believe.

Coats off!

Dead silence reigned during the break between one movement of an item and the next, and I thought of the many homes where a similar silence must have reigned.

I also thought, strangely enough with some slight annoyance, of the sets that had been switched off or ignored. The orchestra was working hard and enthusiastically; the conductor and many others being in their shirt sleeves.

I am told that many people can appreciate so-called "highbrow music" better when they can see the orchestra than when they hear over the radio. I think the reason is because they can see the conductor.

He seems to give life to the complicated melodies (forgive me for putting it thus, because I cannot honestly consider myself even a novice at highbrowism). Under his magic wand the music becomes knit together and almost thrilling.

Those Radio Drums.

Here, I think, is one of the ways in which television will help a lot. If the experts can televise just the conductor alone, I shall be satisfied.

In between the items the red lights were extinguished, which gave me a welcome chance to cough, and settle myself in a new position.

Quite a number of the players retired for some of the items, and I swear that for the life of me I should not have known it had I been listening-in. But no doubt there are those who can tell such differences even on the loud speaker.

The last item arrived with surprising quickness. It contained some drum beating which was almost terrifying, and seemed to shake the building. I wondered how my loud speaker at home was standing it, but was assured later that no unusual quantity of bass was noticed.

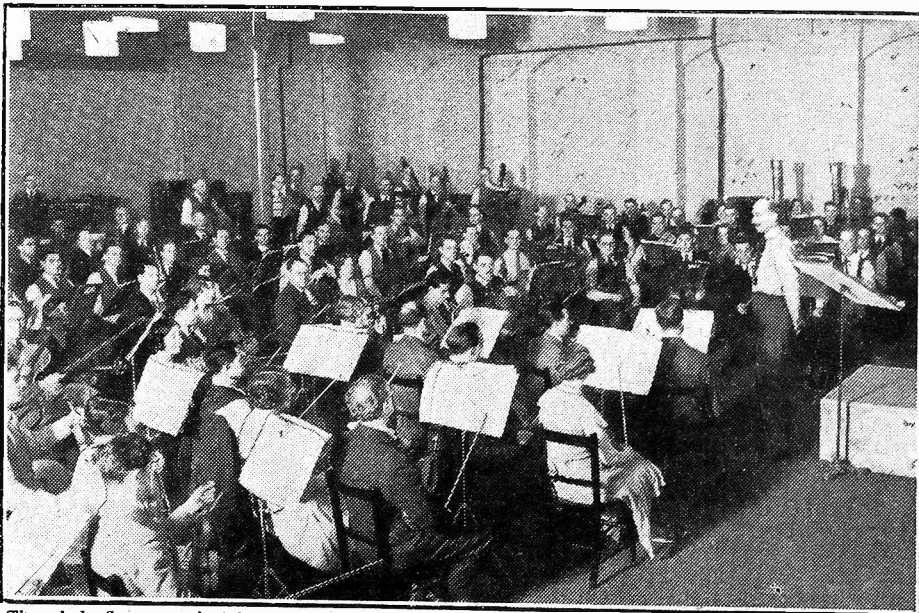
Well, well, perhaps the radio drummer works harder than the stick twiddler in an ordinary orchestra because he is the furthest away from the microphone.

"Appealingly Informal."

Even the orchestra thoroughly enjoyed the playing of the soloist, for they began clapping him before the red lights died out. This may have been intentional, or the announcer may not have been quick enough with his switch.

With the words, "That concludes our programme for to-night, with the exception of the Epilogue, which will follow in a few minutes," I realised it was time to go. I was sorry to leave the studio, and I think the orchestra also will be sorry to leave it when their new quarters are ready at Portland Place. There is something appealingly informal about No. 10.

THE ORCHESTRA READY FOR THE RED LIGHTS



The whole floor area is taken up by the National Orchestra, except for that required around the walls for two or three rows of chairs and a number of settees.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?



FOR THE HANDY MAN.

DID you know that you could braze without heat? It appears that you can braze either iron or steel by taking a quarter of an ounce of fluoric acid, one ounce of steel filings, two ounces of brass filings, and applying these ingredients, well mixed up, to the parts to be united.

You then clamp the pieces together and put them on one side until they are thoroughly set.

This is just one item I haphazardly noted in the 190 pages that comprise Calvert's Mechanics' Almanack, published by John Heyward, Ltd., at 6d. It is full of invaluable workshop stuff, and there are innumerable useful tables, etc.

READY RADIO.

Messrs. Ready Radio have published an excellent catalogue covering a specially chosen range of sets and accessories, that they can supply from stock either for cash or on out-of-income terms.

NEW OSRAM VALVE.

The following extracts are from a letter I have received from Messrs. G.E.C., Ltd., regarding two new Osram valves that are now available:

Proof of the fact that the production of valves designed specially for battery-set owners is not affected by the growing popularity of those intended for use with A.C. mains sets, is furnished by the introduction of new and improved types having characteristics far in advance of those previously available. Research and experiment proceeds without intermission, and as a consequence both the efficiency and reliability of these valves show a marked advance on those formerly representing the standard of their particular class.

A striking instance of this advance in valve quality is revealed by the two new loud-speaker power valves which have just been added to the Osram range. One of these valves has been designated the L.P.2, and the other the P.2, designations which will indicate to those who have become familiar with present-day nomenclature that they have both been made for use with 2-volt accumulators; in the one case, the L.P.2, as a very high efficiency small power valve, and in the case of the P.2, as a super-power valve.

A review of the characteristics of these two remarkable valves will at once show that the manufacturers of the L.P.2 and the P.2 have advanced an important step in valve evolution.

The L.P.2 makes an ideal loud-speaker power valve for portable sets or for any 2-volt battery sets where the highest amplification is required with the lowest possible H.T. current consumption.

For an impedance of only 3,900 ohms, the remarkably high amplification factor of 15 has been attained, equivalent to a mutual conductance of 3.85 ma/volts. The Osram L.P.2 is the first 2-volt valve in the world to attain such remarkable characteristics.

The L.P.2 is specially recommended for sets where one stage only of L.F. amplification is used, and as a loud-speaker valve in the "Osram Music Magnet 3" or kindred 3-valve sets.

The Osram P.2 is a super-power valve specially designed to provide extreme sensitivity, superb quality of reproduction, and to handle the greatest undistorted volume with the lowest possible H.T. and

L.T. current. (The L.T. current is only one-fifth of an ampere.)

It can be used as a super-power valve either in portable sets (particularly with 2 stages L.F.), or in any 2-volt battery-operated set.

The low impedance value of the P.2, viz: only 2,150 ohms means that full loud-speaker strength reception on both local and distant stations can be secured without harshness or "blasting" together with a better reproduction of the bass notes. In addition, the very high mutual conductance of 3.3 ma/volt means that nothing is lost in sensitivity by the low impedance—so often the case with super-power valves.

The Osram P.2, like the Osram L.P.2, sets a new standard in 2-volt power valves for broadcasting purposes.

APPROXIMATE DATA.

	Osram P.2	Osram L.P.2
Filament volts	2	2
Filament currents	2	2
Maximum anode volts	150	150
Amplification factor	7.5	15
Impedance	2,150	3,900
Mutual Conductance	3.5	3.85

It remains only to say that I have tested the Osram L.P.2 and P.2, and find that they are indeed excellent valves. The mutual conductances reveal the very high efficiencies they achieve, and the 3.85, in the case of the Osram L.P.2, is quite marvellous.

The P.2 takes a hefty input, and you can indeed achieve a sufficiently powerful output to work a large moving-coil speaker really well. Two-volt enthusiasts will assuredly have to admit that their interests are being very adequately pursued by at least the G.E.C.

The two new "Osrams" give them a real chance to obtain that kind of performance that until very recently has been thought entirely impossible for anything outside the 6-volt range.

FORMO CHOKE UNIT.

The new Formo Choke Unit comprises an H.F. choke and a .0002-mfd. condenser wired in series with three terminals brought out for external connections.



A batch of "P.W." Dual-Range coils being given wave-length tests at the R.I. factory. All the "P.W." coils made by R.I. are tested for inductance and wave-length.

The use of a bypass condenser with an H.F. choke is, of course, no novel scheme. You will have seen it in several circuits. (The .0002 fixed condenser is joined between the plate of the detector valve and L.T. \leftarrow), but the combination of the two vital components in one unit such as is the case of this Formo production is, I think, quite new.

The price of the article is 7s. 6d. and its component parts are efficient, but it must be pointed out that the unit can only have its special applications. Used in a "P.W." circuit in which our dual-range coil unit figures, it is liable to interfere with the reaction effect rather than improve it, so, for that reason, we are afraid we cannot recommend its use except when it is definitely and specifically recommended, or in a circuit in which the combination of .0002 bypass and an H.F. choke are shown.

Since penning the above I have learnt that there are now two types of these units available: Type A "For use in detector anode circuits," and Type "B" for use "as a coupling device between H.F. and detector valves," but I haven't yet examined them closely.

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department, with the strictest of impartiality, under the personal supervision of the Technical Editor.

We should like to point out that we prefer to receive production samples picked from stock, and that we cannot guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

And readers should note that the subsequent reports appearing on this page are intended as guides to buyers, and are therefore framed up in a readily readable manner free from technicalities unnecessary for that immediate purpose.

A NEW AMPLION LOUD SPEAKER.

The Amplion loud speaker A.B.41 does not carry a new type number, but the present models are greatly improved. The new A.B.41 has an entirely re-designed unit.

It will be remembered by many readers that the Amplion A.B.41 was given a favourable report in these columns

some few months back. The improved A.B.41, the one that is now on the market, is definitely superior and constitutes a distinctly attractive proposition. We recently received one for test and find it greatly improved—good though was the original.

A MARCONI VALVE LEAFLET.

Marconiphone Co., Ltd., have prepared a supplement to their recently issued valve catalogue, containing full details of the new series of Marconi 2-volt valves.

The Finest of all A.C. Mains valves

For all-electric radio of the highest efficiency, for unfailing reception and a perfect background of silence—the improved series of Marconi indirectly heated A.C. Mains valves stands supreme. High conductivity, rigid construction, mesh anode to prevent over-heating and grid emission, exceptional vacuum, and, above all, a long useful life—every feature, in fact, which is desirable in modern receivers is included in this range. There are types for the improvement of every set.

EXCEPTIONAL CHARACTERISTICS

		Amp. Fact.	Imp.	Mut. Conc.	Price.
MS4	Screen grid	550	500,000	1.1	25/-
MH4	General purpose ..	35	16,000	2.19	15/-
MHL4	Detector & L.F. amplifier	20	8,000	2.5	15/-
ML4	Power	9	3,000	3	17/6



G. Marconi

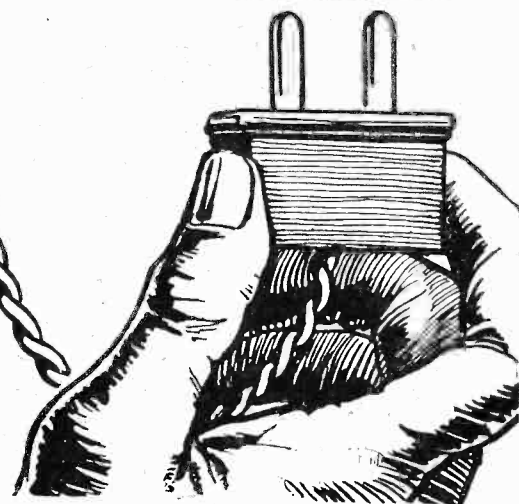
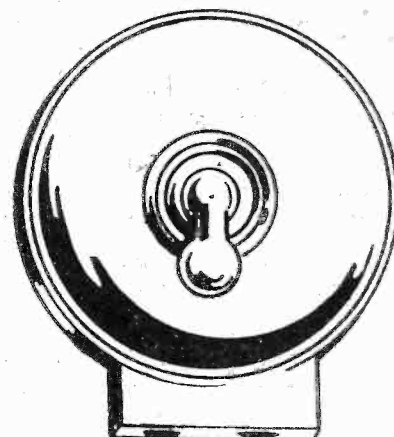
Public Testimony

D.E.R. VALVE No: R.11307.

"I purchased the above valve several years ago, I think about six years, and unfortunately yesterday I dropped it on the floor, breaking the filament but not the glass bulb, thus ending a life of an old reliable friend. Its last position was the detector stage of my short wave receiver, and in this position it worked splendidly. I am certainly going to purchase another Marconi valve. . . . I am writing this letter as a mark of appreciation to your valves, and I thought you might be interested in this report, seeing that the valve has been in continuous use for six years or more. . . . A truly wonderful valve I can only describe it as."—G. W., Stockport.

Expert Testimony

Marconi engineers, who have at their disposal unequalled resources of research and manufacture, have long realised that if really practical benefit is to be derived from high theoretical efficiency in a valve, it is imperative to unite every useful feature in a perfectly balanced design—no single factor must be emphasised to the detriment of practical performance. All Marconi Valves are practical interpretations of theoretical ideals; they contain just those features which, being properly united, will ensure the best all-round results and highest effective efficiency. The soundness of this principle is conclusively established by the fact that Marconi valves are used by the B.B.C., Imperial Airways, Trinity House Beacon Stations and Lightships, Empire Wireless Communications, Large Passenger Liners, etc.—a unique tribute to their unequalled performance and dependability.



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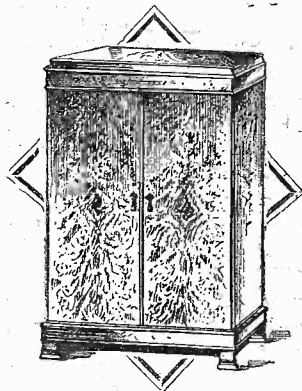
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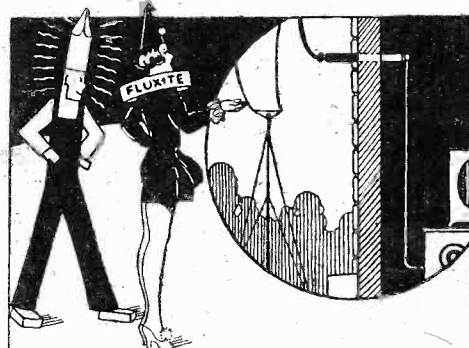
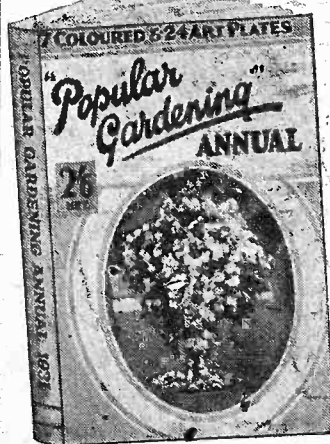
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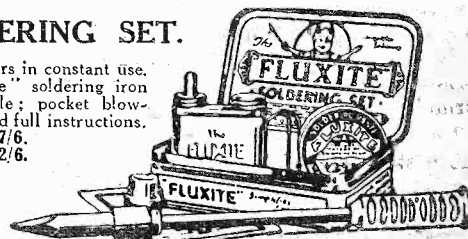
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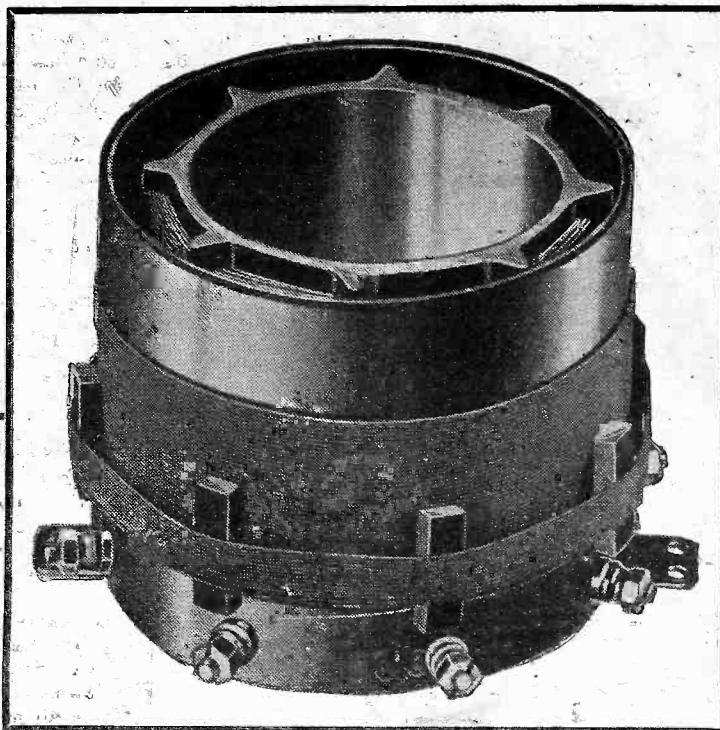
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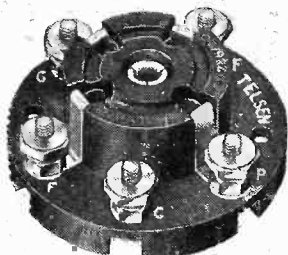
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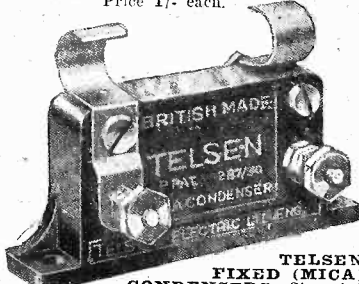
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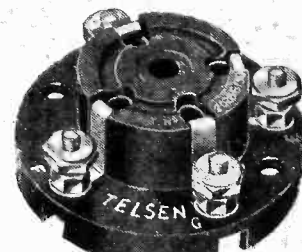
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11, Oat Lane, Noble St., London, E.C.2.

Telephone: National 1977.



IT is extremely difficult to criticise the results given by a radio receiver. I mean scientifically; not in the "that sounds pretty good" sort of way. The only accurate method is to take its "overall" amplification curve. And just to give you an idea of the complexity of this I will briefly describe it.

You feed a range of known frequencies into the set, and I must not forget to add that you must know exactly the proportion of energy carried by each frequency. Near the loud speaker you place a calibrated condenser microphone, and this is coupled to a valve voltmeter.

Very Expensive Apparatus.

The apparatus required is of a very expensive character, and it takes a skilled engineer to handle it. But there is a simple scheme for gauging approximately the quality of the output from your loud speaker, and if you have a fairly musical ear so much the better.

All you have to do is to identify the musical instruments in an orchestra that is being broadcast, and see how easily or how difficult it is for you to follow them. If it is possible to spot them, and they retain their distinctive, individual characters, you can reckon your set is a good one. And you will be able to gauge the degrees of efficiency with which the set deals with the upper and lower frequencies by the manner in which it handles high and low-pitched instruments.

"Hashed-up."

On a very poor outfit, an orchestra or a band sounds like one hashed-up medley of noises, while on a good set the harshnesses and resonances give way to clean definitions of the various units.

Naturally, when the

If you can puzzle out the instruments of a small orchestra, and you know what frequencies those instruments cover, you have an excellent starting-point for building up a true estimate of how good, or bad, a set really is. In this article a scheme that enables you to acquire the necessary knowledge in a pleasant manner is interestingly described.

By G.V. DOWDING, Associate I.E.E.

band or orchestra is playing "ensemble" parts—all the instruments joining in and no one "starring" solo—you must not always expect to be able to take every one in turn and immediately identify it, although, after a while, you will be surprised how easy it is to go a long way towards it—on a first-rate outfit.

At this point I can hear some of you saying, "How on earth can we, who do not know the difference between an oboe and a tin-whistle, hope to do these things?" (On the other hand, there will,

of course, be at least a few readers of "P.W." who will know more about this particular subject than I.)

Broadcasting gives one many opportunities of acquiring the necessary experience, and once you start you will be surprised how simple and how fascinating it is.

The best plan is first to tackle the small combinations, using well-known instruments.

A Good Example.

Jerry Hoey's band is frequently broadcast from the Piccadilly Grill Room, and that is an excellent one to begin with. Here you have in one group a piano, a banjo, and drums.

All these are generally used to supply the rhythm, the "um-pum, um-pum, um-pum" part and, anyway, there can't be many people who are unable to say that that is a piano, that a banjo, or those are the drums, when they hear them at work. In passing, I don't expect it is more than a minority that have sets on which Jerry Hoey's drums get through at all!

Jerry Hoey makes great use of a piano-accordion in his combination. This is like a large concertina in appearance, except that it has a sort of miniature piano keyboard.

It gets over with the effect of a small organ, and provides a fullness, a rich background to certain passages of music. The only high note stuff that is heard providing the melodies are the tenor saxophone and the violin. It won't be hard for you to tell which is which out of these, will it? If you cannot distinguish between them you can reckon your set requires polishing up.

There remains in Jerry Hoey's band only one of those huge fiddle things to contribute deep grunts. But take careful note

(Continued on next page)

SOME INSTRUMENTS YOU HEAR



A typically equipped dance band. On the extreme right you see a trombone. To the sitting violinist's right is a trumpet player and then three saxophonists. Note bunch of four clarinets standing vertically on the floor. From left to right they are alternately of wood and all-metal construction. A banjo player is standing at the back.

TELL-TALE TONES

(Continued from previous page.)

of those grunts. If you can honestly say that they sound like the scrapings of a string instrument and not like the "whoops" of a wind instrument, give your set high marks.

At the other end of the scale, contrast the notes provided by the saxophone and the fiddle, for the one is "wood-wind" and the other "string." The measure of real, vital individuality each retains provides an index of the quality of your set.

There is another little band that broadcasts quite often and which provides a fine contrast with Jerry Hoey's bunch. This is Jack Padbury's Cosmo Club Six. The melodies in this instance are generally contributed by a fiddle and a trumpet. There is no saxophone, whereas Jerry Hoey has a saxophone and no trumpet.

Trombone "Grunts."

Jack Padbury's bass "grunts" are given by a trombone, and he has no string bass. Jerry Hoey, you will remember, has no trombone. Keep these facts well in mind, for they provide cast-iron standards.

Drums, banjo, guitar, piano and piano-accordion complete the Padbury combination. Two of the musicians apparently operate the last four between them, so that only two out of the four instruments are heard at any one time.

I don't think the least musical of you can honestly say that it is impossible for you to dig out the eight or nine instruments I have mentioned. And once you are thoroughly familiar with them you will have no difficulty in analysing intelligently bigger dance bands.

For instance, you will find that both the

ascends the scale. On its lower notes it is very mellow and full. It then goes rather dull, finally emerging on its upper register, first with a round, bright tone, developing at its uppermost limits into a decidedly shrill, almost piercing, tone.

By the way, don't forget that there are seven or eight different saxophones, running from the bass, which can grunt as low as the bass trombone, up to the soprano, which

not reckoned usually to alter its character. But sometimes "mutes" to give queer effects like high-pitched laughter, etc., are employed. I fancy Sid Bright's trumpets are muted rather more than most, but it is a common stunt. The megaphone affairs that are sometimes fixed to clarinets do not often change things much from a radio point of view.

A "muted" trombone is sometimes to be heard in Ambrose's Mayfair Orchestra, doing quite tidy little solo bits.

So much for the dance bands, but what about the more "serious" stuff? Well, here it is, in cases, much easier and, in cases, much harder to dig things out. When you come to an outfit like the new B.B.C. orchestra, there are no solo instruments in reality—you have practically every kind of instrument in common use, while most are played in bunches.

Thus, there are no less than thirty-six

violins and most of the time a group of twenty will be playing identical notes, while a second group of sixteen do likewise. You will easily identify these violins, but it is practically useless struggling with the eighty or so other instruments because they include so many that are rarely, if ever, used in other combinations. Why, they've even got a euphonium, four bassoons and four oboes in that new B.B.C. orchestra!

Now and then various of the popular instruments are billed to solo in radio vaudeville and other programmes—thus you get Teddy Brown broadcasting a saxophone solo, etc. These solos will help you no end, providing you take careful note of how the various instruments sound. If you are a radio-gram enthusiast get one or two solo records—they form excellent testing material apart from anything else.

A Useful Group.

In conclusion, I must point out that this article is by way of a supplement to two other of my articles, "Down Among The Tubas" and "On the High C's," which appeared in "P.W." Nos. 441 and 446 respectively. Now those two articles showed where the low-toned instruments usually scaled down to, and where the high-toned instruments went up to, so the three contributions together pretty adequately cover the ground.

There is just one point I must not forget to bring out, and that is this. I have given an outline of the construction of various of the dance bands that broadcast, but it happens sometimes that changes are made and new instruments introduced or existing ones dropped, so I cannot guarantee that my notes will be strictly accurate by the time these words appear in print.

And by way of a P.S. I must further explain that I have not concentrated on dance bands because I consider they are the most important combinations, but because they are generally small affairs as compared with concert orchestras, and because their instruments are conveniently mixed.

BROADCASTING FROM CIRO'S CLUB

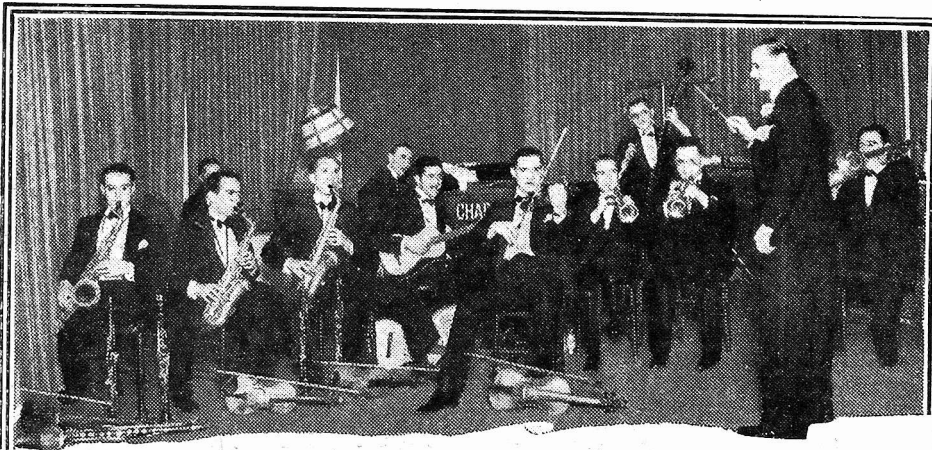


Sydney Kyte's band includes violins, trombone, trumpet, saxophones and clarinets.

can rival the highest-pitched clarinet. Nevertheless, all the members of the saxophone family share the common saxophone character, which you will soon learn to recognise. And the same applies to the three or four different clarinets that are used.

After a while, you will find it fairly easy to differentiate between brass and woodwind units. The trumpet and the trombone are, of course, brass, and clarinets and saxophones are woodwind, although there

MARIUS B. WINTER AND "HIS BOYS"



Here is a band that has been doing a lot of broadcasting lately. And you will see there is a trombone (extreme right), a string bass just behind and between the two trumpets. On the left are three saxophonists at work, but they also have violins and clarinets on the ground before them.

saxophone and the trumpet figure in quite a number of bands. An example is to be found in Sid Bright's Piccadilly Players, where we have very evident trumpets and a strong saxophone section. Sid Bright has a string bass and no trombone. There are other bands, notably Billy Cotton's Ciro's Club Band, which employs two or more saxophones, with some of these alternating with clarinets.

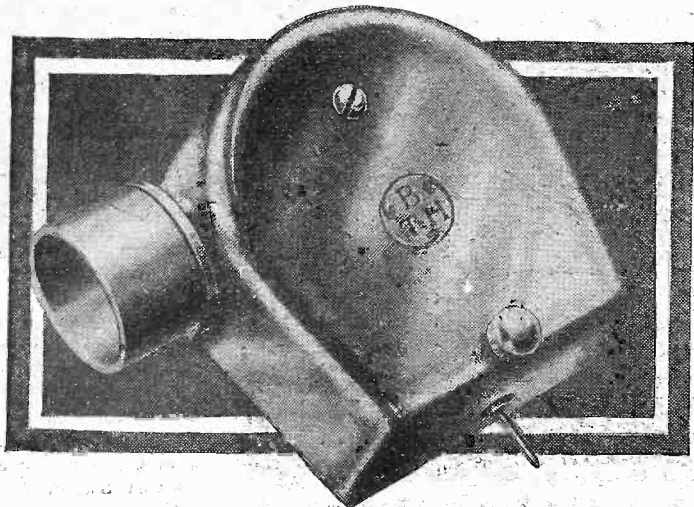
But the clarinet is easy enough to recognise by its changing character as it

are some all-metal clarinets. This is all supposing your set is a good one.

There is one thing that is liable to lead you astray unless you look out for it, and this is the trick of fixing adaptor devices to certain of the instruments.

"Mutes" are quite commonly used for saxophones, trumpets and trombones, although I think it is the trumpet that is "muted" more than any other instrument, but I may be wrong here. Anyway, "muting" softens an instrument and it is

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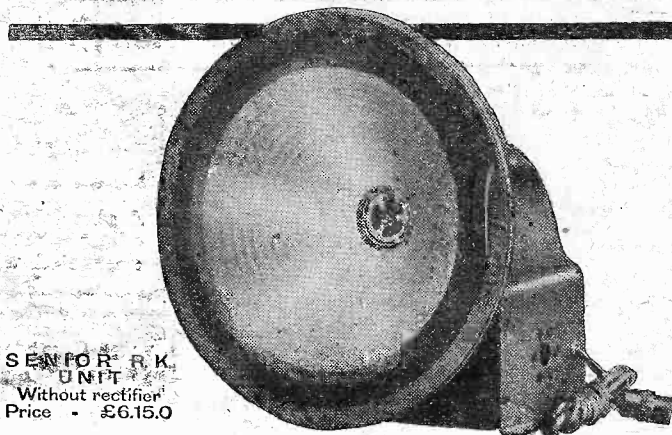


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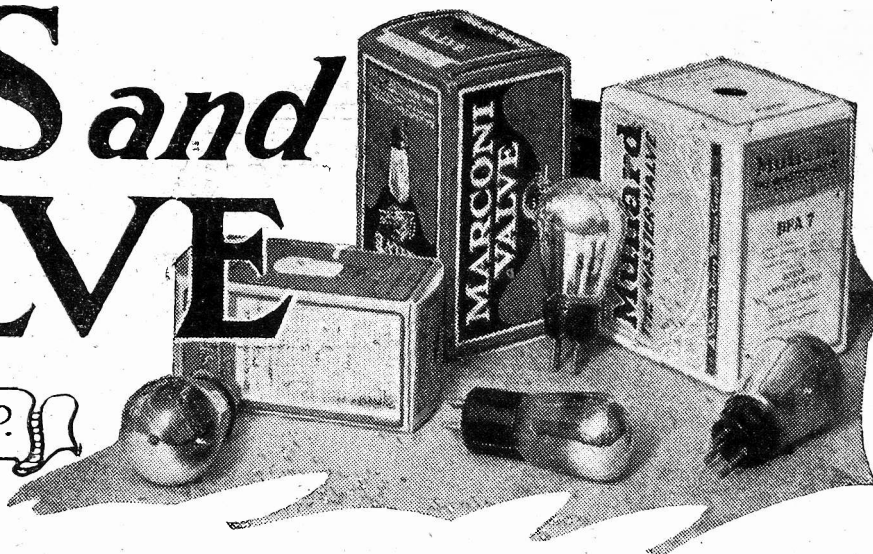
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W.124

OHMS *and* the VALVE

By Dr. J. H. T. Roberts F. Inst. P.



ONE of the fundamental laws of electricity, as we all know, is called Ohm's Law; and it states that the current which passes through a (solid) conductor is proportional to the electro-motive force and inversely proportional to the resistance.

Whilst Ohm's Law applies with considerable accuracy to many types of conductors, it does not apply strictly to *all* and there are some kinds of substances which definitely do *not* obey Ohm's Law.

Generally speaking, ordinary metallic conductors at ordinary temperatures (the temperature question is very important) obey Ohm's Law fairly well, but if the electro-motive force is such as to produce a current which raises the temperature of the conductor considerably, then it is most probable that the resistance will increase and consequently the current will not be accurately represented by Ohm's Law, if we take, for the value of the resistance, the value which the conductor had when it was cold.

Exceptions to Ohm's Law.

In most metallic conductors the resistance *increases* as the temperature is raised, but there are some substances in which the resistance actually *decreases* with the rise of temperature; an example of such a substance is the filament of a Nernst lamp.

When we get away from solid conductors into the realm of liquid and gaseous conductors we find that the exceptions to Ohm's Law become more pronounced. This is particularly the case with the conduction of electricity through gases, or where the current is carried by electronic emission as in the case of an ordinary wireless valve.

In the case of the valve the electrons, as you know, are emitted by the hot filament, and are driven across to the anode by reason of the high-tension voltage existing between these two electrodes.

The actual anode-current is carried through the valve by this electron emission, and it is obvious, therefore, that the total current which can pass is equal to the current represented by the filament emission.

The Saturation Point.

No matter how great a voltage we apply between the filament and the anode, we cannot cause any more current to pass than the total emission of the filament.

Consequently the maximum current which the valve (under definite filament conditions) is able to pass is called the "saturation" current. If the filament of

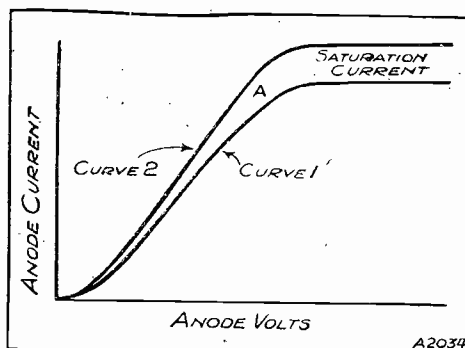
A simple and readable explanation of one of the most interesting things connected with an ordinary valve.

a valve (two electrode) is switched on and kept at a definite temperature and if then gradually increasing voltages are applied between the filament and the anode, you will find that the anode current will rise slowly at first, but will soon become roughly proportional to the anode voltage—that is to say, increases in the voltage will produce proportionate increases in the anode current.

Where Current Changes Stop.

This relationship will continue until the anode voltage reaches a certain value, when you will begin to notice that further increases in the voltage do not produce corresponding proportionate increases in the anode current.

SEE WHAT HAPPENS?



This drawing illustrates diagrammatically what happens when the temperature of the valve's filament is raised. A higher value of anode current is obtainable with the same H.T.

As the anode current is still further increased, the disproportion becomes more pronounced, that is, the anode current fails still more noticeably to increase to the expected extent.

Finally, you will reach a value of the anode voltage where still further increases in this voltage do not produce any increase at all in the anode current. This means that the whole of the emission from the filament is being driven across to the plate and consequently the "saturation" current has been reached.

If you look at the diagram you will see the shape of the curve (Curve 1) showing

the relationship between the anode current and anode voltage, and you will notice that, after passing the point A, the curve flattens out and becomes parallel to the horizontal axis.

A Very Useful Characteristic.

How can we bring about an increase in the anode current in these circumstances? The answer is that we can increase the anode current by *raising the temperature of the filament*, so that the actual emission is increased.

This larger total emission will, however, pass through precisely the same type of variations (as shown in Curve 2 of the accompanying figure), and the only essential difference between the two curves is that the anode current for each value of anode voltage is larger for the higher filament temperature.

You will notice from the diagram that if the valve is brought to the condition marked A, *increases* in the anode voltage can produce little or no effect, whilst *decreases* in the anode voltage will produce a pronounced effect.

It is upon this peculiarity or bend in the characteristic curves of a valve that the particular properties of the valve depend.

If the valve simply obeyed Ohm's Law as, say, a length of copper wire does, it would be impossible for us to use the valve as a detector or amplifier, and therefore we have to thank these remarkable peculiarities or eccentricities in the conductive behaviour of the valve for its enormous usefulness in radio work.

ITEMS OF INTEREST

Short Waves—American Calls—Australian Stations.

On very short wave-lengths of from 10 to 15 metres, long-distance transmission is best carried out in direct sunshine.

Recent research has shown that short-wave transmission is powerfully affected by spots on the sun.

All American broadcasting stations announce their call signs every fifteen minutes except during radio dramas. (This is by ruling of the Federal Radio Commission.)

There are approximately 32 stations either built or projected in the Commonwealth of Australia.

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P103

CORRESPONDENCE.

THE "P.W." "CLEAR-CUT" CONE

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 any information given.—EDITOR.

THE "P.W." "CLEAR-CUT" CONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have made up two of the "Clear-Cut" Cones given in "P.W." No. 447.

I find, as you say, brilliance and naturiness, and, in my opinion, only a moving-coil could ever hope to beat it. I am now eagerly waiting for the particulars of the baffle to complete the speaker. (This appears in the current issue.—ED.)

My unit is one of the original Hegra type, and is well fitted for the job, and with 200 volts on the last valve and choke filtered the speaker does not chatter.

I would like to mention also that I made up two "Crystatube" sets, taken from "P.W." No. 438. For size and simplicity it is simply wonderful, both in volume and selectivity. I was even able to work an old Amplion R.39 horn speaker on an outdoor aerial. One is working in Hammersmith on an indoor aerial of 40 feet of Electron wire quite successfully.

Wishing your paper every success.

I am, yours faithfully,

Bedford Park,
W.4.

R. A. MARTER.

THE "CHEF D'ŒUVRE."

The Editor, POPULAR WIRELESS.

Dear Sir,—Once again, congratulations! The "Exhibition" Four was a good—very good—proposition; the "P.W." new coil a vast improvement on the "Titan" and an intriguing little fellow to play with.

But the "Chef d'Œuvre" is a gift from Heaven. By the way, I was asked in a popular wireless store the other day, "What's this run on 24 and 26 D.S.C. wire mean? You are the fourth in succession." I referred the inquirer to your good selves and suggested that an intelligent perusal of your pages

would probably result in an equally intelligent anticipation of public demand, and enable one to purchase, obtain, or acquire such accessories and components as wire of the dimensions specified, and 3 spring wave-change switches, etc., without searching over half the City of London, only to be told that the required article was out of stock.

One suggestion I would make is to put in a local on-off switch for the S.G. valve. For the lower wave-band so far as London National and London Regional are concerned—at 10 to 15 miles from these stations anyhow—ample volume is available when the S.G. valve is switched off and tuning adjusted slightly. Even Midland Regional is received here in this way at pleasant loud-speaker strength, all this on two valves.

In passing, just a word of appreciation for the "Progressive" series you ran some time ago—the ideal for the "Man in the Street." I was asked to prescribe some modification of the circuit (2-valve) the other day, but suggested that perhaps since for ordinary purposes there could be nothing gained by a

change of circuit, a new detector valve should be tried—it was, and the result left nothing to be desired from the point of view of an ordinary English station listener. It pulls in quite a few others also. Anyhow, if it—the Progressive—is not quite a chef d'œuvre it provided a very useful hors d'œuvre to a feast for the "Fans."

Sincerely yours,

H. V. FIELD.

Hornchurch, Essex.

THE "Q. & A." SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—About the beginning of 1928 you published the details of a set called the "Q and A" Three. I built that set, and until now it has done far more than you told me to expect.

With new high-power stations on the Continent, it is a little too "unselective," and so it is going to be scrapped, but before it is, I thought you would like to know what a 1928 set did on its last calibration during November.

(Here follows a list of 28 stations, eleven being marked "Good"—Ed.)

Those stations marked good are generally reliable, and mostly louder than the London National, which varies very considerably from night to night, and is sometimes hardly worth listening to.

Being very lazy, I have not searched the long waves so much, and only spent part of one night on them when I received: Huizen (fair); Radio Paris (fair); Daventry National (good); Eiffel Tower (fair); Kalundborg (fair); Oslo (doubtful).

The coils, by the way, were, on the medium, 60X (tapped at 1), 60, 50, and 100, 200, 150 on the long waves, and the aerial 80 ft.

Thanking you very much for a good set, I remain,

Yours sincerely

Southend-on-Sea, Essex. DONALD W. OSBORN.

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MODERN WIRELESS

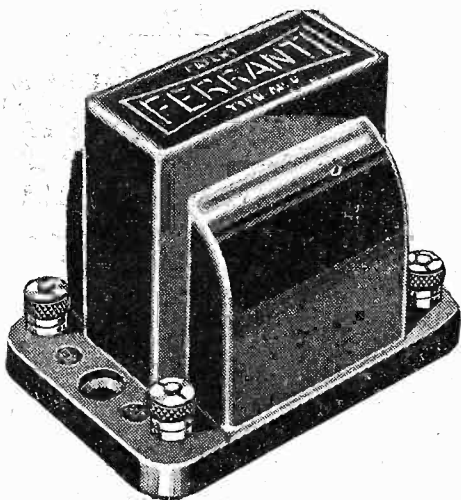
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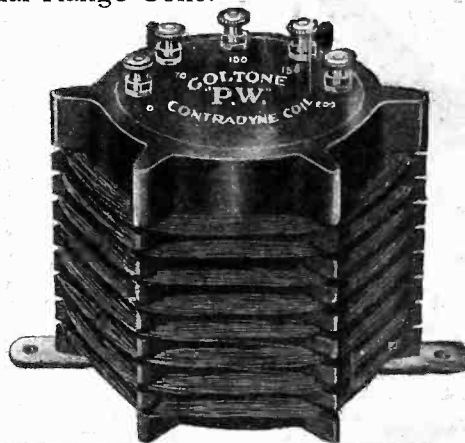
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Dear Sirs,
"Having used a high-frequency choke made by a well-known firm, I decided to change same for one of yours, and finding that much greater results were obtained I am writing to express my appreciation, seeing that such an efficient choke is retailed at the comparatively low price of 3/9, whereas others are nearly three times the price I am fully recommending the use to all my friends and it will be 'BURTONS' for me always.
With best wishes for the success you deserve."

(Signed) Lewis H. Holland.
Messrs. C. F. & H. BURTON,
Progress Works, Bernard St., Walsall.



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A highly efficient Choke covering a waveband of 20-2,000 metres. The self-capacity is extremely low, which, coupled with high inductance, makes it ideal for any set. Price 3/9 each.

See also BURTON Binocular H.F. Choke. Covering waveband of 50-3,000 metres. Price 5/9 each.



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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 reception. 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

OSLO ON LONG WAVES.

H. J. H. (Southampton).—"I notice the Oslo station has taken the Hilversum wave-length, with a power of 75 kilowatts.

"I have tried for this station on the high wave-lengths, but cannot get a sound of it. What is the cause of it? I could always get Hilversum on 1,071 metres, working with much lower power, but Oslo is a washout.

"And yet the programme power and wave-length is published. Perhaps you could enlighten me on this?"

The chief reason that you heard Hilversum and cannot hear Oslo on the long wave-length, even when he is working with increased power, is the great difference in distances between these places and your aerial.

Hilversum is only 232 miles from London, whilst Oslo is about 720 miles. The strength of a station's signals falls off very rapidly with distance, and, in addition to that, we have the fact that the Hilversum station is situated in flat country, with only low-lying land around it, whilst Oslo is in a mountainous situation which is notoriously bad from a wireless point of view.

Oslo has been experimenting a little with power, etc., and some readers have reported very good

reception on the new wave-length. So we think it is quite likely that you will, in the end, hear him, though reception at such distances as this is very uncertain, even on the comparatively reliable long waves.

A READER'S REACTION TROUBLE.

Here is an interesting account of an unusual fault, and its cure, contained in a letter to the Editor from a Kensington reader, who sent it in the hope that it might help others.

"I have had reaction trouble of late with the 'Economy' Three, which I was able to trace after testing valves, coils, transformer, R.C. unit, grid leaks, fixed condensers, wiring, H.T. and L.T. batteries, also G.B. battery, wander plugs, and lastly variable condenser, and differential condenser.

(Continued on page 890.)

HOW IS THE SET GOING NOW?

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: Inquiries should NOT be made by phone or in person at Fleetway House or Tallis House.

CHEAPER ELECTRIC RADIO

by

REGENTONE

Cheaper Electric Radio by Regentone! A new range of Regentone Mains Units at lower prices. A model for your set, for any set, any portable. To electrify your set for D.C. MAINS it costs only £2-12-6 (Regentone Combined Unit Model II). FOR A.C. MAINS it costs only £4-15 (Regentone Combined Unit Model W.5.A.). FOR A.C. MAINS H.T. ONLY it costs only £3-7-6. (Regentone Mains Unit Model W.I.D.—3 fixed tappings).

Write for FREE Art Booklet, with colour supplement "Cheaper Electric Radio by Regentone"—or get it from your dealer.

REGENTONE LIMITED, Regentone House, 21 Bartlett's Buildings, Holborn Circus, London, E.C.4. Telephone: Central 8745 (5 lines).

Irish Free State Distributors: Kelly & Shiel Ltd., 47 Fleet Street, Dublin.

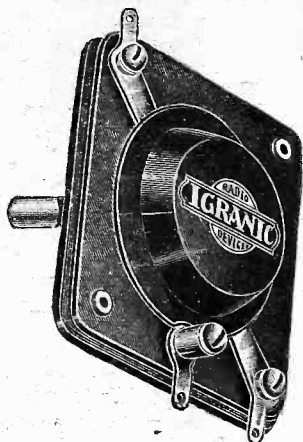
IGRANIC Differential Condenser

Capacity '00015 mfd. each side

PRICE

with Knob

4'.



PRICE

without Knob

3'9

Specified for the
"THIRTY SHILLING" TWO

If you are unable to obtain Igranik Components from your local dealer, write direct to Dept. R.168.

IGRANIC ELECTRIC CO., LTD.
149, Queen Victoria St., LONDON.

IS LIFE BASED ON ELECTRICITY?

*The Amazing Claim of
an American Scientist*

It has recently been announced from [America that a scientist has produced life by treating dead matter electrically.] Of course, the claim has been made before, but in all these cases later and fuller investigations have shown that life was already in the matter treated.

This revival of the attempt to produce life is interesting, but thoughtful people will remain sceptical unless confronted with undoubted evidence. The matter is dealt with in an interesting and readable manner by Mr. George F. Morrell, F.R.S., in this week's issue of **THIS AND THAT**. Order a copy from your news-agent at once and read Mr. Morrell's article.

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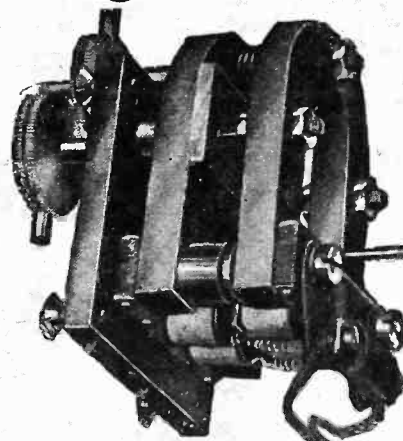


**FOUR POLES
FOUR COILS
AND
DOUBLE MAGNETS**
Price 25'.

Why do so many wireless retailers demonstrate their receivers through a Waters Star Unit? Obviously, because they wish the absolute maximum performance of the set to be passed on to the listener.

That is the one important feature of this remarkable unit—its ability to reproduce, with absolute fidelity, perfect purity and full-throated volume, everything that the set is capable of delivering.

You have never heard your set at its true value until you hear it through the Waters Star Unit.



**DEMONSTRATION
IS THE PROOF OF ITS
VAST SUPERIORITY
OVER ANY OTHER
AT ANY PRICE—**

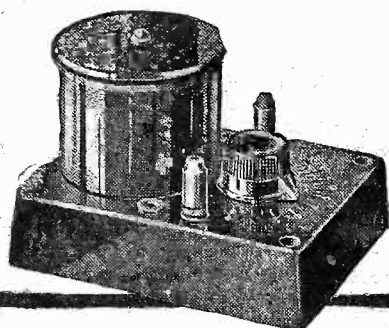
WATERS STAR UNIT

Get one to-day and be truly astonished!

From all dealers, or illustrated lists from:

THE STANDARD BATTERY CO.,
(Dept. P.W.), 184/188, Shaftesbury Avenue, London, W.C.2

SEPARATE THOSE INTERFERING STATIONS



THIS neat and efficient Watmel Wave Trap definitely cuts out interference. Connect it to your aerial circuit—and at once clarify your reception.

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Price 8s. 6d.

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THE WATMEL BINOCULAR H.F. CHOKE.

Type DX3.

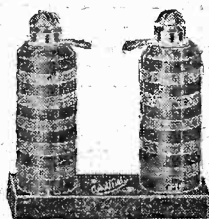
Inductance 200,000 m.h.
Self-capacity 1.6 m.mfd.
D.C. Resistance 1,400 ohms.

Price 6/-.

Type DX2.

Inductance 40,000 m.h.
Self-capacity 1.2 m.mfd.
D.C. Resistance 450 ohms.

Price 4/-.



WatMel

WATMEL WIRELESS CO., LTD.,
IMPERIAL WORKS, HIGH STREET,
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M.C.18

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(Continued from page 888.)

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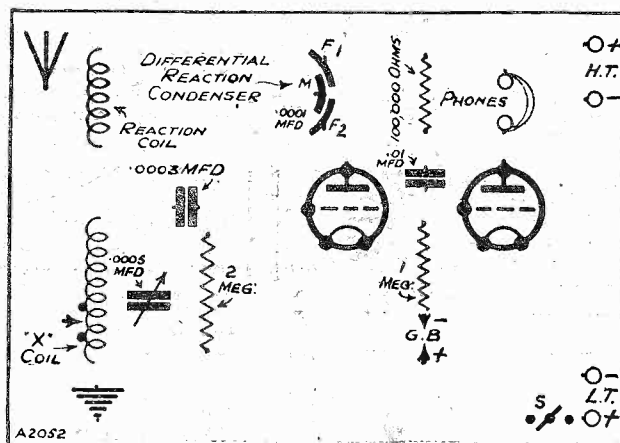
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Whether you are a Wireless Enthusiast or not, you know what an enormous demand there is for Wireless Batteries—a demand which is ever increasing by leaps and bounds. If you are a Wireless Enthusiast you know also that you and millions of others are constantly on the look out for BETTER Batteries.

You Can Do This:



Here is a way in which YOU can meet the demand for BETTER Batteries, and Profit Financially—make them yourself in your Spare Time by means of our Patented Method and Formula! By making your own batteries you can SAVE money—by supplying your friends and others you can MAKE money; and you may make up to £300 a year per Licence!

ANYBODY CAN DO IT!

It has probably never crossed your mind before. You have thought of batteries as "Technical" things—always regarded them as something "mysterious."

The exact opposite is the case. Study the pictures on the left and you will see how really simple it is.

You will need no expensive "plant" or machinery—only a few simple tools and hand presses. You need have no special accommodation—a start can be made upon your present kitchen table. The children can help you.

WE WILL TELL YOU HOW

You may know nothing about Wireless or Electricity—it doesn't matter in the slightest. We will tell you how to do it—FREE. After receiving our instructions you can start right away to manufacture! And the work is intensely interesting as well as easy; more fascinating than making your own Wireless Set! The saving is huge—an

average worker can complete a 60-volt H.T. Battery in 2 hours at a cost of 2/3 approximately! Compare this with Shop Prices!

MAKE YOUR FRIENDS' WIRELESS BATTERIES—AND MAKE MONEY!

Consider what this means to you. Not only can you SAVE money on your own batteries, and get BETTER results, but directly your friends know of them they will want some, too! Thus, you can begin to build up a Profitable Spare-Time Business and reap a Golden Harvest from the Wireless and Electrical Market. Many men are already making comfortable EXTRA incomes in this Pleasant, Easy Way.

There's MONEY in it—big money if you are energetic and anxious to get out of the rut! What could you do with £300 a year?

PROFITS GUARANTEED.

Your market is unrestricted—it can never become overcrowded—you sell where you like and when you like. If necessary we will purchase sufficient of your output to guarantee you a Weekly Profit providing it reaches the required standard of efficiency which is easily attainable. We will continue your training FREE until you reach that standard—that's fair, isn't it? Don't hesitate—if you have never seen a battery before you can MAKE Money this way. Let us explain this GILT-EDGED HONEST PROPOSITION fully. Write AT ONCE! Make Your SPARE Hours GOLDEN Hours!

Send this Form for FREE Instructions How to Start.

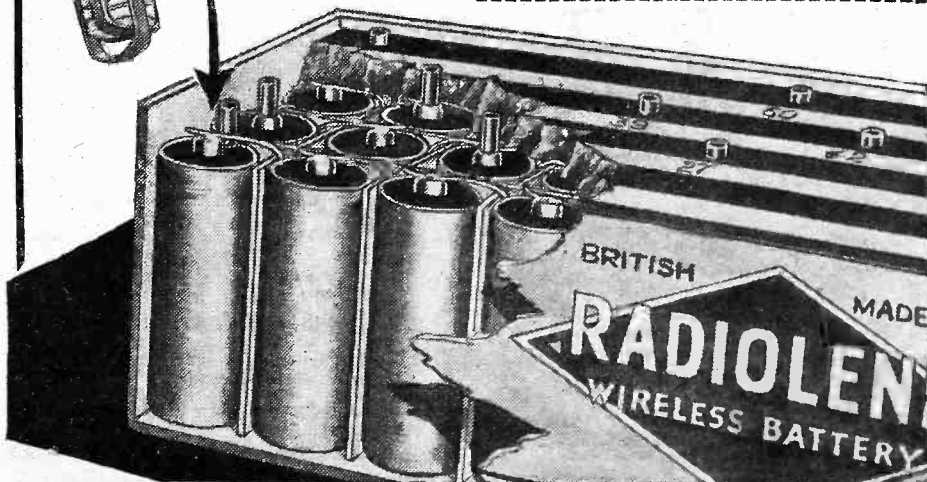
COUPON

To Mr. V. ENGLAND-RICHARDS,
THE ENGLAND-RICHARDS CO., LTD.,
1127, King's Lynn, Norfolk.

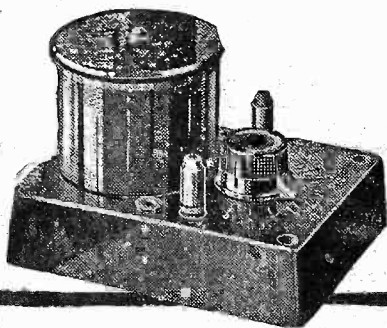
Sir,—Please send me at once, and FREE, full details as to how I can Make Money at home in my spare time. I enclose 2d. stamp for postage.

Print your name and address boldly in capital letters on a plain sheet of paper and pin this coupon to it.

"Popular Wireless," 17/1/31



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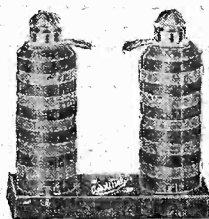
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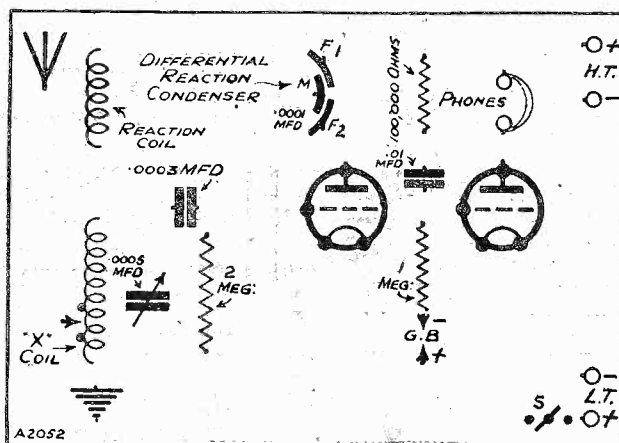
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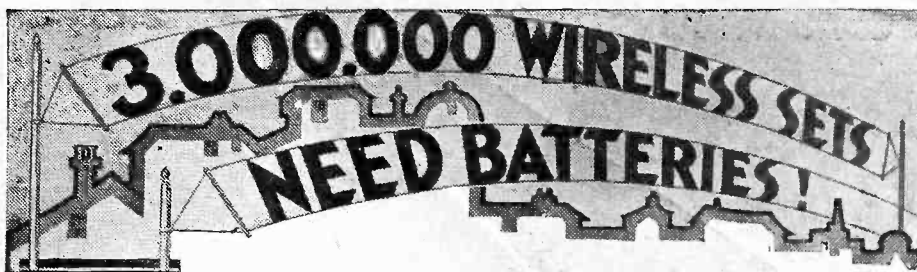
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Whether you are a Wireless Enthusiast or not, you know what an enormous demand there is for Wireless Batteries—a demand which is ever increasing by leaps and bounds. If you are a Wireless Enthusiast you know also that you and millions of others are constantly on the look out for BETTER Batteries.

You Can Do This:



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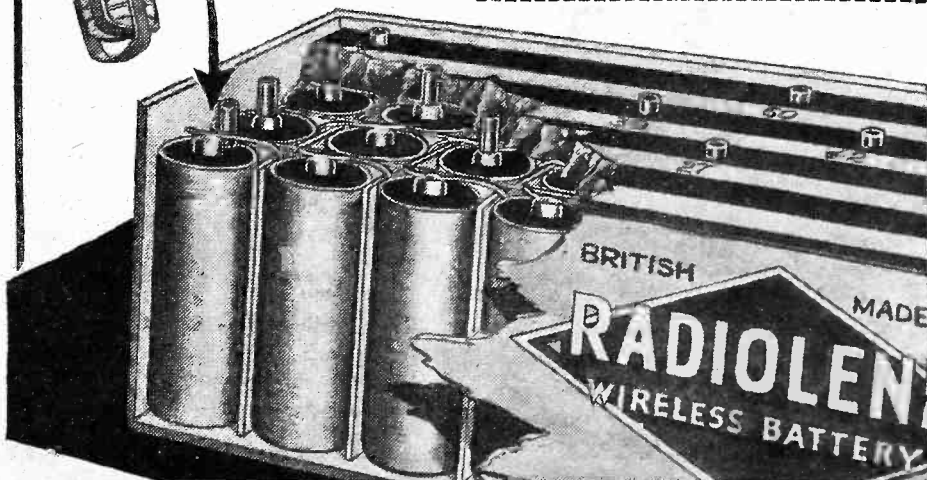
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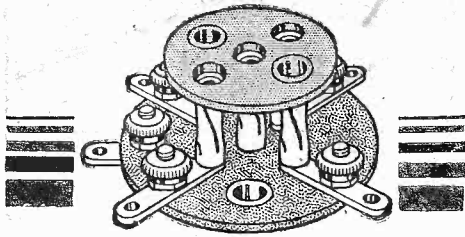
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

regulations unless the alteration is carried out by a qualified electrician.

In any case, you will probably find that the electric light company should be advised of any such alteration before it is carried out.

To use the house lamps for trickle charging, all you need is a double-pole double-throw switch of suitable protected type, the centre contacts being joined in series in that main lead which is earthed. Two of the outer contacts are joined together so that when thrown over to this position the ordinary mains connection is restored and the circuit is exactly as formerly.

The other two outer contacts on the D.P.D.T. switch are taken to two insulated terminals to which the battery that is to be charged will be connected. The negative of the battery must go to the negative side of the leads, and when the switch is thrown over to this position all the current which is used in the house for lighting, etc., passes through the accumulator and charges it.

There is no difference on the light bill because you are not using any more current than formerly! but actually you do pay for the charging, by means of a very slight and unnoticeable reduction in the brilliance of the lamps.

Properly fitted by a qualified man such a circuit is perfectly safe. If used regularly, and the accumulator is in good condition, the ordinary requirements of the household will usually keep it well charged for a long time, without any other care.

It may need an extra charge very occasionally, if

TECHNICAL TWISTERS

No. 44.

Electro-Motive Force (E.M.F.) CAN YOU FILL IN THE MISSING LETTERS?

The unit of electro-motive force is the

It is the force required to make one
..... flow through a resistance of

An instrument capable of measuring
electro-motive force is called a

The E.M.F. of the ordinary dry-cell is

Last week's missing words (in order)
were: Plate (or Anode), Grid, Assist,
Oppose (or Impede, or Hinder), Coil,
Capacity, Resistance, Impedance, Grid,
Plate (or Anode), Coil.

little "juice" is used, but if an electric iron or similar equipment is used it is quite likely that the trickle charging will be sufficient to keep it permanently up to scratch.

IMPROVING THE EARTH CONNECTION.

G. R. L. (Bromley, Kent).—"Back in the summer I saw in 'P.W.' a stunt about running the earth lead through a ventilating brick. At the house I was living in at the time there was no brick suitable, but since then I have moved, and now I would like to try it.

"My earth wire is only eleven or twelve feet long, from the earth terminal to the side door through which it passes to the flower-bed, but I find that almost under the corner where the set stands there is a ventilating brick. This would certainly be quite a bit shorter, but I cannot see the method of passing the wire through the brick. How is it done?"

The ingenious stunt to which you refer was simply an account of how one wily "P.W." reader shortened his earth wire by drilling a small hole through the floor board on a line with the ventilating brick, and passed a string through the hole, allowing it to hang down under the floor.

Then, by means of a bent wire passed through from outside the ventilating brick he picked up the string, tied the earth wire to the inside end, pulled it through to the garden, and thus made a short and satisfactory earth lead direct from the set, through the floor and ventilating brick.

AT HOME WITH RADIO STARS.

(Continued from page 869.)

is when I try to tickle people pink in broadcast comedy!"

While talking, Leonard had been turning over one or two pieces of sheet music, and in doing so he knocked down a pile of books. A big one fell at my hand, and I picked it up. It was on Christian Science.

"Why, what's this?" I asked. "I didn't know you were keen on Christian Science."

"Actually I'm not," said Leonard, readily enough. "But Laddie Cliff (I understudied him and used to write his humorous material) was once a keen Christian scientist; he may still be, unless he has fallen by the wayside."

"It so happened that one week when I was in the middle of writing an important sketch for him, and was doing several acts and broadcasts myself, my father was taken ill and died. Naturally I was very cut up about it, and it was really a big strain to prevent that sudden blow from interfering with my work; and stage work cannot stop, you know."

The Model Trombone.

"To cut a long story short, Laddie Cliff helped me through my troubles, and I found his philosophy very comforting. He gave me that book on Christian Science, and I only wish I had more time to go in for that kind of thing and make a study of it."

And as he said that he gave me the famous Leonard Henry smile—just that merry twinkle of the eyes which I cannot bring myself to think shields a too-serious mind.

Just as I was leaving, he unearthed from behind the typewriter a model trombone.

"I can get three notes out of this," he said. "Pip, pip, PIP. I've just bought it for sixpence. You wait. I'll have a deuce of a lot of fun with this!"

And I believe he will! That's what Leonard Henry is like at home.

BEHIND THE MICROPHONE.

(Continued from page 863.)

blocks off the high-tension from earth, but is designed to pass the high-frequency currents. It has not only to pass high frequency, but also to "stop" the low. Just before zero hour this carefully chosen condenser broke down.

In a great hurry, and with all that "wind up" feeling I was to find so familiar in later days, we substituted another, but 100 times too big! The programme went out. There cannot have been a modulation frequency above 1,000, there cannot have been a depth of modulation beyond 20 per cent.

But something went out! No! We were not satisfied, although we pretended to be. We treated indignant letters from amateurs with an uneasy hauteur. We investigated, waved neon tubes, W. T. Ditcham came up and investigated and waved neon tubes, we all investigated and said it must be all right, and knew it was not.

Two programmes later, H. L. Kirke found it and we yelled! A yell composed of part horror, part joy, part shame—it's very difficult to yell like that, but we did a lot of very difficult things in the early days! Let me tell you more later on.

FOR THE LISTENER.

(Continued from page 868.)

It is all very difficult; and I hope that those who are responsible for these productions will not be discouraged.

"Comedian, Know Thyself."

Amateur actors are always advised to steer clear of "West End successes," partly because they invite comparison, and suffer by it—I also think that comedians, who are not yet first-rate, might be advised to avoid songs which are great "successes."

For example, "Happiness Pie" is a fine song, and is superbly rendered by Layton and Johnstone. I heard them sing it from the Palladium the other day.

I also heard it sung twice in the three following nights by others. Comparison was inevitable; and rather disastrous to the "would-be's."

A song should be sung because it suits the singer's style, and is within his power; it is dangerous to sing it for no other reason than because some other singer has made a hit with it. Comedian, know thyself!

Joffre's Broadcast Tribute.

The B.B.C. may be depended upon to rise to the occasion, especially if it be a solemn occasion! There was a simple dignity about the tribute which General Maurice paid to the memory of Maréchal Joffre, which was entirely becoming.

He was a brave soldier, and much beloved as a man by all who knew him. His strength lay in his judgment of men; his weakness, a lack of imagination.

His imperturbability stood him, and us, in good stead in those early anxious days; and the enviable pinnacle of his fame is that he will always be associated with the Marne where the rising tide of defeat was first turned.

Diamonds and Ethiopia.

Major Trevor took us down a diamond mine, and the Baroness Ravensdale conducted us through the coronation ceremonies of the Emperor of Abyssinia. It was interesting to compare the different methods of these two descriptive reporters.

Major Trevor, simple, direct, matter-of-fact, and without any attempt at flourish, made a scene live; Baroness Ravensdale, with a much more highly coloured and emotional narrative, rather confused her picture. Simplicity scores every time.

I saw the mine, but I did not quite see the coronation. I saw the diamonds on the sorting table, but I did not quite see the jewels on the Ethiopian princes.

Major Trevor got his effect because he was not anxious to make it; the Baroness missed a good deal of her's through a wish to be impressive.

The Flute.

I like the flute. I like Albert Fransella playing the flute. Whether he is playing a valve or a cavatina, it sounds like birds in a wood; and I get lovely images of trees and glancing sunlight and wet leaves.

Unemployment.

I commend to you the talks on this very pressing and difficult subject by Professor Henry Clay. He has a sympathetic voice, a lucid style, and knows what he is talking about.

In my "fat" days I sometimes smoked a cigar called "Henry Clay."

He was just as good as the cigar!

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TECHNICAL NOTES.

By J. H. T. ROBERTS, D.Sc.

HOW MANY H.F. STAGES?

One Stage Usually Sufficient—The Extra Grid—Neutralising—Limit of Efficiency—Use of a Third Grid—Secondary Emission—Magnification Factors—Changing Over—Improving the Receiver—De-coupling—Voltage Dropping Resistances.

EXPERIMENTERS and constructors who are tempted to go in for screen-grid high-frequency amplification, and who have, of course, been previously used to ordinary straight H.F. amplifying stages, are often puzzled to know whether they should confine themselves to a single stage of screen-grid H.F. amplification or whether they should try a couple of stages.

One Stage Usually Sufficient.

This depends a good deal upon conditions, but you may take it that in general a single stage of screen-grid H.F. amplification will be sufficient. You have to bear in mind that the magnification factor of this valve is enormously higher than that of the ordinary straight H.F. amplifier.

For instance, in the old days, a high-frequency amplifier might have an amplification factor of perhaps 15 or 20, and although two or more could be used, coupled by H.F. transformer or tuned-anode arrangements, the amplification was not very tremendous; in fact, it fell very far short of calculations.

With the screen-grid valve the position is very different and, as I say, owing to the enormous amplification theoretically obtainable, and even allowing for a considerable discount from this in actual practice, one stage is ample for the vast majority of purposes.

The screen-grid valve, judging from letters which I receive from readers, still seems to be something of a mystery to them, and, owing to the little extra circuit arrangements involved, people are often deterred from using it. There is no serious reason why this should be so, however, and in point of fact the screen grid is extremely simple in principle and by no means difficult to operate in practice.

The Extra Grid.

The essence of the screen-grid valve, of course, is the introduction of an additional or second grid which is interposed in the valve between the ordinary grid and the anode. Perhaps it may be useful to many of my readers if I just indicate briefly what is the function of this extra grid.

You know very well that one of the main drawbacks, or should I say limitations, of the ordinary straight H.F. amplifier is the internal capacity between the grid and the anode. This capacity has a similar effect to ordinary capacity reaction and places a limit upon the value of the amplification factor which can usefully be given to the valve; if the amplification factor is unduly raised the valve simply sets into oscillation by reason of the capacity effect between the plate and grid which, as I say, produces reaction.

Neutralising.

This trouble has been known for a very long time, and, as most of you are well aware, it has been overcome by means of a neutralising condenser employing the so-called neutrodyne circuit. The neutrodyne arrangement is perfectly satisfactory and

very simple, but the screen-grid valve produces the same sort of effect—only better, and permits of very much higher amplification factors.

By putting in the extra grid between the ordinary grid and the anode, the oscillation current (or capacity current, as it is sometimes called), which previously was liable to be set up between the grid and anode, is intercepted by the second grid, and so the oscillation is prevented.

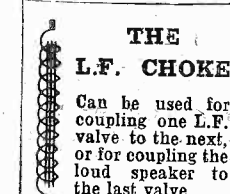
Of course, the extra grid, or "screen grid," is connected to an electrode passing through the valve, and is usually connected to a high-tension voltage tapping. I should mention that the screen grid only screens the anode and the ordinary grid *within the valve*, but the reaction between these two electrodes may still take place at other parts *outside* the valve, and therefore it is very

desirable to screen them from one another outside the valve altogether.

This is done by means of ordinary aluminium or copper screens, with which you are quite familiar, and these screens may be connected to the screen grid, preferably through the medium of a condenser.

Limit of Efficiency.

In considering the screen-grid valve you might think that the limit of efficiency had been reached when



THE
L.F. CHOKE

Can be used for coupling one L.F. valve to the next, or for coupling the loud speaker to the last valve.

An L.F. choke capable of carrying a large current is required for the latter purpose, the usual inductive value for an output choke being 20 henries.

A broken-down choke causes weakness and distortion similar to that due to a "burnt-out" L.F. transformer.

the extra grid had been interposed between the ordinary grid and the anode, so as to cut out capacity reaction. But whilst it is quite satisfactory and, in fact, remarkably efficient for high-frequency amplification, you will notice that some of the emission current, on its way to the anode, will be trapped by the extra grid or screen.

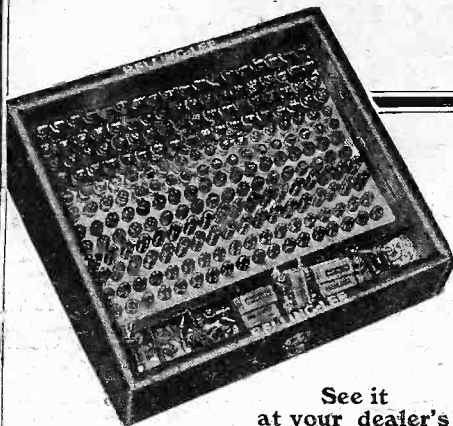
This is not all, for the anode itself emits electrons when the valve is in operation, this being what we may call "secondary emission," and due to the bombardment of the anode by the electrons from the filament. Now some of these secondary electrons will pass away from the anode to the screen, whilst the electrons constituting the emission or anode current are passing towards the anode.

Use of a Third Grid.

Consequently in the space between the screen grid and the anode we have electrons passing in opposite directions, which state of affairs naturally reduces the efficiency of the valve altogether, in addition to the fact that a small current, sometimes called the "screen current," is actually being lost in the screen grid itself.

Therefore, it occurred to valve designers to interpose an additional grid—that is, a
(Continued on next page.)

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TECHNICAL NOTES

(Continued from previous page.)

third grid, this time between the screen grid and the anode. This grid is connected (inside the valve) to the filament, and it has the effect of preventing the passage of the secondary current mentioned above, or at any rate of limiting it to a small part of the region between the anode and the screen grid.

Secondary Emission.

The effect of this additional grid is to increase the output of the valve very greatly, and inasmuch as the valve now has five electrodes, it is called a "pentode."

Since the additional or third grid is connected inside the valve to the filament, no additional contact outside the valve is necessary, and so the pentode has the same five external connections as the screen-grid valve. In fact, we may regard the pentode as being in effect a screen-grid valve which has been modified internally in such a way as to reduce its impedance and enable it to handle a much greater power output.

Magnification Factors.

I have dealt at some length with the screen-grid and pentode valves, because I receive many queries from readers on this subject, and before leaving it I should perhaps remark upon a point which is most frequently raised, and that is the question of using a pentode valve instead of an ordinary power or super-power valve. The point about the pentode valve is that, whilst it is designed for low-frequency amplification and gives a fair output, its magnification is quite large.

This means that it will give the greatest output of which it is capable with a comparatively small input, but it does not mean that you can then increase the input and obtain corresponding larger output, because the valve simply becomes overloaded. The great point to bear in mind about the pentode is that it is an economical and efficient valve if you want magnification at a single stage from a small input to a reasonably large output.

But if, on the other hand, it is large output that you want—larger than the pentode can give without distortion—then you will be better advised to turn your attention to L.F. amplification in the ordinary way by means of L.F. and power stages.

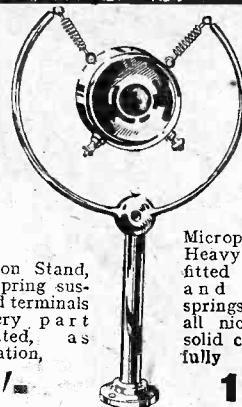
Changing-Over.

I suppose one of the most frequent queries one gets lately in connection with radio receivers relates to the change-over from battery operation to mains-operation. You might think that this was a perfectly simple matter, involving nothing more than the substitution of the unit for the battery.

But in actual practice, as often as not, various little incidental troubles arise and these, although not in themselves serious, are apt to be very perplexing and sometimes very disappointing to the owner of the set. For instance, you fit up a nice H.T. unit, designed to give 150 volts (whereas the old dry battery only gave 100 nominal and about 75 actual!) you rub your hands and look forward to the set standing on its head or doing something else really wonderful on the strength of the extra 50 volts.

(Continued on next page.)

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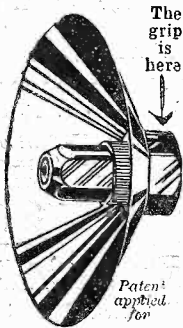
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TECHNICAL NOTES.

(Continued from previous page.)

Actually what you get may be nothing more than a succession of howls and motor-boating and, do what you will, nothing apparently will induce the set to behave itself as formerly.

Let us just look at the situation carefully and we will readily see what are the causes of the trouble.

Improving the Receiver.

In the first place, the mere fact that you are applying substantially increased voltages to the anode circuits and that you are thereby almost certainly obtaining a great increase in the efficiency of the set is in itself a reason why defects in the receiver—formerly unnoticed—may now make their presence very pronounced.

It is, I think, true to say that in a great number of receivers there is quite an appreciable amount of back-coupling at various points, and the only reason that this does not make itself evident is because it is kept in a state of abeyance, as it were, owing to the comparative insensitivity or efficiency of the receiver.

The moment you increase the efficiency of the receiver to any appreciable extent, out come the defects at once.

The foregoing is what we might call a general reason for the change in the behaviour of the set. It is not peculiar to the mains unit and the troubles might, in fact, come into evidence in just the same way if a couple of fresh H.T. batteries were installed giving the same H.T. voltages as the unit.

Now we turn to particular reasons, which are definitely associated with the unit, as distinct from the battery.

De-coupling.

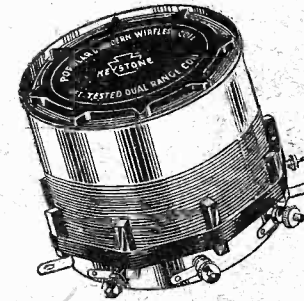
As you know, the unit often has the effect of causing back-coupling and howling in the receiver owing to the fact that it supplies the anode circuits of different valves; the back-coupling therefore takes place via the unit itself. It is true that this may and sometimes does take place even with a dry battery, but with a fresh battery of low internal resistance the effect is negligible.

Again you may say that in any case, even though there is a certain amount of coupling brought about by the connections to the unit, the set itself should provide sufficient de-coupling to overcome this. But there again, as I mentioned above, you come up against the fact that in many sets de-coupling is not sufficient, and this insufficiency of de-coupling is not in the ordinary way evident, owing to the fact that the receiver is being operated usually much below its maximum efficiency.

Voltage Dropping Resistances.

The presence of resistances in the unit, which is the usual way of obtaining different voltage-tappings, produces in itself a liability to low-frequency oscillation or howling and, as I pointed out some little time back, it is very important that these resistances be properly by-passed.

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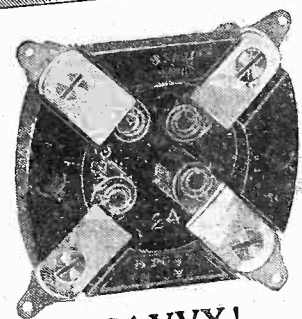
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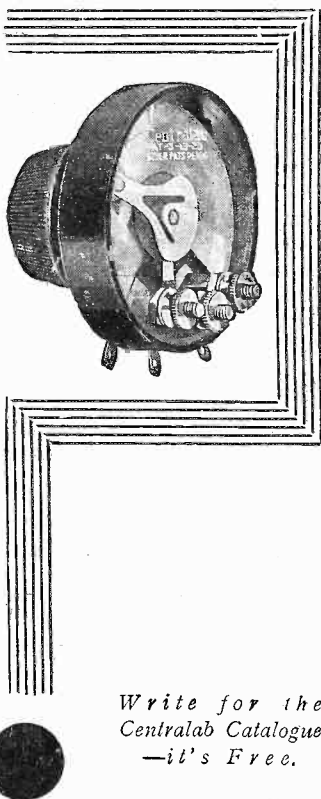
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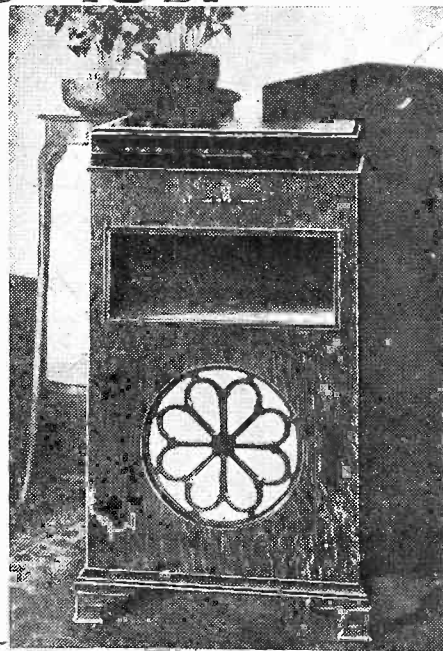
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