WIRELESS, incorporating 'Wireless Weekly.' DECEMBER 4, 1926.

WIRELESS

INCORPORATING

WIRELESS WEEKLY

2D WEEKLY

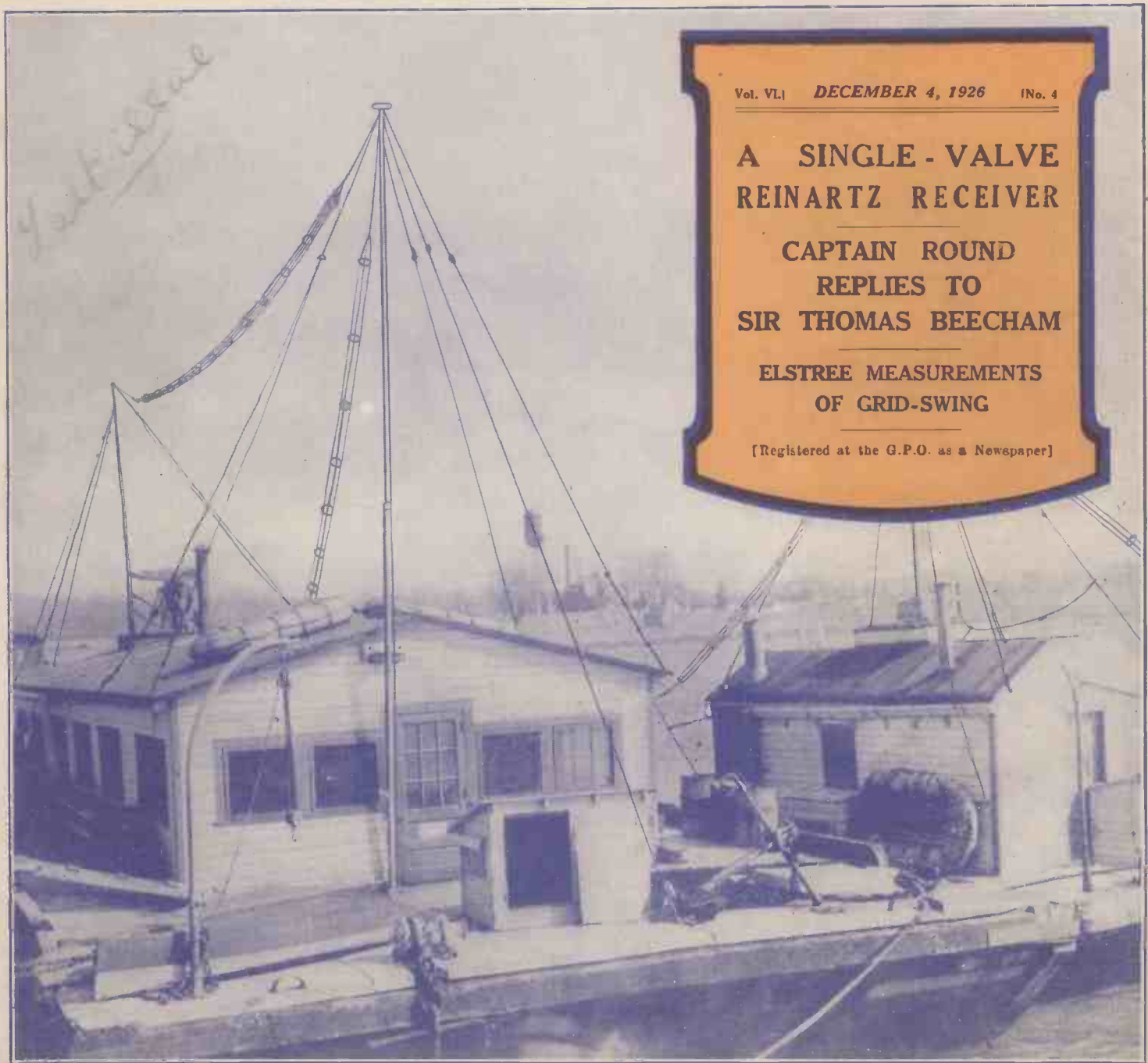
Vol. VI.] DECEMBER 4, 1926 [No. 4

A SINGLE-VALVE REINARTZ RECEIVER

CAPTAIN ROUND REPLIES TO SIR THOMAS BEECHAM

ELSTREE MEASUREMENTS OF GRID-SWING

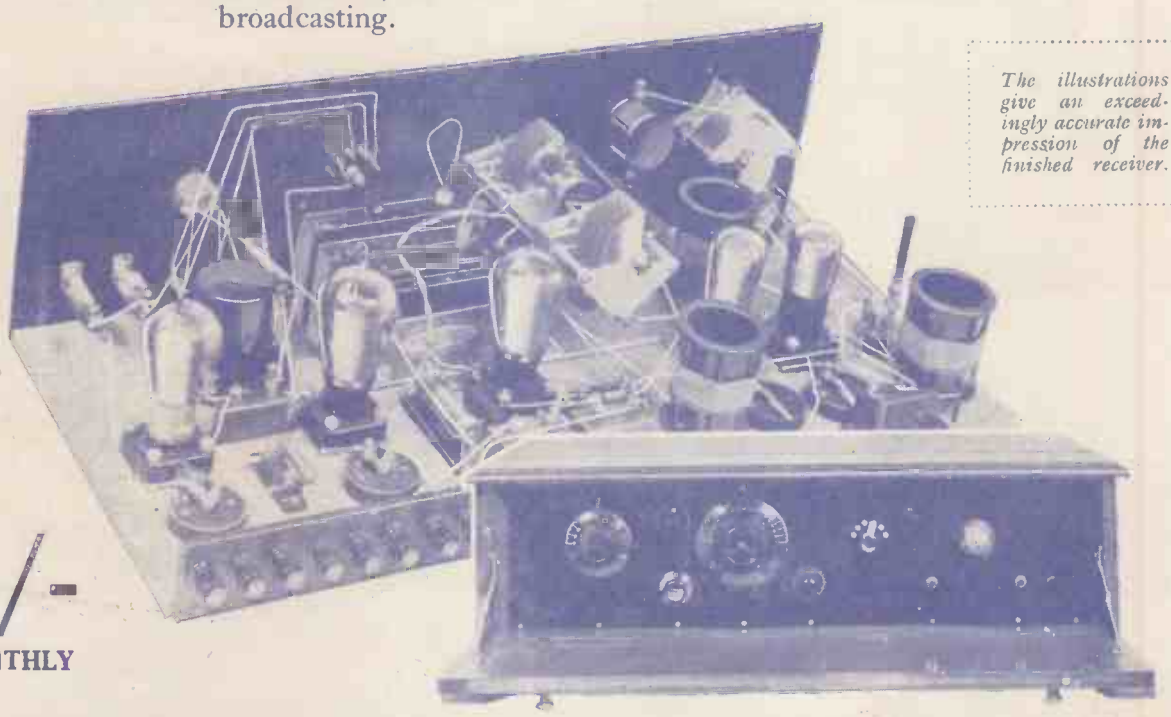
[Registered at the G.P.O. as a Newspaper]



This receiver will appeal to every musical ear

The PURAMUSIC

Designed by Mr. C. P. Allinson, A.M.I.R.E., and described by him in the December issue on sale December 1, this five-valve receiver employs two stages of high-frequency amplification and two stages of L.F. magnification. It has been designed to give the best possible reproduction from the local station or 5XX, but will, in addition, receive other British and Continental broadcasting.



The illustrations give an exceedingly accurate impression of the finished receiver.

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MONTHLY

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Obtainable from all Newsagents, Booksellers or Bookstalls, or direct from the Publishers, Radio Press, Ltd., Bush House, Strand, London, W.C.2. Subscription Rates 15/- per annum (13/6 per annum Canada and Newfoundland). Lesser periods *pro rata*.

The outstanding features of this receiver include—the purest possible reproduction of speech and music; consistent reception at distances of 50 or 60 miles; the elimination of reaction in the detector circuits; the use of a lay-out that gives the utmost stability and the use of a modern neutralised H.F. circuit.

This Magazine published "The Elstree Six"

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to our FREE offer of Blue Print and Instruction Book.

Results from our first announcements have been positively amazing! . . . Tens of thousands of FREE Blue Prints and Instruction Books have been issued in response to coupons received . . . wireless enthusiasts—as never before—are now enjoying clear, undistorted tone, made possible by the wonderful R. C. Threesome. Using the new Ediswan Valves—R.C.2. and P.V.2.—in the new quarter-watt POINT ONE ECONOMY Range—the R. C. Threesome is, without doubt, the receiver of to-day.

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It's simple—you can build it in 3 hours for less than £3. One dial tuning!—High-power station and local station come through with absolute purity and abundant volume..

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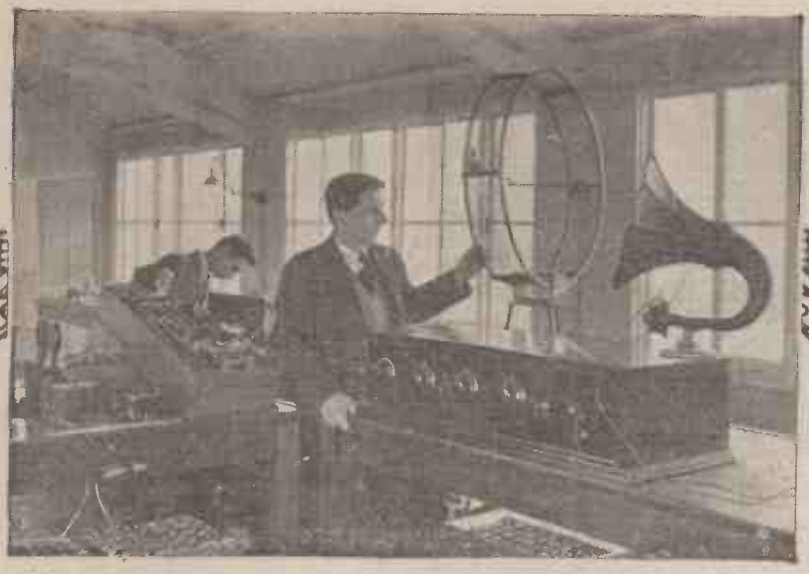

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RADIO ST VALVES

NOTES & NEWS OF THE WEEK

Successful So Far

I HAVE no criticism to make in regard to the new wavelengths. The whole scheme seems to me to be the best thing the B.B.C., and, of course, Geneva, has done. I think it is safe to say that in future one will be able to find a station in its appointed place simply by the process of turning the dials to their correct settings and—waiting!

John Henry (right) took part in the birthday celebrations at Dundee, and is seen above with Uncle Eric, Miss Mavis Bennett and Ballie Frain

A Fruit Idea

WIRELESS is now being used, not only for the control of model railways, but also for the control of fruit! By this means shippers overseas will be informed when to send their produce, and information will also be given as to the best course for disposal in this country.

After the Pirates

MORE licence prosecutions are being reported almost daily. In the cases where cheap crystal sets are being used, one almost feels a sneaking sympathy for the defendant, but when the craze for piracy spreads to owners of expensive four-valve sets, as it appears to have done recently, there can be no excuse whatever.

A Curious Affair

THE recent interruption in the debate at 2LO still strikes me as being decidedly "fishy," to say the least of it. To the first querists on the affair the B.B.C.'s reply was that they could not explain it; later, they described it as a carefully rehearsed incident; now, letters have appeared in the papers with genuine complaints on the bad taste exhibited by touching on a "delicate subject." It is my belief that the interruption was genuine.

"POPULAR WIRELESS"

(Incorporating "WIRELESS")

Important Notice to Readers

This issue of "WIRELESS" will be the last in its present form.

Commencing next week "WIRELESS" will be incorporated with "POPULAR WIRELESS," which is on sale every Thursday, Price 3d., and the combination of these two weekly wireless journals will mean a much improved periodical for the benefit of readers interested in radio matters.

Remember to ask for "POPULAR WIRELESS" on Thursday, on sale at all Newsagents and Bookstalls. Price 3d.

A False Argument

"AS soon as someone brings out a wireless set without an aerial I shall buy one," said a friend to me a few days back. I have often heard this cryptic remark made by those who imagine that one of these sets would be a great discovery. My reply is always the same: "If you prefer to go to the trouble of using four-valves instead of two, just to save the slight inconvenience of an aerial, all you need do is choose your own set—now!" So long as it is possible to improve results by 100 per cent. or more by connecting an aerial to a receiver, I do not think human nature will be content to do without one.

Short-sighted Controversy

THE controversy that has recently been filling the correspondence columns of the Press, on the subject of "Gramophone *versus* Wireless," is apparently doomed to come to a useless conclusion, simply because of the people who will persist in comparing a bad gramophone with a good wireless set, or a good gramophone with a bad wireless set. It is no good comparing individual cases in this way—one *must* analyse the impression made by all the gramophones one has ever heard and compare it with that caused by all the loud-speakers one has heard.

Wireless Trains in Russia

THE Soviet Government is now experimenting with wireless on trains, the Moscow-Leningrad express having already been fitted up in this way. Plugs for loud-speakers or headphones have been installed in every compartment, and the aerial is strung along the roof for the whole length of the train.

(*Continued on next page.*)

Notes and News of the Week—*continued*

Surely Not!

I THINK the allegation that wireless is keeping people away from the concert halls is both untrue and unjust. Those who are content to stay at home and listen to the loud-speaker would surely never have been energetic enough to venture out to concerts more than on very rare occasions. They miss all but the "aural" part of the concert by staying at home, and this, in my opinion, is not more than half!

Patchiness

PERSONALLY, I am intensely irritated by the manner in which the B.B.C. gives half an hour of a concert, then switches back to the studio for another half-hour or so, finally going back to the concert for another ten minutes. I would rather hear nothing at all than this type of "patchwork," of which the B.B.C. has grown so fond lately. After the Abbey evensong a few Thursdays ago, the organist commenced the "St. Anne" Fugue as a voluntary. Instead of leaving the microphone in circuit, the engineer cut off and left us in dead silence for fully five minutes after. Why can we not have a little more continuity in the programme?

Wireless in the Air

THE huge "wonder-airship" R101, recently viewed by the Dominion premiers, will have on board a full wireless equipment, and, in addition, broadcast receiving apparatus for the benefit of passengers. There is an electric lift on board, I am told. I hope the aerial is well away from it, bearing in mind my own experiences of wireless reception and electric lifts!

A Curious Prohibition

THE broadcasting ban on tennis amateurs strikes me as being exceptionally foolish. The wording of the clause is: "An amateur lawn tennis player is specifically prohibited from accepting money or gaining pecuniary advantage from lecturing or broadcasting talks on the game." Does this mean that any musician who broadcasts a solo automatically becomes a professional?

Impracticable!

WILL wireless sets be taxed on a "valve-power" rating in the future? This question was asked by an M.P. not long ago, and Lord Wolmer replied that he considered it a "very attractive idea." It is, from appearances, just barely possible that the licence fee *will* in future depend upon the number of valves in use. Personally, I think it would be a distinct brain-wave to tax a set on the number of knobs in use!

The B.B.C.'s Swansong

I HEAR that towards the end of the year the B.B.C. intends to broadcast something in the nature of a "swansong," particularly on New Year's Eve. In addition to this, we are promised a Church Service on Christmas Day and a Pantomime on Boxing Day.

An experimental radio station which has just been established by the Radio Laboratory of the Bureau of Standards for studying the vagaries of "fading" and "static." The station is situated at a point one mile from Kensington, Maryland.

Beware!

THE magistrates of Reading have enforced their law which deals with the loud-speaker nuisance, and one owner of a "too-loud-speaker" has been fined £5. My neighbour, please note!

Physical Jerks

WE don't seem to have heard very much about the "Physical Jerks by Radio" idea just lately, but I understand that it has by no means been dropped. It is probable that it will be brought before the notice of the new B.B.C. before they are very much older.

Moscow?

A CONTEMPORARY, referring to the proposed Empire wireless chain, calls it the "All-Red Broadcast." I always thought that was the stuff that Moscow had been turning out just recently.

Who Was It?

WHO was the the gentleman who mistook the high notes in the Strauss "Alpine Symphony" for the 10 o'clock time signal? He must have been early to work the next morning!

A Graceful Tribute

SENATOR MARCONI, in the presence of the King and Queen of Spain, recently said that he was proud that Great Britain had permitted him to put into practice his "Beam" system, and expressed his gratitude to the British Government at allowing an Italian to help to effect more reliable communication between Great Britain and its vast Empire.

A Tribute to Dr. Fleming

I HEAR that a fund is being raised to present Dr. Fleming with his portrait, which will be painted by Sir William Orpen. Donations should be sent to Professor W. C. Clinton, University College, W.C.1.

A Novel "Stand-by"

THE "President Lincoln," of the United States Lines, has on board a Chevrolet car engine for use in emergency to drive the generator which supplies the necessary power for the ship's radio.

In Advance

THE service chosen for broadcasting from 2LO and 5XX on Christmas morning will be from York Minster.

CALL-SIGN.

"MUSIC AND BROADCASTING"

An Engineer Replies

This week Captain Round enters the controversy started by Sir Thomas Beecham, and adduces some striking considerations on the vexed question of distortion and its true meaning, and makes some trenchant remarks concerning criticism, helpful and otherwise.

WE are all entirely in agreement with Sir Thomas Beecham when he says that broadcasting does not reproduce music faithfully, but if Sir Thomas will examine critically the various transformations through which ordinary music has to pass before it is received by a concert audience he will find that there is more distortion being produced than he imagines. Let me take one or two examples to illustrate my meaning.

Speech and Writing

Early man could think and mentally create, but except where his thought could be translated into movements, and thus crudely transferred to other brains, his thoughts were localised to himself. Then speech and language were evolved to spread the individual mental efforts over the community, but even after thousands of years most of us are still unable to give in our speech quite the shade of meaning we desire. Thus the first distorting link was forged.

Writing and printing, the next links to be planned, added their distortions, but spread enormously the mental intercourse, and added the new factor of making man's brain immortal. Should the genius of to-day refuse to write his thoughts for the living and the future because he has only clumsy words and letters to name those thoughts, and only commas and full stops to give his expression? What is more mechanical than pens and paper?

Then there remains the final distortion of the man who reads or misreads, for no two will read alike.

Music

Let us follow music from its conception. A good composer, I imagine, does not think primarily in oboes and clarionets. The new thoughts come to him in a far bigger way, and it is only when he endeavours to express his thoughts that he chooses known instruments to produce a likeness as faithfully as he can—but I have no doubt that there is distortion in this stage. Part of his greatness as a musician lies undoubtedly in his ability to orchestrate his ideas with least distortion, but can the ideas be quite truly reproduced?

To carry his ideas outside his immediate circle he writes them down, but musical writing is just as imperfect as speech writing, in its inability to convey the exact thought. Then we have the playing from the written score by the orchestra, conducted, say, by Sir Thomas himself. I dare not suggest further distortion here, but it may be that a rigid test would find some percentage of unfaithfulness.

And so on to the listeners sitting in the audience, and what is not so important with speech becomes of extreme importance here. No two listeners, even if placed side by side, will hear alike. We can tell this by measurement, and even the same listener when in two different positions will get a different "timbre" from the instrument.

If the listener listens to his music in the open air the effect is quite different to what he would hear in a room or a hall. I wonder whether the composer was thinking of all these possible variations? It is certainly impossible that the older composers were thinking in terms of the improved orchestral instruments now used, or of the vast orchestras one hears to-day.

Distortion the Rule

Perhaps I have said enough to show that distortion and unfaithfulness are a rule and not an exception, and necessarily enter whenever there is an attempt to spread thought of any kind.

Given time these transformations steadily improve—thus speech now is infinitely more expressive than the speech of early man. Modern writing and language can hardly be compared with Egyptian cuniform, and the sounds produced by a modern orchestra are a great improvement on those of a hundred years ago.

Distribution of Thought

Through all this we can see the strivings of mankind to build perfect instruments to distribute and perpetuate its thoughts, and it has never refused to accept an instrument for this purpose however imperfect, but has taken it and patiently, with but little thought of time, set about improveing it.

The last fifty years has seen a quickening up of these processes of distribution of thought through necessity. Coal and steam, oil and electricity have enabled us to conquer some of the difficulties of living, and we have multiplied exceedingly with a result that the older methods of thought distribution were not big enough in conception to cope with the vast populations spread over the whole earth.

Ordinary thought has had the high-speed links of telegraphy and telephony added to it, and its distribution has been improved by the photograph and the cinema, but until recently the distribution of music has remained comparatively stationary, unless we accept the almost unintelligible reproduction of the early gramophone.

Distribution of Music

The supply of music to the world by the old method of opera and concerts was becoming rapidly inadequate with the increasing and widely-spread population. It is useless for Sir Thomas to imagine that he can by this means satisfy the world's desire. Finance, lack of musical talent in sufficient quantities, and difficulties of transport will be against him, and at the very best he could only supply the wants of a very few people in heavily populated districts, leaving out far greater numbers elsewhere. Even the suburbanite, whatever his will, finds it beyond his physical strength and pocket to be present at many musical events.

In the past the big music was supported by a limited, wealthy, cultivated class, and with the war impoverishment of that class the support was broken. It is not broadcasting and the modern gramophone which has nullified Sir Thomas Beecham's efforts, it is the individual poverty of those who want the music but cannot pay, and only by larger audiences can the old finance of music be re-established and perhaps Sir Thomas's ideals realised.

Radio Mechanism

Sir Thomas, of course, is as much out of his depth when criticising our mechanism as I am when trying to understand music; but perhaps if in a few words I point out very superfi-

(*Continued on page* 143.)

A Reinartz Set with Home-made Coils

By C. E. LOTCHO.

SIMPLE TO OPERATE—

INEXPENSIVE TO BUILD.

From time to time readers have sent in requests for a simple set which should be as much as possible home made. This little receiver has been designed with these requirements in mind and it will be found to possess them to a high degree.

WHILE it is generally acknowledged that for really reliable long-distance reception a receiver employing one or more stages of H.F. amplification is required, it is well known that a one-valve receiver in which the valve is used as a detector will give really surprising results under favourable conditions. If such a set is to be used with success for distant reception, however, it must be of efficient design and possess a fine control of reaction. It is only comparatively recently that Reinartz tuning, in which the reaction control consists of a variable condenser, has come into general use, and this is undoubtedly one of the most satisfactory where delicate adjustments are required, and is a definite improvement over the old-fashioned set employing a moving reaction coil. Again, in order to secure maximum efficiency, inductances should be of low-loss construction, and recent research has shown that coils of low resistance may be wound in reasonably compact form.

In the present receiver the foregoing points have been borne in mind, and the result is a set which can be relied upon to bring in several distant stations on any evening and regardless of prevailing conditions. It will be realised, however, that a single-valve set is dependent to a marked extent on the conditions prevailing from time to time, and the number of stations which may be picked up one evening may be doubled or perhaps halved the next evening.

Inexpensive Design

The cost of the receiver was also taken into consideration in the present design, and there is therefore a predominance of home construction in the completed instrument. Some degree of selectivity is also a very desirable feature in any receiver capable of distant reception, and from the theoretical diagram herewith it will be seen that the method of aerial coupling known as auto-coupling has been chosen. This, together with the fact that the coil L_1 is of low resistance, results in a satisfactory degree of selectivity, which allows the local station (13 miles distant) to be reduced to negligible strength at five degrees on either side of the point of tune.

Referring again to the circuit diagram, the grid coil L_1 and reaction winding L_2 are wound on the same former and arranged to plug into a special mount, coils of suitable size being substituted when it is desired to change to the longer wavelengths, such as those employed by Daventry and Radio-Paris. C_2 is the reaction control condenser. The high-frequency choke is also of home construction, and may be seen on the right-hand side of the baseboard and near to the ebonite panel in the back-of-panel photograph.

Some Results

As an indication of the capabilities of the receiver, over twenty distant stations were picked up in five minutes on two separate evenings selected at random. Of these several were of remarkably good 'phone strength, whilst others could be followed without straining, and many others could be heard at very weak strength. On the longer waves some of the stations heard are Croydon and Lympne (air stations), Radio-Paris, Daventry and Hilversum. The reaction control is as smooth as could be desired, and after a little practice the tuning process is simplicity itself.

Constructional Details

Turning now to the construction of the receiver, a list of the materials required, together with the names of the manufacturers of the actual components employed, will be found elsewhere in this article, but it will be realised, of course, that components of reliable quality may be substituted for those mentioned if desired.

The Coils

The construction of the coils will be described first, although, of course, it does not matter if the set is completed before tackling these. No special difficulty was experienced in the task of winding the various inductances, but the construction of the high-frequency choke will be explained first as being the simplest task, although requiring the largest number of turns. This constitutes a desirable experience in the manipulation of fine wire, which is somewhat tricky to handle if never

(*Continued on page* 140)

MARCONI

THE NEW POWER VALVE

D.E.P. 215

PRICE
18/6

Write for the Marconi Valve Literature — containing detailed particulars of the D.E.P. 215 and other types.

MARCONI POWER VALVE
TYPE D.E.P. 215
for 2-volt Accumulators.

Fil. Volts..... 2.0 max.
Fil. Current..... 0.15 amps.
Anode Volts ..... 120 max.
Amplification Factor.. 6.25
Impedance ..... 6250 ohms.

AN entirely new type of Dull Emitter Power Valve combining outstanding performance with economy in operation.

The D.E.P. 215 is for use in the last stages of Receivers or Amplifiers operating from a two-volt accumulator.

It embodies just those characteristics which combine to make the ideal power valve :—

MAJESTIC VOLUME,
CRYSTAL-CLEAR TONE,
LONG LIFE AND
VERY LOW CURRENT CONSUMPTION.

The filament is exceptionally robust and rigid, and has a large emission surface.

Type D.E.P. 215, used with the correct H.T. and grid bias voltage recommended in the accompanying table will handle great volume with a purity of reproduction hitherto unobtainable.

	Marconi Valve Type.	Position.	Filament. Volts.	Filament. Amps.	Grid Bias Volts.	High Tension. Volts.	High Tension. Amps.	Low Tension Battery Supply.
Two-Valve Set	D.E. 2 H.F. D.E.P. 215	Det. L.F.	1.8 1.8	0.12 0.15	+2 −9	80 120	1.6 4.6	Two-Volt Accumulator.
Three-Valve Set	D.E. 2 H.F. D.E.P. 215 D.E.P. 215	Det. 1 L.F. 2 L.F.	1.8 1.8 1.8	0.12 0.15 0.15	+2 −3 −9	60 60 120	1.0 2.5 4.6	
Four-Valve Set	D.E. 2 H.F. D.E. 2 H.F. D.E.P. 215 D.E.P. 215	H.F. Det. 1 L.F. 2 L.F.	1.8 1.8 1.8 1.8	0.12 0.12 0.15 0.15	0 +2 −4.5 −9	60 60 80 120	0.8 1.0 4.6 4.6	

Marconi Type D.E.R. or other 2-volt valves are also suitable for the high frequency detector or first low frequency stages.

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THE NEWEST RADIO TRIUMPH

A Reinartz Set with Home-made Coils—*continued from page 138*

used previously. To commence, then, first cut out four cardboard discs of 2¼-in. diameter and make through the centre of each a hole of about ⅛ in. diameter. Now find a former of 1½ in. diameter (a search round the house will generally reveal a suitable article for the purpose), and with this ready for use secure upon a spindle the reel of No. 40 d.s.c. wire specified in the list of components. If nothing better is available, a large knitting needle with the ends held between the feet forms a satisfactory spindle upon which the reel of wire may rotate! The actual winding is now commenced by winding on the former 50 turns in hank fashion.

The "hank" is now removed from the former and bound at three or four points round its circumference with cotton. Proceed now to wind a coil of 100 turns in the same manner as before. Do not break the wire at the end of the first winding, but let the second coil be a continuation of the first. In the same way a third coil of 200 turns should be wound as a continuation of the second, and these three coils may then be placed aside for the moment.

The Plug-in Unit

The next task is the construction of the plug-in grid and reaction coils for the lower broadcast wavelengths. Before commencing this it will be as well to study the drawing in Fig. 2. It will be seen that four Clix sockets are fixed into the ebonite former, three of these constituting the aerial tapping points shown theoretically in the circuit diagram. The other socket marked "R" is connected to one end of the reaction winding, and is employed merely as an alternative to an extra valve-pin underneath the coil.

First of all, then, drill suitable-sized holes to take the three valve-pins and the four Clix sockets shown, and fix these articles loosely in position, placing under the heads of the sockets a couple of washers. A hole of about ⅛ in. diameter or a little less is also drilled next to each of the sockets and valve-pins. It should be noted here that if the old type of Clix socket is obtained it will be advisable to cut off about ¼ in. of their shanks before mounting them. The former is now ready for the winding, and this may be proceeded with. Place upon a spindle the reel of No. 34 d.s.c. wire, and to the right of this a reel of No. 40 cotton. The latter is to act as a spacer between the turns, the result being a spaced winding of low resistance. It may be thought that it is a difficult task to wind on evenly and side by side the cotton and wire, but actually this task is just as simple as plain winding, providing the correct method is adopted. This is as follows:—

Pass the ends of the cotton and wire together through two holes in the former near to the middle valve-pin and secure them between a nut on the valve-pin and the external surface of the former. The end of the wire should, of course, be bared to make electrical contact with the valve-pin. The hole from which the winding is commenced should be 5-16ths of an inch to the side of the valve pin, and since the reaction winding will be commenced 5-16ths of an inch to the other side, the distance between the two windings will be ⅝ of an inch.

Method of Winding

Ten turns are now wound, and, assuming that the constructor is right-handed, the wire should be allowed to pass on the left of the little finger and the cotton on the right. The two are

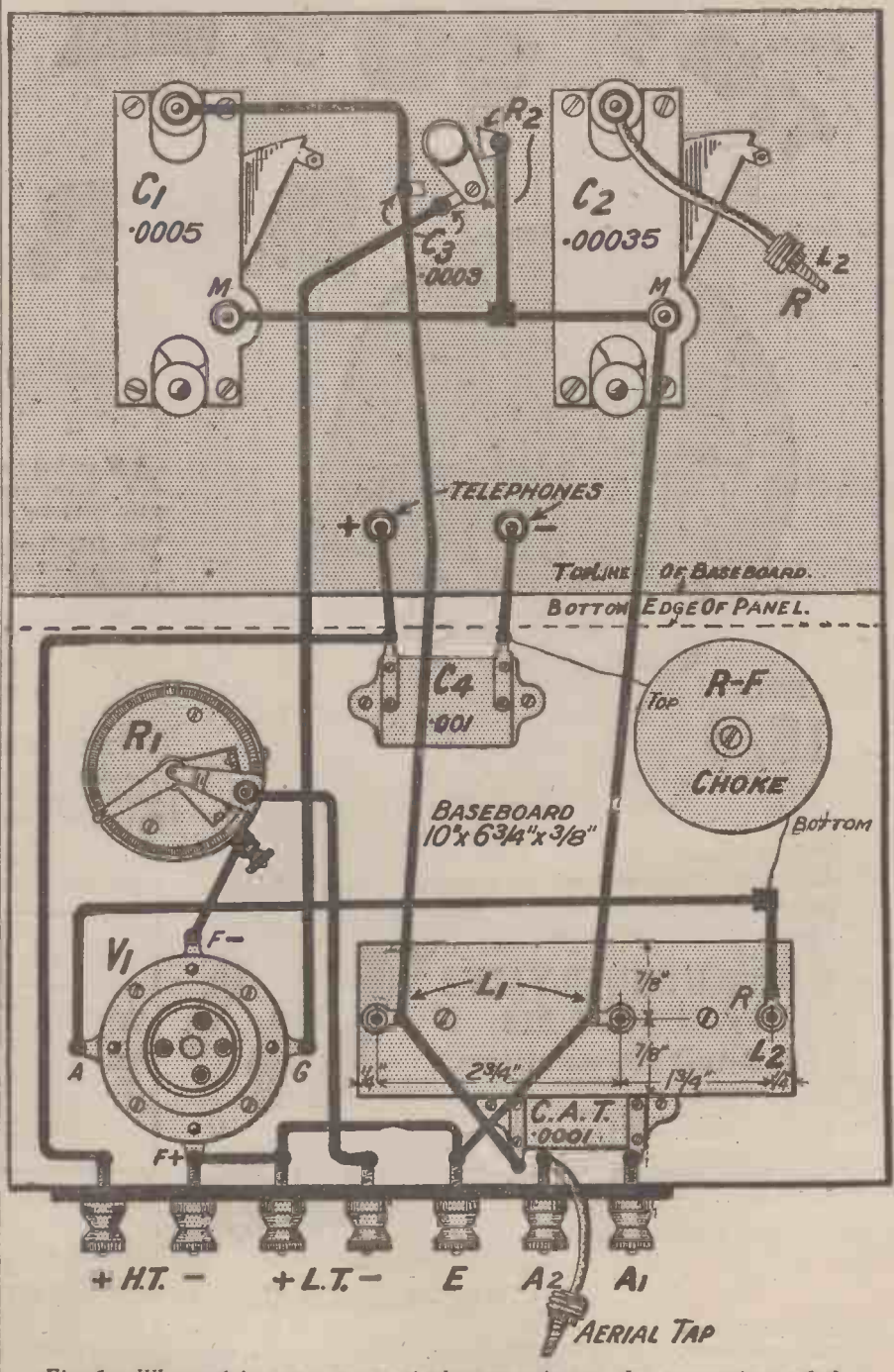


Fig. 1.—When wiring up pay particular attention to the connections of the grid condenser and variable leak. The wiring instructions on page 141 will aid if there is any doubt.

A Selective Single-Valve Receiver

fed on to the former between the fore-finger and thumb, the latter being uppermost, and care should be taken in adjusting the tension suitably. To make sure that the winding is as compact as possible, it is advisable to push the turns together at intervals as the winding proceeds.

Having arrived at the tenth turn, a small hole is drilled next to this and the wire (but not the cotton) must be looped and pushed through. The loop is then drawn up through the hole next to the socket marked "10" and passed round the latter between the two washers mentioned. The free end of the wire is then pulled carefully until there is no slack, and after baring the wire at the point of contact and tightening up the socket, the wire and cotton winding is continued. This constitutes a very neat method of tapping a coil, and is well worth the trouble expended.

The remaining 65 turns are wound in similar fashion, further tappings being taken at the fifteenth and twentieth turns from the beginning of the winding. The end of the coil is treated in the same manner as the beginning, the end valve-pin being employed for fixing the cotton and wire.

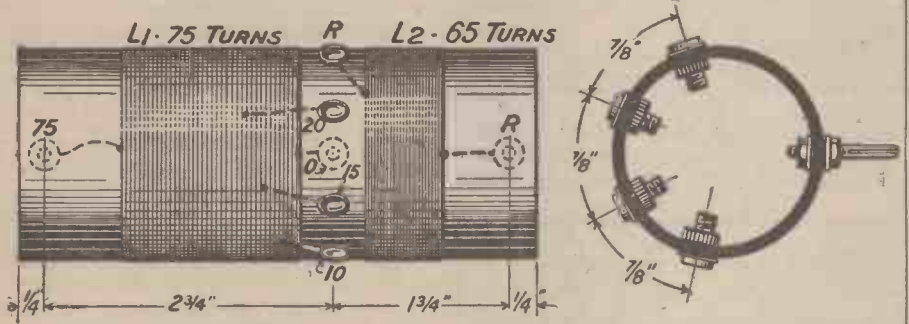


Fig. 2.—The construction of the coils will be clear from this diagram. The dotted circles represent the valve-pins which are mounted on the opposite side of the tube.

WIRING INSTRUCTIONS

Join one side of C.A.T. to terminal A1.

Join other side of C.A.T. to left-hand socket of L1 and thence to free side of C3 and fixed plates of C1 respectively.,

Join other side of C3 (joined to one side of R2) to G of V1.

Join A of V1 to socket R of L2. Join to this wire the bottom connection of R.F. choke.

Join other side of R.F. choke and one side of C4 to telephones — terminal.

Join other side of C4 to telephones + terminal, and join latter point to H.T.+.

Join F+ of V1 and H.T.— to L.T.+ and thence to E, other socket of L1, moving plates of C2, moving plates of C1 and remaining side of R2.

Join L.T.— to one side of R1.

Join other side of R1 to F— of V1.

Join flex wires terminated by Clix plugs to A2 and fixed plates of C2 respectively.

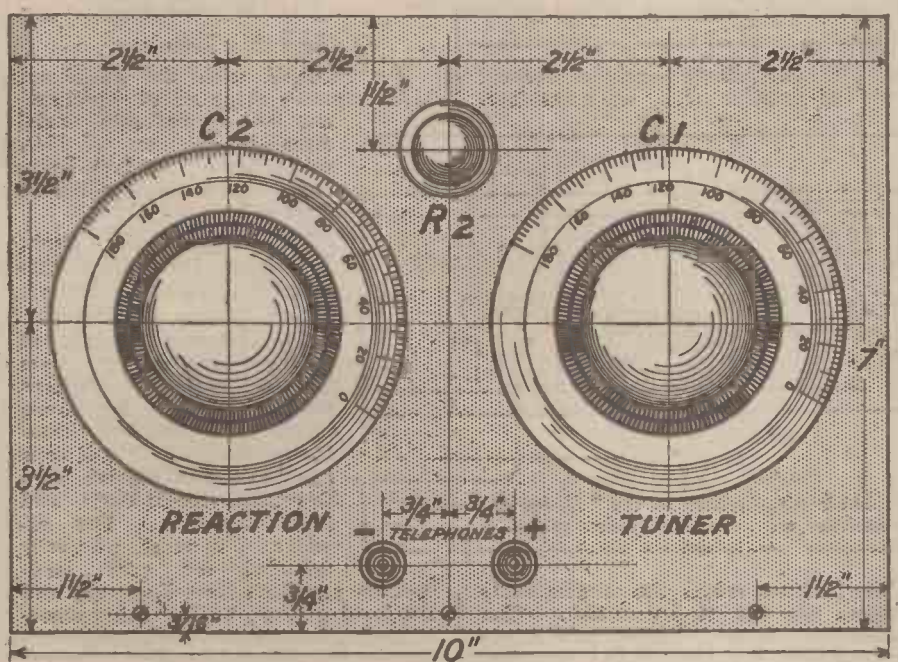


Fig. 3.—The marking-out and drilling of the panel is simplified by the symmetrical lay-out adopted.

The Reaction Winding

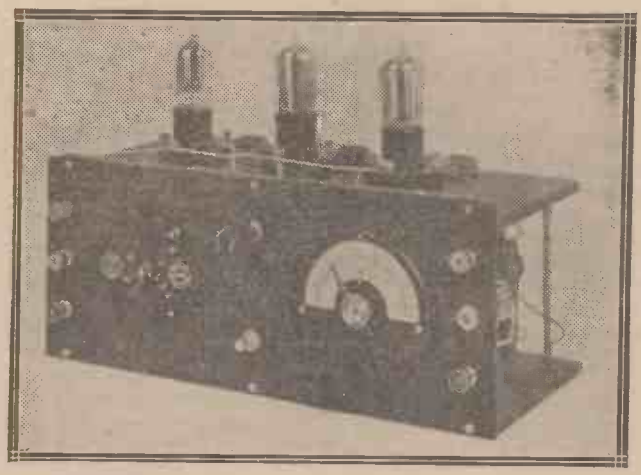
The reaction winding, which consists of 65 turns of the same wire unspaced, now requires to be wound. In this case the beginning of the winding is secured to the Clix socket "R," and the first turn is wound $\frac{5}{8}$ in. from the grid coil. An important point must be noted here. The reaction winding *must* be wound in the same direction as the grid coil; that is to say, both windings must be either clockwise or anti-clockwise. The 65 turns are wound on continuously, and the end of the wire is then secured to the remaining valve-pin. This completes the coil, and if a rest from this type of work is desired, the high wavelength coil may be forgotten for the moment, and attention turned to the completion of the receiver itself.

Assembling the Components

Having drilled the ebonite panel in accordance with the diagram provided, the variable condensers, grid leak and telephone terminals may be mounted, the terminal strip and coil mount should be prepared, and the H.F. choke completed. The coil mount consists merely of a piece of ebonite 5 in. by $1\frac{3}{4}$ in. by $\frac{1}{4}$ in. thick, drilled to the dimensions shown in the wiring diagram, and fitted with three valve-pin sockets. The component is mounted on two small blocks of wood which serve to raise the shanks of the sockets clear of the baseboard.

The three coils constituting the H.F. choke are mounted in tier fashion, the 50-turn coil being nearest the baseboard and the largest coil on top. It is important to see that the windings of the three coils are in the same direction, as otherwise a proper choking effect may not be obtained. When properly connected up this sectional winding has been found very efficient over a very large band of frequencies. Two of the cardboard discs mentioned are used as separators between the coils, while the other two

(*Continued on page* 164)



Adding an H.F. Stage to the "Home or Country" Receiver

By H. BRAMFORD

The "Home or Country" Receiver, which employs three valves, was first described in "Wireless," Vol. 5, No. 3, and although not essentially a portable receiver it has the merits of being compact and self-contained. Below, full constructional details are given for adding an H.F. stage to this receiver.

FOLLOWING upon the complete equipment article for this receiver, which appeared in a recent issue of WIRELESS, I will now describe how a stage of high-frequency amplification may be added, without making any drastic alterations to the existing receiver. In this case four valves will be employed, namely, one H.F., one detector, and two L.F. valves.

In the first place, the extra material which will be required is tabulated below, together with the names of the manufacturers. These items should be adhered to fairly closely, especially in the case of the type of H.F. transformer mentioned, as this component dispenses with the necessity for a further variable condenser, or a neutrodyned arrangement.

Material Required

One Clearer Tone valve holder (Benjamin).

One low capacity valve holder (Magnum).

Two "Constant Tune" aperiodic H.F. transformers (A and B) (Peter Curtis).

One battery plug (red) (Autoveyors).

Glazite for additional wiring (L.E.W. Co., Ltd.).

Small piece of insulated flex (L.E.W. Co., Ltd.).

Necessary Alterations

First mount upon the upper board of the receiver the two valve holders in the positions indicated in the accompanying diagram, which represents a portion of the upper board which was shown in the first article. The wiring alterations should be carefully followed. Where the diagram is used for this purpose, reference should be made to the back of panel diagram given also in the first article, the indicating numbers shown being exactly as before.

Circuit

Reference may be made to the circuit diagram given for making the necessary alterations. It will be seen from this circuit that the negative side

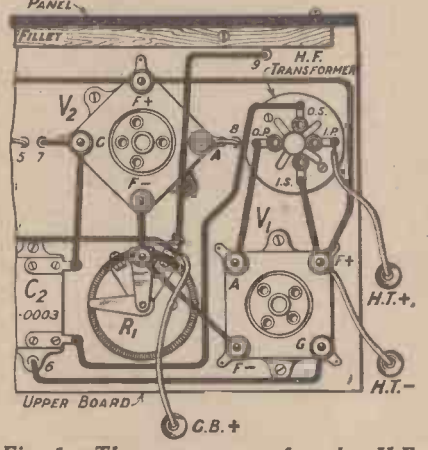


Fig. 1.—The components for the H.F. stage are arranged as shown in this drawing.

of the L.T. battery is earthed instead of the positive side, as heretofore. The filament switch also automatically comes on the negative side. The reference letters have been altered to conform with the other diagram, and also to comply with the additional valve used.

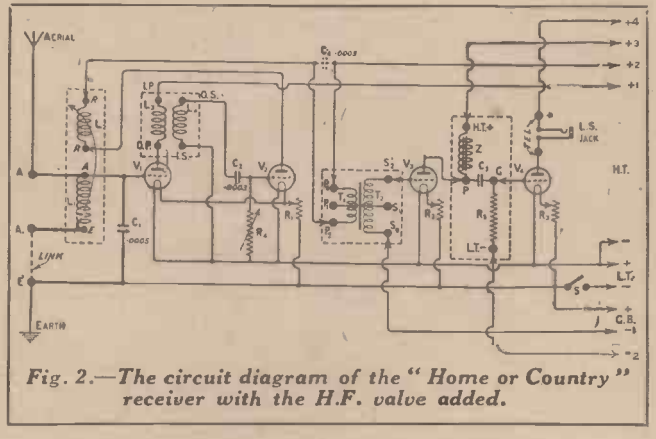


Fig. 2.—The circuit diagram of the "Home or Country" receiver with the H.F. valve added.

The Frame Aerial

I will now describe exactly how the frame aerial is employed. In this case the link between the panel terminals A_1 and E is removed, and the frame connected as shown. Tappings are provided upon the frame aerial winding for experimental purposes.

Operation

Operation remains much the same as before, in view of the fact that the H.F. stage is untuned. For wavelengths from 200-500, transformer A is plugged into the holder provided, and for the higher wavelengths transformer B is used. Tuning is effected as before by means of the variable condenser C_1. Reaction may be cut out by connecting both the reaction leads to one of the R terminals of the tuner. When the frame aerial is used the door of the cabinet is swung into a desirable position, or, alternatively, the whole cabinet is moved. The tuner itself (L_1) will require readjusting for reception with the frame aerial.

Author's Results

The receiver, with the additional high-frequency stage added, was tried out on a moderate aerial some five miles east of 2LO, the following stations being heard on the loud-speaker at good volume:—

Daventry, Radio - Paris, Barcelona, Toulouse, Radio-Catalaña, Radio - Iberica, Radio-Viscaya, and Oslo.

The test was carried out during broadcasting from 2LO. The only stations amongst those mentioned which were received absolutely free of interference from the local station were Daventry, Radio-Paris and Radio-Catalaña. The receiver is, however, primarily intended for good loud-speaker reception from Daventry and the local station, tuning being somewhat flat for the elimination of interference in many instances. Several other stations could, of course, be favourably received on the 'phones.

MUSIC AND BROADCASTING

(*Continued from page 137*)

cially, for my space is small, our technical aims, it will clear the air.

An instrument player has very little control of "timbre," because that is a property of the sound which is decided by the instrument itself. Our endeavours have been to construct every part of our mechanisms without "timbre," so that they are entirely responsive to the player, and in the case of the microphone, the first link in our chain, the player is the sound wave itself. In certain parts of our mechanism so far we have partly failed to attain our ideal, but each day sees us nearer, and by theory, by measurement and by final testing, helped enormously by the criticism of the trained ear, we are improving steadily.

Criticism and Help

Unfortunately, Sir Thomas criticises the strongest link in the chain, the microphone itself, and does not recognise our weakest one. He forgets thousands of us are working at the weak spots every day, with an inevitable result for the future. Even now with receivers purchasable on the market, I think I could show Sir Thomas the oboe or clarinet reproduced from a loud-speaker sufficiently like to the original instrument to be worthy of being used by the composer to register his thoughts.

If Sir Thomas will consider broadcasting only as a partially-developed attempt to carry over to the big new world man's individual thoughts, as a modern parallel to the book, the picture, the photograph and the cinema, and if he will criticise in a generous way, visualising the size of our problem, and remembering that we know the imperfections and limitations, he will help and not hinder.

Perhaps he will also remember that we are working hard and fast to remove the imperfections, that we have only had a short time and there is plenty more.

ACTING WITH YOUR VOICE

By
MABEL
CONSTANDUROS

What is the secret of "putting it over," and why is it that many of the world-renowned Music Hall artists are not enjoyed by Radio? In this special article our contributor, who is herself a much appreciated broadcast artist, explains the necessity for "acting with the voice."

A recent portrait of Miss Mabel Constanduros, whose name will be familiar to all broadcast listeners.

WHAT is the secret of "putting over" a speech or recitation by radio? I am often asked that question by prospective broadcasters. Why is it, they want to know, that actors who can make audiences weep, sometimes fail miserably before the microphone, while people who could not face an audience have become famous in the broadcasting studio? The answer is that the successful broadcaster is usually a man who has realised an obvious fact—listeners can judge by nothing but sound.

"Act with your voice" is the first maxim of broadcasting, and it is not so easy to observe as is generally believed. Acting with the voice does not mean delivering oratorical phrases, but simply reflecting character by speech and by speech alone.

That Terrible First Broadcast

Some people are lucky enough to be naturally gifted with the knack of acting with the voice. Anyone can acquire it by practice. I have always found it easy—in fact, it was my habit of acting with my voice that first led to my association with broadcasting.

I had been reading a humorous article when an actor friend remarked: "Why don't you try broadcasting—you seem to be able to get so much into your voice?" I followed up his suggestion, but my first audition was a terrible ordeal. I was introduced to an empty room, without so much as a friendly announcer to keep me company. At one end was a horn and through this I was given instructions. Somehow or other I struggled through my "turn," but I was so exhausted that I had to go to bed! It was not until a telephone call came through from the B.B.C. telling me that I should be engaged forthwith that I felt better.

Exhausting Work

Broadcasting is still very exhausting work. I find that the only way in which I can carry out my own theory of acting with the voice is to throw myself right into the character I am portraying, and my feelings become so intense that I am left physically tired.

"Acting with the voice does not mean delivering oratorical phrases, but simply reflecting character by speech and by speech alone."

This is where, I believe, acting in the studio differs from acting on the stage. Professional actresses have told me that if they were to "live" their parts every night they would not be able to stand the strain for a week. They must appear to be living their part, but actually they do not undergo the mental agony which would be experienced in real life.

Greater Expenditure in Broadcasting

The amateur actor and the broadcaster, on the other hand, rarely have to play a part more than once or twice, and can afford to lose more nervous energy. Often when I recite a sad piece I shed tears—and they are not crocodile tears because I know that my audience cannot see them. I can only hope they hear them!

A trained ear is an essential part of the equipment of anyone who hopes to succeed as a broadcaster. The stage actor has to notice a character's gestures and actions rather than their intonation, but the broadcaster deals only with tricks of the voice. To be able to make a character live over the ether one must reproduce the shades of its voice, and even emphasise them.

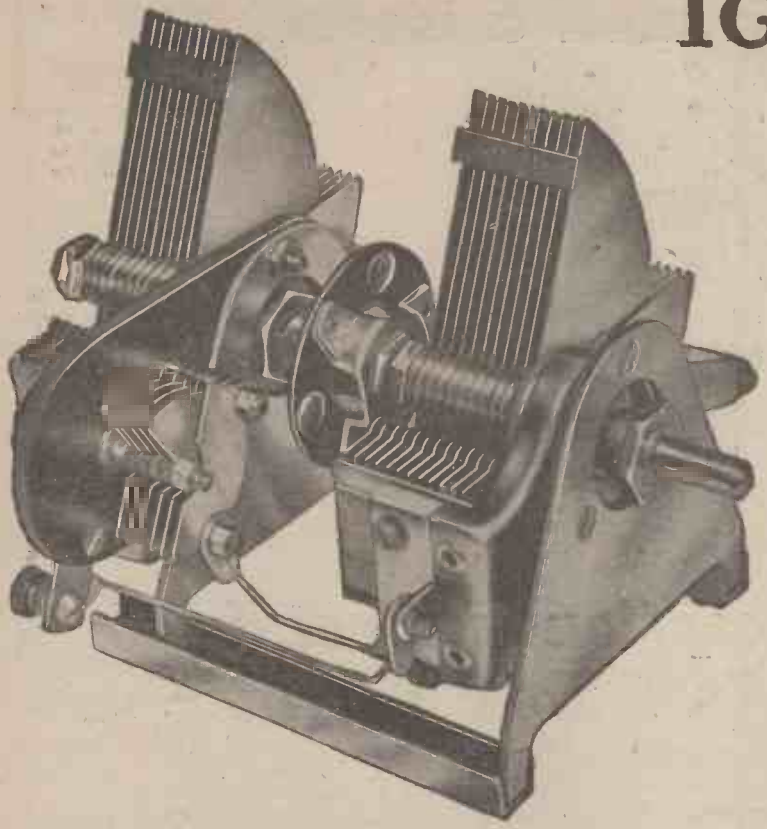
Everyone knows that a blind man hears more acutely than a man who can see. It is not that the man's ears become more sensitive, but that he uses them more. In the ordinary way few people make full use of their senses. They look without seeing and listen without hearing.

The Proof!

Perhaps you have heard the story of the teacher who was trying to impress these facts on his pupils. "You all think you see," he said, "but actually you only look. Now watch me carefully. I want you to repeat my action." And dipping a finger in a bowl of liquid he had before him he placed it in his mouth. One by one the pupils passed his desk dipping a finger into the liquid and sucking it. The liquid had a particularly evil taste, but nobody moved a muscle in case the victim behind should miss his dose. At last the teacher looked wearily at his class and said, "Dear friends, you did not observe that the finger I placed in my mouth was not the finger I dipped in the bowl."

(*Continued on page* 147)

IGRANIC *Radio*
Devices for the
MONODIAL



IGRANIC GANG CONDENSERS

THE Igranic method of balancing is the simple and practical solution of the problem of gang control. Igranic Gang Condensers make the control of multivalve receivers as simple as single valve sets.

Igranic Gang Condensers have small compensating condensers connected in parallel with the sections tuning the H.F. circuits so that each can be balanced—easily and exactly.

With the Igranic method the relative settings of the main condensers are not altered, thus preserving the accurate square law characteristic and maintaining the full tuning range of each section.

Igranic Twin Gang Condenser £2 10s.
Igranic Triple Gang Condenser £3 15s.

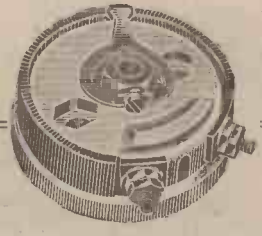
Igranic Gang Condensers are made up of .0005 mfd. square law condensers having extremely low losses and negligible minimum capacity. Flexible couplings between sections maintain true alignment of plates and ensure smooth turning movement.

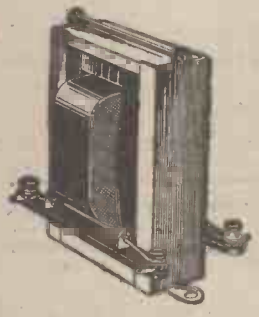
IGRANIC-PACENT Variable Resisters

IGRANIC-PACENT Variable Resisters are particularly suitable for putting a fixed resistance in the filament circuit and yet are as variable as rheostats. Igranic-Pacent Variable Resisters combine the advantage of a fixed resister and a rheostat.

Made with resistances of 6, 10, 20, 30 and 50 ohms.

PRICE 1/8 each.





IGRANIC-PACENT SUPER AUDIOFORMER

THE Igranic-Pacent Super "Audioformer" has a remarkable amplification curve making it quite different from all other transformers and giving uniformity of amplification which results in superlative tone qualities. The Igranic-Pacent Super "Audioformer" has a ratio of 1:3 and is suitable for all stages.

PRICE 24/6

IGRANIC "INDIGRAPH" VERNIER KNOB AND DIAL

THE Igranic Indigraph Vernier Knob and Dial is a slow motion control of very handsome appearance. It has a reduction ratio of approximately 8:1 entirely free from backlash.

The Igranic Indigraph Vernier Knob and Dial is provided with two scales reading in opposite directions making it suitable for all types of condensers. Scale readings pass under a hair line enabling very accurate records to be made, and space is provided on the dial for recording station settings.

PRICE 7/6

WRITE FOR THE NEW IGRANIC CATALOGUE S41.

IGRANIC ELECTRIC Co LTD 149, QUEEN VICTORIA STREET, LONDON.
Works: BEDFORD.

Exactly the same applies to listening. The trained musician sitting in a silent wood at night hears a hundred sounds which the ordinary man would miss.

The Voice Alone

What has this to do with wireless? Well, if you are going to act with your voice you must know what to say and how to say it. If you were rehearsing the part of a sailor for a stage play you would study his gestures and walk. In the same way if you are acting the part in a studio you must study his voice and be able to reproduce all his tricks of intonation. Voice has to take the place of costumes and scenery in the broadcasting studio.

Cockney has been my particular study, and I can assure you it is not as easy as it sounds. Hundreds of Londoners hear cockney every day, and recognise the accent anywhere. But give them a piece of ordinary English and ask them to "translate" it into cockney, and I think the majority would fail miserably. That is because they have only listened to cockney and not heard it.

Creating a Personality

"Somebody was speaking when we switched on the loud-speaker the other night"—it was an acquaintance of mine writing from Madrid—"we didn't hear the announcer, but we knew it was you." When I read that scrap of information soon after I started broadcasting I knew that I had "made good" on the wireless, for I had succeeded in creating a "radio personality." The successful wireless entertainer or lecturer is recognised by listeners even without introduction.

I do not mean that a broadcaster should always give the same type of entertainment. Listeners would soon become tired if he did. I myself do not always broadcast cockney impressions, but vary them with other character sketches. In some sketches I play two or three parts, altering my voice for each. A friend refused to believe that there was only one person in the studio!

ACTING WITH YOUR VOICE

(Continued from page 144)

The Secret

The realisation that one must act with the voice is, I think, the secret of the successful wireless lecturer.

Some of the "Uncles and Aunts" and other members of the studio staff at 3LO, the Australian broadcasting station at Melbourne.

Many people have tried "talks" by wireless, but few have succeeded. Once the secret of "getting over" is discovered, however, listeners welcome a lecturer with open arms. Witness the popularity of Sir Walford Davies. The lecturer who knows the tricks of his own voice and can give those little intimate touches which make listeners feel that he is speaking to *them* as they sit by the fire and not to a vast audience of millions, is the lecturer who becomes popular.

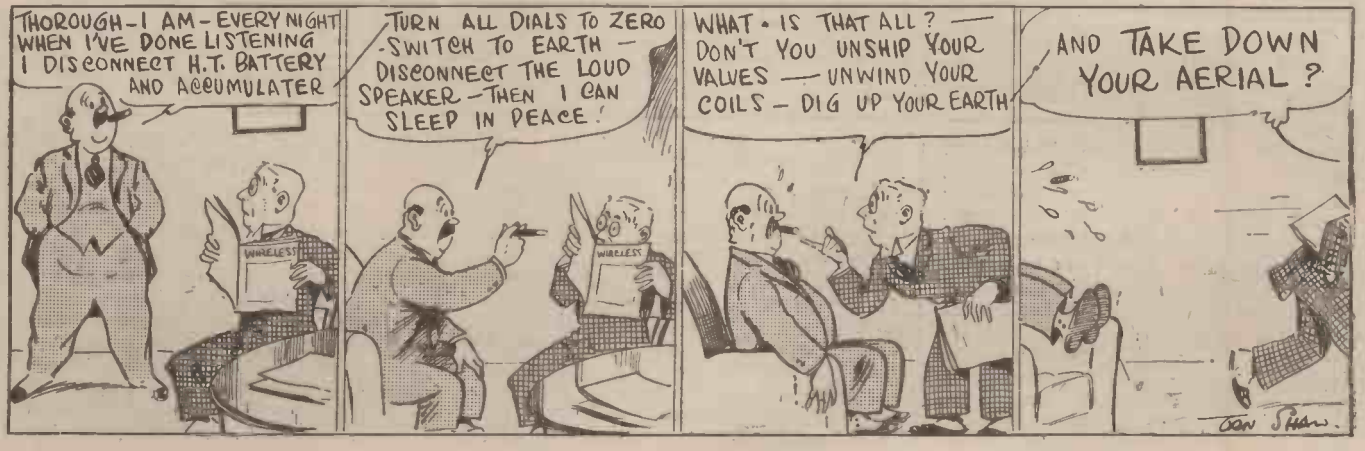
Acting with the voice is not easy under some circumstances. Some time ago "river sounds" were broadcast from 2LO, and a party of us found ourselves on the Thames at Richmond or Twickenham one summer evening. Not a boat was to be seen anywhere, and as for "river sounds"—the only sound was the dripping of the rain! The rain damped our spirits as well as our clothes, but we had to talk as though we were enjoying a picnic on a lovely summer's evening. I never felt so miserable in my life, but I believe many listeners thought we were genuinely enjoying ourselves. Unfortunately, they all believed that we had broadcast faked river sounds from the studio—and this after hours spent in reaching that unappetising river and the dreary hour counterfeiting joy in a damp punt!

The George Stephenson Broadcast

On another occasion we broadcast from George Stephenson's workshop—actually King's Cross Station! Porters made all the necessary noises with weird instruments and a two-horse dray served as a stage coach! I can assure you we had to throw ourselves into our parts in order to stop laughing!

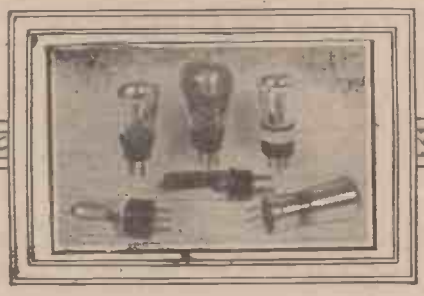
It is good to know that you "get over." Letters from listeners are the greatest spur I have to continue broadcasting, for it is very hard work. That I had "got over" on one occasion was very well brought home to me. I broadcast a monologue about Grandma having lost her false teeth. The next day a neat brown paper parcel arrived for me at Savoy Hill. It contained a fine set of teeth ready for use with best wishes from a sympathetic listener!

No. 50. **Even a Worm . . . . . !**



WHAT IS THE TRUTH ABOUT GRID-SWINGS?

By L. I. LESLIE



An account of some experiments carried out at Elstree to determine the true magnitude of the grid-voltage swings under practical conditions in a low-frequency amplifier

IT has sometimes been said that the theory of wireless telegraphy and telephony is difficult to grasp, because it is a considerable tax on the imaginative powers of those who have not made an exhaustive study of the science. The main difficulty, probably, lies in the fact that we have no electrical sense, or, in other words, we cannot see, hear or feel a wireless wave or a simple electrical current. We know of their existence because of the effects which they have on various instruments.

"Visualising" Difficulties

The mere fact that an electric current is flowing in a conductor is not of much practical use to anyone, but if the type and strength and direction is known, it may then be utilised for some special purpose. So many of the functions of a wireless receiving set take place without the ability of the operator to visualise them; he cannot see high-frequency energy being transferred from one circuit to another, neither can he find out if there is a possibility of overloading valves or loud-speakers unless he experiments with various types.

This "trial and error" method is liable to be very expensive in practice and may waste valuable time. However, if we can measure the currents and voltages in various parts of a receiving set we can then adapt our components to suit these quantities.

Elstree Methods

Tests were recently carried out at the Elstree laboratories with the object of producing an instrument capable of measuring the voltages applied to the grids of low-frequency valves. It was felt that if these experiments were successful, much useful information would be gleaned, which would greatly help in the choice of suitable valves for the first, second and subsequent stages of a low-frequency amplifier. At present we have to "grope in the dark" on such questions as voltage swings. The valve manufacturers can supply us with characteristic curves of their valves; these give us the magnitude of the grid voltages which they can take; and in consequence we can adjust the grid bias to the correct value. But we cannot at present associate grid voltage with the volume obtained from a loud-speaker.

The question of whether to use high-impedance valves with resistance-capacity-coupling in a low-frequency amplifier has often been asked. The voltage swing which can be applied to the grid of this type of valve is usually small, but in the primary stages of an amplifier the voltage obtained may be quite low enough in value for use with high-impedance valves. Then there is the question of using the right type of power valve in the final stage in order to produce the required volume of sound without distortion.

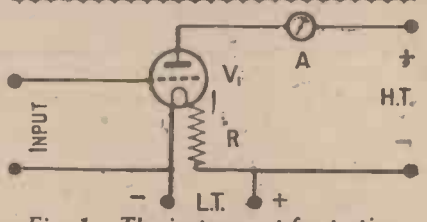


Fig. 1.—The instrument for testing consists of a milliammeter, valve holder, resistance and six terminals mounted on the same panel.

Surprising Results

It was expected that most of these problems would be solved with the aid of a meter capable of measuring voltage swings if tapped across the secondary of a low-frequency transformer: this has certainly proved to be the case. The results are in many ways astounding, and we feel that tests on various receivers will be of much greater practical use with the aid of this instrument.

A description of the apparatus employed in these experiments is given for the benefit of those who are interested in the working of their receivers, and wish to obtain the most efficient results from them.

Methods of Measurements

The Moullin voltmeter principle was finally used. This consists of a simple rectifying valve with a milliammeter in the anode circuit. If varying potentials are applied across the grid and filament then the anode current will also vary, the change being proportional to the magnitude of the grid voltage variations. This is what we wish to measure so that by means of an instrument of this type we can obtain the necessary information.

The first essential, therefore, is a milliammeter which must be sensitive, but, at the same time, must not be too delicate in action. An instrument was chosen having a full scale deflection with one milliamp., and having no appreciable time lag.

Fig. 1 shows the circuit employed for the wiring of the instrument, which consisted of the milliammeter and a valve holder mounted on the same panel with six terminals. It will be seen that the milliammeter is placed in the plate circuit of the valve V_1 and measures the plate current. Two terminals are employed for the input to the grid and negative filament, the remaining four are for the low-tension and high-tension batteries.

Positive grid volts	0	.25	.5	1	1.5	2	2.5	3	3.5	4
Anode current	.03	.04	.05	.06	.12	.17	.22	.29	.36	.43
Positive grid volts	4.5	5	5.5	6	8	10	12			
Anode current	0.5	0.56	.63	.7	.95	1.22	1.41			

Calibration

Before this circuit is of any practical use, however, it must be calibrated. Fig. 2 shows a diagram of the circuit and the extra connections required for calibration purposes. The lead from the grid of the valve is taken to the moving arm of a potentiometer P. The ends of the potentiometer winding are placed across a battery B, and by means of a knife switch these connections can be reversed.

The method of calibration is as follows: A given positive voltage is applied to the grid and the anode

(*Continued on page* 150)

AN INTERESTING LETTER

The "Wood Wind" Question

SIR,—I am particularly interested in the opinions expressed by Sir Thomas Beecham about the reproduction of musical instruments. He mentions the "wood wind," and states that these instruments cannot be faithfully reproduced.

Now it has been my experience, and that of many of my friends, too, that the wood wind comes out particularly well on the wireless. I can claim to speak with some authority on this, because I am a clarinet player myself, and naturally I always take particular note of the wood wind parts in orchestral and solo playing.

It would be interesting to hear from a number of listeners what instruments they think come out best. I was under the impression that the tone depended much more on the loud-speaker and the receiver than on the microphone and transmitter. This question of the microphone raises further interesting points, but I fear that my meagre technical knowledge does not allow me to enter into any discussion of this.—Yours faithfully,

"WOOD WIND."

Wandsworth, S.W.

NEWS IN ADVERTISEMENTS

Now that the Christmas buying season is almost here our readers will have an active interest in the advertisements appearing in this issue. Below will be found a few paragraphs giving in brief the main points of interest contained in current announcements.

* * *

It will be gathered from the advertisement of Messrs. Ediswan Electric Co., Ltd., that their new receiver—the R.C. Threesome—is proving exceedingly popular.

* * *

The fact that the Elstree Laboratories will in future be employed in research work on their behalf, is announced by Messrs. S.T., Ltd.

* * *

Further Electradix bargains are featured in the advertisement of Electradix Radio.

* * *

A new gramo-phone attachment is announced by Messrs. The Telephone Manufacturing Co., Ltd.

* * *

Many useful accessories are being advertised by Messrs. Ward & Goldstone, Ltd., including the "Goltone" High Tension Battery Eliminator.

* * *

A new power valve by Marconi—the D.E.P. 215—for 2-volt accumulators is made the subject of a full-page advertisement issued by Messrs. The Marconiphone Company, Ltd.

What is the Truth about Grid-Swings?—*continued from page 148*

current noted. The switch is then reversed, so making the grid negative and the anode current again noted. Now if we apply a rapidly alternating voltage having a maximum value in each direction equal to that in test just made, the anode current of the valve will take up a mean value between the two extremes.

The Actual Method

We therefore calibrate the instrument in this way; the anode current at any instant will then give a measure of the voltage being applied across the grid and filament. It should be remembered that it is the peak or maximum values which are measured in this way, this being, really, the information we require in our grid-swing experiments.

In the actual calibration a fixed negative grid potential of four volts was applied, so that only positive potentials caused appreciable changes of anode current. Therefore a curve plotted between positive grid volts and anode current serves as the calibration curve of the instrument.

The final readings are given:—

The curve obtained from the readings turns out to be a straight line except for very small grid voltages, where the efficiency of the rectification falls off slightly. Now, if this instrument with its permanent negative grid bias is connected up to the secondary of an L.F. transformer (as shown in Fig. 3) the voltage swing across the secondary will cause a change in the plate current of V_2, and a corresponding change in the milliammeter reading.

Method of Rectification

It will be noticed that anode-bend rectification has been employed. This was done deliberately because, although grid rectification is somewhat more efficient, the condenser in the grid lead will offer a high impedance to low-frequency currents, and may lead to erroneous conclusions. Hence the simple circuit shown in Fig. 1 was adopted.

The results which were obtained in the preliminary experiments utilising this method showed that the grid-swing obtainable was far in excess of what is popularly supposed.

The Moullin voltmeter was connected across the secondary of both the low-frequency transformers in a simple five-valve receiver having two stages of high-frequency amplification, detector, and two note-magnifiers.

When actually measuring the voltage the valve succeeding the transformer on which the measurement was being taken was removed from its socket. The whole capacity of the valve holders, leads, and the valves themselves may have an appreciable effect on the grid-swing. If, therefore, we connect the voltmeter in parallel with the normal low-frequency amplifying valves we shall double any effects due to this cause.

Receiver Used

In the experiments in question, therefore, the voltmeter was made to replace the normal amplifying valves completely, thus duplicating as far as possible the identical conditions under which the receiver normally operated. The receiver in question utilised a high-impedance valve for the detector, a low-frequency valve of the small-power class having an impedance of 7,000 or 8,000 ohms, being utilised for the second low-frequency stage.

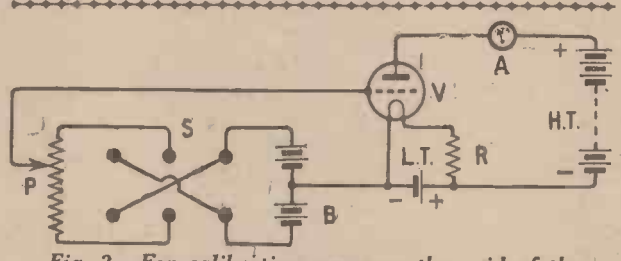


Fig. 2.—For calibration purposes the grid of the valve is connected to the moving arm of a potentiometer, which is in turn connected as shown, across two contacts of a switch S.

Some Results

Under conditions such as this the results were as follows: On the secondary of the first transformer, that is to say, the one following the detector valve, the voltage swing was only comparatively small. When the receiver was tuned in at a strength which gave unpleasantly loud signals on the loud-speaker, the swing was only of the order of one to one-and-a-half volts maximum. When a particularly loud or high note was reproduced the voltage swing rose a little above this figure, but in no case did it rise above a value with which the valves were capable of dealing.

The grid swing on the first valve was somewhat difficult to measure with the particular instrument in use, as with the valves and high-tension voltages employed the meter did not become particularly sensitive until 2 volts or more were attained. There is no doubt that further information on this point is desirable. In this particular case there arises a point where we are considering the use of resistance amplification with the very high-impedance valves which are rapidly coming into favour. It is then quite feasible that the maximum voltage obtained on the first-stage transformer only is greater than can be handled by the valve in question, but for the present the experiments were confined to two transformer coupled amplifiers, and in this case no difficulty was experienced in the first stage.

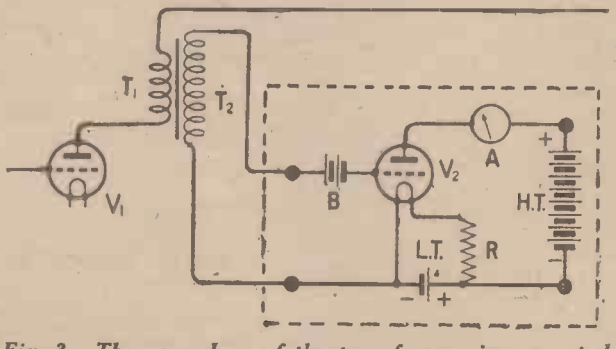


Fig. 3.—The secondary of the transformer is connected across the "input" terminals of the unit-testing

The Second Stage

It is in the second stage that the particularly interesting results arise. Here, as would be expected, the grid-swing is very considerably greater and the question of the valves to be used is of considerable importance. The loud-speaker was again tuned to give loud signals. Such signals would probably be too great for a small-sized room, but nevertheless, were not unduly loud for reproduction in a room about 40 ft. by 15 ft. Such signals produced a grid-swing on the last transformer of the order of 9 volts as an average, whilst a particularly high or loud note increased the maximum swing to 15 to 18 volts.

It is interesting to note that high notes produced a very large grid-swing in a similar manner to that produced by a fortissimo.

For Small Rooms

Where somewhat weaker signals are to be handled, such as, for example, in the case of a comparatively small room, then the grid-swing necessary need not be so heavy and a valve capable of handling 9 or 10 volts is satisfactory.

In this connection the value of the grid-bias battery to be used on the low-frequency amplifier is of interest. It will be obvious that the value of the grid bias must always exceed the maximum value of the grid-swing which the valve is called upon to handle. For example, if we have to handle a voltage of maximum voltage

WHAT IS THE TRUTH ABOUT GRID-SWINGS?

(Continued from previous page)

strength of 9 volts it is obvious that the grid-bias battery must be at least 9 volts, and should preferably be a little more. Under normal conditions a grid-bias battery of 9 volts coupled with a valve which provides a swing of 20 volts without running into bottom bend trouble or grid-current distortion usually gives satisfactory results.

This does not take into account the possible increase in mellowness together with an accentuation of the bass notes which is often brought out by the use of a very low-impedance valve in the last stage, but apart from this an ordinary power valve is normally capable of handling the volume, provided this is not too great.

For Large Volume

Where it is necessary to handle really large volume we are forced to conclude that the ordinary power valve is not suitable, and therefore we must have recourse to a very low impedance valve. In such cases a total grid-swing (each way) of between 30 and 40 volts is possible, and with such valves a grid-bias of 15 to 18 volts is essential. Although these valves have a large grid-swing it is useless to employ a 9-volt grid battery, because this would mean that as soon as the grid-swing is increased above 9 volts, grid-current distortion would arise and the whole benefit of the characteristics of the valve would be lost. At least 15 or 18 volts, therefore, should be provided when such a valve is in use.

These results are interesting as preliminary only. The subject is one which is rarely considered in detail, although many people realise that grid-swing is a property which is of importance in the design of valves and components. They do, however, provide considerable food for thought, showing that where really large volume of sound is to be handled a specially designed valve is essential.

□ □ □

An Interesting Question

I have a receiver consisting of a high-frequency valve and a detector with reaction on to the aerial coil. With the reaction coil shorted, however, the set still oscillates in an uncontrollable manner.

Reverse magnetic reaction may be employed to give stability, but it is somewhat tricky to handle. In practice a very small coil only is generally required, and this must not be too tightly coupled to the aerial coil, as otherwise instead of obtaining only reverse magnetic coupling you will obtain capacitative coupling also, which will allow the receiver to continue to oscillate, despite the reversal of connections.

DO WE NEED A PERFECT TRANSFORMER?

By J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E.

We are so accustomed to the assumption that a perfect L.F. coupling is needed that the ideas presented in this contribution may come as something of a surprise.

IN the recent series of articles on "Secrets of the Low-Frequency Transformer" we have been discussing how the windings on an intervalve transformer are designed in order to give as nearly as possible a uniform amplification for all frequencies.

It was shown that this result is achieved by making use of the several resonances which occur in the circuit of the transformer and valve considered as a whole, and that by judicious accentuation of certain features and partial suppression of others we obtain a very fair imitation of uniform amplification.

A Delicate Mechanism

Now this is really a surprising duplication of the actual process by which we are enabled to hear and appreciate musical sounds. The mechanism of the ear is very delicate and carefully poised, and it obtains a good deal of its sensitivity by appropriate use of the properties of acoustical resonance.

Resonance is a term which one is apt to apply rather to electrical circuits exclusively, but it is possible to have mechanical resonance. It is a well-known fact that a sustained musical note produced by a violin or wind instrument in a room containing a piano will set the corresponding piano string vibrating in sympathy. This is a case of mechanical resonance.

The Resonance Principle

An organ is based entirely on the resonance principle. The pipes of the organ contain columns of air which are set vibrating by means of a reed at the bottom.

These columns of air vibrate at the natural or resonant frequency of the pipe, and different musical notes are obtained by varying the length of the pipe.

Incidentally, a variation in the shape of the pipe or its diameter produces a different quality of note due to the introduction of harmonies, and it is this which gives rise to the distinctive timbre.

Now, the ear makes use of this resonance effect in connection with air vibrations. Fig. 1 shows a diagram of the human ear, and its delicacy and apparent complexity will come as a surprise to many people.

How the Ear Works

In reality the mechanism is very simple. Sound waves from outside

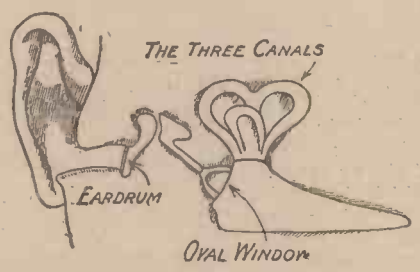


Fig. 1.—The delicacy and apparent complexity of the human ear will come as a surprise to many people.

impinge on the collecting device of the ear, as we usually speak of it. This collects the sound waves and focusses them on to the ear drum.

The vibrations thus set up are communicated by a simple system of levers to the *oval window* of the ear proper. This is a similar diaphragm to the ear-drum, but it covers a hole in a form of bag known as the *cochlea*.

This latter portion is filled with fluid and carries a membrane connected to the auditory nerve, or nerve of hearing. Any vibrations of the fluid inside the cochlea, imparting via the oval window from the original vibrations of the ear-drum, cause this membrane to vibrate, and this results in the sense of hearing.

Three Canals

Now the figure shows three semi-circular canals. These are the secret of the efficiency of the arrangement. They are arranged to resonate at three frequencies within the audible range. It will be noted that these canals are of different size.

One, the smallest of the three, resonates at a high frequency. The next largest resonates at a lower frequency, while the largest of all causes the response to bass notes in the scale. The whole system is so proportioned that a more or less uniform response is obtained to all sounds of frequencies between about 500 and 5,000 cycles per second.

A Limiting Value

For the low frequencies the ear becomes gradually less sensitive, while above about 8,000 cycles per second a very rapid cut off takes place.

The ear, however, successfully maintains a uniform resonance over the majority of the working range by a balance between the three resonances in the semi-circular canals.

It has been suggested that to obtain the best reproduction we should duplicate the resonances in the canals and not attempt to obtain a straight line response.

□ □ □

Have You Heard It?

THE Union Radio (Madrid) Station has now commenced to run regular educational courses between 9.30 and 10 p.m. These are given in a very ingenious manner, a master being heard instructing a class of several pupils, whose replies are also distinctly heard. If you hear a transmission reminiscent of your happy days at the village school you must blame EAJ7!

PLANNED for POWER, PLANNED for PURITY —*it makes a whisper loud*

LISSEN has produced a transformer which has revolutionised all previous ideas about transformer performance and price.

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Small energy-conserving condensers—note the new case which enables the condenser to be used upright or flat. At present the new case is available only in the most used capacities but will quickly become a LISSEN standard.

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To a fine LISSEN quality condenser is added the specially moulded case—the condenser cannot short circuit on to its case. The new LISSEN case protects you if the condenser is used in any circuit connected straight on to the electric light mains. And due to our new policy of direct to dealer distribution this LISSEN Condenser costs no more than the ordinary type.

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.2	2/8
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.5	3/4
1.0	3/10
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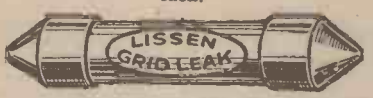
LISSEN FIXED GRID LEAKS.

A case of these was left on our factory roof during the summer of 1925, soaked in rain, baked by sun, and the resistance value of these leaks never altered.

All capacities, previously 1/8. **Now 1/-** each.



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Many are using LISSEN Transformers in " N " Circuits. L121

Correspondence

Music and Broadcasting

SIR,—I wonder whether Sir Thomas Beecham, whose article occupied such a prominent position in WIRELESS last week, has ever heard of a gentleman bearing the name of Bruce and the object lesson provided for his benefit by a certain spider of scarcely slighter fame?

Merely because broadcasting cannot give us faithful reproduction of any music, a statement with which incidentally I completely disagree, seems but a poor reason for decrying altogether the practice of transmitting music and suggesting that we refuse to listen to any music except in the concert hall. Does Sir Thomas Beecham really think that finality has been reached by the scientists and engineers who are daily striving to better the existing excellence of wireless transmission and reception? I grant that perfection has not been attained, but anyone who insists that the conditions of the present are so hopeless that progress is impossible and useless is trampling on the pioneer spirit without which nothing can be achieved.

Yours faithfully,
BERNARD WEATHERSTONE.

Durham.

Putting America on the Loud-speaker

SIR,—I must write and let you know that I have made up the set for short waves published in WIRELESS for November 20, and must say that I am more than surprised at the results. I only roughly made the coil on a cardboard former, the wire I used was from an old coil I had. I got KDKA the first time of trying on the speaker, and listened to the programme from 1.45 till 3 o'clock, without any trouble. Fading was not very bad. I am writing to KDKA for confirmation of programme, and if you are interested will send you on same to see that I was not getting any freak reception. I might state it took me only 45 minutes to make up the set.—Yours faithfully,

M. ULLMAN.

P.S.—It might surprise you to learn that I can get good phone strength without any aerial.

A Plea for Sane Criticism

SIR,—The strain in which the majority of listeners write criticising the B.B.C. with regard to the general compilation of their (the B.B.C.) programmes seems to point to the fact that it should be the duty of the B.B.C. to consult each critic before formulating their programme. To me (a nonentity) it seems incredible that anyone can be so foolish as to criticise the B.B.C., and their methods of trying to satisfy what no doubt constitutes the largest audience in the world. As a case in point, I should like to know why your correspondent "Musicus" was so despondent over the unfortunate state of affairs that has arisen between Mr. De Groot and the B.B.C. Now, Sir, "Musicus" apparently thinks there is no violinist like De Groot. Personally, I think there is no violinist like Mr. Albert Sandler. There is not the slightest doubt that Handel's "Largo," as played by Mr. Sandler on Sunday evening, 14th inst., would compare with any other violinist in this or any other country. It really was Sandler not at his best, but as he always is, wonderfully soul-inspiring. Now both Mr. Sandler and Mr. De Groot are masters of their art. Everyone must admit that. So why should such humble individuals as "Musicus," or I, try to "mar" the good work of the B.B.C. in trying to please everyone? Of course, I am personally sorry that Mr. De Groot cannot come to terms with the B.B.C., but I shall be satisfied with Mr. Sandler whenever I know he is on the ether. I shall also stick to my set, pay my licence, pity the present B.B.C., and save my grumbling until after January 1, 1927, Heaven help us, and leave "Musicus" to his gramophone.

Wishing you every success, yours faithfully,

G. W. BREEDON-BARKER.

Rugby.

"I HAVE NOT BEEN ASKED"

By C. P. ALLINSON, A.M.I.R.E.

If a wire aerial is needed, why is it called wireless?

There are three miles of wire in a low-frequency transformer.

What are the chief troubles encountered in a wireless set?

Visitors.

Explain this more fully.

A wireless set has been functioning perfectly when visitors are heard. The set is switched off while they are being received, and when turned on again so as to demonstrate that you have the finest receiver in the neighbourhood it fails to emit a single sound. After the set has been disembowelled three times and all the batteries tested it is discovered that one of the loud-speaker leads has come away from under its terminal.

Anything else?

Yes. If the set is a powerful one that is always certain to bring in a dozen stations on the loud-speaker, on the advent of visitors it will refuse absolutely to do anything of the sort.

To what is this due?

To the visitor's standard of loud-speaker reception.

What do you do in this case?

You explain how you had Eskilstuna, Liège, Reikjavik and Radio Lyons on the loud-speaker the night before, so loud that your next door neighbour but one thought it was 2LO, and you can't understand why the set is working so badly to-night.

Is this an unusual occurrence?

No. It always happens when visitors arrive.

What is the function of a high-frequency valve?

It makes the receiver oscillate more readily.

Can it not be stabilised?

Yes, it can. When properly stabilised it generates parasitic oscillations which cause it to cease from functioning entirely.

What is a detector?

It is any substance such as a turnip, a lump of sugar, coal or coke, a piece of cheese or biscuit which when brought in contact with a catwhisker made of iron, copper, silver or gold wire will make the local broadcast station audible. People who can afford to, use a valve, however.

How does a valve detector work?

It works by virtue of the grid condenser and leak.

Explain their action.

The incoming signal consists of a fluctuating current on which the modulation is impressed. When this gets through the grid condenser it gets rectified and can't get back again. The part that isn't wanted flows away through the leak, the rest has to pass through the valve where it gets amplified, and turned into music.

What is an accumulator?

It is a transparent box full of acid which gets spilt on the carpet. It contains lead plates which store up the electricity put in them when the battery is charged.

How do you charge an accumulator?

You take it round to the nearest electrician, where it gets half charged at twice the cost.

How do you know when an accumulator is fully charged?

When it is gassing freely. When it is the electrician who is gassing freely it is probable that *you* will be charged twice.

When does one say what a wonderful set one has, what beautiful music it gives and how wonderfully it brings in the distant stations?

When one is trying to sell it.

Now, for but 65/-, comes the really handsome Loud Speaker

BROADCASTING was as yet unknown when the sponsors of the now famous **Brown** range of Instruments placed upon the market the first Loud Speaker ever to be used in this country for Wireless purposes. "**Brown** H.1" was in being when "B. B. C.," "2 L O," "2 Z Y" and "5 X X" were meaningless hieroglyphics. The firm which then led the way in making Loud Speaker reproduction possible has ever since set the pace in Loud Speaker design. It was the **Brown** H3 which first brought high quality reproduction within the means of the average listener; it was the **Brown** HQ which brought to a realisation the ideal of a really handsome Loud Speaker at an unprohibitive price. Now **Brown** once again leads the way. In the new H3Q Model, for the remarkably low price of 65/-, there is available an instrument whose appearance will enhance the setting of any room. All that is best in acoustical design gives to the H3Q a remarkable fidelity of reproduction. All that is artistic in design gives the H3Q a distinctive and pleasing appearance. For a little over three pounds you can buy a Loud Speaker which will look well in your home and fill it with a faithful rendering of the evening's broadcast. Your dealer is selling many **Brown** H3Q Loud Speakers—get yours from him now.

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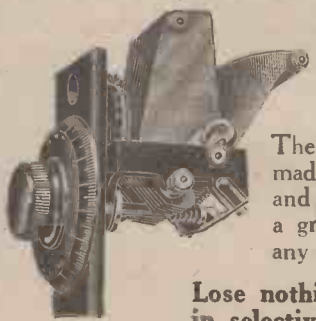

The more supports there are between the fixed and moving vanes the greater is the leakage.

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Parrs Ad.

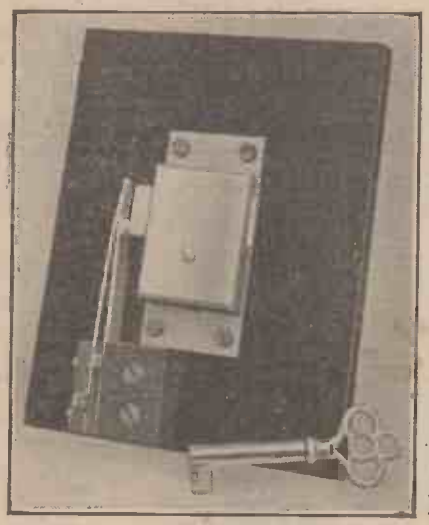
CUT OUT "INTERFERENCE"

A Simple Battery Lock-Switch

UNLESS your receiver is housed in a cabinet with a "fall front" or in a box with a lid, its controls are probably exposed and at the mercy of anyone in the household who wishes to meddle with them. Such "unauthorised persons" may succeed in switching on the set when you are out, and also they may leave it switched on all night, to the detriment of your batteries. Under such conditions it is a great advantage to be able to lock the receiver "off," so that only those with the right key can make use of it. There is no necessity to have a cabinet which will lock. The filament "on-and-off" switch can be made in the form of a lock, so that the filament accumulator can be locked in the "on" or "off" position at will.

Easily Made

Such a lock-switch is very simple to construct, as the accompanying photograph will show. The principal component required is a small, flat lock of the type used by cabinet makers. This sort of lock may be obtained from any ironmonger for a shilling or less, although of course a more expensive one may be used if preferred.



The battery lock-switch can be fixed to the panel of the receiver.

The lock and the switch contacts may be mounted direct on the front panel of the receiver, or alternatively on a small separate panel of ebonite which is itself attached to the back of the panel. In either case all that need show on the front of the panel is the keyhole.

The Keyhole

The first thing to do is to mount the lock on the panel. Having decided where it is to be placed, mark a point on the panel where the centre of the key will come and drill a clearance hole for the barrel of the key. The shape of the keyhole may then be drawn on the panel, and the hole cut out to the right size and shape with the aid of a small drill and a file. Two or three holes should be drilled within the area to be cut out, in order to lighten the work of filing away the ebonite.

Fixing the Lock

Now pass the key through the panel keyhole and insert it in the lock. Then set the lock on the panel in its correct position, the key acting as a guide, and mark the centres of the holes for the fixing bolts. Holes are then drilled at these points and the lock is secured to the panel with small bolts.

It is recommended that "blind" tapped holes be made for, say, 6BA bolts to fix the lock. The advantage of tapping holes in this way is that nothing will show on the surface of the panel. If bolt heads appearing on the panel are no objection, then clearance holes may be drilled, small bolts put in with the heads countersunk flush with the panel surface, and the lock held by nuts at the back.

Switch Contacts

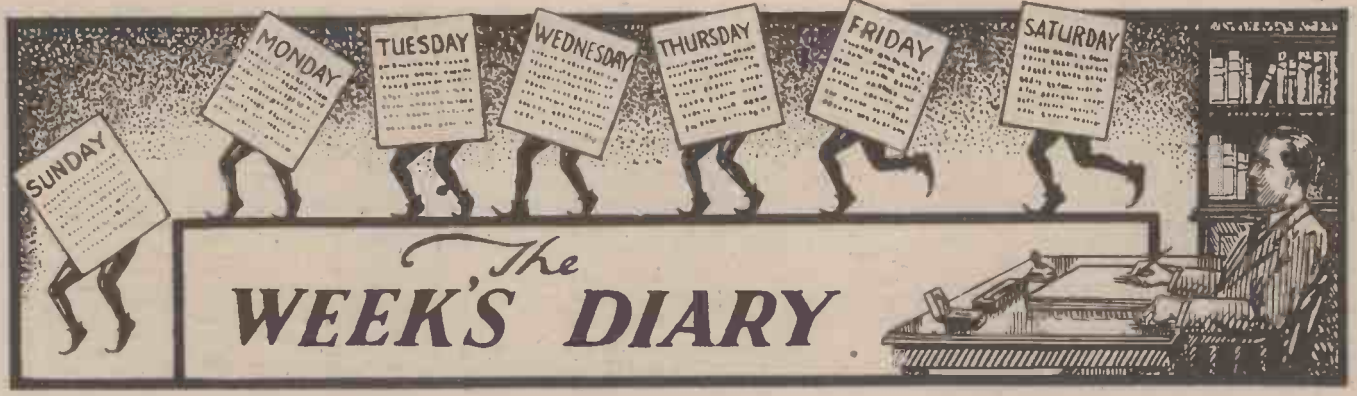
When the lock has been mounted, and tested with the key, to make sure that the keyhole of the lock registers with that in the panel, attention may be turned to the switch contacts. In the lock shown here these were taken from an old Dewar switch, but if ready-made contacts are not available, they may be made of springy strip brass.

Mounting the Contacts

The contacts are mounted on a small block of $\frac{3}{8}$-in. ebonite, which is fixed to the panel with two bolts, again screwed into tapped holes. When the contacts have been fixed to the block, the latter should be placed in such a position on the panel that the bolt of the lock touches the inner contact when it has travelled about half-way from the "off" position. Then the positions of the holes for securing the block may be marked, the holes drilled and tapped, and the bolts screwed home.

It only remains to test the completed switch, and see that a good, firm contact is made between the two blades when the key is turned to the "on" position. The blades may be bent if necessary for final adjustment, and it is important to see that they separate properly when the key is turned "off."

A. V. D. H.



The WEEK'S DIARY

THE American criminal has long been noted for his enterprising methods, but the latest outbreak, in my opinion, "takes the bun." A mysterious explosion caused £4,000 worth of damage to a broadcasting station at Maplewood, New Jersey, and this is believed to be the work of certain gentlemen who objected to the broadcasting of certain talks on the subject of "Criminals and Their Methods"!

* * *

I HEAR that Senatore Marconi has now been elected an honorary member of the Institution of Electrical Engineers. It is, I understand, also very probable that that Institution will shortly be given several lectures by some of its honorary members, Senatore Marconi probably being one of the first.

* * *

THE popularity of Newmarket Workhouse will probably increase very considerably when the public learns that over £120 has been subscribed for the purpose of providing it with a wireless receiver!

* * *

A MR. FAWTHROP, writing in an Indian paper, states that he receives Vienna *regularly*, and other European stations on occasions. I have always thought Vienna one of the most interesting of the European stations; although it is not necessarily stronger in London than the others, it may be tuned in night after night with uncanny regularity. If Mr. Fawthrop listens on 288.5 metres, I should imagine that he would stand a good change of receiving the British relay stations (perhaps rather distorted), since the total power being emitted on this wavelength is quite large!

* * *

THE number of receiving licences issued has grown by nearly half a million since December last, the figure up to date being 2,105,000. The astounding percentage of 79.74 of these are living within crystal range of a station. These statements make one wonder whether anyone in the country has a set!

* * *

UNLICENSED transmitters are now being very severely dealt with by the G.P.O. In one case recently heard at Altrincham the defendant was fined £10 and £5 5s. costs. He had been transmitting for over two years without a licence. Apparently the "detectives" do not work at a very great speed, which accounts for their strange certainty that the culprit really *was* their man!

Elsewhere in this issue a picture appears of the studio staff at 3LO, Melbourne. This photograph shows the well-equipped studio at this popular Australian station.

THE number of public buildings now giving wireless concerts is little short of amazing. Cinema vestibules (!), theatres and concert halls have long been setting an example in this way, and a newest recruit is a public library.

* * *

THE PERUVIAN BROADCASTING COMPANY has gone into liquidation, its selling rights and property having reverted to the Government. Broadcasting in Peru is now to be administered by the Marconi Co., and expenses are to be paid from the licence fees, which will in future be £2 per annum.

CELEBRITIES of the American Radio Relay League are to broadcast from 2XAF (WGY) on 32.79 metres on November 27. This programme has been specially arranged for the benefit of the South African Radio Relay League, and through the courtesy of the G.E.C. of America. 2XAF is at present very well received in this country.

* * *

MEN of the Vienna Fire Brigade have converted a megaphone 300 years old to a loud-speaker, on which they listen to broadcast programmes while on watch in the Cathedral tower. This megaphone was used by the Austrian Army in 1600!

* * *

A WRITER in a daily paper recently likened the B.B.C.'s Sunday evening concerts to "a second-rate sacred concert, than which nothing more wearisome exists," and added, "I can understand that sabbatarians do not wish to hear cheerful dance music on Sundays. Surely they need not switch on their receivers." He is, apparently, hinting that nothing at all should be substituted for the Sunday programmes, which are certainly enjoyed by "sabbatarians." We have "cheerful dance music" for the best part of six evenings a week at present. *Must* we have it on the seventh as well?

* * *

THOSE who have the fortune to be motorists as well as "radio-ists" will no doubt remember their feelings when the first raid on the Road Fund took place. It looks, however, as if there is more than a suspicion of danger that the "radio fund" will be similarly treated. The G.P.O. will have accumulated £900,000 from licence fees by the end of the year, and, unless great care is taken, this will probably be absorbed for some other purpose, though it is obviously only fair that it should be used for wireless purposes.

WAVE-TRAP.

"WIRELESS." **COUPON.** Vol. VI. No. 4.

QUESTIONS AND ANSWERS.

This coupon must be accompanied by a P.O. for 2/6 for each question, and a stamped addressed envelope when sending queries to the Radio Press information Dept. for a postal reply.

I HAVE BEEN ASKED . . . .

When I first switch on my set signals are weak. Gradually strength improves, but the quality is poor until finally, after about five minutes, reproduction becomes normal. Have you experienced this trouble?

Once, and once only, a fault of the kind you are experiencing came to my notice. The set was a straightforward detector with reaction followed by a transformer-coupled note magnifier, and I thought the transformer was responsible. This component was, however, replaced and the trouble was still present. Finally the windings of the loud-speaker, which latter had given three years' service, were found to be faulty, and on returning the instrument to the makers the fault was rectified.

Will one each of split-secondary H.F. transformers for 250/550 and 1,000/2,000 metres be satisfactory for the Elstreflex Two, or do I need two of each range?

If you wish to receive only on the 250 to 550 metres range you will need two transformers stamped for 250 to 550 metres, but if Daventry is required also, two of 1,000 to 2,000-metre type must be obtained. One of each range only will be useless.

With a particular neutrodyne set, which I have constructed, it was stated that with aerial and earth disconnected the set would oscillate strongly, and it was detailed how to neutralise it. I can, however, only obtain oscillation with the set connected to aerial and earth. What do you think is wrong?

Your conception of oscillation is an entirely erroneous one. With the set disconnected from aerial and earth you should not expect to hear heterodyne carrier whistles, normally associated with an oscillating receiver upon an outside aerial and earth system, but the oscillation will announce itself by strong clicks in the telephones or loud-speaker, as either of the tuning condensers is rotated from the position of approximate tune. When carrying out the neutralising operations it is required to so adjust the neutralising condenser that rotating either of the condensers from the position of approximate tune does not give rise to the clicks previously mentioned.

This, of course, is an indication that the set does not oscillate at any setting.

I have an anode-bend rectifier and two resistance-coupled note magnifiers which receiver has given yeoman service for some time. Now, however, from time to time, I experience fading. From this scanty information can you advise me how to overcome the difficulty?

If your set is sharply tuned and the fault is present only during windy weather, make certain that your aerial is taut and cannot sway to a material extent in a high wind. Make certain also that your H.T. and grid-bias plugs make really good contact in their respective battery sockets, and finally if the trouble still recurs suspect your grid-leaks, replacing each in turn with one known to be in proper order.

THE HOME OF ANCIENT CÆSARS

Signor Mussolini addressing an immense crowd of Black Shirts from the ancient Imperial Tribune of the Cæsars at the historic Coliseum. Notice the microphone to the right of the Prime Minister.

With wet Leclanche H.T. batteries I am told that "creeping" proves troublesome. I should like your opinion on this subject, as the advantage of not requiring charging, as do H.T. accumulators, appeals to me.

Provided a drop of paraffin is placed on the electrolyte of each cell no trouble through "creeping" is likely to be experienced, and in practice with a large battery of the above type I have obtained a year's service without renewing the electrolyte.

Would aluminium cases 3½ inches in diameter and 6 inches high be too large for screening cases for split primary H.F. transformers as used in the "Magic Five"?

The cases should make excellent screens. The larger the dimensions the better, provided space is available; it is screens too small, that is, less than 3 in. in diameter and 4 in. high, which should be avoided.

Am I likely to reap material benefit by incorporating a choke and condenser filter arrangement for the loud-speaker into my set?

A definite answer to this question can only be obtained by trial, but usually the trouble and expense is justified. Briefly, the advantages are as follows:—

(1) The loud-speaker windings only have to carry the fluctuating signal currents, and are therefore less likely to break down, whilst risk of magnetic saturation, giving distortion on strong signals, is largely avoided. For this latter to hold, a good choke with ample core must be used in the plate circuit of your last note magnifier.

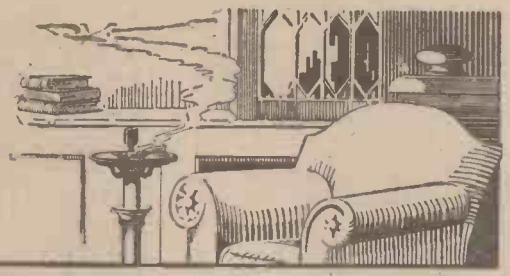
(2) Long loud-speaker leads, or one lead with an earth return in certain cases, may be employed with little likelihood of rendering the set unstable, as sometimes happens when no filter is used.

I wish to build a loud-speaker receiver, mainly for use on the local station 40 miles away, and do not wish to spend more than £5, this sum to include batteries, coils, loud-speaker, etc. Can you refer me to a suitable set in a back issue of this or any of your other journals?

The sum you mention is inadequate to obtain a set, batteries, etc., and under the circumstances I would advise you to build a single-valve detector set, such, for example, as that described in Radio Press Envelope No. 9, with which receiver telephones, of course, have to be employed. At your distance from a main station, to obtain loud-speaker results, it is not safe to recommend less than a three-valve receiver, and here for an economical 3-valve set I would suggest the "Spanspace Three," described by Mr. Kendall in *The Wireless Constructor* for November, 1926. The cost of the parts for this receiver is, however, approximately £8, exclusive of valves and other accessories.

From my Armchair

BY EARL RUSSELL



In these columns Lord Russell expresses each week his own personal views on matters of interest to "Wireless" readers.

The New Wavelengths

Well, we have got our new Geneva wavelengths, and we are asked not to grumble for a fortnight. I don't wonder; it was a very astute precaution of the B.B.C. I was too much occupied to have the chance of trying them till they had been five days in operation, and then I got a dozen stations, home and foreign. And the vast majority of them kept fading at intervals; even the immaculate Bournemouth, which I never knew to fade before.

One could only suppose that they were all so twittering with exitement to keep strictly to the Geneva order that in sheer nervousness they kept getting off them. I even had one heterodyne. But the fortnight isn't up, so I'm saying nothing.

Licence Fees

The action of the Government in keeping back large sums over and above their expenses seems to me to raise very serious issues. Coupled as it is with the raid on the Road Fund, constitutional questions of the utmost gravity are involved. Financial purists have objected for years to the Post Office in its ordinary work being used as a milch cow for the Treasury. But in these two cases of the Road Fund and the B.B.C. we have sums of money raised for specific purposes, and not as part of the ordinary tax revenue of the country.

Clearly on principle such funds should be used either for improving the service or for reducing the licence fee. That is to say, if motor-car licences produce more than is required for the roads they should be reduced; and similarly if wireless licences produce more than is required for the broadcasting service they should be reduced. Any other view results in indirectly imposing a tax on a special class of the community by a side-wind.

Accumulator Rating

I have protested for years against the fraudulent practice originally introduced from France of describing the capacity of an accumulator by an imaginary thing called "ignition ampere-hours." An ampere-hour is a known unit of measurement as definite as a quart, and the practice is exactly analogous to a milkman selling a pint of milk as a "reputed quart" on the ground that it was not all to be consumed at one meal.

The custom has absolutely nothing in its favour, as its only object can be to deceive the purchaser by making him think he is buying something better than he in fact is. It ought to be treated as a false trade description, like calling artificial silk stockings "silk," and I am not at all sure that the Courts would not so hold it. Anyhow, it is quite certain that any purchaser who has bought an accumulator and been deceived can either return it or get damages.

A Reinartz Set with Home-made Coils—*continued from page 141.*

are placed at top and bottom respectively. The completed choke is held together and to the baseboard by means of a single screw passing through the centres of the discs and into the baseboard.

Wiring

With the components mounted correctly upon the baseboard, it remains only to secure this to the upright panel and then perform the wiring operation. The wiring diagram shows all the necessary connections quite clearly, and as an additional check there are the special wiring instructions which may be referred to.

Before proceeding with the operation of the set, the turn numbers for the higher wavelength coil will be given. The No. 40 d.s.c. wire specified in the component list is used for this coil, and for the grid winding 290 turns are required, the three tappings being taken at the 30th, 60th and 90th turns. The reaction winding consists of 170 turns of the same wire. Apart from these points, and the fact that the grid winding is wound unspaced in this case, the instructions given in regard to the lower wavelength coil apply also to this coil. It is advisable to point out, however, that unless the turns are frequently pushed together when winding, it may be impossible to include the necessary number of turns.

Type of Valve

The set now being ready for work, the batteries, 'phones and earth may be connected to their respective terminals and a valve inserted in the socket provided. Regarding the most suitable type of valve to employ, a high-impedance valve of the H.F. or resistance-capacity coupling type is probably as efficient as any, but actually practically any general-purpose valve gives good results.

The filament temperature should first be adjusted temporarily and about 40 volts high tension may be employed. With the coil inserted, place the plug "R" into socket "R," connect the aerial lead-in to terminal "A_2," and place the aerial plug in one of the tap sockets. Upon increasing the capacity of the reaction condenser, if all is correct, a point will be reached where oscillation commences, and the dial motion must immediately be reversed in order to avoid interfering with neighbouring listeners.

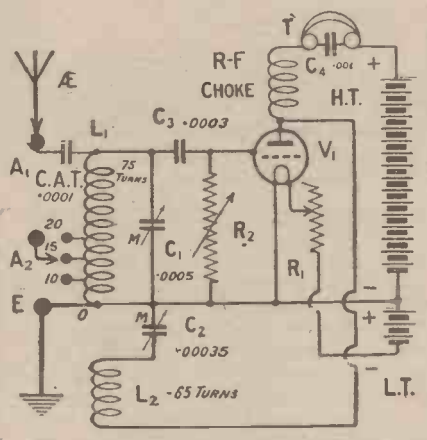


Fig. 4.—This theoretical diagram of the circuit shows how either constant aerial tuning or auto-coupling may be used by utilising the terminals A1 and A2.

A view of the lower-wavelengths coil showing the connections to the socket. The topmost socket is that connecting to one end of the reaction winding.

WHAT YOU WILL NEED

Ebonite panel 10 in. by 7 in. by ¼ in., and cabinet with baseboard 6¾ or 7 in. deep (Peto-Scott).
One .0005 straight-line-frequency condenser (Jackson Bros.)
One .00035 straight-line-frequency condenser (Jackson Bros.).
One .001 fixed condenser (Dubilier).
One .0001 fixed condenser (Dubilier).
One combined variable grid leak and grid condenser (Bretwood).
One baseboard mounting variable 30 ohm rheostat (Lissen).
One anti-phonic valve - holder ("Lotus").
Two 5 in. lengths of ebonite tube of 2 in. external diameter
½ oz. of No. 34 D.S.C. copper wire (London Electric Wire Co.).
½ oz. of No. 40 D.S.C. copper wire (London Electric Wire Co.).
Eight Clix sockets and two Clix plugs (Autoveyors).
Six valve-pins and three valve sockets.
Nine terminals.
Two pieces of ebonite, 7 in. by 2 in. and 5 in. by 1¾ in.

The Tuning Process

To tune in a station the right-hand condenser dial must be slowly rotated, at the same time keeping the set somewhere near the oscillation point by means of the reaction condenser. Actually, it will be found that only a little variation of the reaction control is required over the whole range of the tuning condenser. This, of course, is a very desirable state of affairs, and is, in fact, the main qualification of Reinartz reaction.

Obtaining Best Results

There are a few adjustments which may be made with a view to improving the efficiency of the set. First, there is the matter of the aerial tappings. The set is most selective when the aerial is plugged into the socket which marks the tenth turn of the grid coil. On the other hand, maximum volume is normally obtained when employing a higher tap. This should be borne in mind when using the receiver under differing conditions, the general rule being to use the highest possible number of aerial turns consistent with adequate selectivity.

An alternative form of aerial coupling is provided, namely, constant aerial tuning, in which a series condenser of .0001 capacity is brought into use by transferring the aerial lead-in to terminal A_1, and this may be tried and compared with the other arrangements.

It is very desirable that a gradual approach to the state of oscillation be obtainable, as otherwise distance work may be quite impracticable. If this state of affairs does not exist it may generally be brought about by adjustment of the H.T. and L.T. values, and by an anti-clockwise rotation of the grid-leak knob.

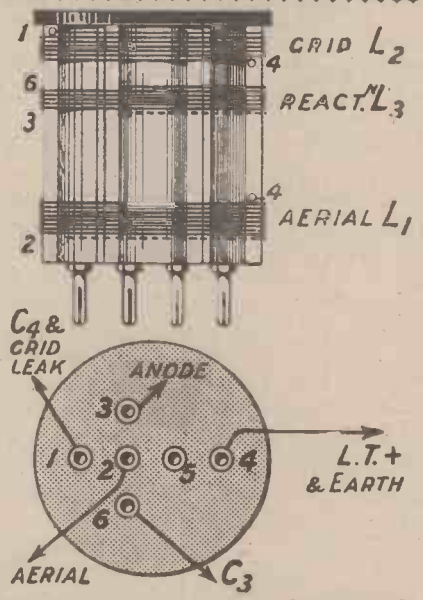
After making these adjustments the constructor may well rest content, reflecting that he has before him a *really* home-made instrument of interesting capabilities.

Broadcast Coils for the "America on the Loud-Speaker" Receiver

AT the conclusion of the article on the operation of the three-valve short-wave set which appeared last week, it was mentioned that the set could readily be used for the reception of ordinary broadcasting by employing a second coil former with a suitable winding. The details given were slight, and did not provide for the inclusion of reaction.

Coil for B.B.C. Stations

Since some readers may find it convenient to use this set for the local station, as well as for short waves, the writer has made up a former for



The windings shown are those for the shorter waves. For the broadcast band the dimensions are as follows: L1, 20 turns; L2, 65 turns; L3, 25 turns. All windings of No. 30 s.w.g., d.c.c. wire, wound in the same direction and terminated as shown.

broadcast reception, of which details are given under the above drawing. The coil arrangement is similar to that of the short-wave former, comprising an untuned aerial winding and separate grid and reaction windings.

Handle Reaction Carefully

In order to fit the required number of turns on the former fairly fine wire is used, the gauge being No. 30 d.c.c. Using the high-impedance type of valve as detector, as recommended for short-wave reception, the reaction winding specified in the accompanying drawing allows of full reaction over the whole range of the tuning condenser. It should not be forgotten, however, that serious annoyance to neighbours can be caused by careless handling of "reaction on the aerial" of this type. The reaction adjustment, that is to say, the variable condenser controlling reaction, should therefore be handled with the greatest care, and on no account should the set be allowed actually to go into oscillation.

Although for reception of the local station the full use of reaction is neither necessary nor desirable under ordinary conditions, if no reaction winding is placed on the former, pins 3 and 6 should be connected together. If this is not done, the set may prove unstable in operation, and liable to oscillate of its own accord at certain settings of the tuning condenser.

Results

At a distance of about one mile from the London station sufficient volume in a loud-speaker for a small room was obtainable with the first two valves only. With three valves signals were uncomfortably loud. To the detector valve 45 volts high tension were applied and about 90 to the L.F. valves during this test, the reaction condenser being at zero.

A German station was also brought in at good strength on the loud-speaker with three valves, though London was not entirely cut out. Several other stations were also audible at varying strengths. By judicious adjustment of reaction very fair selectivity was obtainable, but since the set was originally designed for loud-speaker results on wave-lengths which are possessed of considerable carrying power and on which selectivity is, in a sense, automatic, too much should not be expected of it in the way of long-distance or selective reception.

An Alternative Coil

Where it is desired to receive the local station only, at a distance of a few miles, with the greatest volume, a different size of coil former may be used if desired. Messrs. Collinson can supply formers 2¾ in. in diameter, with the standard 6-pin base mounting.

The winding in this case may be a single coil, tuned by the variable condenser in the grid circuit of the first valve, no reaction winding being included. The ends of the winding, for which about 40 turns No. 22 s.w.g. d.c.c. wire may be used, should be taken to pins 1 and 4. Pin 1 should also be connected to pin 2, in order to connect the aerial to the coil. Pins 3 and 6 should be connected together with a piece of wire, as otherwise the set may prove unstable, as mentioned above.

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—is tapped *every* 3 *volts*, enabling you to apply the exact voltage required by your valves for best results,
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E.P.S. 279

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E.P.S. 247.

ACCUMULATOR LIFE

SIR,—Earl Russell's recent paragraph with reference to his experience with high-class accumulators brings up a very interesting point, namely, the life of such accumulators when working under ideal conditions and properly cared for.

My own experience seems to coincide very strangely with that of Earl Russell's. I have had two 6-volt accumulators of the same make which I cared for and charged myself, taking all the regular precautions in doing so. These gave excellent service for three years, then both began to show signs of "senile decay." In other words, they failed to hold their charge. I dismantled one and found that all the positive plates had become disintegrated, and simply fell to pieces. I fitted new positive plates to this battery and it is still in service although I only get about 50 per cent. capacity results.

From further experience with various makes of accumulators covering some fifteen years, I find that cells, after being in use for about three years, show rapid deterioration.

Perhaps other readers' experiences might prove of interest?—Yours faithfully,

RALPH KEITH COMMON, L.D.S., R.C.S.

Stirling.

A CONSTANT AERIAL TUNING UNIT

A HANDY unit primarily intended as a series aerial capacity device may be made up with ease as described in this article. The unit itself is entirely independent of the actual receiver, but it may be incorporated in the set if desired as a baseboard-mounting component. The material required for construction is as follows:—

Material

One multiple fixed condenser (C.A.V.).

One two-way terminal strip (Magnum).

One spring clip (Peto-Scott).

Small piece of ⅜-inch thick wood for base, and

Four ¾-inch countersunk wood screws.

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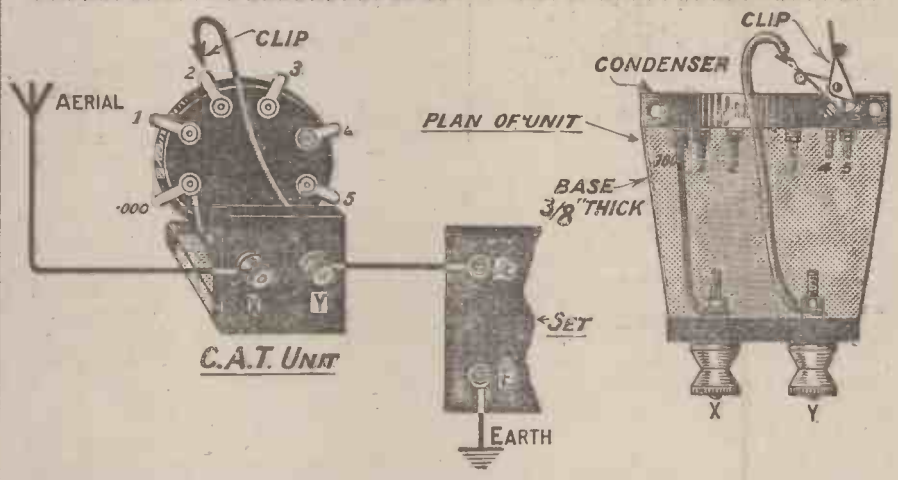

Fig. 1.—The desired capacity is obtained by using the clip in connection with the numbered tags.

A CONSTANT AERIAL TUNING UNIT

(*Continued from previous page*)

Construction

There is little to say about the construction of the unit; it is so simple. Reference to the drawing given should be of ample assistance. The multiple fixed condenser is secured to the back edge of the wood base by means of two screws, for which holes are provided in the component itself. The two-way terminal strip is secured to the front edge of the wood base in a like manner. The wood base itself is cut to suitable dimensions.

Connections

Terminal X is connected by means of a piece of "Glazite" wire to the tag marked .000 on the multiple fixed condenser. Terminal Y is equipped with a short length of insulated flex, the remaining end of which is provided with a spring clip.

The Unit in Use

The actual method of using the unit is also shown in the drawing. It will be seen that the aerial is first connected to terminal X of the capacity unit. Terminal Y is then connected by means of a link, or flex lead, to the existing aerial terminal of the receiver itself. The earth lead is connected to the set in the usual manner. The spring clip may be attached to any of the tags marked 1, 2, 3, 4, or 5 on the multiple condenser, according to the actual value to be used. This automatically gives a number of series capacity values ranging from .0001 to .0005 microfarads, the number upon which the clip is fixed representing the value thus used.

FUSES AND THEIR DANGERS

I wonder how many conscientious users of fuses in the H.T. circuit realise that to insert one of these protective devices in the high-tension negative lead is practically useless if a series of tappings are taken to apply different voltages to various valves? I had this fact brought home to me very forcibly recently, when using a receiver which the maker had very kindly provided with a fuse in such a position, and I may say it did not save six perfectly good dull-emitter valves from being burnt out when a short took place between two of the tapping points in the wiring of the receiver. Such shorts can be every bit as disastrous as one between high-tension positive and negative, and if the thing is to be done at all it seems to me worth while to do it properly and put a fuse in each one of the H.T. positive leads, where they stand a chance of doing some good if anything unfortunate happens.

G. P. E.

COMPONENTS WE HAVE TRIED

Loud-Speakers

WE have received from Messrs. Alfred Graham & Co. two of their new loud-speakers. Both of these instruments are of the "Dragon" type, and are finished in a crystalline-chocolate colour.

The loud-speaker proper is mounted on a circular oxidised-copper base, the loud-speaker unit itself screwing into the union at the small end of the horn. The loud-speaker movement is contained in a moulded-composition box of a mahogany finish.

The larger type, the AR65, on test gave very pleasing results. The instrument handled a considerable volume of sound without distortion, much greater than would be required for a normal room. It was particularly interesting to note that the lower notes of an organ were reproduced with fidelity, instead of the rumble which accompanies many loud-speakers. The high notes were also well produced, and on ordinary music no horn resonance was noticed.

The second loud-speaker, the AR111, is similar in design to the AR65 and, when tested, gave very satisfactory reproduction of band music, and should be suitable for a normal-sized room. It will handle a considerable amount of sound without blasting.

The reproduction with these instruments, both of music and speech, is excellent and the workmanship allows of nothing to be desired. We have no hesitation in recommending both these loud-speakers to our readers.

Balancing Condenser

MESSRS. The Igranic Electric Co., Ltd., have sent us one of their vernier balancing condensers for test and report. This component is intended for use where dual condensers are used to tune two separate circuits, in that it affords a method of compensating any inequality either in the two halves of the dual condenser or in the two inductances that are being used.

The component consists of two sets of fixed plates mounted opposite to each other, while a set of moving vanes may be interleaved with either set of fixed vanes, a maximum capacity of 14 micro-microfarads being obtainable on either side.

On test the insulation resistance between the moving plates and the fixed, and the one set of fixed plates and the other set was found to be infinity in each case.

This instrument is well made, pleasing in finish, and can be recommended where a balancing condenser is required.

P.M.3 Valves

WE have received from Messrs. The Mullard Radio Valve Co. three P.M.3 valves. These valves are similar in appearance and construction to the P.M.4 valve, and are designed to work with a filament potential of 3 to 3.7 volts, with a filament current of .1 volt. As in the case of the P.M.4 valve, the filament does not glow visibly when working.

On test, these valves were found to be quite satisfactorily uniform, taking a filament current of .1 of an ampere at a

(*Continued on next page.*)

COMPONENTS WE HAVE TRIED

(Continued from previous page)

filament potential of 3 to 3.5 volts, which is well within the maker's rating.

When measured at an anode potential of 80 volts, the impedance was found to be 17,000 ohms in two cases, and 18,000 in the other, while an average amplification of 11.6 was obtained.

Toggle Switch

OUR Elstree Laboratories have examined one of the Bakelite toggle switches forwarded by Messrs. The Rothermel Radio Corporation of Great Britain.

This switch is exceedingly neat and compact, consisting of a circular moulding of insulating material 1¼ in. in diameter. In the centre of this is a small cylindrical projection with a dome top to it which has a slot cut down its centre, and in this slot a small black insulated lever moves. The switch is plainly marked for on and off positions, and the two small screws for fixing also make electrical contact with the two parts of the switch. The mechanism is neat and simple, and provides a quick break and a positive contact.

The actual resistance of the component was measured and found to be negligible, and when in the off position the insulation resistance was infinity. Over two amperes were passed through the switch, and it did not show any signs of heating. We can recommend this component for use.

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