BRITAIN'S LEADING RADIO MAGAZINE

MODERN WIRELESS

1/-

VOL. XVII. No. 62

FEBRUARY 1932

2 FINE SETS

Fully Described Inside

ALSO INSIDE :

"M.W.'s"

SPECIAL SUPPLEMENT

Tells you all about long-distance listening. Fascinating and invaluable to every set-owner.

It deals with

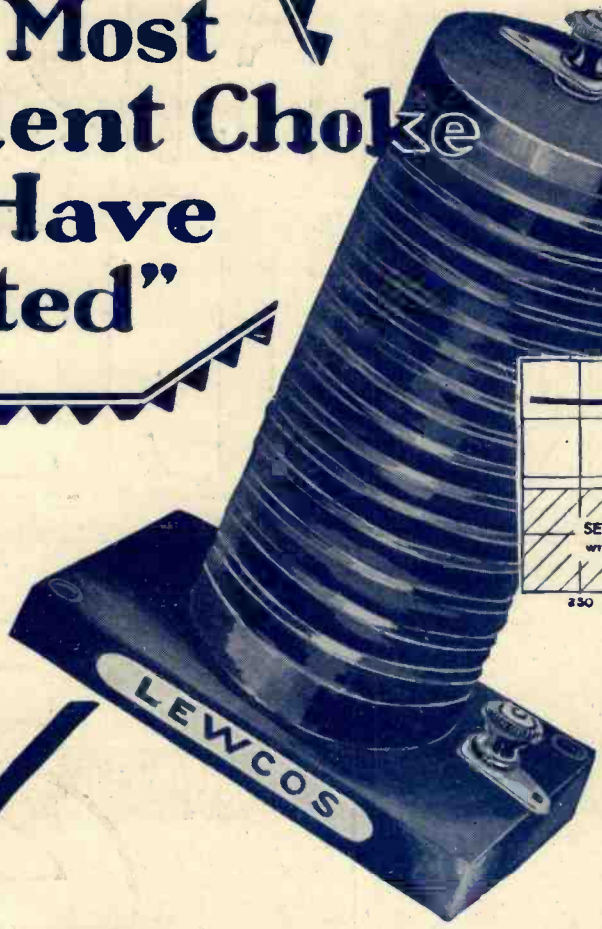
THE WORLD'S PROGRAMMES

What the Distant Stations are Doing. Countries to Listen For. On the Medium Waves. Station Information. Station Alterations. All About Radio Trieste, etc., etc.

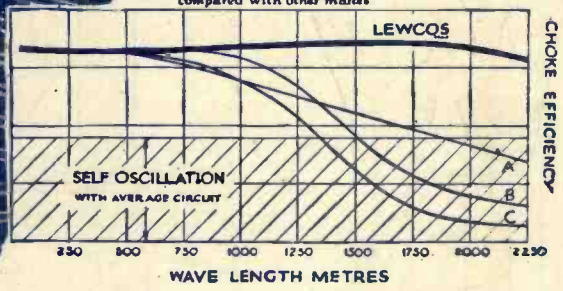
Numerous practical hints and tips on getting the best results from your receiver.

RADIO CONSULTANT-IN-CHIEF CAPT. P. P. ECKERSLEY M.I.E.E.

"The Most Efficient Choke We Have Tested"



H F CHOKE CURVES
Showing the performance of the Lewcos HF Choke compared with other makes



SUPER H.F. CHOKE REDUCED PRICE 6/-

"We are pleased to report that the Lewcos H.F. Choke is, in our opinion, the most efficient choke we have tested, there being no sign of instability even when using 150 volts H.T. on the Anode of the S.G. Valve. The construction is massive and well finished, and its design places it in the front rank of high-class components."

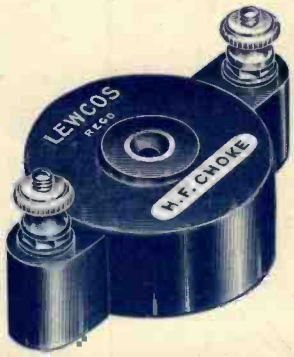
An appreciation from Industrial Progress (International), Ltd., Bristol.

The above letter is a further appreciation of the unique qualities of the Lewcos H.F. Choke. The fine materials and high-class workmanship used in its manufacture make it supreme. The terminals are arranged, one at the top and the other at the base of the coil, to eliminate the risk of additional self-capacity in the wiring of the receiver.

The H.F. Choke curves illustrated above show the astonishing performance and advantages of the Lewcos Choke over other makes.

Full particulars of the Choke, Ref. R.33, will be sent on request.

LEWCOS
H.F. CHOKE
PRICE
2/6
REFERENCE M.C.



PARTICULARLY SUITABLE WHERE SPACE IS OF PARAMOUNT IMPORTANCE. Write for fully descriptive leaflet—Reference R.73.

The Lewcos Super H.F. Choke is specified for the D.C. "SUPER-QUAD" Receiver described in this issue.

This Lewcos H.F. Choke, type M.C., is specified for the "A.C. ECKERSLEY 3" Receiver described in this issue.

LEWCOS RADIO PRODUCTS FOR BETTER RECEPTION

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED, CHURCH ROAD, LEYTON, LONDON, E.10

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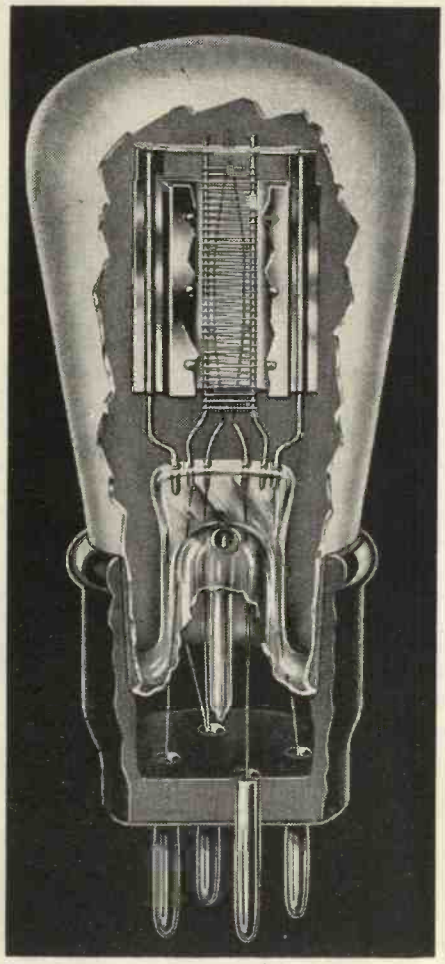
Radio Consultant-in-Chief: Capt. P. P. ECKERSLEY, M.I.E.E.
Scientific Adviser: J. H. T. ROBERTS, D.Sc., F.Inst.P.

Seven-point suspension

Mica Bridge Mounting

both these advanced constructional features are incorporated in this Cossor 2 volt special Detector Valve



SPECIALLY designed for use as a Detector the Cossor 210 DET incorporates all the most advanced constructional features.

By the use of Seven-point suspension and Mica Bridge Mounting complete freedom from microphonic noises is obtained (a feature of special interest to users of portable sets). Due to its grid current characteristic distortionless rectification is ensured.

The use of this Cossor special Detector valve for either leaky grid or anode bend rectification will ensure complete elimination of microphonic noises and a marked improvement in tone.

The Cossor 210 DET. 2 volts, .1 amp. Impedance 13,000. Amplification Factor 15. Mutual Conductance 1.15 m.a./v. Normal working Anode Voltage 90-150. Price 8/6

A new edition of the Cossor Station Chart is now available, price 2d. Ask your Dealer for a copy of this useful novelty, or write us enclosing 2d. stamp.

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THE COSSOR

BRITISH MADE

210 DET

DEFINITELY FREE FROM MICROPHONIC NOISES

A. C. COSSOR, LTD., Highbury Grove, London N.5. Depots at Birmingham, Bristol, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Sheffield & Dublin. ♡ 9603

Vol. XVII. No. 62. BRITAIN'S LEADING RADIO MAGAZINE. FEBRUARY, 1932

The demand for all-electric sets which is now insistent and increasing is met among the varied contents of this month's "M.W." by two unusually fine receivers for operation direct from the supply mains.

THERE are definite indications that those who are served by the electric power mains are appreciating and taking advantage of their good fortune in ever-increasing numbers.

But no doubt there are many who do not yet realise the potentialities of "mains radio," and it is to these particularly that the following few words are directed.

It would hardly seem necessary to point out what an anachronism it is to have the gigantic local power station "on tap," but use batteries to supply current to a wireless set.

And yet there are probably tens of thousands who adopt this uneconomic procedure.

But it must not be forgotten that there is a widespread feeling that mains sets are dangerous devices. We have proof of this in our correspondence.

In actual fact radio receivers in general are far less dangerous than some of the many other domestic electric devices which are in almost universal use.

The truth is that a properly designed and installed mains receiver is as safe as an electric lamp fitting.

And the cost of running an A.C. set from the mains may be as low as a mere shilling or two per year!

Of course, electrical development is rather slow in this country—slow but nevertheless very sure—and soon, when the Grid Scheme spreads it tentacles over the remotest parts of the countryside, a big proportion of our population will be able to enjoy the benefits conferred by the possession of modern mains radio, so well exemplified in, for example, the "M.W." A.C. Eckersley Three, a full description of which appears in this issue.

The A.C. Eckersley Three

THIS set is an A.C. version of Captain Eckersley's first set for constructors, and it employs the now famous "Eckersley" Tuner. Owing to the use of efficient A.C. valves it possesses remarkable sensitivity, while its station-separating powers will astonish those of you who have not yet experienced "Eckersley" Tuner selectivity.

It is no exaggeration to say that the A.C. Eckersley Three rivals a super-heterodyne in this regard, though, of course, it is a much simpler and less expensive type of instrument than the average "super."

We say "average" advisedly, for the other set described this month is a "super," but not one of *average* qualities!

Indeed, it represents a definite advance in the technique of receiver design. For one thing, it is the first "super" to use the new '25 D.C. valves. Other new features found in it are: An original method of oscillator coupling, a scientific but very simple system of volume-control ganging, a triple-gang Extenser giving easy tuning and no wave-change switching, and, finally, an automatic "trimming" for both wave-bands.

This remarkable set, the D.C. "Super-Quad," gives colossal amplification, and its range of reception is limited only by atmospheric conditions.

And yet there is no mains hum, for very close attention has been paid to the smoothing.

If you have D.C. mains, I advise you to give the "M.W." D.C. "Super-Quad" your closest consideration. It is one of the best pieces of work accomplished by our Research Department during the past twelve months, and has set a new standard in D.C. practice.

Amazing Reception on Medium Waves

RADIO is full of surprises—that is why it is so fascinating. Even to-day it is impossible to be dogmatic as to the limitations and potentialities of a given piece of apparatus.

Of course, we can draw on a whole mine of experience and strike averages which give sufficiently sound bases for calculating probabilities in ninety-nine cases out of a hundred, but the exception to such a rule is sure to be *some* exception!

We have an example of this in "L. W. O.'s" notes in our World's Programmes section. With a two-valver he was able to receive all kinds of American stations, not on short waves, but on the medium waves such as are used by the London and Northern National transmitters!

He even added Buenos Aires to his bag—seven thousand miles on a set with which many would think they were doing extremely well to tune in a couple of score of Europeans!

Shakespeare

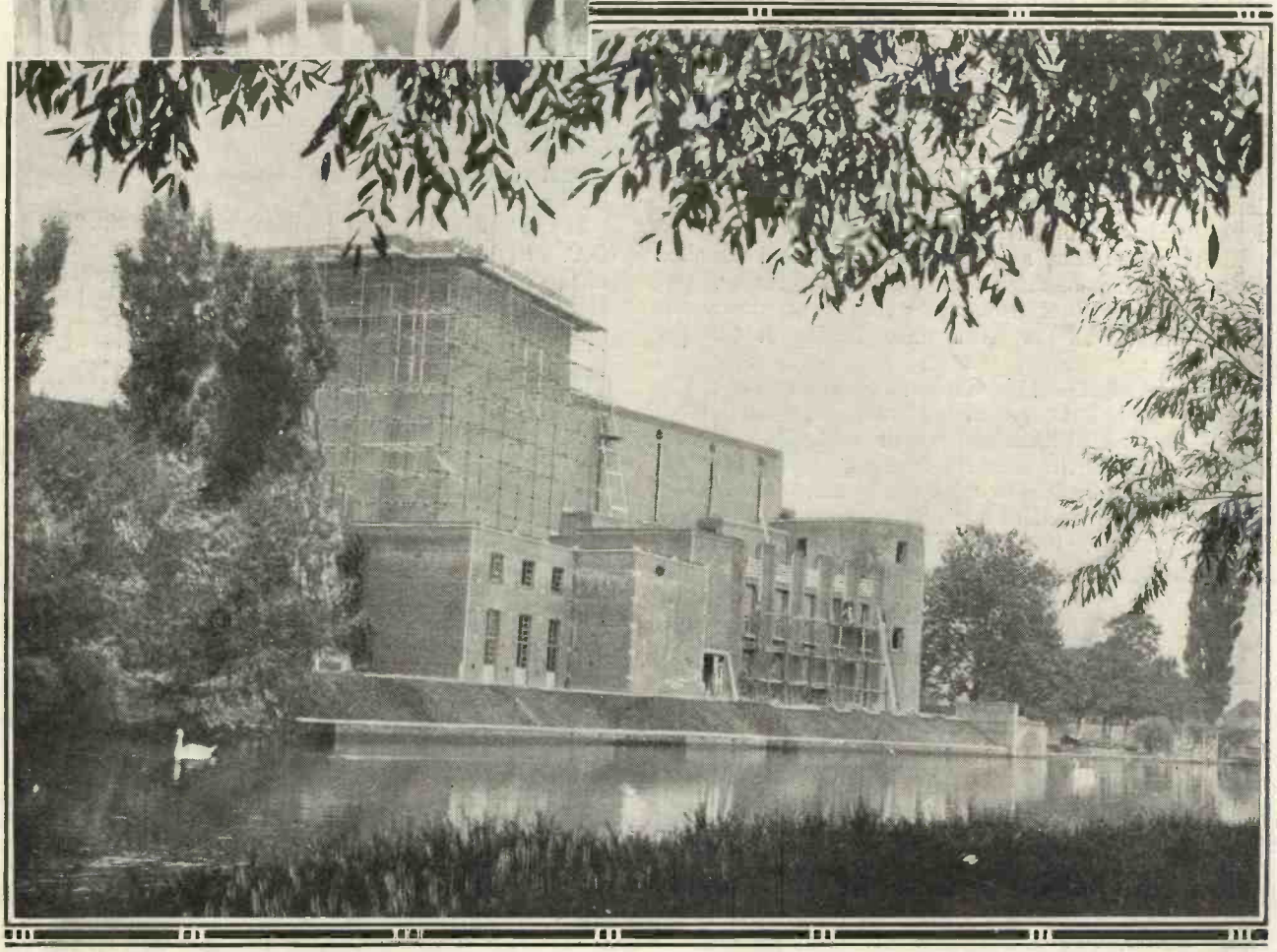
In this intriguing article, Miss Irene the left, suggests that the B.B.C. should Shakespeare for

OPINIONS differ sharply as to whether we get too little, just enough, or too much Shakespeare by wireless. There are even people who protest that his plays do not lend themselves to microphone interpretation.

Whatever one's opinion on the subject, I do not think it can be seriously maintained that we get too much Shakespeare via the loud speaker.

And to argue that because the plays possibly lose something between the studio and your wireless set they should therefore not be performed is hardly legitimate unless at the same time you are prepared to put a similar ban on almost everything which emanates from Savoy Hill—which is absurd !

ON THE BANKS OF THE AVON



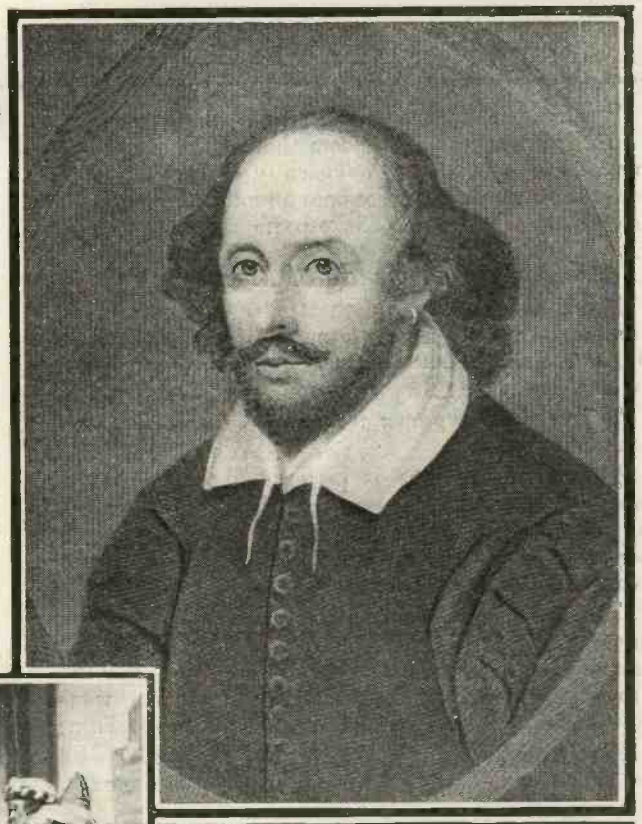
Showing the Shakespeare Memorial Theatre at Stratford-on-Avon. It stands on the banks of the River Avon and was designed by Miss Elizabeth Scott, a young English architect.

by Radio

Vanbrugh, whose photograph you see on pay more attention to the work of William purposes of broadcasting.

Everything, to a lesser or greater degree, suffers by being broadcast. Not even the most perfervid supporter of broadcasting would pretend that a Brahms' symphony sounds quite the same through a loud speaker as it does in the Queen's Hall, but we do not banish music from the loud speaker on this account.

Any means which brings the works of Shakespeare in a vivid fashion to the notice of thousands of men and women deserves one's whole-hearted support.



William Shakespeare was born at Stratford-on-Avon, and he died at the early age of 52. He was buried in the Chancel of Stratford Church

"RICHARD III" AND BROADCASTING!

When Shakespeare wrote "Richard III" and his other famous plays, he made full use of actions and gestures by the actors. For this reason his works are not ideal for broadcasting, but with careful handling they can be made to go over quite well

For this reason I cannot feel anything but admiration for attempts to broadcast Shakespeare even if his work suffers the inevitable but slight dilution which attends the broadcasting of anything at all.

Shakespeare is the greatest dramatist that this country has ever produced, with all due deference to Mr. Bernard Shaw's pronouncement on the subject. I do not, however, bring this forward as a particularly urgent reason for the broadcasting of his plays.

Our Greatest Dramatist

The trouble with Shakespeare is not so much that his name needs bringing to the attention of the man-in-the-street as that the man-in-the-street accepts him as our greatest dramatist—and leaves it at that!

Shakespeare is such a household word, as it were, that many people seem to assume that a knowledge of his works is inherited like a tendency towards early baldness.

They are reverent enough at the mention of his name; his reputation is such that they hardly feel it necessary to gain first-hand experience of the works which made him famous; and even if they want ardently to attend performances of them, they do not find these any too frequent or accessible.

I exaggerate a little, of course. Shakespeare is performed. But just for one moment consider the comparative size of the audiences reached by even a fairly long run in a theatre and those reached by a couple of radio performances of the same play.

The former runs into some thousands, the latter possibly into a million; and the important point is that of the million many would be folk to whom Shakespeare was previously little more than a respected name. Shakespeare by wireless gives our national dramatist a chance of becoming our national dramatist in something more than name only.

Shakespeare's Outlook on Things

There is another important point to be considered. Many a listener was introduced to one or two of the Shakespearean plays at school. He may have studied these very carefully, had the derivation of obscure Elizabethan words explained, and also been regaled with a few words on the Elizabethan theatre in general.

The net result of all this was probably that he left school firmly determined to banish Shakespeare from his life for good. Why? Because Shakespeare is too magnificently adult to be properly understood or appreciated by the child mind.

It is when life has given a man a few digs in the ribs that he really begins to understand Shakespeare's outlook on things.

An Audience of a Million Listeners!

To persuade a child to grapple with Shakespeare's mind is to bring him up against something which he fails to comprehend, and therefore violently dislikes or barely tolerates. And when he becomes an adult, he retains his childish attitude towards Shakespeare.

The Attitude of Many

He runs his eyes down the theatre list in the newspaper, murmurs: "D'you see that, my dear? They're doing 'Julius Caesar,'"—but takes very good care that he does not go to see it.

Possibly, with a proper reverence, he sends his small children instead!

Shakespeare by radio is performing the enormously important function of presenting the plays to adults who will find a surprising richness and a philosophy of life therein which they never suspected as children—simply because they *were* children.

Apart from anything else, the poetic content of the plays makes them magnificent stuff for broadcasting, and most of them, particularly the earlier ones, lose less through the absence of the visual spectacle than would most modern plays not specially written for broadcasting.

My own recollections of the one Shakespearean broadcast production in which I have played a part are extraordinarily pleasant, I worked very hard at my part in my determination not to lose more than was absolutely necessary in putting it over to listeners.

On one point I am strongly convinced. If listeners who care enough about it to take a little extra trouble would follow a broadcast Shakespeare play with the book of the play before them, this would, without any doubt whatever, increase their enjoyment and appreciation beyond all belief.

Shakespeare did not write with any idea that his plays would ever be broadcast, and did not give his characters mannerisms of speech so that they would easily be recognised by listeners! Where the play is not already familiar the possibility of this trouble arises; following the words with the aid of the book is a simple solution.

A Universal Appeal

There is little or no danger of this where the better-known plays are concerned, and for this reason I should think most listeners would welcome the radio performance of the old favourites of which everyone at least knows something, rather than of the lesser-known plays.

Even the better-known plays would amaze thousands of listeners by their revelation of Shakespeare as the dramatist with a universal appeal, a mind very like their own, and an amazing understanding of the human soul

HAMLET AND OPHELIA—AN UNFORGETTABLE SCENE

Hamlet is popularly considered to be Shakespeare's finest work, and this photograph shows one beautiful scene where the Prince talks to Ophelia. Playgoers will recognise the actors as Miss Fay Compton and Godfrey Tearle.

DO CONSTRUCTORS SCORE?

A selected few of the many letters we have received. It is significant that "Mr. X," who championed the manufacturer, has not been supported by a single one of our numerous correspondents.

Sir,—Apropos of the discussion in the January issue of MODERN WIRELESS, I think that the constructor undoubtedly scores over the manufacturer. I do not think it is necessary to battle further with "Mr. X's" opinions, as, to my mind, Mr. Dowding puts the case for the constructor very strongly, but there are two points which Mr. Dowding omitted.

One is the Regional Scheme. When the two stations at Brookmans Park were brought into operation, many people were troubled owing to the great increase in power. Selectivity suffered. The constructor had a comparatively simple job, he could dismantle his set and rebuild the tuning arrangements. Not so the unfortunate possessor of a commercial set

Telling Points

Commercial sets did not, and still do not, lend themselves to rebuilding of tuning arrangements or any other arrangements. I know I was nearly driven crazy by the various queries to which I was subjected. I am, wrongly or rightly, regarded as the "expert" in my circle of acquaintances, and naturally they all asked me for help and advice as to how to adapt their sets for the Regional conditions. And commercial sets were the very devil! Mind you, I don't consider myself an "expert." I remember that pride goes before a fall! But I have been in it since Writtle, and have taken MODERN WIRELESS, "Wireless Constructor," and "Popular Wireless" since their inception, so I think that in my small way I am entitled to back up Mr. Dowding in his case.

Point two. What about the Extenser? Who were the first to benefit from this wonderful boon? Not the manufacturer! The constructor *always* scores as regards modern improvements. The manufacturer may have already laid down his apparatus for his new season's sets when—crash!—along comes a marvellous new valve, or a revolutionary transformer. Think of the delay and the loss of money.

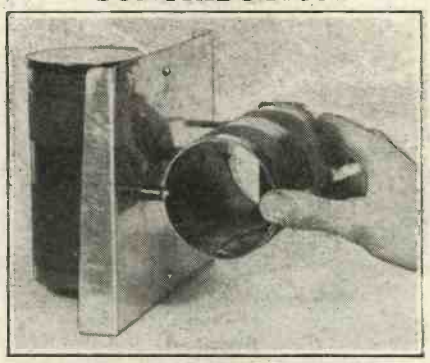
I feel I must protest against "Mr. X's" remarks about research and design. We constructors are just as jealous for our (I hope we may regard them as such) technicians as Mr. "X" is for his.

Anyway, I hope this letter conveys to you *my* views on the subject. Here's success and long life to all constructors, and a bumper circulation for their journals.

Yours sincerely,

Morden, Surrey. W. T. B.

CAPT. ECKERSLEY'S CONTRIBUTION



The famous "Eckersley" Tuner, designed specifically for constructors by Capt. P. P. Eckersley, M.I.E.E.

Sir,—The discussion between "Mr. X" and Mr. Dowding was extremely interesting reading—one of the best articles I have ever read.

I think your readers will be interested to read what "The Broadcaster and Wireless Retailer" said in a recent issue about "Mr. X's" so-very-virtuous manufacturers. Here are some extracts from the "Broadcaster's" articles.

"'A batch of fifteen sets of one make, and all but one faulty.'

"'Six sets delivered together, not one of which functioned satisfactorily.'

"'Four sets which needed hours of "servicing" before they could be put into a retailer's stock.'

"'£70 worth of pre-Christmas business lost due entirely to faults in just-delivered receivers.'

"'Two £20 sets and a £30 radio-gram received faulty. Visit of maker's service man promised for next day (a fortnight ago) but has not yet arrived.'

"These are some of the complaints received by 'The Broadcaster' from retailers this week."

* * *

"The simultaneous and grave complaints from dealers all over the country concerning faulty receivers is hardly an auspicious start for this industry in the New Year.

"'Deliveries are up to date!' manufacturers said triumphantly last week. They may be. But at what a price!

"The excuse that the damage is due to Christmas transport conditions is weak. Manufacturers should know by now how to pack sets so they *cannot* be damaged in transit.

"It is a disgrace to the industry that dealers now dare not take a set from a packing case and set it up before a customer.

"Even efforts that have been made to improve matters are ludicrous. . . ."

* * *

". . . It is infamous, too, that a body of retailers should be able to say 'British manufacturers' methods compare unfavourably with those of foreign firms,' as the Nottingham W.R.A. delicately remarked.

"The root of the trouble is, of course, the cowardice of the manufacturer.

"Any maker of a reasonably efficient receiver, if he had been courageous enough to sink money in adequate stocks before Olympia last year, could by now have scooped the cream of this year's market."

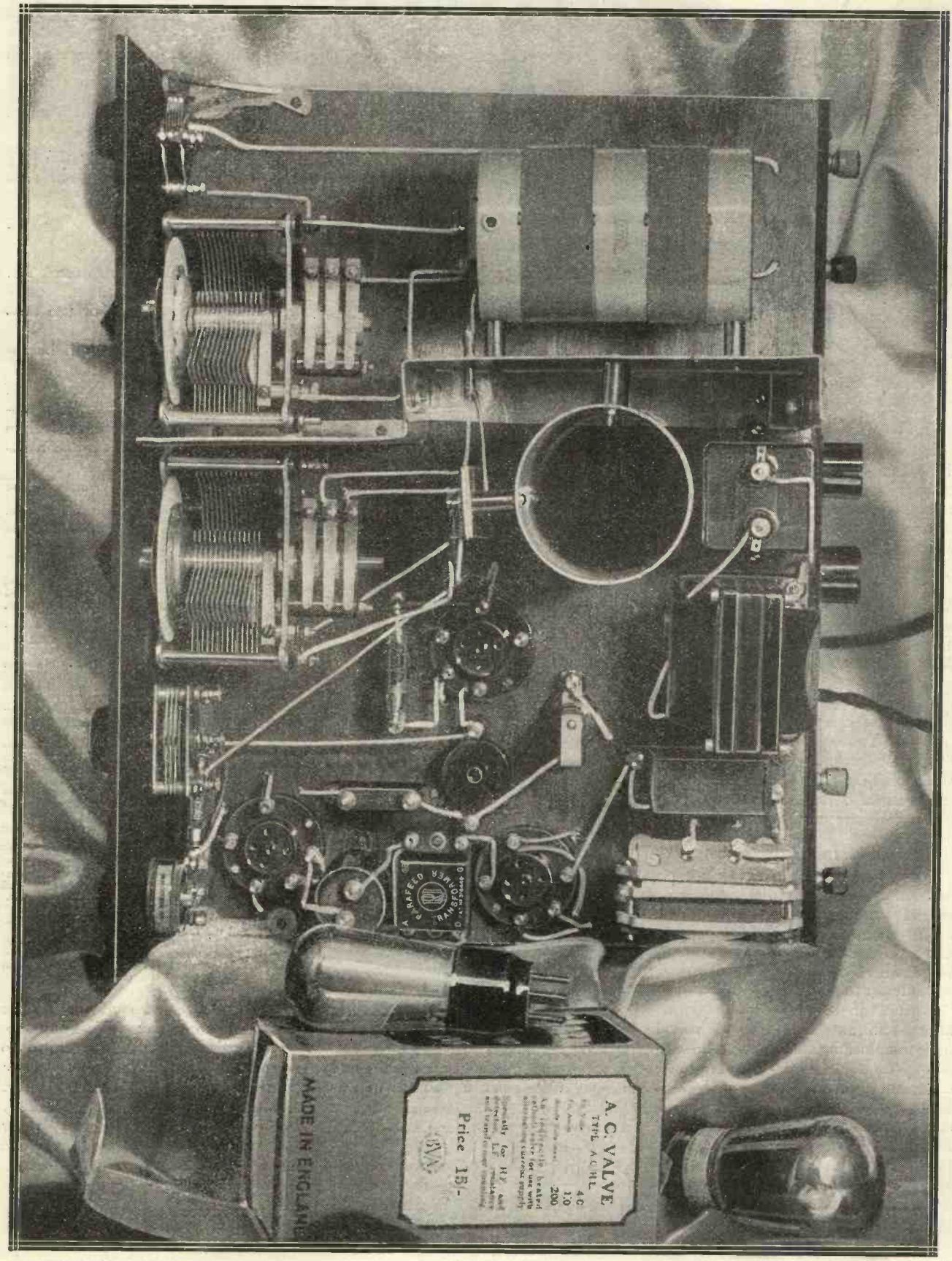
In face of such confirmation as this, and from a trade journal, too, the only thing "Mr. X" is left to do is to write some articles on "Why Manufacturers Don't Score." But, seriously, it would be extremely interesting to have "Mr. X's" reply to all this—if he can possibly scrape one up, though I can't see how he can.

In the meantime, more power to the vanguard of radio progress—the constructor and the men who supply his needs. Yours faithfully,

H. SANDERSON.

London, E.C.

A Fine Set for Use with A.C. Mains



THE A.C. ECKERSLEY THREE

This month we publish full constructional details for building an all-from-the-mains version of one of our most successful receivers, "The Eckersley Three." Owing to the higher efficiency of "mains" valves, it is far superior to corresponding battery models of any kind, and in regard to selectivity, quality and power it reaches heights hitherto considered unachievable with simple apparatus.

SINCE the introduction of the first Eckersley set the ingenious system of tuning, with its combined selectivity and sensitivity, has created widespread interest. "Eckersley" Threes have been built in every corner of the kingdom, and requests are daily reaching us for circuits and constructional articles showing how the Eckersley coil can be employed in this, that, and the other type of set.

Insistent demands have also been made for mains versions of this famous set, especially for one to operate on alternating current supply.

Simple But Very Efficient

We have, therefore, prepared a receiver specially for those who desire an all-electric receiver of simple but efficient design—a set that can be built successfully by almost any home constructor, provided he is capable of carrying out a little bit of soldering, and following a wiring diagram with accuracy.

We mention this latter point because it is being more and more brought to our notice that home constructors are deviating considerably not only from the list of recommended parts, but also from the actual lay-out of the set.

In such as a mains-driven receiver any serious deviation (though it

THE COMPONENTS REQUIRED FOR CONSTRUCTING THIS SET

PANEL
16 × 8 in. (Goltone, Permcol, Becol, Lissen, Peto-Scott, Parex, Ready Radio, Wearite).

CABINET
Panel space 16 × 8 in., with baseboard 12 in. deep, ¼ in. thick (Ready Radio, Peto-Scott, Camco, Pickett, Gilbert, Osborn).

EXTENSERS
2 ·0005-mfd. (Cyldon, Formo)

SOLID-DIELECTRIC CONDENSERS
1 ·0003-mfd. with shorting position (Ready Radio, Ferranti).
1 Differential reaction (max. ·0001 to ·00015 mfd.) (J.B., Telsen, Ready Radio, Igranic, Formo, Polar, Dubilier, Lissen, Magnum, Lotus).

SWITCHES
1 On-off rotary snap type (Ready Radio Bulgin, B.A.T.).
1 Radio-gramophone change-over rotary snap type (Ready Radio, Bulgin).

RESISTANCES
1 ·5-megohm volume control (Igranic, Sovereign, Clarostat, Wearite, Ready Radio, Varley, Magnum, A.E.D., R.I.).
1 2-megohm grid leak and holder (Graham Farish, Telsen, Dubilier, Ferranti, Igranic, Loewe, Watmel, Varley).
1 ½-megohm grid leak and holder (Dubilier, etc.).
2 25,000-ohm wire-wound resistance (Sovereign).
1 100,000-ohm wire-wound resistor and holder (Igranic, Varley, Sovereign, Ferranti).
1 600-ohm Spaghetti (Telsen, Sovereign, Lewcos, Ready Radio, Bulgin, Magnum, Peto-Scott, Graham Farish, Goltone, Igranic, Varley).
1 350-ohm Spaghetti (Telsen, etc.).
1 30-ohm potentiometer (Lyons humdinger).

VALVE HOLDERS
3 5-pin type (W.B., Telsen, Graham Farish, Lotus, Igranic, Clix, Wearite).

FIXED CONDENSERS
1 ·0003-mfd. (Formo, Telsen, Dubilier, T.C.C., Ferranti, Igranic, Watmel, Sovereign, Lissen, Graham Farish, Goltone).
1 ½-mfd. (Dubilier, etc.).
1 ·01-mfd. mica (T.C.C., Dubilier, Graham Farish).
1 2-mfd. (Telsen, Dubilier, T.C.C., Ferranti, Formo, Helsby, Hydra).
3 2-mfd., for under-baseboard mounting (T.C.C.).

CHOKES
1 H.F. (Lewcos flat type, Telsen, Wearite, Ready Radio, Graham Farish, Lotus, Sovereign, Varley, Peto-Scott, R.I., Parex, Magnum, Atlas).
1 Output (Igranic C.40, R.I., Wearite, Varley, Tunewell, Graham Farish, Ferranti, Lotus).

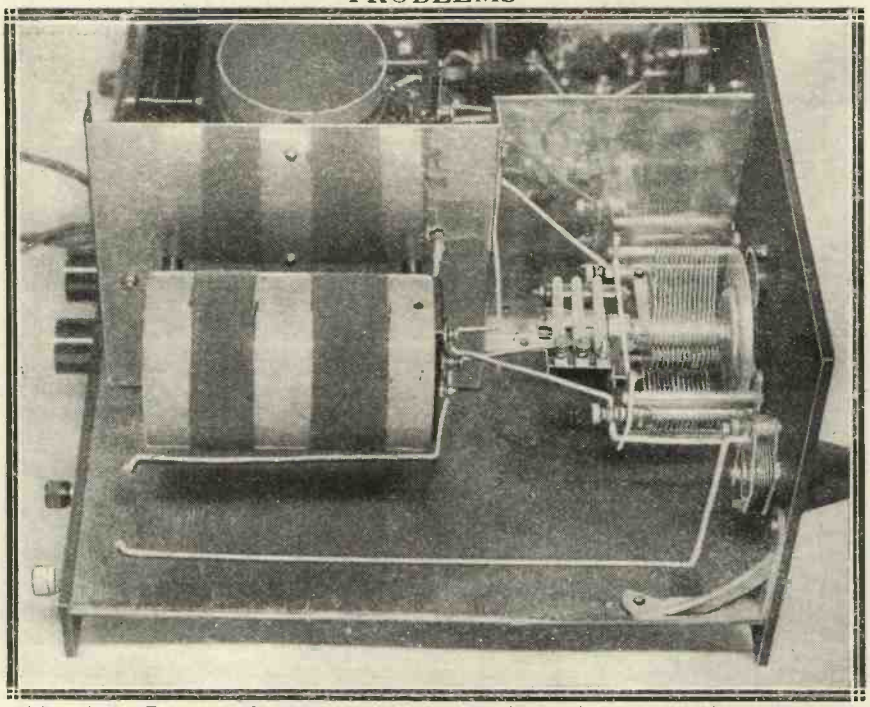
L.F. TRANSFORMER
1 Parafeed (R.I.).

COIL
1 "Eckersley" tuner (Goltone, Lewcos, R.I., Sovereign, Formo, Melbourne, Wearite).

MISCELLANEOUS
1 Screen, 6 in. × 6 in. (bent 1½ in. from end)
2 Mains plugs and sockets (Bulgin).
Terminal strip, 16 × 1½ in.
4 Indicating terminals, spade terminals (Bulgin, Eelex, Belling & Lee, Igranic, Clix).
2 Pick-up sockets.
1 Pair panel brackets.
Metal-covered wire.
Glazite, Lacoline, Quickwyre or Jiffi inx.
Plugs, flex, screws, mains adaptor, etc.

AUXILIARY COMPONENTS (see text)
1 4-mfd. condenser (Dubilier, etc.).
1 L.F. smoothing choke (Ferranti).

THE ECKERSLEY TUNER SOLVES SELECTIVITY PROBLEMS



Although the Eckersley Tuner is such an exceedingly simple and straightforward design, it has tremendous advantages over any other similar arrangement. The aerial and closed circuits are separated from one another by a vertical screen, and the only coupling between the two coils is through a 100,000-ohm non-inductive resistance.

might look slight to the uninitiated) from the layout, may mean complete disaster from the point of view of results. (So serious may such alterations be that in the description of another mains set in this issue—the "D.C. Super-Het"—we are providing no alternative to the components list, except in such cases as substitution cannot possibly cause the constructor to go wrong.)

We have also followed our policy of designing the set so that it can be used with commercial mains units. It will, no doubt, be built by many who at present have battery sets and A.C. H.T. supply units.

These units can be used with the "A.C. Eckersley" Three, plus an A.C. L.T. transformer. Or, if you have no unit, any of those makers on the accessory list have suitable models; the main point to remember being that the L.T. winding of the unit should not have an internal connection to H.T.—

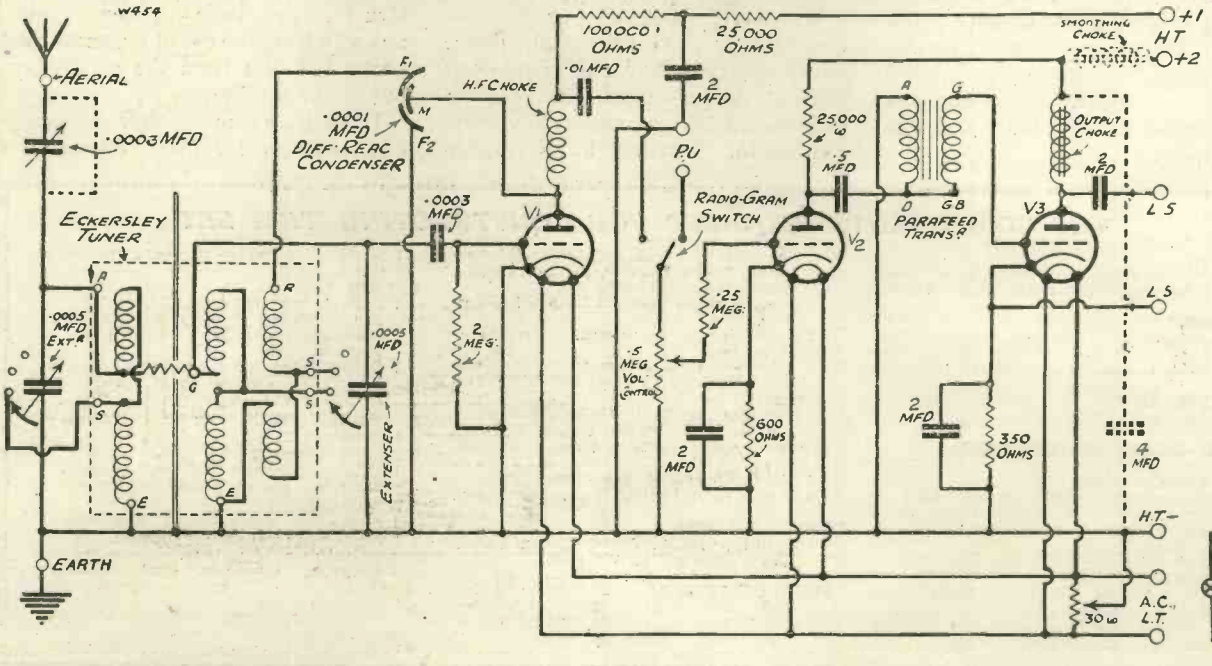
The L.T. Supply

The "Heayberd" "M.W.1" unit has been specially designed for our requirements in this matter of a non-earthed L.T. winding, and differs only in this respect from the "M.W." model produced some months ago.

The "M.W." had the centre tap of the L.T. winding connected to H.T.—, and those of our readers who have this unit and wish to use it with the "A.C. Eckersley" Three should open the unit and disconnect the lead from the centre of the L.T. winding to H.T.—.

Others will use the "M.W.1" unit, where they will find that the centre tap has been brought out to a terminal marked "E." This allows the unit to be used with any set design, for where the centre tap is required to be taken to earth it is easily arranged by

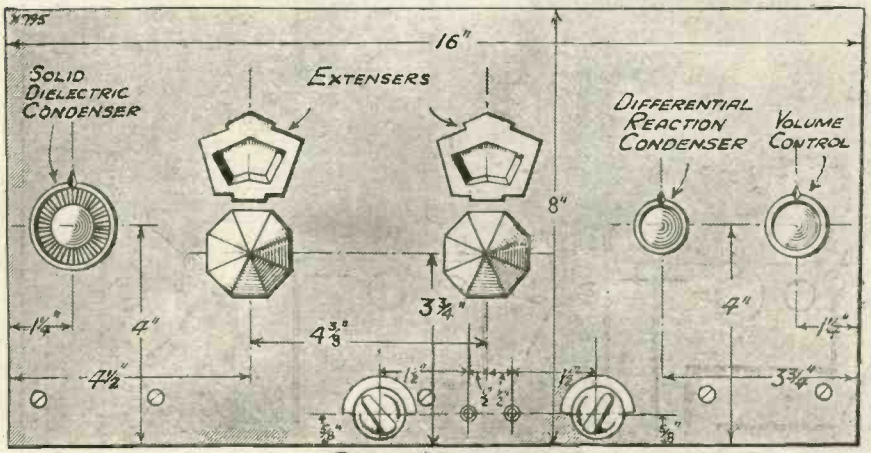
This is the Theoretical Diagram of the Circuit



If you study this circuit diagram you will note several outstanding features. The famous Eckersley Tuner is well to the fore, and its method of resistance coupling can readily be seen. Another interesting point is the small series aerial condenser which makes a splendid selectivity adjustment on medium waves; it can, however, be cut out when receiving on the long-waves. A radio-gram switch is provided, and when the set is used in conjunction with a good pick-up very fine record reproduction can be obtained.

A Separate Aerial Circuit for Super-Selectivity

A VERY PLEASING PANEL LAYOUT



There is little doubt that the hexagonal Extenser knobs and shapely escutcheon plates give the panel a very artistic appearance, and they are well worth the little time and trouble necessary for their proper fixing. All the other panel components are one-hole fixing, and, by the way, don't forget that the baseboard is mounted a little way up the panel, the fixing screws for this being in line 1⅜ in. from the panel edge.

connecting this terminal to the H.T.— terminal, and where, as in the case of the set under consideration, the tap is to be left free, the terminal is not used.

Hum-Free Results

This is really a very important feature if hum-free reception is to be obtained, and it is surprising that so many all-power units are placed on the market in which the L.T. winding is irrevocably connected to earth.

It may be argued that this should be all right seeing that it is the centre tap that is earthed, but in practice it is next to impossible to tap the transformer at the electrical centre and thus to ensure proper anti-hum balance.

A far better scheme is to leave the winding untapped and to place a small potentiometer across the L.T. wiring of the set—at the set end, and not by the transformer—taking the earth return of the set to the slider of the potentiometer. By this means an electrical centre can be obtained merely by adjusting the position of the slider of the potentiometer while the set is working, and setting it at that position where there is freedom from hum.

Automatic Bias

By this means it is possible to "tune" the hum in and out, whereas were the L.T. winding of the mains unit already earthed such a procedure would be impossible.

And while on the subject of L.T. earthing, there is one more "anti" argument which we would like to put forward here, though it has no direct bearing upon the particular receiver under consideration.

It is this. No mains set is worthy of its name if it does not incorporate automatic grid-biasing. This is easily provided for, whether or not the L.T. winding is centre-tap-earthed in the unit, *as long as the indirectly-heated type of valve is used.*

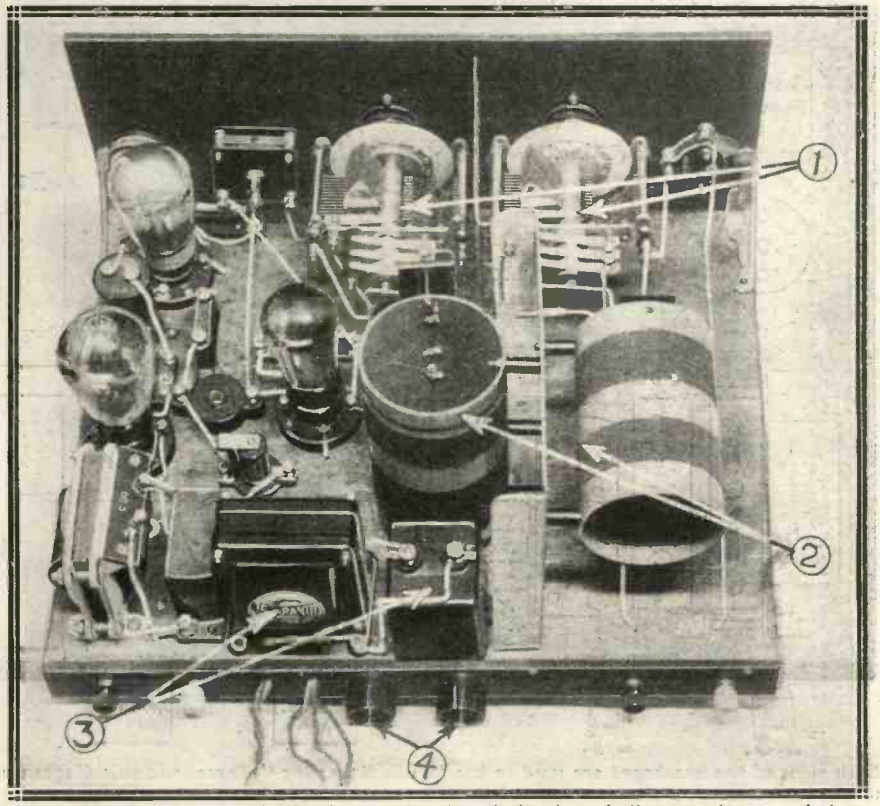
As soon as the directly-heated valve, which is often desirable in the output stage, is considered, it immediately becomes apparent that automatic biasing is impossible, unless the centre tap to H.T.— connection can be got at and broken. (Only one simple connection, but it does tie one's hands, doesn't it ?)

Shunt-Fed Transformer

But to get back to the "A.C. Eckersley" Three. As in the battery versions it consists essentially of a detector, one resistance-coupled L.F. stage, and one transformer-coupled stage. This latter, however, is of the shunt-fed auto-transformer type, making for a good characteristic reproduction curve.

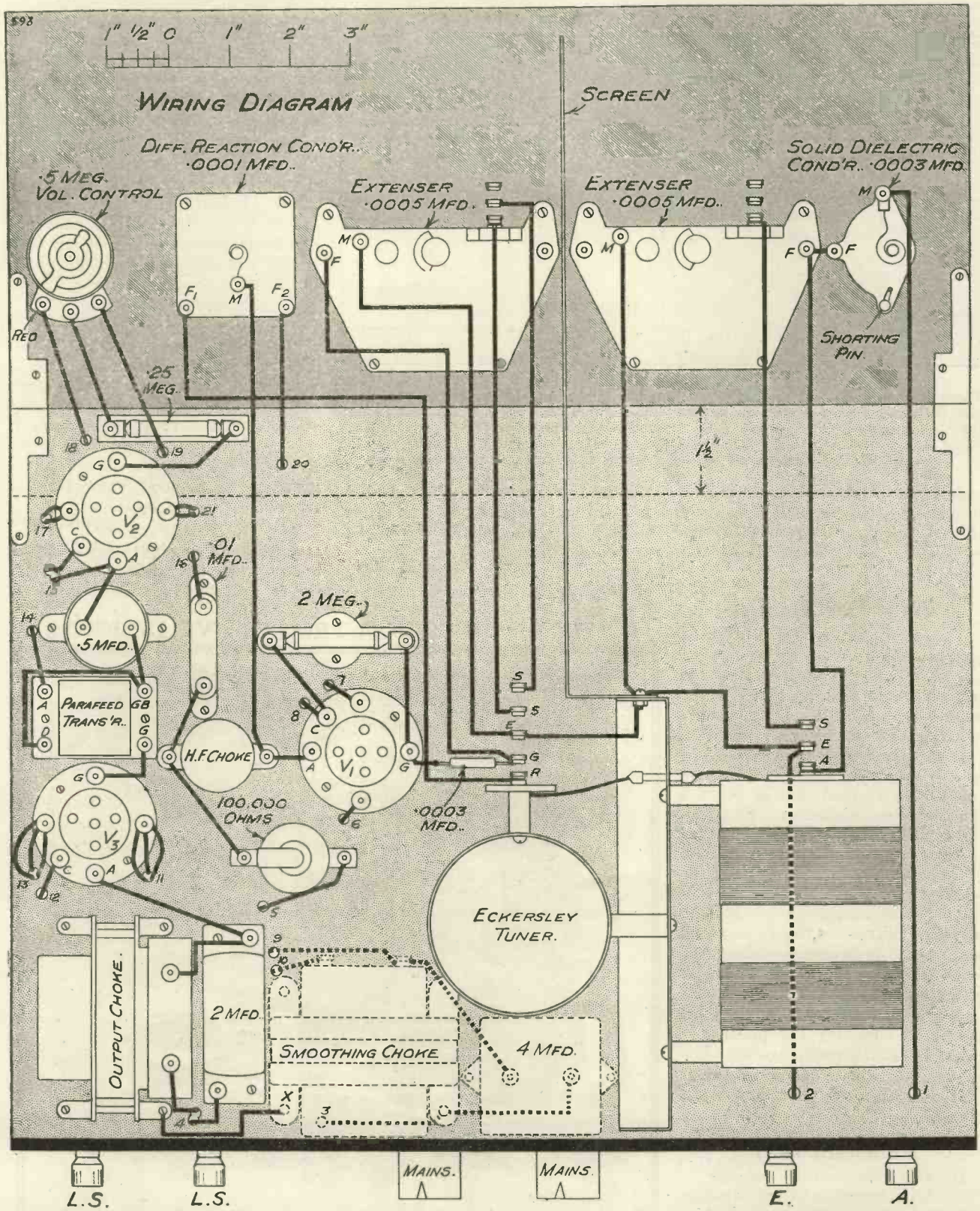
Two Bulgin mains sockets are necessary, one for the mains themselves, the other for the power unit. They enable the whole outfit, including the power

FOUR POINTS IN A PROGRESSIVE DESIGN



(1) The two Extensers, which make possible the elimination of all wave-change switches; and (2) the "Eckersley" Tuner, which has already gained a name with "M.W." readers; (3) is the choke-capacity output filter and (4) the sockets for connecting the set to the mains and external power pack.

The Top of Baseboard and Panel Wiring



Both sides of the baseboard are used in the "A.C. Eckersley" Three, and this diagram shows the parts and wiring accommodated on the upper side, and also the back-of-panel arrangement. The nearer part of the coil screen is actually built into the tuner, but the section nearest the panel is an extension piece which should be bolted to the existing screen.

All the Mains Equipment is in an External Unit

unit, to be controlled by the switch on the panel of the set. (It does not matter which plug is used for the mains and which for the unit, they are quite interchangeable on that score.)

A further feature is the provision for gramophone record reproduction by the use of a radio-gram switch and two pick-up sockets on the panel. These enable two stages of L.F. amplification to be employed with the pick-up, the detector valve being employed only for radio reception.

This has the undoubted advantage that the volume control, which operates on the first L.F. stage, is switched across the pick-up as soon as the radio-gram switch is over to "gramophone," obviating the need for an external volume control.

For Noisy Mains

The theoretical circuit of the "A.C. Eckersley" Three shows how the power supply feed is arranged, and also shows how easily extra smoothing, which may be useful in cases of "bad" electric mains, can be added.

This smoothing consists of an extra low-frequency choke and a 4-mfd. condenser situated in the H.T. lead supplying the first L.F. and output valves. In most cases this will not be required, but it has been inserted in the design, and is shown in dotted outline both in the theoretical and wiring diagrams, so that it can be employed if necessary.

The most important hum preventer, however, as we mentioned before, is the little potentiometer (known commercially as a "humdinger"), placed across the L.T. supply to the set, and with its slider earthed.

Under the Baseboard

The actual construction of this set is carried out in the usual manner, employing the underside of the baseboard for heater and mains wiring, and for the automatic bias resistances and by-pass condensers.

This procedure makes for very much more efficient layout, more compact design, and in the main for considerable simplification of wiring and construction in general.

As the baseboard is to be lifted up from the bottom of the panel, the panel height is increased from the normal 7 in. to 8 in., and the length (by virtue of the under-baseboard wiring and component mounting) is kept down to 16 in. With a baseboard depth of 12 in. this enables a reasonably compact design to be carried out, the whole set fitting in the standard 16 in. by 8 in. by 12 in. cabinet.

The tuning circuits of the "A.C. Eckersley" Three follow their battery predecessors. Extenser wave-length control is employed, this completely eliminating wave-change switches, while the usual Eckersley selectivity control, in the shape of a ·0005-mfd. solid-dielectric variable series aerial condenser, with self-shorting position, is used.

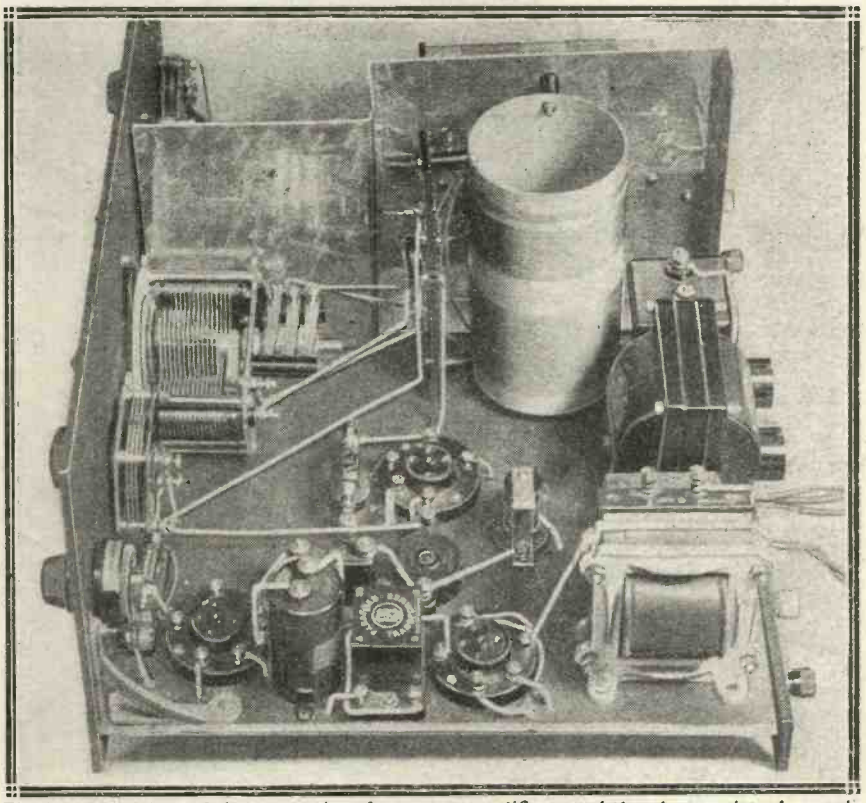
In the original set it was ·0001 mfd., but many people seem to think that the value of this type of component is not critical—that any capacity in excess of this figure does not matter, it will only make "reaction easier."

The Solid Di-electrics

In this case such an idea is entirely erroneous. It is critical and the condenser should not exceed ·00015 mfd. maximum capacity. If it does, although reaction will be "easier" to obtain (that is, the state of oscillation will be more quickly reached), it will be difficult to control the degree of feedback and the set will become difficult to handle.

The "A.C. Eckersley" Three is a powerful receiver capable of delivering big volume, and it is very selective. This selectivity would become a drawback instead of an advantage if the reaction control were rendered difficult. The small value of reaction condenser capacity is ample, for it must be remembered that we are dealing with mains valves, which are more lively, and have as a general

LENDS PUNCH TO DISTANT PROGRAMMES



The last two valves of the set are low-frequency amplifiers, and they have colossal magnifying powers. The first employs a resistance-capacity-coupling arrangement and the second a parallel-fed transformer scheme. This combination gives exceptionally realistic reproduction, and in conjunction with mains valves will put out power sufficient for all ordinary loud-speaker requirements.

Wire-wound resistances are utilised for the L.F. circuits, the 100,000-ohm anode resistance for the first stage being mounted on the upper surface of the baseboard, the detector decoupling resistance and the anode resistance of the second stage being mounted underneath.

Differential Reaction

While we are discussing the various components used in this set we should like to stress one very important point. This is the value of the differential reaction condenser.

rule greater mutual conductances than the battery types.

It might also be an advantage if here we drew attention as well to the series aerial condenser. At first sight this would appear to be of the usual ·0003-mfd. solid-dielectric type.

An Important Point

Actually, it is not so, for it has, in addition to the usual characteristics, a shorting position (the minimum) in which the moving vanes make contact with the fixed vanes by means of a small pin on to which the moving vanes come to rest when the minimum position is reached.

This feature is important, because when the long-wave band is being explored no series condenser is required; in fact, to have one in circuit between 900 and 2,000 metres is a definite drawback as regards signal strength.

On the other hand, should you be situated close to 5 X X you may find it advantageous to have a controllable series condenser available to increase selectivity. On the medium wave-band such a condenser is essential to the correct operation of the "Eckersley" tuner.

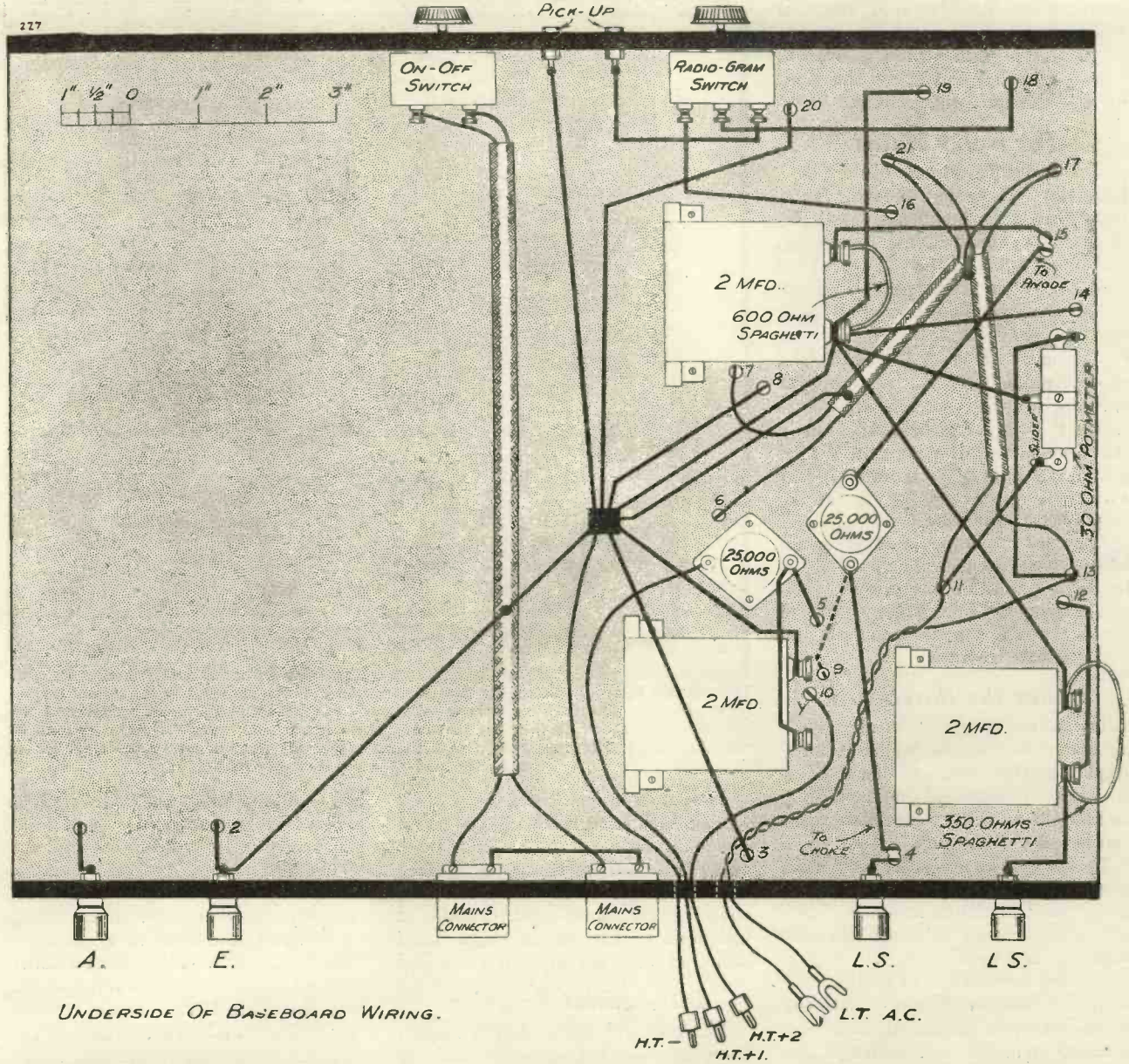
Thus for best operation under all circumstances we require a variable series aerial condenser which can be switched in or out at will, and which can be controlled on the panel.

The obvious solution is the type of control we have provided here, a control which does its own switching in or out, and thus obviates the need for a further addition on the panel in the shape of a shorting switch.

About the Layout

Before we discuss in detail the various outstanding points in the actual construction we must emphasise the importance of keeping rigidly to the layout and to the parts specified or their listed alternatives.

The Components and Wiring Below the Baseboard



UNDERSIDE OF BASEBOARD WIRING.

The top of the baseboard is mounted 1½ inches up from the edge of the panel, which arrangement leaves room for some of the smaller components and their associated wiring underneath it. The on-off mains switch, the radio-gram switch and the pick-up sockets are mounted in this position, and can be seen at the top of this diagram.

Whether on Radio or Records it Passes All Tests!

You will notice that the wiring diagram is drawn to scale, and the scale is given. Keep to the positioning shown thereon, especially as regards the position of the tuner, valve holders, and the output choke, and the extra (dotted) smoothing choke and condenser, if this is required. You will naturally build the set without this to commence with, and only add it if you are troubled with hum (an unlikely contingency); but you will be very fed-up if you have so far departed from the original layout or specification that on attempting to drop in the two additional components you find that you have not left room for them.

"Upstairs" First

In building this set it is best to mount all the "upstairs" components first, and to drill the holes through the baseboard (exactly in the positions shown). Then turn the baseboard up and from the under-baseboard wiring diagram mount the remaining components in their correct positions relative to themselves *and to the holes* (which are numbered) *round about them.*

The extension screen continuing the partition between the two coil units of the "Eckersley" tuner is important, as it shields the two tuning Extensers from each other, and thus minimises capacity coupling between the circuits.

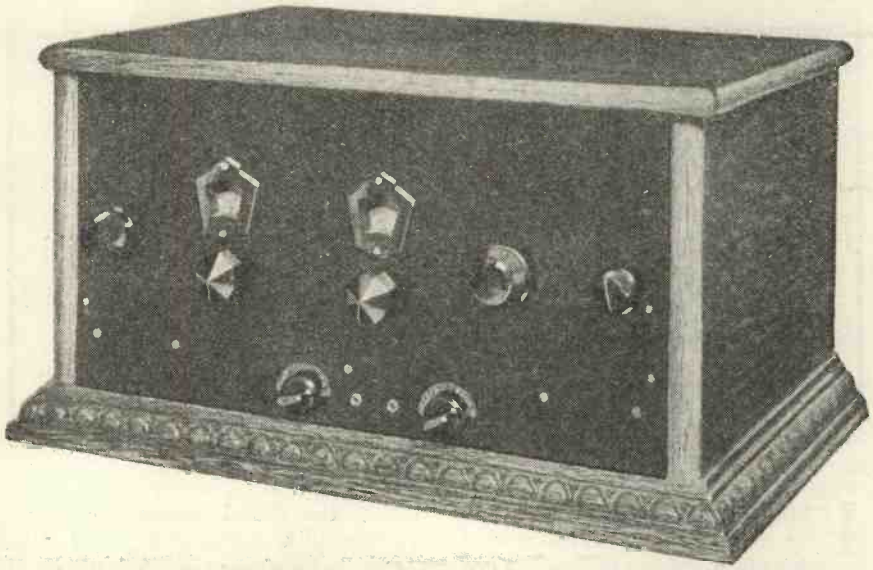
It consists of a piece of standard screen, 6 in. long and 6 in. high, bent 1½ in. from the one end and bolted at that end to the main screen on the "Eckersley" tuner. (It must not be mounted "free," i.e. in an unearthed condition, and not connected to the main screen.)

The actual wiring of the receiver is really very simple. The heater connections are carried out with metal-braided twin wire, with exception of the leads from the L.T. terminals of the mains unit, which are of the ordinary twisted flex variety. This departure from metallised wire is because the latter is not really flexible enough for such a connection.

The Covered Wiring

The metal covering of each section of the heater wiring, which is of braided tinned copper, is bonded together and taken to the junction point of a number of leads which connect up earthed parts of the circuit.

WIRED UP READY FOR WORK



In its finished state the A.C. Eckersley Three presents a very pleasing appearance and, what is more, when connected up it can give an excellent account of itself, both for distance and volume. It is easily the best Det. and 2 L.F. type of set we have ever described in this journal.

This junction is clearly shown in the wiring diagram of the underside of the baseboard. It can conveniently be anchored to the baseboard itself by means of a copper staple, if desired, and though this was not done in the original set, it is a very good plan, as it makes the leads very much more secure, especially as the H.T. negative lead to the power unit comes off at this point.

ACCESSORIES YOU REQUIRE

Loud Speaker.—(Blue Spot, Marconiphone, Celestion, Amplion, H.M.V., Undy, R. & A., W.B., Epoch, Graham Farish).

Mains Unit.—(Heayberd, Model M.W.1) (see text).

Valves.—1 Cossor 41M.H.L., Mazda A.C.H.L., Mullard 354V., Six-Sixty 4G.P.A.C., Marconi and Osram M.H.4, Tungsram, Triotron, Dario.
1 L.F. valve (Six-Sixty 4Det.A.C., Mullard 164V.).
1 Output valve (Cossor 41M.P. or 41M.X.P., Mazda A.C.P. or A.C.P.1, S.S.4P.A.C., Mullard 104V., etc.).

The rest of the construction is straightforward, with the exception of two or three points which need some explanation. The first concerns the point marked X on the "upstairs" wiring diagram.

This, it will be seen, is an anchoring point on the *frame* of the Ferranti choke (which is the supplementary choke we have already discussed) of a lead from the frame of the output choke. Electrically, this lead continues via the Ferranti frame to the supplementary 4-mfd. smoothing condenser, and through hole 3 to the earthed junction we have recently been considering (see underneath-baseboard diagram).

If you do not use that auxiliary choke and condenser, the lead is taken off X, and goes from the frame of the output choke direct through hole 3 to the earthed junction.

Why the "Y"?

Also concerned with the auxiliary smoothing arrangement is the point on the under-baseboard diagram marked Y. This is the hole 10.

Studying the two wiring diagrams, you will see that this hole carries the H.T. + 2 lead through the baseboard to the auxiliary choke, and from the other terminal of that choke returns a lead through hole 9 to one of the 25,000-ohm resistances.

Should the choke not be used, then the holes 9 and 10 become unnecessary, and H.T. + 2 goes direct to the 25,000-ohm resistance in question.

So much for the two main points about which doubt might arise in the mind of the constructor.

Now for two peculiar holes, Nos. 4 and 15. These have been made in a sort of double, or figure 8, form, because two leads go through them to

(*Continued on page* 197)

A popular broadcaster tells you how she obtains the most delightful music from an ordinary carpenter's saw.

IT probably will come with surprise to many people to learn what beautiful music can be obtained from a common carpenter's saw and fiddler's bow. It is strange that this plebian instrument is so little used, when taking into consideration its comparative cheapness and the ease with which one can acquire the necessary skill to perform.

The instrument has a wonderful melodious tone, and is gradually making itself known through the medium of the wireless. It can be learned by anyone with a good ear for music if the following instructions are carried out. It may take time before it is perfected, but it is an interesting and delightful novelty, and will fill in many long winter evenings—after the children have gone to bed.

A 'Cello Bow

The best results are obtained from a long saw, about 32 in., and a 'cello bow. The bow must be well resined, as in ordinary practice.

The saw can be purchased for 15s. and the bow at anything from 6s. 8d. upwards—not a high price for a musical instrument.

In playing, take the saw, resting the handle between the knees, the right foot being raised on the toes. In this position, work the right leg in an even tremble and that will give vibration to the notes when they are struck.

With the bow held in the right hand, draw the hairs across the smooth edge of the saw. The left hand must be stretched to the end of the blade, with the fingers curved over the top, the tips resting lightly underneath, the thumb pressing on top. To get different notes, bend the "saw" towards the ground, and strike in the new curve then shown on the blade.

When practising, think of the following story, how this delightfully

JUST AN ORDINARY SAW

Miss Joan Stonehewer demonstrating the possibilities of her novel musical instrument.

amusing instrument the "saw" became musical as well as useful.

"In the forest, day after day, the saw' worked backwards and forwards, backwards and forwards, and the noise it made was harsh, monotonous and tiresome; and day by day the beautiful green trees, which gave freely of their shade to the small, shy things of the forest, and sheltered the birds that sang peacefully and happily in their branches, were felled to the ground, there to be cut by the 'saw,' for the use, comfort and convenience of man.

"One night when silence had fallen and the birds had all sung themselves fast asleep, the Spirit of Music passed through the forest, carrying life for the saw in the shape of a bow. 'This will help you to make music,' she said, and she drew the bow gently up and down the edge of the saw.

Success at Last!

"At first there was no sound and the saw despaired of ever making music.

"And then a low, sweet note sounded on the air, and then another, until at last the whole of the forest was ringing and echoing with its beautiful melodious tones, and the saw had learned that music can be drawn from the most unexpected sources, even from an ordinary humdrum, everyday piece of steel, like himself."

IMPROVING A MINOR COMPONENT

By A. S. CLARK.

I SHALL always assign those who maintain that radio progress is stagnating or slowing up to the band of undesirable pessimists! Radio progress is going on as healthily as ever.

A Vital Part

Take the terminal, which admittedly is only a small affair, but a necessity to practically every component. We might perhaps be forgiven for thinking that this had reached finality, but it is far from it, as witness the new type of terminal exhibited by J. de Wet at the recent Inventions Exhibition, and which was awarded the special money prize.

It does not matter which way one twists the wire round the shank of this terminal, and there is no possibility of strain being put on the wire as the terminal screw is tightened up. Briefly, the principle is this.

The terminal is in main form like an ordinary screw-down terminal, but the lower portion immediately below the wire is hollowed out like a crystal cup, and the top screw part fits down into this. Down the sides of the cup are slots into which fit projections on a washer that fits over the shank.

The wire is first twisted round the shank, after which the washer is dropped on to it and the terminal screw tightened, making an absolutely secure and quick connection, good enough for any purpose.

CHOOSING YOUR AERIAL

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

The results which can be obtained from a frame aerial and a modern receiver are such that our contributor provocatively suggests that it is becoming difficult to make out a case for outdoor aerials !

MANY enthusiasts take a delight in a fine outdoor aerial. It is the outward and visible sign of the wonder set within, the symbol to the world at large—and the neighbours in particular—that the owner has staked a claim in the ether and means to keep it.

But fashions change—in aerials as in other things—and the ultra-modern listener will bring you in as many stations on a 2-ft. frame as you could have got a few years back (if they had been there to get) on a full-blooded 100-ft. twin aerial.

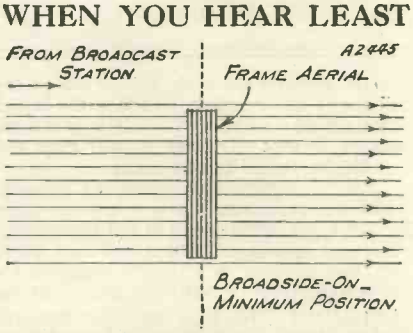
Personally, I think this change is all to the good ; it always pleases me to see anything complete and self-contained.

Efficient H.F. Amplification

The improvements in sets employing frame aerials are, of course, due in the main to the introduction of highly efficient high-frequency amplifying valves, particularly of the screened-grid type. It used to be reckoned that a good outdoor aerial was worth two ordinary stages of H.F. amplification, and the presumption was that, whereas the two H.F. stages cost something for capital outlay and maintenance, the aerial was only outlay and no maintenance.

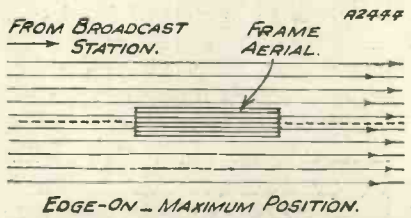
In point of fact—although I don't recollect the figures ever having been gone into by a chartered accountant —I venture to think that you would find depreciation and maintenance costs of a good outdoor aerial much greater than the corresponding items for a couple of H.F. stages ; whilst it is obvious that in the matter of capital outlay the H.F. has the pull every time.

WHEN YOU HEAR LEAST



Normally, with the frame at right angles to the direction of the station you will either not hear it at all or hear it but very weakly.

FOR LOUDEST RECEPTION



When a frame is in line with the waves from a station it is possible for it to pick up another station lying in exactly the opposite direction at the same time.

Now that selectivity has become so much more important than formerly, at least one H.F. stage is desirable, if not essential, even with an outdoor aerial, for cutting out local B.B.C. stations and getting away for distant reception. Add to this the remarkable facilities of the screened-grid valve and it seems that the case for the outdoor aerial—at any rate on technical grounds—is just about gone altogether.

Directional Properties

So far as selectivity is concerned, the frame aerial has the still further advantage that its directional properties can often conveniently be pressed into service for the purpose of avoiding unwanted or interfering stations.

As most wireless experimenters know perfectly well, the frame or loop is most responsive to wireless waves when the loop is " edge on " to the oncoming waves.

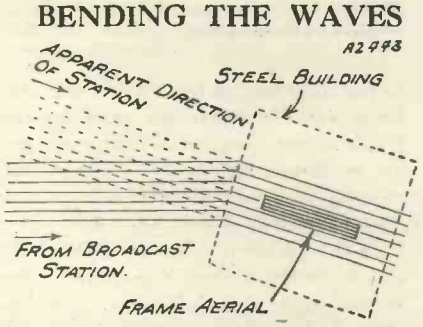
If the loop is rotated to a right-angle position—that is, " broadside on " to the waves—then the response is reduced to a minimum, not actually zero, but very small compared with the maximum response.

Natural Selectivity

According to the simple theory of the action of the frame aerial the minimum response ought to be zero, but the simple theory does not take account of various more or less accidental circumstances which have their effect in practice.

If the frame is placed in the best direction for the waves coming from the desired station, clearly it will be in a position *below* the best for any stations sending waves from other directions, and to that extent the frame has natural selectivity which is often very useful.

BENDING THE WAVES



A steel building, or other mass of metal near a frame aerial, is quite capable of giving a misleading idea of the direction in which a station lies.

"The Frame is Rapidly Coming into its Own"

With an outdoor aerial, although it has a slight directional property, it is not possible to rely on this to any extent; and, anyhow, the aerial is fixed, and so its directional property favours only one particular station (or stations on one particular bearing) and cannot be adjusted according to the station you wish to receive or cut out.

Beginners often wonder why it is that the frame should have maximum pick-up when "edge-on" to the waves and minimum when "broadside-on." This seems just the wrong way round. You would think that anything broadside-on to the waves would get the maximum effect.

The Magnetic Flux

But you have to remember that the oscillating magnetic flux takes place parallel to the surface of the earth and at right angles to the direction in which the waves are travelling. If the frame aerial is "edge-on" to the waves, the flux, being at right angles to the direction of the waves, will also be at *right angles* to the plane of the frame aerial, and so the frame will get the maximum effect.

Rather Confusing!

If the frame is "broadside-on" to the direction of the waves, then the flux, being at right angles to the direction of the waves, will be *parallel* to the plane of the frame, and so the frame will get the *minimum* effect. The apparent paradox arises because the effect which the frame is intended to pick up is one which takes place at *right angles* to the direction of travel of the waves, and so the frame has to be in a position at right angles to that which you would at first expect.

"Position Finding"

It will be clear that if the frame is in the best position for waves coming in a certain direction it will also be in the best position for waves coming in the exactly opposite direction, so that a frame aerial, in the ordinary way, cannot tell you on which side the received station is located; for instance, supposing the frame aerial, when in the best position, is lying in a plane north-and-south, then you know that the bearing of the station is either due north or due south, but you don't know which.

Since the actual location of the station is very important for many purposes (such as for direction-finding on ships and aeroplanes), a second aerial of the vertical type is often used in conjunction with the frame aerial. The vertical aerial is a very small one as a rule; like the frame, it is unable to differentiate between the two bearings. But if the voltages induced in the vertical aerial and the frame aerial are combined, we can make use of phase differences which arise according to the actual bearing of the station, and it becomes a simple matter to find whether the receiving station is, for example, north or south of the operating position.

When using a frame aerial in a modern steel-girder building, or, in fact, anywhere in proximity to large masses of iron or steel, you will often find that the bearing of the aerial for a given station appears to be incorrect.

Deflecting the Waves

For instance, suppose you happen to know the actual bearing of a certain station and you rotate your frame aerial so as to get maximum response from that station, you will possibly find that the bearing as given by the frame is different from the known bearing; this is due to the deflection of the radio waves by the masses of iron or steel. The frame aerial only indicates the direction of the radio waves when they actually arrive; naturally it can take no account of any direction which the waves may have followed *before* they arrived.

For ordinary reception purposes, however, you are seldom concerned with the actual bearing of the station, and, as a rule, all you want is to get the position of the frame which gives you the best response.

Do You Agree?

A frame aerial, as you see, is very handy in many ways, and now that high-frequency amplification has become so efficient and so convenient the frame is rapidly coming into its own; many people predict that within a few years the outside or garden aerial will disappear altogether.

Other things being equal, it would certainly be a very good thing if the outside aerial could be dispensed with entirely; erection and maintenance troubles, cleaning of insulators, lightning risks (if any) and the rest would then be eliminated.

[Dr. Roberts certainly makes some very emphatic statements in regard to the choice between frame and outdoor aerials, and we should be very interested to hear from our readers in regard to this matter.

But Dr. Roberts has expressed a personal opinion, remember, and it is not one with which I, for instance, am in full accordance. My own present outdoor aerial cost about 5s., and has had no attention whatever for at least three years, yet I am able to receive programmes on a simple three-valver (when I want to) which could be picked up only with a powerful super-het on a frame aerial! And what about a reasonably good indoor aerial?—TECHNICAL EDITOR.]

ANNIVERSARY OF FIRST TRANSATLANTIC RADIO

At the recent commemoration of Marconi's first radio message across the ocean, his original apparatus was on show. In the foreground can be seen an ordinary cigar box containing some of this historic gear.

A RADIO RECKONER

By W. A. BARCLAY M.A.

The set of diagrams published this month enables you to find the value of inductance or capacity required to institute a condition of resonance at any particular low frequency. They should prove extremely useful when it is necessary to adjust a part of the musical scale which is not faithfully reproduced by an amplifier, and the author shows how this can be done.

WE were discussing last month the "series resonant circuit." It was then shown how, when the values of inductance L and capacity C, illustrated in Fig. 2, are given, the wave-length to which the circuit is resonant may be simply obtained.

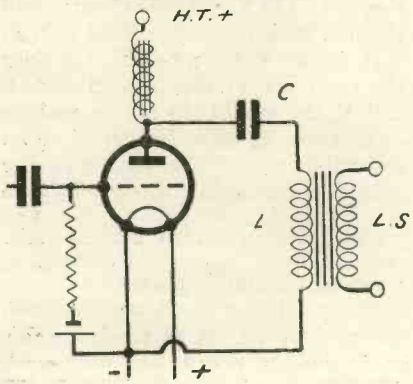
L.F. "Tuning"

As was explained in the June issue of MODERN WIRELESS, the "wave-length" is merely another way of expressing the frequency of the oscillations of current in the circuit when these frequencies attain the very high values met with in radio practice.

But alternating currents whose oscillation frequencies are much smaller in amount are also met with in wireless work, notably currents of "audio" or "sound" frequency, which are amplified subsequently to the detector valve and ultimately energise the loud speaker.

It is, of course, possible to arrange series combinations of capacity and inductance so as to present a resonant path to currents of such audio-frequencies. In general, however, audio-frequency resonance is bad and should be avoided; in the ordinary way we do not wish to single out only one of the many notes of the musical scale for special attention and amplification as we do on the radio-frequency side of a receiver by the selective process of tuning.

SHUNT FED



R2415 FIG 1

An output stage using a choke-capacity coupled transformer. The steady anode current flows through the choke and the audio-frequency current through the fixed condenser and transformer primary. For one particular frequency this is a series resonant circuit.

Improving the Response

Rather do we aim at an even response over the whole of the musical range. There are times, though, when it is desirable to "boost" a portion of the musical range in order to make up for losses which this portion may suffer while passing through certain parts of the receiver. In such cases the principle of series resonance may be resorted to.

For example, in order to bring up certain low notes where these are lacking unduly, the capacity-coupled transformer of Fig. 1 is sometimes employed.

It will be observed that the condenser C is in series with the primary winding of the transformer, so that the series circuit of Fig. 2 is reproduced. For some frequency, therefore, the circuit will be resonant, and when energy of this frequency is fed into it a much larger current will flow

A RESONANT CIRCUIT

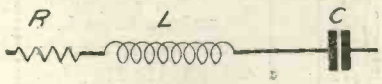


FIG. 2.

Resistance, inductance and capacity in series. The frequency to which the arrangement is resonant depends on L and C, and not at all upon R, which mainly serves to limit the current at resonance.

INFINITE IMPEDANCE

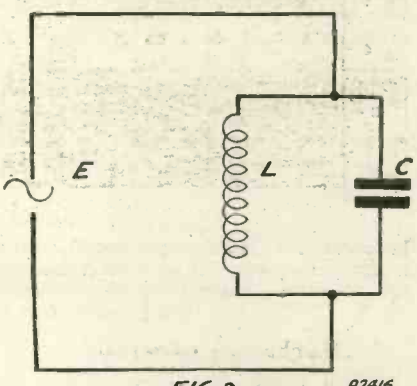


FIG 3 R2416

Applying an E.M.F. across capacity and inductance in parallel. If no resistance is present in the coil and condenser, the combination will act as an infinitely great resistance to oscillations at the resonant frequency.

than would be the case at any other frequency.

Let us suppose that we wish this resonance to take effect at a certain definite frequency, say, 120 cycles per second. Then we can easily find the necessary values of C and L which will effect this.

Resonant Values

For this purpose we use the chart reproduced in Fig. 4. This chart has been designed on the same principle as the two that were given in the last number for radio waves, but the present one deals with audio frequencies.

HOW TO BOOST THE BASS

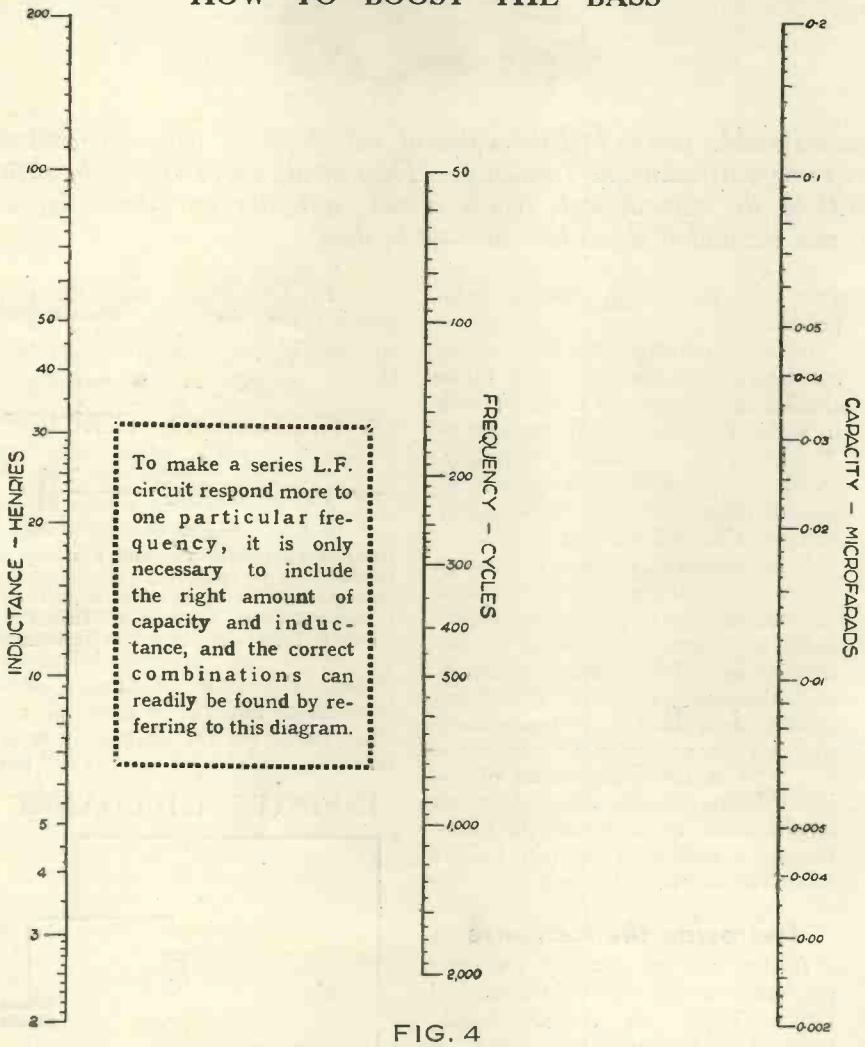


FIG. 4

Supposing that in an output circuit, such as that shown in Fig. 1, we wish to accentuate a certain frequency. If we pivot a straight-edge around this value in the above diagram, the required combinations of inductance and capacity can be read off where the straight-edge cuts the two outside uprights.

A straight line placed across the diagram meets the three scales of capacity, frequency and inductance in corresponding values, so that if two of these are known the third be found straight away.

As an example, we may take the case cited above. If a resonant frequency of 120 cycles per second is desired, we may swing a ruler about this point, using it as a sort of pivot, and read off the corresponding pairs of values of C and L where the ruler intersects the other two scales.

Thus we might have C=0·07 μF., L=25 H., or C=0·025 μF., L=70 H., or, again, C=·022 μF., L=80 H. Each of these three pairs of values would, therefore, give resonance at the musical note corresponding to 120 cycles per second.

It was shown in the last instalment that if an alternating E.M.F. be applied to a circuit which is itself resonant to the frequency of the E.M.F., infinitely great oscillations of alternating current would flow in the circuit were it not for the fact that in practice such circuits are never free from resistance.

That is to say, although at resonance the circuit possesses no reactance, it yet has a modicum of resistance which remains unaffected by tuning considerations, and this resistance operates in accordance with Ohm's Law to limit the amount of current flowing.

Effect of Resistance

A series circuit containing inductance, capacity and resistance, such as that in Fig. 1, thus behaves at the resonant frequency just as though the inductance and capacity were entirely absent and only the resistance left.

The smaller this resistance is, of course, the larger will be the resulting current at resonance.

So far we have considered the series arrangement of inductance and capacity. Now let us turn our attention to their arrangement in parallel, as shown in Fig. 3.

What sort of opposition will this combination offer to the passage of alternating current if we set up an alternating E.M.F. across the whole in the manner shown in the diagram?

The result will be found to be the exact opposite of the case of series working already considered. At a certain frequency, depending on the values assigned to L and C, the series circuit had zero reactance.

Parallel and Series

In the case of the parallel arrangement there is a certain frequency, depending on L and C as before, *at which the reactance of the parallel circuit as a whole is infinitely great.*

In other words, if an E.M.F. of this frequency is applied to the combination shown in Fig. 3, no current at all will flow from the source of the E.M.F.

If we let the symbol X stand for the reactance of the parallel circuit, and E the amplitude of the voltage oscillations at this frequency, then the value of the amplitudes of the current oscillations will obviously be $\frac{E}{X}$, and this, of course, becomes zero when X is infinitely great.

The particular frequency to which the parallel circuit responds in this manner is also called the "resonant" frequency, and depends, as we have seen, on the values of L and C. And now for some good news.

The resonant frequency of a parallel circuit having given values of L and C is precisely the same as the resonant frequency of the series circuit which has the same values of L and C. It is thus very fortunate that we can make use of the same charts as were given last month in order to show the

Complicated Calculations are Unnecessary

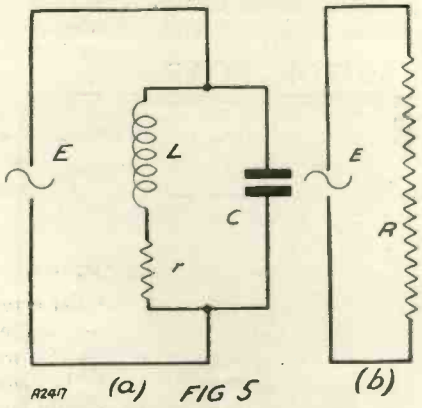
relations between L, C and wave-length in the case of parallel circuits also.

For example, by referring to the first of the two charts in the last number it is easy to see that if L and C of Fig. 4 have the values 300 μH. and 0·00015 μF., the parallel combination will be "resonant" at 400 metres, i.e. it will oppose absolutely the passage of any alternating currents which have this frequency.

The parallel circuit is even more widely used in radio than is the series circuit, and we shall have occasion to allude frequently to it in the sequel.

Such well-known circuits as the "tuned anode" system of H.F. coupling depend essentially on the principle of parallel resonance, by

ANOTHER FACTOR



In practice the coil will have a slight D.C. resistance, as shown in (a). The effect of this is to make the combination behave as a large (but not infinite) ohmic resistance R at the resonant frequency (see (b)).

means of which they are enabled to single out one special frequency for amplification while permitting other unwanted frequencies to pass on their way.

It should be pointed out, however, that, equally as in the case of the series circuit, the parallel combination of capacity and inductance is never actually found to behave in the ideal manner suggested by theory.

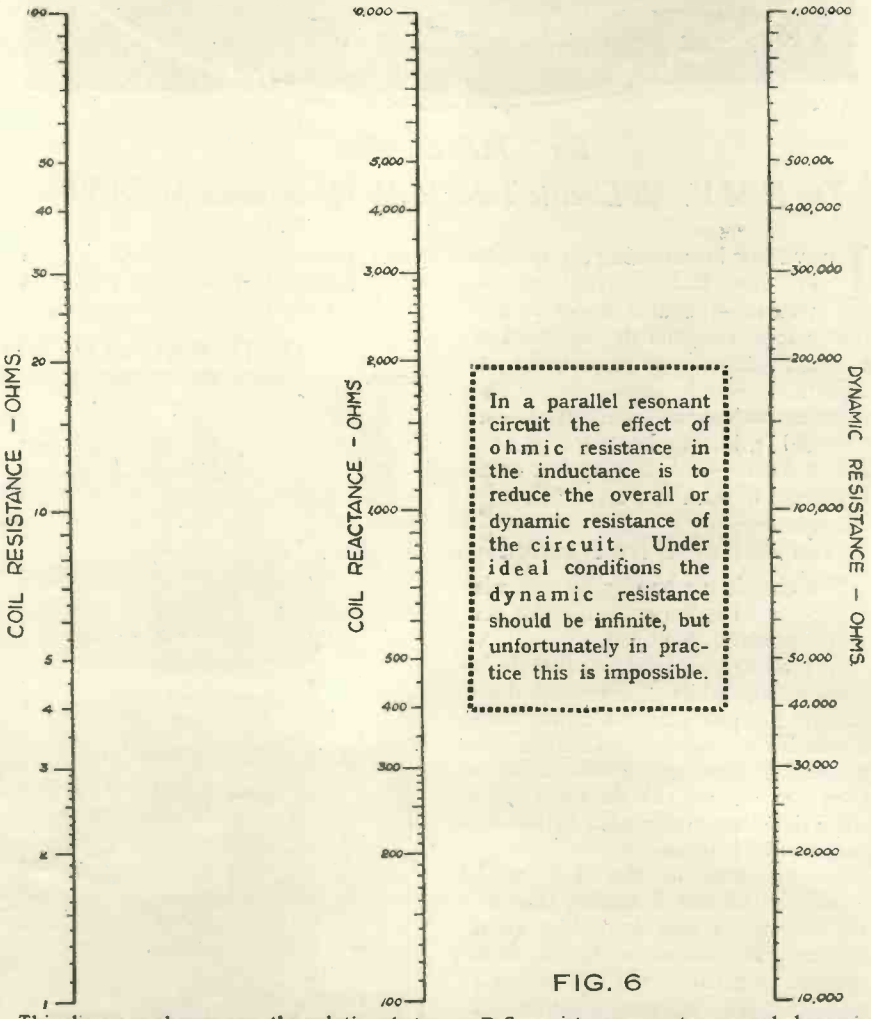
In Practice

There is always the effect of the resistance of the components to reckon with, and in a parallel circuit this operates in a peculiar and at first sight rather confusing manner.

We have seen above that in the ideal case, where no resistance is present, the circuit would behave at resonance like an infinitely great resistance. But, in practice, there is always a small amount of D.C. resistance present in the coils.

This may be illustrated as in Fig. 5a, where the resistance of the coil, usually a few ohms, is denoted by the symbol r. The effect of this small resistance is to reduce the total effective resistance of the circuit at resonance, so that it is no longer infinitely great.

FINDING THE DYNAMIC RESISTANCE



In a parallel resonant circuit the effect of ohmic resistance in the inductance is to reduce the overall or dynamic resistance of the circuit. Under ideal condifions the dynamic resistance should be infinite, but unfortunately in practice this is impossible.

FIG. 6

This diagram shows you the relation between D.C. resistance, reactance and dynamic resistance of a coil. The lower the D.C. resistance the higher the dynamic resistance. The diagram is used in the same manner as Fig. 3.

It will, however, still be a resistance of very large amount—in a typical radio circuit it may be many hundreds of thousands of ohms. This *effective* resistance, or, as it is sometimes called, *dynamic* resistance, may be denoted by the symbol R, and, as shown in Fig. 5b, is the exact equivalent of the circuit of Fig. 5a for currents of the resonant frequency.

We have, then, the curious paradox that the smaller the D.C. resistance r of the coil in a parallel circuit such as Fig. 5a, the greater will be the effective or dynamic resistance R of the circuit to currents of the resonant frequency.

It is very often necessary to know the value of the dynamic resistance of a parallel tuned circuit. For this we need to know two things: (1) the reactance of the coil L at the resonant frequency, and (2) the small D.C. resistance r of the coil.

Armed with these, we can then make use of the chart given in Fig 6, from which the required values of dynamic resistance can be read off on the extreme right-hand scale. In order to find the coil reactance at the resonant wave-length, we turn up the coil reactance charts given in the October and November numbers.

By "TONE ARM."

The H.M.V. All-Electric Table Radio-Gramophone Model 501.

I HAVE just been testing the smallest of the H.M.V. radio-gramophones—the table model No. 501. It is a most scientifically designed instrument, capable of results that are astounding.

Three valves are employed—one screened grid, a detector, and an A.C. pentode—and the very last ounce is got out of each valve.

No Aerial Wire Needed

The circuit is a band-pass one, with triple-gang condenser, while the L.F. transformer is shunt-fed.

A moving-coil loud speaker is incorporated, while "extra speaker" sockets are provided. A mains aerial device is also a feature, so that there is no need to erect an outside aerial, or even use one of the indoor variety, when listening to the main British and continental stations.

In the case of the A.C. model (which is the one I tested, though a D.C. model is also available) an inductor gramophone motor is incorporated, together with the model 15 pick-up. The cabinet is of walnut, and the instrument is of very dignified and compact design.

On test it behaved itself excellently. Plenty of stations were heard at good strength and the quality was of a high order, on the gramophone side as well as on radio.

Very Simple Operation

An ingenious scheme for preventing the input from the pick-up reaching too high a voltage is used, the volume control being limited at its maximum end by a resistance in series with it. This successfully prevents really bad overloading of the detector (first L.F. when pick-up is employed). The extra speaker terminals are placed in parallel with the secondary winding of the transformer feeding the moving coil used in the radio-gramophone, the incorporated speaker being fed by a step-down transformer.

Nothing could be simpler to operate than the H.M.V. table radio-gramophone. One knob controls the wave length range, the on-off switch and the radio-gram change-over.

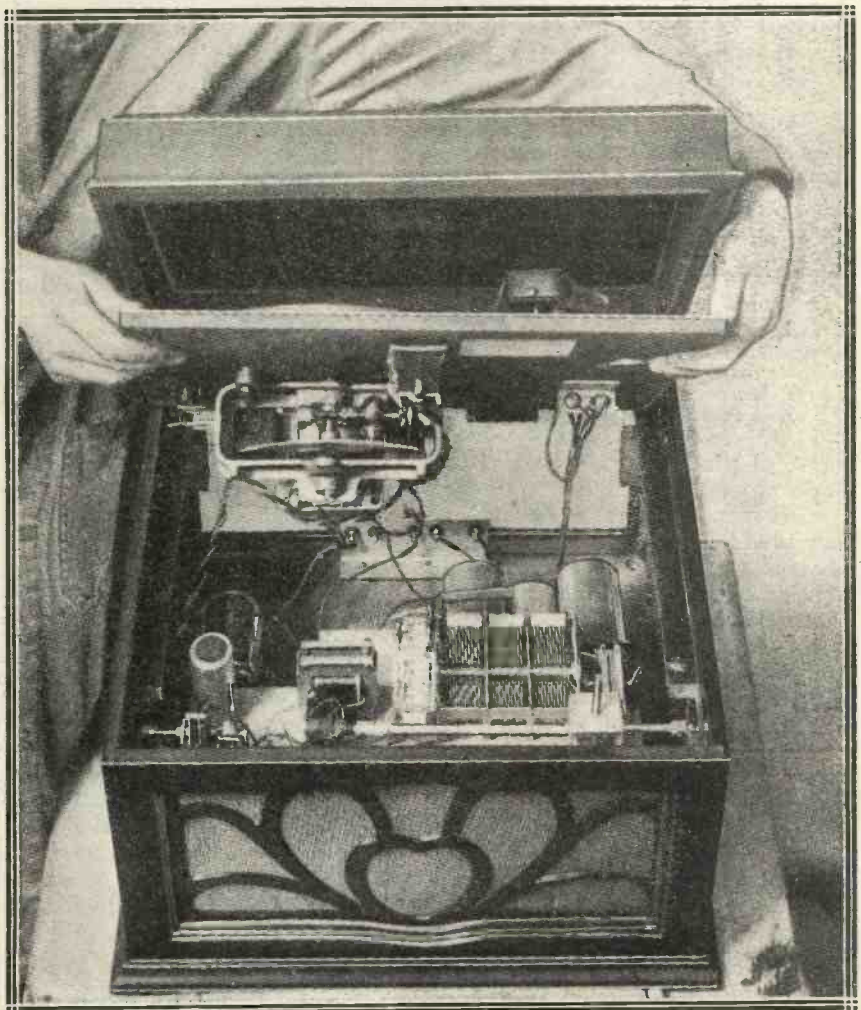
Direct Calibration

Another knob controls volume on either radio or gramophone, and the calibration of the illuminated drum-drive condenser unit is in wavelengths, so that no aggravating calibrations have to be done before you are quite *au fait* with the instrument.

Simple mains voltage adjustment is provided, in the form of a small panel with a number of sockets. These, by means of plugs, allow adjustments for many different voltages to be carried out.

The instrument is clearly the result of much careful thought and at 29 guineas represents remarkable value.

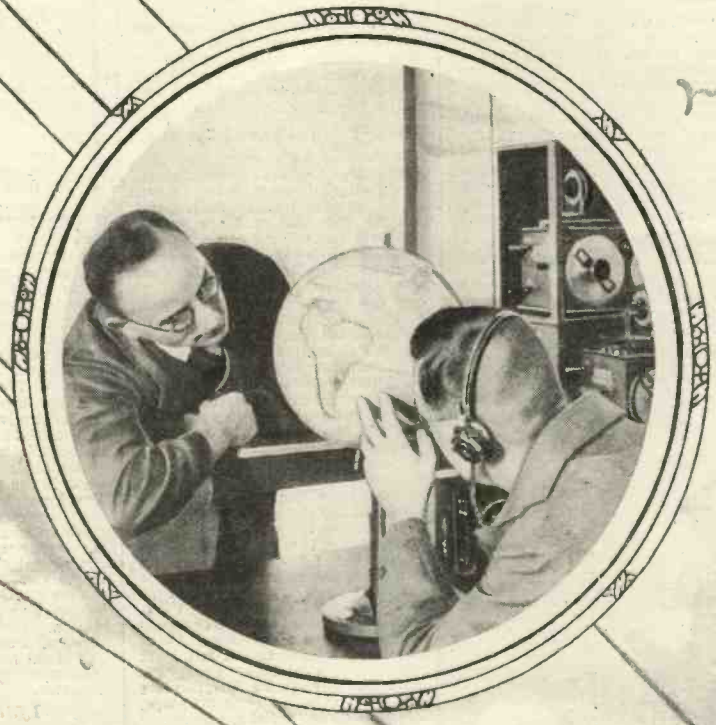
UNDERNEATH THE MOTOR BOARD



This photograph shows the internal layout of the set. The induction motor is seen on the underside of the motor board, while below lies the set chassis with its triple-gang tuning control and band-pass circuits.

THE WORLD'S PROGRAMMES

HOW, WHEN AND WHERE TO HEAR THOSE FOREIGNERS

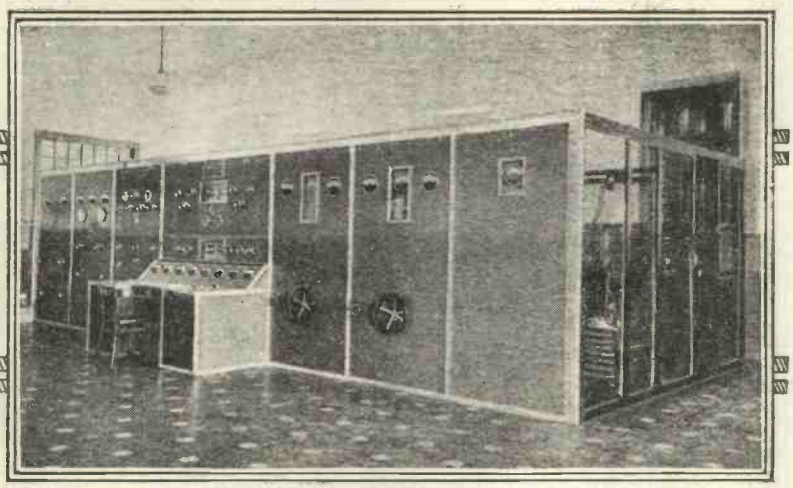


TRACKING ATMOSPHERICS. German technicians who have been making directional observations on atmospherics are here shown speculating on the whereabouts of the source of interference recorded by them.

CONTENTS OF THIS SPECIAL SUPPLEMENT

ALL ABOUT RADIO TRIESTE

Italy's newest and British-built broadcaster whom you can hear on 247·7 metres.



"RAH-DEE-OH TREE-ESS-TAY," it calls itself—and everyone who uses a sensitive set on wave-lengths just below the London National must have heard the new Italian high-power broadcasting station which has been brought into service at Monte Radio, in the suburbs of Trieste.

The new station was officially opened on October 28th in the presence of the Crown Prince and Crown Princess of Italy, His Excellency Costanzo Ciano, the Italian Minister of Ways and Communications, and a large gathering of high Italian dignitaries.

An Excellent Station

The completion of Radio Trieste is a further step in the reorganisation of the Italian broadcasting system. This was undertaken by the E.I.A.R.—the Italian Broadcasting Company—with the aim of covering not only the main industrial and artistic centres of Italy with an adequate broadcasting service, but also the less densely populated countryside. And it has given British listeners an excellent alternative programme.

Heard Throughout Europe

The powerful voice of the new Trieste broadcasting station has been heard at great strength and clarity far beyond the Italian borders, and already the Station Director has received many favourable reports from listeners in Great Britain, Germany, Switzerland, Holland, Yugo-Slavia, Albania, Greece, Turkey and Spain. An English report comments on the extreme purity of the transmission, equalling that of the B.B.C. stations.

There is no cause for surprise in this, for the Trieste transmitter was manufactured at the Marconi Works at Chelmsford, which has provided many of the principal broadcasting centres in Europe with their equipment. Notable among these is the super-power station near Warsaw, which is one of the largest long-wave broadcasting stations in the world. The Trieste transmitter is of the Marconi PA.14A type, and it embodies the latest refinements of modern broadcasting technique.

Up-To-The-Minute Design

The principle of low-power modulation has been adopted, a stage of small power being modulated, after which the modulated energy is delivered through an intermediate amplifier to the last or power stage, and then to the aerial system.

Powerful water-cooled valves are used in the main amplifying stages. The unmodulated energy of the Trieste transmitter is 10 kilowatts; modulation up to 100 per cent can take place, so that the C.C.I.R. rating amounts to 15 kilowatts.

The transmitter covers the wave-band of 200 to 545 metres, but the working wave of the Trieste station is 247·7 metres, or 1,211 kilocycles.

Everybody interested in foreign radio knows that, in view of the already overcrowded state of the ether, the necessity for new broadcasting stations to adhere with great exactitude to their allotted wave-lengths has become a matter of the greatest urgency. The Trieste station complies in this respect with the most advanced requirements.

A special crystal drive, fitted in a heat-insulated box, with thermostatic control, prevents any variation in the transmitted frequency. Developed in the Chelmsford research laboratories, this form of drive ensures that the constancy of the carrier wave is well within the exacting limits specified at the Hague Conference in 1929.

Two masts, each of 80 metres in height, carry the aerial of the Trieste station. The aerial is of the "T" type, with a single wire horizontal top of 20 metres in length and a three-wire cage down-lead 3 ft. in diameter.

Efficient Aerial

The down-lead descends vertically to a feeder house situated below the aerial half-way between the masts, and feeder lines, suspended on poles above the ground, convey the energy from the transmitter output stage to the aerial coupling circuits in the feeder house. This method has proved extremely successful, and it was tried under the most stringent conditions when applied to the Brookmans Park station.

The new Trieste station can be regularly heard with great strength in the British Isles, and English listeners may find pride in the fact that the equipment, which has already placed Trieste amongst the foremost broadcasting stations in Europe, is of British design.

If you have not already heard "Rah-dee-oh Tree-ess-tay," turn your tuning dials down well below London National—about half-way between it and Nurnberg, or Belfast—and listen for the clear-voiced woman announcer, speaking tunefully in Italian.

"Buona Notte, Signores"

You will not have to wait long, in all probability, for the station has been "romping in" at far greater strength than might be expected from its rated power. And there is quite a thrill in being wished "Good-night" in such a pretty tongue as Italian.

It usually comes at the conclusion of two martial airs—one the Royal Italian March and the other the Fascist Hymn—which follow the announcement: "Fine della trans-missione."

The latter sounds like "Finny della trans-missy-oh-knee"; and then comes "Buona Notte, Signores"—you being one of the signores in question, and "Buona Notte," of course, "Good-night!"

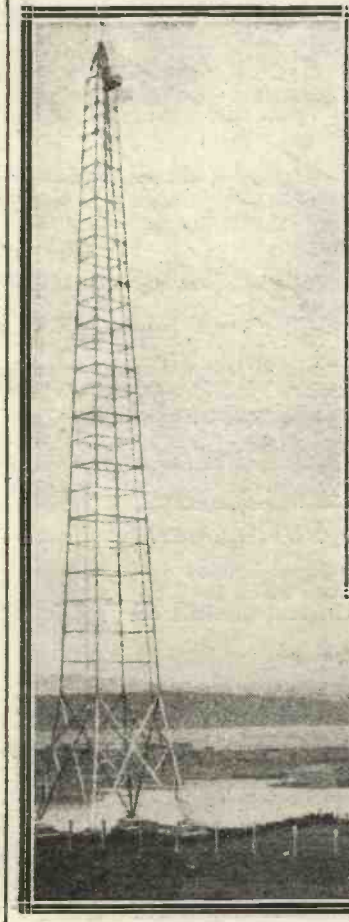
PICTURESQUE!

The Trieste station is picturesquely situated, overlooking the Adriatic, and below is a general view of the station with its feeder-hut and lead-in midway between the masts.

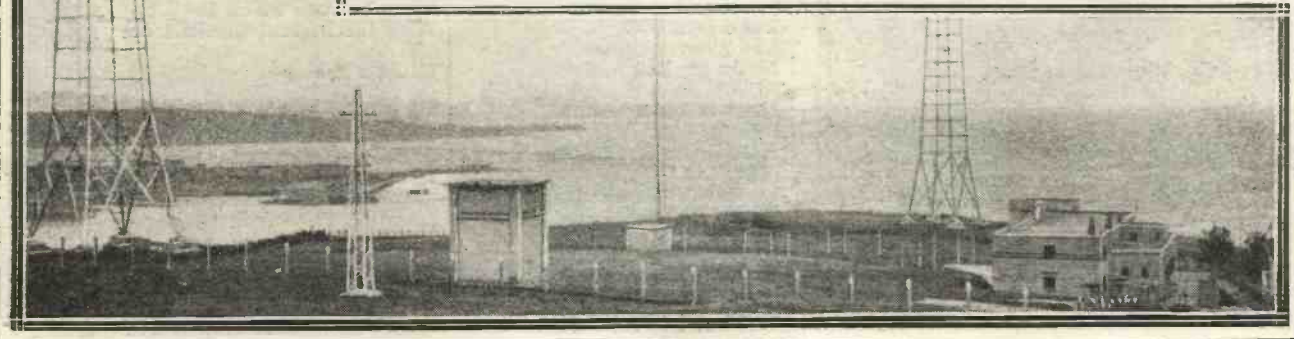
The upper picture shows the transmitter with the control desk in the foreground.

RADIO TRIESTE.

Wave-length: 247·7 m.
Power: 10 kw.
Opening Signal: Bell.
Interval Signal: Nightingale.
Distance from London: 755 miles.



LOOKING OVER THE ADRIATIC TO VENICE



STATION ALTERATIONS

Items of broadcasting news of interest from here, there and everywhere.

BARCARENA, near Lisbon, is named as the site for a new Portuguese broadcasting station to operate on 456 metres.

* * *

HILLSBOROUGH, N.J., the headquarters of International Communications' Laboratory, have asked for permission to erect two transmitters working on wavelengths between 1 and 3 centimetres! (The former represents a frequency of 30,000,000,000 cycles per second!)

* * *

CORK. The announcement "Glaodhach radio Corcaighe é séo" means "Cork Calling."

* * *

PRAGUE has evidently been a great success in its own district, for licences have gone up over 10,000 in a month.

* * *

REYKJAVIK station authorities would be glad to hear from British listeners who have been able to pick up this station.

* * *

GLEIWITZ and other German stations are now regularly attempting relays of American broadcasts, usually between 8 and 9 p.m.

* * *

CARDIFF. The B.B.C. will provide a studio for broadcasts from the Cardiff Industries Exhibition, to be held from February 11th to February 24th in the Greyfriars Hall.

* * *

CHELMSFORD. The 1-kw. ultra-short-wave transmitter designed for the B.B.C. is now completed.

* * *

HOLLAND is the latest country to consider a regional scheme. The Finance Minister has suggested that two powerful stations would be quite sufficient.

RADIO LUXEMBOURG, the 200-kw. "publicity station," is expected to begin testing in July.

* * *

FECAMP (Radio Normandie) usually closes down with a local folk song.

* * *

MUNICH transmits official police news from 07.00 to 08.00, and from 19.00 to 20.00, on 1,340 metres.

* * *

BUDAPEST police have established a radio organisation for disseminating emergency messages. An 800-watt transmitter is used.

FROM A VIENNESE CAFÉ

A scene in one of Vienna's oldest and most famous cafés, from which outside broadcasts are frequently given on 517 metres.

U.S.A. The recent U.S.A. census disclosed that over 40 per cent of American households now contain radio sets.

* * *

ICELAND. The Reykjavik transmissions (1,200 metres) are usually made at the following times: 19.30 G.M.T., service (on Sundays). 20.30, news and weather. 21.00, time signal. 21.05, talks. 21.30, news. 22.00, concert or play. Dance music till 01.00.

* * *

TURIN'S increase in power is partly due to the modulation percentage being raised from 70 per cent to 100 per cent.

* * *

LIÈGE REGIONAL has been carrying out tests on 215 metres.

* * *

FALKIRK may be hearing "artificial aerial" tests from the Scottish Regional before the end of April.

KALUNDBORG has a woman announcer during the afternoons.

* * *

THE VATICAN engineers have decided to instal an ultra-short-wave outfit to keep in touch with the Papal Villa at Castel Gandolfo.

GERMAN STATIONS have now discontinued the 10-minute time signal formerly broadcast daily.

* * *

KONIGSWUSTERHAUSEN now broadcasts a two-minute time signal daily, terminating at 1 p.m.

* * *

BLOEMFONTEIN recently enjoyed its first broadcast from the new relay station on Naval Hill.

* * *

RADIO-PARIS has made arrangements with the Opera Comique for ten broadcasts during the present season.

* * *

EIFFEL TOWER sends out a time signal at 9.26 a.m. and one at 10.26 p.m., on 2,650 metres.

* * *

SAN SEBASTIAN usually works from 7.30 to 9 p.m. on Mondays, Wednesdays, and Fridays, and from 10 p.m. to 12 on other days.

* * *

ARCHANGEL has been heterodyning the Frankfurt transmissions on 390 metres.

* * *

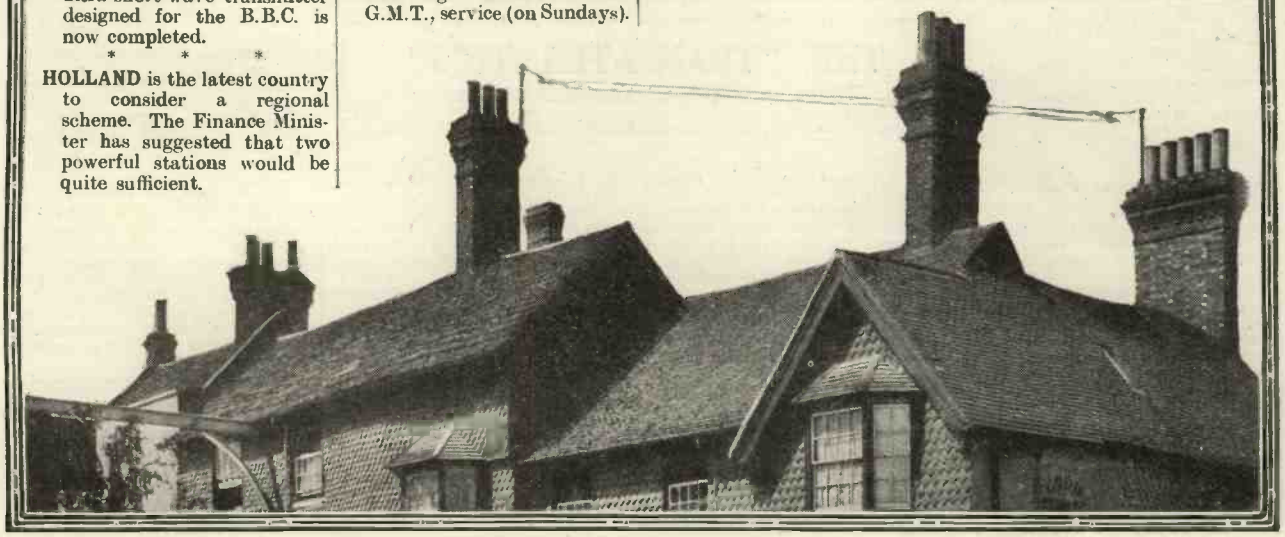
MADRID appears to have been completely eclipsed on 424·3 metres by Moscow Stalin.

* * *

MOSCOW (Old Komintern) has been getting over well with an early morning transmission on 1,481 metres.

* * *

ZAGREB, Yugoslavia, occasionally gives a "Young Authors'" programme, when writers are allowed to read from their own works.



TUNING-IN "DX"

Some practical hints on how to handle a short-waver to get the best results from it.

WHY is it that, even with a commercial "one-knob" set, there is usually one member of the family who can provide the magic touch necessary to bring in all the foreign stations, while the others merely achieve a futile fumble?

It can't be a matter of luck; at least, you can't imagine that unless you are very superstitious. All that it boils down to in the end is a certain dexterity possessed by the favoured one; and though there are some people that can never hope to possess the patience necessary for threading a needle, it *is* possible to learn!

We all know the "ham-handed" method of attacking a wireless set. Round go all the dials at once; any switches available are pushed up and down; the reaction control is handled most unmercifully; and the net result is plenty of squeals, but very few stations.

The Best Methods

Generally the average short-wave set requires more delicate handling than even the sharpest of broadcast receivers, while even the best of short-wavers are not too easy for the uninitiated to handle. Thus a few hints on the best methods to adopt when coaxing them may be of assistance to those readers who are not yet experts.

First, a few words on the technical side of the subject. If your short-wave set is a commercial product, these do not apply. If, however, it is home-made, or if you are just toying with the idea of making one, take careful note.

An important thing to remember, if you want your set to bring in everything, is this: Do not try to cover too wide a wave-band in one swing of your condenser. This means—use a smaller condenser and more changes of coils. The slight extra trouble of coil-changing will be repaid by the ease of operation.

Next, use a really good slow-motion dial, not only on the tuning control, but, if possible, on the reaction condenser. This is always well worth while.

The remaining points deal more with the operation of a set that is not all that it might be. The first is—get rid of "hand-capacity effects." These need not be present, even in a short-wave set. If they are, try the following expedients. Remove the earth lead, if you use one. Its removal quite often improves matters.

If this does not work, try a small adjustable condenser in series with the earth lead, and see whether you can find a point at which the hand-capacity troubles disappear

A False Panel

If this is of no avail, cover the back of the panel, and also the underside of the baseboard, with copper foil, and earth it. If you still can't hold a signal when you take your hands away from the controls, there is nothing for you to do but mount a false panel (preferably of wood or ebonite), a few inches in front of the other, and bring the control knobs through by means of ebonite extension rods.

It has been assumed, of course, that in your set it is the moving plates of the variable coudensers that are earthed. If this is not so, you may expect hand-capacity trouble, and you will certainly find it!

Another important point is that the reaction control must be smooth. When you go from oscillation outwards, or from "non-oscillation inwards," there should be no "plop" and no musical howl. The howl may be stopped by various expedients which have been detailed from time to time by "W.L.S." in these pages. The "plop" is generally caused by excessive H.T. on the detector valve, a wrong choice of valve, or possibly one which has partly lost its emission

How to Search

Now, assuming that all the little matters mentioned are in order, we will deal with the actual procedure of tuning in a signal. On short waves it is not usually possible to search, as one should on broadcast waves, with the receiver not oscillating. Search with the set *just* beyond the oscillation point but only just beyond. You will not interfere with other listeners on the short waves, unless they are next door! If you go too far, signals will be much weaker and more difficult to tune. Rotate the detector tuning control very slowly, and keep the reaction control always in such a position that a movement of about one degree—or even less—stops oscillation.

When you hear a carrier-wave, move the reaction control by this amount at once. And here is the rub. Probably the movement of the reaction condenser, or whatever control you are using for reaction, will affect the tuning slightly. Thus, in effect, you will have lost your signal. When you have got the knack properly this will not happen. You will simply move your tuning control *in* by about half a degree as you take the reaction control *out* by half a degree, and you should be very near the true tuning point.

In a Nutshell

At all events, if you are on your signal, with the set oscillating, and you give your reaction control such a delicate touch that the set is only taken just the merest fraction below the point of oscillation, you should be able to hear your speech or music faintly, and tune it up to full strength by a hair-breadth movement of the main control.

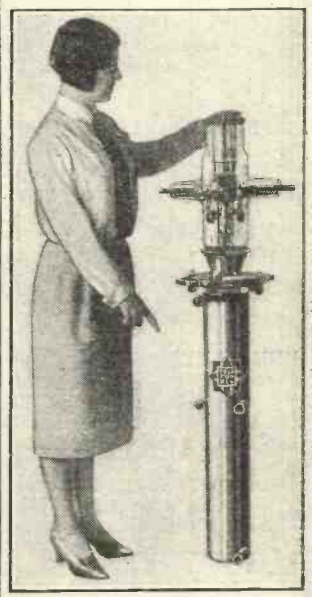
There you have the principle of tuning in a nutshell. No jerks, no sudden wrenches, but just a smooth, continuous movement.

Do not take up the practice of listening to the carrier-wave of a broadcast station with the set oscillating, and trying to get down into the silent point. You will almost certainly produce a heterodyne note again when you remove your hand from the dial.

RADIO BUCHAREST

Madame Cretzoi, the "voice" of Bucharest, on 394 metres.

SOME VALVE!



An interesting illustration of the size of a modern water-cooled valve.

THE "TRANSATLANTICS"

Notes on Receiving American Stations.

TO an old-stager it is very queer to reflect upon the changing conditions under which long-distance radio reception and transmission are carried out. Many of us, of course, treasure up memories of radio long before it was dreamed that programmes from across the Atlantic would *ever* be heard in this country.

"*Wonders Never Cease*"

When, in the winter of 1923, during the transatlantic tests, American signals were heard "loud and clear," we simply expressed the view that "wonders would never cease," and left it at that. But when it was found that they came over *consistently*, if only one had a good enough receiver we really began to sit up and take notice!

But what of to-day? Anyone with an *average* receiver (not even a good one) can receive American broadcasting on about one night in four. The secret, of course, is *short waves*.

As a guide to those who have not yet sampled the joys of listening to an American accent announcing a programme by the "Blank Tooth-Paste Corporation," the following short notes may be useful.

First, you will need a good short-wave receiver. Next, you will have to get some idea of "where you are," speaking in wave-length. This subject has been covered from time to time.

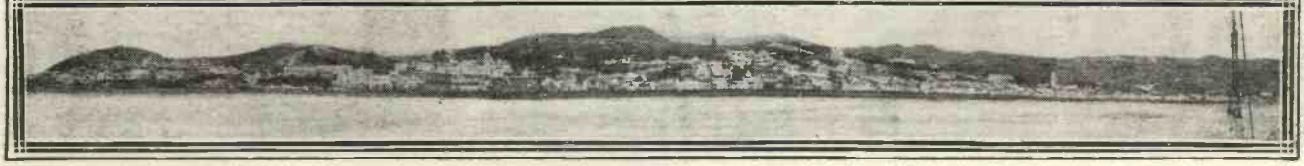
All that remains is to tune the set to about 50 metres at 11 p.m. one night, and to search patiently round that region. Within ten degrees of the dial there should be four or five American stations. If you don't find them right away, listen to something else for an hour and then go back. If you repeat this performance on three or four consecutive nights without identifying an American you are *very* unlucky.

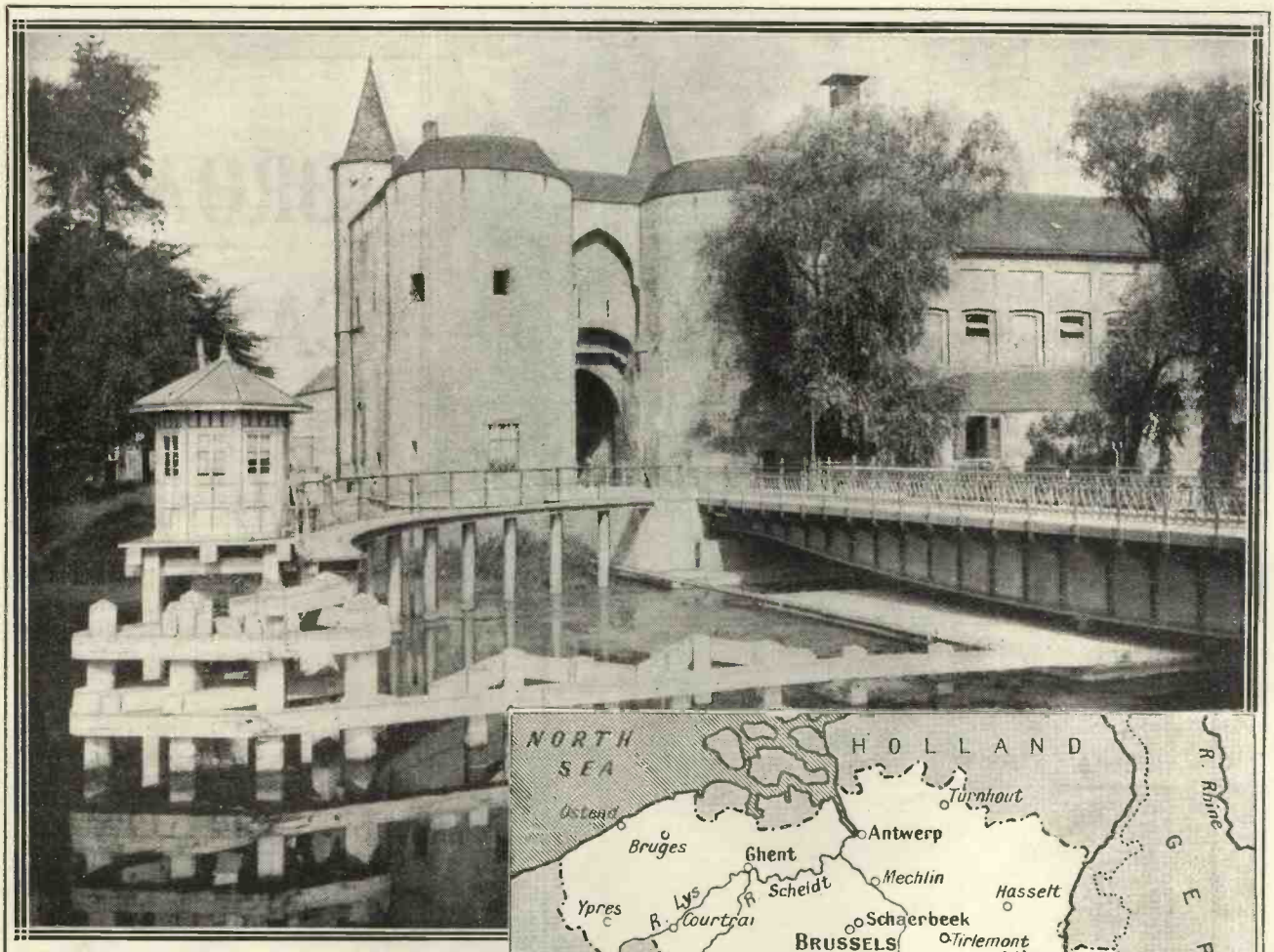
Good stations to look for are the following: W 3 X L, Bound Brook, on 46·69 metres; W 8 X K, K D K A, Pittsburgh, on 48·86 metres; W 3 X A L, Bound Brook, on 49·18 metres; and W 8 X A L, Cincinnati, on 49·5 metres.

Round 32 Metres

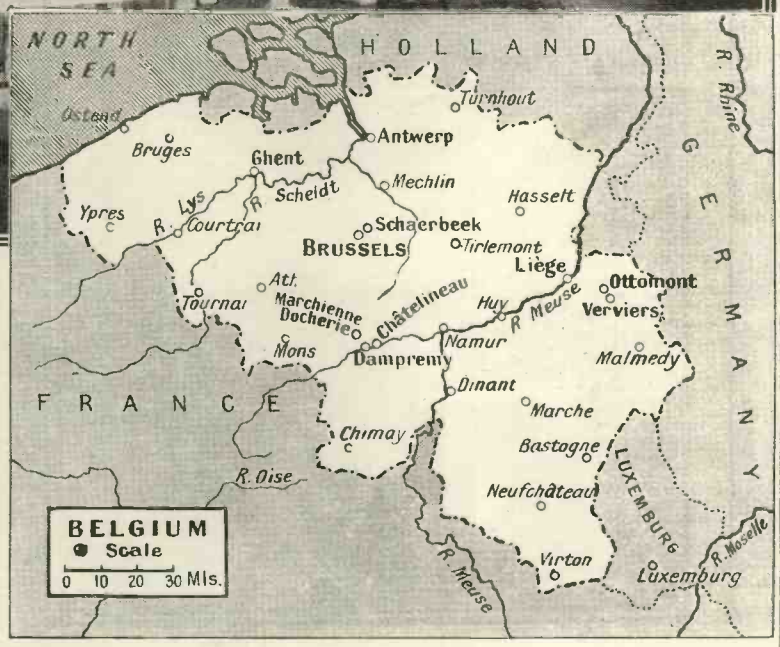
To a talkie-educated public it is only necessary to catch about four words of an announcement to identify the American origin!

As soon as you have identified 32 metres on your dial, you may try again. In this neighbourhood you will find W 2 X A F, Schenectady, on 31·48, and W 1 X A Z, Springfield, on 31·35.





Typically Belgian is the delightful scene shown in our picture of the Porte de Gand, Bruges.



Countries to Listen for—

BELGIUM

ALTHOUGH it is very favourably situated for reception in England, Belgium has not always been a favourite country here from the radio point of view. Its neighbour, Holland, at about the same distance, was providing us with regular programmes of good quality long before there was any general interest in the broadcast from Belgium; but during the past twelve months or so a complete change has come over the situation, and now the closing of the Belgian stations would be quite a catastrophe for many listeners in this country.

Tuning To Brussels

Probably most readers will be well aware how to find the Belgium programmes, but for the sake of those who may be a little uncertain, their wave-length positions can be outlined in a few words. There are only two stations of real importance, namely, Brussels No. 1 and Brussels No. 2.

Both of the Brussels stations employ a power of 15 kw., and Brussels No. 2 on 338·2 metres puts out its programme in the Flemish language. The nearest British wave-length is that of the London Regional, and Brussels No. 2 is below this and separated from this by five stations, namely, Graz (Austria), Leningrad (very seldom, if ever, heard), Barcelona, Strasbourg-Brumath, and Brno.

Brussels No. 2 comes next. Below it is a common wave-length of 335 metres shared by Cadiz and Pozuau, neither of which stations is usually to be heard in this country. But in descending order of wave-lengths there next come three important stations, the first being Milan (Italy), which recently moved from over 500 metres to make way for the new Florence station.

Easily Found

Directly underneath Milan is Post Parisien on 328·2 metres (which shares a wave-length with Grenoble, France), and immediately below this is the Breslau station, which, although it employs a rated power of 1·5 kw., is often heard in this country.

As you will see, most of the above stations are well received in Britain, so the position of Brussels No. 2 is easily found relative to any the dial-reading of which is known.

The Brussels No. 1 station on 509 metres is still more easy to recognise from its neighbours. It comes immediately below the Vienna station, which, on most receivers, is about ten degrees from the top of the dial.

On almost the same wave-length, separated by less than 1 kilocycle instead of the normal 9 kilocycles, is the new Florence station, which has recently been testing on high power. And about two degrees lower still on the dial there is Prague, the Czechoslovakian high-power newcomer which has been doing great things on the wave-length immediately above that of the North Regional.

The Other Stations

There are several other Belgian stations, but none are received consistently except in their own immediate neighbourhoods.

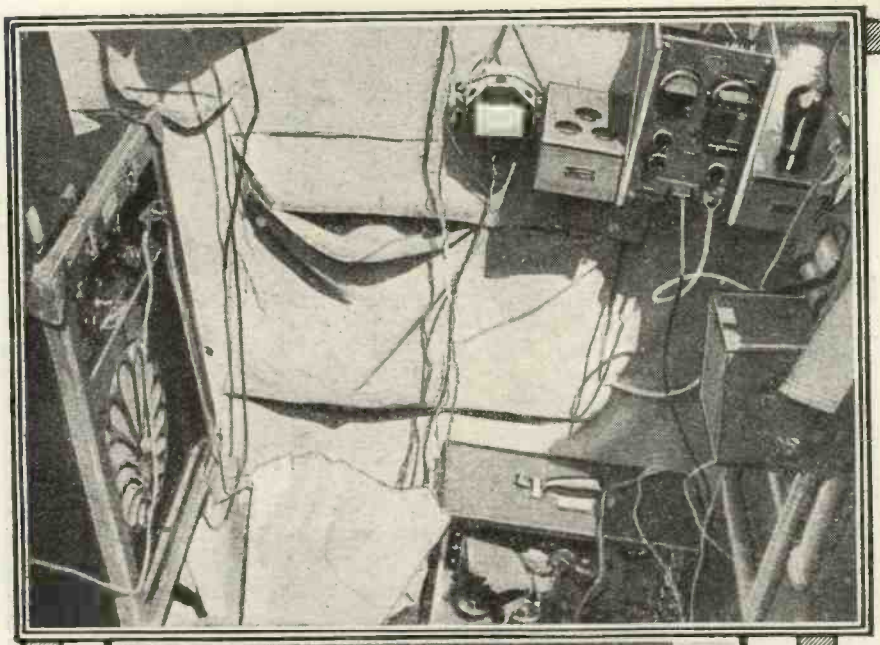
Belgium itself has an area of about 11,400 square miles, and Brussels is situated near the middle of it. It is the old capital of Brabant, and of the Duchy of Burgundy, and it dates from the seventh century.

Brussels has had an eventful history, its last invasion being by the Germans, who entered it on August 20th, 1914.

Two Languages

The total population of Belgium is round about eight millions, about half of whom speak Flemish alone. Another very large proportion of the population speak French alone, and it is, of course, this duality of language which necessitates Brussels having two stations speaking different tongues.

Apart from its two main stations, Belgium has several small independent ones, including Radio Schaerbeek and Radio Chatelineau. But at the moment difficulties in connection with advertising have restricted or closed these, and in any case they are not comparable with either Brussels No. 1 or No. 2 as possible providers of alternative programmes.



BROAD-CASTING FROM A BALLOON

Some interesting pictures of aeronautics in Austria.

Quite a novelty in radio entertainment was given to Austrian listeners, in the form of a talk from a balloon engaged in a long-distance race.

The top picture shows the sending gear in the gondola, with the microphone slung to the side of the car.

* * *

The second picture shows the balloon straining at her moorings and all ready for the release and the race.

* * *

To the right is a close-up of the aeronauts fixing the aerial by which they kept in touch with the radio receiving station on the ground.

LONG-WAVE LISTENING

A Time-Signal Tip—The Latest from France — Reykjavik's Request.

APPARENTLY the new Radio-Paris station is now behaving much better than when it first took the air, and morning reception has been distinctly good. Listeners who have a train to catch in the morning, and who sometimes forget to wind their clocks overnight, might like to be reminded that the Radio-Paris station puts out a time signal at eight o'clock.

Daylight Reception

Stay-at-homes and invalids will long since have discovered that there is often a good deal of activity on long waves quite early in the morning; and though at the moment of writing the medium-wave stations are coming over so well that one can safely neglect the long-wavers to listen for the early morning Germans on medium wave-lengths, it will be on the long waves that daylight reception is best when the days lengthen.

It is probable that next year will see many changes in the long-wave station situation, including the belated improvements to our own Daventry, considerable activity on the Russian front, and possibly a straightening out of the French position. Under the General Ferrie plan for broadcasting, the idea is now to provide a very powerful long-waver to take the places of Radio-Paris and Eiffel Tower, the suggested power being 100 kw.

Good in England

This would certainly provide enormous strength all over England, and particularly in the south, where even on comparatively low power the French programmes have always been popular.

The improvement of Radio-Paris programmes appears to have put Eiffel Tower on its mettle, and the strength of programmes from this station continues to be unusually good. Konigs-Wusterhausen is still good, though he appears to have faded off a little from his form of some three or four months ago; 60 kw. is being employed at the Berlin long-waver, but many stations of much lower power, like Motala and Kalundborg, are being received at far greater strengths.

One of the best of the long-wavers is certainly Warsaw, on 1,411 metres, which is only about 34 metres below Eiffel Tower—a very small separation indeed for long wave-lengths. On my own aerial, Eiffel Tower, owing to the much shorter distance, is generally the stronger, but Warsaw can usually with a little careful use of reaction be sharpened up to deliver a clear quality, good programmes even in daylight.

H. G. WELLS IN AMERICA.
The famous author broadcasting from a New York studio.

Reliable After Dark

After dark Warsaw is on the reliable list and it is amazingly superior to such stations as Moscow Trades Union and Leningrad.

The authorities of the Reykjavik station, Iceland, have been asking for reports from long-distance listeners, so anyone who has definitely identified this station (on about 1,200 metres) is invited to write to the station.

HERE AND THERE

Heilsberg's Record—Heston's Weather Reports—Naples' New Wave-length.

BISAMBERG, 8 miles from Vienna, has finally been selected as the site for Austria's new high-power station.

* * *

BINCHE-RADIO, a small Belgian station, is protesting vigorously against a recent ministerial decree against radio advertising.

* * *

BRUSSELS No. 1 and BRUSSELS No. 2 are exempt from the above decree.

* * *

BRUSSELS CHECKING STATION identified 45 unknown transmissions last season, some of them being from stations over 2,500 miles away.

* * *

HEILSBERG was recently picked up at good strength in India on a 3-valve set.

* * *

HESTON AIRPORT weather reports are broadcast in connection with the A.A.

* * *

RADIO SUISSE ROMANDE, like Beromunster, its fellow Swiss Regional, is an early-to-bed station, and has usually closed down well before 10 p.m.

* * *

LEIPZIG is one of Europe's early birds, and is often on the air before 6 a.m.

* * *

RABAT, MOROCCO. This station has been heard (using the call-sign F V C N) on 32 metres.

* * *

VENEZUELA, Y V Q. Signals from this little-known station on 16·39 metres have been picked up in Lancashire.

* * *

THE VATICAN. Times of transmission are 10.00–10.30 and 19.00–19.30 weekdays. Sundays and Feast Days, 10.00–11.00.

* * *

GENOA is shortly to increase its power.

BARI, the latest of the Italian main stations, is to rank in importance with Rome, Milan, Florence and Trieste.

* * *

PALERMO, which is supposed to work on 212·4 metres, has been sharing the Sundsvall wave-length (542 m.).

* * *

BOLZANO recently increased its power, but is remaining on 368·1 metres with Helsinki and Seville.

* * *

NAPLES is now working on 319 metres.

* * *

SYDNEY, N.S.W., churches —Anglican, Presbyterian, Methodist, Baptist and Congregational—have co-operated in sponsoring a new station to work on 248 metres. Its call will be 2 C H.

RADIO-PARIS is still, at the time of writing, making alterations to its new station, and some morning programmes are emanating from the old Clichy transmitter.

* * *

NAPLES recently relinquished its wave-length, 331·5 metres, to Milan, who had long been working on 501·7 metres.

* * *

MILAN expects its new high-power station to be working this spring.

* * *

FLORENCE has been allotted the old Milan wave-length (501·7 metres) because it has difficult wooded country to serve.

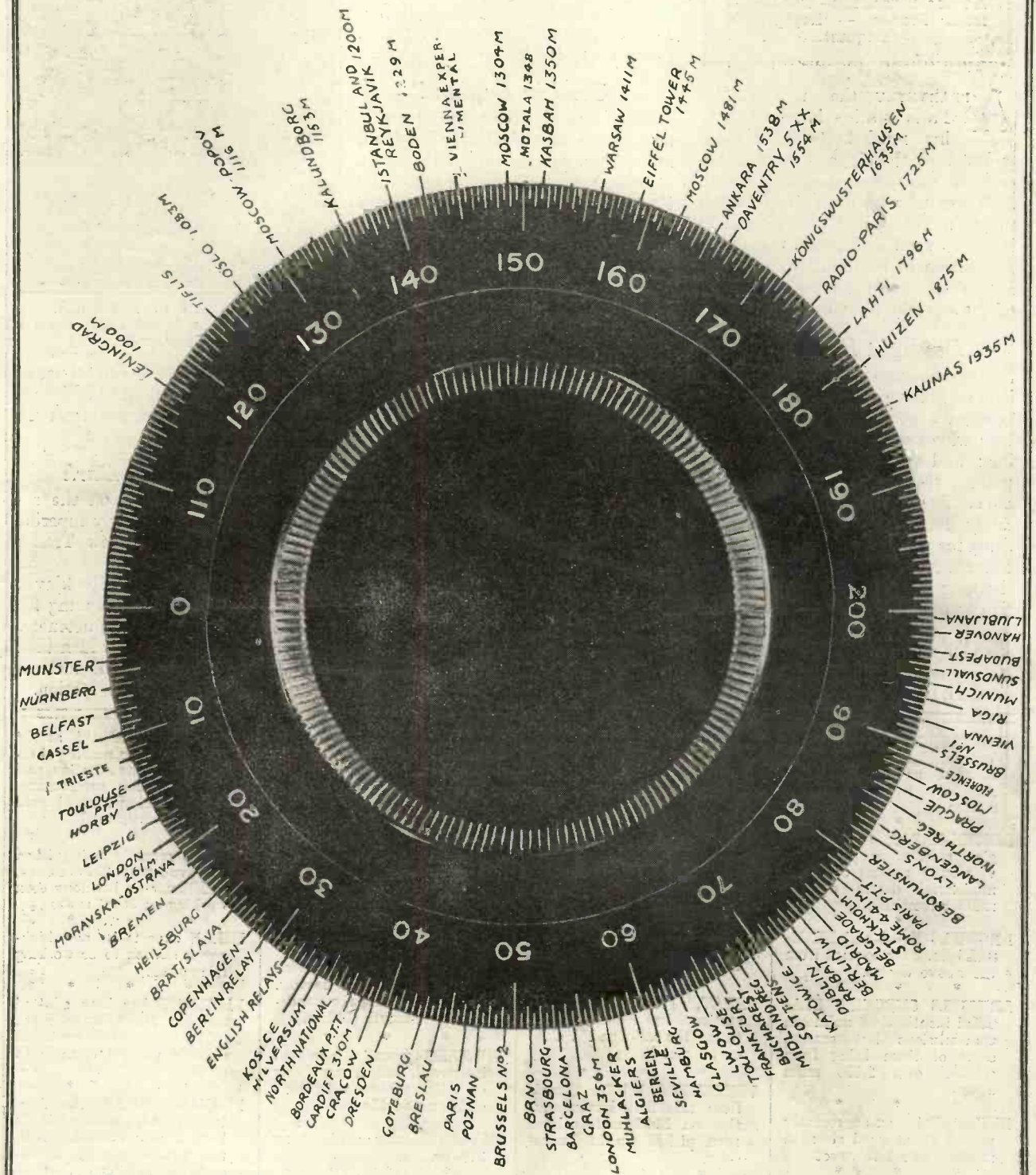
* * *

PENNANT HILLS, the Australian radio centre, is to have a new station, 2 S M, to provide special broadcasts for the Roman Catholic Church. (The letters SM indicate St. Mary's Cathedral.)

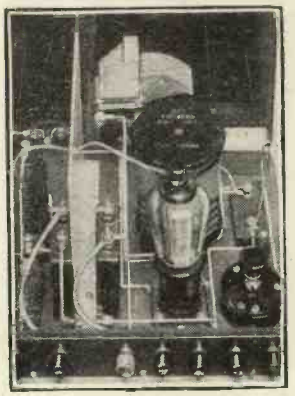
* * *

2 S M is to be run on commercial lines, in competition with other "B" stations, for advertising revenue.

A SEPARATE READING FOR EVERY STATION!

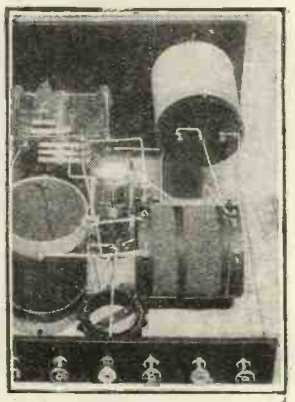


HOW THE STATIONS STAND ON A TYPICAL EXTENSER



STATION INFORMATION

The New Regionals—Langenberg's Accident—Turin Turns Over a New Leaf—Florence's Bow—A Mexican Monster—Building as a Mast!



FRANCE intends to equip all her large towns with radio police stations fitted with Belinographs, for picture transmissions.

* * *

PARIS. The Radio Police station has been doing early morning testing on wavelengths between 1,200 and 1,400 metres with a power of 2 kw.

* * *

GENEVA recently opened a service of broadcasting to its telephone subscribers.

* * *

WASHFORD CROSS, near Watchet, is the site of the new B.B.C. Western Regional station.

* * *

WESTERGLEN, near Falkirk, is where the Scottish Regional station is being built, and it should be testing in a few months time.

* * *

LANGENBERG had one of his masts blown down during a gale, but the service was carried on successfully by a temporary one.

HAMBURG uses the Morse letters ▪ ▪ ▪ ▪ ▪ ▬ (H A) as an interval signal.

* * *

REYKJAVIK, the Icelander, has been experimenting with small wavelength wobbles, apparently to dodge interference.

* * *

TURIN, for long the despair of the Prague Planners, because of its persistent wave-length deviation, has at last returned to 274·2 metres, where it belongs.

* * *

LENINGRAD is one of the stations that now puts out occasional programmes in Esperanto.

* * *

U.S.S.R. stations such as Leningrad and Moscow frequently give "physical jerks" programmes in the early morning.

* * *

AACHEN is the German name for what we call Aix-la-Chapelle. This station works on 227 metres.

* * *

LODZ, the Polish station on 235 metres, is still working experimentally with a power of 2 kw.

* * *

A 40-FT. SAILING BOAT, which is undergoing a round-the-world trip from Daytona Beach, plans to keep in touch with amateurs of all countries by short-wave radio.

* * *

PALISADES, N.J., is reported to be the centre of amateur 5-metre transmission work, at least fourteen enthusiasts in that neighbourhood being in regular communication with each other.

* * *

SOUTH KENSINGTON. Visitors to the Imperial Institute were recently afforded the opportunity of hearing and seeing the 5-metre transmitter developed by the P.O., in action.

* * *

ATLANTIC CITY, W P G, the American station in New Jersey, has been getting over the Atlantic well on 273 metres.

* * *

HEILSBERG has recently been coming through in daylight at remarkably good strength.

TURIN recently increased his power to more than double its former value.

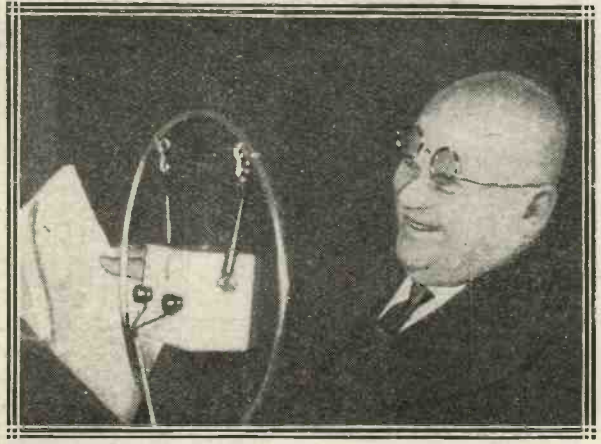
* * *

BULGARIA is planning a big broadcasting station to serve the country around Sofia.

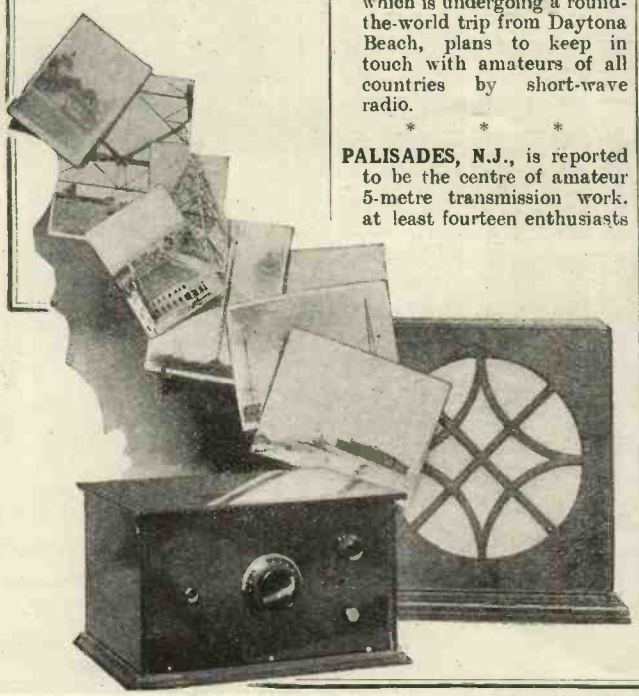
* * *

MOSCOW-STALIN, the 100-kw. station on 424·3 metres, is causing considerable interference with Berlin Witzleben on 418 metres.

"HAVE YOU HEARD THIS ONE?"



A quarter of an hour of the latest jokes is a popular item of the Munich programmes! Would not this be a good lead for the B.B.C. to follow?



The distance from London is 868 miles, and the wavelength 276·5 metres.

* * *

FLORENCE, the new Italian station, should be conducting its high-power tests regularly by the time these lines are in print.

* * *

MILAN'S wavelength is being used by the new Florence station after Milan has closed down.

* * *

"RADIO FIRENZE" is the Italian name for the new "Radio Florence."

* * *

HUNGARY'S new high-power station, to supersede the Budapest transmitter, is making good progress.

LANGENBERG has taken its new transmitter into service for all evening and Sunday programmes.

* * *

MEXICO is credited with the New World's most powerful broadcasting station, X E R, which works on 408 metres and puts out advertising programmes for American consumption.

* * *

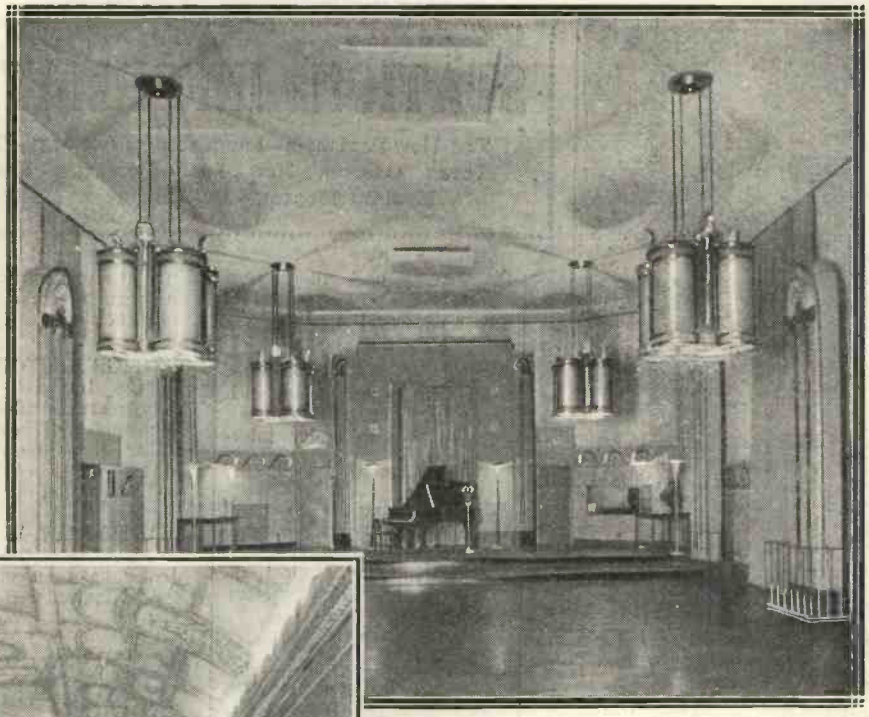
RADIO IZERDA is the Dutch name for the experimental transmitter at the Hague.

* * *

EMPIRE STATE BUILDING New York, the highest construction in the world, is to be used as a "mast" for the aerial of a television station

THE PORTLAND PLACE OF NEW YORK

A peep at the latest studios of the American National Broadcasting Co.



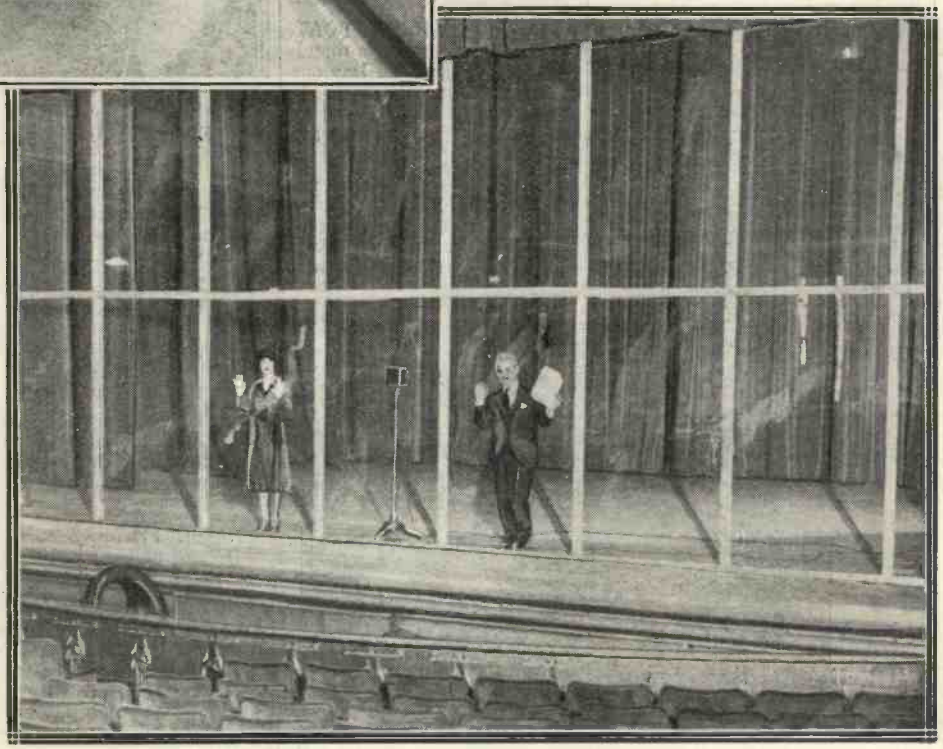
PALATIAL STUDIO EQUIPMENT

Situated in New Times Square, in the heart of New York City, the palatial studios of the N.B.C. are the last word in American studio technique.

The picture above shows one of the magnificent subsidiary studios from which entertainments are nightly given to be radiated from W E A F and its relays.

FIRST IMPRESSIONS

If you were due to broadcast from the New York station (W E A F) your first impression on stepping from the lift would be of the magnificent entrance hall shown in the picture above. From it the studios and offices open off right and left.



CURTAINED OFF

This view was taken from the auditorium of the main studio, and shows the famous steel-panelled glass "curtain" which shuts sounds out from the studio. The audience looks straight at the artistes, but hears them via loud speakers.

AMERICA'S SUPER STUDIOS

Some details concerning the newly-equipped studios of Station W E A F—the New York station of the American N.B.C.

FROM A SPECIAL CORRESPONDENT

The glass " curtain " of the main studio weighs six tons, and yet it can be operated by one man alone.

IT is, perhaps, in the nature of things that they should want something really " super " in connection with their broadcasting way over in New York. And although the palatial studios of our own B.B.C. which are to be may very well equal or even excel those of New York's station, W E A F, there is no gainsaying the fact that the American National Broadcasting Company has gone in for something " big " in the recent re-design, construction and equipment of its studios.

An Early Broadcaster

MODERN WIRELESS has on previous occasions closely followed the developments and improvements which have been made on the technical side of this giant New York broadcaster. It may, however, be expedient to repeat the fact that Station W E A F is one of the earliest of the popular American broadcasting stations.

It made its opening bow to the radio public in July, 1922. In those early days its transmitter was located in New York City, but in 1927 the transmitter was removed to Bellmore, on Long Island.

Here a gigantic transmitting plant was erected, and with several modifications in detail it has been functioning ever since.

The Bellmore, Long Island, transmitter of W E A F has a power of 50 kw., thus enabling it to make itself felt in the ether in no unmistakable manner.

Evolutionary Improvement

To revert, however, to the W E A F studios, which are the main subject of these notes. From the earliest inception of the station in New York City the station's studios have continually been subjected to a process of evolutionary improvement.

They have been entirely knocked down once or twice and rebuilt in different situations. When the transmitter was removed to Bellmore, Long Island, the studios of W E A F were entirely re-equipped and reorganised. Now they have undergone a further change, and it is claimed that the New York " Broadcasting House," as it stands at present, embodies a more efficient, luxurious and magnificent broadcasting centre than the studios of any other radio organisation or company in the world.

HER FIRST BROADCAST

Artistes are received at W E A F by a pleasant host or hostess, to set them at their ease, and here a visitor is being welcomed in a reception foyer.

Such is the claim which W E A F makes. Whether, of course, it will turn out to be a strictly accurate one only the passage of time can determine.

W E A F's studios are now situated in New Times Square, in the heart of New York. It is a huge building, almost entirely devoted to broadcasting activities.

The main studio is situated on the fifth floor of the New Times Square House, well above the noise of the street level. The studio is, of course, amply sound-proof, and the W E A F authorities are very proud of the fact that their studio is the first one to adopt the glass curtain scheme by means of which the studio proper is shut off from an auditorium by a glass screen.

Absolutely Sound-Proof

This screen is quite sound-proof, and listeners in the auditorium, although they witness directly the studio performances, hear them indirectly by means of suitably placed loud speakers.

The glass screen or " curtain " at W E A F's studios is a rather remarkable affair, and certainly an excellent piece of engineering work. It weighs no less than six tons.

The glass is of the best plate quality obtainable, yet, despite the fact that it is set in rigid steel frames, the entire assembly is so well balanced that it can be raised quite easily by one man. Other studios have adopted this glass-curtain plan, and doubtless it will become more or less universal in the future.

The Waiting-Room

The New Times Square studios have been equipped with a magnificent complement of reception foyers and waiting-rooms for artistes. A " Chinese Room " is also provided for the use of waiting broadcasters. This is an elaborately furnished and decorated apartment, got up, of course, in the approved Oriental style, and it is much favoured as a " green room " by the casts of studio plays and by choral parties.

Perhaps, however, the studio control rooms at W E A F, New York, will be of greater interest to the technical man than any other feature. There are three of these rooms, a main one and two subsidiary ones.

The main control room is quite simple, yet undoubtedly efficient in its general design and outlay. It contains the principal control-board of the station to which all the various studio lines are ultimately linked after they have passed through the smaller control or "monitoring" panels in the same or in the other control rooms.

Network of Stations

From the main control-board the studio's output goes off by land-line to the Bellmore, Long Island, transmitter, and also to the huge network of land-lines connecting up with the other stations of the American National Broadcasting Company which are located in the various American States.

Each of the affiliated stations, therefore, gets its programme material direct from New York, and not through the medium of W E A F's powerful transmitter on Long Island.

When it is realised that W E A F's farthest affiliated station is situated in the western city of San Francisco, and that its network of stations extends over a dozen States, some idea of the vastness of the American National Broadcasting Company's radiating system will be gained.

Fifty-Five Broadcasters

Besides being directly affiliated with broadcasting stations throughout the United States, the National Broadcasting Company of America has also some say in the operation and management of many other stations in America. The most recent figures available give *fifty-five* as the number of broadcasting pies, so to speak, which W E A F and its company have their fingers in, in one way or another.

At the same time, however, these W E A F people emphasise the fact that they do not desire to obtain an absolute broadcast monopoly. They realise that the small broadcasting station has its uses and its rights, and that a programme of inferior quality may be just as interesting to a certain class of listeners as the very best material in the broadcasting world coming along from the New York organisation.

A Creditable Policy

All of which is really a very praiseworthy and creditable policy, and one which is bound, in the end, to enhance rather than to inhibit W E A F's popularity and progress.

J. F. C.

WHEN TO TUNE THEM IN

Some practical notes about short-wave reception, and the best time to listen for the various continents and countries.

ONE of the most curious things about the short waves is that one can choose a certain section of them, and listen carefully over it for hours and hours without ever hearing a sound. It is most important to have some slight knowledge of when the various parts of the world may be expected to come in if one wants to be successful in hearing the DX stations.

The following gives you a rough indication of the best times to listen, from now until May, for the various stations.

The Americans

First, the Americans on 20 metres and 25 metres may be expected to come over best between about 5 p.m. and 10 p.m. As the year goes on they will come in later and later. W 2 X A D on 19·56 will probably be heard even earlier than 5 p.m. by the end of this month.

Next, the Americans on the 49–50-metre band. They are at their best all the year round from 11 p.m. until the small hours are nearly out. The same applies to W 2 X A F on 31·48, except that he starts coming in rather before those on the higher wave.

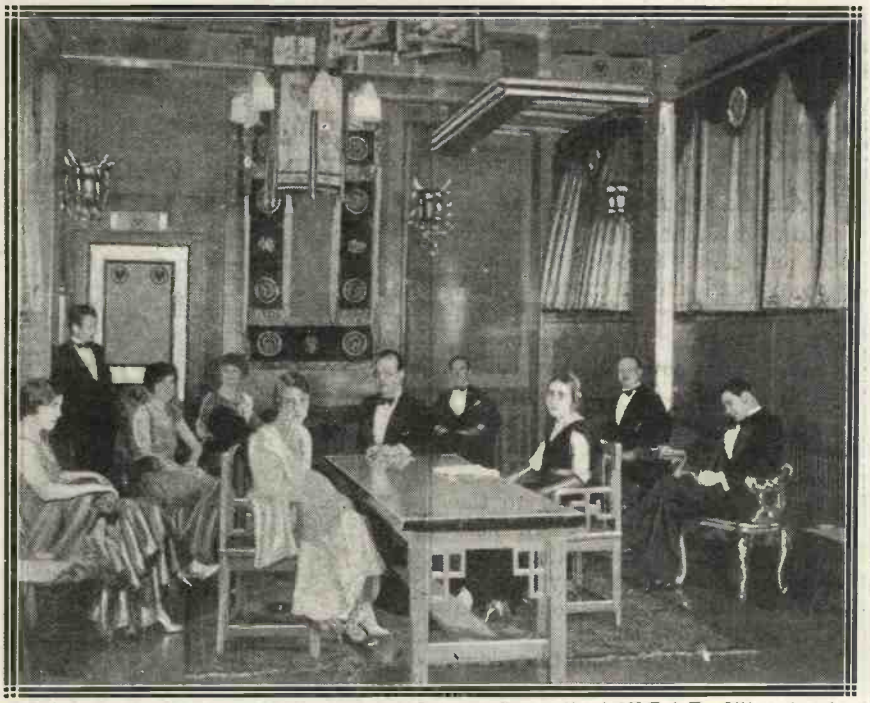
So much for the "Yanks." Now for our exciting friend V K 2 M E, Sydney. He comes round the world in both directions, and may therefore be found either during the evening or in the early mornings. Whether he is on his 31-metre or 28-metre wave seems to make little difference. If he is known to be on, and conditions are at all good, you should find him between 9 and 10 p.m. or after 6 a.m.

From the Far East

At almost any season of the year the "Far East" stations may be logged during the afternoons. The Dutch East Indies people are either on the 32-metre band or on about 16 metres, and always seem to be good. Among the others, Radio Saigon and Chi-Hoa (both Indo-China) do not seem to require much skill in tuning. The latter is on 49 metres approximately, and the former on all sorts of different wavelengths, the best being 24·91 metres.

European stations, of course, are on at all times of day or night, although they are not very strongly received in this country except for half an hour or so during their "peak" periods. As these vary from week to week there is not much point in mentioning them here.

BEFORE THE PROGRAMME BEGINS



Artistes in the handsomely-appointed "Chinese Room" of W E A F, filling in that trying time while waiting their turns to broadcast.

WHAT THE DISTANT STATIONS ARE DOING

Notes and News from a Long-Distance Listener's Log

READERS of my last report will probably remember that I predicted a patch of good DX reception on the medium waves. They may also remember that I related how I had received various American stations on a two-valve receiver.

Since then reception of medium-wave American stations has steadily improved until really worth-while conditions are upon us. For instance, early in December, W T I C (Hartford), W P G (Atlantic City), W G Y (Schenectady), W N A C (Boston), all came in at respectable strength, on the two-valve receiver, whilst various others came in faintly.

A Little More "Ginger"!

For the sake of greater amplification, I inserted a pentode in the L.F. stage, and I discovered the extra amplification well worth while when I again "tried" for America on December 7th (1931). As is my "wont" when going to make a night of it, I waited until after 2 a.m. (when I concluded that the American stations would have begun to reach a respectable strength if conditions were favourable) before attempting to receive anything.

Switching on, I almost immediately came upon a station broadcasting a "tango." Strength was fair and the signal was constant, and I concluded that it was probably a late European. Imagine my surprise, then, when instead of, as I had expected, an announcement in German, the announcer told me that I was listening to "Radio Splendid, Buenos Aires"!

Needless to say, I was thrilled. Who would not have been? Seven thousand miles is not a bad haul for a two-valve receiver!

My appetite was whetted. I went up dial and I went down dial, but for the Buenos Aires station and a station above 500 metres there was nothing but Morse. Still, when I heard where that station was, I was—to say the least—pleasantly surprised, for it was W Q A M, a station located in Miami, Florida.

The Fun Starts

Around 2.30 a.m. conditions took a remarkable change for the better, and within a moment I was listening to my old friend, W T I C, at Hartford. This station was followed up by W C A U, Philadelphia; K M O X, St. Louis; W E N R, Chicago; W G Y, Boundbrook; W G Y, Schenectady; K D K A, Pittsburg, and then another surprise.

I was doing my best to separate a heterodyne when, in the peculiar way American stations have, one of the stations appeared to part itself from the others and I found myself listening to dance music and all about "My Girl Gives Me the Blu-u-es . . ." Then the announcement: ". . . listening to station W A A T." What! Where is that?

I looked up the letters in my call book, and made the interesting discovery that W A A T is a 300-watt station located in New Jersey. Certainly conditions were remarkable.

"Rio de Janeiro"!

Up to now I had been passing over a number of stations which had not been speaking in the English language, and, considering that conditions were so good and it was so late, I thought it might be worth finding out where they were. Consequently I turned to the loudest, and was well rewarded.

The announcer informed me that it was "Rio de Janeiro." I next turned my attention to a very faint station. This, however, turned out to be merely a French amateur.

Then I swung up to see whether I could hear anything of the new high-power Mexican station X E R. My luck was in, and for the first time I received Mexico on a two-valve receiver (medium wave).

There were innumerable other stations, but they were either too faint to catch the announcements or faded at the critical moment, an annoyance every DX-man knows. And so, after a remarkably successful DX night, I retired.

Mexico As Well

Information just to hand from America rates X E R as a 100,000-watt station, though, the communication adds, it usually employs only (!) 80,000 watts. Those desirous of receiving this station should set their receivers to Rome on 441 metres (a station which almost everyone can readily receive) and in the early hours switch on and turn slightly above that wave to 446 metres.

If conditions are good—as at present—you stand a good chance of hearing a Mexican broadcast. If not, well, you have stayed up for nothing!

L R 3 is the "star" South American station at present, and it is located at Buenos Aires and employs a wave-length of 315·8 metres. This station is being reported as received in England very frequently.

Considering the peculiarly good conditions, I intend to give the wave-lengths of the South American stations most likely to "get across," for the benefit of "fans" who may like to "try their luck" in this field.

South Americans

Besides L R 3, which I have just mentioned, there are various other Buenos Aires stations that have recently been received in England. These include L R 5, which operates on 315 metres; L R 4, which operates on 303 metres; L R 5, which operates on 368 metres, and, lastly, L R 9, which operates on 291 metres.

Leaving the Argentine Republic, we turn to see what Chili has to offer. We find many very low-powered stations, but only two stations worth mentioning.

They are both located in the capital, Santiago, and employ the calls of C M A B and C M A C. The former works on 480 metres, whilst the latter has a wave-length of 375 metres. Both are 1,000-watt stations.

Peru is worse off than Chili as regards the number of its stations, but at Lima there is a fairly powerful station in the form of O A X, which works on 350 metres. There appears to be some doubt as to the actual power of this station, for some call books give it as 1,000 watts, whilst others give it at 3,000 watts.

Brazil next attracts our attention. Unfortunately, though this country is so large, it employs only just over twenty stations and none of these are of much power.

Some Short-Wavers

However, Brazil has various short-wave stations which are occasionally heard in England, and fairly frequently heard in the United States. There are, for instance, S Q B N at Bahia, which may be found on 24 metres; Para on 34 metres; Rio de Janeiro on 31·75 metres; and, slightly higher up the dials, Manaos on 100 metres.

The remaining countries of South America have not much to offer us, and so I think it high time we return to Europe.

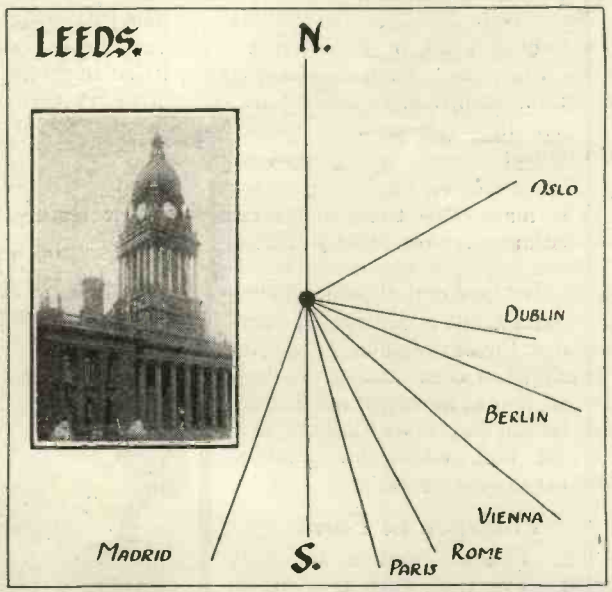
Daylight Results

The most remarkable aspect of medium-wave European reception I notice at present is the ease and volume with which continental stations come in in broad daylight. It is a frequent occurrence to receive Hilversum and Brussels and Langenberg, in the daytime, but until lately it has not been usual to receive Rome, Trieste, Milan, Turin, Toulouse, Strasbourg, Fécamp, Hamburg, Frankfurt, Berlin, Mühlacker, Heilsberg, and Katowice at good strength in daylight.

In the evenings there is little one could desire in the way of volume, and I find almost all the stations need the volume control to bring them down to reasonable volume (when employing my larger receiver—S.G. det., 1 R.C.C., P.P.). Trieste and Rome are probably the strongest signals.

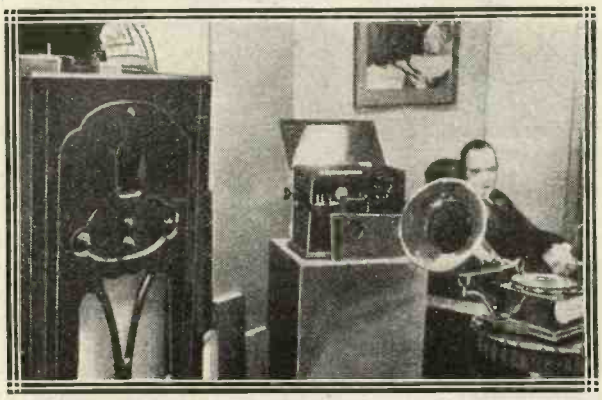
L.W.O.

USING A "FRAME"

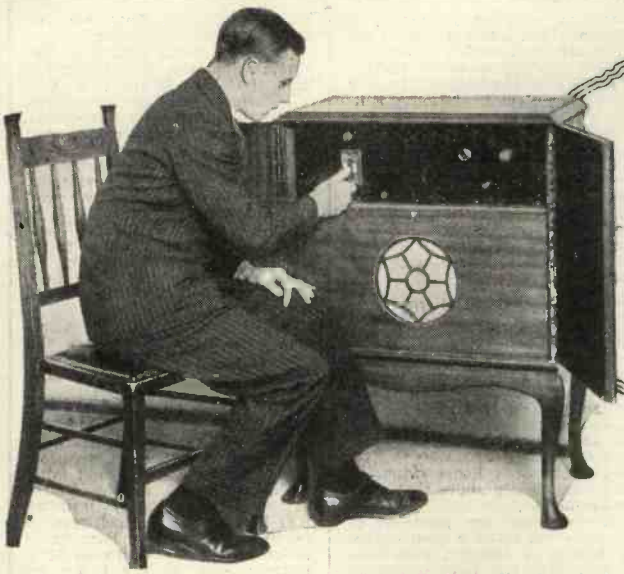


To get maximum strength from a foreign station the windings of a frame aerial should be "pointed" at it. This shows how a listener in the Leeds district should align his frame for some famous foreigners.

AN INTERESTING TEST



This listener is a German technician, comparing the quality of an old gramophone (1897 vintage!) with that of a modern 2-valve mains-run receiver



ON THE MEDIUM WAVES

Some practical details of recent reception on ordinary wave-lengths which will aid you in improving your long-distance results.

QUITE the most remarkable feature of medium-wave reception noticed during the past few weeks has been the positively amazing daylight strength of some of the foreign stations. Probably there will not be many weeks of this particularly fine reception condition, so readers are advised to try their own sets for daylight range before the days start to get really long.

* * *

The remarkable thing about this particular feature of medium-wave reception is that it does not appear to be confined to one or two stations, or to those employing high power, but is distributed fairly well over the wave-band. Trieste, for instance, has been coming in like a Trojan, and at the top of the dial the new Italian station at Florence, testing on high power, has afforded another great surprise.

Florence in Form

The Florence station (officially listed, by the way, as "Radio Firenze,") appears about half-way between Vienna and Prague.

* * *

The actual run of the stations above North Regional is interesting, because most of them are now coming over extremely well, the exceptions being indicated by the bracketed stations in the list below. In the order of wave-lengths they are:

North Regional; Prague; (Trondheim); (Moscow); Florence; Brussels No. 1; Vienna; (Riga); Munich; Sundsvall; (Palermo); and Budapest.

The Sundsvall station, which is situated between Munich and Budapest, has been an interesting one to watch, for although of fairly low power (only 10 kw.), it has for some reason been coming over with quite a punch. Vienna has been a trifle ragged, but as a new station is expected to be erected there shortly we probably shall have nothing to complain of, for even on its present 15 kw. the Vienna transmitter has always been a favourite with British listeners.

Another Daylight Eye-Opener

The strength of the Heilsberg station on 276·5 metres has been another daylight eye-opener. The other quite outstanding transmission in daylight has been Trieste, which for some reason appears to have picked on British aerials as the recipients of its favours. Reports from all over the country indicate the uncommon strength and good quality of this station, which is another step in the Italian Regional scheme now approaching completion. There is another powerful Italian station to come, namely, Bari, and the advent of this will be watched with great interest in view of the enormous success of the Trieste transmissions.

* * *

Down towards the bottom of the dial, Radio-Normandie (Fécamp) has been going strong, this being another station that it is well worth keeping an eye on before darkness falls.

The Hilversum "Swop"

Hilversum, as usual, celebrated the New Year by changing over its transmitter with the Huizen long-waver, according to an arrangement which has long been in force between these two stations.

* * *

One of the really noteworthy events has been the good behaviour of Turin, for long the bad boy of Europe as regards the wave-length question. At the time of writing, Turin is allotted 274·2 metres, and is actually working there, a state of affairs which a few months ago was reckoned among the extreme improbabilities! Cork has been coming in very well indeed, and has been putting up a much better show than Dublin, which never seems to recover his good form of last year.

* * *

Milan, who relinquished his wave length to the new Florence station, is now to be found on 331·5 metres. Immediately above is Post Parisien, and a trifle below the Brussels No. 2 station, which is another one worthy of special mention as a possible daylight alternative.

"LITTLE MISS BRATISLAVA"

Like Italy, Czechoslovakia believes in woman announcers, and this is the young lady who can be heard from Bratislava on 279 metres

NO HOPE FROM MADRID

An exclusive interview with Oberpostrat Münch, of the German Ministry of Posts.

BRITISH listeners are being constantly told that even though the International Broadcasters' Union is only an expert adviser, whose views can be heard but need not be followed, there is hope of a complete revision of the Prague conference plan at, or shortly after, the Madrid conferences.

The British listener also knows that it was Germany, and, of all people, France, who opposed a second Prague conference this autumn. To enquire into the exact position that Germany probably will take at the coming conference at Madrid I interviewed Oberpostrat Münch. He was one of the German delegation at Prague and probably will also go to Madrid.

The result of the interview for all listeners is rather hopeless. There is no hope of improving the Prague Plan!

The Limit

Captain Eckersley has very rightly pointed out that ten kc. separation will be the utmost that will ever be arrived at now. Oberpostrat Münch goes farther and says *nine* kc. will probably have to stay—not that the Germans want it (they would prefer twelve kc., too), but there is no way out!

Now why is there no hope for listeners on the transmitting side? Why will Madrid and a subsequent European conference not improve the Prague Plan? These were the two questions I set before Oberpostrat Münch.

He began by telling me that the Germans had proposed a limitation of the power of broadcasting stations at the Hague. They had proposed 50 or 60 kw., and this only in consideration of the British regional scheme. (I saw the exact protocol and know this for a fact.)

Then the Czech representative got up and said: "All right, but we have already ordered a 120-kw. transmitter and we intend going ahead." Naturally nobody would consent to let the Czeks alone have the privilege of working with double the power allowed anybody else! The result was a limitation somewhere near 120 kw.

This limitation still has to be made law at Madrid so, no wonder all countries are hurrying up with their transmitters so that nobody will be able to set a smaller limit.

Then there is another consideration, Russia does not intend limiting her power.

Oberpostrat Münch pointed to a chair next to mine and said: "There you see that chair, well, a few days ago the head of the technical department of the Russian broadcasting service sat there and told me quite openly that all the Russian stations now transmitting with high-power were being brought up to 500 kw.!" Even if this is "only" five times 100 kw. it is quite a lot.

The first thing that has burst the Prague Plan as it now stands is the increase in power of most stations and the increase in the power of the Russian stations in particular. They do not adhere to the Prague Plan, they never will, but they will soon be disturbing more than they do now.

The second item is the increase in the number of the stations. If one looks at the original Prague Plan and looks at the present list of stations, one finds numbers of new stations which have crept in and are now there. Nobody will be able to get them away again.

The Broadcasters' Union hope to obtain a larger wave-band for broadcasting. But nobody wants waves below 200 metres or above 2,000 metres. Well in that band broadcasting already occupies 75 per cent of the wave space! Roughly, some 80–100 kc. might be won *if* the police were to give up their wave, the flying service theirs, and *if* the ships were to forsake their 600-metre wave, which they never will. Room for just 11 more stations! And since Prague in 1929 many more have cropped up or are shouting for exclusive waves.

A Misapprehension

I left Oberpostrat Münch with the feeling that we have been doing wrong in considering Germany the black sheep. She wanted to limit high-power—the Czechs prevented that: she forsook at Prague two of her longer waves (round 450 metres) to help general conditions; she will free the waves she has taken the loan of from Greece and Bulgaria, but she will not give up an exclusive wave just to see another country pounce upon it.

A. A. G.

AT THE MUNICH MICROPHONE

Priests and monks are frequent visitors to the microphone at Munich, which numbers many Roman Catholics among its audience.

THE SKI CHAMPIONSHIP

A scene at the broadcasting of the Austrian Ski Championship, during the long-jump contests.

THE FINAL TOUCHES

WHEN you are out for long-distance reception you should tune in a weak station and then make your final adjustments, the effect of which will be far more noticeable on weak "signals" than they would have been on strong.

* * *

Don't forget the detector voltage. Sometimes you get better results and smoother reaction if you take the detector's H.T. down to about 40 volts. Try the plug in different places to find the best setting.

Best Voltages

If your S.G. has a variable resistance to act as volume control you should find the best position for this in conjunction with anode voltage.

* * *

Finally, do not forget your loud-speaker adjustment, which may have been moved from the best sensitivity position.

AFRICA'S ALTERNATIVES

The Editor, MODERN WIRELESS.

Dear Sir,—Having read an article appearing on page 437, November MODERN WIRELESS, entitled "What the Distant Stations are Doing," I think it only fair to many of your readers that your correspondent should be corrected regarding the South African stations.

Durban has no relay station—on short waves, Johannesburg station operates on 450 metres and 49·2 metres, NOT 31·4.

Z U 6 X is a Johannesburg amateur on 40 metres.

Thank you very much for the splendid Wireless Map given with the world's best wireless magazine last November.

Yours faithfully,
B. KENT-BROWN.
N. Rhodesia.

WITHIN THE ARCTIC CIRCLE

THE Canadian Government has just completed arrangements for three of the most northerly wireless stations in the world. Acting as communication-links for the scattered trading and police outposts of the Far North, they will be used also for the collection of meteorological data and similar semi-official services.

One of the stations is to be situated at Coppermine River, far within the Arctic Circle, where in mid-winter the sun does not rise for many days.

Great Advance

At present the traders and lonely outposts of the districts rely on dog-sledge communication, supplemented by an infrequent aeroplane service, and it is, therefore, with the greatest interest that the results of providing the posts with rapid radio communication will be watched.

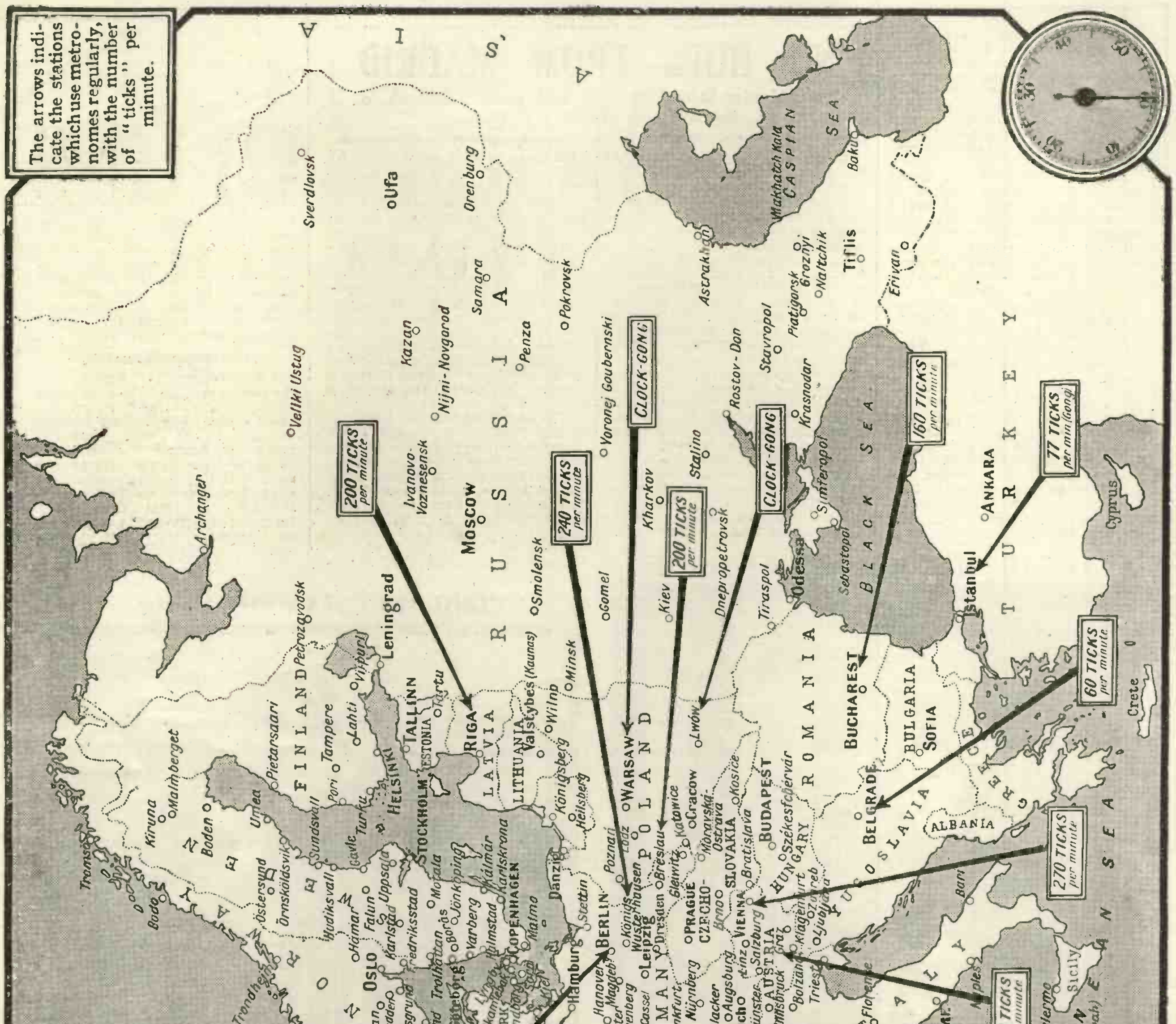
STATIONS OF THE U.S.A.

There are nearly 23,000 of them in all, including ships, amateurs, broadcasters, land stations, etc., and according to recent official figures they are made up as follows:

Amateur transmitters	18,994
Ships	2,173
Broadcasting	612
Commercial land-stations	468
Experimental (and television)	391
Commercial aircraft	215
Direction-finding	119
	22,972

Note the preponderance of amateurs—actively encouraged by the Government, and forming a magnificent man-power reserve.

In this respect America sets an example to the rest of the world, for nowhere else are radio amateurs so warmly encouraged and invited to co-operate in important Government investigations.


EUROPE'S TICK-TOCKS
The arrows indicate the stations which use metronomes regularly, with the number of "ticks" per minute.
ALL BRITISH STATIONS 60 TICKS per minute
240 TICKS per minute
200 TICKS per minute
240 TICKS per minute
CLOCK-GONG
200 TICKS per minute
CLOCK-GONG
160 TICKS per minute
77 TICKS per min (Gong)
60 TICKS per minute
270 TICKS per minute
200 TICKS per minute
J. T. RANKIN CARTOGRAPHER

ALL ABOUT VOLUME CONTROL

There are many methods of controlling the volume in a radio receiver, and in the accompanying instructive article our contributor interestingly describes those that are in common use. He also compares the merits and demerits of the various systems and makes some valuable suggestions.

By M. G. SCROGGIE, B.Sc., A.M.I.E.E.

THOSE readers who were interested in reception five years or more ago will perhaps remember that although receivers of that day were plastered thickly all over with controls of various sorts, a volume control was not generally included among them.

When It Was Sinful!

The fact of the matter was that broadcast stations were so few and feeble, and valves and circuits so ineffective for H.F. amplification, that it was as much as one could do to scrape together enough volume to be audible. One can scarcely say *distinctly* audible, though that claim was often made for it at the time in a moment of enthusiasm. But actually to cut down volume—a gift from the gods—seemed little short of a mortal sin!

A DIFFERENTIAL SCHEME

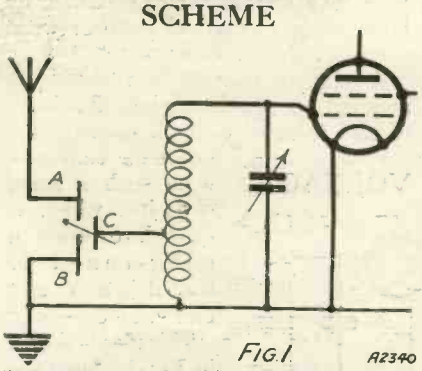


FIG. 1. A2340

This method of control has several advantages over other methods. It governs the actual input to the first valve, and does not appreciably upset the tuning of the aerial circuit owing to the differential condenser arrangement used.

Then, later, when it was no longer the ultimate criterion of a radio expert to be able to make the loud speaker tremble with passion, volume controls of a sort became recognised as essential in well-regulated broadcast receivers.

There are so many ways of cutting down the amplification, however, at various points in the circuit that it was not considered necessary to expend a vast amount of thought on the problem, and if a little distortion was introduced—well, it was not noticed among the rest.

"Afterthoughts"

But now the need for effective volume control is greater than ever before, and the writer's opinion, as the result of tests carried out on a large number of leading commercial sets, is that this feature is one of the weakest, and appears still to be regarded as an afterthought in many designs. Actually it is a very important control, and on it much of the satisfaction of working the receiver depends.

What is a volume control? A reaction knob controls volume, so why have another? One answer is that though reaction helps to bring up the strength when tuned to stations that would otherwise be too weak, it does not reduce those high-power local stations that so many of us have close at hand, and that more of us will have shortly.

Detuning Debarred

In the old days one could get over the difficulty by detuning, but that method now would just bring in hopeless interference. The increase in power of stations and in sensitivity of receivers is responsible for that. Furthermore, the high-amplification receivers—the very ones that need a volume control most—now often have no reaction, so that is that!

FOR H.F. VALVES

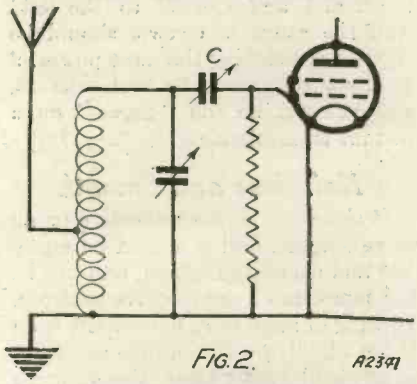


FIG. 2. A2341

In this scheme a small variable condenser is placed in series with the grid of the first H.F. valve. It should have a maximum capacity of about ·0001 mfd. and an extremely low minimum, and the high resistance connected between grid and earth should be about 1 meg. (This scheme is not suitable for detector valves.)

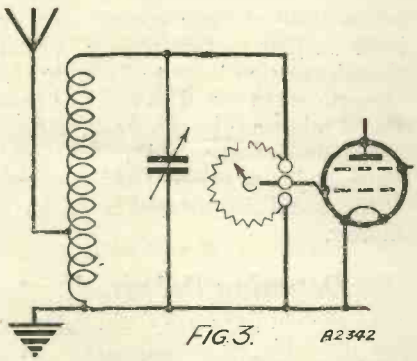
Volume Controlling as an Aid to Better Reproduction

Another point is that though reducing reaction is effective to some extent in reducing the strength of the station which is tuned in, it has no appreciable effect on other stations' transmissions which may be interfering, and consequently the latter become more noticeable by comparison.

Constant Tuning

Reaction is, therefore, a very bad form of volume control, but used in conjunction with a proper volume control can be very useful indeed. A " proper " volume control is one which controls volume and nothing else—that is to say, it should not alter the selectivity or the tuning or the tone.

POTENTIOMETER CONTROL



Another method of controlling the input to a radio receiver is to connect a high-resistance potentiometer, about 1 megohm, across the first tuned circuit, as illustrated in the above diagram. If a much lower resistance is used it will probably impair the selectivity of the set.

It would be very confusing to drive a car in which applying the brake not only slowed it, but also switched off the lights and steered to the left! And the range of control should be capable of reducing the most powerful local station practically to extinction, and yet not be too " fierce " on a distant transmission.

Noiseless and Smooth

It should be equally effective on all wave-lengths, and it should be noiseless and smooth in action, and not be too complicated or expensive to apply. Bearing in mind that, even apart from those who live within a mile or two of a powerful broadcaster, the strength received from some stations may be thousands of times greater than from other more distant or weaker ones, it is not very difficult to see that the ideal volume control is not such a small problem as it used to look.

One question that can be settled fairly easily is that of whereabouts in the circuit the control should be placed. One sometimes still sees volume controls well up towards the loud-speaker end of the set—a variable resistor across the intervalve transformer primary, for example.

When a strong local transmission is tuned in, which may require to be cut down to, say, one hundredth of the full amplification in order to be reproduced at normal loudness, it is clear that the whole of the receiver between aerial and volume control has to handle one hundred times the normal volume, and the H.F. and detector valves are driven far beyond their capabilities for distortionless working.

Nor is distortion the only unpleasant feature; there is considerable loss of selectivity introduced by overworked H.F. valves. It is wise to put the volume control as near the aerial end of the set as possible, so as to cut down the overwhelmingly powerful local transmissions before they can overload any of the valves and ruin the good qualities of the set.

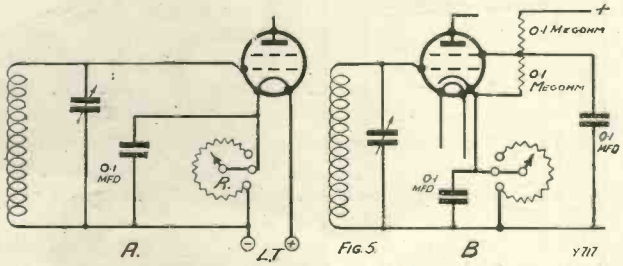
"One Man's Meat . . ."

Obviously, this is not so important to those few listeners who are still a good distance from the nearest broadcaster; one has to take circumstances into consideration. " One man's meat . . . ! "

One arrangement which is quite often used, and which comes nearest to fulfilling the above requirement, is a variable condenser in series with the aerial. The more sensitive the receiver the smaller the capacity of the condenser.

For an average set with one H.F. stage, ·0001 mfd. is about right. One disadvantage of this system is that it is difficult to get sufficient range of control, so that a powerful station is apt to come through strongly even though the condenser is set at minimum.

FOR BATTERY OR MAINS SETS



The two diagrams here reproduced show how volume can be controlled by altering the grid bias on the H.F. valve. The first one (A) is for a battery valve, and the second (B) for an indirectly-heated valve.

A Differential Idea

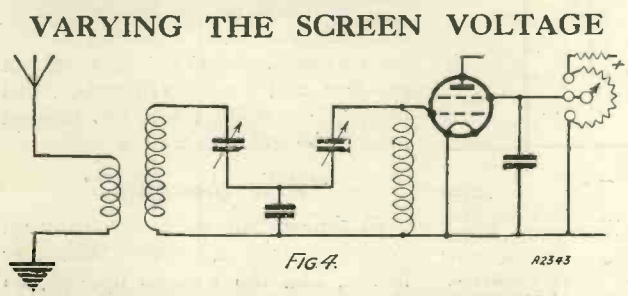
This may be due to the receiver picking up on its own, so it is a good thing to have the H.F. circuits well screened. The condenser should have as low a minimum capacity as possible; something might be done by a component manufacturer to introduce a special condenser for this purpose, the capacity being varied by interposing an earthed plate between the aerial and receiver plates.

A similar construction could be adopted to avoid another drawback of this form of control, namely, the effect on tuning of even such a small capacity, which is enough to upset a gang-tuned or band-pass set badly.

This idea is shown in Fig. 1. Here the aerial condenser has three plates or sets of plates (A, B, and C). A and B are fixed, and C at one end of its movement is entirely interleaved with B, being screened as far as possible from A.

At the other end of the scale a large part has emerged from B and is interleaving with A. The capacity of C to earth, which is that which effects

VARYING THE SCREEN VOLTAGE



When employing a screened-grid valve in a receiver a very effective way of volume controlling is that illustrated above. It consists of a potentiometer arrangement for varying the voltage on the screening electrode.

the tuning, is thus kept constant, because what it loses by moving away from B it gains by approaching A; but the condenser should be so arranged that it does not withdraw from B so much as it interleaves with A, because the capacity of the aerial has not such a large effect on tuning as that straight to earth.

A Promising Scheme

It will be noticed that the coil is tapped down; that enables one to use larger capacities for the control, which helps us to escape the difficulty of getting a very low minimum compared to the maximum; and, at the same time, it still further reduces the effect on tuning.

If it is connected at the top end of the coil it may be difficult to avoid the very slight stray capacity to the aerial which is sufficient to bring in quite a lot.

A minor disadvantage is that this control tends to be rather less efficient on long waves if it is correct for medium; or, if it is correct for long waves, the condenser will be too large.

IN THE L.F. CIRCUIT

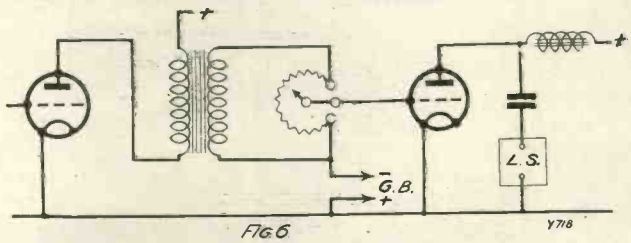


FIG 6

Until recently nearly all systems of volume control have been applied in the L.F. part of the set only, and this diagram clearly illustrates how this method can still be used by those readers who prefer it.

But it is easy to arrive at a very good compromise. And the selectivity is maintained at its best at all adjustments. It is an excellent form of volume control, which may be developed quite a lot in the future.

Another system which is rather similar in characteristics is that of Fig. 2. C is a condenser with a maximum capacity of about ·0001 mfd. and a minimum as small as it can possibly be made. The success of it depends entirely upon this. An ordinary grid leak of about 1 megohm is used for the H.F. valve. This method is not suitable for a detector valve.

"Tapered" Types

Sometimes a high-resistance potentiometer is used, as in Fig. 3. About 1 megohm is a suitable value; anything lower reduces the selectivity of the aerial tuning badly. Many such controls are inclined to be noisy and to cause hand-capacity effects, so the method is not very strongly recommended.

A point to notice in the wiring of three-connection rheostats of this sort is that in some models their resistance is graded or "tapered," so that it enters much more rapidly from one end than from the other. It should be connected in Fig. 3 so that as the slider moves up from the earthed end the resistance is brought in first gradually and then more rapidly.

Coming now to methods applied to the H.F. valve itself, these are excellent if properly arranged, but one must be careful if there is an extremely powerful station close at hand.

For instance, there is the well-known method of varying the screen potential by means of a potentiometer (Fig. 4). If a very strong signal is received it is necessary to reduce it very greatly, and, in so doing, to bring the valve into a condition in which it is easily overloaded, thus causing rectification and distortion.

Even if the powerful station is not tuned it may force its way through enough to cause "cross-modulation," which ruins selectivity. For that reason the aerial tuning circuit should be fairly selective, and this has been suggested in the figure by showing one form of band-pass circuit.

Another arrangement which is also quite successful, if used with an eye on these limitations, is the variable grid bias. Fig. 5A shows the connections for a battery valve (in which the filament voltage is simultaneously varied), and 5B for a "mains" valve R is a rheostat appropriate to the filament of the battery valve—perhaps 50 ohms with present-day valves—and may be about 10,000 ohms for the mains valve.

AUTOMATIC IN ACTION

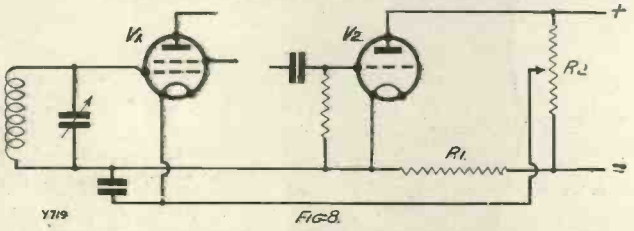


FIG 8.

An interesting circuit for enthusiastic experimenters. Within certain limits it will keep the volume constant, irrespective of fading or other causes of varying input, and in the accompanying article Mr. Scroggie gives a very full explanation of how it works.

In order to get over the limitations of these methods the Americans have introduced a type of valve which they have unpleasantly named the "variable-mu tetrode." This valve is of the S.G. type and is so designed that the effect of biasing, as in Fig. 5B, does not cause curvature of the characteristic, but enables the valve to handle a large carrier-wave at all settings of the volume control.

Avoiding Mistuning

But provided you take especial care over the aerial circuit selectivity if you are very close to a powerful station, you can use these potential-varying methods very successfully, and there is no difficulty in fading a programme right down if required. There is no mistuning difficulty, provided that the control is shunted by a condenser.

Where there is no H.F. stage the volume control does not have to handle such a wide variety of signal strengths, and a simple aerial series condenser is usually sufficient.

Modern long-range receivers, particularly those which have no reaction control, have to cope with a tremendous range of signal-strength, and sometimes it is found that the only really satisfactory way of doing this is to control in two places at once by means of ganging.

In this case it is allowable to have one of the controls situated in the L.F. part of the set, because very strong carrier-waves are cut down by

(*Continued on page* 200)

ACROSS THE LOUD SPEAKER

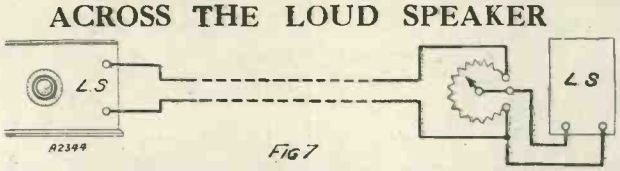
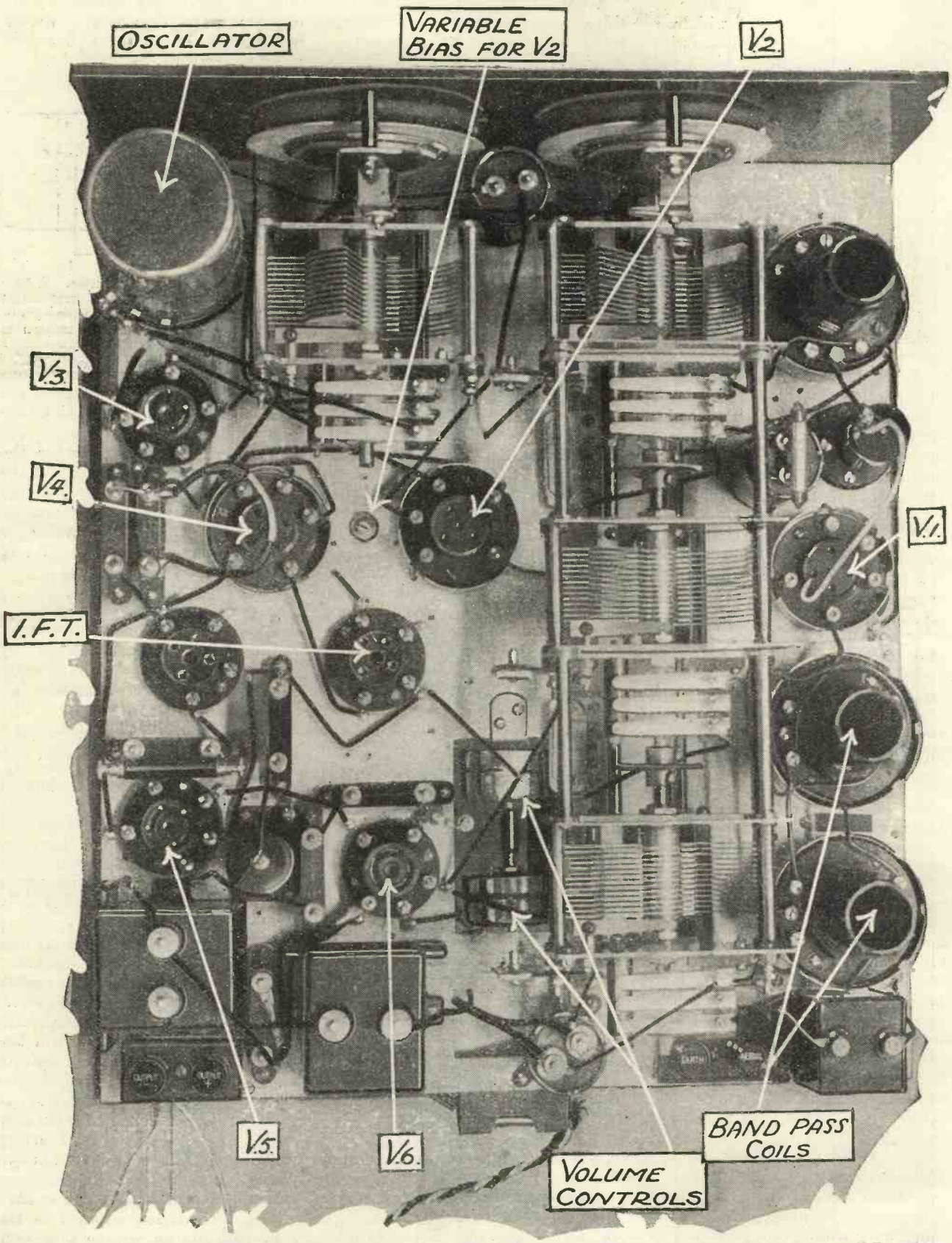


FIG 7

Where the radio receiver is installed in a different room from the loud speaker it is often useful to join a potentiometer directly across the latter. Its value in ohms should be about twice or three times the impedance of the loud speaker. A potentiometer is better than a plain parallel resistance scheme, as it does not have such a detrimental effect on the quality of reproduction.

No Batteries are Required for this Super



Some of the more important parts are indicated above, and the valves in numerical order from V_1 to V_6 are: H.F., mixer, oscillator, intermediate H.F., detector, and pentode.

THE "M.W." D.C. "SUPER-QUAD"

A Superlative Set for All-Mains Working.

Designed and Described by K. D. ROGERS.

HERE is the set many of you must have been waiting for. The first home-constructor's super to operate off D.C. mains, using the new ·25-amp. D.C. valves. It is full of new features, and leads the way in super-het design.

During the last twelve months we have seen a vigorous revival of interest in that ingenious piece of electrical engineering, the super-het.

But the super-het is not—and until much further research is carried out it's not likely to be—everybody's meat. It is essentially a receiver for the D.X. man who is situated in such local conditions that he requires super-selectivity, and yet at the same time does not want a multi-dial receiver, or any device that is going to make tuning difficult.

In such a case the reception of distant stations is as important as hearing the local, and the main feature of a set to fulfil this particular type of listener's needs is an ability to worm its way through the tangled ether and pick out a reasonable number of worthwhile programmes.

Selectivity and Sensitivity

Such qualification is necessary because in the present state of super-het development one must not expect (nor will one get) all the advantages of a really good local station set, together with the required features of selectivity of a knife-edge order, and high sensitivity.

A receiver specially built for ordinary "local and one or two others" reception, if properly designed and used on a good aerial, will give, in all probability, more punch and better quality on the local than the average super-het. *But* it will not do much in the way of distance getting, unless it be of the band-pass variety and used on a really good aerial.

Easy Control

Even so it will probably require more "handling" than a well-designed super, and the erection of a really good aerial is not easily possible as often as one might imagine.

FIVE POINTS IN A FINE DESIGN

1. **The new D.C. valves incorporated in a "Super" for the first time.**
2. **A novel oscillator coupling is introduced.**
3. **There is a band-pass H.F. stage.**
4. **A gang Extenser greatly simplifies the controls and construction and facilitates tuning.**
5. **A scientific and original scheme of ganged volume controls is used.**

This argument may appear to be leading nowhere in particular, but we are endeavouring in a few words to give readers an idea of the sort of niche into which the super-het falls, for it serves a particularly valuable purpose, by reason of its easy control, extreme selectivity and high sensitivity.

We have in MODERN WIRELESS published a series of super-het designs, including the famous "M.W." "Super-Quad" and the "A.C. Super-Quad." Both these—the first a battery set and the latter a mains receiver—have been designed for outdoor or indoor aerial operation as distinct from the frame aerial.

Most people can put up some sort of an aerial, and almost any type is better than a frame. Obviously, then, one is going to get better all-round results with a super-het on these aerials than on a frame, and so our "Super-Quad" receivers have been designed with the idea that they shall be used on ordinary aerials.

No Radiation

To do this successfully one must incorporate a selective aerial tuning system, and, moreover, one which will effectively prevent any radiation from the super-het being caused from the aerial and so setting up interference with neighbouring listeners.

The "Super-Quad" had a band-pass aerial system, and a double-grid valve was used so as to keep the number of valves down to reasonable limits for battery operation.

The "A.C. Super-Quad" employed a similar circuit with the exception that a separate oscillator and detector were used instead of the double-grid valve.

But the D.C. mains owner had so far been neglected, and it is to fulfil his needs in the way of a super-het design that the receiver described in this issue was built.

It is, admittedly, a big set. We have deliberately set out with the intention of employing the new indirectly-heated D.C. valves to their best advantage, though by reason of the insulation resistance between cathode and heater of the ·25-amp. type we have been limited to six valves.

Heater Connections

Not that we were inclined to use more, but without paralleling some of the heaters, and thus increasing the current consumption from the mains, we could not exceed six valves, owing to the fact that the voltage across heater and cathode insulation of the valve at the positive end of the string reaches something like 96 volts, and the valves are designed for voltages not exceeding 100 volts across these two points.

With parallel-fed heaters, of course, such high voltages would not occur, but the current consumption would be unnecessarily increased.

So, having got a limit of six valves to play with, we set ourselves the task of designing a super-het that would give not only adequate punch on the local station, but also really good reception of anything worth listening to in the European ether.

As the set must not radiate, and must be available for use on even the largest outdoor aerial, we had to be careful of our design of the input system.

Band-Pass H.F. Stage

After much experimentation we decided on a ganged band-pass screened-grid stage, feeding on to a screened-grid mixer valve, whose mixed impulses (the separate oscillator valve being employed to supply the necessary heterodyne) should be passed through an S.G. intermediate to an ordinary grid detector, and thence through resistance coupling to a pentode output.

That is the brief outline of the circuit scheme, but, of course, in its practical fulfilment many ingenious and novel ideas were incorporated, to make up a really outstanding receiver.

Let us look at the theoretical circuit, then, and study it stage by stage in some detail.

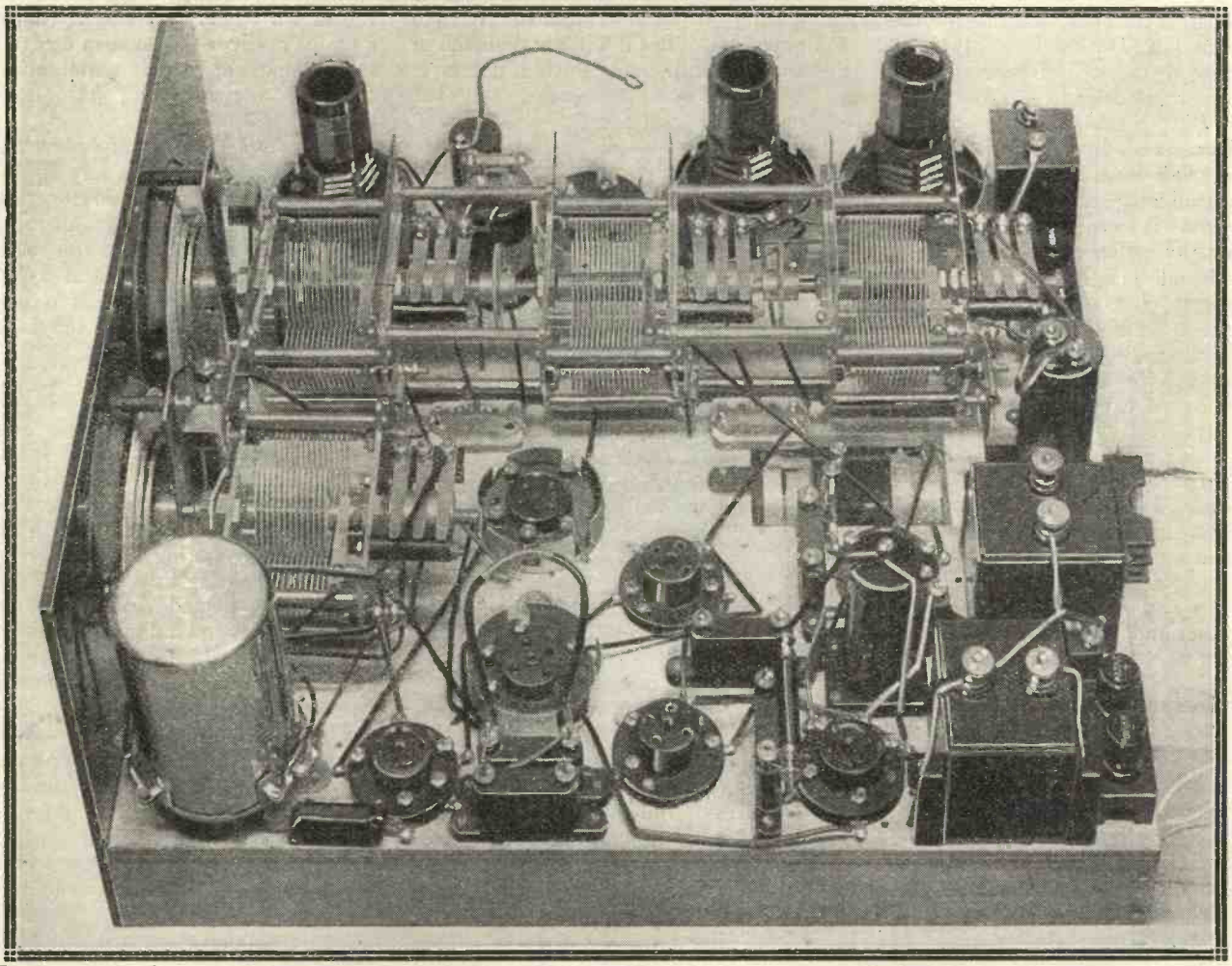
Straightforward Scheme

The circuit employed is what could be strictly called "straight." That is, there are no peculiar twists that are capable of providing funny results that are not expected after a brief examination of the circuit.

But the final arrangement is the result of a considerable amount of experiment, and was not arrived at merely by pen-and-paper methods.

Starting at the heaters of the valves, it will be seen that these are in series, with the second detector and the pentode at the negative end of the line. This is important, as it is not advisable to alter the sequence of heaters shown if freedom from hum is desired.

Note the Efficient Directness of the Wiring



The layout was, of course, carefully planned so that all the leads should be as short as possible compatible with various other requirements.

It Leads the Way in Super-Het Design

The tuning arrangements of the set consists of a triple-gang Extenser (whose cams must be insulated from the moving-vanes spindle—i.e. the centre grub screws must be withdrawn) controlling a Colvern band-pass and inter-valve H.F. coil.

To isolate the mains from the aerial a ·0005-mfd. fixed condenser is employed (a necessary safeguard in case the set is to be used on positive-earthed mains, while the 2-mfd. condenser in the earth lead carries out a similar necessary precaution).

Special Trimming

The aerial is also variably coupled to the first section of the band-pass coil by means of the ·0003-mfd. compression type condenser, which is situated underneath the baseboard. It should be set at maximum where a small aerial is being used, and at a lower capacity when a full-sized outdoor aerial is employed.

A specially interesting feature of the tuning circuits is the trimming system. It will be noticed that the three sections of the triple-gang Extenser have "medium-wave" trimming condensers across them.

These consist in the actual set of three small mica variables, which fix by one lug of each on the three fixed-vanes terminals of the three sections of the Extenser. The other end of each is taken by a wire to the moving-vanes terminal of its respective Extenser section.

So far this is quite normal. But a specially useful scheme has been rendered possible by the use of the Extenser; that is, the inclusion of separate long-wave trimmers across two of the coils.

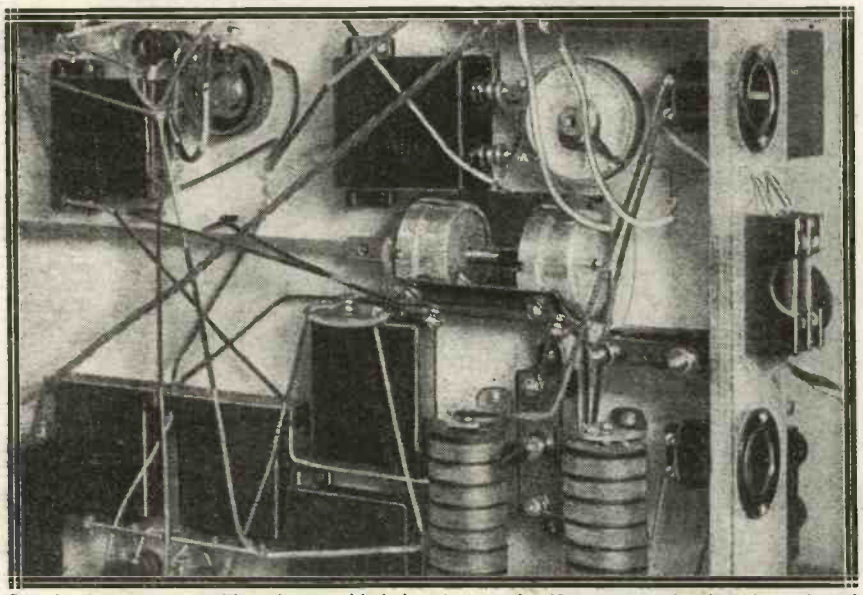
As trimming is not so critical on the long waves only two trimmers were found to be necessary, though, should you desire it, a third could be connected across the terminals 5 and 2 of the first section of the K.B.L.C. unit.

Automatic Shorting

These long-wave trimmers are automatically shorted out with the windings they tune when the Extenser rotates between 0 and 100 on the dial—i.e. when the rotating brass cam is in contact with the spring contacts.

In this position the medium waveband is being covered, and only the medium waveband trimmers are in use.

EXTREMELY EFFECTIVE SMOOTHING



Supplementary smoothing is provided in the set itself, so that despite the colossal magnification achieved there is a complete absence of hum.

After the band-pass coil comes the S.G. H.F. stage shunt, fed through a condenser incorporated in the K.G.C. coil unit, which provides a tuned grid circuit for the mixer valve, which is also of the S.G. type.

The oscillator valve, an L.F. type, reacts as usual into its grid circuit, and the pick-up winding of the

CHOOSE YOUR COMPONENT MAKES FROM THIS LIST

PANEL
1 14 × 8 in. (Wearite. Permcol, Becol, Goltone, Peto-Scott).

CABINET
(Peto-Scott). Baseboard, 16 × 14 in., with side battens 2¼ in. wide, one 14 in. long and two 15⅝ in. long. Thickness of wood should be ⅝ in.

EXTENSERS
1 Triple-gang disc-drive ·0005-mfd., type EXG3, with VD. dial and ebonite rod dial support (Cyldon).
1 Disc-drive ·0005-mfd., with VD. dial and ebonite rod dial support (Cyldon).

SWITCH
This is fitted on side of cabinet, and should be long wood-mounting type B.A.T. (728-LT.) (Lyons).

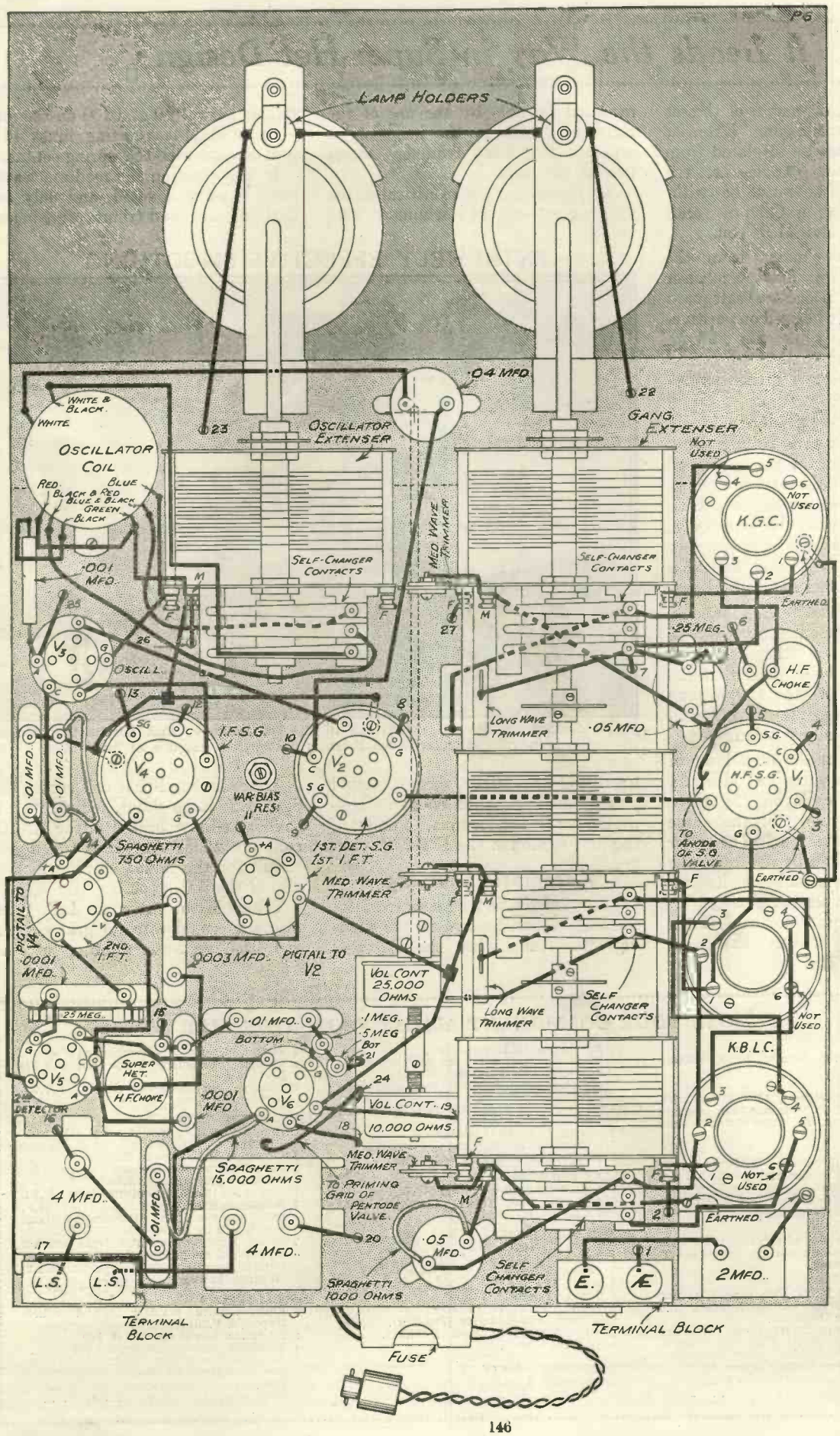
RESISTANCES
1 10,000- and 1 25,000-ohm ganged volume controls with extension rod, knob, and coupling piece (Wearite).
4 600-ohm de-coupling resistances (Wearite).
1 2,000-ohm Spaghetti (Lewcos, Goltone, Igranic, Telsen, Bulgin, Varley, Sovereign)
2 15,000-ohm Spaghettis (Telsen, etc.).
1 1,000-ohm Spaghetti (Lewcos, etc.).
1 750-ohm Spaghetti (Telsen, etc.).
1 300 Spaghetti (Lewcos, etc.).
1 3,000-ohm potentiometer without knob, but with slotted spindle (Wearite).
1 400-ohm potentiometer, baseboard type (Igranic).
2 ·25-meg. grid leaks (Graham Farish and Dubilier 1-watt type).
1 ·5-meg. grid leak (Loewe).
1 ·1-meg. grid leak (Loewe)
1 25,000-ohm (Dubilier 1-watt type).

VALVE HOLDERS
6 5-pin baseboard-mounting (W.B.).
2 4-pin (Wearite, Telsen, Lotus, Graham Farish, W.B., Clix).

FIXED CONDENSERS
2 1-mfd. (Telsen).
6 1-mfd. (T.C.C.)
1 2-mfd. (Formo).
1 2-mfd. (T.C.C.).
2 2-mfd. (Telsen).
2 4-mfd. (T.C.C., or Dubilier).
2 ·05-mfd. non-inductive (Dubilier).
1 ·04-mfd. non-inductance (Dubilier).
4 ·01-mfd. mica (T.C.C.).
1 ·001-mfd. (Dubilier 670).
2 ·0001-mfd. mica (T.C.C.).
1 ·0003-mfd. (T.C.C.).
1 ·0005-mfd (T.C.C.)
1 ·0003-mfd. maximum compression (Formo).
3 Trimmer condensers (type No. B.T.50) (Cyldon).
2 Trimmer condensers (type No. S.T.70) (Cyldon).

CHOKES AND COILS
2 Heavy-duty H.F., with brackets (Wearite H.F.8).
1 Super-het H.F. (Ready Radio).
2 H.F. (Wearite and Lewcos).
1 Auxiliary grid choke (R.I.).
1 Pentomite (Model B) output choke (R.I.).
1 Band-pass filter (type K.B.L.C.) and 1 H.F. coupling (type K.G.C.) (Colvern). Without switch rods for preference
1 8-lead Extenser oscillator (with bracket for vertical mounting) (Wearite).
2 Band filters with pigtails (type No. O.T.2) (Wearite, Lewcos).

MISCELLANEOUS
2 Flush-mounting mains plugs and sockets (type No. P.20) (Bulgin).
2 2-terminal blocks (Belling & Lee).
4 Terminals, type B (Belling & Lee).
1 Baseboard twin fuse holder with two 500 m.a. fuses (type T.) (Bulgin, or Belling & Lee).
3 Valve screens and bases (Colvern V.S.).



"TOP-WIRING"

In wiring up the super-het it is possible to complete most of the above-baseboard connections irrespective of those leads that have to go through the baseboard to components underneath. No foil is used, so troubles from faulty insulation are not likely to occur except in the cases of the canned coils and the valve cans. In these instances the utmost care should be taken that the leads coming through the screens are placed centrally in the slots and are not injured or pressed upon by the aluminium lids when these are placed in position. The trimming condensers are mounted, in the cases of the medium-wave ones, by securing one of the two lugs under the fixed-vane terminals of each Extenser section, and in the cases of the long-wave trimmers by mounting on the baseboard.

THE UNIT

An adaptor plug is shown connected to the fuses in the diagram, but when the set has been tested this is removed while a switch on the side of the cabinet is inserted to break one lead. This adaptor plug, by the way, can conveniently be the plug removed from the H.T. mains unit, when the special Bulgin plug is fitted to the wires from this unit, for insertion in the holder on the back batten of the set. One final point: Should no panel lights be desired, the holders should be short-circuited, otherwise absence of the bulbs will cause a disconnection in the heater wiring of the valves.

The First Super for the New D.C. Valves

oscillator-coupler is connected between the cathode of the mixer valve and the negative main supply.

In this way, while automatic bias is still retained on the mixer valve the pick-up coil of the oscillator is placed in series with the H.F. grid circuit.

Shunt-Fed Oscillator

It will also be seen that the oscillator is shunt-fed so that an ordinary Extenser (whose rotating cam need *not* be insulated from the moving spindle) can be employed with the rotor at earth potential.

It should here be noted that the bias on the mixer valve is variable within limits. This is desirable if best results in all cases are to be obtained. This valve should operate on the bottom-bend point of its anode-current-grid-volts curve, and though the screened-grid potential is variable by virtue of the fact that H.T.+1 is connected to the variable tapping on the H.T. unit, further control of the operating characteristics of the valve are valuable. More of this will be given when the practical operation of the set is discussed. And at the same time the practical application of the pentode choke and the impedance equaliser across it will be dealt with.

From the mixer valve we go via an intermediate transformer of usual type to the first intermediate S.G. amplifier, and thence to the detector.

Power-Grid Detector

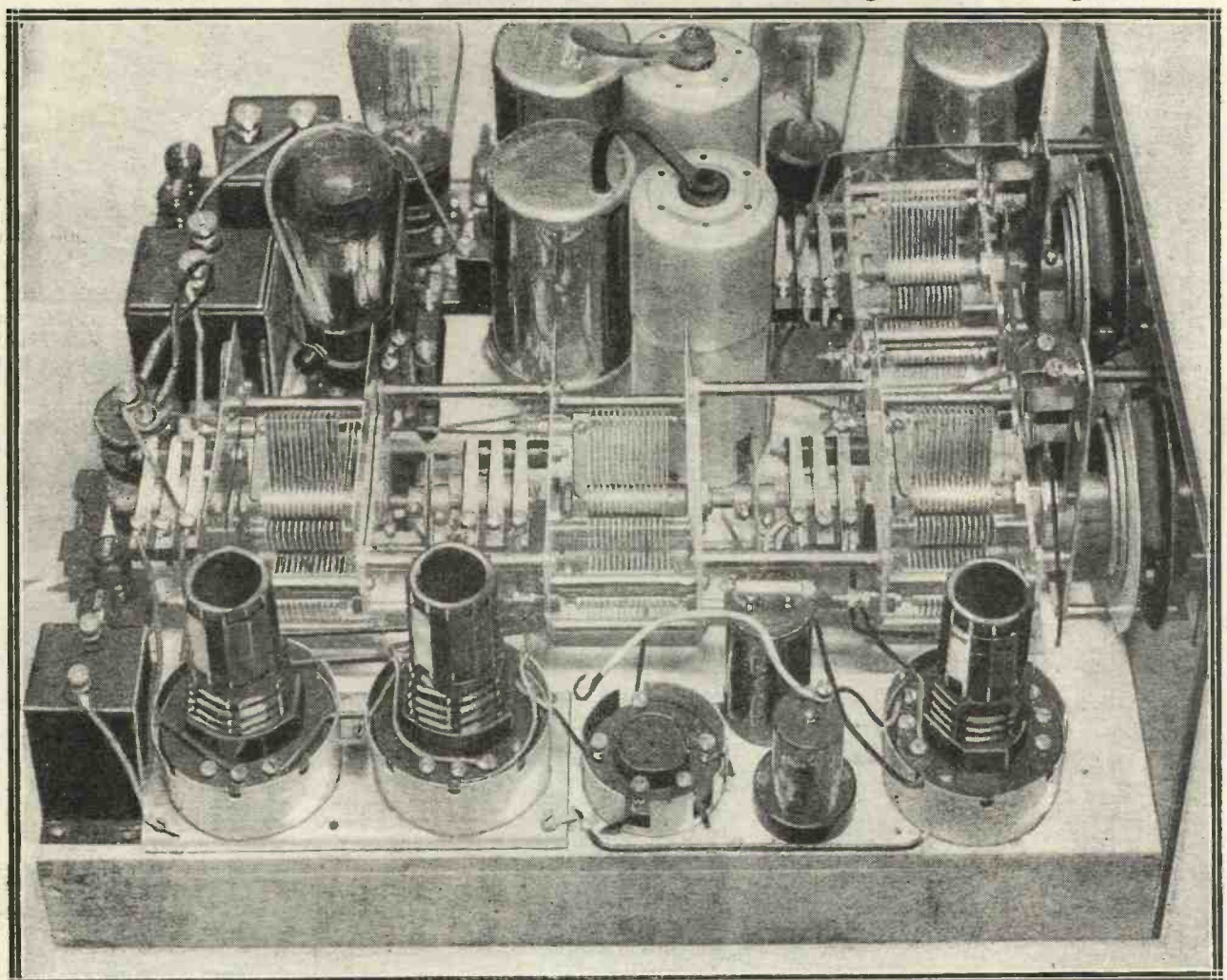
This is arranged to act on the power grid system.

The powerful H.F. impulses in this rectifier valve's anode circuit are safely by-passed by two condensers, one on either side of the anode choke. The values of these condensers have been chosen on safety-first principles. They are quite adequate to ensure efficient by-passing, though naturally audio-frequency high-note attenuation must also occur to a certain extent.

Pentode Output

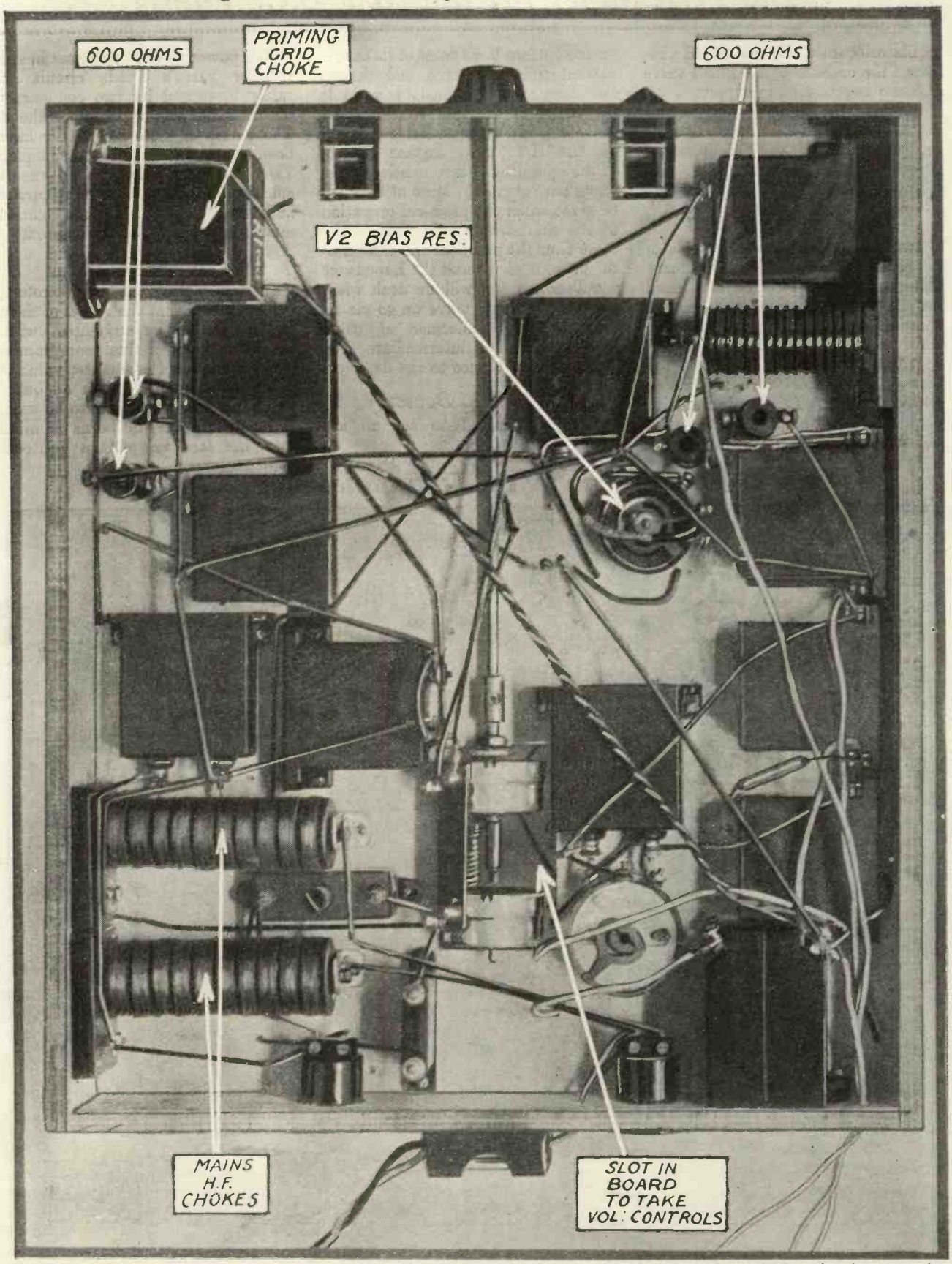
In constructing the set, therefore, it is suggested that the values of these condensers be experimented with, having in view a final compromise which will allow the smallest value of condenser compatible with adequate high-frequency by-passing to be used. It must, however, be borne in mind that the last valve is a pentode,

Three Sets of Switches Simultaneously Operating



Besides simultaneously tuning three circuits the ganged Extenser also automatically carries out three individual sets of switching operations—a triumph of operating simplification. And the component works as smoothly and easily as the simpler single-type condenser without the slightest stiffness or harshness. Indeed, the velvety nature of this control will surprise you.

Neatly Tucked Away Below the Baseboard



A number of the components are mounted underneath the slightly raised baseboard—a procedure which assists in preserving a tidy back-of-panel appearance.

A Ganged Extenser Contributes Control Simplicity

which in itself is liable to amplify H.F. impulses if any reach it, besides to provide certain harmonic distortion which might render the output too high-pitched.

It is to reduce the danger of this that the 15,000-ohm resistance and ·01-mfd. condenser are placed in parallel with the output choke. With the arrangement shown there is not a trace of screechiness or hardness.

A final point or two. The smoothing choke and condenser in the pentode priming grid circuit is included to act as a hum eliminator as well as an audio de-coupler. In certain circumstances this may be omitted and a de-coupling resistance used instead, but in the vast majority of cases the choke will be necessary. Its inductance need not be high, 15–20 henries being sufficient, the one used in the original set being an R.I.

Maximum Sensitivity

The 750-ohm bias resistance in the oscillator cathode circuit allows the valve to be well biased down and thus keeps the anode current to a reasonable figure, while the bias of the first S.G. valve is reduced below usual voltage to provide maximum sensitivity.

Finally let us draw attention to the ganged volume controls, which in the one case operate across the aerial-earth circuit, and in the other provide a potentiometer control of the H.F. voltage applied to the grid of the mixer valve.

Systematic Construction

And now let us get on to the actual construction of the receiver.

The construction of a modern multi-valve receiver such as the one described here may be looked upon as an almost impossible task if viewed as a whole. On the other hand, the process of construction not only seems simple, but is so in actual fact when the assembling of the various parts is undertaken systematically.

Having regard to these points, it then becomes necessary to consider the order in which the various jobs should be tackled. Probably the marking out and drilling of the panel is a good initial step, because in most cases this will be purchased cut to size, as well as the various pieces of plywood which go towards the making of the raised baseboard.

The cutting of the large rainbow-shaped pieces for the Extenser dials is not a difficult matter, as metal templates are supplied by the makers. Before drilling a series of holes around the inner edges of the templates, carefully recheck their positions from the diagram showing the panel dimensions.

The templates are capable of being self-supporting in view of the positioning holes made in them for the support screws; further details are available from the instruction sheet supplied with each Extenser.

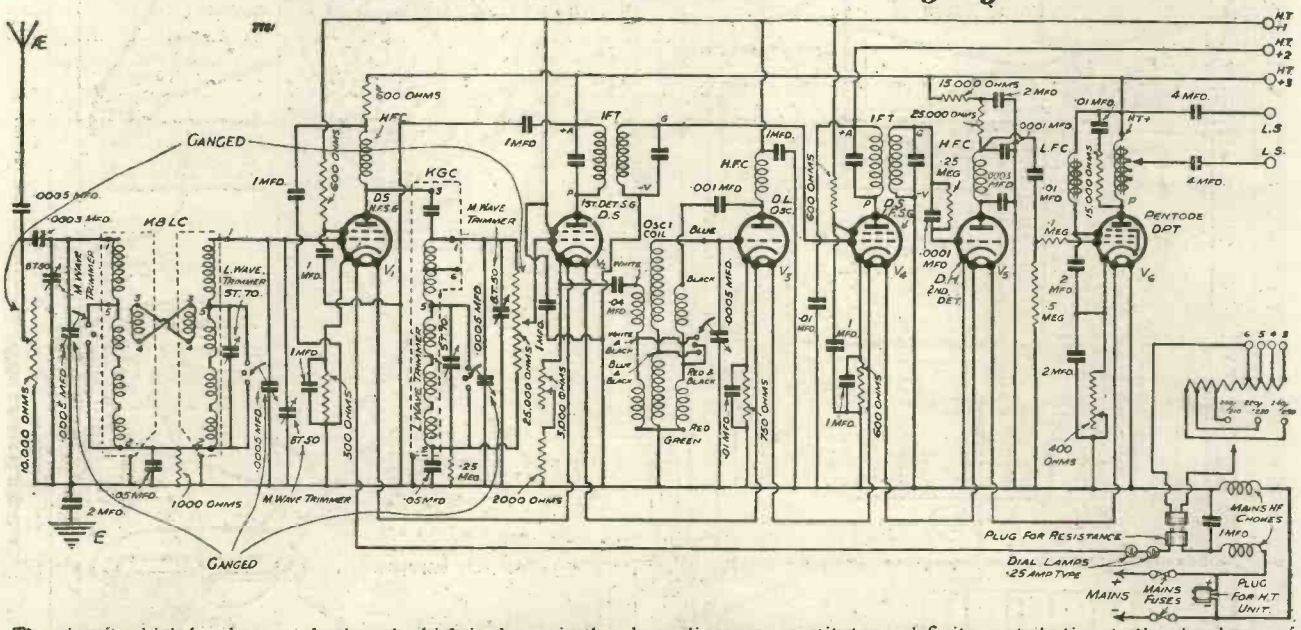
Next assemble the wooden supports to the plywood baseboard by means of countersunk brass wood screws, say, No. 4 ½-in. type. Before attaching the back support, two holes must be drilled in it in order to accommodate the flush-mounting sockets. These holes can be made by means of a brace and bit, by drilling a series of small holes and filing the rough wood away, or even by a fretsaw, according to the tools available.

It is as well to mount the sockets and double-fuse holder direct on the wood strip before attaching it to the baseboard.

Baseboard Holes

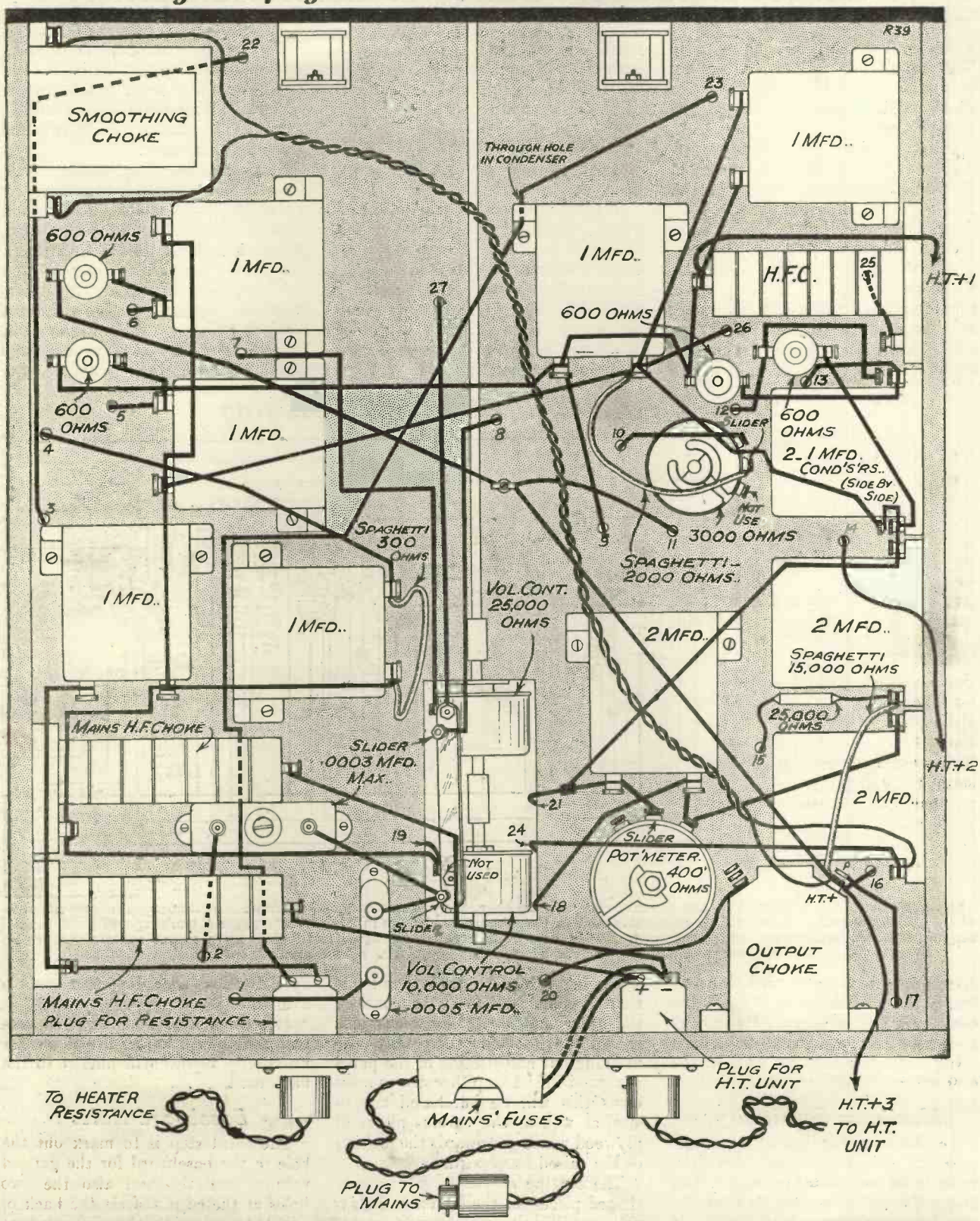
The third step is to mark out the hole in the baseboard for the ganged volume controls, and also the two holes at the edge nearest the back of panel for clearing the dial support projections. For the former purpose a pencil line may be marked down the centre of the baseboard, as this will represent the centre of the extension rod actuating the volume controls.

The Circuit is Well Worth Studying



The circuit which has been evolved, and which is shown in the above diagram, constitutes a definite contribution to the development of the science of radio set design. It epitomises modern thought and tendencies in "super-heterodyne" working and itself reveals original features having real, as against mere novelty, value. It is extremely doubtful whether there as yet exists anywhere an equivalent grouping of valves which could give equal results on D.C. mains.

Every "Safety-First" Precaution Has Been Taken



If you doubt the safety of the D.C. "Super-Quad," glance critically at the wiring as revealed by this under-baseboard wiring diagram. The pentode choke shown in the photographs and above was an experimental model used in tests with the original set. Slight modifications have since been made, however, which somewhat alter this component's appearance. This will be fully dealt with next month. To accommodate this choke the mains plug for the H.T. unit must be placed with its centre five inches from the end of the batten.

Linked Volume Controls are Employed

It is an excellent plan to procure the ganged controls as a next step, and mount the single support bracket on the front one (see photographs). The size of the hole can then be determined by making the width equal to a little more than the overall diameter of the potentiometers and the length of the hole equal to the length of the two of them, plus another quarter of an inch for clearance and bracket.

Now assemble the Extensers to the panel, using ebonite (or fibre) supporting pieces for the top screws on the dials (to insulate the metal escutcheons from the common negative mains lead) instead of the metal ones supplied, and slide the panel up to the assembled baseboard.

Fixing the Panel

If the Extensers are correctly mounted, the metal screens attached to them being parallel with the top edge of the panel, it should be easy to verify the positions of the holes for the dial support projections. In any case, these holes are not critical, as they can be of any convenient size, so long as they prevent the dials fouling the baseboard.

Assuming the three holes made in the baseboard are correct, the latter may be screwed direct to the panel, although not before the supporting bracket at the back of the three-gang Extensers has been adjusted to a suitable height; actually, on the original set this bracket had to be pushed as near to the Extenser as it would go. Screw the ganged Extenser to the baseboard by the bracket.

Extenser Dial Adjustment

Before proceeding farther, the engraved scales on the Extensers must be rotated to read correctly for each wave-band. Rotate the moving vanes until they are just fully meshed with the fixed ones, and after loosening the grub screws holding the dials, turn the latter until the junction of the red and black engravings comes under the centre indicating lines, after which retighten the screws; this should show maximum readings on each scale.

If these adjustments are correct, further slight movements towards the red (long wave) parts of the scale will cause the switches on the Extensers to open-circuit. Be sure to see that the grub screws on the Extenser control knobs are sunk well below the surfaces of the knobs, as this will prevent accidental shocks. Similarly, it is as well to repeat that the escutcheon supports at their tops are of an insulating material instead of the metal pieces normally provided.

The Volume Controls

To complete the panel controls the extension rod for the volume controls must be fitted, and the bracket holding the latter two units (ganged) screwed to the top of the baseboard by the inverted L piece, but only after all necessary adjustments have been made to provide an easy movement on the control knob (the grub screw on this knob should also be sunk).

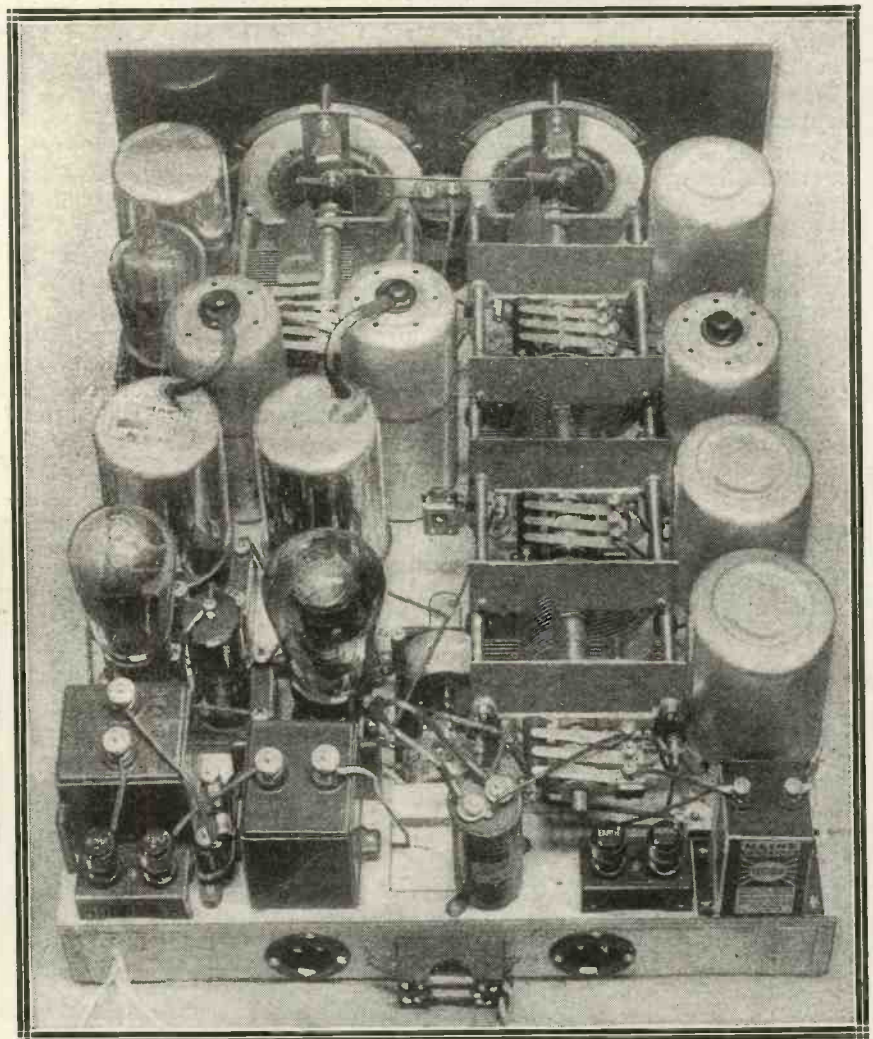
Finally, the two small vertical screens next to the panel on the Extensers (oscillator and H.F. section) must be removed completely, and the pilot lamp-holders fitted complete with bulbs consuming ·25 ampere (any voltage).

The skeleton chassis is now ready to receive the remaining components, and as these are of the conventional two-, three- or four-screw fixing type, it is only necessary to mount them on the baseboard in the positions indicated on the photographs and diagrams.

Mounting the Coils

Great care is essential when mounting the screened band-pass aerial and H.F. coils, as their metal containers must not touch the triple-gang Extenser; at least, not the fixed vanes, which project slightly beyond the connecting bars on the assembly. Short-circuits between these points would lead to a total absence of signals.

READY TO COMB THE ETHER



Such is the power of the D.C. "Super-Quad" that its range of reception is, for all practical purposes, unlimited. Only atmospheric conditions can curb its distance-piercing qualities, and it is, of course, exceptionally selective, even for a super-het.

although no damage would be done.

Do not omit to provide soldering lugs under the metal containers, as these must be " earthed " in order to provide adequate screening. With the exception of the 2-mfd. condenser in series with the earth lead, and the two 4-mfd. condensers in the choke-filter output circuit, all 1- and 2-mfd. condensers must be arranged to be screwed on their sides, since it is not possible to mount them otherwise owing to the shallowness of the " tray " provided on the underside of the baseboard.

Brackets for Chokes

Of course, the constructor can employ existing condensers not fitted with side lugs if he procures or makes some little L brackets for them.

When fitting the Colvern coils the switches should be turned to long-wave position and then the rods should be withdrawn.

The two heavy-duty H.F. chokes in series with each mains lead are supported at their extremities with small brackets to prevent damage to their bases owing to the top weight. Suitable brackets can be obtained from the makers.

A 3,000-ohm wire-wound potentiometer in series with the cathode lead of the first detector (or mixer) valve for grid biasing is mounted direct on to the underside of the plywood baseboard, while the clamping nut is fitted on top and sunk below the surface by means of a brace and bit. Another arrangement could take the form of a flat metal strip with a hole in its centre to take the single-hole-fixing bush on the potentiometer, the ends of the strip being drilled to take two ¼-in. No. 3 or 4 round-head screws and fitted to the underside of the baseboard.

Watch the Sides

When mounting the components on the top side of the baseboard be careful to see that none of them project over the sides, as difficulty would be experienced later in sliding the set into its cabinet. A strip of wood must be removed from the back so that the fuses and sockets are accessible.

RECOMMENDED ACCESSORIES

Loud Speaker.—(Amplion, Blue Spot, H.M.V., Marconiphone, B.T.-H., W.B., Ormond, R. & A., Celestion, Graham Farish.)

Valves.—3 D.S., 1 D.L., 1 D.H., 1 D.P.T. (·25-amp. D.C. valves, Marconi or Osram).

Mains Unit.—Atlas D.50 D.C. unit, R.I. D.50/3 unit, or other make capable of supplying 50 milliamps. at 200 volts (from 240-volt mains), with three taps: 1 variable 60–90, 1 120 to 150 fixed tap, and 1 maximum.

1 Mains universal D.C. resistance for ·25-amp valves, up to six valves (Bulgin type " B ").

Before the wiring can be undertaken a number of holes must be made through the baseboard, as wires in their insulated sleeving have to pass through them so as to join up various components. As it is not possible to enumerate them here, it is suggested that constructors refer to the wiring diagrams, and before drilling mark the position of each hole with a pencil on the wood. Needless to say, the utmost caution is essential in noting whether each proposed hole is likely to foul a component drilling either from the top or below the baseboard.

To assist in wiring later, each hole, after being drilled, could be marked on the wood alongside with its equivalent wiring diagram number, as this will prevent mistakes later.

In view of the inaccessibility of certain components, such as the nuts on the threaded portions of the loud-speaker, aerial and earth terminals, it is advisable to attach the wires to them before screwing down the blocks. No. 20, 21 or 22 gauge tinned copper wire with close-fitting " Empire " tubing or " Systoflex " is recommended for wiring purposes, as this is not too thick to be handled comfortably, nor yet too thin to be self-supporting when bent at right angles, looped, etc.

Preparing for Wiring

The fixing of the small balancing condensers (trimmers) on the main three-ganged condenser, the positioning of the soldering lugs on the eight-lead Extenser oscillator, the fixing of the Spaghetti resistances and various other minor fittings, should be undertaken before wiring is commenced.

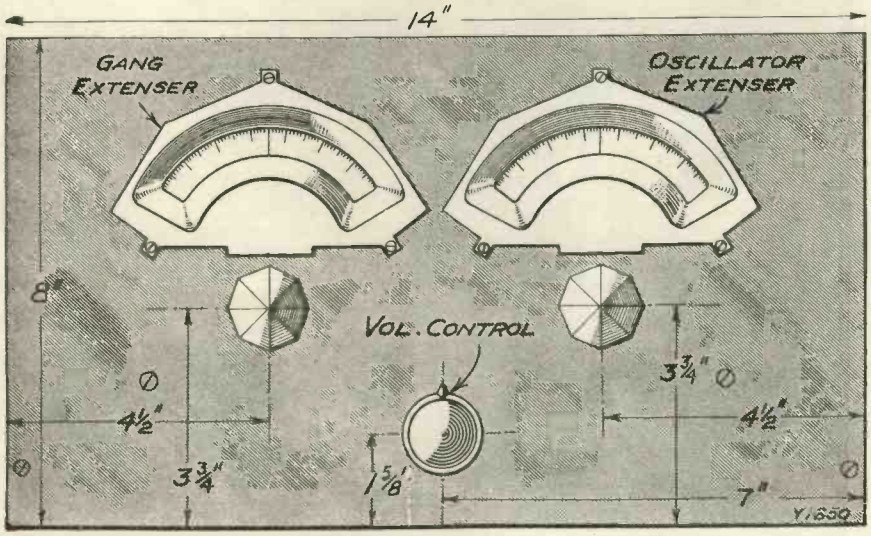
There is little to add regarding the wiring itself, since this is quite straightforward. Probably the oscillator coil and condenser wiring can next be undertaken, and the awkwardly situated wires, followed by the aerial and H.F. coils and condensers. At least two very careful checks and rechecks of the wiring are advised, in order to discover mistakes, " dry " soldered joints, omissions or short-circuits.

Component Points

Before completing these constructional hints a few words on the components would not be out of place. Alternatives in a few cases, such as the leaks, may be employed, and non-inductive bobbin wire-wound or synthetic graphite resistances of equivalent values may be used instead of the Spaghetti resistances, while the constructor has a large choice for small fixed mica condensers.

The Dubilier ·001-mfd. fixed condenser in the anode circuit of the oscillator valve, however, has only an alternative in the T.C.C. flat or

EXTREMELY EASY TO OPERATE



PANEL LAYOUT.

Besides being perfectly safe for anyone to handle, the D.C. " Super-Quad " is particularly easy to operate, as there are only the three controls on its symmetrical panel.

Automatic Trimmer-Control is Included

Loewe tubular types, because space is a consideration here.

It is important to note that where the Colvern valve screens are employed only W.B. 5-socket valve holders are suitable, owing to these two parts being made to fit each other. Regarding the absence of a mains on-off switch, this should be included in one mains lead between the mains plug and the fuse. This switch can be mounted on the side of the cabinet in any convenient position.

Simple Operation

As far as the operation of the D.C. "Super-Quad" is concerned you will find it quite a simple business. The valves are placed as follows: S.G. valves (D.S. type) in holders V_1, V_2, and V_4. A D.L. valve goes in holder marked V_3 and is the oscillator valve, while V_5 takes a D.H., and V_6 a D.P.T.

In the original receiver Marconi valves were used throughout, but there is no reason why Osram valves should not be used. The valves must be of the ·25-amp. indirectly-heated variety.

The two dial lights are connected in series with the heater leads, and should be of the ·25- or ·3-amp. type. If desired, and it is quite in order to do so, these lamps can be shorted out and the set used without them.

Heater Current

As a couple of mains H.F. chokes are used in series with the mains, a slight drop of voltage across the heaters occurs, and so it is best when connecting up the set to check the heater current by means of a small ammeter reading to ·5 or 1 amp.

You will probably find that to get exactly ·25 amp. you can place the mains flex that goes to the 200–250-volt side of the heater resistance on a tap one lower down than is apparently required by your mains voltage.

For instance, if you have 240–250-volt mains, you can use the 230-volt tap. With 200-volt mains, of course, you have to stay on the 200-volt tap, and if you are unlucky enough to have mains with voltage less than 200 you will have to give the set a miss, as it is not suitable for such low voltage supplies.

But to resume our connecting-up process. The mains themselves are connected via a plug and flex to a break switch—we suggest a long spindled B.A.T. switch that is specially made for mounting on wood, placed on the side of the cabinet. It can be obtained from Messrs. Claude Lyons & Co., Buckingham Gate, S.W.

From this switch goes a lead to one fuse on the back of the baseboard batten.

Having removed the adaptor plug from the H.T. mains unit and substituted the Bulgin plug, place the adaptor on the main mains feed to the set. Put both the plugs in their sockets and switch on. If nothing is heard, reverse the plug in the mains.

If you still hear nothing, reverse the connections to the plug of the H.T. unit and again switch on.

If still no results are heard, reverse the mains plug again. One of the four variations must be correct, and at that particular combination the set should show signs of "life." Remember, however, that at each trial half a minute or so must be allowed for the valve heaters to warm up.

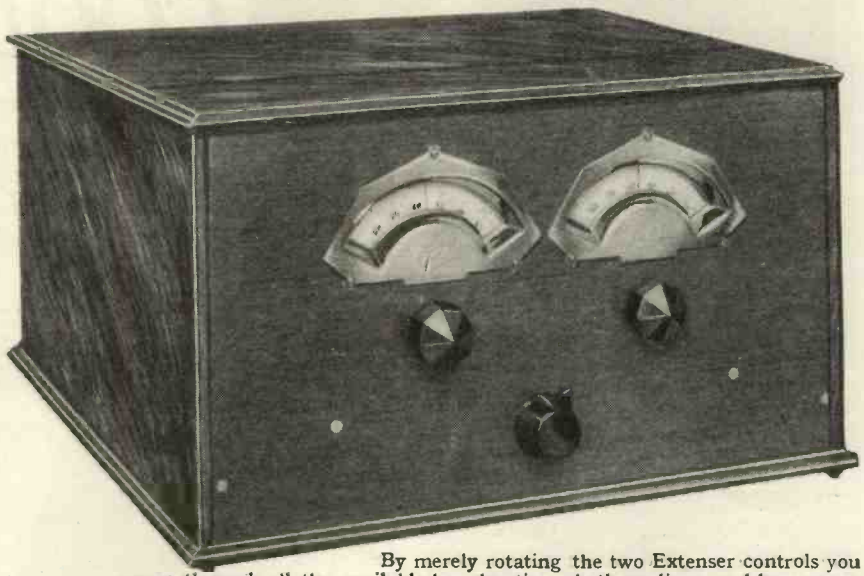
The heater resistance has been connected all the time these tests have been going on, of course; one of the leads from the set going to No. 6 terminal on the resistance and the other to the suitable terminal marked for mains. It does not matter which lead goes to which, and the negative terminals are neglected.

The H.T. Taps

Check up the heater current, as mentioned before, with the ammeter in one of the two heater leads. Here are the connections to the H.T. mains unit. No H.T.— lead is required, the common mains negative supplying this. H.T.+1 goes to one of the variable taps of the Atlas D.50 unit (or to the one variable tap of the R.I. unit), H.T.+2 can go either to the 120-volt tap or can be connected with H.T.+3 to maximum. You will have to find which arrangement works best.

With the set in operation, which we will discuss next month, the variable H.T. tap voltage is altered until best results are obtained.

NO WAVE-CHANGE SWITCHING



By merely rotating the two Extenser controls you sweep through all the available broadcasting—both medium and long wave.

Final Fixing

These tests have, of course, been carried out with the set out of its cabinet, sufficient flex being left from switch to fuse holder to allow of this procedure. Before placing the set in the cabinet we shall have to gang it, and to set the aerial compression condenser. Then we shall put it back in the cabinet, fix the mains resistance on the back (it does not get hot), run the H.T. leads through the back, and all will be shipshape for normal operation.

Meanwhile, however, be really careful while the setting of the various controls and voltages is taking place, for the set is a mains receiver, and you can get quite nasty shocks if you forget this essential fact. All connections should be made *with the mains off*. They may then be switched on, but switched off again before anything in the set is touched. *This precaution is most important.*

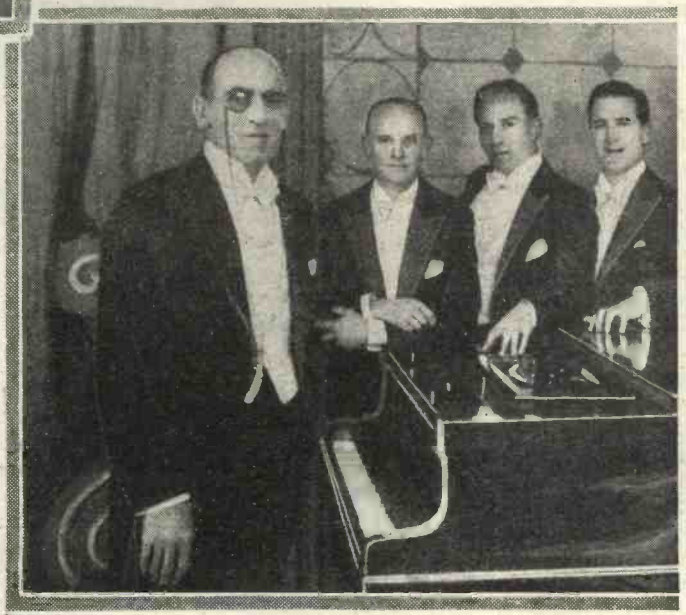
Here is the author with his very valuable "Strad."

ALBERT SANDLER

asks "M.W." readers this important question—

ARE WE GETTING TOO MUCH GOOD MUSIC?

Everyone knows how Albert Sandler handles a violin—but he can handle a pen too! Read this forceful and convincing article, in which he hits out at many a fallacy and tells us how he decides on his own programme values.



Popular broadcasters—J. H. Squire and members of his famous Celeste Octet.

IT does not matter very much what sort of boon is conferred upon people, there are always those who will not appreciate it. In some quarters there is a disposition to feel that a large proportion of the volume of good music issued every week from Savoy Hill is wasted on the desert air; in short, that too much good music is being broadcast.

I have heard it suggested that the musical taste of the ordinary listener nullifies to a great extent the work of those who are responsible for the provision of the musical programmes.

Does the Public Want It?

People point to the shout of horror which goes up from a certain dinner table when it is found that chamber music figures in the evening programme, to the wails on the same topic from "Disgusted Listener" which enliven the pages of "The Radio Times." From this and other signs they argue that music, by which I mean good music, is overdone on the radio.

I wish most emphatically to protest against this point of view, with which I do not agree for one moment, even though there is a substratum of truth running through it.

Gratitude is the hardest and possibly the most embarrassing of all the emotions to express. One does not expect every listener who has found a new joy in life in listening to good music to take pen in hand and indite a glowing letter of thanks to the B.B.C.

He is far more likely to seek self-expression in writing if there happens once in a while to be something in the programme which for some reason or other he violently dislikes!

Criticism is easier, and comes more readily to all of us than praise. But for all that I firmly believe that a preponderating majority of listeners really does appreciate the musical fare which is put before them, and would indeed become vocal if—impossible thought!—it were suddenly withdrawn.

What marvellous fare it is!

Music, once more or less exclusive and expensive, laid

on to one's house like gas or water, but considerably less expensive; the pick of British orchestras, and many foreign musical combinations of note; works which the music-lover of twenty years ago thought himself lucky to hear once or twice in a lifetime now available once or twice a year, with the minimum of trouble and expense. All this and much more for ten shillings a year and the cost of upkeep of a wireless set.

If you tell me that this is not genuinely appreciated by the vast majority of contented but unvocal listeners I frankly refuse to believe you. It is tremendous, and is appreciated as such.

Cut Down the Chamber Music

A short way back I referred to chamber music, and this, I think, is the only type of good music of which the average listener notices an excess. I agree that this could with benefit be cut down, because for its full appreciation it needs a musical education and knowledge of construction.

This the average listener does not possess, and has moreover neither the time not inclination to acquire it; most of his listening being done in the evening at a time when he is tired, and not in the mood for too much concentration.

I agree, too, with the suggestion that, in the case of many of the symphony concerts, listeners would have their enjoyment heightened very considerably if some sort of explanatory matter, suitable for the non-technical listener, were broadcast before the performance began.

In listening to music which, to the connoisseur, is

Solomon preparing to broadcast one of these delightful recitals from the London studio

familiar, the ordinary listener often has a feeling of being in the dark and of not knowing what it is all about.

Checking the "Jazz-Mad" Craze

I think, possibly with others, that explanatory matter would solve this problem and be very welcome in most homes.

But as a general principle, apart from these quite minor matters, I cannot see how in an age like this anyone could wish to lessen the influence of music—one of the

POPULAR CONCERTS IN A MUSEUM

Listening to one of the popular concerts given by the National Orchestra of Wales in the National Museum.

civilising agencies which counteract the growth of the jazz-mad, cocktail-party state of mind.

Has Existed for Centuries

Good music existed for centuries before the insane crazes and habits of this year of grace nineteen hundred and thirty-one, and will prevail long after these are forgotten. I do not know where the world is going in its present mad career, or where it will stop.

But this I do know—that music is one of the greatest forces working for sanity and tranquillity

MASTERLY MAKERS OF MELODY

This is the Covent Garden Octet.

"We Cannot Possibly Have Too Much"

and peaceful enjoyment. Radio has made it possible for this mighty force to be unleashed and to extend its benediction to the meanest home in the country; just at the time when it is most needed.

Why, therefore, attempt to impede its progress? Good music is pure anti-cocktail-mad propaganda. How can we possibly have too much of this in the present state of affairs?

We All Enjoy His Music!

And now you will forgive me for being personal for a moment. In my own programmes on Sunday evenings I restrict myself to what can be called good music—good of its kind, but not too heavy; and in every programme I try to put one or two items which every listener is bound to like.

There is no particular virtue in the mere playing of the majority of these items—most of them are in every violinist's repertoire, but I try very hard to play them better, with more depth of feeling, and with more showmanship than anyone else.

But remember this. Everything I include can be classed as good music. Now will those pessimists who assert that the public taste is not improving and that good music is a waste of time please note that after a recent broadcast, as described above, I had 500 letters of appreciation.

A Force-of-Habit Fault.

At this point I would like to refer for a moment to the listener's part in the appreciation of the musical feast so continually set out before him. I feel sure, to begin with, that the ranks of the music lovers would be immensely strengthened if every listener were to make sure that the reception he is getting is the best possible—consistent, of course, with the means at his disposal.

I cannot help feeling that, in spite of the pitch of perfection to which modern reception has attained, there are still a considerable number of listeners who listen to poor reproduction of music which has only the remotest resemblance to what is actually being broadcast. Force of habit makes this a fault which is fatally easy to commit. Happily, it is equally easy to remedy.

The same applies to those who continually play gramophone records without bothering to see that the indicator is set to the correct speed.

Straight from Albert Sandler Himself!

They forget that, in the case of my own records, for example, the whole character of the performance is changed if the pitch is altered through playing the record too fast or too slowly. It is no longer Albert Sandler's orchestra at all; it sounds like a particularly bad military band!

Points like this in connection with the reproduction of music, either by radio or gramophone, are extremely important, because before judging whether or not one likes good music it is obviously necessary to make sure that one is getting it, and not unconsciously putting up with imperfect reproduction.

The need—the taste—for good music is growing; faster, I think, than any of us realise. With a growing demand staring one in the face it is absurd to contend that the public is getting too much.

YOU'VE HEARD THESE PEOPLE

They form "three-fifths" of that very well-known Gershom Parkington Quintet.

MY BROADCASTING DIARY

Our own Broadcasting Correspondent records the progress of the British Broadcasting Corporation, and frankly comments on the policies in force at B.B.C. headquarters.

The New Board at Work

IT is true, I believe, that no one at the B.B.C. knew who was to be the new Governor until the appointment was published in the "London Gazette." Likewise, the only Governor or B.B.C. official whom Mr. Harold Brown had met was Sir Gordon Nairne, whose place he was to take.

But the first meetings of the new Board have been much the same as those since Mr. Whitley took over from Lord Clarendon. The idea of allotting to each Governor the supervision of a specific part of administration or work has been frequently mooted, but is still as far as ever from acceptance.

I understand that the new Governor agrees with his chairman and his colleagues that the responsibility of the board is general. It is being assumed that the idea behind the Prime Minister's policy of continuing three of the Governors for one year more is to arrange an effective continuity, and that at the end of this year there will be only one retirement, the remaining two being extended for a further year.

Then in 1934 there will be one more replacement and another in 1935, the process continuing indefinitely. So far as I can see, the chief practical objection to this plan is that it may deprive broadcasting of the services of Lady Snowden prematurely. This would be a great misfortune—so great, indeed, as to justify exemption from the general rule.

Sponsored Programmes

The development of sponsored programmes from stations outside the United Kingdom goes on apace. There are now half a dozen companies and agencies engaged in "time-broking."

The B.B.C., sensing danger to its system of finance by licence revenue, has banned the advertisements of sponsored programmes from its periodicals. And now certain organisations of newspapers, sensing danger to their advertising revenue, are co-operating with the B.B.C. in an endeavour to restrain the movement.

Another factor at work in the same direction is the public opinion of the countries from which these sponsored programmes are broadcast. There is most irritation in France, where listeners are complaining that such a large proportion of the time of their stations is occupied by sponsored programmes designed only for England, that there is practically no interest of a national or local character.

It is likely that this subject will be ventilated in Parliament. I understand that the General Post Office does not associate itself with the movement to restrain sponsored programmes except in so far as to deny the use of telephone lines in cases where the programme, originating in England, is to be radiated from the Continent for British consumption.

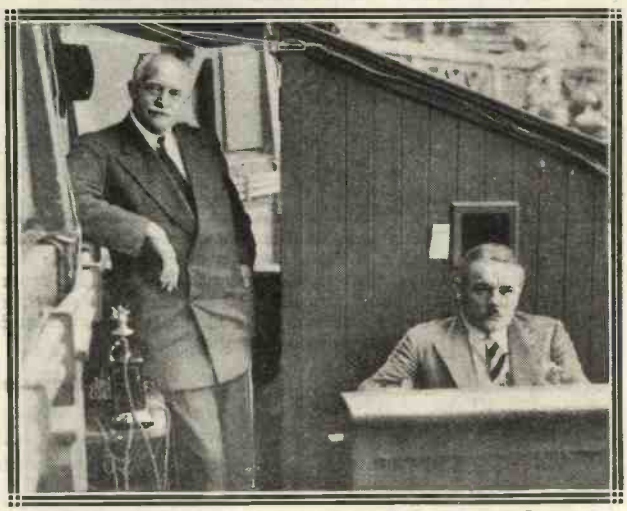
Upheavals and Changes

The deaths of Mrs. Courtauld and of Mr. Lionel Powell portend far-reaching changes in the musical and concert-giving worlds. Readers of this page will recall the formidable rivalry between Mr. Lionel Powell and the B.B.C.

True, the acute difficulties of earlier years tended recently to subside, but Mr. Powell remained a potential adversary for whom the B.B.C. entertained respect.

As the premier impressario and the practical monopolist of the big-concert business of this country, Mr. Powell was in a peculiarly advantageous position to influence the B.B.C. Mrs. Courtauld, also, in the sphere

THE MEN BEHIND THE O.B.'s



One of the entertainment fields in which the B.B.C. is most successful is that of "Outside Broadcasts." Here are two of their most popular commentators—Col. Brand (left) and Capt. Wakelam.

Latest News Items for the Listener

of Opera and Symphony, held a unique position and only recently developed any friendship for the B.B.C.

With the passing of these two great figures, the entertainment world outside broadcasting is in a much weaker position *vis-à-vis* the B.B.C. The danger is that the B.B.C. will have too much of its own way, which would be unhealthy for music in general and for the B.B.C. in particular.

There remains, of course, the group headed by Lady Cunard and Sir Thomas Beecham. Do they intend to continue their independent attitude?

Birmingham's Progress

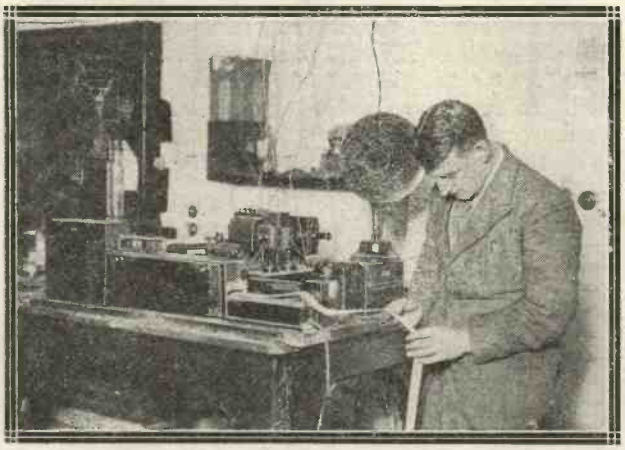
The increasingly high standard now demanded from microphone aspirants is well demonstrated by the fact that out of several hundred people to whom auditions were given by Mr. Edgar and his staff at Birmingham during 1931, only 69 passed the test, and of these only five per cent were good enough to secure repeat engagements.

During the year the Birmingham region carried out no fewer than 690 outside broadcasts, many of which broke new ground. New telephone lines have been installed between the B.B.C. and three Birmingham theatres, and the Midland Region has the distinction of being the first to link up a theatre which has provided its own studio for broadcast relays—the famous Birmingham Rep.

Broadcasting House

While officially the B.B.C. professes to be well pleased with the general progress of Broadcasting House, I hear that the same view is not expressed internally. There is

THE BIG BANG AT BIRMINGHAM

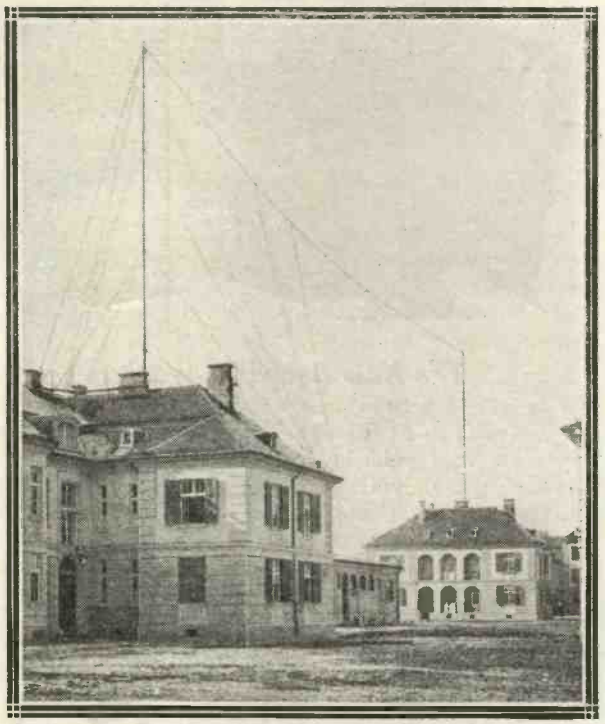


The powerful amplifier and recorder shown here is installed in the Physics Department of the University of Birmingham. It is being used to listen to a time signal, and simultaneously to record the exact moment when a muffled bang arrives all the way from Woolwich, where a big gun was fired at intervals for scientific research into acoustics.

nothing seriously wrong; but there is an accumulation of matters of detail which extends delay of occupation.

There had been hopes of the evacuation of Savoy Hill by not later than March. It appears that these hopes are doomed to disappointment; staff will continue to trickle in, but the move will not be complete until towards the end of May, if then.

TO TRAP THE TRICKSTERS



Most of the European countries now call in radio as an aid against the criminal fraternity, and this photograph shows the aerial at the headquarters of the Hungarian police.

Sunday Programmes

The agitation for recasting or strengthening Sunday programmes has received a setback from an unexpected quarter. It has become apparent that in the past year or so a very large number of people have equipped themselves well enough to be able to listen at least to the long-wave continental stations as well as to the B.B.C.

To these listeners and to wireless experimenters the silent periods on Sunday are invaluable, and they would greatly resent their being filled up. I have not yet gauged the political power of this school of thought, but I have an impression that it will be considerable.

Of course, this intervention is blessed by the B.B.C., which had been hard put to it to meet the objections from all classes of the community to the absence of variety on Sunday.

The Return of "Conversations"

The return to programmes of informal conversations among people of distinction is heartily to be commended.

I remember one of these about six years ago in which Mr. J. H. Thomas participated. There was a bright and vigorous exchange on a lot of subjects. It was instructively amusing. I hope the new series turns out to be as good as the foretaste of which it reminds me.

... ON THE ... SHORT WAVES

By W. L. S.

Our short-wave expert comments on the improving conditions now being experienced on the short waves. He also remarks, among other items, on how little is known of the cause and nature of the varying reception which is obtained on short waves during different periods of the year.

By the time you scan these notes we shall all be thinking of the coming of Spring, which is, to the short-wave man, a term synonymous with good reception (unless, that is, he thinks of the "black year" of 1930). It is significant, then, that as I write these notes, with the memory of Christmas dinner not far behind, and snow on the ground outside, conditions are already improving apace.

Looking Forward

Our usual dull period from October to December is well behind us, and we have something to look forward to. Letters I have received for the past week bear witness to this, and my own receiver shows distinct promise!

It is not unusual nowadays to receive broadcast from all continents in a few hours, and the amateur signals have been outstandingly good, though not too regular. Up to date my prize log for 1932 (for one day) contains the following broadcasters: Chi-Hoa (Indo-China) on 49 metres; Moscow, Rome, Zeesen, Skamlebaek, and G 5 S W; V K 2 M E, Sydney; Rabat, Morocco; and the following from the States: W 2 X A D, W 2 X A F, W 9 X F, W 8 X K, W 3 X L, W 3 X A L, W 8 X A L, and W 1 X A Z. All continents except South America in a total period of two hours' listening! So let us forget bad conditions for the moment.

Single-Station Listening

One of the most fascinating things, I always think, is to forget the urge to search for new stations and to hang on to one particular station for a long time, noting his strength at every quarter of an hour or so.

If you have the patience to do this for several days, and on several different stations, you will often find that each has his own "characteristic curve," irrespective of conditions, but that no two are alike.

For instance, you may find, when reception is good, that W 2 X A F fades from R8 to R6 between midnight and 12.15 a.m. If this is so, the chances are that when conditions are *bad* he will do the same thing, perhaps from R2 to R0! This is a purely imaginary case, just to illustrate what I mean. I think a large body of enthusiastic short-wave listeners, checking up on this sort of thing, could do a vast amount of really useful work in getting down to the question of the causes of fading.

I say "a large body of listeners" because the behaviour of a given station will vary at two receivers only a mile apart. It is therefore necessary to compare a fairly large number of logs to extract anything useful.

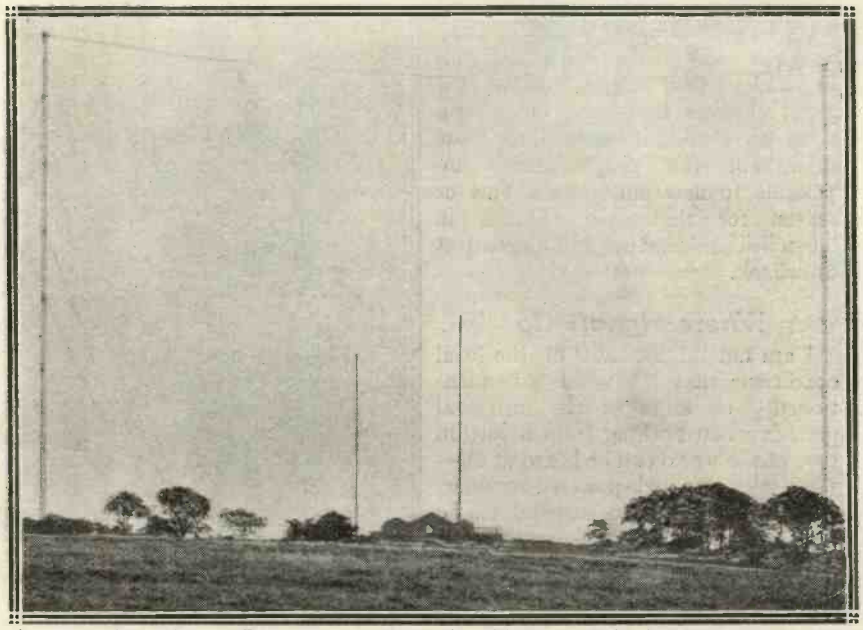
If any of my regular readers feel that they have enough patience to tackle something of this kind, I would gladly take on the work of comparing their logs and extracting from them any definite information that can be got from them. Suppose we mention W 3 X L (46·69 metres) and W 2 X A F (31·48 metres) as stations to watch?

Commercial Stations

What an eye-opener it is to study a list of short-wave commercial stations nowadays. When one recollects that in 1923 there was not a solitary commercial below 100 metres (except sundry experimental transmitters), and that the amateur transmitters were given the short-wave bands to play with "just to keep them quiet," one has to think *very* hard.

Of course, we know that the powers-that-be are not inclined to give the amateurs much credit for "discovering" the long-distance properties of the short waves, but I rather think they *know* (without saying so) who was responsible for this revolution in commercial radio.

WHERE THE EMPIRE STATION WILL STAND



A recent view taken at Daventry, the Northants village which is situated near the centre of England, and which has become world-famous since the B.B.C. established its National and Midland Regional stations there. This year they plan to put up an Empire short-wave station also.

The Best Set for Logging Amateurs

When one really thinks it over, it is fairly obvious that it required somebody like the amateur experimenter to get down to such a problem in the first place. The amateur is renowned for attempting the impossible, and also for being laughed at in the process. There are not many cases in which he has pulled it off so successfully as in this short-wave business.

Discovery of Short Waves

Some day I am going to write a book on the more romantic side of the "discovery of short waves." If one merely collected together the dry facts and put them down in black and white it would make sufficiently interesting reading.

To be brief, the result of the "blind" work of 100 amateur stations, not too well equipped technically or financially, is that some 10,000 commercial stations are now doing their work more reliably, more economically, and over greater distances, than they were in the days when they used wave-lengths of 8,000 metres or so.

When one looks back on this brilliant record, and reflects on the great changes that have come over short-wave work, it seems all the more remarkable that people find it impossible to determine any rhyme or reason for the rapid changes in "conditions" that are still its greatest drawback.

Where Signals Go

I am not talking now of the local conditions that I have already mentioned, but more of the universal periods when nothing from a certain part of the world can be heard at all—when even two high-powered commercial stations have to suspend traffic for a time.

I have often expressed the view that the only cause of these so-called "blank periods" is a change in the height of the Heaviside layer. The angle of reflection of signals may thus be changed in such a way that they land in some part of the world where they are not wanted, perhaps where there is no one to receive them!

After all, the radio-equipped areas probably only total about one-hundredth of the surface of the Globe, if as much as that. So when our signals apparently don't get anywhere, we can console ourselves by reflecting that they may be coming down beautifully in mid-Siberia or the Pacific Ocean, and it only wants a MODERN WIRELESS reader with a portable to assure us that they are really all right!

* * *

As an up-to-date example of freaks, I may mention that on the night before writing these notes I heard more American amateurs coming over on 40 metres than I have heard for many moons. Thinking to myself, "Ah, the broadcasters will be good to-night. Let's listen to 'em and tell those MODERN WIRELESS people all about them to-morrow!" I set to. But not one could I find. *There* is a good example of varying conditions on slightly different wave-bands.

With the 100-watt amateur stations pouring in on 40 metres, one would expect to hear 50 kw. or so coming over from W 3 X L, for instance, on 46·69, but it certainly wasn't. I waited from 11 p.m. till after midnight, and although the "hams" were improving all the time, the broadcast people might have gone to sleep for all I could hear of them.

Single-Waver Best

After eight years on the short-wave game, I am convinced that the best receiver for "ham" work is a straightforward single-valver. I now use one myself for that purpose, and, owing to the beautifully silent background, I hear signals (very weakly, of course) that disappear beneath the "mush" when a note-magnifier is added. This applies, of course, only to code signals. Telephony certainly requires a stage—or even two—of L.F.

Switching Out L.F.

After my experiences with this single-valver I shall never make myself an "all-purpose" type of receiver without making provision to switch out the L.F. stage.

I am still rather inclined towards the super-het as the ideal telephony and short-wave broadcast receiver, but it needs careful designing and careful operating.

* * *

I have no wish to start the "earth or no earth" controversy raging again, but one or two letters that have reached me indicate that some people still do not quite appreciate the snag. Put briefly it is this—you *can't* have a short-wave set that isn't earthed. The capacity of the batteries, battery leads, metal baseboard or box, to earth, provides quite a nice low-impedance path. One requires such very small capacities at these ultra-high frequencies for by-passing purposes that the capacity of the gear to earth provides a more efficient earthing system that would be obtainable with a long lead down to the garden!

OPENING THE NEW RADIO PARIS

A visit to the main building at St. Remy l'Honoré by the P.T.T. Minister (Posts, Telegraphs and Telephones) on the occasion of the opening ceremony.

AT YOUR SERVICE

by OUR TRADE COMMISSIONER

Here is some varied news of the trade that should interest all readers, whether or not they are connected with the radio industry. Manufacturers, dealers, home constructors and general readers are invited to send items of interest to be included under this heading.

New Heayberd Unit

I SHOULD like to draw your attention to a new A.C. power unit placed on the market by Messrs. F. C. Heayberd & Co.

Primarily it was designed by request of the Research Department of MODERN WIRELESS, who desired a good unit—after the style of the Heayberd M.W. unit—which would supply up to 5 amps. at 4 volts L.T., but which should have an alternative centre-point earthing scheme for the L.T. winding of the power transformer.

Most commercial units have the centre point taken inside the unit to H.T.– ; a quite excellent feature except that it renders the unit far less flexible than it need be. With the new Heayberd M.W.1 unit you can do what you like with the centre tap, thus allowing directly-heated output valves and automatic bias to be used, and also any hum to be "tuned out" by the well-known potentiometer method.

This unit, I understand, will gradually replace the M.W. unit; it will be the same price, and have the same output. It should have a very ready sale.

Eric Resistors

The famous U.S. fixed resistors known as the Eric resistors are now being made in this country. A special factory has been opened, run by Eric Resistor, Ltd., Waterloo Road, Cricklewood, London, N.W.

Resistances are supplied in $\frac{1}{3}$-, $\frac{1}{2}$-, 1-, 3-, and 5-watt types, covering from 15 ohms to 10 megohms. Welded leads are employed for connection purposes, the whole unit being extremely robust and perfectly rigid.

The Telsen "Telexor"

Have you seen the new Telsen version of the "Extenser"? It is a delightful little job, known as the "Telexor," and is bound to be a firm favourite in thousands of homes within a very short time. It retails for 1/6, and has a very handsome slow-motion drive and escutcheon.

1932 Madrigal

This is the third season of R.I. Madrigal receivers, and the latest developments in this famous line include band-passing and make for even greater sensitivity. The no-aerial feature of the Madrigal sets is retained.

It is housed in a handsome case, and includes a first-class moving-coil speaker mounted in a particularly spacious compartment so that boominess shall not be caused by the walls of the cabinet.

Bedford's Best

The best of the Igranic Electric Co.'s radio lines are catalogued in a little folder that has just reached me. Known as publication No. 6,747, it is an abridged catalogue, and serves as a very useful reminder of the varied assortment of components that are made by the famous Bedford works.

Another Igranic leaflet (No. 6,746) illustrates and describes the permanent-magnet moving-coil loud

ANCIENT AND MODERN

Making a sound film of one of Faraday's famous experiments ; that of a man sitting inside a metal cage charged with a pressure of 250,000 volts.

A Valve Factory which is Working Night and Day

speaker. A special centring method and system of diaphragm suspension is employed in this speaker (which sells for £3 without input transformer, or £3 7s. 6d. including this component), so that exceptional freedom without lateral movement is claimed.

A 10-in. cone is employed of special construction, and this, together with the magnet, is mounted in an aluminium chassis.

More Mains Units

Messrs. H. Clarke & Co. (Manchester), Ltd., announce that they are now producing two further mains units. These are both for A.C., and are listed Model A.C. 244/25 and A.K. 260/25. The latter provides trickle charging at ·3 amp. Both can be obtained on the hire-purchase system

Weston Meters

The Weston Electrical Instrument Co., Ltd., famous for their electrical meters, have moved from Great Saffron Hill to premises on the Kingston By-Pass. Instruments are also now being manufactured in this country at these premises, and it is hoped that better delivery and better service will be available. All communications should now be addressed to the new premises, Kingston By-Pass, Surbiton, Surrey. 'Phone: Elmbridge 6400 and 6401.

No Pauses at Ponders End

When the new Mazda A.C./S.G. was launched into the market this year a keen demand for this amazing valve was anticipated. This anticipation has been justified many times over, and the factory at Brimsdown, Ponders End, Middlesex, where Mazda valves are made, works day and night in an endeavour to keep pace with the huge volume of orders being received.

The success of Mazda A.C. mains valves has in past years centred round the screened-grid type, the phenomenally good characteristic of which first attracted considerable attention in 1929. The introduction of the A.C./Pen. last year also commanded attention in opening up a new field of inquiry into the possibilities of the pentode, which had begun to be regarded as of a very limited nature.

Belling & Lee

We are requested by Belling & Lee, Ltd., the well-known terminal makers, to assure home constructors and dealers that though in the past they may have had difficulty in obtaining the type " B " (6d.) B. & L. terminals, the makers have inaugurated a special sales campaign to ensure that every dealer throughout the country has ample stocks available.

Polar Ganged Condensers

We have received the following letter from Messrs. Wingrove & Rogers, manufacturers of the famous Polar condensers.

" We are pleased to say that we now hold ample stocks of Polar Tub 2, Polar Tub 3, and Polar Uni-knob condensers, and can dispatch by return.

" As stocks, however, are not necessarily held by all dealers in the country, customers should, in case of difficulty, communicate direct with us, mentioning the name of their local dealer, so that we can supply direct and credit the dealer with his appropriate discount."

Readers should note the above information, and application direct to the manufacturers at Arundel Chambers, 188–189, Strand, London, W.C.2, will greatly facilitate delivery where local stocks are not available.

Interesting Items

I have been looking through the latest " Formo " catalogue and have come across one or two items which are particularly interesting.

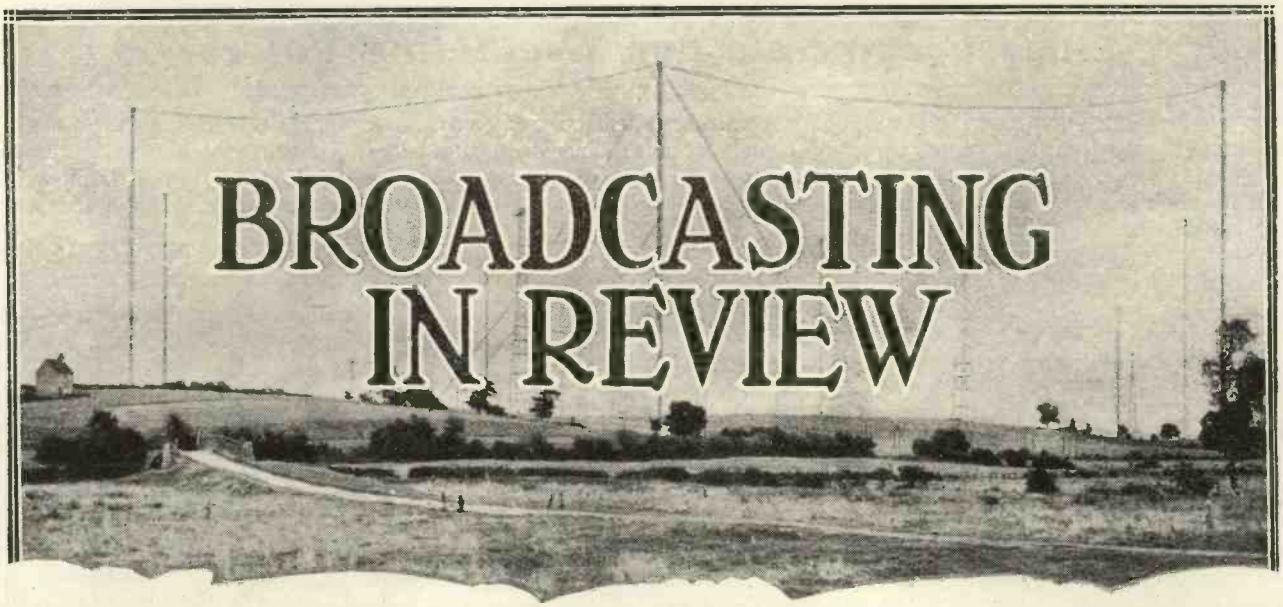
The first is the new Quadruple and Triple Gang Condensers, which can be obtained at the remarkable prices of 55s. and 45s. respectively. The whole assembly is neat and workmanlike.

A second item is a small de-coupling unit which for 3s. 6d. should meet the needs of many home constructors.

A new button condenser series is also worth noting, for here we have a range of mica condensers from ·0001 to ·002 at prices from 6d. to 10d. These Mika-Densors, as they are called, will enjoy a ready sale.

"YOU HAVE BEEN LISTENING TO JACK PAYNE AND . . ."

Jack Payne and his " boys," the famous radio dance orchestra, just before a broadcast from Savoy Hill.



BROADCASTING IN REVIEW

An illuminating article dealing with present-day problems, and explaining outstanding achievements and ideas which go a long way towards solving them.

By J. C. JEVONS.

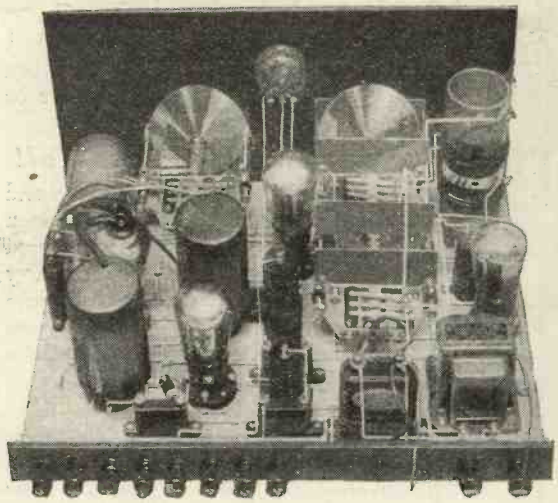
RECEPTION in this country—and elsewhere—is at present seriously overshadowed by the problem of the ether. Month by month new transmitters come into being, whilst others increase their power outputs, and so far as one can judge there seems to be no end to the process. Three years ago, for instance, there was only one European transmitter rated at 50 kilowatts, and now there are nearly thirty.

The Political Side

More than half the problems which are now occupying the attention of wireless designers would automatically disappear if we had an International Board of Control over the ether, invested with authority to limit the number of stations, restrict their power, and enforce the minimum "spacing" necessary to prevent overlap.

But as such a happy solution is apparently outside the reach of practical politics we have to make the best of things as they are. Designers have to some extent succeeded in overcoming the handicap of "congestion" by forcing up the efficiency of radio-frequency stages and by utilising special input circuits, such as the "Eckersley" tuner, and various forms of band-pass filter. An alternative line of attack has led to the revival of the super-het receiver in a new and improved form.

REVIVAL OF THE SUPER-HET



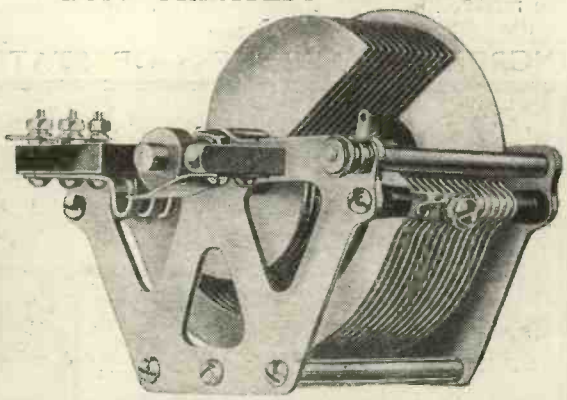
Endeavours to overcome the "congestion" problem have led to the revival of the super-het type of receiver in a new and improved form, such as the one illustrated above.

Tuning Control. The band-pass method of tuning is really a return of the old idea of loose-coupling—with the added advantages that both circuits are now tuned by a single control. Various forms of "mixed" coupling have been designed to ensure that the input "band" width is kept constant over the whole tuning range.

Simplified Tuning

In a dual-range set it is necessary to match the ganged tuning condensers on both sides of the two-wave switch, whilst at the same time the coupling between the filter circuits must be reduced on the shorter wavelengths. These difficulties have, however, been satisfactorily overcome very largely by the help of the Extenser.

1931's GREATEST ADVANCE



Changing from long to medium waves and vice versa is a necessity on a modern receiver, and all the sting is taken out of wave-changing by the Extenser (an example of which is shown above), which among other advantages has that of doing the switching entirely automatically.

In the case of the super-het receiver, single-knob control is still more or less in the experimental stage. Here the problem of ganging the tuning condensers is complicated by the fact that the oscillator valve must also be kept "in step," but with a

A New Principle For Oscillating Valves

constant frequency-difference, so as to maintain the resultant beat frequency at a steady value.

The obvious solution is to use straight-line-frequency condensers for all the tuned circuits, and to displace the "oscillator" condenser by the required amount before ganging to the control shaft. Unfortunately this does not always prove satisfactory in practice owing to the difficulty of "matching up" the different inherent capacities prior to ganging.

For Varied Inputs

Volume Control. The new variable-mu valve provides an extremely elastic volume control, which, with a single stage of H.F., is quite competent to deal with distant stations as well as the local transmitter—and this without upsetting the existing tuning, whether ganged or not.

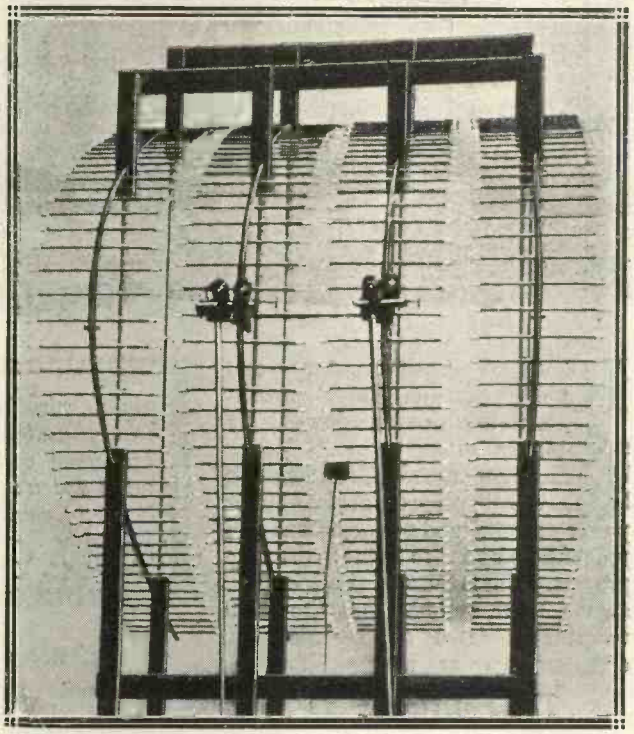
It can also be utilised to give automatic control in order to compensate for the effect of fading. To secure this result a second detector valve is connected in parallel with the ordinary detector through a blocking condenser, and the rectified output from this second valve is passed through a high resistance, from which tappings are taken back to the grid of the variable-mu H.F. stage.

Since the output from the second detector varies with the strength of the received signal, the negative grid bias taken from it will be greater as the signal strength increases and less as the signal weakens, so that the volume in the loud speaker is kept at constant strength under all conditions.

With two or more stages of H.F. amplification it is difficult to devise any simple scheme of volume control capable of handling the input signals both from a distant station and from the local transmitter, because the input voltages may differ by as much as 10,000 to 1. The solution in this case is to insert a "local-distance" switch, which either cuts out one of the H.F. stages when the set is tuned to the local station, or else inserts damping resistance to help to cut down excessive input voltage.

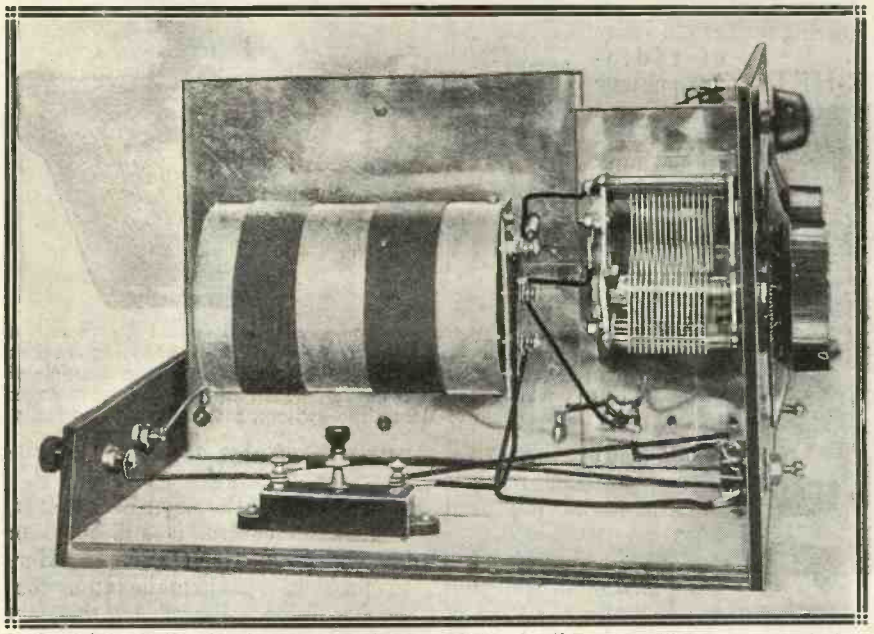
A very neat idea is to use the local-distance switch to convert one of the S.G. stages into a simple type of band-pass filter. If the screened grid of the valve is isolated from the H.T. supply, the ordinary inter-electrode capacity between the grid and anode is restored, and can be made to serve as a coupling capacity between the input and output circuits of that valve. The "converted" valve and its associated circuits then act as a band-pass coupling between the aerial and the next amplifier or detector valve.

ULTRA-SHORT-WAVE TRANSMISSION



Important advances have been made during the last year or so in the reproduction and use of ultra-short waves, and this picture shows the aerial used for transmission on a wave-length of 50 centimetres.

INCREASING KEENNESS OF STATION SEPARATION



A view of the H.F. side of a set employing an "Eckersley" Tuner, which uses an entirely new system of coupling between two tuned circuits to obtain really sharp tuning.

Power Grid and Push-Pull

Detection. Ordinary anode-bend and grid-leak detection have been largely replaced by the so-called "power-grid detector," which is now standard practice in many up-to-date receivers. This gives practically no distortion even with a high percentage of modulation. On the other hand, it tends to damp the input circuit by feed-back through the anode-grid capacity of the valve.

A new development which is free from this defect is the push-pull detector, where two valves are

(*Continued on page* 199)

Professor Thunk's New Attack on Alpha

A SMART attack of lumbago, during which I have been laid aside from the busy world of men—though left at home to see how confoundedly busy women are, too—has given me leisure to observe that almost every physical movement a man may care to indulge in involves the lumbar muscles. A wink of the eye is plain heck; a sniff means unvarnished hades; a cough is the two added and raised to the fourth power; turning over in bed is like a sword through the backbone, and putting on one's socks is enough to gain a martyr's crown.

Defying the Doctor!

Whenever I feel non-official—that is, unable to attend at the office—I

SEARCHING FOR SYMPTOMS

"I pass the weary hours—in search of symptoms."

pass the weary hours in hunting up the dictionaries and encyclopædias in search of symptoms. I recall that in the Easter holidays of 1913 I perished—according to "The Complete Home Medico"—of cholera. I had it to the T! But as I survived I presume that there must have been a misprint.

In the spring of 1923, "One Thousand and One Ailments" assured me that I was as good as cold mutton on account of a pain in the windbox. Not so! Jolly old bean that I was, I walked 190 miles with a 20 lb. pack through the hilliest chunk of Great Britain, and enjoyed it. In 1925 I had wasting of the legs—according to "The Doctor at Home"—yet with such wasted legs I contrived to buzz up and down several of Helvetia's most pointed crags, and came home ramping like a tiger. ("Give me blood or snow!")

True, Alec! There is not much radio about this, thus far. But give a man time! We lumbagists move deliberately! There's plenty of time between now and my next mustard plaster! Besides, I've got to create "atmosphere." Very important thing—atmosphere! Where would we be without it?

Celestial Radio

Another thing! The title of this display is "In Passing"; that's English for "By the Way." Sometimes the way is longer than at other times. It's all according to my sperrits—see? And lumbager gives me darned low sperrits. See?

Another mustard plaster having been driven home with a dull thud, I am enabled to bring my mind round to radio—and Professor Thunk.

Professor Thunk, the discoverer and sole custodian of *Alpha Thunkii*, a star invisible to all eyes save those of faith and mathematics, a star over whose adventures Professor Thunk has watched since 1876, gave me the dirty eye last August after I had failed to intercept *Alpha Thunkian* signals, though I fixed up some excellent substitutes. Therefore, I was amazed to receive from him the following note, which must be considered cordial in the extreme—coming from Thunk—commonly called "Absolute Zero."

Important Experiment!

"My dear Mr. Jones,—You being rarely usefully employed might deem it expedient to call here on Friday, the fourteenth, in order to hear news of an important experiment which I contemplate. I need hardly say that I refer to *Alpha Thunkii*. Seven—post meridian!"

KNOT LANGUAGE!

"What," I cried. "Cat's-cradles?"

As I was anxious to make peace with so eminent a scientist, I accepted his invitation and duly presented myself at his new flat in Russell Circus, W. I found him seated at his desk, playing with a piece of string. "What!" I cried. "Cat's-cradles?"

"I apprehend that you refer to an infantile pastime; hence your

"I Propose to Transmit Two Dashes"

comment must be assumed to be facetious. I am, in fact, studying the knot language of the Atacopi Indians, for I believe there is evidence that *Alpha Thunkii* was formerly one of their tribal deities."

"But how could the old girl have been known to them, she being invisible?" I inquired.

"Revelation, young man, revelation," he snapped.

"Well," I said, "what's this radio experiment all about?"

The Signal

"I have decided," he replied, "to communicate with *Alpha* by wireless. That decision taken, all you, as a wireless expert, have to do is to work out the method. Next Tuesday would suit me."

"That's a mere nothing," said I. "I'm polishing off little jobs like that every day. But the experiment is bound to be inconclusive unless *Alpha* replies, and do you think she has a population?"

SPEECHLESS!

"Hence in *Alpha*, zero would equal 0·003—and there would be no nothing, and twice nothing would be 0·006."

"Pray refrain from referring to this star as a female! Hem! The reply is not my concern. I shall have done my part if I signify our cognisance of *Alpha's* existence."

"So you will! So you will! But how will you signify that?"

"By means of the Morse telegraph code."

"But what words will you send?"

"No words! Young man, do you think that intelligences existing in an environment composed of sulphuretted hydrogen and acetylene, at a temperature of 60,000 degrees centigrade, are likely to need or use mere words?"

"I should think that's just exactly what they *would* need. *I* should, in such an environment. Anyway, if you don't send words, what *are* you going to send?"

"A mathematical conception."

"M'yes! Something frightfully axiomatic, eh? But I can't send Pons Asinorum in Morse, you know."

"A universal truth."

"Tell me one."

"Two plus two equals four."

"Can you swear that twice two comes to four in an atmosphere of rotten egg gas and acetylene? Gosh! I'd say anything in a landscape like that!"

"The fact is indubitable, and independent of cosmography."

Zero Equals What?

"Are you sure? Suppose that in a temperature of 60,000 degrees 'one' expands till it equals 1·003! Twice two would then equal 4·012. Hence in *Alpha*, zero would equal 0·003—and there would be no nothing, and twice nothing would be 0·006."

"I don't follow you. Nevertheless, we are bound to assume that the conceptions of zero and of unity are universal. I shall stick to twice one equals two."

"How will you convey 'equals' in Morse—to a star bloke who does not even know about America. Can America be a universal conception?"

"I propose to transmit two dashes, followed, after a marked interval, by four dashes."

"Do you feel convinced that *Alpha* will understand that an interval denotes equality? Suppose they understand intervals to mean multiply or subtract! Or cube! Two cubed equals four, eh?"

Anything Might Happen

"If they have reached the—aw—matriculation standard," said my Professor, "they will know the relation existing between two and four, —especially if I follow up with three dashes and, after an interval, six dashes."

"They may, of course, add them all up and refer the result to acetylene. Anything might happen at 60,000 degrees C."

"Yes, I see your point! Nevertheless, I am resolved to proceed. In any case, they won't know it is acetylene, because if they can smell they will commit suicide at the earliest possible opportunity."

"Exactly! Now, how far away from Earth is the old lady—I mean *gentleman*—er—I mean '*it*'?"

He jotted down a number of miles, and I proceeded to work out a little sum.

Millions of Years!

"Are you fully aware," I said eventually, "that your radio message won't reach *Alpha* for four and a half million years? Are you prepared to wait so long? Why, by that time the temperature will have dropped and 'nothing' will be equal to only 0·000001. This will throw their calculations out so drastically that they will become atheists and doubt the existence of the dollar! Are you going to stand for that?"

TO BE CONTINUED

"Don't bang the door, Alpha is very sensitive."

"I am prepared to stand by the results of anything that I may do in the cause of science. Besides, as you indicate, by the time that my message reaches *Alpha Thunkii* I shall not care a tinker's cuss. Hem!"

"Good enough! Now, what wavelength do you propose to use?"

"About 900,000 miles."

"Thank you, kindly! I'm only the jug-and-bottle department. What you need is Henry Ford. Why, my dear old squint—if I may call you that without inheriting a curse from the Atacopi Indians—you can't get through the Hon. P. Heaviside's layer unless you use short waves. Darned short 'uns, too. I'll fix you up with 0·001-metre waves."

As I left him his parting remark was—"Don't bang the door, Alpha is very sensitive."

How little did I expect that the great Thunk had thunk out my difficulties with friend Heaviside. Well, watch for a further thrilling instalment, when I shall describe not only the great experiment, but the result according to Thunk.

Free—

Ask your radio dealer for your Free Copy of the Meteor III Folder, which includes Full-Size Plan and Wiring Diagram with complete building instructions. You can build the Meteor III in an hour or so—the most fascinating radio set ever designed. It gives world-wide reception on ALL WAVE-LENGTHS—Long, Medium and *Ultra-Short*. In addition, with pick-up connected, the Meteor becomes an electrical reproducer of gramophone records at a flick of the radio-gram switch.

Wonderfully selective and sensitive—big volume—delightful quality—equal in appearance to a 15-guinea model—at a price you can easily afford.

No longer is there any need for you to use a separate receiver for Ultra-Short-Wave Reception of America, Australia, Africa and other far-distant stations. The Meteor fulfils every ideal of the radio enthusiast and the ordinary listener.

Designed by G. P. Kendall, B.Sc.

METEOR III

METEOR III KIT

Complete Kit of Components

75/-

or 9/- down and 7 monthly payments of **10/6**

METEOR III STANDARD CABINET MODEL

Complete Kit of components and cabinet to house set only)

89/6

or 11/- down and 8 monthly payments of 11/-

METEOR III CONSOLETTE CABINET MODEL

Complete Kit of components and cabinet, as illustrated, to house set, speaker, and batteries—equal in appearance to a 15-guinea model)

£5.0.0

or 11/- down and 9 monthly payments of 11/-

Choice of Recommended Accessories

Mullard Valves

1—P.M.2DX	8 6
1—P.M.1L.F.	8 6
1—P.M.2	10 6

Batteries

Pertrix 120 v. Super capacity	1 5 6
or	
Pertrix 120 v. Standard	15 6
or	
Ever Ready 120 v. Popular Power	1 4 0
Pertrix 9 v. G.B.	1 6
or	
Ever Ready 9 v. G.B.	1 0

Accumulators

Fuller 2 v. 2 amp. type S.W.X.H.5	8 3
or	
Pertrix 2 v. 20 amp. type P.X.C.2	9 0

Loudspeaker Chassis

R. & A. type 40 Reproducer	16 6
or	
Celestion Chassis type M. 12	1 15 0
or	
Blue Spot Special chassis & 66K Unit	1 12 6

Gramophone Pick-up

B.T.H. Minor	1 7 6
or	
B.T.H. Senior	2 5 0

Volume Control

ReadiRad 5 meg.	5 9

Gramophone Motor

Collaro Type B.30 with Unit Plate and Automatic Stop	1 13 0

ALL BRITISH

Note these special features of the Meteor: 18 to 1 Slow Motion Control on both tuning and reaction; Extended anti-capacity reaction drive; Adjustable selectivity; Kendall loose-coupled air-spaced coils; Radio-Gram Switching; R.I. Transformer; Graham Farish and Lewcos Resistances; Condensers by T.C.C.

No soldering, no cutting, no drilling—a screwdriver and pliers are the only tools you need. All the necessary wires, flex, screws, plugs, etc., are included in the Meteor Kit. Mullard Valves are recommended by the designer.

Daily demonstrations of this wonder receiver at the Ready Radio Showrooms: 159, Borough High Street, London Bridge, S.E.1.

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READY RADIO

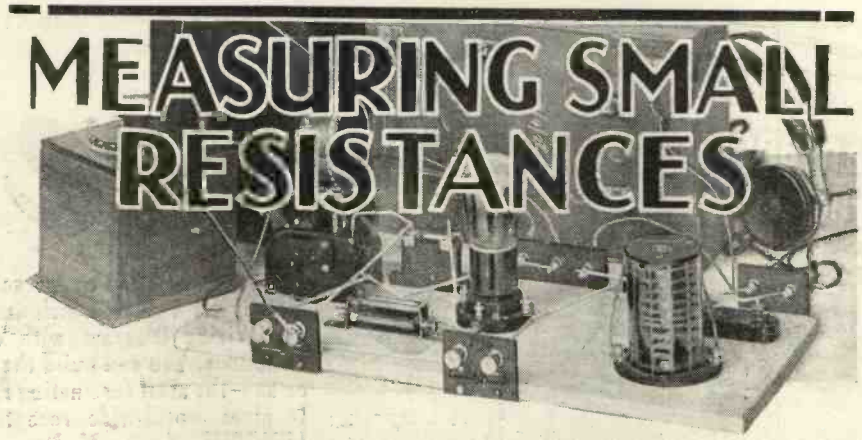
Ask your radio dealer for your Meteor Folder. If he is out of stock, post coupon now to:—Ready Radio Ltd., Eastnor House, Blackheath, S.E.3. If you also enclose four 1½d. stamps we will send you Mr. Kendall's latest book entitled "Ten Hows for Modern Radio Constructors." Packed full of useful information.

Name.....

Address.....

M.W. 2/32. BLOCK LETTERS—IN INK—PLEASE.

MEASURING SMALL RESISTANCES



T. P. BLYTHMAN, B.Sc., tells you how to fix up and use a useful "ohmmeter."

IT is often useful to know the actual resistances of coils and small resistances used in wireless receivers, and they can be ascertained by means of very simple apparatus. The only accessories needed are a pocket voltmeter of known resistance, a small flash-lamp battery and a few pieces of wire for connecting the components together.

A Switch is Useful

The meter can be fixed on a small baseboard and the battery fastened by a clip so that it cannot move. A switch is useful so that the battery is only used when a reading is being taken, thus making the battery last for a long time.

The voltmeter, battery and switch are joined in series as in the diagram of Fig. 1. Care is necessary so that the negative pole of the battery is joined

ALL YOU NEED

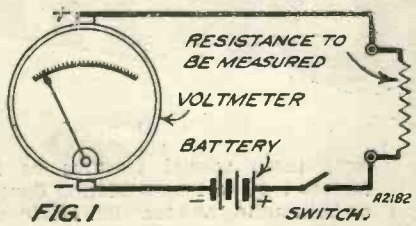


FIG. 1

A pocket voltmeter and a flash-lamp battery are the only items required.

to the negative of the meter. The positive pole of the battery and the positive lead from the voltmeter are brought to two terminals which can be fixed on the baseboard and the resistance to be measured is fixed to these two terminals.

Preliminary Measurement

Before finding the resistance of a coil or piece of wire, the voltage of the battery must be found. The two terminals are short-circuited by a strip of wire and the switch is closed. The voltmeter should register $4\frac{1}{2}$ volts if the battery is new.

We must now make a table so that the value of any resistance can be found if it is connected across the terminals, and we proceed in the following way.

Suppose the resistance of the voltmeter is 200 ohms (for the small scale of a double-reading meter), we know by Ohm's law that the voltage equals the current multiplied by the total resistance in the circuit. If C is the current in amps. when a resistance of R ohms is joined across the terminals, we have $4\frac{1}{2}=C\times(200+R)$.

When the terminals are shorted by a thick wire of negligible resistance, we have $4\frac{1}{2}=C\times 200$, which gives C equal to 4·5 divided by 200, which is ·0225 amp., or 22·5 milliamps. This gives us a factor for finding the current flowing in the circuit, as it will be seen that the current is numerically five times the voltage reading, $22{\cdot}5=5\times 4{\cdot}5$.

Drawing Up the Table

To draw up the table of Fig. 2 we find the current flowing for different values of external resistances, and divide by five to get the voltage reading. Thus if the extra resistance were 100, we get current equals 4·5 volts divided by 200+100, which would equal 15 milliamps. Dividing this by five gives a voltage reading of three, and similarly the other voltage readings are obtained.

Table of Voltages and Resistances

Voltage	Resistance in Ohms
4·5	0
3·0	100
2·25	200
1·8	300
1·5	400
1·25	500
1·15	600

FIG. 2. A2184

A "ready reckoner" for resistances.

A graph can be constructed to show the value of resistances for any intermediate readings as follows. Obtain a sheet of graph paper and draw two axes at right angles as in Fig. 3.

The horizontal axis is marked in ohms from 0 to 600, and the vertical axis in voltages from 0 to 4·5. The points calculated are plotted on this paper and are joined by a smooth curve.

How to Use the Graph

All that is necessary is to read off the voltages on the vertical axis by making a horizontal line to cut the graph, and then draw a vertical line from this point to the bottom line, where the value of the resistance will be found. For instance, if the volt-

INSTANT READINGS

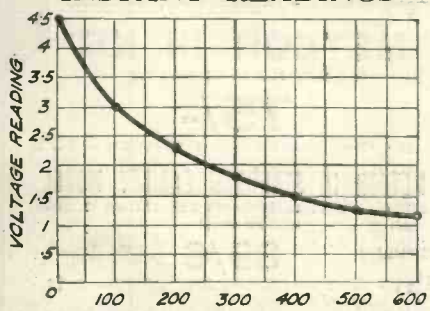


FIG. 3

Mr. Blythman describes the preparation of a simple graph which enables intermediate readings to be obtained.

meter reads 2 volts with an unknown resistance connected, from the graph it will be seen that the resistance is 250 ohms.

If larger values of resistances than 600 ohms are to be found, a battery of a higher voltage must be used and a similar table constructed. This method will be found very useful for measuring the resistances of tuning coils to direct current and for home-made potentiometers. The accuracy to be expected depends upon the accuracy of the stated resistance of the voltmeter used.

Another method of finding the graph points is to multiply the voltage (4·5) by the meter resistance (200) and divide by the total resistance (200 + R).

STARTING A BIG BROADCASTER

It is interesting to compare the control of a big broadcasting station, such as Brookmans Park or any large radio transmitter, with that of your own receiving gear, and here a B.B.C. engineer makes this comparison and tells you how these big stations are tuned in.

I OFTEN wonder, when the Brookmans Park twins are started up each day, how many listeners ever stop to compare the control of the average small receiving set with that of one of these big transmitting giants.

After all, the general principle is the same. There are valves, coils and tuning condensers. Both have to be tuned in, although in quite a different manner, and the best voltages have to be found for the high tension, low tension and grid bias.

Keeping the Wave-length Constant

All transmitters are "mains driven," to use receiving set parlance, and the troubles to which ordinary mains-driven sets are prone also occasionally inflict transmitting gear; although, of course, they are greatly magnified.

The big trouble when tuning a receiver nowadays is to get good selectivity without heterodyning. Conversely, when the engineers tune a transmitter their big trouble is to keep the wave-length constant, because if the transmitting frequency varies at all there will at the end of the month be a nasty report from the listening post, and perhaps also from the Brussels Laboratory testing people, who publish regular wavelength charts.

It may take four or five engineers to start up a transmitter in the morning, even when, as at Mühlacker and Langenberg, the controls are interlocked.

Operations start about half an hour before the programme is due to begin. A man goes round each part of the gear and sees that everything is in order after the previous night's transmission. This is a routine job. Hardly anything can go wrong overnight, but there are, on occasions, troubles outside for which one has to look.

The aerials at Slaithwaite, for instance, may be partly short-circuited by the thin coating of ice which overnight forms on the insulators. There would be trouble if the plant were started up before this conducting path were removed.

This is done electrically by passing a low-tension current from aerial to earth, and at a station like Langenberg, which is provided with automatic earthing for the aerial when thunderstorms are about, there would be disaster if the "juice" were turned on while the aerial was short-circuiting. Little snags like these have to be found by the first engineer at the station in the morning.

What happens next depends largely on the type of transmitter. The switching details differ, but the general idea is the same. In the machine-room a man closes a switch which brings into circuit the main power lines, which, for safety, are switched off overnight.

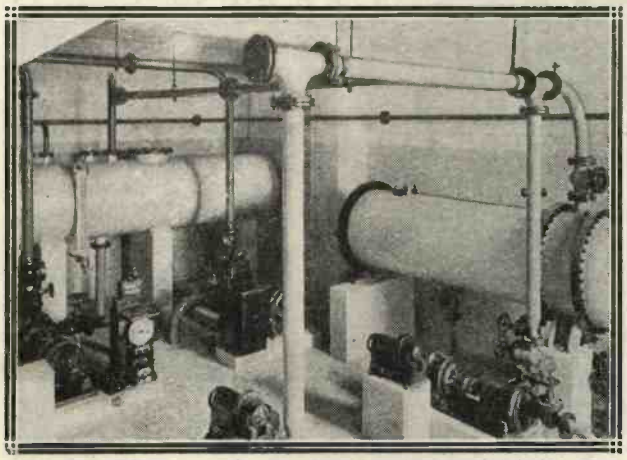
Water for the Valves

At Brookmans Park, where the emergency power only comes from the mains, and the main current is provided by generators driven from oil engines, these semi-Diesel's have to be started up, and this is done by a compressor plant.

Another switch is closed, starting up the water pumps. At Slaithwaite these pumps suck up water from the large concrete-lined reservoir and pump it through the hollow anodes of the big transmitting valves. At Brookmans Park distilled water circulates round the anodes, and this

A Tour Round a Regional Station

COOLING THE VALVES



After the cooling water for the valve has done its job it is passed through a special cooling plant, such as the one here illustrated.

water is cooled in turn by another spray (pumped by separate apparatus) which has to be started up.

Nothing can be done until the man in the machine room 'phones through to the control-room, or switches on the signal light, telling that the water is in full circulation. At some stations there is a glass section in the water tubing leading to the water-cooling side of each valve.

In this a glass marble bubbles up and down all the time the water is flowing, and often a man will be sent round to each section of the transmitter to examine these indicators. Meters show the water pressure and the rate of flow in gallons per minute.

Next the filaments are switched on—this meaning that either the separate low-tension generator is set whirring into motion or that another section of the main power transformer is switched into circuit.

A Matter for Minor Anxiety

Degree by degree the big rheostats (filament rheostats are still used in transmitters, although obsolete in most receivers) are turned on; the greatest care being needed here, because if the full voltage were applied to the filaments the sudden expansion of the metal with the heat might crack the glass or break the seals.

Grid bias comes on next, the generators being switched on, or the extra power transformer switched into circuit. The man in charge of the speech amplifier and modulating gear will also be busy for the next two or three minutes in seeing that his switches are right and that the small valves in the first stages of the L.F. amplifiers are O.K.

Then comes the high tension; nothing very exciting to look at perhaps, but switching on the H.T. is always a matter of minor anxiety for the engineers. A few needles on the dials quiver and move slowly over to their working positions.

Two or three lights on the indicator panel may change from green to red. Nothing else indicates the all-important fact that the station is now "on the air." There are 10,000 volts on the anodes of the big valves.

The first few minutes are vital. That is when a breakdown is most likely, if anything at all is going wrong. Everyone stands by in case of an emergency.

There are, perhaps, five minutes to go before the programme is due to commence, but down at the transmitter, miles away from the studio centre and control-room everything is in working order.

With the standard wave-meter at the station one of the engineers may make a frequency test just to see that everything is well and that the station is properly on its wave-length. If there is any reason to suspect a big deviation, then in all probability one of the station officials will 'phone through to the listening post—Tatsfield, if it is the B.B.C., and Zehlendorf, if it is the German broadcasting company—and ask for a wave-meter test.

The First Item of the Day

Then comes a 'phone call on the private line from the studio control-room. The first item of the day is ready for broadcasting. Now it is up to the engineer in charge of the modulating gear.

The control man, listening on a side-tone set at the station, clamps the 'phone more tightly to his ears, and stands by his subsidiary potentiometers, which will prevent over-modulation if the control engineer at the studio end has not watched the volume indicator.

The announcer has finished his introduction. Every-

GERMAN THOROUGHNESS

The Chief Engineer of the State Broadcasting Corporation at work. He keeps in close touch with all departments under his control, and personally watches every detail of their work.

What the Engineers Do All Day

thing is going according to schedule. "O.K.," says the modulation engineer, laconically, and takes his seat at the main control table. The station is now working.

"What," you may wonder, "do engineers do at the station all day? Do they listen to the astronomy talks and chamber music, or do they tackle cross-word puzzles?"

Only One Man Listens-In

The truth is that only one engineer for each transmitter listens to the broadcast; he does not control the volume, for that is done at the studio end, but he watches the programme from the transmission point of view.

The other engineers have neither the time nor the opportunity to do cross-words. Each man has his particular station where he must be found in case of trouble. Trouble is always likely to crop up in the shape of frequency variation ("wandering" of the wave-length) or a valve breakdown.

The wave-length will change if anything goes wrong with the transmitter or if there is a sudden variation of temperature. This, of course, is a very slow effect, which makes it all the more difficult to watch. It has no relation to modulation and is most noticeable when the transmitter is first started up and when the gear has not reached constant temperature.

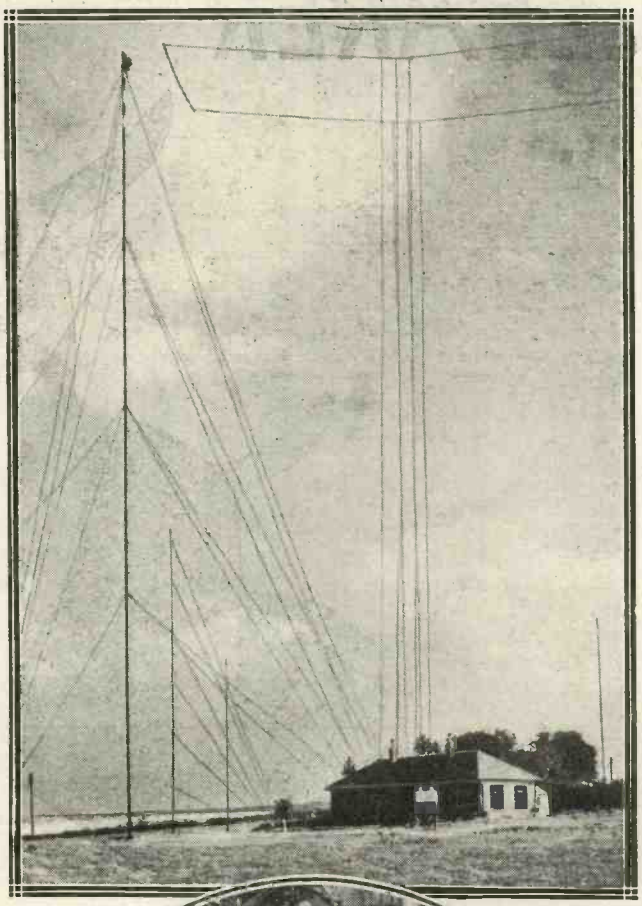
With our B.B.C. transmitters I am proud to say that a frequency change of more than 200 cycles is never permitted. But, unfortunately, a drift of some kind is common to all transmitters in the absence of temperature control to the drive.

A Peculiar Valve Trouble

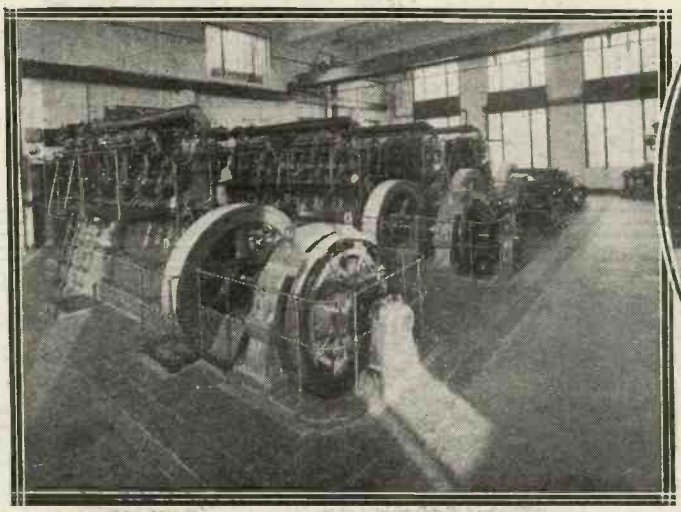
A valve may go. Power valves when worked in parallel banks are liable to what is known as the "Rocky Point" effect. This is a flash-over between the electrodes, and is so called because the trouble was first experienced at the big "Rocky Point" commercial station. It usually occurs in water-cooled valves and is due to an ionisation effect caused by traces of gas left in the valve.

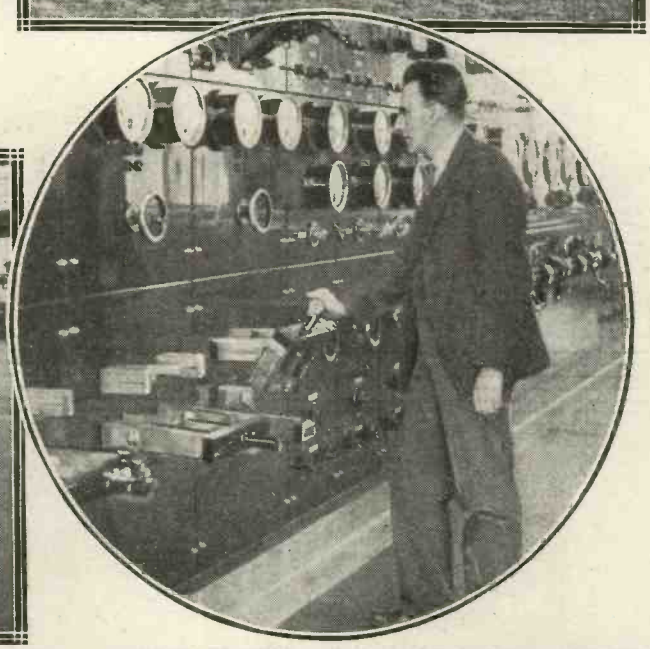
It is not curing trouble, but watching for it that takes up the engineers' time. The B.B.C. has been particularly lucky with its plant, but, nevertheless, all station engineers are able to breathe a sigh of relief when the big Diesel's are stopped at night!

THE EARS OF THE B.B.C.



BROOKMANS PARK POWER-HOUSE





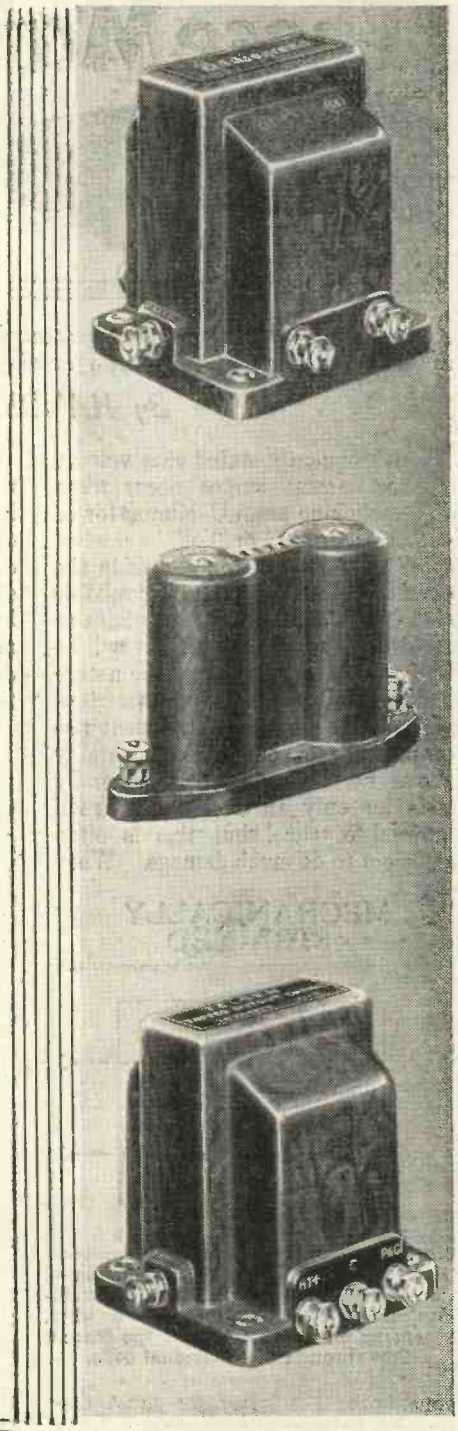
(Top, right) The receiving station of the B.B.C. at Tatsfield, which keeps a watchful eye on the wave-length wanderings of British and foreign stations. It is also well known as the receiving station that makes possible the transatlantic relays. (Left) The power house at Brookmans Park, showing the Diesel electric plant. It is interesting to note that this station generates all its own power and only draws on the supply mains in an emergency. (Right) An "outsize" in filament switches at the North Regional station

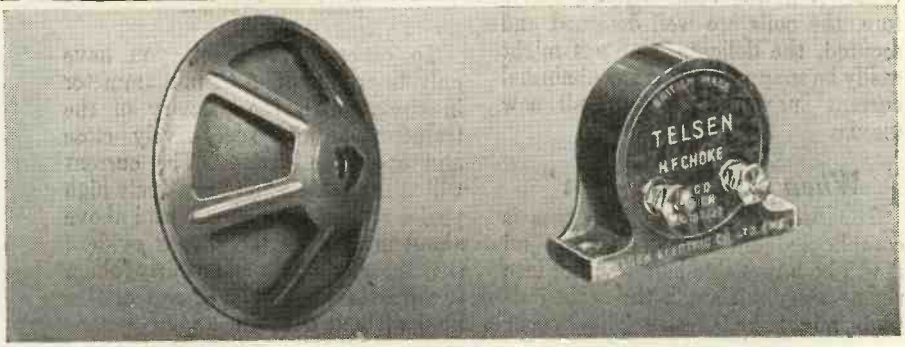
"CHANGING over to Telsen is like taking the wool out of your ears"—that is the verdict of an enthusiastic Telsen constructor which inspired the illustration on the opposite page. Telsen Components in your set give you a realism which is astonishing—they enable you to sit back and **hear,** without straining forward to listen—they bring every item on the programme "nearer, clearer, more lively than before."

L.F. Transformers	from 5/6
Output Transformers	... 12/6
L.F. Chokes	from 5/-
Output Chokes	from 8/-
Binocular H.F. Chokes	... 5/-
Standard H.F. Chokes	... 2/-
Loud-Speaker Chassis	from 5/6
Fixed Condensers	... 6d.
Mansbridge Type Condensers	from 1/6
Valve Holders ...	4-pin 6d., 5-pin 8d.
Grid Leaks	... 9d.
Grid Leak Holder	... 6d.
Fuse Holder	... 6d.
Telsen Screens	2/- and 2/6

TELSEN

100% BRITISH RADIO COMPONENTS





Those Mains Surges

At times transformers and other components become faulty due to excessive voltages or currents being developed. Here are a few enlightening remarks on this interesting subject.

By HANDEL REES.

It is frequently stated that voltage or current surges occur when switching an A.C. eliminator or mains set "on" or "off," or when there is an intermittent break in the circuit. In fact, it is highly probable that most transformer breakdowns are caused in this way, and it will be interesting to study briefly the nature and sources of these abnormal rises.

A "surge" means a transient rise in pressure or current considerably above normal values. It generally lasts for only an exceedingly small interval of time, but this is often sufficient to do much damage. When considering the latter we must distinguish between the effects of voltage and current

MECHANICALLY STRAINED

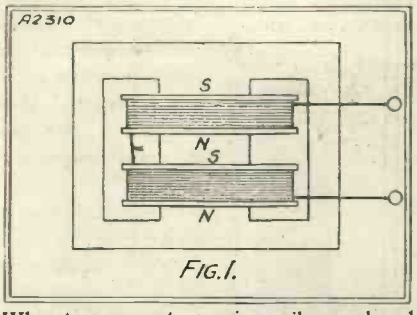


FIG. 1.

When two current-carrying coils are placed close together on a common core, the windings tend to attract or repel one another, depending on the direction of the current flow through the individual coils.

Excessive Strain

A *voltage* rise strains the insulation, thus tending to give rise to leakages or short-circuits, e.g. a number of turns on a mains transformer might become shorted, usually resulting in a complete burn-out. These pressure rises can occur anywhere in a receiver where an inductive circuit is suddenly or intermittently broken, and are not necessarily confined to mains devices.

For instance, it is well known that the insulation of a loud speaker or L.F. transformer might break down due to an intermittent break in the circuit. In fact, we may state generally that excessive voltages are caused by *breaking* an inductive circuit, the magnitude of the induced pressure depending, among other things, on the *speed* of the interruption.

Electro-Magnetic Surges

A *current* surge, on the other hand, brings into being electro-magnetic *forces* between the windings concerned. Thus consider two adjacent coils carrying current in the same direction, fixed on a transformer core as shown in Fig. 1.

It can be shown that the magnetic polarity of each coil would be that indicated by the letters NS, NS, and this would result in magnetic attraction between the coils. That is, a force would be exerted tending to draw the coils together, and the greater the current the greater the force.

If the coils carried current in opposite directions, the mutual forces would repel one another.

Not only do these forces exist between complete coils, but also between the adjacent turns of *one* coil. These turns, of course, always carry current in the same direction, with the result that attractive forces are exerted between them.

The same is true of adjacent layers of turns in the coil. Unless, therefore, the coils are well designed and secured, the delicate windings might easily be snapped during the abnormal current surges which we shall now discuss.

When Switching "On"

The problem of current surges is complicated by many factors, and it will be impossible here to enter into their theory, although the main outlines might be given. They occur during switching "on," and are practically confined to mains devices using transformers and large capacity condensers. When there is a break in the circuit they can be present alongside pressure rises, the latter occurring when the circuit is broken.

Cutting the Curve

Briefly, the disturbances depend on the part of the alternating voltage wave at which switching-in takes place. Thus, referring to the cycle of voltage shown in Fig. 2, it is evident that at the instant of switching-in the voltage may be passing through one of its zero values on the base line, through a positive or negative maximum Vm and —Vm, or through a point intermediate to these values.

If the switching is done at the correct point in the wave, little or no current rise will occur, but it is obviously impossible to ensure this, as the switch may be closed at any point.

The effect may be diminished or accentuated by the constants of the circuits. Especially is this the case with a mains transformer.

If a high flux-density core is used, combined with material of poor permeability, the instantaneous rise in current will be greatly increased. Furthermore, the core might have retained considerable residual flux after a previous "run," and in bad cases of this kind the initial current rush can be ten to twenty times its normal maximum, although it is rarely so bad as this in small transformers provided the flux density is kept within limits

A VOLTAGE CYCLE

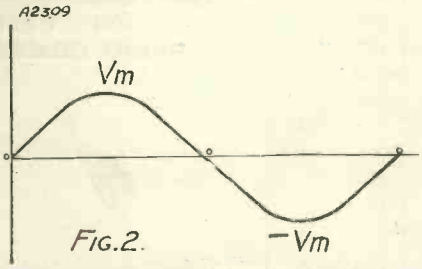


FIG. 2.

This diagram shows a complete voltage cycle. Note the three points at which there is zero potential; that is, where the curve meets the base line.

To observe the effect, you have only to couple an A.C. milliammeter in circuit with the primary of the transformer, and successively close and open the circuit. The current will at times kick-up to relatively high peaks, and from what was said above about magnetic stresses it is evident that the windings must be fairly robust to withstand a prolonged test of this kind without damage.

MORE NEW VALVES

By K. D. ROGERS.

As one of H. G. Well's characters remarked: "This 'ere Progress, it goes on!" And if he had been referring to the advancement in the commercial application of the thermionic valve, he could not have uttered a more pertinent remark.

And especially does this "progress" go on in the case of the screened-grid and pentode valves. Within the last few months we were introduced to the first variable-mu valves. These were for mains working and were constructed on the indirectly-heated-cathode system.

Screen Subtleties

They have now been followed by a battery-operated 2-volt S.G. valve of the variable-mu variety, and having a commendably high mutual conductance.

The construction of a screened-grid valve is not an easy affair, because it is not the mere placing of a screened grid between the anode and grid that matters, it is exactly how and where this grid shall be placed and what size its mesh shall be to allow of sufficient screening without loss of magnification.

The screened-grid valve would be useless if its anti-capacity device between the anode and grid were to cut down its mutual conductance, or to make its impedance unworkably high.

Remarkable Figures

At the same time, the impedance has to be kept up, because the valve is intended as a voltage amplifier and not as a power multiplier—this latter is left to the S.G. valve's first cousin, the pentode, which is, in fact, an L.F. S.G. valve.

Some remarkable figures are to hand concerning the grid-anode leakage capacity of Osram valves of the screen-grid type. The valves in question are the M.S.4 and the M.S.4B., six of each kind of which have recently been under test at the National Physical Laboratory, Teddington.

No branch of radio is advancing more rapidly than that dealing with the thermionic valve, whose development is becoming the outstanding feature in radio engineering.

In a recent report the officials of the laboratory testify that they have measured the capacity between the control grid and the anode (the leakage capacity) for the series of valves referred to at a frequency of 210 kilocycles per second. The results in the case of the M.S.4 were:

	Leakage capacity in m.mfd.
Valve No. 1	0·0026
" " 2	0·0023
" " 3	0·0029
" " 4	0·0023
" " 5	0·0025
" " 6	0·0026

In respect of the M.S.4B. valves the results were:

	Leakage capacity in m.mfd.
Valve No. 1	0·0026
" " 2	0·0022
" " 3	0·0021
" " 4	0·0032
" " 5	0·0027
" " 6	0·0025

It has always been a primary aim in the design of screen-grid valves to make the grid-anode leakage capacity as low as possible, as it is appreciated that this is a criterion of overall magnification.

It is particularly interesting to note that the capacity of the M.S.4B., in spite of its high mutual conductance (i.e. 3·2 m.a. volt), is as low as that of the M.S.4 type.

Bonding Electrodes

The slight increase in the capacity of the M.S.4 over the previously published figure of 0·0019 m.mfd. is due, I am informed by the makers, to the system of electrode bonding now employed in its construction, with the object of reducing

RADIO OR RECORD

An example of German radio-gram construction. Note the compact stowing away of the multitudinous parts.

Calculating Mains-Valve Grid-Bias Resistances

microphonicity, and it has proved very successful in doing this. Even so, the revised figure of 0·0026 m.mfd. average is as low as can be turned to practical advantage in a radio set.

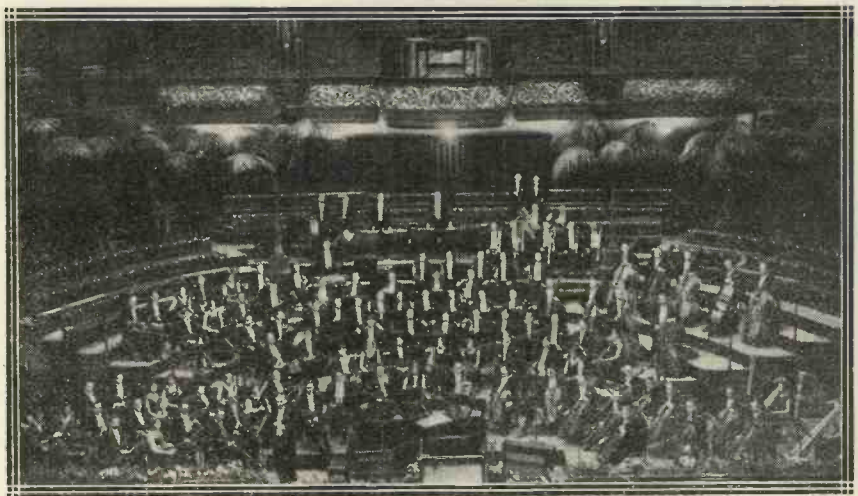
It is also interesting to observe the remarkable consistency in capacity apparent from the N.P.L. test on valves taken at random from stock. Such consistency is invaluable in the case of sets produced on bulk lines, as it contributes an important factor towards attaining uniformity in their results.

Powerful Pentodes

Among the latest pentodes the Pen.220 and Pen.220A. (Mazda) are indeed remarkable valves.

The power handled by these tiny valves is truly astounding, for a set of the ordinary detector and one low-frequency, using, say, the Pen.220, is quite powerful enough to provide adequate room strength on the local station some twelve to twenty miles away, and will allow operation to take

"THE AIR SHALL BE FILLED WITH MUSIC"



A few years ago the broadcasts of huge gatherings of musicians such as the B.B.C. orchestra shown above were largely wasted, as the old valves and speakers hardly did justice to their efforts Nowadays very realistic reproduction is possible.

place from an ordinary size of H.T. battery. The milliamp. consumption at 100 volts is only 5 milliamps.

Half a Watt

If the H.T. voltage is increased to 150 volts the consumption goes up to 12 milliamps., but at this figure the valve is capable of handling something like 400–600 milliwatts undistorted power.

As two of the sets—the chief ones—described this month are for mains operation and employ mains valves, a few words about that type of valve will not be out of place here.

It will be noticed in the case of the "A.C. Eckersley" Three that special attention is drawn to the bias resistances in series with the cathodes of the last two valves.

An Important Point

This is important and very necessary, owing to the fact that the various apparently interchangeable valves of different makes vary most surprisingly as to their bias requirements.

We can take as an example the Mullard 164V. This has an exact cousin in another make, but one is liable to class it as an "L.F. valve," and to consider that the M.H.L.4 or the Cossor 41M.L.F. are suitable alternatives.

In a way they are, in as much as they will *do*. They have not exactly the same characteristics, and so in critical cases they might not be suitable. But for most sets where a fairly low impedance L.F. valve is required the valves mentioned are interchangeable if one is not going to be exacting in one's requirements.

But they are certainly not interchangeable from one point of view—the required bias resistance. A study of the curves of these valves will elucidate the fact that whereas the 164V. is what I term a "square" valve (requires 1 volt bias per milliamp. anode current), borrowing an engineering phrase, the other valves are by no means in the same category. Thus the 164V. takes 8 milliamps. at 200 volts H.T., and when properly biased needs 8 volts negative bias. That means it requires an automatic bias resistance of 1,000 ohms.

The M.H.L.4, however, needs 5 volts at 10 milliamps. anode current and requires 500 ohms, while the Cossor needs 600 ohms.

From these variations in requirements it is obvious that one can hardly ever pull out one A.C. (or indirectly-heated D.C.) valve and plug in a substitute, other than one of the same make and type, without first altering the bias resistance.

Work It Out

All sorts of resistances are required for these, and before building a mains receiver it is essential that you choose the make and type of valve you are going to use and then work out the required resistance for each valve.

It is an easy formula and a simple calculation, and if you do it for several valves you will be surprised at the diversity in ohmage required by the various makes and types.

We take the volts required according to the makers' bias figures, and we divide these by the anode current in *amps.* at that particular bias and the anode potential we shall be applying to the anode of the valve. This is found by the characteristic curve of the valve.

A Simple Formula

Our formula, correcting for the fact that Ohm's law requires the current in amps. and we have only milliamps., then becomes $R = \frac{E \times 1{,}000}{C}$.

This is explained and examples given in the article describing the "A.C. Eckersley" Three, but I am referring to it here because I want to emphasise the importance of getting this bias business right. One bias resistance will not do for more than one or two particular valves. If these types are changed, then the resistance must be changed accordingly.

Trouble Tracking

On this page the Chief of the "M.W." Query Dept. discusses, month by month, some of those common difficulties and troubles which can be so perplexing. This month he deals with super-heterodyne faults.

THE return to popularity of the super-het has brought in a certain amount of correspondence from listeners who are unable to get their sets working satisfactorily.

Now, unfortunately, a super-heterodyne is not quite in the same category as a "straight" set.

In some cases the trouble seems to be due to the fact that the oscillator circuit is not functioning correctly.

Oscillator Units

We have traced the fault in a number of instances to defective oscillator units, and we advise those who are in doubt to return their units to the makers for examination.

Moreover, readers have not always obtained the type of oscillator specified. For example, super-heterodynes employing Extensers require a special Extenser model oscillator, and this has no switch knob for wave-changing. The wave-changing is automatically carried out by the Extenser.

The "M.W." "Super-Quad" oscillator unit is not the same as the one specified for the A.C. version, although an Extenser is used in both cases. The A.C. "Super-Quad" requires a special type of oscillator, and when ordering readers are advised to mention the particular "Super-Quad" (A.C. or battery version) they intend building.

H.T. Voltages

Apart from possible troubles caused by incorrect or faulty oscillator units, readers should make sure that their D.G. valve is functioning properly (in the battery model), and also that they are applying adequate H.T.

Weak volume, in spite of the oscillator working correctly, might be due to a fault in the matching of the intermediate transformers, but, of course, it could also be caused by a defective component elsewhere in the circuit, and also to incorrect H.T. voltages.

In one or two cases we have received letters from readers who remark on the amount of background noise brought in.

Background is inseparable from distant reception, and these noises increase with the amount of overall amplification available.

Even the local station has some background noise, but this is not, in the majority of cases, noticeable, because the amount of amplification required to bring it up to loud-speaker strength is relatively small, and, secondly, the ratio of volume to background noise is very great.

High Sensitivity

In the reception of a distant station the receiver has often to be worked "all out," that is to say, in its most sensitive state. In consequence the background noises, which are composed of static, mush, etc., sometimes become comparable with the strength of the transmission.

The effect is experienced with any super-sensitive design, whether "straight" or otherwise, and is not due to a fault in the set. It may usually be taken as a sign of liveliness

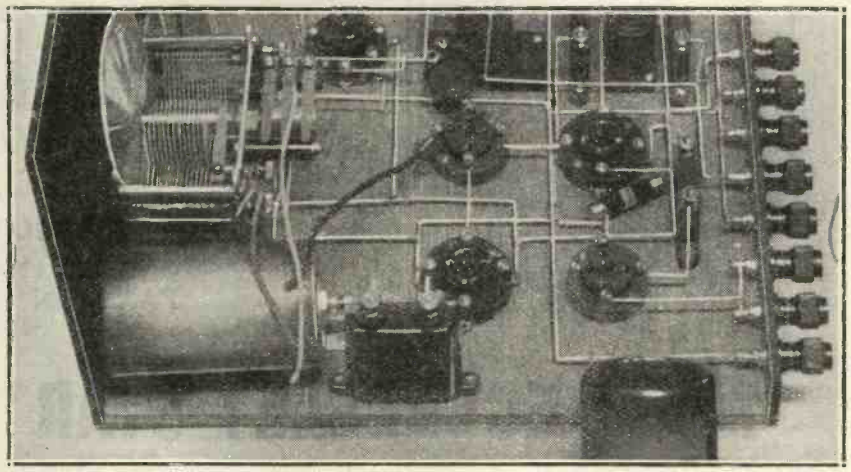
Sharp Tuning

The high selectivity of the super-het in some instances has been the undoing of some readers. Unaccustomed to razor-sharp tuning, they have failed to get the best results from their receivers owing to their lack of practice in handling sets of this type.

A super-het does require a little skill in manipulation, but once the knack of handling has been acquired no further trouble should be experienced. Both the aerial tuning and oscillator dials should be rotated slowly, and the correct relation between the dials must be maintained in order to keep the beat frequency constant.

Incidentally, the "M.W." battery model and A.C. "Super-Quad" designs are not suitable for work on the ultra-short waves.

IS YOUR OSCILLATOR SUITABLE?



When building a super-het it is essential to obtain an oscillator unit of the right type. The unit shown above is the Extenser model 126 and is suitable for the "M.W." "Super-Quad" (battery version).

BROADCAST "NINES"

HONOURS are even this month among the "Nines" of the Vocalion range between the inimitable Buggins family and Monte Hunter. The former record reached us just too late for inclusion in last month's review, and although it is of a New Year flavour, it is too good to be neglected just because we cannot refer to it in its proper season.

Michael Hogan as the tired and harassed father who takes the whole gamut of the Buggins family, plus Grandma and Aunt Emma, to the pantomime, forms a picture that is bound to bring the house down. Mabel Constanduros, of course, takes all the children's and female parts in her own faultless style. **The Bugginses at the Pantomime.** (780.)

Monte Hunter has chosen that somewhat lengthy but rapidly-becoming-popular ditty, **Eleven More Months and Ten More Days**, and has doubled it with **Foolish Facts**, on 789. Both are excellent records.

Bobbie Comber, in **Rhymes**, is sure of a great success. This is a record which will appeal to a great many people (mainly of the male sex), not because of any intrinsic value in the record itself, but because it appeals to the limerick lover—a vast section of the public. On the other side is **On a Cold and Frosty Morning.** (781.)

A good "atmosphere" record is to be found in No. 791, which bears a selection of well-known airs played on an equally well-known instrument. The airs are: "Estudiantina," "Londonderry Air," "Washington Post," "La Paloma," "Old Folks at Home," and "The Blue Danube," and the instrument is the one which has done probably more than any other to make the tunes popular—the humble, but not modest, barrel organ.

It is accompanied by vocal and spoon effects, and very truly gives the impression of the side street with its mournful occupant monotonously turning his handle.

Dance numbers among the "Nines" are well rendered by Harry Roy and his R. K. Olians, and Bidgood and his Good Boys. Their items include **Joey the Clown and Me!** (785), **To-day I Feel So Happy** and **The Penguins' Patrol** (792), **Oh, What a Night!** and **The Longer that You Linger in Virginia** (786).

BROADCAST "TWELVES"

The Ride of the Valkyries, one of Wagner's greatest masterpieces, albeit its oft repetition has somewhat dimmed its brilliance, is the subject of the most outstanding "Twelve." It is to be found on 5261, and is recorded by the Berlin Philharmonic Orchestra. A little too edgy perhaps in parts, the wail of the violin being a trifle too harsh, but the recording as a whole is excellent.

The Super-Twelves—red label—have a large selection from which one may choose. **Echoes From Musical Comedy** is good on 3135; it includes such favourites as "Roll Away Clouds," "Here in My Arms," and "Song of the Drum."

Sweet and Lovely and **This is the Missus** make a useful pair of dance numbers (3131), as also do **Just Once for All Time** and **Live, Laugh and Love** on 3138.

The orchestra and organ at Madame Tussand's Cinema have combined to record a tuneful disc on which are two very old favourites—**Simple Aveu** and **Elgar's Salut D'Amour** (3129).

But to radio listeners the plum in the Broadcast pie is Tommy Handley's first record on the Twelve—**Wireless Oscillations and Aggravations** (3133). Tommy as a demonstrator and would-be salesman of an expensive radio receiver (whose value, incidentally, falls from eighty-nine guineas to ninepence during the course of the demonstration), is priceless. This record is one of the best he has done, and the skit on the average Children's Hour is exceedingly good. You should get it.

COLUMBIA

It is difficult to pick out any outstanding record from the Columbia range this time—they all come to such a high level that any extra merit would be difficult to find. Perhaps our best plan is to tell you which ones we enjoyed most.

First of all, then, let us bring before your notice a couple of airy trifles, guaranteed to entertain your lighter moods. They are **Raindrops** and **A Fairy Ballet**, on DB689, played by the Bournemouth Municipal Orchestra, under the baton of Sir Dan Godfrey. Both are entirely delightful; the former being a piece of colourful pizzicato work for the strings, with a 'cello melody running through, and the latter a light orchestral number containing 'cello and trumpet solos. You'll like it!

A brief selection from some of the records released during the month. They have been chosen because of their special interest to the pick-up user.

H.M. Grenadier Guards' Band, playing the rather hackneyed **Zampa** overture, is not as good as it should be. It is an enjoyable record if you are not in a critical frame of mind. As a piece of recording, however, it is rather flat. Even in the final bars no great body is given to the music. The brass is clear, but one has the feeling that half the band—especially the drums and the percussion instruments—are on "half pay." They do not show any great enthusiasm for their work. True, the cymbals come through as a somewhat indistinct background, but we would have liked to hear more from them and from the drums (DX308.)

William Murdock, the well-known pianist, gives us Sibelius' **Valse Triste** and Grieg's **Norwegian Bridal Procession**, on DX314. The recording of the latter is not as steady as it might be. The sustained notes in the first few bars of the "Bridal Procession" are not exactly tuneful, for they waver rather badly. Both records are well played, but there is a lack of enthusiasm in the Grieg composition that is a pity, though the restrained sense of tragedy in the "Valse Triste" is well portrayed. It is a pity that the timbre of the piano itself is not better retained.

Of great popular appeal are the two Ketelby descriptive recordings on DX315. These are **The Vision of Fuji-San** and **By the Blue Hawaiian Waters**, played by Reginald Foort on the organ of the Regal Cinema, London. Foort is a past-master of the cinema organ, and here, on what is considered by many to be the best instrument of its kind in London, he gives of his best. The reed stops are particularly well recorded, and the pedal notes come through with fine effect. Added realism—even more realistic, perhaps, than in actual life, for they are not usually heard in the auditorium of the theatre—is provided by the noise of the organ stop continuation mechanism preceding the "dance of the Japanese actors" in the former composition. The recording throughout is faultless. (DX315.)

Another organ record, though not nearly so good, is that of Quentin Maclean at the Trocadero Cinema, Elephant and Castle. **He plays You Are My Heart's Delight** and **Springtime Reminds Me of You.** (DB703.) Binnie Hale is good in **Who Am I?** and **You Forgot Your Gloves** (DB698), and so are **The Masqueraders** in **Eleven More Months**, on CB402.

From a recording standpoint the banjo solos, **St. Louis Blues** and **Some of These Days** (DB713), by Eddie Peabody, are excellent. Vocal chorus and piano accompaniment are included, while the sense of rhythm in the former number is superb. In the second item the soloist makes use of the banjo, mando-'cello, mandoline and banjoline.

Jack Payne is unfortunately leaving the B.B.C. and Columbia, though he will record elsewhere. Two of his numbers are typically his this month. **My Song and That's Why Darkies Were Born.** (CB390.)

Finally we would commend to your notice CB394, the Savoy Hotel Orpheans playing **I Don't Know Why.**

H.M.V.

The selection of H.M.V. records sent to us this month contained one really outstanding item. We refer to the descriptive record **Cavalcade.** This follows on Noel Coward's own recording of "Cavalcade Suite," one of the outstanding records of last year, and presents in most dramatic form a few excerpts from the stupendous Drury Lane spectacle.

Henry Oscar is the narrator, linking up the sections with a few dramatic sentences, spoken in that fine, resonant voice of his, while the full choir, soloists and organ continue to provide a really thrilling musical pageant.

The record is undoubtedly an achievement, not only in recording excellence, but in what may, perhaps, be called dramatised music. Few could hear it and not be stirred. (C2330.)

It is a far cry from "Cavalcade," with its picture of agonised Europe and hysterical youth, to the mud flats of the Mississippi. But thence we must go to the origin of the next record on our list. Paul Robeson stands alone in his portrayal of Negro spirituals, and though in his latest record, in which he has the "assistance" of Jack Hylton's Orchestra, he is not given a chance to bring across the full pathos of those well-known swamp songs, he is still the inimitable Paul.

Negro Spiritual Medley is, in our opinion, out of place. The Negro spiritual does not stand the combined attacks of syncopation and up-to-date orchestration inflicted upon it by the modern dance band. So neither as a dance band number, nor as an example of Negro songs, can this record be considered a success. It falls between two stools. (C2287.)

In a quite different category, of course, is Gracie Fields' **Obadiah's Mother** and **Oh! Glory**, two excellent numbers on B3998. Gracie has a very strong following of fans and they will be delighted with these latest recordings of their Idol.

Rudy Vallee is always worth hearing, and this time we want to bring to your notice B3999, on which are **My Song** and **The Thrill is Gone.** We like his singing of this type of music.

The Clarice Mayne Medley is good (C2331), and so are Patrick Waddington, Peggy Cochrane and William Walker in **Got a Date With an Angel** and **Life is Just a Bowl of Cherries.** The piano (there are two of them) interludes an excellent, the artistes realising exactly how to balance vocal and instrumental entertainment. We wonder, by the way, to what next our song writers will liken life! (B4020.)

ZONOPHONE

Owing to our receiving them too close to press date, we have been obliged to hold over the review of the Zonophone records till next month.

"WHAT I THINK OF THE 'UNI-COIL' THREE"

From a Reader.

To the Editor, MODERN WIRELESS.

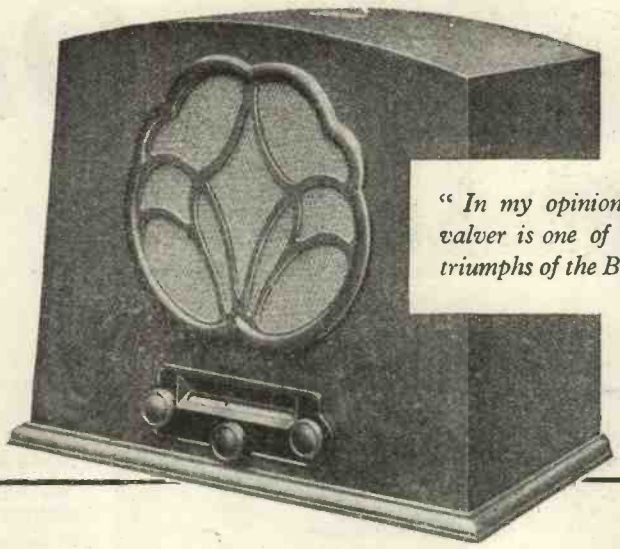
Sir,—I really must write and tell you what I think of the "Uni-Coil" Three, Model A, published in the November, 1931, issue of your journal.

Although I have not stuck to the specified make of components in every case (those substituted are of first-class manufacture, and were on hand at the time), results far exceeded my expectations. On first test no fewer than 20 stations were logged, all at loud-speaker strength, and in most cases free from jamming. Of course, London Regional, Midland Regional, and 5 X X roar in.

I must say the selectivity is far above the average. Radio Paris and Eiffel Tower are received clear of 5 X X, and with careful tuning the German high-power Stuttgart can be received almost clear of London Regional, which is exceptional for a single-dial tuner.

Yours sincerely,

Camberley, Surrey. S. COX.



" In my opinion the H.M.V. three-valver is one of the most outstanding triumphs of the British radio industry."

WITH the above words " Set Tester " concludes the review in the December 26th issue of "Amateur Wireless " of a receiver that is already making 1932 radio history — the "His Master's Voice" Model 435 three-valve all-mains radio set with self-contained moving-coil loudspeaker.

ARE YOU CURIOUS?

Here are a few answers to questions you might ask about this wonder receiver—

QUESTION. *What is this Instrument?*

ANSWER. *A straight radio-set which can reproduce records electrically by connecting a pick-up or record player such as the "H.M.V." models* 11, 116 *or* 117.

QUESTION. *What valves are used in this set?*

ANSWER. *In the A.C. — MS4B; MH4; MPT4; U10. In the D.C. —DSB25; DH25; DPT25.*

QUESTION. *On what voltages will this instrument operate?*

ANSWER. *Separate models are made for A.C. or D.C. The A.C. voltage range is:* — 95-164. 190-260 *volts.* 50-100 *cycles. D.C. model*—190-250 *volt.*

QUESTION. *Are there any batteries used in the* 435?

ANSWER. *None at all; the instrument is completely mains operated.*

QUESTION. *Is this set easy to tune?*

ANSWER. *One dial tuning is employed and the scales calibrated in wave-lengths.*

QUESTION. *Does that mean there is more than one scale?*

ANSWER. *Yes; this instrument has an ingenious feature whereby the switch that changes the wavelength ranges automatically presents new scales reading as follows: " Medium Wave," " Long Wave," " Gramophone " and " Off."*

QUESTION. *Are the wavelengths easy to read?*

ANSWER. *Very: the pointer moves horizontally, and the dials are illuminated by concealed lighting.*

QUESTION. *Is it possible to control the volume of the output from the radio?*

ANSWER. *One volume control is conveniently situated on the front of the instrument and enables either radio or gramophone music to be regulated with a fine degree of accuracy.*

QUESTION. *How does the quality of reproduction from this set compare with other radio-receivers?*

ANSWER. *By reason of the special band-pass tuning circuits whereby distortion during tuning of radio signals is eliminated, extremely good reproduction is obtained.*

QUESTION. *Is it necessary to attach a loud-speaker to the set?*

ANSWER. *A permanent magnet moving coil loud-speaker is built in the cabinet of the instrument.*

QUESTION. *Is it possible to receive any signals without an aerial?*

ANSWER. *A mains aerial device is fitted to the A.C. instrument which enables the principal Continental stations to be received without the necessity of erecting an aerial. In the case of the D.C. model similar results may be obtained by a few feet of flex run round the picture rail.*

QUESTION. *Can this set be taken from room to room without difficulty?*

ANSWER. *As it is a self-contained unit there is no reason why the receiver should not be taken from one room to another as desired.*

QUESTION. *What is the arrangement of the valves in the* 435?

ANSWER. *There is a screened-grid high frequency stage, a detector valve employing power grid rectification which is coupled to a super-power pentode by a* 7 *to* 1 *transformer of special design.*

QUESTION. *What is the output of the receiver?*

ANSWER. 1½ *watts undistorted, which is ample volume for the average room.*

QUESTION. *What are the wave-lengths ranges of this set?*

ANSWER. 220-550 *metres;* 800-2200 *metres.*

QUESTION. *Can extra loudspeakers be operated by the* 435?

ANSWER. *Up to two moving coil loud-speakers of low resistance type may be connected to this receiver—for instance, the "H.M.V." models L.S.* 5 *or L.S.* 7.

QUESTION. *What type of cabinet is the radio-set housed in?*

ANSWER. *An arched walnut cabinet of pleasing design.*

QUESTION. *What is the price of the " His Master's Voice" Model* 435?

ANSWER. *Cash Price* 22 *guineas, or* 46/2 *down and* 12 *monthly payments of* 37/3.

THE FIRST WIRELESS SET TO QUALIFY FOR THE WORLD'S MOST FAMOUS TRADE MARK

His Master's Voice

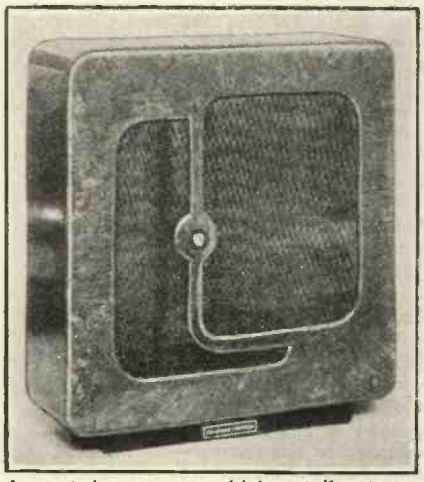
The Gramophone Co. Ltd., London, W,1.

By the Technical Editor On the

Loud-Speaker Progress

THIS radio season has already seen the introduction of a greater number of different new loud speakers than any previous one, and if any more are produced a record will have been set up which it will be difficult to beat. And, in any case, it is hardly likely there will be a continuous progress in the future which will justify any attempt to do so.

THE GRAHAM FARISH "SNAP"



A neat instrument which retails at an attractively low price.

You see, this season the great listening public is "radio conscious" for the first time. And a loud speaker cannot now hope to succeed if it merely is a *loud speaker* and nothing more.

There are these days but few listeners who regard loud speakers as musical instruments which can and, indeed, ought to manufacture tones of their own. In short, loud speakers are universally expected to respond faithfully to the various frequencies fed into them. Thus the ever-growing popularity of the moving-coil types of speaker.

And thus, too, the strenuous attempts on the part of manufacturers to improve and keep on improving their products, and the numerous new models which have made their appearance in recent months.

And so well have manufacturers responded to the urge that, as we have said, it is improbable that the advance in design can continue at an unabated rate. Indeed, the gap between the commercial product and perfection is rapidly closing. You need have no qualms as to the wisdom of buying a new speaker nowadays—it will not be a hopeless back number within a comparatively short time.

Of course, there are grades more or less corresponding with prices, though the all-round standard, bearing this distinction in mind, is very high.

One of the cheapest loud speakers on the market is the Graham Farish "Snap," which forms the subject of our first illustration. This little speaker has a decidedly attractive appearance which gives little indication of its inexpensiveness. And it has a response which would not disgrace a two- or three-year-old loud speaker of a much higher "price grade."

The Moving-Coil Types

One of the greatest surprises of the season has been the emergence of the moving-coil type from its comparative seclusion, and its development as a "popular" article.

No longer can the possessor of a moving-coil speaker claim superiority over the majority of his fellow listeners, for it is quite possible that owners of such instruments will soon outnumber the others!

But it has not only been the amazing drop in prices that has made the moving-coil one of the best sellers of the season; it is the almost universal application of the permanent magnet that has contributed largely to that.

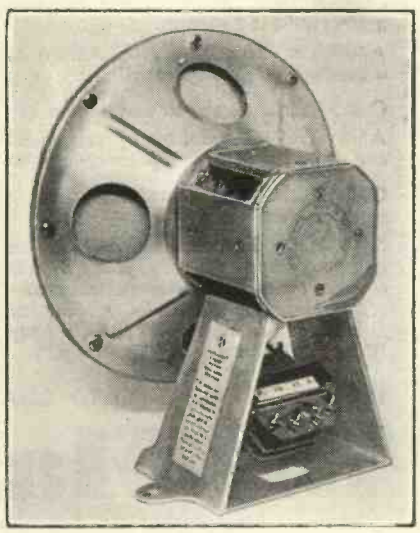
We wonder how many of the mains-driven types are sold these days, apart from those included in complete console receiving outfits? It must surely be a small number.

At one time it was generally believed that it was not possible to obtain satisfactory sensitivity with a permanent magnet unless this was a very large and costly affair.

But now we have compact little "P.M.'s" which have all the technical efficiency of their older and more clumsy mains-driven predecessors, plus four times their attractiveness as regards neatness. In parenthesis we must point out that the modern mains-driven moving coil, such as is used with the larger outfits, is correspondingly magnificent in technical effectiveness.

Returning to the permanent magnets, we have a fine example of what can be done nowadays in the W.B.

THE NOTED W.B.



The P.M.3 model W.B. permanent-magnet moving-coil speaker.

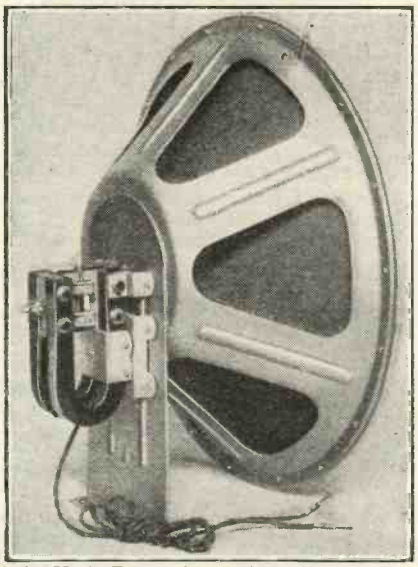
Test Bench

Graham Farish, W.B., Undy, Eelex, Atlas, R.I., and Six-Sixty products are impartially dealt with this month.

P.M.3, a photo of which accompanies this article.

And if we ever called this a " little " speaker, we intend the adjective to define its physical dimensions and price. Its response is first-class, and it can handle practically any input from that of a modest two-valver upwards.

THE NEW "UNDY"



The Undy Dynamic 8-pole loud speaker.

The Electro-Magnetics

The advance of the moving coil has not completely overshadowed the improvements made in the electro-magnetic varieties, for one or two of these stand out with almost equal prominence.

The new Undy Dynamic 8-Pole is a case in point. This is a speaker that is well above the average both in point of general evenness of response and sensitivity.

Also it is free from those very prominent peaks so often associated with this class of instrument. We should certainly advise readers who contemplate purchasing a new speaker to give this particular one their serious consideration.

A New Mains Unit

If there has been progress in loud speakers this has not been to the exclusion of progress in other directions. For example, the use of the mains for radio purposes is extending at a breath-taking pace.

Well in the van of progress in this branch of the art are the well-known manufacturers of " Atlas " mains units. The latest " Atlas " should prove particularly popular, too, in that it is elastic in its output.

It is an H.T. unit designed for D.C. mains, and it has three " tappings " giving 60-80, 50-90 and 120-150 volts. The last is fixed, but the other two provide intermediate voltages. A switching scheme enables all these voltages to be obtained on either a 15- or 25-milliampere load, thus its name—the Model D.C. 15/25. This elasticity is, of course, a valuable feature, and in an inexpensive unit one that should greatly facilitate its sales.

On test we found this " Atlas " unit to be completely satisfactory.

A New Eelex Terminal

Those years when our terminals were crude brass exasperations seem a long way away now. And they seem the farther when one examines closely a modern terminal of the nature of the new Eelex T.2L.C.

This item will do everything it is possible for a terminal to do. It will take pin or spade lead ends, bare wire or wander plugs. And yet it remains an eminently practical and neat little article. It is brightly plated and is supplied with clear lettering.

A New H.F. Choke

The R.I. Quad-Astatic H.F. Choke retails at only 3s. 6d., and is one of the neatest components that has come to our notice. It is built into a solid and clean moulding which provides complete protection for its patent windings, and which gives it that polished appearance for which we look as a matter of course in R.I. products.

We must also take this opportunity of complimenting Messrs. Radio Instruments upon their acumen in so plainly labelling all their manufactures. This is not courage, for they do not make apparatus they need be anything but proud of, but plain business

The new Atlas D.C. mains unit.

wisdom. Every R.I. product is an R.I. advertisement, though the neat monogram could never cause offence.

QUAD-ASTATIC

R.I.'s New H.F. choke.

But to return to the Quad-Astatic, this we find on test to be an excellent H.F. choke, one which can efficiently " choke " over the whole of both bands of broadcasting wave-lengths.

The Six-Sixty Multistat

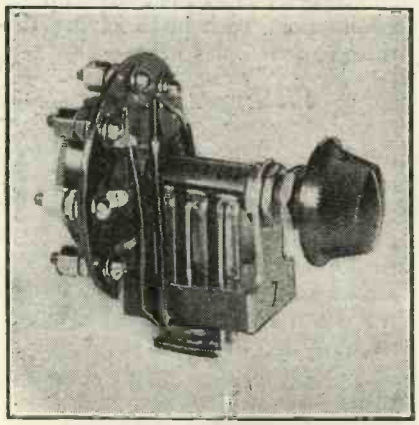
This is a particularly ingenious component capable of performing no less than four distinct functions, viz., radio volume-controlling, pick-up volume-controlling, radio or records switching, and set on-and-off switching.

And it will be noticed that none of these operations ever overlap so that their control by one knob is a logical and valuable simplification.

And we believe the inclusion of filament switching is quite new.

The Six-Sixty Multistat is a soundly constructed component and performs its tasks efficiently. The battery model costs 8s. 9d.

A USEFUL DEVICE



A useful combination device of particular interest to radio-gram enthusiasts.

Trouble Saving Terminals

Here is a useful scheme for making connection to those popular Spaghetti resistances when they will not reach their allotted components.

By C. P. ALLINSON.

THE first time I used some of the Spaghetti resistances that are now proving so popular I was rather worried how to make a good connection to the free end, as they were too short to reach their ultimate destination.

I didn't like soldering a lead to it, and if I did I should have to wrap the joint with insulating tape to prevent short-circuits occurring, especially as a metal chassis was being used.

The Problem Solved

I quickly found the answer to this little problem, and half an hour's work at the bench provided me with a dozen little aids to wiring Spaghetti resistances into a set, even if a metal chassis was being employed.

The diagram shows what I did. I found an odd scrap of $\frac{1}{4}$-in. ebonite, which I cut into $\frac{1}{2}$-in.-wide strips. In these strips I drilled a number of 6 B.A. holes from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. apart. Then I cut the strip into small pieces, each piece having two, three or four holes in it.

Fitting Together

Next, one of the end holes was countersunk on one side of the ebonite and the rest countersunk from the other side, only rather more deeply than the first hole. I then turned to the box containing my screws and nuts, and I picked out a few dozen 6 B.A. countersunk screws about $\frac{1}{2}$ in. to $\frac{5}{8}$ in. long, and an equal number of 6 B.A. nuts and 6 B.A. terminal heads, together with the same number of soldering tags.

The screws were put through the ebonite strips from the deeply countersunk side, a soldering tag slipped over, and the nut screwed tightly down. Then the terminal nut went on, and all holes but one were filled up on each strip in this fashion, the finished "gadgets" being as shown on the right of the diagram.

Easily Wired

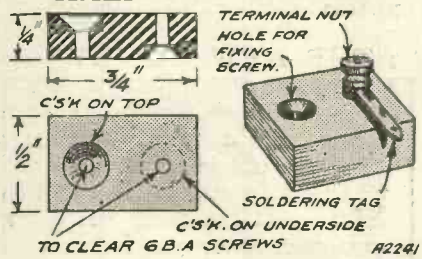
It was now a simple matter to wire Spaghetti resistances of any length into any circuit in any position. They were easily removable in cases where different values had to be tried out, or easily replaceable should an accidental overload break one down.

They made wiring very simple, and the run of the leads was brought much closer to the ideal arrangement by their aid. Although two or even three resistances could be put under one terminal, the use of the multi-terminal type was often found preferable.

Many Other Uses

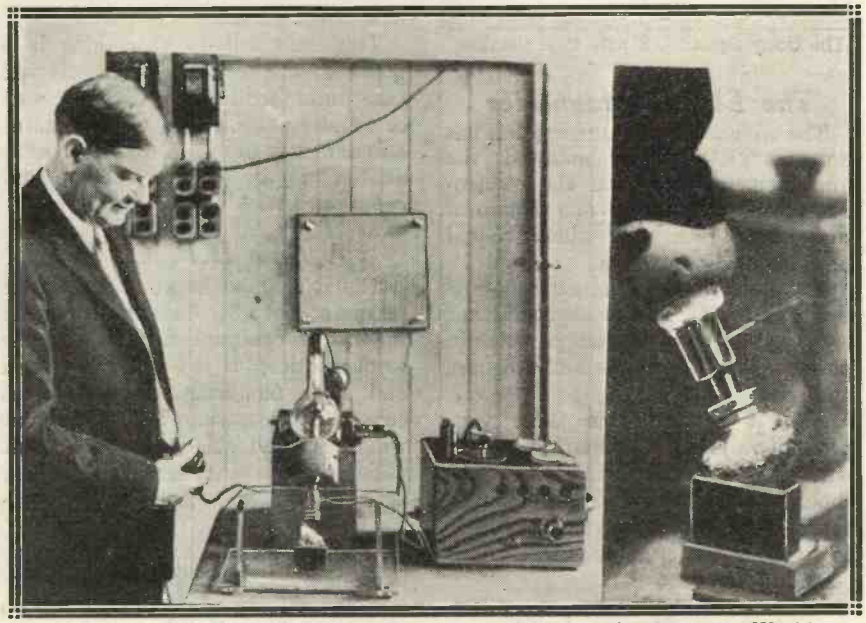
I speedily found that although these gadgets were originally made for use with Spaghetti resistances they came in extraordinarily handy for ordinary wiring up. There are often places in a receiver where five or six leads all come together, before they go off somewhere else. One of these little insulated terminals simplifies the run of the leads and the completion of the wiring.

"HALF-WAY HOUSE!"



These little terminal blocks are particularly easy to make, and prove a useful "Half-way House" for Spaghettis when they are too short.

CATHODE-RAY DEVELOPMENTS IN AMERICA



The apparatus illustrated above is an American cathode-ray development. Working at full pressure it can bombard a substance with electrons which shoot forward at the colossal speed of about 90,000 miles a second. When this electron stream is directed on to certain chemical substances it turns them into "red-hot" particles, which are in fact icy cold. On the right is a close-up of the business end of the instrument.

QUESTIONS ANSWERED

Condensers in Parallel

D. A. (London) wishes to know how to find the capacity of a number of condensers joined in parallel.

This is quite simple, D.A., you just add the respective capacities together in order to find the resultant capacity. Thus two ·0005-mfd. condensers joined in parallel are equivalent to a single ·001-mfd. condenser.

Similarly, a ·00015 mfd. in parallel with a ·0003 mfd. gives a resultant capacity of ·00045 mfd.

Moving-Coil Speakers

S. H. (Weybridge).—"I should very much like to get one of the latest permanent-magnet moving-coil speakers, but I am doubtful whether my detector and two L.F. set is sufficiently powerful to work a speaker of this type. Do you think that my receiver would be suitable, and, if so, are any modifications required?"

The sensitivity of the modern moving-coil speaker is very high, and there is no reason why you should not obtain excellent results from one of the permanent-magnet types used in conjunction with your three valves. To get the best results it is advisable to employ a super-power valve in the output stage.

Heterodyne "Whistles"

M. S. (Cobham).—"I have a three-valve receiver (Det. and two L.F., R.C. coupled) which is not sufficiently selective. When I listen to my local Regional I notice that I get a faint heterodyne which is very irritating. How can I increase the selectivity of my set in order to cut out this interfering station?"

If it is only the heterodyne whistle you hear the trouble is caused by inadequate spacing between your local station and the interfering transmission.

The fact that you hear the whistle proves that the high-note response of your receiver is good, and since the note is probably due to a station separated in frequency from your local by about 9 kc. any method of reducing the high-note response of the set should tend to remove the whistle.

TECHNICAL QUERIES DEPARTMENT

Are you in trouble with your set?

The MODERN WIRELESS Technical Queries Department is in a position to give an unrivalled service. The aim of the department is to furnish really helpful advice in connection with any radio problem, theoretical or practical.

Full details, including the revised scale of charges, can be obtained direct from the Technical Queries Department, MODERN WIRELESS, Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this all the necessary literature will be sent to you, free and post free, immediately. This application will place you under no obligation whatever. Every reader of MODERN WIRELESS should have these details by him. An application form is included which will enable you to ask your questions so that we can deal with them expeditiously and with the minimum of delay. Having this form you will know exactly what information we require to have before us in order to solve your problem.

London readers, please note: Inquiries should not be made in person at Fleetway House or Tallis House.

If you attempt to obtain better selectivity by "juggling" with your aerial circuit you will lose a certain amount of volume. So try a small condenser across the first anode resistance, say one of those semi-variables of the compression type having a value of not more than ·0003 mfd. max. This will reduce the high-note response and may solve the trouble.

Grid-Current Rectification

M. L. (Blackheath).—"I have been told that the usual values specified for grid-current rectification—viz., ·0003 mfd. and 2 megohms—tend to produce a loss of high notes, and therefore to spoil quality. If this is so, why are these values so often used in set designs?"

It is true that the values which give the best sensitivity are not necessarily the most desirable from the fidelity standpoint. A receiver designed for general purposes must be a compromise between quality and sensitivity—apart from questions of selectivity and cost.

It is necessary for the rectifier to have a good measure of sensitivity, but quality must not be sacrificed to an audible degree. The common values of ·0003 mfd. and 2 megohms are satisfactory in most cases.

If a better high-note response is required from this type of detector, then the values can be reduced to ·0001 mfd. and ·5 megohm. These values, however, have an effect upon the sensitivity, a factor which is not always acceptable to constructors.

"Indoor" or "Outdoor"

L. T. (Northampton).—"I am at present using an indoor aerial consisting of a single wire stretched across the room. Although I get good results on the Regional stations, I find that tuning in continentals is somewhat critical. Would an outdoor aerial improve matters?"

Yes, a good outdoor aerial should bring about a very marked improvement in distant reception, but it will also increase your selectivity troubles. Provided your set has a selective aerial circuit the outdoor aerial will be well worth while.

Generally speaking, it is inadvisable to use indoor aerials unless the set has at least one S.G. H.F. stage.

We frequently receive letters from readers who are employing simple sets, such as a detector followed by one or two L.F. stages, and who complain that their results are not what they expected. Upon investigation it is found that the majority of these readers are in possession of poor aerials which are entirely responsible for the ineffectiveness of the sets. It always pays to erect the best possible aerial in the circumstances.

THE NEW TUNGSRAM POWER DETECTORS

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T.3123

Here are three types from the complete new TUNGSRAM range, particularly suitable for portable receivers: PD220 — a new and specially-designed anti-microphonic detector valve; P220 — a new and extremely efficient low-current consumption power valve; L210 — an entirely new valve which is mainly suitable as detector or first low-frequency amplifier. Characteristics are given below.

Type	Fil. Volts	Fil. Amps.	Max. H.T. Volts	Amp. Factor	Anode Resistance (Ohms)	Mutual Cond. m/a V.	PRICE
L210	2	·1	200	16	16,000	1·0	6/3
PD220	2	·2	150	17	10,000	1·7	7/-
P220	2	·2	150	6·6	2,200	3·0	8/9

Write to Dept. S.T.2 for full particulars of the complete new range. Prices from 6/3 to 22/6.

Tungsram Barium Valves are manufactured under one or more of the following Patent Nos.: 289,762, 289,763, 311,705 and 313,151.

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THE NEW 2 VOLT SUPER DETECTOR AND POWER VALVES

THE PORTABLE TRANSMITTER

An incident concerning a novel application of the "radio link."

"THIS," said Blazer, "is Baron Maestro."

Dare shook hands with the tall, dark Silesian and invited his two visitors to sit down and make themselves comfortable.

"I should explain," continued Blazer, "that Baron Maestro is a client of mine, and has commissioned me to——"

A Dangerous Habit

"Excuse me, inspector," interrupted the Baron, holding up his hand, "before we go any farther it is necessary to impress upon Mr. Dare the necessity for the greatest possible secrecy."

"It is *not* necessary to do that, sir, confidences are just as much a line of Mr. Dare's business as they are mine," observed the ex-inspector of police with some slight irritation. The well-groomed foreigner smiled and bowed slightly in Dare's direction.

"That Mr. Dare is a friend of yours——!" he murmured apologetically.

"Well, to get back to the job of work," said Blazer, "Baron Maestro has retained me to act as a guardian shadow for his countryman, the Duke of Kelsburg, who is a-holidaying over here. Seems there are some political enemies on his tail. But the Duke, says Baron Maestro, hates like poison the idea of being protected—which, by the way, don't make my work easy, seeing as he flits about like a butterfly. The Baron won't have me leave my men to the job, and as he's paying the piper mighty handsome, I'm not raising any objections just yet. The only snag is that the Duke has suddenly taken to darting off to the East Coast for night fishing, which he does all on his lonesome in a small boat.

The Criminals' Chance

"Baron Maestro insists I should still keep right on his darn heels for fear these enemies make this latest stunt their opportunity." The ex-inspector paused, and the foreigner took advantage of this to emphasise, in his faultless English, the perfect opportunity presented to an evil-doer by this adventuring, for the space of hours at a time, into the dark, lonely night waters of the East Coast. The radio expert nodded his head in agreement, but couldn't for the life of him see what it all had to do with him! He politely intimated as much and, as a hint, glanced at his wrist-watch.

"The Baron has suggested it might be at least possible to keep within earshot of the boat by wireless, laddie. And that's where you come in," said Blazer.

Dare frowned thoughtfully.

"But a small boat such as the Duke would use for solitary night fishing wouldn't be fitted with radio," he pointed out.

"Certainly not," interposed Baron Maestro, "but I thought perhaps the methods used by your Post Office—what you call them?—ah, yes, pirate-tracking wireless vans, could be employed so that a following boat could keep just out of sight in the darkness, but within hearing, and ready to draw close should any other boat be heard to approach. The Duke's stationary boat will make no noise, and neither will ours as we lurk close at hand in the darkness, but we'd quickly hear——"

"We?" queried Blazer surprisedly.

"Yes, inspector, I feel the—the 'hunch,' as you say, that terrible danger threatens the Duke on these nocturnal expeditions, and it is is my duty to accompany you—I am sure you will not object to that. Personally, I dislike the Duke intensely, but— Now, Mr. Dare, are you hopeful that radio can provide the link which will keep us in touch?"

"I'll not say it is impossible, I don't like that word, but I can't at the moment see any way of doing it. However, let me think it over—I'll ring you at your office within the hour, Blazer."

On their way out the ex-inspector drew behind Baron Maestro.

"It sounds wild, laddie," he whispered quickly in Dare's ear, "probably nothing but imagination in it—but the baron parts up widely—get in on it if you can—honestly."

Direction-Finding Difficulties

Dare was not at all keen on "getting in on" anything that did not call for direct applications of his professional skill; nevertheless there was a strong essence of romance and adventure about the affair which attracted him mightily. Therefore, he gave it considerable thought during the following hour.

Finally he came to the conclusion that there was only one way to arrange a radio link between two such boats, and that involved planting a small portable transmitter on the Duke's boat and installing a direction-finding apparatus on the other. But it all seemed far too complicated to succeed. Indeed, it is dubious whether he would have made the suggestion had not Blazer put through an impatient call.

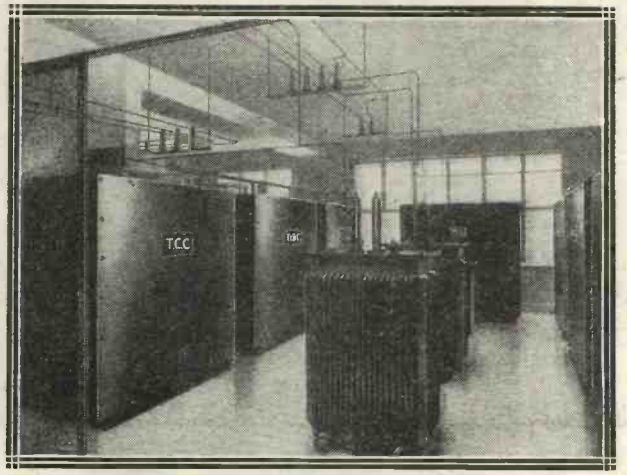
"Your anxiety on behalf of Mr. 'So-and-so' does you credit," laughed the radio expert into the 'phone, but surely you are failing just now to give the er—trailing the personal attention insisted upon?"

A "Shadow" Set

"I'm doing that O.K.—his dukeship doesn't start his flitting around till nightfall; my boys hang about the hotel during the daytime. But have you got any ideas?" returned the ex-inspector impatiently. Dare somewhat off-handedly outlined what he considered to be the only scheme, but added that he did not think it a particularly practical one. "Would the transmitter to be planted be a bulky affair?" asked Blazer. Dare admitted that as it had only to cover a very

(*Continued on page* 190.)

SEVEN GIANTS OF PRAGUE



Seven of the huge British condensers installed at the new 200-kw. Prague broadcasting station.

THE PORTABLE TRANSMITTER

—*continued from page* 188

short distance it could be, on the contrary, considerably smaller than the average portable receiver, although, he pointed out, it would take a day or two to get working, and he would have to accompany the "shadowers," the first time at least, in order to test the apparatus.

"That's great!" exclaimed Blazer. "The Duke doesn't make his next trip to the East Coast till the day after to-morrow. I've got the boatman who hires him the tackle well palm-oiled, and it'll be as easy as falling off a house to get him to stow the transmitter away in one of the lockers. But will this thing make any noise while it's working? And will it keep going for a long spell?"

Night Adventures

"No and yes to those queries," said Dare; "and now here's one for you. Why is it Brother Maestro doesn't hand over his little bag of intrigues, fancy or otherwise, to the Special Branch? You say it's not yours to reason why, but yours to do and debit! That's a crafty one!"

. . . .

The moon was hidden by clouds and the night almost impenetrably dark when, two days later, a large limousine deposited the Duke of Kelsburg at a lonely point on the coast near Clacton. Dare, who with Blazer and Baron Maestro watched the arrival of the distinguished foreigner from a window of the unlighted boathouse, wondered why on earth he chose to come so far for what seemed to him so little. It was ten o'clock, and the boatman had prepared the vessel and this was lying ready at the edge of the smooth sea. At first it appeared to the watchers as though the Duke was going to enter the hut, but the boatman said something about lights, and so he wandered over to his car, preceded by the other's swaying storm-lantern, and there, in the glare of the headlights, briefly referred to various papers he produced from a pocket of his voluminous oilskins. At length he said something to the driver, and the limousine glided away into the darkness.

A crunching of footsteps over the sand, a splashing of water, the sound of squeaking rowlocks, and the Duke commenced his piscatorial adventure.

"Can't understand why he doesn't take someone with him to do the rowing," observed Dare, still keeping his voice low.

"The Duke craves the solitude of your true devotee of Izaak Walton," laughed Baron Maestro. "Now, gentlemen," he continued in a serious vein, "once more, have I your words of honour that *nothing, nothing* of this night's incidents will be told to a living soul? I assure you, matters of state render such secrecy a matter of vital urgency."

The others at once, albeit amusedly, "gave their words."

The Second Boat

After a delay of about a quarter of an hour the three men quietly took leave of the boatman and crept round to where a second boat was concealed behind a conveniently placed breakwater. Caution was needed, for no one could say how far out the Duke had rowed. It was at this juncture that, for the first time, Dare conceived the idea that there was a great deal more in the whole affair than the mere protection of an important foreign potentate against "political

(*Continued on page* 192.)

THE PORTABLE TRANSMITTER

—*continued from page* 190

enemies." He wished he could have had a word or two with Blazer alone, but that was now quite impossible, for they were at the point of embarking and their vigil on the dark waters had begun.

With a gentle "throosh," followed by a bubbling, the boat was launched, and the time had come for Dare to attend to the wireless apparatus.

Blazer silently plied the oars.

The Unseen Watchers

The radio receiver was an adapted "wireless compass" for aeroplanes, and it could at once indicate the exact direction from which radio signals of a pre-arranged wave-length were coming. Dare settled the headphones he was wearing more comfortably, and twisted the two small dials on the instrument. Almost immediately he picked up the steady radiation from the planted transmitter—it came in like the thin, sustained scream of a far-distant bat. He adjusted a screw device and an illuminated hand rotated around a small dial. The guiding signal grew less and less in strength, until at last it disappeared into inaudibility. He touched Blazer on the arm and whisperingly drew his attention to the illuminated needle, for, of course, this was now pointing directly at the boat with which they were to keep in unseen attendance.

The ex-inspector changed their course to agree, and slowly, silently bent himself to his task. Just visible in front of him, the Baron gazed concentratedly ahead through powerful nightglasses; at the first glimpse of their quarry he would signal Blazer to stop rowing or to reverse their direction of movement as needed. They had planned to take up a stationary position on the far confines of the range of the Baron's exceptionally efficient binoculars.

A Silent Vigil

But they had headed some miles out to sea before the Baron gave the signal to stop. Rhythmically the boat rose and fell to the lilt of the sullen, black sea as they remained tensely motionless. Then the silence was broken by a faint clattering from ahead as the lonely fisherman began to make ready for his night's work with hook and line. A pinprick of light sprang into evidence; he had lit a small lantern. The Baron lowered his glasses and Dare switched off the radio receiver. So long as that lantern remained lighted there was no need for any artificial aid to observation.

What the Light Showed

Ever and anon tiny splashing sounds drifted across the intervening darkness, but that was all there was to occupy their attention that quiet, windless night.

Sounds and lights carry exceptionally well over water, so both smoking and conversation were denied to the watchers. Subsequent to about an hour and a half of this deadly monotony, Dare came to the conclusion that he would in future leave detective work to detectives, for although he still sensed a great deal of the unusual in this apparently absurd interlude, he was also fast becoming terribly bored and tired. Eventually he began to nod and probably would have fallen asleep had not the moon suddenly broken out from behind a bank of clouds and irradiated the scene like a giant floodlight. It was so unexpected that it caught them entirely unawares,

(*Continued on page* 194.)

WHAT OUR READERS SAY

A Helpful Milliammeter Idea—Appreciation of the "Eckersley" Three—The "M.W." "Inter-Axials."

From a Dutch Reader

To the Editor, MODERN WIRELESS.

Sir,—Herewith I beg to inform you that I am reader of your magazine for some two years, being always greatly interested in your valuable schemes and hints.

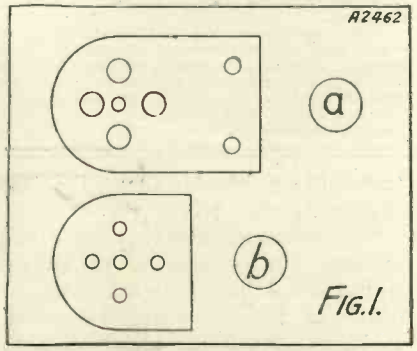
Often you published interesting items from readers. In connection I may mention that I have something which might prove to be suitable for description under those headings. At least I think it will be of some interest to other readers and amateurs.

It is a little gadget, which has saved me much trouble and time.

Amateurs and other radio people have often to check up sets of any kind, and the first thing to be done should be to insert a milliammeter successively after each valve, in order to state where distortion takes place or what valve is faulty. However, this is often neglected, because of the very nature of sets, the inaccessibility of connections to the anode of the valve concerned.

Often the milliamm. is inserted between the battery or mains unit, and the anode leads to the set itself, but it will be clear that only wrong results can be obtained in this way, especially in the case of parallel-feed systems.

HERE IS THE BASIS



The unit is made up on two small pieces of ebonite, to take valve legs and the sockets for a valve.

Checking Up Anode Current

Therefore some time ago I constructed a little device, which enables me to check up the anode-current of any valve, without trouble and in no time, in the right place. It is a plug-mounting device, to which a milliammeter is connected. The only thing to be done is to take the valve out of its holder, plugging the device into the latter and placing the valve on top of it. And there you are.

Enclosed is a drawing of the device, which I hope will give you a good idea for construction details. The instrument is a combination of valve holder and valve pins.

Fig. 1 (*a*) and (*b*) shows 2 pieces of ebonite; (*a*) drilled for containing 4 sockets (valve holder) and 2 terminals, to which later on a milliammeter is connected.

Fig. 2 (*a*) and (*b*) gives the same 2 pieces: (*a*) mounted with 4 sockets and 2 terminals; and (*b*) with 4 pins.

SHORT—AND SWEET!

A UNIQUE APPRECIATION ON A POSTCARD TO THE EDITOR

"Made up 'Eckersley' Three as Dec. 'Modern Wireless.'
"GOD BLESS ECKERSLEY!"

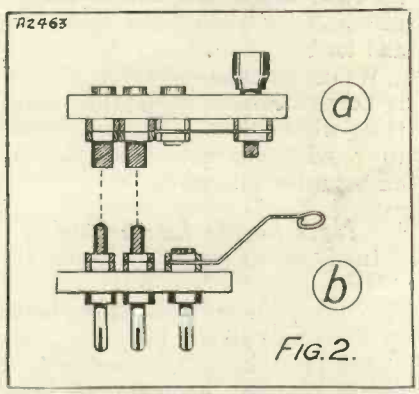
Terminal Connections

Please note that plate pin and socket are cut off for some length and connections provided for wiring up the plate socket to one terminal and the plate pin to the other.

Fig. 3 shows the whole plug-mounting device.

Be sure you get "open" sockets, with a hole in the bottom, so that the projecting heads of the filament and grid pins will nicely fit in with them; a little soldering will do the rest.

READY TO JOIN UP



Here you see the two parts of the little gadget ready to be joined together.

The device was intended for ordinary valves, not for pentode. You may construct a special device for the latter (with 5 sockets and 5 pins in the usual way), but that will require a little modification.

For this purpose I use some inches of insulated wire, one end provided with an eyelet, the other with a pin.

Use With Pentode

Measuring a pentode: first plug the pin of the wire into the centre hole of the valve holder, insert the plug-mounting-device and place the pentode on top of it, having beforehand fitted in the middle pin of the pentode with the eyelet of the remaining end of the wire.

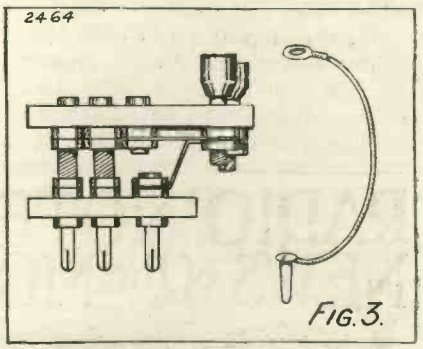
I hope you will think it worth while, and meanwhile I remain, dear sir,

Truly yours,
F. BRONKHORST.

Gorinchem,
Holland.

P.S.—Please excuse plain English!

READY FOR THE METER



The milliammeter is connected across the two terminals, the flex lead on the right being for use with pentode valves

The "M.W." "Inter-Axials"

Sir,—I should like to thank you for your details for making a free-edge cone loud speaker in your last February issue. I have made the Inter-Axial Senior using a Blue Spot Unit 66R. I have made it exactly to your specification, and am amazed at the results. When I tell you we have been using up to the present a horn speaker, date 1922, you will readily understand how much we appreciate the difference. I have cut up the cabinet of my old "Transatlantic" Five to make a case for the speaker. You will know by that what an old reader of yours I am, and that was not the first set of yours I made. I have been a regular reader ever since, and wish you all the success you deserve.

Yours faithfully,
W. J. GYLES.

Bournemouth.

THE PORTABLE TRANSMITTER

—*continued from page* 192

and they sat rigidly, stupidly gazing at the sharply silhouetted figure of the Duke crouching in his boat. And it was plainly to be seen that he was reading by the light of a partially shielded lantern. But a rod, apparently tied in place, projected over the sea. Then:

The Fatal Shot

"Stop him!" shouted Dare agonisingly. The warning was too late, there was a shaft of flame which seemed to spring from Baron Maestro's extended hand, a loud report, and the Duke slumped forward in a crumpled heap. With a leap forward that sent their boat rocking dangerously, Blazer sprang at the Silesian; there was a grunt, a smothered exclamation, and a splash as the automatic pistol struck the water.

The ex-inspector pushed the Baron from him, slid back quickly, produced his own automatic with the dexterity of a conjuror, and sat menacingly holding it trained on the fallen man.

"Move—and you'll get your medicine without a trial!" he grunted.

Baron Maestro slowly raised his head; he was smiling—nastily.

"I simply could not resist the temptation, gentlemen," he muttered. "I hated him, and Silesia will be the richer for his despatch, though I appreciate the awkward position in which I have placed you. I——"

That Promise of Silence

"You can tell all that to the sergeant at the police station," interrupted Blazer. "Take the oars, Dare laddie, and put back to shore."

"One moment, inspector; have I not your solemn promise, your word of honour, to say *nothing* about what has happened to-night—extracted from you in advance, I know. But given, I trust, in accordance with all the traditional sincerity of the English gentleman?"

Blazer scratched his head irritably with his left hand; the other still gripped the automatic with unwavering firmness.

"Heck! I reckon circumstances alter cases," he said, "but what's the big idea? Looks to me as though you been playing young Dare and me as a couple of dummies."

"You misjudge me, inspector. As I have already indicated, my personal feelings overcame my duties as an officer of State. This unfortunate contretemps is, believe me, quite unpremeditated. Shall we return? Remember your promise; no one need be one bit the wiser. Maybe you would permit me to sink that boat?"

For a moment Blazer said nothing, then, without taking his eyes off the Silesian, he addressed Dare.

"Take the oars and pull over to the other boat, laddie," he requested.

The young engineer, who had sat aghast at the tragedy he had sensed was imminent and been unable to prevent, mechanically carried out the instructions. They drew alongside the Duke's boat, and only one quick glance was needed to show that it was, in fact, a boat of death.

The Last Act

"Hold fast" said Blazer, moving a bit farther back. "Take the oars from the other boat, laddie, and park 'em on ours. Now, then, mister Baron, you can climb into the other boat just as quickly as you can without rocking ours too much. If you do that, or if you refuse to move, I'll plug you. After all, *that* is as good a way out as any other!"

Baron Maestro looked uncertainly at Dare, and then back again at Blazer's grim countenance, made the grimmer by the hard shadows cut on it by the bright moonlight, shrugged his shoulders and heaved himself up. He clambered circumspectly from the one vessel into the other.

"And what do we all do now?" he asked, as he stood balancing himself against the rocking movement.

"Dare and me—we slip back as quickly as we can to keep our promises and say nowt! Your future is in your own hands, Baron. You can use 'em to try and paddle the five or so miles to land, or you can use 'em to try and swim it. Somehow I don't think either's a good bet!" said Blazer unhumorously.

RADIO NOTES and NEWS of the MONTH

Seven-Metre Tests

It is reported that the 1-kw. transmitter for use in connection with the B.B.C.'s 7-metre tests is now ready. It is probable, however, that this transmitter will not be put into use until the B.B.C. has moved to Broadcasting House.

If these 7-metre tests prove successful there will undoubtedly be some very interesting developments during the year.

Saturday Programmes

A considerable amount of controversy has been taking place in connection with the programmes broadcast by the B.B.C. on Saturday afternoons. At present the air is empty on Saturdays between 2 and 3.30 p.m., except for occasional sporting items, and as quite a lot of people aren't too keen on listening to, for instance, a description of a Rugger match, complaints have been long and loud.

We understand, however, that it is now extremely likely that something will be done in the near future to provide alternative programmes on Saturday afternoons.

New Leeds Land-line

In a recent interview with the "Daily Express," a B.B.C. official stated that a new land-line from Leeds to Edinburgh should be in use "in a matter of weeks." This cable will be of the modern underground type, which is much more satisfactory for transmitting music than the old overhead type.

We understand also that a new and modern control-room is to be installed at Edinburgh, to take over the duties of the old Glasgow control-room, the apparatus of which is to be scrapped. Edinburgh will thus become the centre of the land-line system. The English line will come from Newcastle and lines will also be taken to Glasgow, and through Dundee to Aberdeen, thus providing a communication network.

A Capable Conductor

Mr. Harry Hall, who will succeed Jack Payne as B.B.C. Dance Orchestra conductor, will probably have a hard fight to win over some of the most ardent Jack Payne devotees, but, judging by the great strides he has made in his career, he seems pretty capable—even of this hard task!

Controlling Fourteen Bands

Mr. Hall began his career with the London Midland and Scottish Railway on December 13th, 1922, and at the age of 22 he became a pianist in the Midland Hotel Band at

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Manchester. Before long, however, he was promoted to the conductorship, and eventually to the music directorship of alll the L.M.S. hotels. This latter position involved the controlling of fourteen bands—and he was then only 32 years of age!

The Prince's New Set

The Prince of Wales has just bought a new all-electric receiver for use in St. James' Palace, states the "News Chronicle." The Prince's new set is a four-valver—a self-contained model which can be plugged in to any alternating electric light socket. The Prince likes a set which will give him foreign stations, for he is interested in listening to all the chief broadcasters of Europe.

According to the "News Chronicle," the Prince is no technician, and likes a receiver which is simple to adjust and doesn't give any trouble.

More Portable Police-Radio

Experiments are being carried out in Bradford which if successful will result in every member of the Bradford City Police Force carrying a miniature wireless receiving set as part of his equipment.

This set will be complete with earphones, and will be small enough to be tucked away in the policeman's helmet. A transmitting station would be set up at police headquarters, with an unvarying wave-length, and pre-arranged signals would warn constables when on their beats.

Growing Exports

In 1931 exports of wireless receiving sets from the United States to Great Britain rose in value to £375,000 as compared with £60,000 in 1930.

Recent returns show that Britain forms the most important market for the United States wireless export trade. During September last sets to the value of 376,572 dollars were exported from the U.S. to Britain, Canada being next with 183,316, while Switzerland was third.

British Scientist Honoured

Professor E. V. Appleton, F.R.S., Wheatstone Professor of Physics at King's College, London, has been recently elected to the Vice-Presidency of the American Institute of Radio Engineers for the year 1932. In 1929 Professor Appleton was awarded the Morris Liebmann Memorial Prize of the Institute for the most important contribution to wireless progress during that year.

Loud-Speaker "Gun Shots"

Newcastle listeners who live near tram routes recently put up a very strong complaint to the tramway authorities in connection with the problem of tramcars spoiling their wireless reception, and we understand that as a result this matter is being taken up nationally. An alderman of Newcastle, who was one of the complainers, described the interference as being like "gun shots in the loud speaker!"

A Very Tiny Set!

Princess Elizabeth is to have her very own wireless set. It will be a very tiny set, and it will be installed in the model cottage which the Welsh people are presenting to her. The set, although small, is guaranteed to be quite capable of getting foreign stations!

Only Ten Survivors!

When the National Broadcasting Company of New York recently required a new announcer they set applicants for the post the following test. They were asked to say: "The seething sea ceaseth and thus the seething sea sufficeth us."

It is not very surprising to learn that only ten of the 2,500 candidates survived.

Turkish Pirates

According to the latest estimates received, Turkey holds the record as regards wireless "pirates," for in that country licence holders are outnumbered by pirates to the extent of 300 per cent. The number of wireless licences in force in Turkey is about 5,000, but it is believed that the number of people enjoying radio programmes is actually about 20,000.

The Copenhagen Rating

A new system of rating the power of European broadcasting transmitters, known as the Copenhagen rating, is now in force. For over a year prior to the adoption of this new system, ratings were estimated by the Hague system, but it was found that the definition required extension to indicate the actual percentage of modulation in use.

Under the new system, 160-kw. transmitters, for instance, will be rated at 120 kw., and others will show similar reductions, but there will be no difference in the carrier power of the aerial.

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different points, and it is, of course, important that these leads do not become mixed up.

To make things clearer, then, we will just verify the diagram verbally. Through hole 4 go two leads. One goes from the L.S. terminal to the output *condenser*, and the other lead joins the 25,000-ohm resistance to the output *choke*. Don't get these leads mixed up, or your set will not work.

Valves to Use

Through hole 15 go two leads as follows: One from the cathode terminal of the V_2 valve holder to the 2-mfd. condenser and 600-ohm resistance, and the other from the anode of V_2 to the 25,000-ohm resistance. Here again care must be taken that no mixing of these wires takes place.

The rest of the construction is perfectly simple, and no snag of any sort should be encountered.

When the set has been completed the procedure for operation is as follows. In V_1 valve holder insert an indirectly-heated A.C. valve of the order of the Mazda A.C./H.L., Mullard 354V., Cossor 41M.H.L., Marconi or Osram M.H.4, Tungsram A.G.4100, Eta D.W.1508, etc.

In the second stage (V_2) you require a valve of the order of the Cossor 41 M.L.F., Mullard 164V., or Six-Sixty 4 Det. A.C.; do not use a valve of the H.L. type here, except the Osram or Marconi M.H.L.4, or you may get serious overloading and consequent distortion.

The output stage needs a Cossor 41M.P. or 41M.X.P., Marconi or Osram M.L.4, Mazda A.C./P. or A.C./P.1, Tungsram P.414, Eta D.W.1003, etc.

Here, however, we must draw your attention to the bias resistances. Those shown on the diagrams are the nearest obtainable in Spaghetti form for one particular selection of

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valves—the detector has no bias, so it does not come into the calculation—the Cossor 41M.L.F. in the V_2 position, and also for the output valve, Cossor 41M.P.

If you use other valves you must ascertain the correct bias resistance. For instance, the Cossor 41M.X.P. needs 300 ohms.

Such bias resistance adjustment can only be approximate if average Spaghetti resistances are used, because the accuracy of these is only to some 5 per cent as a rule. Also it will be noticed that the Cossor 41M.P. really needs 320 ohms. We have used 350 ohms and not 300 ohms (the two nearest figures obtainable) because it is better to over-bias than to use too little, and with a 5 per cent possible error you may quite easily get down to 335 or a 350 resistance or up to 365, neither of which variations will cause any harm.

Reckoning Resistance

On the other hand, if a 300 nominal resistance is used this may be only 285, and cannot well be above 315, so that you may be very much too low in value without ever reaching the correct figure.

There are so many peculiar resistances required by the nominal characteristics of the various valves that it is impossible where easy home construction is concerned to get the resistance dead right, especially as in practice the valves vary somewhat. So if you decide to use valves different from those specified as used in the original set, don't forget to get as near as you can to their characteristics and then to choose the best bias resistance value to suit them.

To aid you in your choice we give here a few valves suitable for the L.F. and output stages of this set, and the nearest available bias resistance values.

L.F. STAGE.

Mullard 164V...	.. Resistance, 1,000 ohms
Six-Sixty 4Det.A.C.	Resistance, 800 ohms (Use 300- and 500-ohm spaghettis in series).
Osram M.H.L.4	.. Resistance, 350 ohms
Marconi M.H.L.4	.. Resistance, 350 ohms
Cossor 41M.L.F.	.. Resistance, 600 ohms

OUTPUT.

Mullard 104V...	.. Resistance, 750 ohms
Mazda A.C./P.	.. Resistance, 600 ohms
Mazda A.C./P.1	.. Resistance, 700 ohms
Six-Sixty 4P.A.C.	.. Resistance, 750 ohms
Cossor 41M.P...	.. Resistance 350 ohms
Cossor 41M.X.P.	.. Resistance, 300 ohms
Osram M.L.4 ..	.. Resistance, 350 ohms
Marconi M.L.4	.. Resistance, 350 ohms

The calculation of the required resistance is quite easy. You have the anode current of the valve flowing through the resistance, and by the valve-makers' curves you can see the anode current at the required H.T. voltage, and also the grid-bias voltage necessary.

So we have by Ohm's law:

$$R = \frac{E}{I}$$

$$\therefore R = \frac{\text{Bias volts required}}{\text{Anode current in } amps.}$$

Suppose we have a valve taking 10 volts negative bias at 20 milliamps.

$R = \frac{10 \times 1{,}000}{20}$ (multiplying by 1,000 to compensate for the fact that the 20 is in 1/1,000th amp., i.e. milliamps.)

$$\therefore R = \frac{1}{2} \times 1{,}000 = 500 \text{ ohms.}$$

The Potentiometer

With the valves in position the set can be connected up. The power unit is plugged in one of the sockets on the set, and the flex to the mains (either electric light or power plug) is plugged into the other socket.

The L.T. terminals on the power unit are connected to the L.T. flex on the set, the centre terminal (E) on the unit being left unconnected; H.T. + 1 goes to the variable tapping on the unit, and H.T. + 2 to the maximum tap. H.T. —, of course, goes to H.T. — on the unit.

Switch the set on, and without tuning a station in, but with aerial and earth connected, listen for hum. If there is none, well and good, but if there is a background, turn the set on its side and with it still in operation adjust the position of the slider of the "humdinger" potentiometer with a screwdriver until the hum is at a minimum or disappears. It should be practically inaudible close to the speaker, and in most cases will be quite inaudible.

Some Final Hints

If it is bad you will probably have to try the extra choke and condenser already mentioned.

With the "humdinger" adjusted, the set is ready for use. It is tuned in the usual way, and you will find that the tuning on the second dial is quite critical.

The series aerial condenser can be used as a volume control for powerful stations on the medium wave-band,

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but on the long waves it should be placed at minimum, in which position it is automatically shorted out. Reaction will be found to be rather more vigorous than in the ordinary battery set, and should be adjusted carefully. Varying the potential on the detector by means of the variation provided on the mains unit will enable smoother reaction control to be obtained.

To those not used to the Extenser we would point out the fact that these ingenious tuning devices automatically change the wave-band, and the Cyldon Extenser scales are marked in two colours.

The medium wave-band is shown in black (from 0–100), and the long-wave figures in red. Thus you can tell at a glance on which wave-band you are tuning.

The tuning of the second dial is critical, and it is suggested that as stations are found the reading of this dial be logged, so that it shall be easy to revert to these stations without a lot of searching. The first dial is not at all critical, and this need not be calibrated.

BROADCASTING IN REVIEW

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arranged in push-pull across a tuned H.F. circuit. As the two grids are connected directly to opposite ends of the input circuit, without any blocking condenser, there is no necessity to make a compromise between "quality" and the size of the grid condenser as in power grid detection.

Further, since any high-frequency energy in the output circuits of the two valves will be in phase-opposition, there is no chance of its being transferred to the audio-frequency stages. Since both grids are connected through a high-frequency winding, they are in parallel so far as the low-frequency components are concerned, because this winding offers very little impedance to L.F. currents. The result is that the rectified currents are added together in the output, although, as previously stated, radio-frequency components are cancelled out.

Ultra-short Waves. Important advances have been made during the last year or so in the production and use of ultra-short waves. In this connection it will be remembered that telephony signals were recently transmitted across the English Channel, and between various other points, on a wave-length of seven inches.

"H.T." on the Grid

The ordinary type of back-coupled valve will not oscillate at wave-lengths of this order, because the time taken for the electrons to travel across the valve from the filament to the plate is too great. Barkhausen and Kurz have, however, developed a method of using a valve with the grid biased at a high potential relative to the plate.

Under these circumstances the electrons are more restricted in their movements. Instead of passing directly from filament to plate, they are first attracted to the grid, and then shoot past it until they come under the influence of the negative charge on the plate. This repels them back towards the grid, and beyond it, until they are again drawn back by its positive charge. The consequence is that the electrons are kept oscillating from one side of the grid to the other, at very high frequency over a comparatively short path.

Actually, the generated frequency depends in part upon the grid voltage which attracts the electrons, and the plate voltage which repels them. High-frequency oscillations measuring only a few inches in length are produced in this fashion, and can be modulated to carry speech in the ordinary way.

On Short Waves

Super-het Adaptors. The new scheme of Empire broadcasting should help to foster a still keener interest in the reception of broadcast programmes between 16 and 60 metres. One of the simplest methods of using a standard type of broadcast set for this kind of reception is to fit it with the well-known "Kelsey" Short-wave Adaptor. Another alternative is to apply a super-het adaptor.

This consists of a local oscillator valve which is adjusted so as to "beat" with the incoming short-wave signals and convert them into a long-wave "intermediate frequency." The converted waves are passed through the high-frequency stages of the broadcast receiver, which then really functions in the same way as the intermediate-frequency stage of an ordinary super-het receiver.

ALL ABOUT VOLUME CONTROL

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the first control, which may suitably be of the Fig. 1 type, so there is no risk of badly overloading the previous valves.

The second control has the advantage that when one is working at low loud-speaker volume, hum and valve noises are reduced too, giving a quiet background.

Joint Controls

One system for, say, a powerful super-het is a Fig. 1 control with a potentiometer of ·25 megohm coupled on the same shaft and connected in the grid circuit of the power valve (Fig. 6). If resistance coupling is used, then this potentiometer may take the place of the grid leak.

The two controls are, of course, coupled so that when the condenser is entirely interleaved on the earth side, the potentiometer slider is also at the lower end, away from the grid.

It was mentioned earlier that it is possible to make good use of a volume control in co-operation with a reaction control. The key to the matter is that the reaction control varies only the station which is in tune, but the volume control varies the strength of all received transmissions equally.

Reducing Interference

So if an interfering station is causing trouble, the volume control should be shut down to reduce it, and the reaction then increased to make up for the loss in strength of the desired programme.

But in conditions where there is little interference it is undesirable to work with utmost reaction, and the process can be reversed, to the advantage of quality of reproduction.

Many listeners take the loudspeaker into another room, and find it a nuisance to have to go right to the receiver to bring the programme up in strength or to quieten it a bit, and want some sort of volume control at the loudspeaker.

There is no entirely satisfactory inexpensive method; a variable resistance in series or in parallel has a bad effect on quality, making it shrill or broken.

Fairly good results are obtainable, however, particularly with moving coils, if a potentiometer is used (Fig. 7). The resistance is not critical, but may be about twice the impedance of the loudspeaker, say, 5,000 ohms for an ordinary cone speaker connected straight across it, and 25 ohms for a low-impedance moving coil.

The quality is not preserved absolutely intact at all settings by this method, but is generally satisfactory. It is very important, however, to adjust the strength to the maximum you will want, *at the receiver*, with the loud-speaker volume control *full on*, so as to make sure that the receiver is not being overloaded.

Automatic Control

Of course, the acme of laziness is to make the receiver do its own volume controlling! That is very useful when long-distance listening, because otherwise fading makes it necessary to keep a hand always on the volume control.

It is rather outside the scope of this article to give full constructional details, but the broad idea is illustrated in Fig. 8. V_1 is the first H.F. valve, and V_2 is a detector valve.

When a station is tuned-in the anode current of V_2 falls, and the voltage across R_1 falls with it, thus biasing the grid of V_1 negatively. The more powerful the station the more the amplification is reduced by the bias voltage.

Slight Variations Only

By proportioning the circuits properly it can be arranged so that variations in signal strength are automatically compensated. Of course, the volume must vary a little in order to bring about the controlling effect, but the variation is much less than with an ordinary set, with which one has to rush for the volume control when tuning past the local station or else endure the wrath of other members of the household for creating such a row.

With an automatically-controlled set all stations sound much the same in strength. The level to which the volume is automatically brought in each case can be set by an ordinary hand control.

Listening to a station which fades is peculiar; the programme remains much the same strength throughout (unless it fades right out), but the background of mush, atmospherics, etc., comes up to strength during fades and dies down during strong periods.

But that is not likely to become a universal system.

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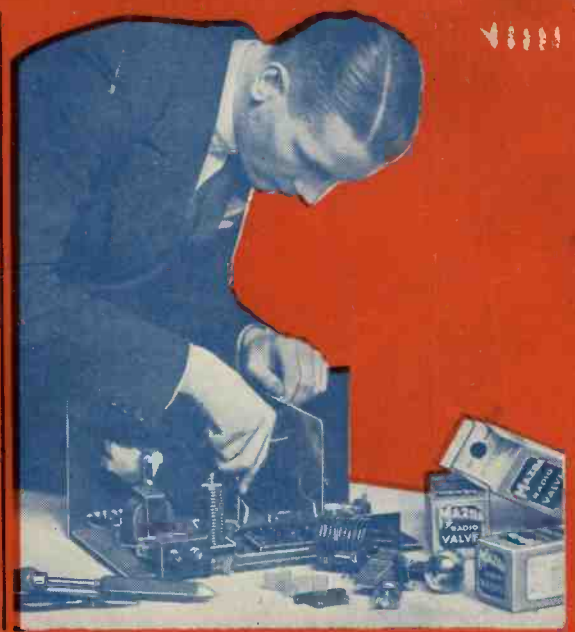

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