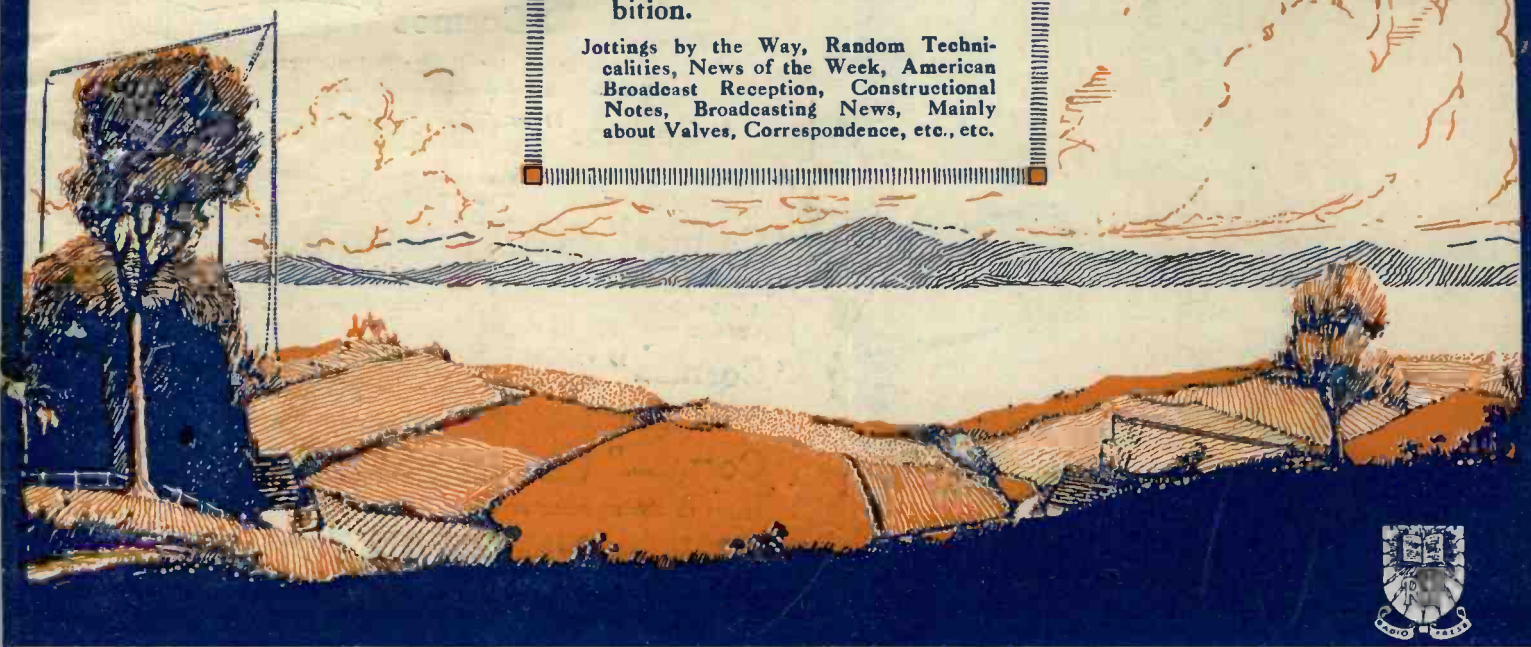
Wireless Weekly, 6d. Net. Wednesday. November 7th, 1923.

Wireless Weekly

and The Wireless Constructor.

Vol. 2.
No. 17.

CONTENTS



Our First Exhibition Number

Wireless Weekly

Vol. 2, No. 17.
Nov. 7, 1923.

CONTENTS

Editor: JOHN SCOTT-TAGGART, F.Inst.P.

Assistant Editors { E. REDPATH. P. W. HARRIS.

Radio Press, Ltd.

Publishers of Authoritative Wireless Literature
DEVEREUX COURT, STRAND, W.C.2
Tel.—Central 3763.

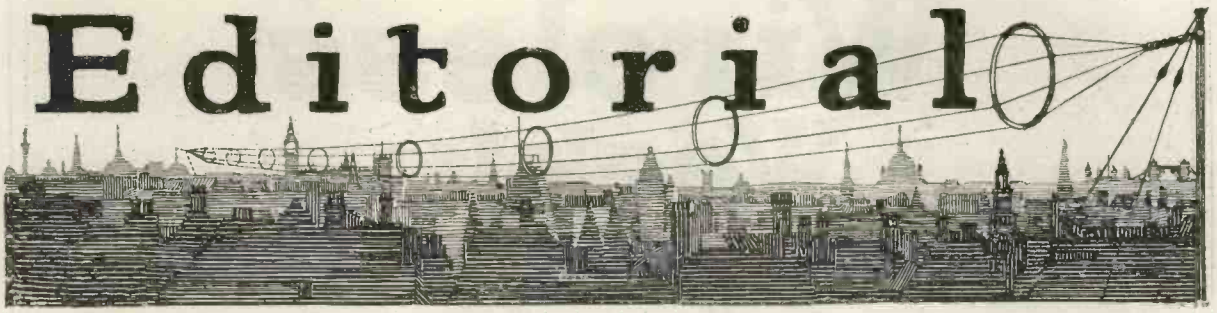
Advertisement Managers: { SCHEFF PUBLICITY ORGANIZATION, LTD., 125, Pall Mall, London, S.W.1
Tel.—Regent 2440.

Scientific Adviser
Prof. G. W. O. HOWE, D.Sc., M.I.E.E.
Advisory Editors:
Prof. R. WHIDDINGTON, M.A., D.Sc.
Prof. C. L. FORTESCUE, A., M.I.E.E.

Staff Editors
E. H. CHAPMAN, M.A., D.Sc.
A. D. COWPER, M.Sc.
G. P. KENDALL, B.Sc.
R. W. HALLOWS, M.A.
S. G. RATTEE.

All correspondence relating to contributions is to be addressed to the Editor of "Wireless Weekly."

Editorial



The Exhibition.

AS we go to press, practically all the leading wireless firms of the country are making their final arrangements, urging delivery of the very latest apparatus from their works, checking advanced copies of new pamphlets and catalogues, and generally making sure that nothing is left undone which will help to assure the success, from all points of view, of the All-British Wireless Exhibition.

It is undoubtedly a fine opportunity for the wireless industry as a whole, and by that we mean the British Broadcasting Co., as well as its individual members, the manufacturers and dealers, to co-operate and demonstrate to the thousands who will make their first practical acquaintance with the science, that to be without a wireless receiving set is to be deprived of a new and certain source of delight, and is, in fact, to be out-of-date.

One or two points occur to us in this connection. Last week we referred to the undesirable transmission of gramophone music. This should be taboo during the period of the exhibition, and in its place orchestral music, instrumental solos, and well-rendered vocal items should be transmitted.

We note that—" by special arrangement with the B.B.C., demonstrations are to be given." To us, there appears to be a suggestion about this, that the B.B.C. have been as it were " engaged " and, from their lofty position have agreed to demonstrate a little.

If this is the position of affairs, it is entirely a false position. The B.B.C. *is* the exhibition just as much, or more so, than the array of well-designed and perfectly-finished instruments upon the stands of the exhibitors. In the opinion of the non-technical public, the whole appeal and utility of those instruments, depend not upon their design and finish, but upon the pleasure and satisfaction they can yield in receiving whatever the B.B.C. transmits.

Throughout the period of the exhibition, the transmissions should be the most varied and of the highest quality ever attempted. Although rather of the opinion that of late we have had a little too much simultaneous broadcasting, with its attendant delays, interruptions and upsetting of time-tables, we hope the B.B.C. will introduce into each evening programme, at least one interesting item, perfectly relayed to London from a distance. If it can be a really important public speech or event, so much the better. It would undoubtedly have a great effect upon those who hear such a performance for the first time.

Trade Revival.

That the tide of wireless, recently at a low ebb, is flowing again there is no longer any doubt. Orders placed for tons of aluminium condenser vanes and thousands of loud-speaker bases and, in another direction, a month's turnover exceeding the best month of the boom at the beginning of this year, are indisputable proof of this.

It remains for the Exhibition to remove the last vestige of doubt from the public mind, to show how simple, efficient and worth-while the reception of broadcasting really is, and we are confident that this result will be attained if it is remembered that not merely wireless instruments, but *wireless broadcasting* is being exhibited.

THE RESONANCE WAVE COIL ELIMINATOR.

By S. R. WINTERS.

The following article, dealing with a practical method of eliminating atmospherics, will appeal particularly to those readers who have experienced the difficulties of long distance reception.

THE partial elimination or subduing of atmospheric disturbances, in the majority of instances, has involved the draining off of such distracting noises at the receiving station, separating them from the orderly wireless signals before the latter reach the ears of the listener. If we could compare electromagnetic waves and the attendant atmospheric disturbances to a liquid, it would be permissible to describe the separation of the meaningless noises from the uniform sounds as a filtering process.

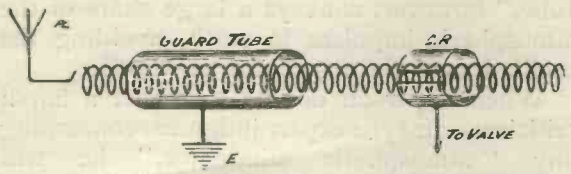


Fig. 1.—The resonance wave coil with solid guard ring and split collector ring.

Atmospheric eliminators, drain coils, resonance wave coils and other forms of appliances for reducing atmospheric disturbances, with certain modifications, adhere to the principle of draining or filtering at the receiving stations. Notably among the comparatively recent inventions, or application thereof, for minimising the bane of radio telegraphy and telephony is the adaptation of the resonance wave coil, a compact form of aerial, to the specific purpose just outlined. The resonance wave coil, as well as its application in eliminating atmospherics should challenge the interest of the experimenter.

The original resonance wave coil consisted of a hollow cardboard tube, 38 in. long and 2¾ in. in diameter. Wound around this tube was a single layer of No. 32 gauge insulated wire, affording about 100 convolutions to the inch. Terminals were placed at each end of this tube for making connections with the receiving instruments. A brass band or ring, approximately ¼ in. wide, and just large enough to slip snugly over the wired coil or tube, has a split in it to avoid the possibility of the development of annoying eddy currents.

However, when a resonance wave coil is employed in the capacity of suppressing atmospheric disturbances, there is no arbitrary requirement with respect to the size of the wire or method of winding same. Dr. Louis Cohen, who has adapted the resonance wave coil to the suppression of atmospheric disturbances, suggests that in the reception of signals on a wavelength of 200 metres, a coil wound double-banked on a four-inch cardboard tube 10 in. long is suitable. No. 30 S.W.G. wire is suggested, but this recommendation is not arbitrary. For the reception of music and speech from broadcasting

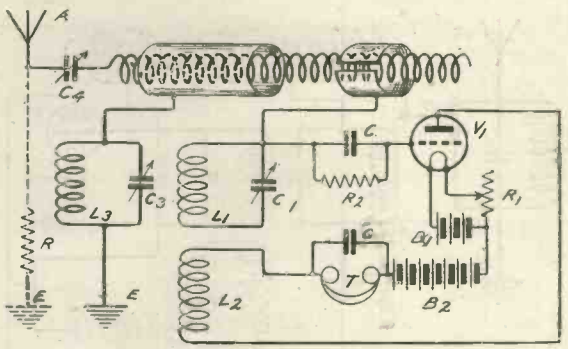


Fig. 2.—Receiving circuit with rejector between guard ring and earth.

stations, ordinarily operating on wavelengths varying from 200 to 600 metres, a single layer of No. 30 S.W.G.-d.c.c. wire, 18 in. long, on a cardboard tube 3 in. or 4 in. in diameter, is worthy of a trial.

The principle governing the operation of the resonance wave coil may be explained in this way. The cardboard tube around which is wound the insulated wire, also contains a ring of metal which forms a capacity connection to the coil itself, yet insulated therefrom in other particulars. This circular band, described as a " collector ring " because of its ability to assemble or collect electro-magnetic waves, is enabled to take the voltage from the particular point on which it is located, and transfer it to the grid element of the valve. By the use of two such metallic rings, involving the services of two radio operators, signals may be obtained from two broadcasting stations, operating on different wavelengths, simultaneously. This is accomplished by placing both metallic bands on the same resonance wave coil, with each operator connecting the grid element of a receiving valve to one of the rings.

The resonance wave coil when functioning in the capacity of reducing atmospheric disturbances involves the use of a so-called " guard tube." The latter, which may or may not be slit, is from one-half to one-third as long as the resonance wave coil itself. The " collector ring " is located at the opposite end of the coil. If the " guard tube " is earthed it appears feasible that it will capture all of the wireless voltages that strike the coil and that no electric impulses will find their way to the opposite end of the coil where the collector ring is stationed.

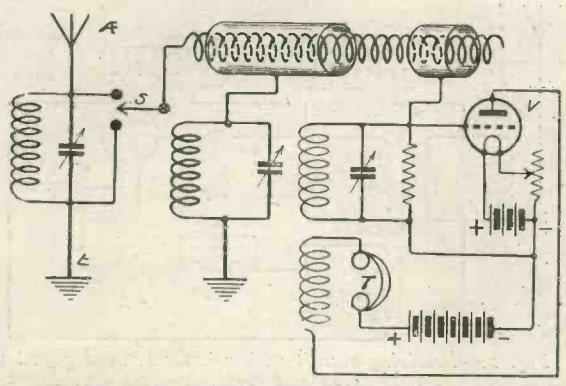


Fig. 3.—The circuit arrangement when using a separately tuned aerial.

Atmospheric disturbances are assumed to travel in trains of extremely low frequencies—between 200 and 300 cycles a second. On the basis of this assumption, what is the effect of the crashing noises of " atmospherics " on the resonance wave coil? When this noisy, abrupt impulse invades the aerial, a high voltage is set up on the left end of the resonance wave coil (see Fig. 1). The electric charge is imposed abruptly, and then proceeds to travel along the coil, the latter absorbing the impulses, as it were. If this tendency is not interrupted, the resonance wave coil will

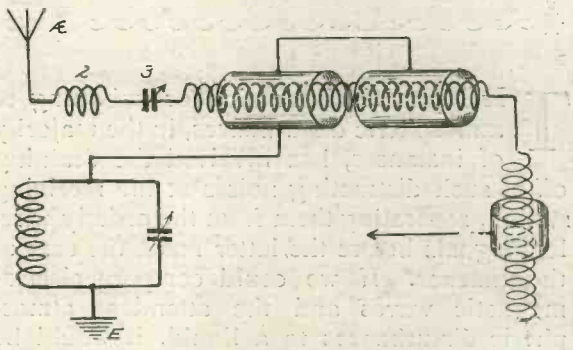


Fig. 4.—Duplicate resonance coils and guard rings may be used as shown.

oscillate at its own frequency. The " guard tube," however, conveys a large share of the atmospheric impulses to earth, avoiding the oscillation of the resonance wave coil.

When a person desires to render a harsh criticism or maybe expert judgment concerning any " atmospheric eliminator," he will usually exclaim, " Oh yes, it kills atmospherics and signals, too." This occurs in the arrangement of the resonance wave coil in its suppression of atmospheric disturbances at this stage, but thanks to the ingenuity of Dr. Cohen and his co-workers, there is a resourceful addition to this arrangement which reserves the orderly radio signals for reception by means of the head telephones. It is called the " rejector circuit "; obviously, because it rejects the useless noises and conserves the useful signals. This is accomplished by earthing the " guard tube " in such a manner that the connection functions as a ready conductor on all wavelengths except one.

Suppose the electric circuit of the resonance wave coil is adjusted to a frequency of 300 metres, all other electric waves are conveyed to the ground. The 300-metre wavelength is rejected, or arrested, more properly speaking, and the signals are transferred to the " collector ring." The " rejector circuit "

not only drains the atmospheric disturbances to the earth, but likewise conveys signals of frequencies other than one particular wavelength to the ground. The latter action should prove useful in eliminating some of the interference now caused by a nearby broadcasting station.

The " rejector circuit " is one possessing low electrical resistance, which necessitates the use of heavy wire in the construction of the inductance coil and a variable condenser of unquestioned quality, with small losses. Such a variable condenser may, suitably, be of 0.001 microfarad capacity, shunted across a coil having 55 turns of No. 14 or 16 S.W.G.-d.c.c. wire wound upon a tube 3¾ in. in diameter. This arrangement will afford an inductance of about 0.1 of a millihenry.

Structurally, the " collector ring " and " guard tube " entering into the formation of this " atmospheric-eliminating " device are made of brass and should fit snugly. By way of suggestion, the winding may be covered with a layer of thin paper and then tubes employed that will slide smoothly over the paper. It is optional with the constructor whether the " guard tube " is split or not, but the " collector ring " necessarily contains a split.

A reaction or plate-circuit variometer is employed if regeneration is desired in this particular electric circuit. Use of either of these instruments in this connection demands a tuned secondary circuit connected to the grid element of the vacuum tube. Regeneration is also possible by means of the resonance wave coil in the absence of additional windings of wire.

In this capacity of reducing atmospheric disturbances, both the resonance wave coil and the radio-receiving instruments must be screened, if the most violent crashing and rumbling noises are to be suppressed. Complete screening is absolutely essential, which requirement indicates that the entire outfit must be enclosed in an air-tight copper case of reasonable thickness, 18 gauge, for instance. The batteries or wiring to and from the latter to the radio instruments must not be exposed. The telephone cord should be protected by copper braid, connected to the copper shield.

The resonance wave coil lends itself to use with a variety of electric circuits in the capacity of " atmospheric eliminator." It may be employed with a single-circuit, commonly found in homes of broadcast listeners, or with a loose coupled tuner. The latter arrangement is likely to result in sharpness of tuning. Likewise, the resonance wave coil is adaptable to use with a tuned aerial system, which arrangement, however, is conducive to extreme selectivity. In this instance, a switch is provided so that the coil may be connected above the tuned primary circuit when receiving weak signals, or below (at the earth connection) when listening to robust signals through interference. (See Fig. 3.)

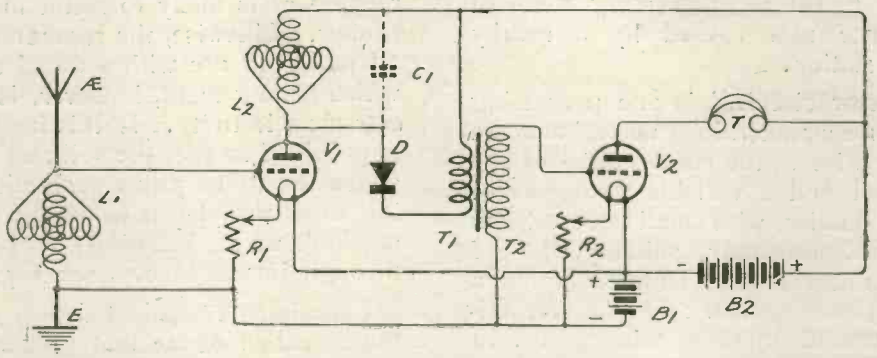
Experiments conducted over a period of three years indicate that greater suppression of atmospheric disturbances may, occasionally, be obtained in the absence of critical adjustments by dividing the " guard tube " into two parts, and including a second resonance wave coil for holding the " collector ring." The second resonance wave coil, in winding, is a duplicate of the first one. Such a circuit permits the use of radio-receiving apparatus of practically any design.

The performance tests of this new device, or rather applications of an instrument invented several years ago, indicate the possibility of receiving long-distance radio communications that would otherwise be inaudible because of the prevalence of atmospheric disturbances.

Resonance wave coils, in their multiple variations of size and windings of wire, lend themselves to a diversity of uses. One type of coil constitutes a full-fledged wireless aerial, dispensing with any radio-receiving instruments other than a detector and a pair of head telephones. No earth connection, either counterpoise or actual, is required. As a single-unit radio direction finder another design of resonance wave coil is able to determine the position and altitude of aircraft in flight. Still another type of resonance wave coil enables the laboratory of the Signal Corps in Washington, when using six stages of radio amplification, to receive signals from a radio telegraph station of the United States Navy Department located at Guantanamo, Cuba.

The application of resonance wave coils in the reduction of atmospheric disturbances, however, offers the most fascinating field for radio experimenters.

"WIRELESS WEEKLY" CIRCUITS—No. 30



COMPONENTS REQUIRED

L_1 } Variometers.
L_2 }

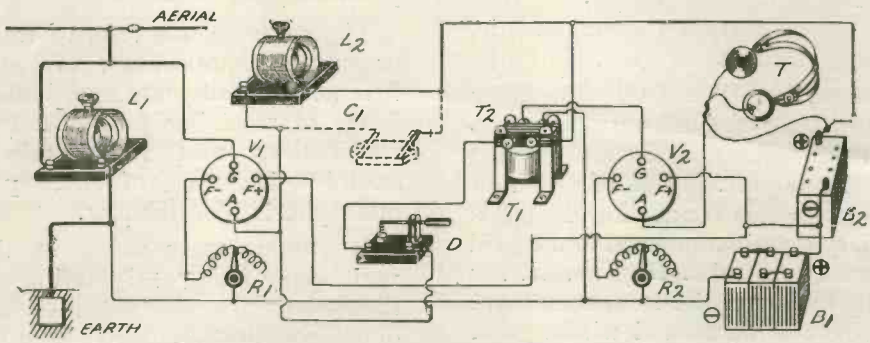
D : Crystal detector.

C_1 : 0.0003 μF (if necessary).

GENERAL REMARKS

This two valve circuit involves the use of variometer coupling between the valves. The variometer L_2 is of larger pattern than ordinarily employed and should be tuned to the incoming wavelength. If an ordinary variometer, as used in aerial circuits, is employed, a fixed condenser C_1 of 0.0003 μF capacity should be connected across L_2.

The plain variometer arrangement is best if the right size is used, but, on the other hand, if the selectivity is inferior a reaction effect is obtainable by connecting a variable condenser across the grid and anode of V_1.



PRACTICAL WIRELESS NOTES—No. 12

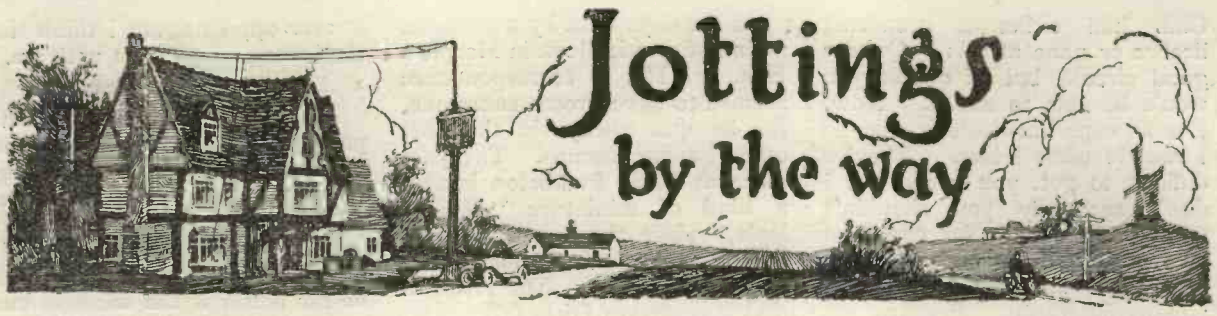
CRYSTAL DETECTORS

require a certain amount of consideration apart from the mere selection of and making careful contact with a sensitive spot upon the surface of the crystal. In the first place the surface of the crystal (or crystals if two are employed) should be clean. Any accumulation of dust should be removed with a soft brush, not with the finger tip. Crystals which have become slightly greasy, due to handling, should be cleaned with a soft rag and a few drops of petrol.

If the detector is of the cat-whisker type, the tip of the fine wire should also be perfectly clean. A new and pointed tip should be obtained from time to time by cutting the wire obliquely with a pair of scissors. It is very desirable that crystals should make the best possible contact with their cup or holders, and, although involving perhaps a little more trouble, the method of securing with Wood's metal, a special alloy having a very low melting point, is strongly recommended. Ordinary solder should not be used, as many crystals are impaired by the temperature required.

Where the crystal is to be gripped by screw points or between metal jaws, the contact will be considerably improved if the lower part of the crystal is wrapped with several thicknesses of tin- or lead-foil.

In many cases insufficient attention is paid to the matter of *pressure* between a pair of crystals or a cat-whisker and a crystal. With many of the cheaper forms of cat-whisker detector it is admittedly very difficult to obtain a nice adjustment in this respect, and it will be found well worth while to employ a detector in which the movement of the cat-whisker is controlled positively by means of a fine-threaded screw provided with an insulating knob.



At It Again !

BORROW, I regret to say, has been and gone and done it. You may remember that I gave you the week before last some account of his adventures with the spark transmitter and the friends whose zeal outran their truthfulness. He did eventually get this bag of tricks working, and having found out that the ordinary reports of his pals were not to be relied upon, sent thereafter code messages requesting them to write them down. This brought to light the beautiful fact that many of those who had previously reported getting every word could not read a letter of morse unless transmission was at the rate of about one word every five minutes. Ah, me, what sad knaves some of us wireless folk are !

The success of his spark set fired our hero with the noble desire of ascending to the higher planes of C.W. and telephony. To that end he acquired by devious, and in some cases nefarious, courses three B valves, an assortment of coils and condensers, a microphone and a mighty generator which was supposed to deliver 500 good volts at its business end.

The Vigil . . .

Three nights ago he telephoned me to say that as soon as the broadcasting station had closed down and made room in the ether for the serious-minded he would make his first essay in telephony. Would I listen and report? I would? Splendid ! Wavelength 180 mètres. As he lives within ten miles of me, I shed one high-frequency valve and a note mag as a precaution against his dulcet tones waking the sleeping household.

At 10.30 pip emma I had the receiving set carefully wavemetered and adjusted. A quarter of an hour later, that being the agreed moment, I switched on and waited. Nothing happened for a few seconds, then came an eerie screech that left my ears a-tingle, followed by silence utter and complete. A little tuning brought in other amateurs engaged in their nightly cross talk. Two Oh Emma was dealing out fatherly advice to the members of his flock; the ether was full of beers and tocs and dons, but of 12BF, the enthusiastic Borrow, there was never a sign on any wavelength. I tried for him high, I tried for him low, with no result whatever. The land line was equally hopeless; after receiving from the lady at the exchange (1) " no reply "; (2) " number engaged "; (3) " the line has been out of order for two days," I gave it up as a bad business and sought my couch.

. . . and What Happened.

Next day I met Borrow in the train. Woebegone was his usually sunny countenance, broken his voice, sad the tale that he unfolded. As zero hour approached he sat at his bench eagerly awaiting the great moment. It came. He switched on his generator. It started off with a cheery hum which changed into an angry growl as the hand of the milliameter swung over to the hundred milliamp mark. A smell of burning rubber assailed his nostrils. One valve exploded (a fact !), whilst the other twain gave up the ghost in more seemly fashion by quietly burning out.

The milliameter showed him that something was amiss, but he sat as though hypnotised and unable to switch off until the wreck was complete. The generator on subsequent testing —you can search me if you want to know why it wasn't tested at first—was found to deliver the goods with both hands, so to speak. In place of a mere 500 volts it churned out the best part of a round thousand. Add to this a set of valves which having seen much previous service in other hands, had softened somewhat, and you have all the ingredients necessary for a first-class firework display. To judge from the appearance of the *débris,* it was quite a good effort. I am deeply sorry for Borrow, but I am sorrier still for those from whom he obtained the loan of the various gadgets that went to make up his apparatus.

The Man Morple.

Little Puddleton was the scene of quite a pretty little comedy during the sorting out of the sheep and the goats in the licence round-up. In the spring of the year there came to live amongst us one named Morple, a loud-voiced, rather domineering fellow who appeared to be a kind of walking Outline of Everything. He joined the wireless club soon after his arrival and usually managed to do most of the talking at our meetings. There was a kind of finality about his pronouncements which rather tended to stifle discussion.

What we disliked most was the patronising way in which he conducted conversations. He assumed as a matter of course that every other member of the

Club had either a broadcast licence or none at all: "Quite a good circuit, but of course you won't be able to use it. Now, I've an experimenter's licence, so I can do what I like. They're difficult to get, you know, but I don't see why you shouldn't manage to qualify for one in a year or so. Bring me your form before you send it in and I'll help you to fill it up. Perhaps my influence might be of some use. . . ."

The Helping Hand.

That was the kind of thing that got on our nerves. Morple was not the most popular member of the Club. Still, when we held a meeting just after the P.M.G. had promulgated (that is the word) his pronouncement to consider what should be done and to help those who did not quite know where they were, the man was distinctly useful. He took the chair, and having told us, in case we had forgotten it, that he was the holder of an experimental licence, he made quite a nice little speech explaining that all who had been naughty boys in the past might make bygones into bygones by planking down their fifteen bob. *Au fait* with the latest regulations, he answered questions ably and gave comfort to many a stricken heart.

As the days went by we noticed a kind of worried look in Morple's face. His correspondence seemed to have grown enormous, for he was always in the post office buying stamps. The post office at Little Puddleton is also a kind of miniature "Whiteley's," since there you may buy baccy, boots and bacon at different counters. The result is that it is always fairly full.

In the Post Office.

One day as the close season for pirate hanging was drawing to its end I had to go out at lunch time to send a reply to an urgent telegram. As it was pouring with rain I donned gum boots. These deadened the sound of my footsteps as I crossed to the post office counter, so that a man whose back was towards me did not hear me.

"I want one of those new constructor's licences," said a muffled voice. "Fifteen shillings," replied the maiden; "full name, please." I had not recognised the macintosh-swathed figure, and when I heard the voice bleat out, "Morple, Henry Augustus Pottinger Morple," you could have knocked me down with a grid-leak. No, I did not slap him on the back. I retired noiselessly to the baccy counter. But if Morple is ever uppish again I think that the last word will rest with me.

Mark Your Man.

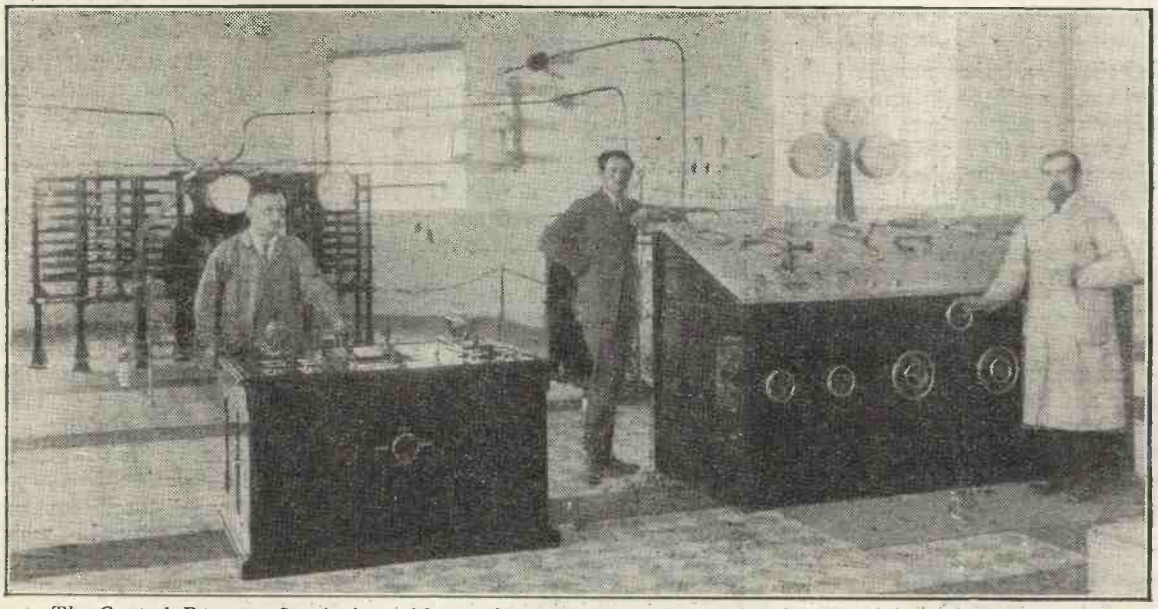
All this business of silly little paper licences that you stick into a drawer and lose makes things very confusing. You cannot tell who are the experimenters, who the constructors and who the broadcasters. It would, I think, be far better if the wireless man were provided with a neat round cardboard ticket with a pretty design upon it like the things that you stick on to the dashboard of your car.

There ought to be a law that the licence should be carried in a holder stuck in the buttonhole or slung on the watch chain. Then one would know. There would be no risk of offending susceptibilities by unfortunate remarks.

The Experimenter's Undertaking.

Such a marking of men would save you, for instance, from putting temptation in the way of the genuine experimenter, who has subscribed to the dread covenant, by suggesting that he should entertain you with music from a broadcasting station. Ah, my friends, I foresee that there will be grave trouble over that undertaking ere we are done with it!

WIRELESS WAYFARER



The Control Room at St. Assise, with switchgear in the foreground and aerial tuning inductance in rear.

A REGENERATIVE REFLEX RECEIVER

This compact receiving set, built by Mr. H. B. Phelps, of America, gained the first prize in a recent competition amongst American wireless experimenters.

THE receiving set illustrated in Figs. 1 and 2 was designed primarily for receiving broadcast music, and in selectivity and signal strength excels an ordinary regenerative set. It is a combination of the regenerative and reflex circuit, employing a single-turn coupling between the aerial and secondary circuits, a very tight reaction coupling and a tuned high-frequency transformer.

Fig. 1 is a front view of the panel showing the two selector switches, upon the left and right respectively, for tuning the aerial circuit and the secondary of the high-frequency transformer. Of the two knobs provided with engraved dials, that on the left varies the reaction coupling, and that on the right the capacity of the secondary condenser. Each of these, it will be noted, is provided with a vernier adjustment. The remaining knob, situated centrally between the last-named con-

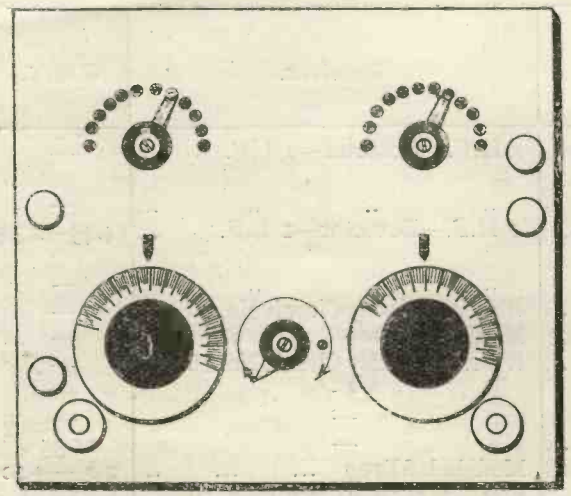


Fig. 1.—A front view of the panel.

trols, actuates the filament rheostat. Fig. 2 shows how the various components are disposed at the back of the panel, whilst the circuit diagram, Fig. 3, shows the complete circuit arrangement.

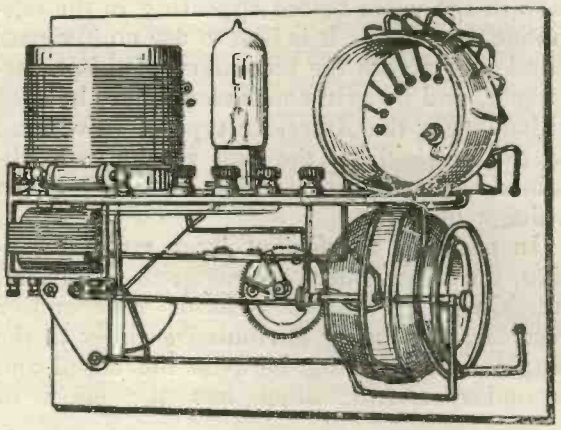


Fig. 2.—Disposition of the components as seen from back of panel.

The aerial circuit is tuned by the tapped inductance coil L_1, which consists of 48 turns of No. 22 S.W.G.-d.c.c. copper wire wound upon a $3\frac{1}{2}$ in. diameter former and tapped at every fourth turn. Connected in series with this inductance is a single loop of stout wire L_2, which is coupled to the secondary inductance by being wound around the outside of the variometer, as shown in the lower right-hand corner of Fig. 2.

The secondary inductance L_3 is the outside or stator winding of the variometer, and, in parallel with it, is the variable condenser C_1, capacity 0.00025 μF. The variometer rotor functions as a reaction coil, indicated at L_4 in the circuit diagram.

The high-frequency transformer T_1, which transfers the high-frequency energy from the plate circuit to the crystal detector, is made by winding 53 turns of No. 22 S.W.G.-d.c.c. copper wire upon a $3\frac{1}{2}$ in. diameter former, tappings beng taken at every 3rd turn, beginning with the 20th—*i.e.*, 12 tappings in all, connected to the contact studs of the

selector switch. This transformer will be seen upon the left-hand side of the shelf in Fig. 2.

The crystal detector, a zincite-tellurium couple mounted upon the same shelf and alongside the H.F. transformer, is connected in series with the iron core step-up transformer T_2 and shunted across the fixed condenser C_2. The primary of the iron core transformer is provided with a bye-pass condenser, C_3, capacity 0.0001 μF.

The rectified signals are fed back into the grid circuit through this iron core transformer, and undergo low-frequency amplification in the valve before appearing in the telephone receivers. It is best to use no bye-pass condenser across the secondary of this transformer, and no grid condenser should be used either. For the American type of valve used in the original set the best results were obtained when the high-tension battery B_2 had a voltage of 45.

In addition to efficient long range reception, the arrangement affords great selectivity, much more so than a 3-circuit regenerative receiver, this being attributed entirely to the single turn coupling between the aerial and secondary circuit, which has the effect of reducing practically to zero value, the capacitive coupling which in ordinary couplers broadens the tuning.

Another advantage of the single turn coupling is that the set may be allowed to

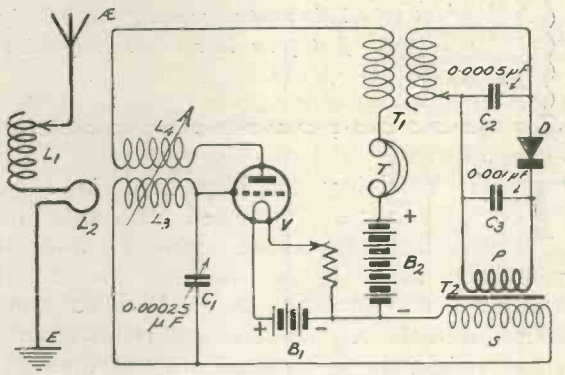


Fig. 3.—Circuit arrangement of the receiver.

oscillate without disturbing neighbouring receiving sets by radiation. The reason for the very slight radiation is the high ratio between the secondary inductance L_3 and the single loop L_2, which gives a decided step-down effect and makes the voltage applied to the aerial very low.

AMERICAN BROADCAST RECEPTION.

Further reports received from our readers.

Date.	Call-Sign.	Wave-Length in metres	Name.	Town.	Receiver.	G.M.T.
24-9-23	WEAF	400	N.	Birkdale, Southport.	2 H.F.—Detector—1 L.F. ...	—
,,	WIP	485	,,	,,	,, ,, ,, ...	—
,,	WJZ	360	M.V.P.	Kew Gardens, Surrey.	1 H.F.—Detector—1 L.F. ...	11.45—2.30
,,	WMAF	,,	,,	,,	,, ,, ,,	—
,,	,,	,,	J.G.R.	Glasgow ...	*Wireless Weekly* Circuit No. 16 ...	—
25-9-23	WGY	400,485	J.O.J.H.	Edmonton, N.18	Modified ST100	—
,,	,,	,,	J.G.R.	Glasgow ...	*Wireless Weekly* Circuit No. 16 ...	—
,,	,,	,,	R.G.B.	Loughborough	—	—
,,	WLAF	300	,,	,,	—	—
,,	,,	360	,,	,, ...	—	11.35
,,	WJZ	,,	J.O.J.H.	Edmonton, N.18	Modified ST100	2.0 —3.20
,,	WMAF	,,	J.G.R.	Glasgow ...	*Wireless Weekly* Circuit No. 16 ...	—
26-9-23	WGY	400,485	S.W.H.	Colchester ...	1 H.F.—Detector—1 L.F. ...	1.0 —3.0
,,	,,	,,	J.O.J.H.	Edmonton, N.18	Modified ST100.	1.16—2.25
,,	,,	,,	J.B.	Lewisham, S.E.	Detector	1.40—3.02
,,	WMAL	360	B.D.B.	Kirkdale, Liverpool.	1 H.F.—Detector—1 and 2 L.F.	0.3 —1.30

News of the Week

THOSE holders of experimental licences who have any doubts as to whether they may or may not use their apparatus for the reception of Broadcast programmes, except for experimental purposes, should note that the only experimenters who are being called upon to sign the form of Declaration are those who apply for *new* experimental licences at 10s. per annum. There is no present intention of disturbing *existing* experimental licences. In the case of *new* experimental licences the payment of an extra 5s. (15s. total) waives the question of the Declaration.

□ □ □

We learn from Reuter's News Service that it will not be long before Norway follows the example of other nations and enters the arena of broadcasting. In a lecture at Trondhjem the Director of Telegraph Services stated that the final recommendations for the issue of a broadcasting concession to a Norwegian firm would, in the course of a few days, be submitted to the proper department. For some time past negotiations have been in progress between the telegraph department and the firm in question, and it is now practically certain that a full agreement has been arrived at upon all disputed points.

□ □ □

We note that the Electrical Federation of Victoria has decided to hold an Electrical Exhibition at Melbourne, Australia, during September, 1924. The Exhibition will be designed to cover every phase of electricity and its uses, inclusive of wireless telegraphy and wireless telephony.

□ □ □

Members of the National Association of Radio Manufacturers are prepared to credit their trade customers with the difference between the old B.B.C. tariff and the scale now in force in respect of sets in stock on October 1, 1923, to which the B.B.C. tariff applies. Trade buyers desirous of claiming such credit must lodge the claim with the respective suppliers of the set on or before November 10, 1923, after which date no further claims will be entertained; each claim must be accompanied by a certificate that the sets were actually in stock on October 1, 1923. Trade buyers should apply to their suppliers for the necessary forms of claim.

□ □ □

According to the *Times*, in response to a request put forward through the Navy Welfare Conference that telegraphist ratings might be given facilities in the Service to qualify for the P.M.G.'s certificate, a course of five working days is to be instituted at all three naval depots for men in their last two years of service who have not taken certain qualifying courses mentioned by the Admiralty within the last two years, or who have failed to take the opportunity of sitting for the P.M.G.'s certificate after such courses. In the event of the necessary facilities not being available at any time at Devonport or Chatham, men are to be sent to the Signal School at Portsmouth to undergo the five-day course.

At the forthcoming All-British Wireless Exhibition, the Radio Society of Great Britain has very kindly allotted a part of their stand for the exhibition of radio apparatus made by pupils from schools which are members of the Schools Radio Society. This should prove an attractive feature, as it will give the public some idea of the advanced stage wireless has reached in schools. All schools wishing to exhibit apparatus should join the Schools Radio Society without delay.

Members of the above Society can obtain tickets at the reduced fee of 9d. each by applying to the Hon. Secretary, Mr. R. J. Hibberd, of Grayswood School, Haslemere.

□ □ □

We note that at a recent meeting of the Radio Association held in Dublin the appearance of the words " instruments or parts made in Great Britain and Northern Ireland " in the new agreement, thereby emphasising the exclusion of those made in Free State Ireland, was discussed by members. Prof. Lyons, the President, expressed a hope that Ireland would manufacture its own apparatus. Mr. Hancock, President of the Institute of Electrical Engineers, argued that there is no chance of wireless apparatus being manufactured or even assembled in Free State Ireland. The great factor would seem to be the attitude of the Government in regard to tariffs. We are watching with considerable interest the broadcasting developments in the Irish Free State.

A COMPACT VARIOMETER

By B. JACKSON.

Constructional details of an easily made and very useful component.

THE variometer herein described, although occupying only a space of $2\frac{3}{4}$ in. by $2\frac{3}{8}$ in. upon a panel, covers a range of wavelengths from about 250 to 700 metres. It is simple to make, and costs very little for the materials, which are as follows :—

- 2 pieces of hard wood $2\frac{3}{4}$ in. by $2\frac{3}{8}$ in. by $\frac{1}{4}$ in. thick.
- 6 lengths of 2 B.A. screwed rod, each $3\frac{3}{4}$ in. long.
- 18 No. 2 B.A. nuts.
- 1 piece of cardboard tube, 2 in. in diameter by $2\frac{1}{4}$ in. long.
- 2 wooden plugs, to fit the cardboard tube.
- 2 small condenser spacing washers.
- 2 condenser spindle bushes.
- 4 ounces (approx.) No. 24 S.W.G.-d.c.c. copper wire.

The two pieces of hard wood are first cut to shape and drilled as shown at A in Fig. 2, to form the stator end pieces. The two condenser bushes, having been coated upon the outside with shellac, are pressed firmly into the centre hole to form bearings for the rotor spindles. The two wooden plugs for the rotor are then drilled and tapped, and a length of 2 B.A. brass rod is shellaced at the end and screwed tightly into each until about $\frac{1}{4}$ in. projects on one side, as shown at B in Fig. 2.

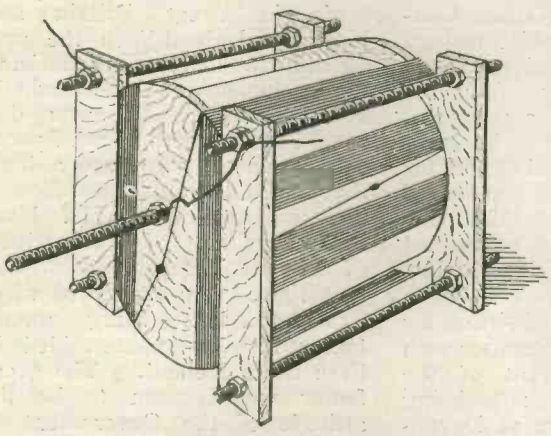


Fig. 1.—The completed variometer.

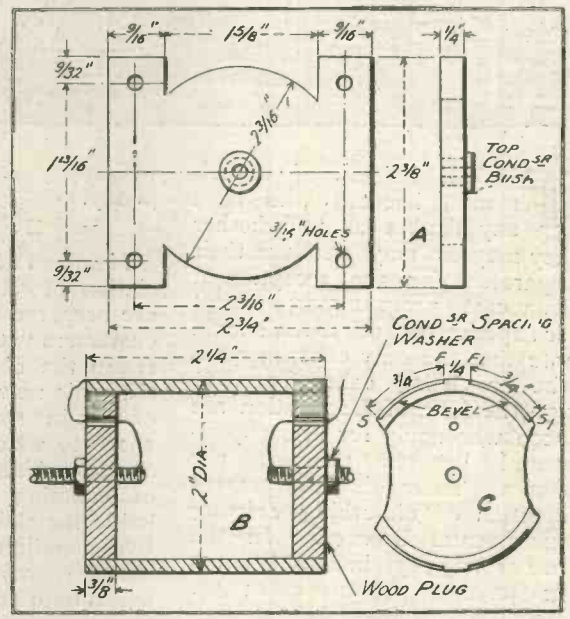


Fig. 2.—Constructional details of the variometer.

The 4 ounces of wire is next to be halved, approximately, one end of each section is to be passed through the small hole in one of the wooden plugs, and soldered to the spindle. The plugs are then to be shellaced and fitted into the end of the cardboard tube, being made additionally secure by means of two or three panel pins, passing through the cardboard into the wooden plugs.

The edges of the cardboard tube or rotor former having first been bevelled as shown at C, in Fig. 2, to prevent the wire from slipping, 24 turns of wire are to be wound upon each side of the rotor former, commencing at F and F_1 and finishing at F and F_1 respectively. (See Fig. 2 C). The direction of the winding is to be the same from start to finish. This applies to both rotor and stator windings. The finishing ends of each half winding are to be soldered together at the centre, and the whole is to be given a good coat of shellac varnish and left to dry.

(Concluded on page 592.)

CHARGING ACCUMULATORS AT HOME.

By R. W. HALLOWS, M.A., Staff Editor.

The following article shows how to overcome one of the principal difficulties attendant upon the use of a valve set.

THOSE readers who are fortunate enough to have a direct current electric supply should instal a small charging board, so that they may attend to their own accumulators, rather than consign them to the tender mercies of the local garage. If you charge your own secondary batteries, they are always under your eye. You

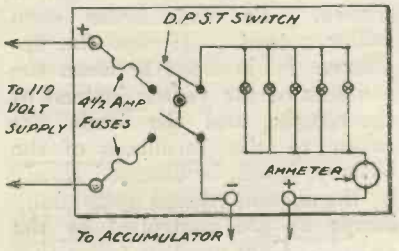


Fig. 1.—Showing connections of charging board.

can see that the gravity of the electrolyte is exactly what it should be, and as the charging station is so near by, there is no excuse for allowing them to remain for more than a few hours in a discharged state. The saving in expense is also very considerable, especially if the necessary parallel lamps are so contrived that they are part and parcel of the household lighting arrangements.

The actual board is a very simple affair indeed. It can be made by anyone at a cost of less than a sovereign.

The panel is a piece of ¼-in. ebonite 18 in. by 8 in., mounted upon a suitable wooden base. The drawing shows the lay-out; actual dimensions are not given, since these will vary according to individual needs.

At the left-hand side are two large terminals, to which the mains are connected. It is extremely important that the polarity should be correct, otherwise the accumulator will be discharged violently and plates will become buckled. Find the polarity by means of pole-finding papers, or by immersing leads from the mains—with a lamp, of course, in series—in a solution of salt and water. The lead which produces the most bubbles is the negative.

Between these terminals and the double-pole, single-throw switch are fuses the carrying capacity of which exceeds by 50 per cent. the maximum charging rate. In the drawing their value is given as 4.5 amperes, suitable for charging at 3 amperes.

The negative terminal of the switch leads direct to the output terminal, to which will be attached the negative terminal of the battery. From the positive end of the switch a lead runs to five ordinary lampholders wired in parallel. Their lower ends, connected to a common wire, pass *via* an ammeter to the positive output terminal of the board.

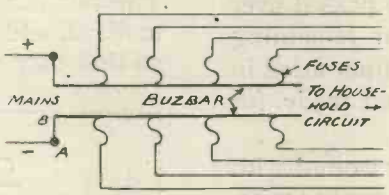


Fig. 2.—Usual wiring of household switchboard.

The first point to notice is that the fuses are on the mains side of the board. The object of this is to provide a safety cut-out should anything go wrong with the switch. A momentary overload of 50 per cent. will do no harm to the accumulator.

The lamps act simply as resistances. If we connected the accumulator directly to the mains, an enormous current would pass. The internal resistance of the accumulator would not be more than .6 ohm, and if a 6-volt accumulator were run down to an E.M.F. of 4.5 volts, the current would be as follows:—110 volts from the mains, less 4.5 volts,

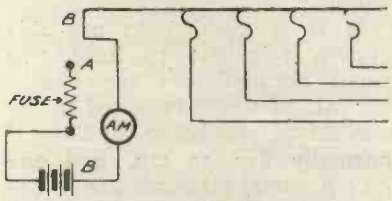


Fig. 3.—Method of charging accumulator from house mains, utilising the household lights.

equals 105.5 volts. Then $\frac{105.5}{0.6}$ 176 amperes, which would suffice to destroy even the most robust accumulator in a matter of seconds.

If we use carbon filament lamps, which pass far more current than any others, we may take their consumption at 4 watts per candle-power. With a 10-candle-power lamp in each holder, this represents a total consumption of 200 watts. To find the amperage, we divide by the E.M.F.; therefore $\frac{200}{110} = 1.8$ amps., which is the amount of current passing through the bank of lamps.

This will suffice for small accumulators; but for large ones it is better to use a greater current. If we use 15-c.p. lamps, the total wattage will be 300,

which gives a charging current of 2.7 amps. Or if we want to charge a large accumulator rapidly, we can insert 25-c.p. lamps (and stouter fuses), and obtain a current of 5.5 amps. The ammeter (A in the drawing) will show exactly what current is being supplied to the battery under charge.

It has already been mentioned that the greatest economy is achieved when the lamps used for charging form part of the household lighting circuit. In this case the diminution in the brilliancy of the lamps is so small as to be unnoticeable; hence, if the accumulator is put on charge whilst the ordinary lamps are in use, the cost is literally nothing. Most of us use metal filament lamps nowadays for lighting purposes. They are very much more efficient than carbon lamps, the wattage being about one per candle-power.

If it is decided to use this system it is best to have two small accumulators the charging rate of which is suited to the current of the house. Thus if normally five 30 c.p. and one 50 c.p. metal filaments are in use the wattage will be 200, which as calculated above gives a charging current of 1.8 amps. Accumulators of from 40 to 60 ampere hours capacity would be suitable for this rate. One is kept on the set whilst the other is charging. In this way the battery is steadily charged at a low rate and is never completely run down.

To charge in this way we make use of the household switch board, the wiring of which is usually as in Fig. 2. Each of the main terminals is connected to a busbar between which, and the

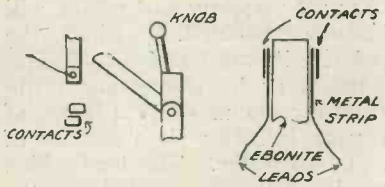


Fig. 4.—Details of the tumbler switch arrangement.

leads running to the various household circuits, are fuses.

If now we disconnect the connection between the negative terminal (A) and the point B we can insert the accumulator as shown in Fig. 3. We shall thus be making use of the whole of the household lights, the current passed by which we can calculate, besides measuring it with an ammeter (A.M.). We do not need a charging board since we have the household lamps, and fuses are already provided; but to make assurance doubly sure we can place a fuse of appropriate maximum load in series with each of the leads to the battery.

There is a very simple and useful tip for charging small accumulators slowly. If you screw off the top of the switch on one of your walls you will find that it has two metal contacts (Fig. 4) between which a tongue is forced when you turn over the knob. Cut out a piece of $\frac{1}{4}$ in. ebonite to fit in between these contacts, and to each edge of it attach a strip of sheet brass by means of countersunk 4B.A. screws. To each brass strip solder a lead. If now the appliance is inserted between the contacts of the switch instead of the tongue, and the leads are taken to the terminals of the battery, it will be charged slowly by the current passed by as many lamps as are controlled by the switch. Care must be taken that the polarity be correct, as before mentioned. R. W. H.

A COMPACT VARIOMETER.

(*Concluded from page 590.*)

When thoroughly dry a small spacing bush and one stator end piece is to be passed over each rotor spindle, and the four remaining lengths of 2 B.A. rod and eight nuts fitted in position and the whole assembled ready for the stator winding.

Each side of the stator is to be wound with 24 turns of No. 24 S.W.G.-d.c.c. copper wire, in a similar manner to the rotor, the starting end of one side being soldered to one of the brass securing rods, and the starting end of the other side being soldered to one of the rotor spindle bushes. The finishing ends are then to be soldered together at one end, and a connection made from the remaining rotor spindle to another of the brass securing rods. The two rods to which connections have been made should be provided with additional nuts so that they will serve as terminals.

CORRESPONDENTS.

We shall be pleased to hear from readers in the Cardiff, Bournemouth, and Aberdeen districts, who, possessing the necessary wireless and journalistic qualifications, would be prepared to act as our Broadcasting correspondents.

THE ALL-BRITISH WIRELESS EXHIBITION

This Exhibition, which, it is confidently believed, will be the best the wireless industry have had, will be held at the White City, Shepherds Bush, W.12, from November 8th to 21st.

LIST OF EXHIBITORS AND STAND NUMBERS.

	No.
Abbey Industries, Ltd.	85
Amalgamated Press, Ltd.	51
Ashley Wireless Telegraph Co., Ltd.	84
Aucklands Wireless, Ltd.	77
Auto Sundries, Ltd.	41
Autoveyors, Ltd.	16
Belmont Rose	63
Ball, T. C.	23
Beldam Tyre Co., Ltd., The	34
Bowyer-Lowe Co., Ltd., The	6
British Ebonite Co., Ltd.	59
British L.M. Ericsson Mfg. Co., Ltd.	104
British Thomson-Houston Co., Ltd.	99
Brown Bros., Ltd.	12
Brown, S. G., Ltd.	102
Burndept, Ltd.	75
Burndept, Ltd.	112
Burns, J., Ltd.	46
Canadian Brandes, Ltd.	66
Cassell & Co., Ltd.	29
Chambers, L. J., & Co.	48
Chloride Elec. Storage Co., Ltd.	7
Climax Patents, Ltd.	25
Coomes, J. A., Ltd.	91
Cossor Valve Co., Ltd.	56
Darimont	71
Davenport Wireless, Ltd.	35
Day, Bertram & Co., Ltd.	73
Diamond Wireless, Ltd.	9
Dubilier Condenser Co., Ltd.	106
Dubilier Condenser Co., Ltd.	107
Eagle Engineering Co., Ltd.	52
Economic Car Light, Ltd.	10
Edison Swan Electric Co., Ltd.	87
Elwell, C. F., Ltd.	111
Ever Ready Co., Ltd., The	1
Falk, Stadelmann & Co., Ltd.	79
Fallon Condenser Co., Ltd.	11
Fuller's United Electric Works, Ltd.	27
Gamage, A. W., Ltd.	81
General Electric Co., Ltd.	103
General Radio Co., Ltd.	74
Graham, A., & Co.	113
Great Motor Ballot	21
Hart Accumulator Co., Ltd.	32
Hart, Collins, Ltd.	24
Harwell, Ltd.	44
Hazeltine Neutrodyne Radio Sets, Ltd.	43A
Henderson, W. J., & Co.	2
Hestavox, Ltd.	3
Heath, J. E., Ltd.	36
Igranic Electric Co., Ltd.	43
Jones, Sydney & Co.	19
McClelland, J., & Co., Ltd.	26
McDonald, J., & Co.	28
McMichael, Ltd.	83
Marconi Scientific Instrument Co., Ltd.	57
Marconi's Wireless Telegraph Co., Ltd.	101
Marconi's Wireless Telegraph Co., Ltd.	110
Marshall, Percival & Co.	22
Metropolitan Vickers Co., Ltd.	98
Mullard Radio Valve Co., Ltd.	90
National Wireless & Elec. Co., Ltd.	30
Newnes, Geo., & Co., Ltd.	45
Odhams Press, Ltd.	15
Penton Engineering	69
Peronet	20
Peto Scott Co., Ltd., The	42
Preen, A., & Co.	4
Pye, W. G., & Co.	92
Radiax, Ltd.	8
Radio Acoustics	68
Radio Communication Co., Ltd.	111
Radio Instruments, Ltd.	105
Radio Press, Ltd.	47
Radio Society of Great Britain	54
Radio Supplies, Ltd.	33
Rewlplug Co., Ltd.	14
Rogers, Foster & Howell, Ltd.	96
Siemens Bros. & Co., Ltd.	76
Solidite Manufacturing Co., Ltd.	37
Sterling Telephone Co., Ltd.	108
Sterling Telephone Co., Ltd.	109
Telephone Manufacturing Co., Ltd.	33
Trader Publishing Co., Ltd.	31
Tudor Radio Co.	70
Vanstone, W., Ltd.	11
Western Electric Co., Ltd.	100
Wilton Wireless, Ltd.	5
Wireless Press, Ltd.	53

THE Exhibition should prove of particular interest to the public generally, and to the amateur and experimenter particularly. It has been organised in conjunction with the National Association of Radio Manufacturers and the co-operative efforts of its members should do much to further the development of wireless in this country.

In addition to catering for the requirements of constructors and experimenters, those who have not yet taken up the fascinating hobby are by no means neglected. There will be a series of interesting lectures and demonstrations, the latter by special arrangement with the B.B.C. Although the purely wireless interest is, of course, the first consideration, ample provision will be made for the comfort and convenience of visitors. The organisation is in the hands of Bertram Day & Co., Ltd., of Charing Cross, S.W.1.

Ashley Wireless Telephone Co. (Stand No. 84).—The principal items of this firm's exhibits will be their "Claritone" loud speaker and new "Claritone" headgear, well designed and extremely comfortable to wear. Another interesting departure will be their new line of component parts, each specially packed in a small carton, together with working instructions, and each carrying the Company's guarantee.

Auckland Wireless, Ltd. (Stand No. 77), are showing a complete range of component parts required by the amateur and experimenter for transmitting and receiving purposes, complete sets of parts for home constructors, and broadcast receiving apparatus ranging from crystal and crystal valve combinations to two- and three-valve receiving sets.

Autoveyors, Ltd. (Stand No. 16), amongst other interesting items, are showing their variable three-electrode condenser, of special interest to the experimenter who is interested in new circuit arrangements.

The Bowyer-Lowe Co., Ltd. (Stand No. 6), are exhibiting their crystal and valve receivers, component parts, wavemeter, wave trap, audibility meter, and many other interesting devices for the experimenter. In particular, the new line of components for mounting upon wood panels deserve attention.

The British L.M. Ericsson Manufacturing Co., Ltd. (Stand No. 104), are showing an interesting line of receiving apparatus, in addition to their well-known headphones and loud-speaker.

The British Thomson Houston Co., Ltd. (Stand No. 99), are arranging to show a complete line of receiving sets in addition to an amplifier specially designed for use with loud-speakers when a comparatively large volume of sound is required.

This amplifier, which is enclosed in an insulating case, approximately 10 inches by 7½ inches by 7 inches, is fitted with especially-designed power amplifying valves (type B4), which operate upon 6 volts and consume only 0.25 amperes. A variety of loud-speakers will also be exhibited, and altogether the Stand should prove very attractive.

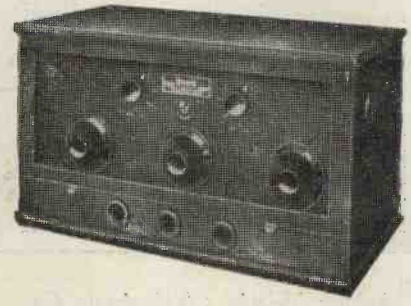
S. G. Brown, Ltd. (Stand No. 102), are exhibiting the latest pattern of their well-known loud-speakers and a complete range of telephone receivers.

Burndept, Ltd. (Stand Nos. 75 and 112).—This firm's exhibit should prove attractive to all visitors interested in wireless, as it provides for the broadcast listener, the home constructor and the experimenter. All Burndept's products, whether complete sets or component parts, are sent out with a written guarantee. In their Ethophone apparatus, primarily designed for broadcast reception, tuner and receiving valves are incorporated, the valves and high-tension batteries being completely enclosed but readily accessible. The new Ultra IV, Mark 2, is specially attractive, a new feature of importance having been introduced by making the last stage of low-frequency amplification a power stage, using a special power valve. Amongst the apparatus which may be assembled by home constructors are a long-range two-valve set, a three-valve set, a speech amplifier and an Ethophone home constructional power amplifier.

The Cossor Valve Co. (Stand No. 56) are showing, for the first time, their new dull-emitter valve, for which many advantages are claimed.

G. Davenport (Wireless), Ltd. (Stand No. 35).—The range of sets exhibited by this company will include a crystal set at the low price of £1 1s., crystal and valve sets, note-magnifiers, and their new regenerative receiving sets, comprising H.F. valves, detector and L.F. valve, with tuned anode coupling and reaction. They will also be showing a new headphone, B.B.C. stamped, of exceptionally light construction, and for which it is claimed that reception is free from distortion.

The Ever Ready Co. (Great Britain), Ltd. (Stand No. 1), will exhibit all kinds and sizes of dry cells and accumulators, particularly their "Hercules" dry batteries for dull emitters.



The Hazeltine Neutrodyne Receiver (Stand No. 43a).

Alfred Graham & Co. (Stand No. 113) will afford visitors an opportunity of seeing their complete range of Amplion loud-speakers, including their latest development, a portable loud-speaker, which in appearance resembles a high-class box camera. This portable loud-speaker is the result of much experimental work, conducted with the object of obtaining maximum sound amplification with improved tonal qualities within the smallest possible limits of space. A telescopic tripod is supplied with the loud-speaker, although, if preferred, the instrument may be placed upon a table or other support.

Hazeltine Neutrodyne Radio Sets, Ltd. (Stand No. 43a).—This company is showing a range of instruments making use of the Hazeltine Neutrodyne circuit, of which they have the sole rights for this country. The circuit design of the instruments follows the invention of Prof. Hazeltine, and the instruments themselves are enclosed in a polished wooden case with sliding glass fronts, all the exterior connections being so arranged that the instrument can be closed up after adjustment has been made.

Igranic Electric Co., Ltd. (Stand No. 43).—Amongst the many interesting components which this firm are exhibiting, are their variometers and variocouplers. Their well-known line of components, including their honeycomb H.F. transformers and screened L.F. transformers, will appeal to constructors and experimenters.

L. McMichael, Ltd. (Stand No. 83), specialise in British-made receiving sets of a high standard of manufacture and performance. Their stand will also contain a varied selection of components and accessories for experimenters and home constructors. Of particular interest to the latter class of visitor will be the home assembly sets of H.F components, characterised by excellent designs and finish.

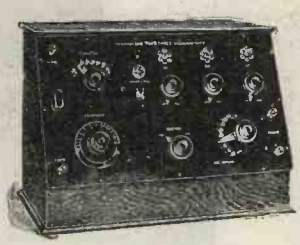
The National Wireless & Electric Co. (Stand No. 30).—In addition to a range of valve sets, and their "Gnat" long range crystal receiving set, this firm is also exhibiting complete sets of parts for assembly, and a line of useful components, such as variometers, condensers, transformers, etc. Their new catalogue will be available at the Exhibition.

Peto-Scott Co., Ltd. (Stand No. 42), are showing their well-known receivers and a new set of components for mounting upon wood panels, so enabling experimenters to dispense with expensive ebonite sheets.

Metropolitan Vickers Electrical Co., Ltd. (Stand No. 98).—The chief features of this firm's exhibits will be their latest improved type of two-valve and four-valve sets, with dual amplification circuits, and the "Cosmos" radiobrix. They will also be exhibiting a new six-valve set with frame aerial, and the "Cosmos" Radiophone crystal set with single-valve and two-valve amplifiers, specially designed to fit into the crystal receiving set. The special circuit now employed in the improved "Cosmos" Radiophone valve set gives excellent results, the performance obtained with two valves being fully equal to that hitherto obtained with three. The "Cosmos" Radiophone two-valve set consists of a two-valve tuner unit, with the necessary batteries and telephones. The addition of a two-valve note-magnifier unit converts this into a four-valve set. Each unit is connected up to the next by a single plug which cannot be inserted wrongly, so that connecting up is simplicity itself. The "Cosmos" radiobrix comprise a comprehensive range of units which will enable the home constructor or experimenter to build up almost any type of receiving set and to try out a variety of circuit arrangements. On this same stand may be seen a six-valve set, comprising three high-frequency amplifying valves, a carborundum crystal detector and three low-frequency valves.

W. G. Pye & Co. (Stand No. 92) are showing a number of very interesting components such as plug-in coils, of extremely low self-capacity, coil-holders, variable condensers provided with vernier adjustment, anti-capacity switches and a system of unit valve panels. In addition to these, they will have on view a range of receiving sets covering ranges from 300 to 3,400 metres, also a two-valve power amplifier.

Radio Supplies, Ltd. (Stand No. 38), are showing a special line of broadcast receiving apparatus, experimental apparatus, and components for home constructors.



The Bowyer-Lowe "Plus Three." Stand No. 6.

The Radio Communication Co., Ltd. (Stand No. 110), are showing apparatus to meet all requirements. Their very latest is their well-known seven-valve receiver, with remote control, fitted into a cabinet which can be supplied in various period styles.

The McMichael Three Valve Receiver. Stand No. 83.

There are also the four- and seven-valve sloping panel and book case sets, already well known. A new feature for this firm is the "Polar" Bloc system which enables a complete receiving set to be constructed in a short space of time, embodying any type or make of apparatus. Further exhibits are the "Polar" Weconomy Peanut valves and equipment and the Polar Specialised Accessories.

Radio Instruments, Ltd. (Stand No. 105), will have a very attractive exhibit in their Lyrian series of four-valve cabinet receivers, with self-contained loud-speaker and high-tension battery. These sets can be supplied in satinwood, silver birch, mahogany, or other woods to suit individual taste. There will also be on view a complete range of valve receiving sets employing from one to seven valves. All of these models are fitted with sloping hinged lids and arranged so that the instrument can be closed with the valves, battery leads, etc., in position. An outstanding feature of all these receivers is their wide range of wavelength, all sets from two valves upwards being suitable for a range of wavelength of from 300 to 4,000 metres, which enables all British and Continental telephony to be received.

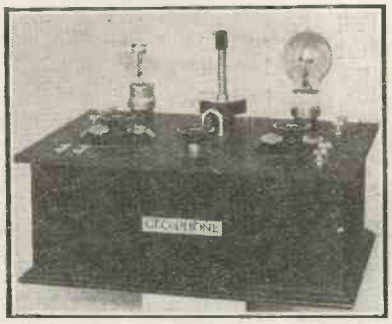
Rogers, Foster & Howell, Ltd. (Stand No. 96), are exhibiting a four-valve "super" set suitable for receiving all British and Continental broadcasting, in addition to their standard range of sets. The home constructor is catered for by many attractive sets of parts, from which crystal or valve receiving sets can be built up with very little trouble.

The Sterling Telephone and Electric Co., Ltd. (Stand No. 109).—This firm's exhibits will include many well-known items, such as the Baby, Standard and Magnavox loud-speakers, their combined valve-and-crystal receiving set, two-valve and four-valve long range receivers. They are also exhibiting their radio unit system, together with a variety of component parts for the experimenter, including a new design of variable condensers, provided with vernier attachment and specially designed to give an even variation in wavelength over the complete scale.

SOME S
THE EX

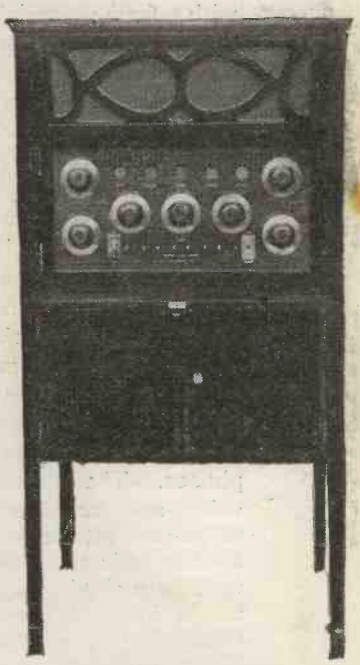
Radio Communication Co.'s Cabinet Receiver. Stand No. 111.

"Cosmos" 2-valve Set. Stand No. 98.

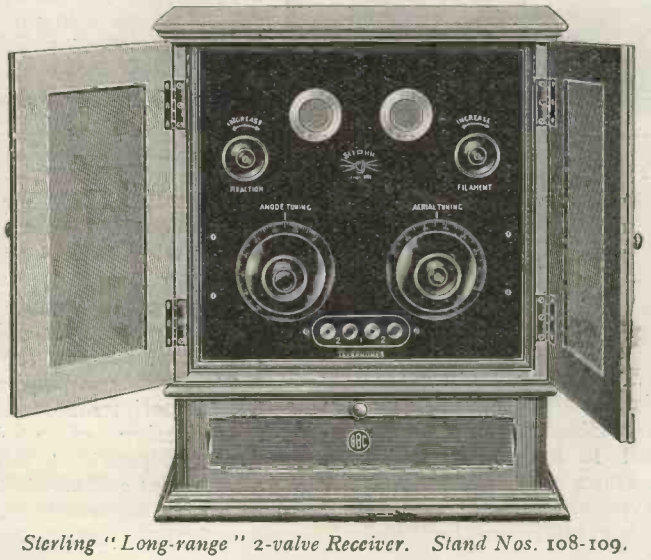


G.E.C. "Constructor's" 2-valve Set. Stand No. 103.

Burndept "Ethophone V." Stand No. 112.

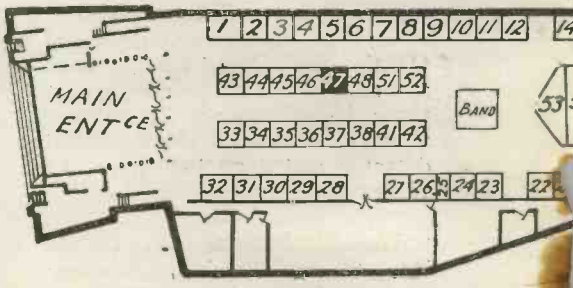


General Radio Co.'s Cabinet Receiver. Stand No. 74.

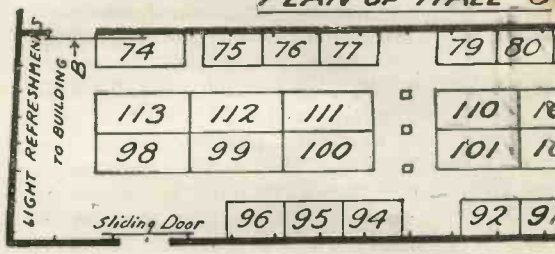


Sterling "Long-range" 2-valve Receiver. Stand Nos. 108-109.

PLAN OF



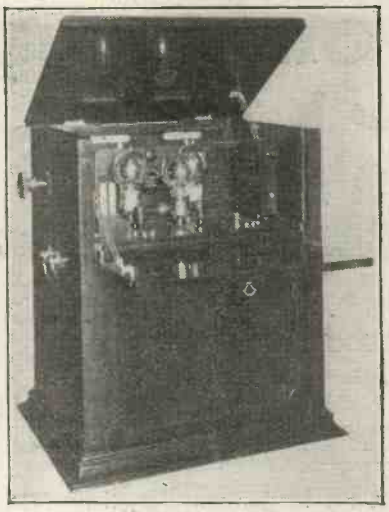
PLAN OF HALL C



ETS AT HIBITION

Marconi Scientific Instruments Cabinet Receiver. Stand No. 57.

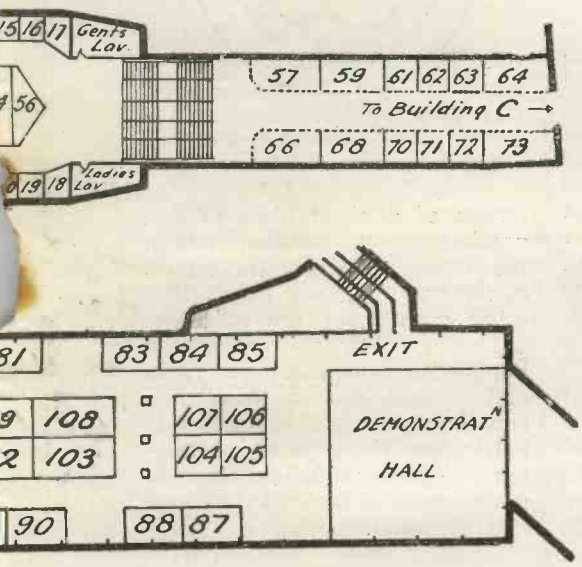
National Wireless 3-valve Receiver. Stand No. 30.



Marconiphone V3. Stand No. 110.

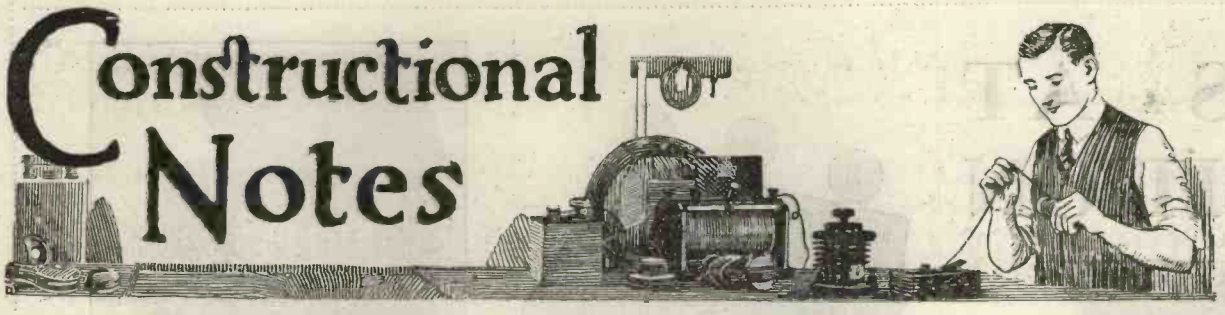
"Aristophone" Receiver by C. F. Elwell. Stand No. 111.

A AND B. HALLS



Radio Instruments 4-valve "Lyrian" Receiver. Stand No. 105.

Constructional Notes



Conducted by R. W. HALLOWS, M.A., Staff Editor.

AN ANODE REACTANCE.

FOR the longer wavelengths the semi-tuned reactance-capacity method of coupling high-frequency valves has many advantages; it is very cheap in comparison with the tuned anode method, it is extremely simple to operate, and its efficiency is high when the anode coil is properly designed. The amount of amplification which is given is somewhat greater than that of the resistance-capacity system.

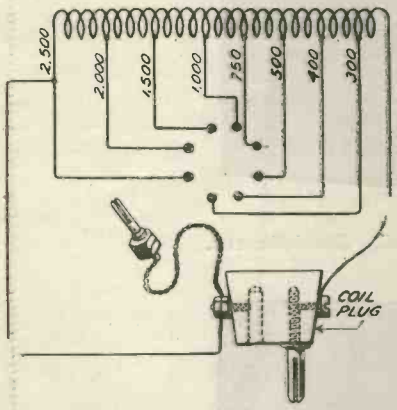


Fig. 1.—Illustrating the connections of the unit.

For an all-wave receiver a good arrangement is to use the tuned anode method of coupling upon the shorter waves, where the utmost amplification and selectivity are wanted, and where the small size of the coils needed makes it reasonably cheap, and upon long waves to use a tapped semi-aperiodic reactance coil, this latter being so mounted as to be interchangeable with the plug-in coils used for the short-wave coupling.

An efficient anode reactance for the waves between 1,000 and 20,000 metres can be quite easily made. Turn for yourself, or have turned for you (it will cost about 2s. 6d.) an ebonite bobbin 3 in. in diameter by ¼ in. thick, with a groove ⅜ in. wide by ½ in. deep in its edge.

The winding consists of 2,500 turns of No. 42 single silk-covered resistance wire in the groove in the bobbin, having tappings taken out at turns numbers 300, 400, 500, 750, 1,000, 1,500 and 2,000. These tappings are taken out to eight valve-leg sockets mounted in a circle upon the bobbin, the variable contact consisting of a valve-pin at the end of a short piece of flex. The connections to the windings, the moving plug, and the standard coil plug upon which the bobbin is mounted are shown in Fig. 1. As will be seen, the method of connection is such that the unused turns are short-circuited. This is essential to success with a coil of this type.

The tappings are brought out through a saw-cut made in the walls of the bobbin for the purpose, and consist of loops in the wire very carefully scraped bare and screwed down under the washers of the valve legs.

A plan of the bobbin is given in Fig. 2, showing the position of the valve sockets, etc. A centre hole (not shown) is required for attaching the bobbin by means of a 4BA brass screw to the coil plug upon which it is mounted. A hole to receive this screw is drilled and tapped in the top of the coil plug, whose position is shown dotted in Fig. 2. The wander-plug is attached by means of a short piece of flex passing through another hole in the bobbin to one of the screws of the coil plug, and the various other connections are made as indicated in Fig. 1. The results obtained on waves between 1,000 and 20,000 metres with this coupling unit are considerably better than those given by resistance-capacity coupling, but do not quite equal those of the tuned anode method.

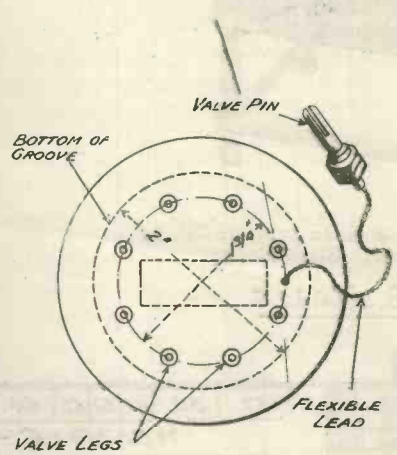


Fig. 2.—Plan of the bobbin.

G. P. K.

A QUICKLY SET DETECTOR.

ONE of the disadvantages of the detector of the usual type is that the search for a really sensitive spot on the crystal may entail quite an amount of trouble. Some crystals are more or less sensitive all over, whilst others, such as galena, have often a few tiny points on their surfaces which give vastly better results than any others. The detector about to be described has several good features: the contact is made not by a single wire, but by several, which greatly facilitates adjustments, since one of the wires is almost bound to be in contact with a "ticklish spot" on the crystal. It is very easy to make, and the cost of doing so is less than 1s. Once set, it is not easily jarred out of adjustment; the insulation is perfect, which makes a big difference to results.

The materials needed are few and inexpensive. All that is required is a 2-inch length of screwed rod (2 BA is recommended), six

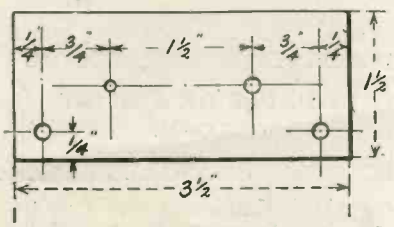


Fig. 3.—A Drilling Plan of the Panel.

hexagon nuts, a 1-inch screw, two terminals, a crystal cup, a thick and a thin strip of brass, about a foot of fine brass wire, and a piece of ebonite measuring 3½ inches by 1½. Fig. 3 shows how the ebonite is marked out and drilled.

In Fig. 4 is seen the way in which the detector is assembled. The drawing is self-explanatory, and the only point that calls for detailed description is the method of mounting the multiple contact. Cut the fine brass wire into ⅝-inch lengths and make them into a bundle, binding them together with a few turns of florist's wire. The binding should stop about ¼ inch above the lower end of the bundle so that the contact wires may spread a little.

Drill a hole near the end of the thin brass strip just large enough to admit the bundle. This hole should be immediately over the centre of the crystal cup when the detector is assembled. Smear the bound end of the bundle with fluxite, and push it into the hole. Now lay a small piece of solder on the brass strip, and hold it with a pair of pliers in the flame of a spirit lamp or a bunsen burner. In

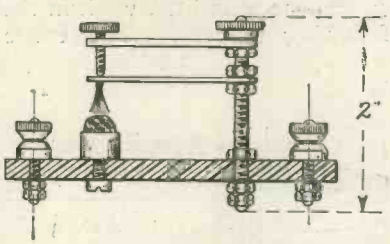


Fig. The Complete Detector.

a few moments the solder will run, binding the tops of the wires into a solid mass, and attaching them securely to the brass strip.

If hertzite, permanite, or one of the other specially treated crystals is used with this detector, searching will be unnecessary, for one wire at least can be relied upon to make contact with a good spot. All that is necessary is to adjust the pressure by means of the screw. Even with galena a sensitive place is usually discovered at once.

R. W. H.

A SIMPLE TELEPHONE SWITCH.

IT is very often the case that the busy experimenter is driven nearly to his wits' end by the constant arrival of visitors who all want to hear the "wonderful music."

Perhaps Jones has asked Smith to come up and assist him to conduct some important experiments. As always happens, his father, mother, sisters, brothers, aunts and any other relatives he might be the unfortunate possessor of, all turn up with *their* friends on the same evening. Courtesy demands that they all get what they have come for, so poor Jones has to turn to and do his duty like a Briton. If he is a wise man (as, of course, all wireless enthusiasts are) he will have a small set rigged up for just that contingency, and also to keep himself popular with his family and their friends. Even with the small set, he has in all probability to twist telephone leads together with bits of wire, which makes an ugly sight of which no self-respecting amateur is proud.

Here then is a simple switch controlling 'phones from one to four. The components required are:—One piece of ebonite about 3½in. × 2in. × ¼in., eight small terminals of the telephone type, a *small* selector switch, such as are used for tapped inductance coils, and five switch studs.

The drilling of the ebonite and the wiring need no explanation, as they may easily be followed from the accompanying drawing. If a telephone condenser is used, it may be connected across the input terminals and secured to the underside

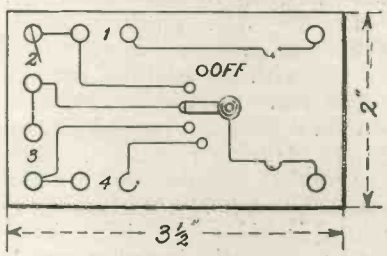


Fig. 5.—The Telephone Switch Panel.

of the piece of ebonite. When complete, the whole should be placed in a suitable box.

It will be seen that the number of telephones in use could be increased *ad infinitum*, but four pairs is a very useful number.

The complete arrangement should be made as small as possible, so that it will not take up room that may be required for more important panels.

L. H.

In connection with our Editorial notice regarding the C.F. Elwell Universal Tuning Unit appearing on page 483 of the Oct. 10th issue, we are advised by the manufacturers that they now have a special loose plug which permits the insertion of any make of British coil into the coil-holder.

Referring to our report on the A.C.H. Variable Condenser on page 515 of Oct. 17th, issue we have to point out that owing to a printer's error the minimum capacity of the condenser tested was given as 0.00015 μF whereas it should have read 0.000015 μF.

CUTTING EBONITE WITH A CHISEL.

THE chisel may be put to several uses from a wireless constructional point of view, a reasonable proficiency being readily acquired with a little practice. Consider such an operation as cutting a slot in an ebonite panel. Ebonite, being quite a different substance from wood, calls for quite different treatment, it being very necessary to proceed slowly and carefully in order to avoid breakage.

In the first place, a chisel should be procured which corresponds with the width of the slot to be cut. Chisels are made in standard widths from $\frac{1}{8}$ in. to 3 in. Having carefully marked the outline of the slot with a steel scriber, hold a steel straight-edge with the left hand along one of the long lines, and, holding the chisel in the right hand with its flat side against the straight-edge, and the cutting edge at an angle of approximately 45 deg. to the ebonite, run the chisel sharply along the straight-edge two or three times. If a little downward pressure from the hand is maintained, the result will be a V-shaped cut. The operation should be repeated in the opposite direction on the other side of the slot, giving a W-shaped cut, and continued in this manner from one side to the other until the ebonite is cut about half-way through.

The same method is repeated upon the reverse side of the panel which has been marked out with great precision. In this way the panel may be cut right through, care being taken to work *inside* the marking lines, as there is always a tendency to overlap. The ends are shaped with short downward cuts, and the slot is finally cleaned up with a small fine file.

H. B.

A CONVENIENT METHOD OF TAPPING COILS.

A VERY neat looking job of tapping tuning coils can be done with little work in the following manner. The entire winding is done first with enamelled wire, which ensures tightness and neatness, after which about $\frac{1}{4}$ in. of the selected turns are scraped of insulation with a knife.

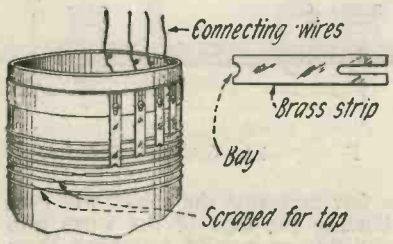


Fig. 6.—Showing how to tap coils by the method described.

The tapping leads are cut from stiff brass ribbon, as shown in the drawing, being about $\frac{1}{4}$ in. wide, with a slot cut in one end, and a bay as wide as the diameter of the wire in the other end. The slot should be wide enough to be slid on to a small screw fastened to the tube by a nut on the other side. The lengths of the strips vary according to the distance of the tapped wires from the screws. The small bay at the other end permits soldering.

In order to bring the contacts exactly on the wires, the former should be bent slightly downward, and slid back and forth under the screws until adjusted. Connecting wires are fastened with another nut on the screws inside the tube. The wires in the drawing are shown spaced only for clearness.

K. L. M.

MATT FINISHING BRASSWORK.

A VERY neat matt finish may be given to small brass parts, terminals, etc., by the process known as "dipping," which may be new to some readers. The *modus operandi* is as follows:—Slip each part to be dipped in a loop of 24- or 26-gauge wire, dip in strong nitric acid and out again, once only. This must be done *as quickly as possible;* the part is then rinsed in hot or boiling water, and dried in sawdust or bran. If it is in the acid for more than one or two seconds, uneven colours will result. (Be very careful not to splash the acid on the flesh or clothes, as it would cause serious burns.) The finish thus obtained is of a pleasing golden tint, with a very fine matt surface, and well repays the slight trouble taken.

S. A. W.

THE USE OF A MITRE BLOCK.

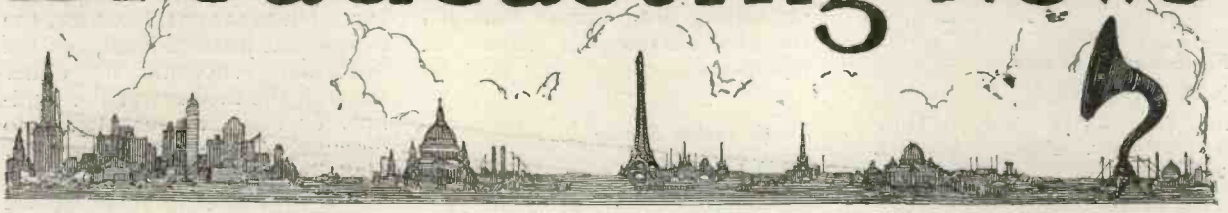
THE simplest type of mitre box is made from a solid block of hard beech wood, cut about 12 in. long and shaped thus L. The top is slotted by means of saw-cuts to various angles, 90 deg. and 45 deg. being most common.

The tenon saw is worked in the usual way between the slots at the desired angle, the wood being very hard, stands the wear and tear. The block is first clamped to the bench ready for use. Where it is desired to join corners cut at an angle of 45 deg., the wood is clamped to the mitre block, the position where the cut is needed being opposite the slot of the desired angle.

The tenon saw is placed in the slot and worked until the wood is sawn through, the resulting cut being a perfectly true angle.

B. H.

Broadcasting News



LONDON.—At the moment the final arrangements for the procession on Lord Mayor's day have not been made. There will, of course, be a wireless car with at least four loud-speakers radiating a performance of the Irish Guards' band, which will be playing at 2LO. The exact scheme about fitting the car has not been arranged, but there is a suggestion that it should be in the form of a bandstand.

□ □ □

The B.B.C. are making elaborate arrangements for the wireless Exhibition. There will be a replica of the studio in the hall and the leading broadcasting artistes will go down to the studio and render their favourite items. The public will thus be enabled to visualise some of the conditions under which broadcasting is done. There will be one hour performances at 11.30 and 3.30, in addition to the usual evening programmes.

□ □ □

Forthcoming Events

NOVEMBER.

7th (WED.)—Wireless Orchestra. Mr. Lee Thistlethwaite. Miss Amy Buxton Nowell. Miss Irene Morris, soprano.

9th (FRI.).—7.30, Mr. Maurice Cole, pianist; Mr. Lyell Johnston, singer. Hawaiian Players. 8.45, Speeches from Lord Mayor's Banquet.

10th (SAT.).—Orchestral Dance programme. Miss Nora Lynn and Mr. James Bolden, duetists; John Henry, entertainer.

11th (SUN.).—Wireless Orchestra and Choir. Miss Yvette Gimblette, contralto; Mr. Stuart Robertson, baritone. Rev. Archibald Reith, M.A.

13th (TUES.).—Aunt Priscilla on "This Week's Film Talk." The English Trio. Miss Carmen Hill, mezzo-soprano; Mr. Norman Notley, baritone. Savoy Orpheans.

14th (WED.).—Birthday of the B.B.C. Wireless Orchestra, conducted by Uncle Jeff and Members of the B.B.C. staff.

□ □ □

ABERDEEN.

Forthcoming Events

NOVEMBER.

8th (THURS.).—Orchestral selections.

9th (FRI.).—Orchestral night, with solos by Miss Marie Stuart and Mr. George W. L. Rae.

10th (SAT.).—Popular Concert.

□ □ □

BELFAST. — The difficulty under which the B.B.C. is labouring in an endeavour to please everybody is exemplified in a communication we have received to the effect that the dance music by the Savoy Orpheans is not by any means popular in Northern Ireland. The music, though good, seems to suffer from super-imposed noises and distortion.

□ □ □

BIRMINGHAM. — It speaks much for the merit of 5IT's operatic performances that the "encore" requests which followed the recent programmes of "Faust" were so numerous that it was decided to postpone "Lohengrin," which had been arranged for Wednesday, November 7th, to enable a repeat performance to be given.

□ □ □

Forthcoming Events

NOVEMBER.

8th (THURS.).—Station Orchestra.

9th (FRI.).—Mr. Wilfred Ridgeway on "The Appreciation of Music."

10th (SAT.).—Station Orchestra.

11th (SUN.).—Rev. D. Waldergrave, Chaplain 8th Battn. Royal Warwicks.

13th (TUES.).—Lloyd's Rhythmic Dance Band and the University Literary and Dramatic Society in Malvolo.

□ □ □

BOURNEMOUTH.

Forthcoming Events

NOVEMBER.

9th (FRI.).—Station Orchestra.

10th (SAT.).—Dance Music.

13th (TUES.).—Augmented Orchestra under Capt. Featherstone, M.V.O., with Mr. Davies' Welsh Choir.

□ □ □

CARDIFF.

Forthcoming Events

NOVEMBER.

8th (THURS.).—Welsh Concert.

9th (FRI.).—The Silurian Gleemen.

10th (SAT.).—Programme by Local Artistes.

11th (SUN.).—Mr. Gilbert Bailey, baritone and Station Orchestra.

13th (TUES.).—"Paolo and Francesca." Station Orchestra.

□ □ □

GLASGOW.—That the programmes broadcast by 5SC are appreciated abroad as well as at home is evident from several letters which have just been received at the Glasgow station. One correspondent, resident in Basle, Switzerland, expresses his pleasure at obtaining such a fine reception of the Glasgow programme, and another, in Camershaven, in Sweden, 800 miles away, states that 5SC's items are more clearly heard than those from any other station. A third writer, a Scotsman, in Madrid, observes that nothing delighted him more than to listen to the

" Scots Night " and to hear the " hoochs " of the members of the wireless orchestra during the dance music.

□ □ □

Forthcoming Events

NOVEMBER.

9th (FRI.).—Mr. Robert Murray, entertainer. Popular Concert.
10th (SAT.).—Popular Concert.

□ □ □

MANCHESTER.—The sixth symphony concert performed from 2ZY and relayed to London, was very successful, as far as the Manchester district was concerned at any rate, and we congratulate the conductor, Mr. Dan Godfrey, junior, A.R.A.M., on an excellent performance of works which have not hitherto been broadcast in this country.

□ □ □

Forthcoming Events

NOVEMBER.

8th (THURS.).—11.30 2ZY trio. 6.30 Girl Guides and Boy Scouts' Bulletins. 6.40, Gothic Architecture in Medæval England, by Mr. G. W. Thompson, of Liverpool. 7.45, Miss J. Lamb, solo violin; Mr. Eric Fogg, solo piano.

9th (FRI.).—3.30, Miss Daisy Ward, contralto; Mr. W. Lomas, tenor; Miss Beatrice Eveline, famous London 'cellist. 6.40, French talk. 7.45, Miss Nora Delmarr, soprano; Mr. Ellinton Shepherd, baritone. 8.15, Piccadilly Picture House Orchestra.

10th (SAT.).—3.30, Oxford Picture House Orchestra. 6.30, Organ Recital, Piccadilly Picture House. 7.45, Miss Elsie Warner, solo violin; Mr. J. C. Whipp, dialect entertainer; Mr. H. Brown, baritone.

11th (SUN.).—Armistice Day. 8.0, Talk to Young People by Mr. S. G. Honey, assistant director, Manchester station. 8.30, 2ZY Orchestra. 9.0, Rev. J. H. Ward, of St. Clements', Salford.

13th (TUES.).—3.30, Oxford Picture House Orchestra. 6.30, Orchestra. 10.0, Miss Mary Ogden, contralto; Mr. Tom Sherlock, baritone.

□ □ □

NEWCASTLE.—Mr. E. L. Odhams is proving highly successful as Director of 5NO, in spite of the many difficulties with which he has had to contend since the introduction of simultaneous broadcasting. This had the effect of completely disorganising programmes arranged for a considerable time in advance.

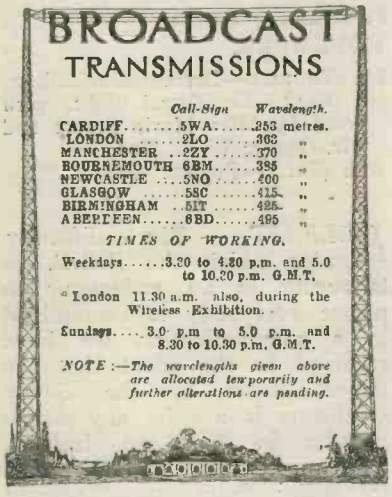
□ □ □

Forthcoming Events

NOVEMBER.

7th (WED.).—3.45, Mr. H. K. Cutchie, piano; Mr. G. Hill, tenor. 7.30, Newcastle Wireless Orchestra; Miss Beatrice Evelyn, 'cello; Miss Nora Delmarr, London, soprano.

8th (THURS.).—3.45, Miss Florence Farrar, pianist; Mr. W. A. Crosse, clarionet. 7.30, Mr. Lang, of Westminster Abbey, tenor.



9th (FRI.).—3.45, Miss Florence Farrar, piano; Mr. and Miss Golightly, vocal duets. 7.30, Miss Hilda Rood, of London, contralto; Mr. John Collinson, London, tenor.

10th (SAT.).—3.45, Mr. W. A. Crosse, piano; Mr. Purves, bass. 7.30, Band of 6th Batt. Northumberland Fusiliers; Mr. Will Knowle, entertainer; Mme. Phyllis Howe, soprano.

11th (SUN.).—8.30, Miss I. Forsyth's Orchestra; Miss Ida Cowey, soprano.

12th (MON.).—3.45, Miss Farrar, pianist; Mme. Evelyn Longstaffe, contralto.

13th (TUES.).—3.45, Miss Gladys Edmondson, pianist; Mr. Fletcher, 'cello. 7.30, Newcastle Wireless Orchestra; Gateshead L. & N.E.R. Temperance Choir.

SHEFFIELD. — The results from Sheffield relay station vary greatly, and for many listeners have been somewhat disappointing. On occasions, however, the experiment justifies itself, but the distortion encountered either through the medium of the land-line, or other causes, tends to discourage the modest tyro. Happily, a change comes once a week with the local broadcast programme, which maintains a standard worthy of the musical reputation of Sheffield.

□ □ □

Simultaneous Broadcasting Events.

NOVEMBER.

7th (WED.).—7.0, News Bulletin and Time Signal. 7.10, Mr. Archibald Haddon, Dramatic Critic; News and Views of the Theatre.

8th (THURS.).—7.10, Mr. Percy A. Scholes, Musical Critic. 7.20, Radio Society of Great Britain; Talk. 7.30, Shakespeare Evening. 10, Dance Music by the Savoy Orpheans.

9th (FRI.).—7.10, Mr. G. A. Atkinson, B.B.C. Film Critic. 8.45, Speeches at the Lord Mayor's Banquet.

10th (SAT.).—7.10, Mrs. Kendall; the League of Remembrance.

11th (SUN.)—11 (approximately), Ceremony at the Cenotaph, Whitehall. 3.0-5.0, Trafalgar Square Meeting. Speakers: The Prime Minister, Viscount Grey of Falloden, the Hon. Stanley Bruce (Australian Prime Minister), Miss Margaret Bondfield, J.P., Rev. H. R. L. Sheppard, M.A. The Massed Bands of the Coldstream and Welsh Guards. 9.45, Sir Hall Caine, Address on " Peace."

12th (MON.).—7.10, Mr. John Strachey, Literary Critic, Weekly Book Talk. 7.30-9.10, All English Symphony Concert. 9.45, Continuation of Symphony Concert.

13th (TUES.).—10.0, Savoy Orpheans —Dance Music.

14th (WED.).—7.10, Mr. Archibald Haddon, Dramatic Critic, News and Views of the Theatre. 7.30-10.30, The B.B.C. Birthday. 9.0, Mr. J. C. W. Reith (General Manager B.B.C.), the Year's Work. 9.10, Senatore Marconi, G.C.V.O., LL.D., D.Sc., M.I.E.E. 9.20, Sir Patrick McGrath (the first journalist to report the success of Marconi's early experiments).

Apparatus we have tested

Conducted by A. D. COWPER, M.Sc., Staff Editor.

A Two-Valve Cabinet B.B.C. Receiver.

THE MANCHESTER RADIO CO., LTD., have submitted a two-valve B.B.C. receiver, of the sloping cabinet or desk type, in a polished hard-wood cabinet fitted with a convenient hinged door behind. The circuit is the customary H.F. and detector, with tuned-anode coupling; a two-coil holder (with fine motion gear—a good point), taking plug-in coils of the ordinary type for anode and reaction respectively, is provided on the left side of the case. A tapped inductance covering from well under 300 to over 1,000 metres, for aerial tuning inductance, with a parallel condenser, is also embodied. Provision for plug-in loading coils is made, the last point on the 7-point tapping switch bringing this into the circuit to cover the longer waves. Separate filament resistances are fitted for each valve, giving, with anode tuning condenser, five controls; in addition, there is a variable reaction control on the tuned anode.

The instrument is of prepossessing appearance, nicely finished, and soundly constructed; it was noted that the components used were of high quality. All controls worked smoothly. A useful point is the provision of telephone transformer for L.R. phones, as well as the usual telephone terminals for H.R. phones.

On trial on a fairly good P.M.G. aerial near London, Birmingham's afternoon transmission was readily tuned in at good strength in the phones. Later, 2LO came in at very reasonable loud-speaker strength, and after dark the Ecole Supérieure, Glasgow, and Newcastle were clearly audible in the loud-speaker across a small room, whilst London was transmitting, and free from interference. Cardiff came in as strong, and Manchester was also picked up.

The Radio Instruments version of the ST100.

On putting in the requisite coils, Radiola was easily found, and distinct in the phones through bad jamming. The receiver was found to be as selective as could be expected with such a simple circuit, but tuning would not be easy without some experience or without a wave-meter, as there is no scale to guide one in searching. Hand capacity effects were quite noticeable with the anode condenser adjustment on distant signals; the remedy would be easy to apply. Another minor point is the rather exposed position of the valves, for domestic use.

In all, a sound and efficient receiver of the semi-experimental type, but sufficiently self-contained and free from trailing wires, etc., for family "gramophone" use.

Set of ST100 Components.

Radio Instruments, Ltd., have submitted for inspection their set of components for the use of the home constructor, to make up into an elegant and self-contained version of the ST100 circuit. All the components fit on to an ebonite panel, which forms the top of a polished box.

The panel itself is already finished, drilled and engraved, the positions of the components thereby being already determined. These components submitted were of the highest quality, filament resistances and condenser handles, *e.g.*, having that silky feeling in operation that bespeaks good workmanship, whilst two of the well-known R.I. intervalve transformers were also included. A blue-print is given with the set with diagram of connections. Much thought had evidently been expended in arranging the parts in so compact and practical order. The crystal detector is of a form already noticed in these columns, on the R.I. crystal receiver.

A two-coil holder and Nos. 50 and 75 Igranic coils are provided for broadcast reception.

There is no doubt that this will make up into an exceedingly efficient and handsome receiver.

Mainly about Valves

Our Weekly Causerie written by the Editor.

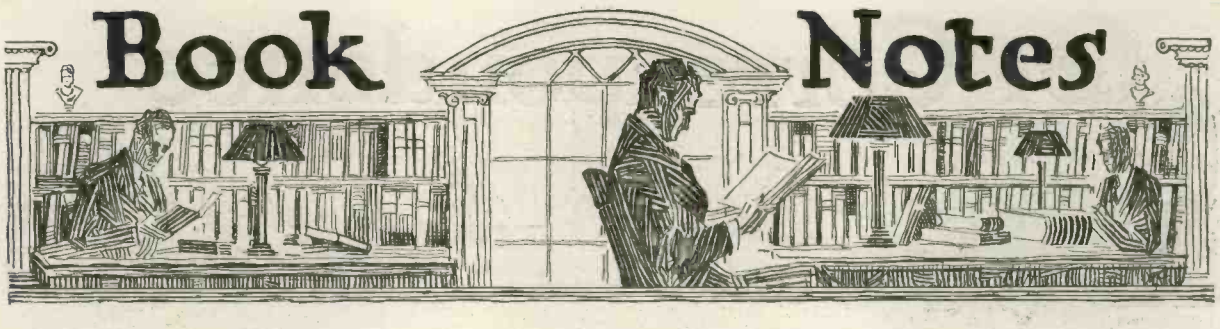
More About Reaction.

A VERY important point in connection with reaction receivers is that whenever the reaction is altered the tuning will also be altered. There are two effects which should be noticed; firstly, when there is no reaction, tuning is much coarser and signals may come in equally well when the condenser is set at anything from, say, 40 degrees to 45 degrees. Working say, with the adjustment at 45 degrees, as we introduce reaction, selectivity becomes very much sharper, and, in fact, the circuit will become selective at a wavelength a considerable number of metres above the wavelength of the incoming signals—the result being that signals become weaker, instead of stronger. After increasing the reaction, the experimenter will find that he will usually have to reduce the value of his condenser reading. When the new adjustment has been found, the circuit in which reaction has been produced, for example, a tuned grid circuit or a tuned anode circuit, should be particularly responsive to the incoming wavelength.

Another important effect is that as reaction is increased, the wavelength to which a given circuit responds increases. If, for example, a circuit is normally tuned to 363 metres without reaction, as the coupling is increased, the wavelength will increase from, say, 363 metres to 400 metres. The application of reaction, therefore, without a corresponding readjustment of tuning, usually results in a decrease of signal strength.

I have found that when working on the broadcast wave band an average increase of 50 metres wavelength is obtained, but this change will depend largely on the size and nature of the reaction coil. I am, personally, in favour of small reaction coils when untuned, but in the case of honeycomb coils, we have, unfortunately, to use a relatively large coil in order to get sufficiently tight coupling. Whereas a 35 turn coil is ample in the case of an ordinary tubular coil, when a honeycomb coil is used for producing reaction, one having about 75 turns is necessary. This is one of the disadvantages of honeycomb coils, and the experimenter must remember when using such coils that the right value is essential. A No. 100 coil, for example, will not give as good results on the broadcast wave band as a No. 75 coil. When coils of smaller numbers are employed, insufficient reaction is usually obtained.

The disadvantage of having a large inductance is that the natural wavelength is usually close to that of the signals to be received, and owing to the capacity coupling effect mentioned above, the valve may readily burst into oscillation to one side or other of the adjustment on which the incoming signals are being received. This effect has already been explained in these notes.



How to Make Your Own Broadcast Receiver. (Radio Press Series No. 3, 1s. 6d.)

This book, by John Scott-Taggart, F.Inst.P., Editor of *Modern Wireless* and *Wireless Weekly*, in addition to dealing in a lucid manner with the essential theory of wireless, describes the construction of several simple receiving sets, the constructional work involving only the use of simple tools.

The Construction of Crystal Receivers. (Radio Press Series No. 6, 1s. 6d.)

A handbook by Alan L. M. Douglas, devoted exclusively to crystal receivers. In addition to constructional details of various types of sets, from simple broadcast receivers to long distance sets, details are given regarding the conversion of the well-known Mark III tuner.

Pictorial Wireless Circuits. (Radio Press Series No. 8, 1s. 6d.)

This handbook, by O. J. Rankin, aims at overcoming the difficulty experienced by many beginners in understanding circuit diagrams. Instead of the conventional diagrams, the numerous circuits are illustrated pictorially, the actual components and the connecting wires being plainly shown.

Radio Valves and How to Use Them. (Radio Press Series No. 12, 2s. 6d.)

This handbook is written by John Scott-Taggart, F.Inst.P., in a popular style, and takes the form of questions and answers on the valve. It deals with all the points usually raised by the student and experimenter, and is particularly well illustrated. To some extent this book may be considered a sequel to "Wireless Valves Simply Explained," by the same author.

---

500 Wireless Questions Answered. (Radio Press Series No. 13, 2s. 6d.)

This handbook is the joint work of G. P. Kendall and E. Redpath, and it deals with exactly 500 difficulties commonly met with by experimenters. The questions and their solutions are arranged in sections, numbered and well indexed, so that advice upon almost any wireless problem is readily obtained.

Twelve Tested Wireless Sets. (Radio Press Series No. 14, 2s. 6d.)

To anyone desirous of building his own receiving set, this handbook, by Percy W. Harris, Assistant Editor of *Modern Wireless*, offers an excellent selection of designs, with full and thoroughly practical constructional details of each. A chapter is also devoted to the design and construction of wave traps.

More Practical Wireless Circuits. (Radio Press Series No. 15, 3s. 6d.)

This handbook is really a continuation of "Practical Wireless Valve Circuits," and is by the same author. All the latest developments in valve circuits are fully dealt with, and a very useful feature of the previous book, namely, the description and criticism of each circuit is retained. The necessary values are given of the components in the various circuits, each of which has been tested and proved.

Home-built Wireless Components. (Radio Press Series No. 16, 2s. 6d.)

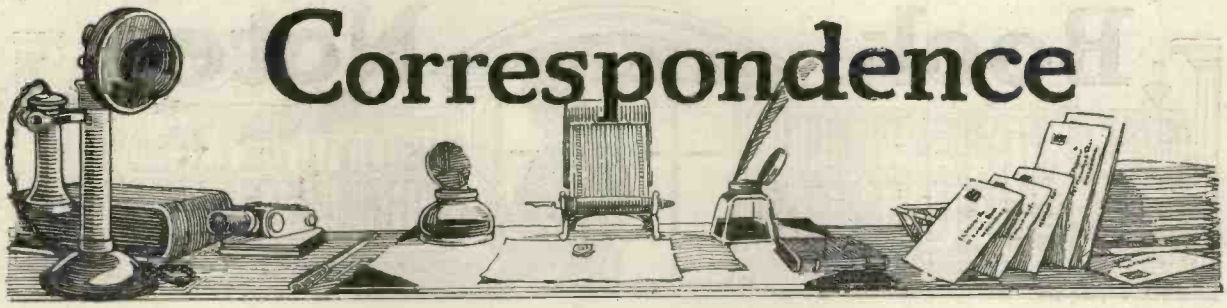
This handbook is a collection of really useful constructional articles, dealing with practically every component necessary in the construction of a wireless receiving set. It is well illustrated both diagrammatically and pictorially, and should prove of considerable assistance to all experimenters.

Wireless Sets for Home Constructors. (Radio Press Series No. 17, 2s. 6d.)

In this handbook, the author, E. Redpath, Assistant Editor of *Wireless Weekly*, describes the actual construction of crystal receiving sets, valve amplifiers and two- and three-valve receiving sets. Sufficient theory is included to enable the reader to appreciate the action of the various sets, and chapters are devoted to the operation of receiving sets and considerations of design.

Wireless Valves Simply Explained. (Radio Press Series No. 9, 2s. 6d.)

In this handbook the author, John Scott-Taggart, F.Inst.P., explains in a lucid and popular manner, the theory upon which the action of the wireless valve depends. He aims at giving his readers, possessing some knowledge of wireless and desiring to make further progress, a sound working knowledge of what takes place inside a valve in a wireless set.



ST75

SIR,—It may interest you to know that I have received WGY, on your ST75 circuit. I consider this very good, especially as my aerial is a very poor one, being 25 ft. high at the lead-in and sloping down to only 6 ft. at the far end. The length is about 75 ft., and the set is situated on the top floor of the house, so that I have a short lead-in and a long earth wire.

I have also heard faint music on 360 metres and 400 metres, but have not been able to identify the stations. WGY's carrier wave could at times be heard 3 ft. from the phones, and some of the musical items were audible 6 in. from the earpieces. Spark jamming was bad at times, but there was practically no atmospheric interference.

In conclusion, I should like to say that the ST75 circuit is the best of its kind I have yet tried, its only drawback being that on H.R 'phones, tuning is very tricky, owing to capacity effects. 5SC is nearly always audible all over the room with the telephones on the table.—I am, etc.,

W. K. ISLIP.

Cambridge.

[If the ST76 is used, which is ST75 with an additional low-frequency valve, the tuning is easier. When a loud-speaker is used with ST75, there should be no trouble at all. These circuits were recently demonstrated publicly at Ilford.

A modified ST75 particularly suitable for use with 'phones is given in my British Association paper, reproduced in the October issue of *Modern Wireless* and also in *Wireless Weekly*, No. 15, on page 545.—ED.]

WEEK-END PROGRAMME

SIR,—As a business man whose duties compel absence from home from Monday morning until Friday evening each week, it is very disappointing to learn from the programmes published daily what interesting fare is provided for the "listener" who is able to be home every evening in the week.

As one of a very large body of commercial travellers, most of whom are wireless enthusiasts, I feel sure that any efforts you may make to induce the B.B.C. to transmit theatrical performances, better class concerts, and music and addresses by celebrities, during the week-ends would be very much appreciated. Further I believe that if this point is put to the B.B.C. in the broadest sense they would see the reasonableness of the request.—I am, etc.,

"COMMERCIAL TRAVELLER."

Hampton Wick.

ST100

SIR,—After two years in the wireless field I have come to the conclusion that in this line, as in others, there are sets and *sets*. The ST100 apparently comes in the last category. Would it be another case of the age-old exaggeration to say that we have heard our nearest (26 miles distant) broadcasting station from attic to cellar? Further, to say that all stations are loud-speaker strength? Nevertheless, this is true, and, in consequence, we have three valves and various other components lying on the shelf — the remains of a "once was" five-valve set.

How can we show our appreciation of your production of such a good circuit.—I am, etc.,

W. DRAKE.

Huddersfield.

SUNDAY CONCERTS

SIR,—I notice in *Wireless Weekly*, Vol. 2, No. 13, a remark concerning the reproducing organ at the Steinway Hall, which is broadcast every Sunday afternoon.

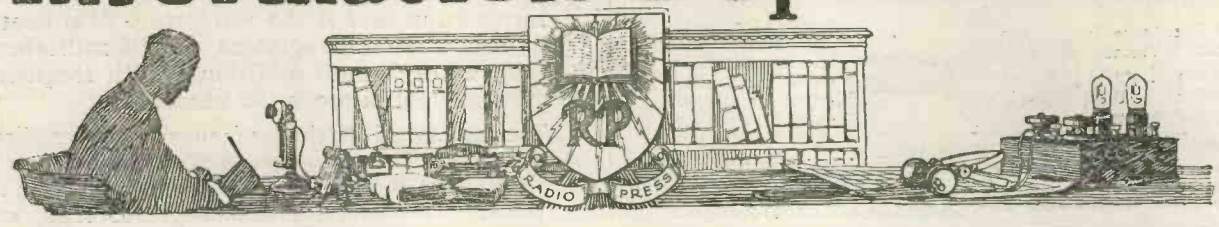
Personally, I cannot find any of the mechanical effect so obvious in the case of the Duo-art piano-player at the studio. This latter is a part of the programme which I, along with several others in this district, heartily dislike.

It would be interesting to hear other people's opinions on this.—I am, etc.,

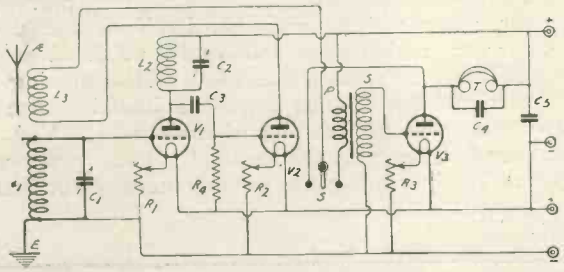
W. E. PHILPOTT.

Kent.

Information Department



B. J. (LONDON) asks for circuit of three-valve receiver employing reaction direct on to the aerial if such is permitted by the P.M.G.

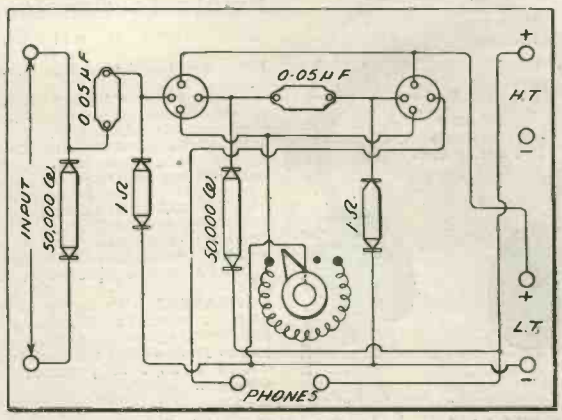


Under the new licensing regulations reaction direct on to the aerial circuit is permitted providing that it is not used in such a way as to cause interference with the working of other stations. We reproduce herewith a circuit diagram fulfilling the condition you specify. The aerial tuning coil L_1 is a plug-in coil having 50 or 75 turns tuned by the condenser C_1 of 0.0005 μF. The tuned anode coil L_2 is a plug-in coil having 75 turns, tuned by the condenser C_2 of 0.0003 μF. The reaction coil L_3 is a similar coil of 35 to 50 turns. By means of the switch S either two or three valves may be used at will.

J. R. (BARNES) asks various questions concerning the super heterodyne circuit given in "WIRELESS WEEKLY," Vol. 2, No. 10, page 385, Fig. 2.

The whole principle of this circuit is, that by the time the signals are passed through to the resistance capacity amplifier, they are no longer of short wavelengths, but of a lower frequency corresponding to about 3,000 metres in wavelength. The action is briefly as follows:—Signals induced in the secondary of the loose-coupled tuner are heterodyned by the valve V_1 to generate a beat-note, which is still at radio-frequency, corresponding to a wavelength of about 3,000 metres, as stated. The valve V_2 then amplifies this lower frequency, causing it to appear in the circuit C_2, L 400. These resulting long wave signals are then successively amplified by the valves V_3, V_4, etc. The circuit is especially valuable on the really short wavelengths, such as 200 metres, but it is nevertheless capable of giving extremely good results on the broadcasting wavelengths also. Coils 22 T and 20 T should be suitable for maintaining the valve V_1 in a state of continuous self-oscillation at such a frequency as will produce a beat-note of a required frequency with the oscillations in the tuned circuit. We believe that figures 6 T and 22 T, etc., refer to the actual number of turns in common use in the United States for these coils. The coupling between the coils 6 T and 22 T should be extremely tight. The values for the various condensers given in *Wireless Weekly* are merely those in common use in the United States, and it is suggested that the condenser C_2 should in each case be variable and of 0.0005 μF capacity.

R. C. D. (WOLVERHAMPTON) asks for wiring diagram for two stages of resistance capacity L.F. coupling.



We reproduce herewith a diagram of a suitable arrangement.

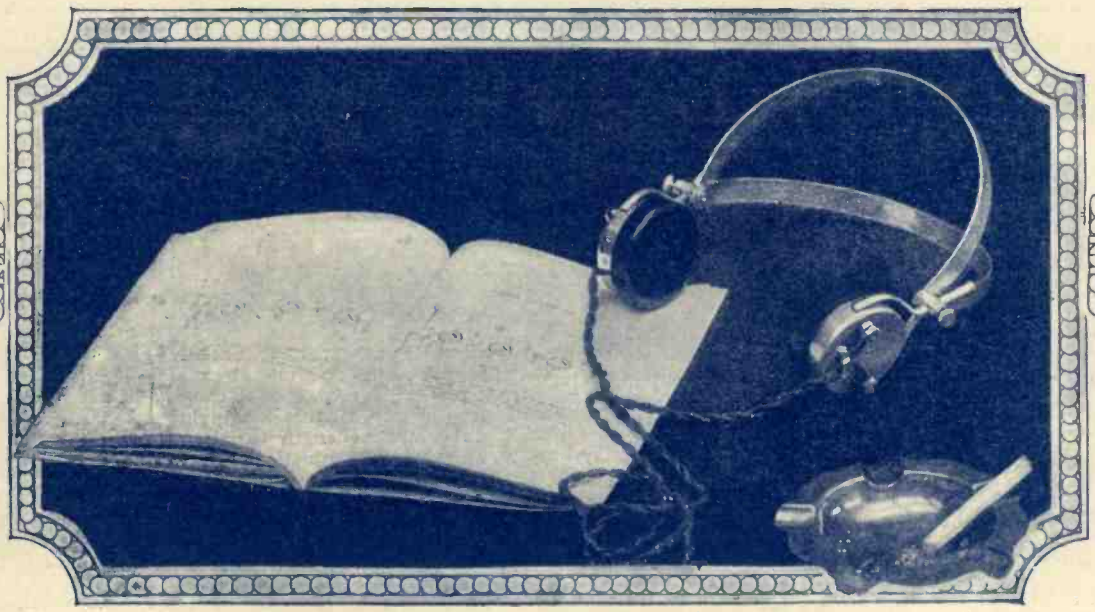
H. D. (BIRMINGHAM) asks for values of condensers and coils in the circuit on page 20, Vol. 2, No. 1, "MODERN WIRELESS."

The aerial tuning coil L_1, No. 35 or 50, according to size of aerial, for broadcasting. The tuned anode coil L_2, No. 75, the "rejector" coil L_3,

No. 75. The reaction coil L_4, No. 75. C_1, 0.0005 μF; C_2, 0.0003 μF; C_3, 0.0002 μF; C_4, 0.0005 μF; C_5, 0.0003 μF; C_7, 0.05 μF.

V. G. P. (HIGH WYCOMBE) is using a 0 to 5 amp. hot wire ammeter under the impression that if the wire were first heated by D.C. so that it registers say 300 milliamps, then a very small additional high-frequency current should move the needle.

The attempted method of superimposing direct current and oscillating current in the milliameter circuit breaks down for the following reason:—When you adjust the milliameter to read, say, 300 milliamps. of direct current, and add, say, 50 milliamps. of oscillating current, half of each oscillation opposes the direct current voltage in the circuit and produces a reduction of current to 50 milliamps. below the 300 point on the scale. The succeeding half of the oscillatory current in the reverse direction adds itself to the direct current, making 350 milliamps. total. You will see that the total effect upon a slow-moving hot wire instrument is to produce neither increase nor decrease in the reading of the needle. You will therefore see that this method is not a practicable one for increasing the sensitiveness of the instrument to small current.



Dependable Books
—your greatest aid

Choose your Books from this List:

	Price.
1. **Wireless for All** .. .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	6d.
2. **Simplified Wireless** .. .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	1/-
3. **How to Make Your Broadcast Receiver** .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	1/6
4. **How to Erect Your Wireless Aerial** .. By MITTELL, A.M.I.E.E.	1/-
5. **The Construction of Wireless Receiving Apparatus** .. .. By P. D. TYERS.	1/6
6. **The Construction of Crystal Receivers** By ALAN L. M. DOUGLAS.	1/6
7. **How to Make a "Unit" Wireless Receiver** .. .. By E. REDPATH.	2/6
8. **Pictorial Wireless Circuits** .. .. By OSWALD J. RANKIN.	1/6
9. **Wireless Valves Simply Explained** .. By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
10. **Practical Wireless Valve Circuits** .. By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
11. **Wireless Licences and How to Obtain Them** .. .. By E. REDPATH.	1/-
12. **Radio Valves and How to Use them** .. By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
13. **500 Wireless Questions Answered** .. By G. P. KENDALL and E. REDPATH.	2/6
14. **12 Tested Wireless Sets** .. .. By P. W. HARRIS.	2/6
15. **More Practical Wireless Circuits** .. By JOHN SCOTT-TAGGART, F.Inst.P.	3/6
16. **Home Built Wireless Components**	2/6
17. **Wireless Sets for Home Construction** By E. REDPATH.	2/6
Elementary Text-book on Wireless Vacuum Tubes .. .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	10/-
(post free)	

TO attempt to understand Wireless without the aid of good books, is both foolish and shortsighted. True, you can make a certain amount of progress by your own endeavours—just as you can learn to swim without the assistance of an instructor—but in each case progress is much more rapid and pleasant if you have a helping hand to guide you.

The list of books given here comprises a complete library, dealing with every phase of Wireless. Each book is written in a masterly fashion by an authority. The fact that Radio Press, Ltd., are publishers exclusively of Wireless Books is a guarantee of their accuracy and dependability.

These books can be obtained from all booksellers or direct from publishers (postage 2d. per volume extra).

RADIO PRESS, LTD.
Devereux Court, Strand, W.C.2.

Radio Press Series.

Gilbert Ad.

Printed for the Proprietors, RADIO PRESS, LTD., Devereux Court, Strand, W.C.2, by THE AVENUE PRESS (L. Upcott Gill & Son, Ltd.), 55-57, Drury Lane, London, W.C.2. Published on Wednesday of each week at 3, Bolt Court, Fleet Street, London, E.C.4. Address for Subscriptions and Editorial Communications:—Devereux Court, Strand, London, W.C.2. Advertisement Managers:—THE SCHEFF PUBLICITY ORGANISATION, LTD., 125, Pall Mall, London, S.W.1. Registered as a newspaper and for transmission by Canadian Magazine Post. Subscription rates:—32/6 per annum, 16/3 for six months, post free. Sole Agents for Australasia:—GORDON & GOTCH (Australasia), LTD. For Canada:—IMPERIAL NEWS, LTD. For South Africa:—CENTRAL NEWS AGENCY, LTD.

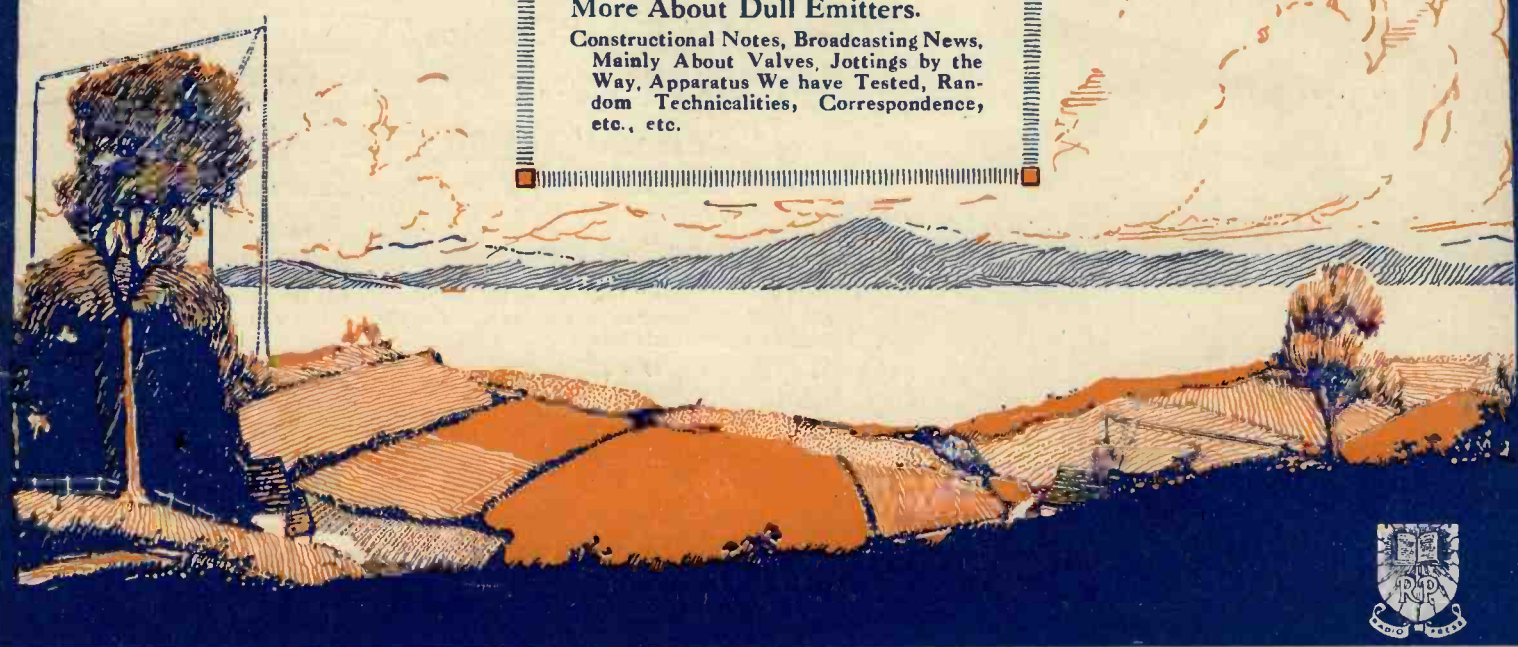
Wireless Weekly, 6d. Net. Wednesday. November 14th, 1923.

Wireless Weekly

and The Wireless Constructor.

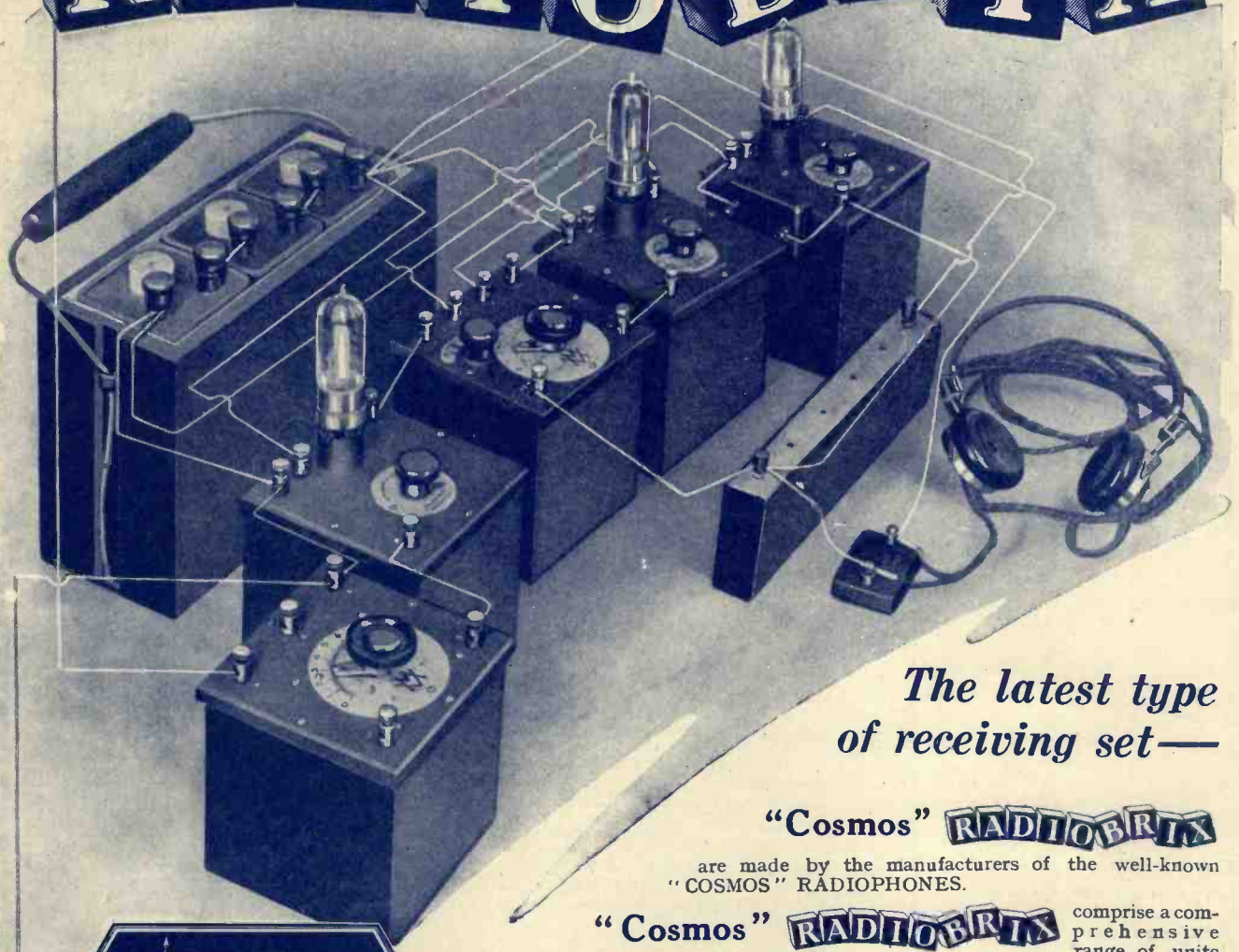
Vol. 2.
No. 18.

CONTENTS



Guide to the Exhibition

RADIOBRIX



The latest type of receiving set—

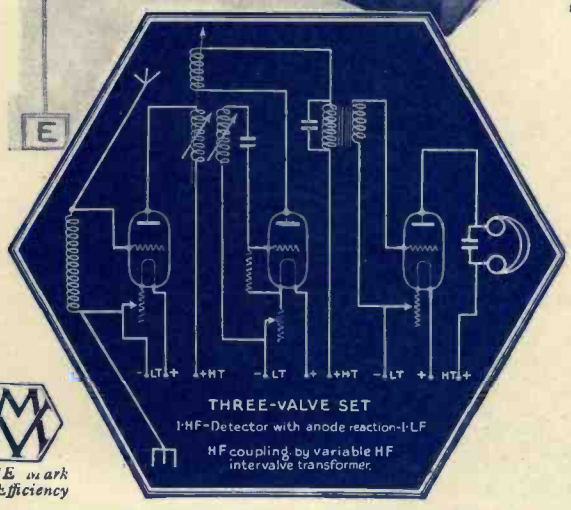
"Cosmos" RADIOBRIX are made by the manufacturers of the well-known "COSMOS" RADIOPHONES.

"Cosmos" RADIOBRIX comprise a comprehensive range of units by various combinations of which the radio experimenter or amateur can build up any type of receiving set or circuit.

"Cosmos" RADIOBRIX have been designed to secure the utmost flexibility. They enable the "listener" to build up his set gradually as his means allow, yet the bricks obtained at first never become useless but can be utilized as part of a more elaborate set.

"Cosmos" RADIOBRIX are thoroughly well made and moderate in price.

ASK YOUR REGULAR WIRELESS DEALER TO SHOW YOU **"Cosmos" RADIOBRIX** If he has not yet obtained his stock write, sending his name to the manufacturers—



THE mark of Efficiency

The above illustration and diagram shows a three-valve set made up with RADIOBRIX. Get a copy of the new book "BUILDING WITH RADIOBRIX," full of useful circuits with theoretical and wiring diagrams. OBTAINABLE EVERYWHERE, ONE SHILLING

METROPOLITAN Vickers ELECTRICAL CO. LTD

WORKS: TRAFFORD PARK, MANCHESTER

WE ARE SHOWING AT THE WIRELESS EXHIBITION AND CONVENTION WHITE CITY NOV. 8th to NOV. 21st STAND 98

BUILD YOUR RADIO SET WITH RADIOBRIX

Wireless Weekly

Vol. 2, No. 18.
Nov. 14, 1923.

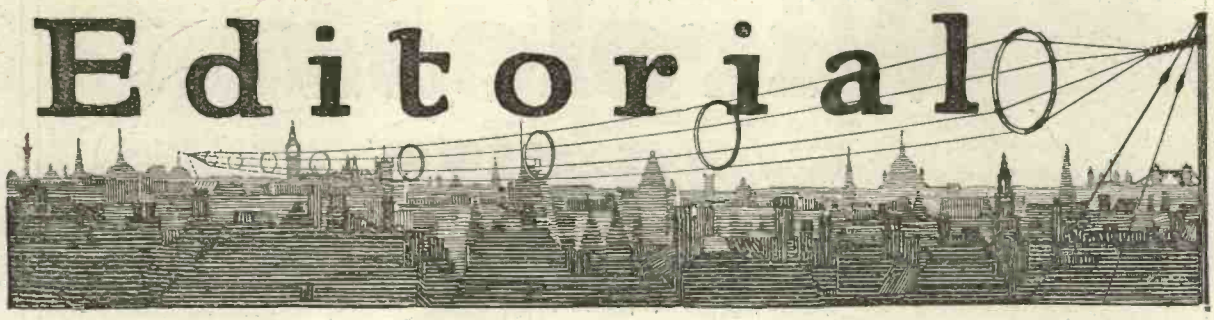
CONTENTS

Radio Press, Ltd.

Publishers of Authoritative Wireless Literature
DEVEREUX COURT, STRAND, W.C.2
Tel.—Central 3763.

Advertisement Managers: SCHEFF PUBLICITY ORGANIZATION, LTD., 125, Pall Mall, London, S.W.1
Tel.—Regent 2440.

Editorial



The P.M.G. at the Exhibition.

JUST as we go to press the All-British Wireless Exhibition has been opened by Sir W. Laming Worthington-Evans, the Postmaster-General, and all concerned have now settled down to a steady and united effort to make the Exhibition fulfil its real purpose —to popularise wireless.

The industry has every reason to feel gratified at the P.M.G.'s remarks regarding the importance and the range of the future developments of broadcasting, whilst his further remarks, carefully chosen to avoid controversial matters, in connection with the provision of improved facilities for broadcasting and the futility of anyone endeavouring to obstruct the march of its progress, were certainly very encouraging, both to the wireless industry and the listening public.

Of particular interest was the P.M.G.'s statement regarding the issue of licences. Up to date 492,000 licences have been issued, so that there is every prospect of the number reaching half a million by the New Year, as we suggested just a month ago. The P.M.G. stated that this number of licences would bring in a very fine income for the B.B.C., and while they have done very well in the past, it was very obvious they had to do a very great deal better in the future.

The Amateur's Position.

Elsewhere in this issue we publish details of the proposed reconstitution of the Radio Society of Great Britain, and we recommend all experimenters to give the matter their careful attention. We fully endorse the principle of "unity of control," and for that reason regret that there is no further news with regard to an amalgamation or affiliation between the parent Society and the Transmitters' Society, the position being, to the best of our knowledge, as stated in our issue of October 24, in which, it will be remembered, we advocated a resumption of friendly discussion with a view to finding a way out of the difficulty. Possibly the proposed reconstruction of the parent Society may afford an opportunity for bringing all parties into the one camp.

Transatlantic Tests.

Although details are not yet available, we understand that the experimental Transatlantic tests will commence next month. As a preliminary, and with a view to enabling experimenters to calibrate their receiving sets. the Radio Society of Great Britain are arranging for the transmission of low-power signals on a wavelength of about 200 metres. The first of these preliminary transmissions will probably take place to-night (November 14) at about midnight.

Experimenters of experience well know the difficulties of employing high-frequency amplification upon the short wavelengths in a satisfactory manner. Of particular interest, therefore, will be an article to appear in our next issue, which embodies the results of considerable research on the part of our technical staff, and which will prove of considerable service to all who intend to participate in the forthcoming reception tests.

MY IMPRESSIONS OF THE EXHIBITION

By THE EDITOR.

BEFORE going to the Exhibition I received an ordinary season ticket, a press ticket, an exhibitor's ticket, a luncheon ticket, a complimentary ticket, a trade ticket, and a workman's ticket. After a little deliberation, I decided to wend my way to Shepherd's Bush armed with the workman's ticket, and also, of course, the luncheon ticket.

It is good! There is no question about it. Never yet has the wireless industry been so well represented in one building. Stands of all sizes and shapes are there. Every conceivable kind of set is to be seen; every possible kind of price is open to those who enter the portals of the White City Exhibition.

As you enter the doors you see a large hall filled with numerous stands. This hall alone is as large as last year's wireless exhibition at the Horticultural Hall. These are the goats (or are they the sheep?), for the visitor to the exhibition must note carefully that the sheep have been separated from the goats, in other words, those firms who are members of the National Association of Radio Manufacturers have their stand in the large hall beyond, while the non N.A.R.M. firms, together with the humble members of the Press of the industry, are collected in the first hall.

In the forenoon of the first day a large gathering was present, and passing through the throng the figure of Sir Laming Worthington Evans was to be seen moving from stand to stand, followed by his staff.

Luncheon time very soon arrived, and was followed by three speeches by Mr. Guy Burney, the Chairman of the N.A.R.M., Sir Laming Worthington Evans, and Mr. Reith, the General Manager of the British Broadcasting Company. Mr. Burney expressed his appreciation of Sir Laming's visit to the Exhibition, and laid stress on the growing importance of the wireless industry. Even a casual visitor would be struck by Mr. Burney's strong personality and obvious enthusiasm for the trade association of which he is a Chairman.

Sir Laming Worthington Evans followed. To those who were not familiar with his appearance, it was a joy to note the similarity of his features to those so often caricatured in the papers. He made an excellent speech under circumstances which were far from ideal; hemmed in on all sides by the B.B.C. and the trade he somehow seemed dwarfed by the personalities on both sides of him; personalities which had unquestionably won a great victory in which he was rather an ignominious loser. He somehow suggested a rabbit which had been driven into its burrow and, delighted at having saved its skin, was shaking the sand from its fur. He gave one the impression of weakness, but after all, it was probably only his case which was weak. There was a hard and fast agreement made by a predecessor, and he found it difficult to do anything to modify it.

He evidently did not think very much of the Broadcasting Committee's report, or pretended not to. Of course, that is what committees are for. They work hard and sleep harder, and when they ultimately make a report, nobody pays the least attention to it. The question certainly flashed across my mind why the Right Honourable gentleman and his predecessor did not realise that there was such a thing as an agreement with the B.B.C., which would have to be carried out, in spite of any committee's report. Sir Laming spoke many words of encouragement to the industry as befitted the occasion, but somehow there seemed little real sincerity in what he said. He had had ample opportunities of using his influence to benefit the industry, but he does not appear to have done very much.

Mr. Reith, who next spoke, made some characteristic remarks. There was very little

of the mutual admiration business in his remarks; he said he was out to improve the broadcasting service to the utmost extent, but he hinted pretty plainly that the Postmaster General would have to do his part as well. I like Mr. Reith. There is something very rugged and keen about his attitude towards his job. Moreover, in spite of the great amount of criticism which has been levelled at his Company, he always appears ready to pick out any essential truths, and to put matters right. He once brought tears to my eyes at a meeting of the Radio Society of Great Britain when he told them in his earnest manner how anxious the B.B.C. was to help the experimenter and not to interfere with his right of making his own set. It was wonderfully touching, but that is another story.

Now as regards the exhibits. These were very varied, and, as regards the sets, the prices were lower, and the quality of manufacture is better. The present time seems unquestionably the best to buy sets and parts of sets. The demand is increasing, and their is little likelihood of a further decrease in prices. I notice that the old, old story about receiving all the broadcasting stations is still very popular. Manufacturers, especially the smaller ones, vie with each other in their statements regarding range. It is to be hoped that the innocent buyer will not purchase the set with the longest stated range. I could not help noticing that some of the larger electrical firms which were exhibiting did not attract as much attention as some of the smaller, go-ahead concerns. Some of the larger companies are merely dabbling. There seems to be no imagination or originality being exercised; they are making petty little efforts to see whether wireless is really worth going in for; they will probably in the end decide that it is not, and the fault will be their own.

Regarding valves, the most interesting were unquestionably the new .06 ampere types, and the " Peanuts." The former certainly possess exceedingly interesting features, and we intend giving the results of some impartial tests to our readers. The " peanut " valve is probably more robust, and has other special features, but the filament current is considerably higher. Both types will, of course, have their supporters.

Another interesting valve was the Penton, which takes very little filament current, and which nevertheless is sold at a very reasonable price. This also will be tested.

As I examined the different sets, I could not help feeling that it must be extremely difficult for anyone to decide on what type of set to buy. Price, of course, is no criterion. For example, there are innumerable types of two and three-valve sets, and yet their working capabilities are widely different. The two-valve sets with high-frequency coupling between the valves, are generally the cheapest, but on the other hand, the signals obtainable are not very loud.

As regards components, there is an extremely large variety, and great ingenuity has been displayed by the manufacturers of these parts. Some of the larger firms, of course, have not yet condescended to anything but complete sets. However, this will probably change in time.

I was very pleased to see several interesting types of apparatus which may be wired up in numerous different ways for different circuits. The most original was probably a system in which sets may be built up by means of panels in such a way that the whole apparatus presents the appearance of a single instrument. I did not notice any Armstrong or Flewelling sets on view, although a Neutrodyne instrument has been placed on the market. Dual amplification circuits do not seem to have yet become very popular amongst the manufacturers, although several, without specially announcing it, have incorporated dual circuits. The difficulty of stable operation and effective design is no small one, and the majority of the sets are using standard circuits. Curiously enough, the one handle control type of set does not seem to have found much favour. People still seem to prefer a set with plenty of knobs on it. The enclosed cabinet type of instrument is not gaining much headway.

The general finish to the apparatus shown at the Exhibition is a great improvement, and the internal construction of practically all the sets seems to indicate that the summer has been spent in elaborating really efficient designs. Incidentally, the summer has apparently eliminated those firms who intended to make the maximum profit out of the public by giving a minimum in the way of design and workmanship.

A TWO-VALVE "COMPONENT" SET

By STANLEY G. RATTEE, Staff Editor.

The following article gives full constructional details of a two-valve receiver for short wave work.

THE receiver about to be described is made entirely from bought parts, and was designed primarily for the home assembler. The tuning arrangements are carried out by means of plug-in coils and a series condenser in order to ensure the efficient reception of the shorter wavelengths. Aerial reaction is employed, and readers are warned that when using this receiver for purposes of broadcast reception, every effort must be made to prevent the receiver from energising the aerial, by careful and deliberate adjustment of such reaction.

Figs. 1 and 2 show the front and back of the panel respectively. In the former may be seen on the left the aerial and earth terminals, with those for the telephones on the right. Along the lower edge are seen, reading from the left, the L.T. negative and positive and H.T. negative and positive. The positions for the coil-holder, condenser and filament resistances may also be gathered from the photograph.

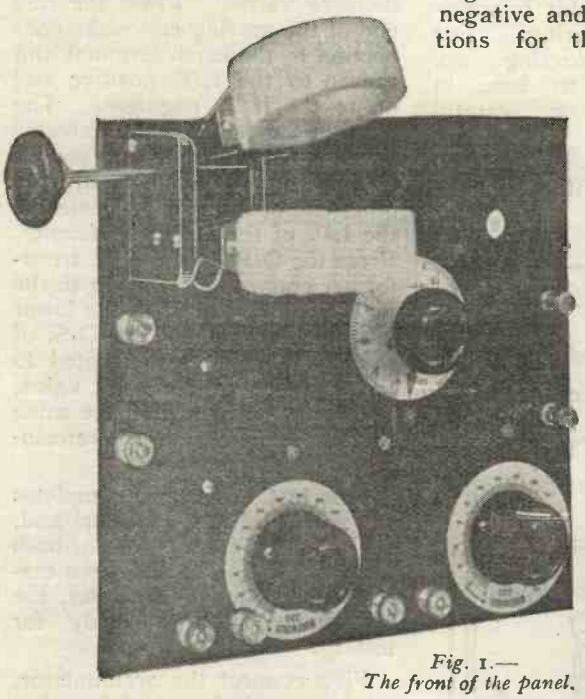


Fig. 1.—The front of the panel.

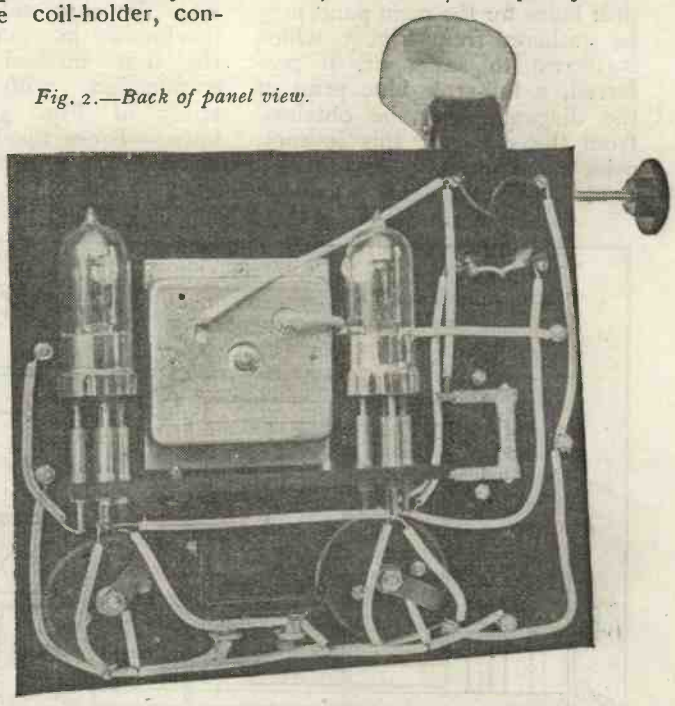


Fig. 2.—Back of panel view.

In Fig. 2 is seen the disposition of the various components behind the panel, which for purposes of clearness are shown in the wiring diagram, Fig. 3.

Materials Required.

The materials and components required for the assembly of the receiver are as hereunder :—

One piece of ebonite, 9 in. by 9½ in. by ¼ in.

One ebonite strip, 6 in. by 3½ in. by ¼ in.

Eight terminals.

Two filament resistances with dials.

One Polar condenser (or other make) of 0.001 μF capacity.

One Polar cam-vernier two coil-holder (or other make).

Set Atlas coils (or other make). If the receiver is to be used for broadcast reception only, coils No. 50 and 75 will suffice.

One fixed condenser of 0.0003 μF capacity fitted with one grid leak of 2 megohms.

One Elwell low-frequency transformer (or other make).

Eight valve legs.

Quantity of No. 18 or 20 tinned copper wire for connecting purposes and systoflex.

The Panels.

The positions of the holes for drilling both the main and valve-panels should be determined by means of intersecting lines made with the aid of a scriber, and with the holes drilled the panels should be rubbed on both sides with fine emery paper until the glossy and undesirable surface is removed. The ebonite strip 6 in. by 3½ in. by ¼ in. is intended for mounting the valves and low-frequency transformer, and since the drilling of this may offer some difficulty, readers are referred to *Modern Wireless*, Vol. I, No. 6, wherein is given a template for drilling holes for valve legs. The positions of drill holes for the main panel may be gathered from Fig. 3, which is drawn to scale, or, if preferred, a full-scale blue print of the diagram may be obtained from the office of this journal, price 1s. 6d.

Assembling the Parts.

Before mounting the components permanently on the panel, it is suggested that they be laid out on a temporary baseboard and connected up in accordance with the circuit diagram, Fig. 4. By this means the reader is assured of results when the set is assembled, as any misunderstanding of the circuit will make itself manifest before care and labour have been expended upon the finish of the final assembly.

Assuming everything to be satisfactory, the components may now be mounted upon the panel, and so long as the arrangement of them is as in Figs. 2 and 3 every connecting point is accessible for easy soldering. For quickness in connecting up, the best method to use, in conjunction with a careful study of Fig. 3, is as follows :—From the L.T. negative make connection with the detector valve filament resistance switch arm, I.S. of the L.F. transformer and switch arm of the L.F. filament resistance. From the ends of each of the two resistances make individual connection to the filament legs nearest to the main panel. Connect the two remaining (positive) filament legs together and then to the L.T. positive. From the aerial terminal connection is made to one side of the condenser, from the other side of which connect one end of the moving coil and thence to one side of the grid condenser and leak. The other side of the grid condenser and leak is connected to the grid leg of the detector valve. From the free end of the moving coil make connection to the earth terminal and thence to the L.T. positive and on to the H.T. negative. The plate or anode leg of the detector valve is connected to one end of the fixed (reaction) coil, the other end of which is connected to the I.P. of the L.F. transformer. From the O.P. of the L.F. transformer connection is made to the H.T. positive and on to the lower telephone terminal. The O.S. of the transformer is connected to the grid leg of the L.F. valve, whilst the plate leg of the same valve is connected to the remaining telephone terminal.

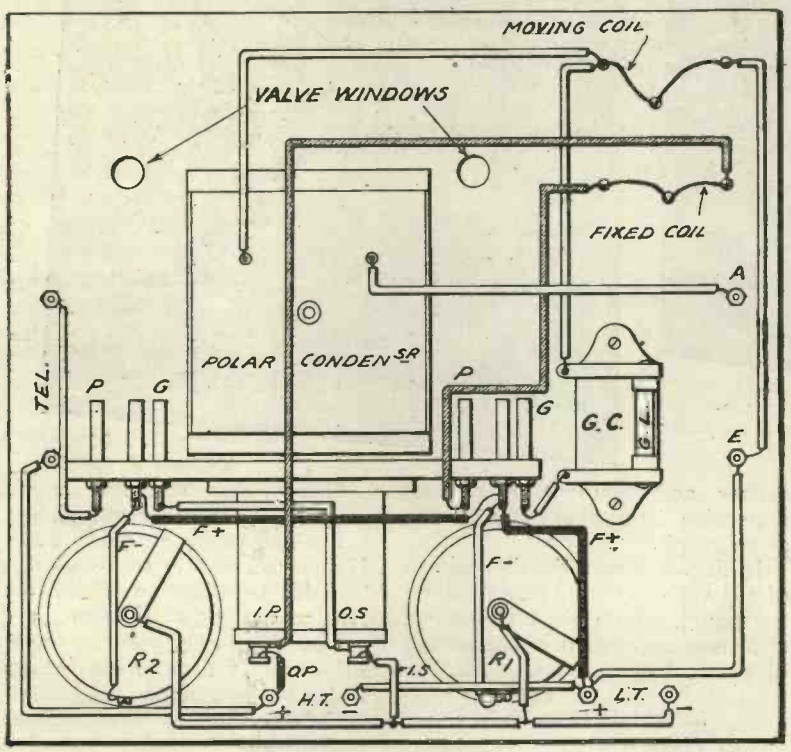


Fig. 3.—A wiring diagram of the receiver with the L.T. positive connections shown in black and the reaction coil circuit shown shaded for clearness.

This last connection completes the wiring of the receiver and, subject to the instructions of both text and Fig. 3 having been carried out in the correct order, the instrument is now ready for testing.

First connect the accumulator, taking care before so doing that the filament resistances are in the "off" position, and test each valve. Subject to the filament brilliancy being consistent with the movement of the switch arms, the H.T. battery may now be connected.

Attach the aerial, earth and telephones; select a suitable pair of coils (for wavelengths other than broadcasting if the test is being made during broadcasting hours) and insert them in the coil holder with the smaller in the moving socket. Turn the coils

at right angles to each other, switch on the filament current and by turning the adjusting handle of the moving coil towards the fixed, a relatively loud " plonk " should be heard in the telephones. If no " plonk " is heard, it indicates that the set is not oscillating, in which case the connections to one of the coils should be reversed.

Operating the Receiver.

As previously stated, the tuning arrangements are such as to be most efficient for short wavelengths, but by altering the condenser from the series to the parallel arrangement a receiver of this type permits tuning over a multiplicity of wavelengths according to the coils inserted in the coil holder, and for guidance in the matter of which coils to use for certain required wavelengths, the reader is referred to the chart given in *Modern Wireless*, No. 6. To tune to a given wavelength the required coils should be placed at right-angles to each other and by slowly turning the condenser, at the same time bringing the moving coil nearer to the fixed coil in a very slow movement, the required signals are easily found.

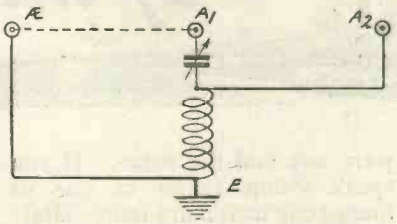


Fig. 5.—The suggested arrangement for series-parallel capacity switching.

For the best results the set should be just off the point of oscillation, which if exceeded produces not only interference with neighbours, but also bad distortion in one's own telephones.

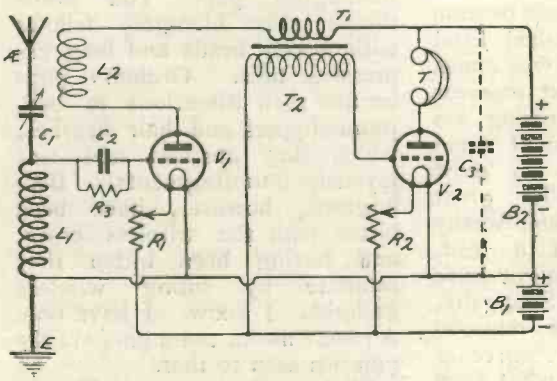


Fig. 4.—The circuit arrangement of the receiver. The condenser C_3, shown dotted and connected across the H.T. battery, may be found desirable, though the writer has omitted it without any disadvantage. When used this condenser should be of not less than 0.02 μF.

Parallel Capacity.

The arrangement for connecting the condenser in parallel, though not embodied in the set under description, is best executed as shown in Fig. 5. A_1 is the aerial terminal shown in Fig. 1, whilst A_2 and AE are extra terminals fitted near to A_1. Connection is made from A_2 to one end of the moving coil, whilst from the other end connection is made to AE. With this arrangement the condenser is put in parallel with the coil by connecting the aerial to A_2 and bridging a short-circuiting bar or piece of wire across A_1 and AE.

The Containing Box.

This may, of course, be left to the reader's particular requirements, but for the guidance of those who prefer instructions full constructional details are given in Fig. 6. The box is made from ¼ in. mahogany, whilst the back is made removable to permit of access to the interior for inserting the valves.

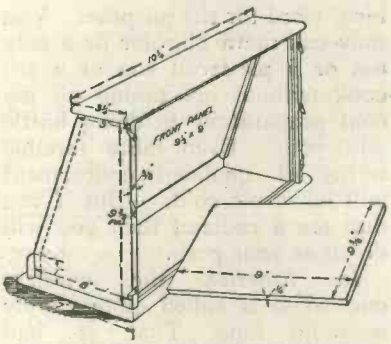


Fig. 6.—Constructional details of the containing cabinet.

TRADE NOTES

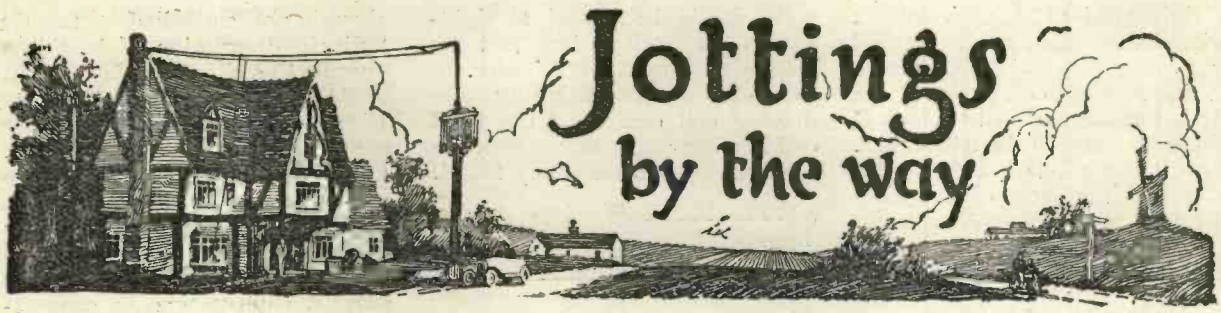
The Griffin Wireless Supplies Co.—This firm has sent us a copy of its latest price list of wireless sets, accessories and components, and will be pleased to forward a copy to any interested reader.

The Cinema Traders, Ltd.—We are in receipt of a copy of this firm's illustrated catalogue of apparatus, the wireless section of which is of interest. It should be noted that particulars of apparatus for charging accumulators from both A.C. and D.C. mains are included in this list.

Western Electric Co., Ltd.—Lists relating to loud speakers and Weconomy wireless sets have been sent to us by this well-known firm. They are well illustrated and of interest to readers.

N. V. Webber & Co.—A booklet has been sent to us dealing with equipment for experimenters in the shape of valve and tuner panels, potentiometers, etc. These incorporate high-class components, and will interest those experimenters who prefer the unit system.

Alkum Electric, Ltd.—We have received pamphlets describing the uses of Alkum Storage Batteries. These batteries are of the nickel-iron type with alkaline electrolyte, and it is claimed that the cells are mechanically robust and have a very even discharge curve.



Finding a Name.

SOMEBODY, I see, has been ventilating in the daily Press his dissatisfaction with the term "listener-in" as a generic name for the wireless man. He has the temerity to suggest that a new name be coined, and he even ventures to put forward "radiaud" as the ideal word for the purpose. You may call me a blighter or a silly ass or a pie-faced son of a sea cook without my taking off my coat preparatory to doing battle with you. Even more forcible terms of qualified endearment will leave me cold. But if you dub me a radiaud then you will do so at your peril.

In America the wireless enthusiast is called quite simply a radio fan. That is bad enough, but it pales into insignificance beside the beastliness of radiaud, a term that seems to carry a stigma with it like kleptomaniac or bodysnatcher. It is said that listener-in suggests eavesdropping, and has a kind of furtive air about it. If that be so, let us call ourselves plain wireless men, and let that part of the world that knows nothing of the joys of radio find what name for us it will.

Mind Your Step.

Talking of eavesdropping reminds me that you should be very careful what you say when things go wrong if you have 'phones upon your wireless table and a loudspeaker connected thereto in the drawing room. When things are so arranged the twain act as the earliest magnetic telephone in which transmitter and receiver were one and the same. If you speak within range of one of them your words are immediately broadcast by the other.

That is what happened last week to our old friend Snaggsby. Friends were sitting around the drawing-room fire listening to a delightful concert when suddenly the music became mute. Snaggsby rushed from the room to see what was amiss with his set, and next moment the amplion was delivering his bitter and profane lament upon the burning out of his most cherished valve. With great presence of mind Guppworthy rushed to disconnect a lead, otherwise the thing might have fused. Luckily for Snaggsby, the audience put the remarks down to Uncle Arthur, agreeing that you never know what even the nicest man will do or say when he is roused.

The Ancient Blighter.

A still worse adventure befell a friend of mine who dwells in Northern London. Next door to him lives an ancient man called by those who know him not a dear old fellow, and by those who do a confounded crusty old bore. Taking pity upon his aged loneliness, my friend ran out a line from his set and installed a small loudspeaker near his favourite chair, so that he could listen when he listed to such wireless entertainments as were tuned in upon the set.

One evening, when the programme was not a particularly bright one, a junior member of the family cried during a "one minute, please": "I say, Dad, let's switch off. I expect the old blighter next door's had enough too." "No, the old blighter jolly well hasn't," came a stentorian bawl from the spout. And then they realised what had happened.

Sold a Pup.

Do not, I beseech you, buy a Bedlington pup. You know them? The blue-grey fellows with woolly heads and long expressive tails. Ordinary pups confine their attentions to bedroom slippers and hair brushes, which they abstract and tear joyously into fragments. Bedlingtons, however, have been bitten with the wireless craze, and having been bitten they retaliate by biting wireless gadgets. I know. I have one. A pup, I mean, not a gadget; the pup has seen to that.

His particular speciality is coils. No matter where you put them or how soundly you belt him, he has them, and I can assure you that when he has finished his investigations into the way in which basket coils are wound, the sight of the remains upon the hearthrug is enough to make gods and men burst into scalding tears. His other passion is for my earth lead, which he has twice dug up by the roots. A few more depredations and I shall have to decide whether to give up dogs (which heaven forbid) or wireless (which is not to be thought of). A hard world, my masters.

A Slight Misunderstanding.

These wireless terms are a little confusing at times. Bloggsworth was holding forth the other evening before the club fire on frequencies. "And so

you see," he remarked, "that works out at a bit over 800 kilocycles for 2LO." "Kilo whats?" asked Pillsworthy, looking up from the paper in which he had been immersed. "Don't be more of an ass than you can help," sneered Bloggsworth. "Who on earth would suggest 800 kilowatts for 2LO?"

"I said 'kilo whats.'"

"I know you did; shows what an idiot you are." And that is how the row started that called for all the secretary's tact to straighten out.

A Welcome Stranger.

Some weeks ago I told you pretty plainly what I thought of my high-tension battery, reviling it as a thing accursed, a breeding ground of crackles and splutters, a blot upon the fair escutcheon of my otherwise irreproachable receiving set. Like the psalmist of old, I admit that I spoke in my haste, for really that battery was suffering from senile decay, having given me several months of good hard service. It had let me down rather badly, and I was feeling sore.

Would you believe that my cry of anguish thus broadcast was picked up in America—so far afield does *Wireless Weekly* travel—where it fell upon sympathetic ears. You may imagine my pleased surprise when one day a parcel arrived covered with U.S.A. stamps and addressed to "Mr. Wireless Wayfarer." Within was a comely H.T.B., such as they dub a "B" battery in the States. An accompanying letter from the manager of the Burgess Battery Company of Wisconsin begged me to accept the offering, which I did *instanter*. "We have removed all his noises," wrote Mr. Schulte; "he will save you from earning bad marks by uttering naughty words."

A New Theory.

I took the little fellow—really he is a fat, heavy fellow—home. With English valves he was uneasy, for he could not supply voltage enough for their unaccustomed plates. Americans seldom use plate potentials beyond 22½, for rectifiers anyhow. Thinking that he might be lonely and homesick after his long voyage, I routed out a quartet of U.V.199's and rigged them up. Yoked to American tubes his spirits rose at once.

Within a short time he had settled down and was supplying nourishment nicely. Anxious to treat him really well, I sat up till the wee sma' 'oors and searched around for U.S.A. broadcasting. Sure enough I got it, and I don't think I have ever had such a clear reception. English valves and batteries, of course, find it hard to deal with the accents and the idioms of announcers across the Herring Pond, but to the Amurrican toob and battery they are as easy as rolling off a log. Such is my theory.

WIRELESS WAYFARER

W. G. Y.

The following are the latest particulars concerning this well-known station.

G.M.T.	Wavelength 380 metres.	Refer below.
11.00 p.m. to 11.20 p.m.	Stock Quotations Produce Market Report News Bulletins	B.
11.30 p.m.	Children's Stories	Friday only.
12.30 p.m. or 1.00 a.m.	Sunday Evening Services	—
12.40 a.m.	Health Talks	Friday only.
12.45 a.m.	Regular Evening Programme	A.
2.55 a.m.	Arlington Time Signals	C.
3.00 a.m.	Dance Programme	Saturday only.
3.30 a.m.	Late Programme	Friday only.

A. = Monday, Tuesday, Thursday, Friday only.
B. = Daily except Saturday and Sunday.
C. = Daily except Wednesday, Saturday and Sunday.

A "PEANUT" REINARTZ SET.

By PERCY W. HARRIS, Assistant Editor.

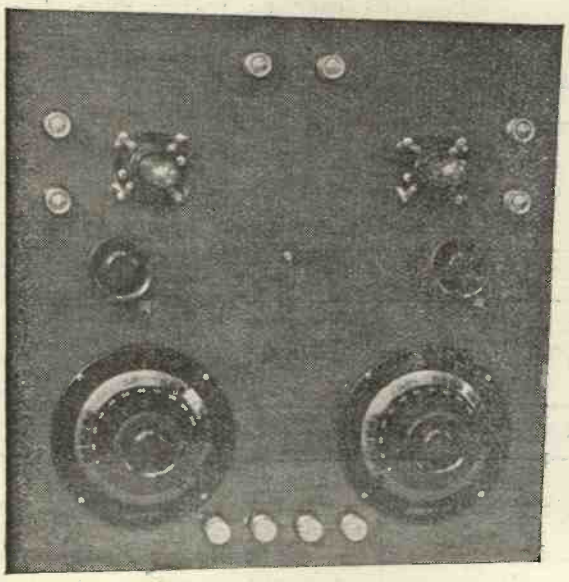
The following article, besides giving all constructional details, introduces a new form of inductance winding in this already well-known circuit.

THE Reinartz circuit, first introduced to the British public by the present writer in the early part of 1922, was invented by John L. Reinartz, an American amateur. Its two points of special interest are the aperiodic aerial circuit, both inductively and conductively connected to the grid circuit, and its peculiar method of obtaining reaction. In its original form it contained three tapped inductances and two variable condensers as its tuning controls. The aerial coil was tapped at each turn, so that any number of turns up to 10 could be included; the grid circuit was tapped in three places, so that a fairly wide range of wavelengths could be covered with the given variable condenser, and the plate coil (reaction coil) was also tapped at intervals. One variable condenser was used to tune the grid circuit (the aerial was not tuned save by trying the best number of turns) and the other condenser gave the reaction control. The reaction coil was only varied in its number of turns when adjusting the set to widely different wavelengths.

A Reinartz receiver embodying these switches and general arrangements was recently described in *Wireless Weekly* by Mr. Stanley G. Rattee.

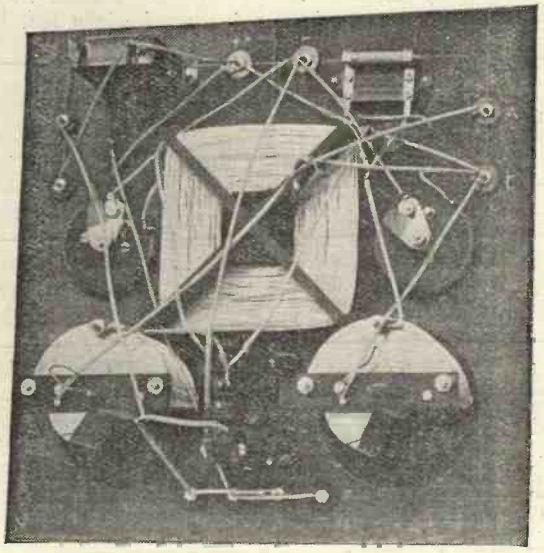
It has been found possible to dispense with the tappings on the inductances with consequent simplification of control. Obviously the grid coil need not be tapped if one can cover the necessary band of wavelengths with the size of inductance used and the particular variable condenser, while if the coil is wound with thick wire (No. 22 or larger), no difficulty is found in making the set oscillate without any plate coil whatever—at least on the broadcast band. Much experimenting has been done to find the best arrangement and the number of turns of aerial coil. The number does not seem to be very critical, and I have personally used various numbers of turns with almost equal success. A considerable improvement has been introduced into the Reinartz tuner by Dr. E. H. Chapman. It consists in winding the aerial and grid coils simultaneously, and then continuing the grid coil until the full number of turns have been wound on. In *Modern Wireless* for September a description was given by Dr. Chapman of a receiver made in this way.

The advent of the Pea-nut valve caused me to turn my mind to the design of a simple receiver of high efficiency which would



The Front of the Panel.

A Back of Panel View.



utilise these valves to the best advantage. Its property of oscillating readily suggested that it would make an excellent valve for the Reinartz, and I accordingly set to work to build the Reinartz tuner with one stage of note magnification added. The completed set is seen in the photographs and diagrams accompanying this article.

The circuit is given in Fig. 1. It will be seen that there are only two controls—the two variable condensers. Tuning is carried

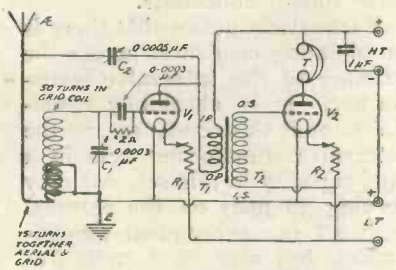


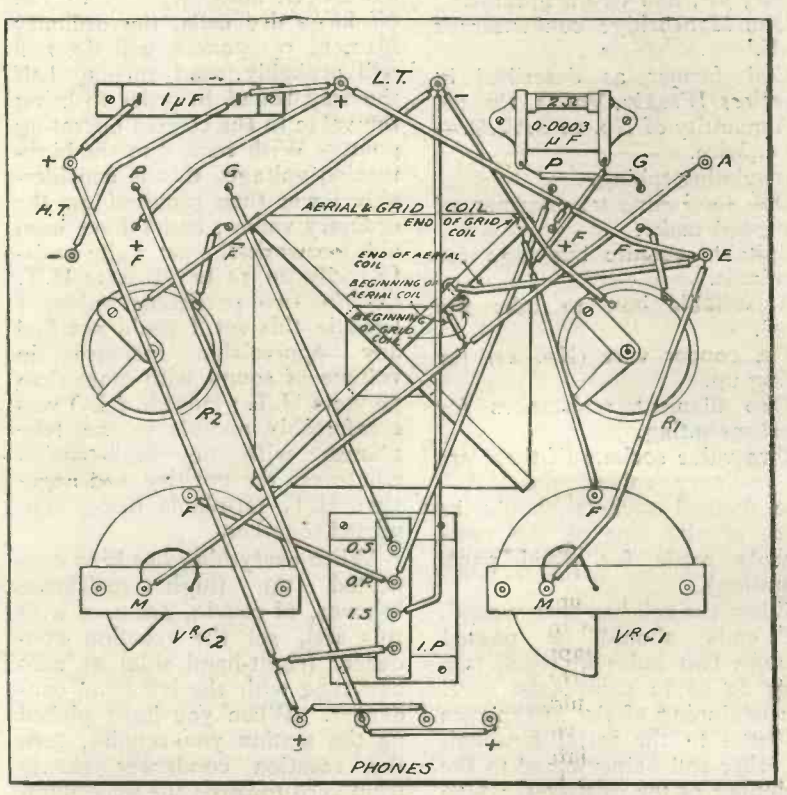
Fig. 1.—The circuit arrangement.

out entirely on the left-hand condenser, reaction being controlled very easily and gradually by a movement of the condenser on the right side. The general disposition and layout of the parts can be seen from examination of the back of the panel, which is made of wood and measures exactly 12 in. by 12 in. The terminals are fitted in polished ebonite bushes made by the Bowyer-Lowe Co., and the two variable condensers are also products of this firm. The intervalve transformer is the new Igranic shrouded type, a particularly nice instrument. The coil is wound by the new method described by me in *Wireless Weekly*, Vol. 2, No. 16, the dimensions of the former being exactly as given in that article. The wire is No. 22 d.c.c. and 15 turns of aerial and grid coil are wound on simultaneously. Loose ends of the two windings are left at the beginning, and when the fifteenth turn is reached a loose end is left for further connection. The grid coil is then carried on until a total of 45 to 50 turns are wound (the exact number of turns does not matter within these limits and is best decided by the number of turns of wire you can get into the slot). Pea-nut sockets are mounted on the front of the board and holes are drilled in the panel so that leads can be taken from the back. If the reader desires to use this circuit with any other types of valves, he can fit the ordinary flange type of socket. It would perhaps be advisable to so fit these sockets at the beginning, for "Pea-nut" adapters can be obtained and the ordinary type of socket enables rapid changes of valve to be made.

The instrument was designed to run off primary batteries, and in my experiments I have used the new Darimont primary cell very successfully. This is of the correct voltage to run "Pea-nuts" after the filament resistances of the ordinary type have been suitably adjusted. One large Darimont cell, or one large dry cell, such as is supplied by the leading firms for use with dull emitters, is quite suitable.

The method of securing the former of the coil is best determined by the facilities available to the experimenter. If he is able to tap a hole and feels so inclined, a single hole can be drilled in the centre of one of the ebonite strips (edgewise), and this hole tapped to take a 4 B.A. brass screw. A hole can then be drilled through the panel and the screw passed through from the top and screwed into the hole, thus securing the former. If a suitable tap is not available, the coil can be clamped in place with a strip of wood and two wood screws.

Having cut and sand-papered the board, it is best to give it a coat of a water-stain (such as Stephen's) of a suitable tint. The positions of the various parts should then be marked out on the back of the panel. It is quite permissible to use lead pencil for marking out the panel, for holes will be cut in the wood and bushes inserted, thus obviating leakage along the lead pencil line. It is



Wiring diagram of the receiver.

best to start work by ruling a line 1 in. from the edge of the panel all round. On this, space out the terminals, as shown. Those at the top left-hand side are separated by 1½ in., whilst the four telephone terminals are each separated by an inch. Holes are next drilled for the condenser spindles and the spindles of the filament resistances. These components can be secured in place either with wood screws, or, if the particular component is not suitable for such mounting, clearance holes can be drilled in the wooden panel and metal screws passed through, the components being secured with nuts on the other side.

The following is a complete list of the components required:

One wood panel, 12 in. by 12 in.

Ten terminals.

One variable condenser, 0.005 μF.

One variable condenser, 0.0003 μF.

One grid leak and condenser, 0.0003 μF, and two megohms.

One Mansbridge condenser of 1 μF.

Coil former as described in *Wireless Weekly*, Vol. 2, No. 16.

A quantity of No. 22 S.W.G.—d.c.c. wire.

Insulating tubing.

One intervalve transformer of any good make.

Suitable ebonite bushings for terminals.

A suitable box to take the panel.

Tin copper wire (No. 22) for wiring up.

Two filament resistances for panel mounting.

Two valve sockets (if these are for ordinary valves, the "A" type flanged sockets should be used, or else one of the components made for wood panel mounting).

When the coil has been wound, the ends should be passed through two holes for each tapping, so as to secure the wire. The beginning of the fifteen-turn coil goes to the aerial terminal, the other end being joined to the beginning of the grid coil, which is also connected to earth, as shown. The end of the grid coil is connected to the grid condenser and leak.

Be particularly careful to connect the moving and fixed plates exactly as shown in the wiring diagram, for if they are differently connected you may be troubled with body-capacity effects.

Handling the Set.

The "Pea-nut" valves, when operating, burn at a very dull red heat; indeed, in bright daylight it is quite impossible to see if they are alight at all. In a bright, artificial light it is sometimes necessary to shade the valve to see if the filament is alight. If used with a 2-volt accumulator the ordinary filament resistances are not sufficiently large to bring down the voltage to the required figure, and it is therefore advisable to place a 3- or 4-ohm. fixed resistance in series with each of the ordinary resistances if you must run them off a 2-volt accumulator. If, however, they are run off large dry cells, the ordinary filament resistances will do and will probably need turning half the way round in order to bring the valve to the correct operating point. With regard to the high-tension voltage, this is considerably lower than required on the ordinary valves, and I have been able to work the set quite satisfactorily on 12 to 15 volts H.T. On the two particular valves I tried in this set I could not find any appreciable increase in volume of sound with more than 36 volts H.T.; indeed, 2 LO was comfortably audible in the telephones with no high-tension whatever, the positive and negative H.T. terminals being connected together.

When everything has been connected up (high-resistance 'phones, of course, are used with this set), set the reaction condenser (right-hand side) at zero and tune with the left-hand condenser. When you have picked up the station you require, turn the reaction condenser slowly from zero towards the maximum, whereupon you will find the strength of signal will gradually and very steadily increase until a point will be reached when the set will oscillate. As the set in this condition will radiate from the aerial, care must be taken to avoid self-oscillation when turning. However, the control of reaction is so particularly fine on this receiver that there is no danger of the set being made to radiate with ordinary care in handling. When you are approaching the best strength of signals on the reaction condenser you will need slightly to readjust your tuning condenser.

Particularly notice that there is no shunting condenser across the primary of the intervalve transformer. It is absolutely essential to omit this condenser, as the intervalve transformer acts in a dual capacity in this set, not only serving to pass on the rectified currents for subsequent amplification, but also as a radio-frequency choke to prevent the signals taking the wrong path.

This set should be particularly useful for those who are unable to erect an outside aerial, for it works excellently with an indoor aerial with only a few feet of wire, up to six or ten miles from a broadcasting station. It is also a very suitable receiver for use with the Ducon. I have been at some pains to work out suitable values for the tuning coil, and although Dr. Chapman has given 20 in his article in *Modern Wireless* as a suitable number for the aerial, I have found admirable results with 15. The sharpness of tuning is one of the valuable features of this receiver, as readers will find who try it.

Those readers who are interested in the Reinartz circuit and desire to use it with a high-frequency stage preceding the detector, will find a complete design of such a receiver, together with a further note magnifier (making three valves in all), in my book, "Twelve Tested Wireless Sets," just published. This latter receiver will give all broadcasting stations in this country quite comfortably in the telephones, provided a reasonably good aerial is used and conditions are normal.

THE AUTOPLEX CIRCUIT

By M. L. MUHLEMAN, A.M.I.R.E.

We mean to take an early opportunity of testing this circuit ourselves. Meanwhile we shall be pleased to hear from readers who care to try its merits.

FIRST of all it is to be understood that the Autoplex receiver is but a modified form of super-regenerative circuit. To be specific it is a common form of one valve super, minus one of the large oscillating coils and all concentrated capacity (except that existing between the elements of the valve and the capacity of the aerial and the set to earth). Its satisfactory operation is based on simplicity above all and secondly on the electrical efficiency of the apparatus employed.

While speaking of its simplicity, it is well to mention the primary reasons for using the various parts it is composed of. A valve having large elements and consequently an increased internal capacity is most favourable since considerable regeneration (reaction) is desired. The "feed-back" system of regeneration being rather critical when utilised in a super-regenerative circuit, was discarded in favour of the tuned plate method with which the control is less complicated and better advantage is taken of the inherent capacity of the valve. Furthermore, by the use of two variometers, one in the grid circuit and one in the plate circuit, the impedance of both grid and plate circuits can be easily and most effectively adjusted to the same value or values most suited to the L.C. characteristics of the large coil.

There are a number of ways of producing low-frequency oscillations in a regenerative receiver to bring about the super effect. The method of using a large inductance, such as a 1,250 or 1,500-turn honeycomb coil, the L.C. of which corresponds to a suitable low frequency, is by far the best, since it will oscillate when placed in an oscillating circuit which excites it.

Referring to Fig. 1, let us consider the oscillating circuit. Radio- or audio-frequency currents traversing this circuit are not impeded to any great extent, since the self capacity of both the phones and the oscillating coils are sufficient to pass both the radio- and audio-frequency oscillations, the latter of which have considerable amplitude. The by-

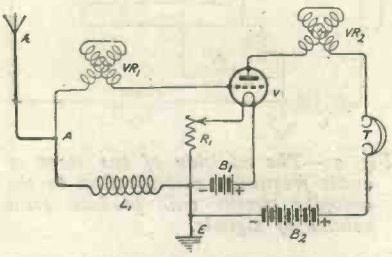


Fig. 1.—The Circuit Diagram of the Autoplex Receiver. With hard valves, the usual gridleak and condenser may be found necessary.

pass capacities are therefore not necessary; the use of them, in fact, considerably broadens the circuit characteristics. It will be noted that the collective agency (aerial or earth) is connected between the large coil and the grid variometer; this is quite important. The capacity existing between the aerial and earth should not be introduced across the variometer. Both grid and plate variometers should be free from capacity and the self capacity of both should be low.

Practically any type of collective agency can be used. One thing of importance is that better results will be obtained by using a good earth connection to point "A" than if the earth connection is allowed to remain and a make-shift aerial connected to "A." In all cases connect the best collective agency to the point "A."

Operation.

The operation characteristics of the Autoplex circuit are similar to those of a super-regenerative circuit. The correct functioning of the receiver is denoted by the presence of a very high pitched whistle in the phones or loud-speaker. If a small oscillating inductance is employed at L_1 (this applies to short wave reception only), so that the variation frequency is super-audible, it is possible to determine if the super-action is being obtained by the manifestation of a comparatively loud rushing noise when resonance or balance points are reached. This noise is even more noticeable when an audible variation frequency is employed. In tuning, it is best practice to vary both variometers simultaneously and for every movement of one, follow up with the other until the rushing noise, mentioned before, is heard. Thus one can run from zero to 180 deg., keeping at balanced points throughout the scale readings. This should always be followed for it is at resonance points that the stations are picked up. If the grid and plate circuits are unbalanced there is small possibility of picking up signals. This is particularly true of the plate variometer adjustment.

It has been noticed in numerous instances that transmitting stations at considerable distances have been received as well and

sometimes better than local stations. Also, when employing inefficient collective agencies, the volume and quality of nearby signals are considerably improved. This peculiar performance might be attributed to shock excitation which would tend to destroy the sensitive characteristics of the valve, brought into play by the use of the super effect. By actual experiments it has been proved that *the amplification factor of a super-regenerative circuit increases as the signal strength decreases, and decreases considerably as the signal strength increases.*

These facts are both interesting and distracting. They cast considerable light on the sensitiveness of the super-circuit, but demand some suitable means by which incoming signal frequencies can be regulated as to strength.

It is well known that in both crystal and valve the greatest current changes take place at rather critical potential points. A high potential will shift the locus of the grid curve of the valve to such an extent as to make the plate current changes small. This action can be off-set to an extent by proper grid bias, however, in a super-regenerative circuit, the grid bias is not constant at all adjustments, due principally to the effects of the amplitude of the variation frequency. The most important considerations in the super-circuit are the grid-swing potential, the amplitude of the variation frequency and the amplitude or the strength of the incoming signal frequency. The latter can be controlled by some form of coupling system. The other two are more or less relative and vary considerably with circuit adjustments (so tend to undo any good that might be obtained from a coupling system). It stands as a fact, however, that with the Autoplex circuit the best means of signal strength control is by varying the size of the collective agency. When local stations are weak as to volume, decrease the size of the collective agency. Even a ground connection may be unsatisfactory as it stands. In some cases a length of lamp flex may be found the most efficient type of aerial to use with the set.

This all requires experimenting on the part of the operator, but is the only way to determine the type and exact size of the collective agency for the particular location.

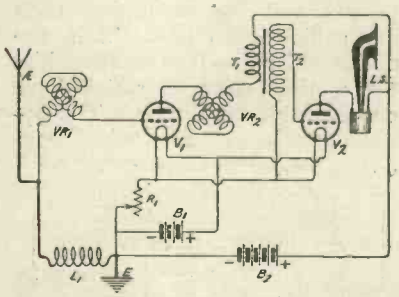


Fig. 2.—The addition of one stage of audio-frequency amplification to the autoplex circuit will produce great volume of signals.

Low-Frequency Amplification.

If considerable volume is desirable one stage of low-frequency amplification can be used without noticeably changing the operation characteristics of the receiver as often experienced in connection with regenerative circuits. The connections for such an arrangement are shown in Fig. 2. It may be found, in some cases, that the impedance of the primary of the amplifying transformer is not sufficient to match that of the valve, therefore added impedance will be a requirement.

Added impedance, it is understood, can be connected in series with the primary of the amplifying transformer. The value can only be determined by experiment or by actual measurement of the plate filament impedance of the vacuum tube and the impedance of the primary winding of the amplifying transformer. It should be remembered, also, that the primary leads of the low-frequency transformer should be reversed to determine the most favourable connection.

The addition of low-frequency amplification has another advantage. Most low-frequency transformers are very inefficient in amplifying high-frequencies. Therefore the little of what there is of the variation frequency produced by the first valve finds a high impedance path in the amplifying transformer, and is therefore amplified only to a small extent or, in some cases, practically obliterated. Signal and speech frequencies, however, are amplified in the usual manner, and what part of the variation frequency might reach the loud speaker would be so weak as to make it unnoticeable when compared to the strength of the signal or speech frequency.

MORE ABOUT DULL-EMITTERS

The following particulars have been sent to us by the Western Electric Co., and, in view of the technical interest taken in the new valves, are reproduced herewith.

MANY excellent articles have appeared from time to time on Dull-Emitter Valves, and from these the general impression is gained that whereas the early attempts at their manufacture were not altogether satisfactory, the thoriated tungsten valve of which several patterns are now on the market is a very satisfactory and thoroughly sound article giving an efficiency considerably greater than that obtainable with ordinary high temperature valves. This, however, is not the last word on the subject as valves are now being manufactured in this country having an oxide coated platinum alloy filament which for thermionic efficiency is far ahead of the thoriated tungsten. The oxide coated filament valves function at a remarkably low temperature, in fact the latest valve placed on the market for broadcast receivers, that is the small peanut valve, will operate to a limited extent with the filament at so low a temperature as to be invisible in a dark room. A slightly higher temperature than this, however, is desirable for ordinary operation and the emission at 1,000 degrees centigrade, that is, a dull red heat, is then 30 times greater than that obtained from a thoriated tungsten filament and 1,000,000,000 times the amount obtainable from ordinary tungsten at the same temperature. It must be remembered, of course, that ordinary tungsten valves are not expected to function at so low a temperature, but the comparison is drawn to show the great strides that have been made in valve development. The production of this new oxide coated filament has resulted in a valve not only economical, but one having a long life coupled with remarkable uniformity in operation.

At present a life of 1,000 hours is quoted by the manufacturers, but 4,000 or even 5,000 hours life is by no means unusual whilst in skilled hands; for example, when used in telephone repeater stations, oxide coated valves have been run for 20,000 hours and still remain active, being withdrawn then only to avoid possible interruption of service.

Resulting from the high emission at low temperatures, the characteristics of the oxide coated valve are but very slightly changed by minor alterations in filament current, and further—a most valuable property—little or no permanent change occurs in the characteristic of the valve should the filament be inadvertently over-run.

The great density of the emission, if such a term may be used, obtainable with the oxide coated platinum filament renders it possible to use electrodes of small size for a given energy input, and this in turn enables a small-sized valve to be produced, which incidentally gives that low inter electrode capacity so desirable for H.F. work and for all modern circuits.

The use of an oxide coated filament enables a predetermined amplification factor to be obtained with a comparatively low internal impedance. This permits distortionless working to be secured when using L.F. intervalve transformers with primary windings of low impedance, and in turn this enables one to use efficiently transformers having a high voltage ratio. The net result is to secure an amplification factor for the valve-transformer combination considerably higher than that usually obtained with any other type of valve.

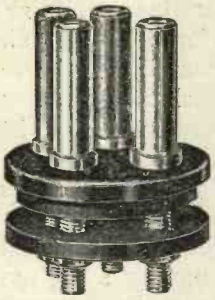
The oxide coated filament valve therefore bids fair to being as great an advance on the thoriated tungsten valve as the latter has been to the ordinary tungsten valve.

Unfortunately the nature of the filament and the complex operations involved in giving the filament its many and varied coats result in a comparatively high initial cost, but this is more than off-set by the economy in current and the greatly extended life obtainable with these very low temperature valves. A. J. G.

THE ALL-BRITISH WIRELESS EXHIBITION

A further list of interesting apparatus to be seen at the White City, Shepherd's Bush, from November 8th to 23rd.

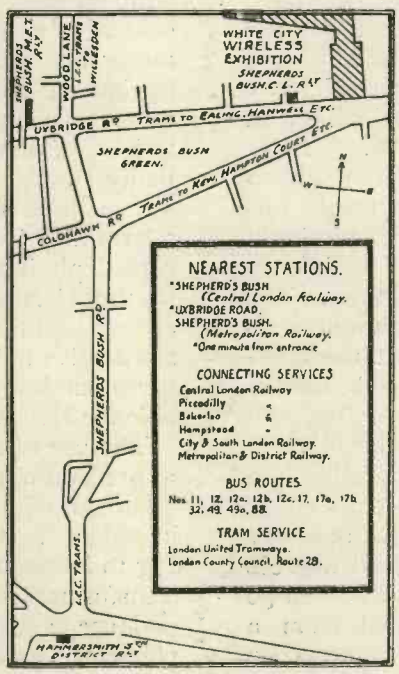
Abbey Industries, Ltd. (Stand No. 85).—This firm is showing a comprehensive range of receiving sets and accessories, including crystal sets, at prices from 10s. 6d. to £5. There will also be shown for the first time, a new line of valve sets, B.B.C stamped, and permitting full use of reaction. Other lines are their indoor aerial equipment, capable of being erected in five minutes, variable condensers, coil holders, and a new broadcast wavemeter.



The Bowyer-Lowe valve socket for wood-panel mounting.

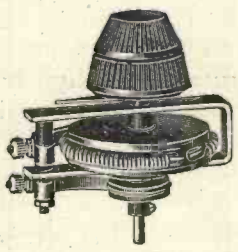
Climax Patents, Ltd. (Stand No. 25).—Of particular interest is this firm's Monovalve set. The makers claim that this set is extremely portable, requires no outside aerial or earth connection and gives excellent results upon a folding frame aerial. It is British made throughout, simple and straightforward to operate, whilst the claims regarding its performance are supported by the firm's guarantee.

The Chloride Electrical Storage Co. (Stand No. 7) are exhibiting their well-known storage batteries of every type, specially designed for wireless work, including filament lighting batteries for valves; high-tension batteries and two new types, the H.Z. (specially designed for dull emitter valve filaments) and the D.C.G. (specially suitable for use with the "Pea-nut" type of valve). The last-named can be supplied in a dry-charged condition, and requires only the addition of electrolyte to render it ready for service.



The Exhibition is open daily from 10 a.m. to 10 p.m. The price of admission is 1/3, including Tax. Members of the Radio Society of Great Britain and (through their secretaries) of affiliated societies can obtain admission tickets at the special rate of 9/- per dozen, from Mr. L. McMichael, 32, Quex Road, West Hampstead, N.W.6. Schools and Colleges can obtain tickets at special rates from the Organising Director, Mr. Bertram Day, 9 and 10, Charing Cross, London, S.W.1.

J. A. Coomes & Co., Ltd. (Stand No. 91).—In addition to an interesting selection of crystal sets, valve sets, amplifiers and components such as transformers and variometers, this firm is showing a new Battery Charger, of particular interest to users of valve apparatus who wish to recharge their accumulators at home, but who have an alternating current supply. It is claimed that the device is particularly steady in operation and will work for long periods without attention.

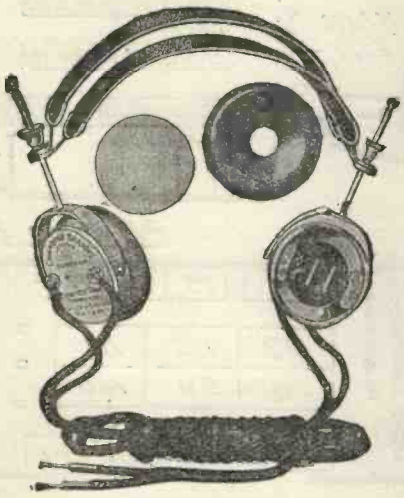


The Igranic filament rheostat.

Peter Curtis, Ltd. (Stand No. 61).—The sole London distributing agents for the Paragon Rubber Manufacturing Co., Ltd., of Hull, have an interesting show of ebonite products, sheets, dials, valve holders, etc. The makers have adopted the welcome innovation of "trade marking" all their ebonite sheets, as a guarantee of quality. Their new material, "Paralite," is claimed to be superior to ebonite, though unfortunately more expensive, and is guaranteed to have a dielectric resistance of 25,000 volts per millimetre, and to be entirely free from surface leakage.

On this same stand may be seen samples of "Paraflex," the

new ebonite composition flexible sleeving, and the Crystor Cowl Insulators. The Curtis V2, a two-valve receiving set, designed not only to be highly efficient and to give purity of reception, but to be quite simple to operate, will no doubt interest many to whom ease of operation particularly appeals.



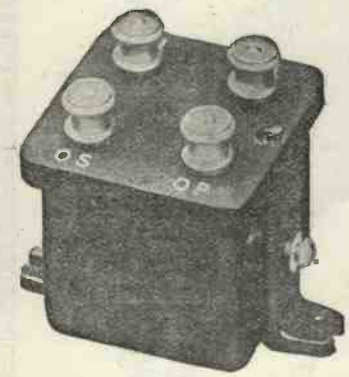
The "Brandes" telephones.

Darimont Electric Batteries, Ltd. (Stand No. 71).—This firm is placing on the market a new primary battery, the invention of a Belgian engineer, Mr. L. Darimont. The battery is of the two-fluid type, and owing to its special construction, local action is practically non-existent. The E.M.F. is about 1.6 volts, and the internal resistance varies very little during discharge. For operating dull emitter valve receiving sets, especially where the charging of accumulators presents difficulties, this type of battery should prove very useful.

The Dubilier Condenser Co. (1921), Ltd. (Stand No. 107), illustrates upon this stand the large range of sizes in which their well-known condensers are now manufactured. Various types of these condensers are used for all kinds of wireless purposes, from the smallest receiving set to the largest transmitting station. Special types of screened variable condensers, for use as precision or standard instruments, and for experimental work on short wavelengths where electrostatic

The Siemens loud-speaker.

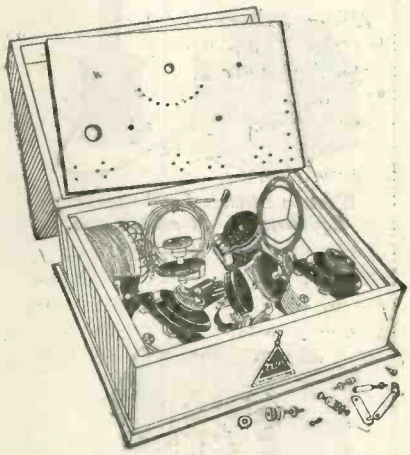
screening is desirable, are also shown. The "Ducon" attachment, which enables the ordinary house lighting wires to be used in lieu of an orthodox aerial, will interest those to whom the erection of the latter proves a difficulty. Of interest also is the new "Minicap" key switch, designed to have a small electrical capacity so that harmful



Fullers United Electric Co.'s inter-valve transformer.

effects are avoided when the switch is employed in valve circuits.

The Edison Swan Electric Co., Ltd. (Stand No. 87), are showing a comprehensive range of complete receiving sets (crystal and valve) and component parts. The principal item of interest is a two-valve set employing an improved method of dual amplification with reaction, with which it is claimed remarkable results have been obtained. For long range work this firm make a four-valve set containing many refinements, such as the provision of a change-over switch for 'phone or loud-speaker, and a selector switch for two, three or four valves. Either of these sets can be supplied in handsome Japanese lacquered cabinets,

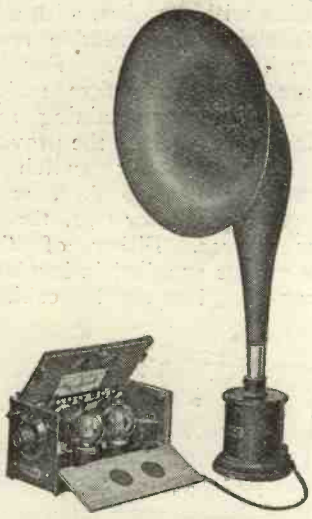


A box of Radiax components.

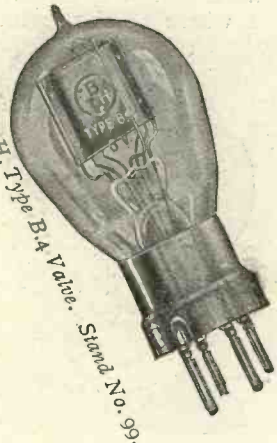
complete with doors. Other interesting exhibits include Ediswan headphones and loud-speakers, a neatly designed low-frequency transformer, having a ratio of 1 to 3.5, and provided with a 0.001 μF condenser across its primary winding.

The Formo Co. (Stand No. 4).—The principal item of this firm's exhibit is their range of low-frequency transformers, designed to give maximum results in different stages of a multi-valve set, for which purpose they are made with ratios of 1 to 2; 1 to 3; 1 to 4; and 1 to 5, the last-named being the standard for single-stage L.F. amplification. They are also showing their open-core transformer, the Formo-densor, a new type of variable condenser, the Formo rheostat, the parts of which are carefully machined and the base turned from solid ebonite, a plug-in detector and a number of small component parts.

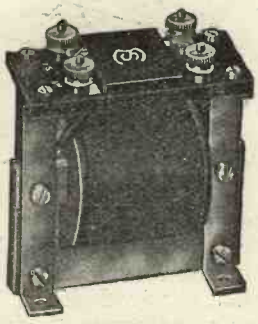
"WIRELESS WE
TO THE E



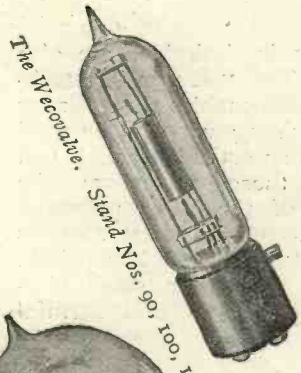
Western Electric Loud-speaking Equipment. Stand No. 100.



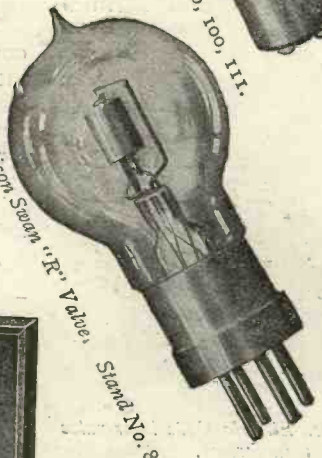
The B.T.H. Type B.4 Valve. Stand No. 99.



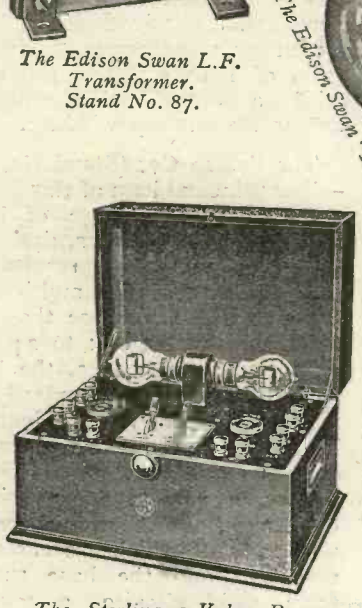
The Edison Swan L.F. Transformer. Stand No. 87.



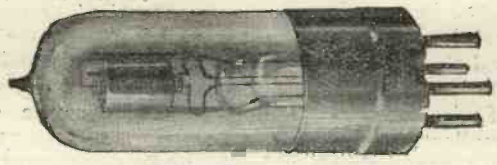
The Wecovalve. Stand Nos. 90, 100, 111.



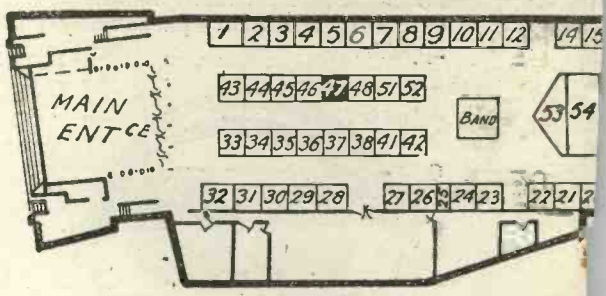
The Edison Swan "R" Valve. Stand No. 87.

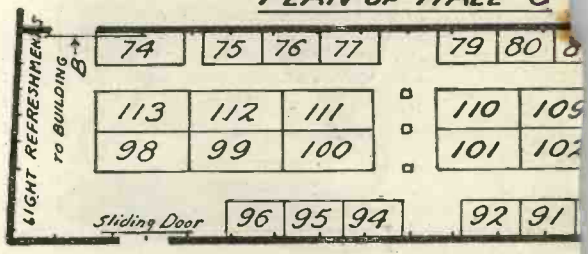


The Sterling 2-Valve Power Amplifier. Stand No. 108/9.



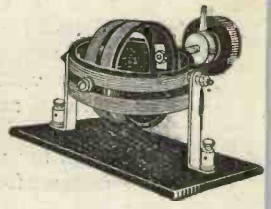
The Edison Swan A. R. Valve. Stand No. 87.





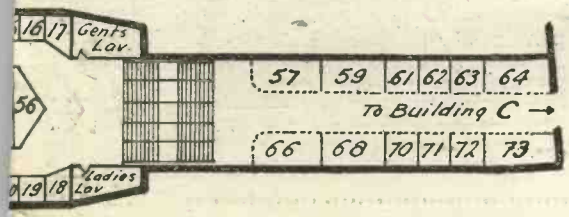
LIST OF EXHIBITORS

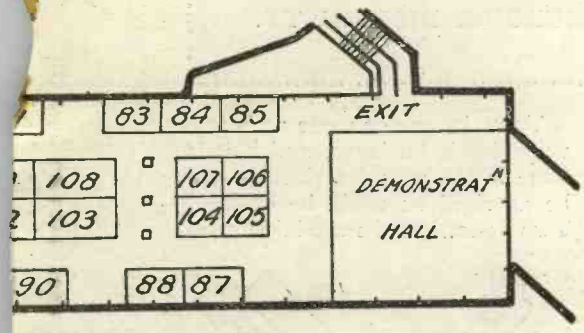
	No.		
Abbey Industries, Ltd.	85	Dubilier Condenser Co.,	
Amalgamated Press, Ltd.	51	Eagle Engineering Co.,	
Ashley Wireless Telegraph Co., Ltd.	84	Economic Car Light, Lt	
Aucklands Wireless, Ltd.	77	Edison Swan Electric C	
Auto Sundries, Ltd.	41	Elwell, C. F., Ltd.	
Autoveyors, Ltd.	16	Ever Ready Co., Ltd., Th	
Belmont Rose	63	Falk, Stadelmann & Co.,	
Ball, T. C.	23	Fallon Condenser Co.,	
Beldam Tyre Co., Ltd., The	34	Formo Co.	
Bowyer-Lowe Co., Ltd., The	6	Fuller's United Electric	
British Ebonite Co., Ltd.	59	Gamage, A. W., Ltd.	
British L.M. Ericsson Mfg. Co., Ltd.	104	General Electric Co.,	
British Thomson-Houston Co., Ltd.	99	General Radio Co., Ltd.	
Brown Bros., Ltd.	12	Graham, A., & Co.	
Brown, S. G., Ltd.	102	Great Motor Ballot	
Burndept, Ltd.	75	Hart Accumulator Co.,	
Burndept, Ltd.	112	Hart, Collins, Ltd.	
Burns, J., Ltd.	46	Harwell, Ltd.	
Canadian Brandes, Ltd.	66	Hazeltine Neutrodyne Re	
Cassell & Co., Ltd.	29	Henderson, W. J., & Co.	
Chambers, L. J., & Co.	48	Hestavox, Ltd.	
Chloride Elec. Storage Co., Ltd.	7	Hough, J. E., Ltd.	
Climax Patents, Ltd.	25	Igranic Electric Co., Lt	
Coomes, J. A., Ltd.	91	Jones, Sydney & Co.	
Cossor Valve Co., Ltd.	56	McClelland, J., & Co.,	
Curtis, Peter, Ltd.	61	McDonald, J., & Co.	
Darimont Electric Batteries, Ltd.	71	McMichael, Ltd.	
Davenport Wireless, Ltd.	35	Marconi Scientific Inst	
Day, Bertram & Co., Ltd.	73	Marconi's Wireless Tel	
Diamond Wireless, Ltd.	9	Marconi's Wireless Te	
Dubilier Condenser Co., Ltd.	106	Marshall, Percival &	



The Abbey Industries Variometer. Stand No. 85.

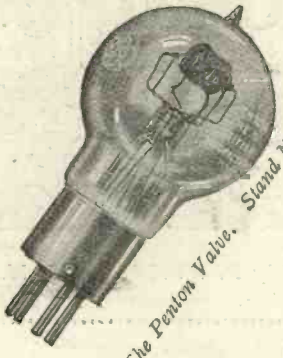
EKLY" GUIDE
XHIBITION
A AND B. HALLS



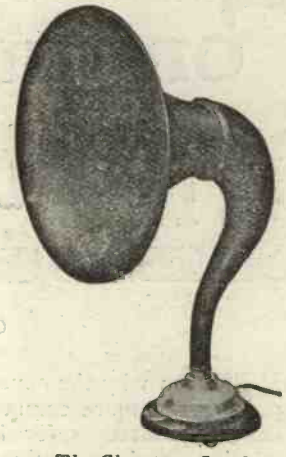


AND STAND NUMBERS.

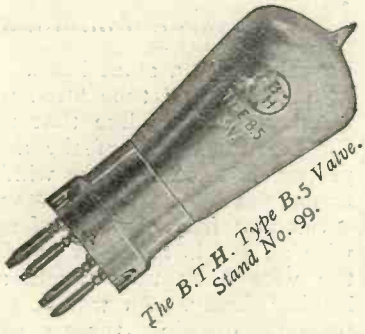
	No.		No.
Ltd.	107	Metropolitan Vickers Co., Ltd.	98
Ltd.	52	Mullard Radio Valve Co., Ltd.	90
d.	10	National Wireless & Elec. Co., Ltd.	30
o., Ltd.	87	Newnes, Geo., & Co., Ltd.	45
.. .. ..	111	Odhams Press, Ltd.	15
e	1	Penton Engineering	69
Ltd.	79	Peronet	20
Ltd.	11	Peto Scott Co., Ltd., The	42
.. .. ..	4	Preen, A., & Co.	4
Works, Ltd.	27	Pye, W. G., & Co.	92
.. .. ..	81	Radiax, Ltd.	8
td.	103	Radio Acoustics	68
. .. .	74	Radio Communication Co., Ltd.	111
. .. .	113	Radio Instruments, Ltd.	105
.. .. ..	21	**Radio Press, Ltd.**	**47**
Ltd.	32	Radio Society of Great Britain	54
. .. .	24	Radio Supplies, Ltd.	38
dio Sets, Ltd. ..	43A	Rawlplug Co., Ltd.	14
. .. .	2	Rogers, Foster & Howell, Ltd.	96
. .. .	3	Siemens Bros. & Co., Ltd.	76
.. .. ..	36	Solidite Manufacturing Co., Ltd.	37
d.	43	Sterling Telephone Co., Ltd.	108
.. .. ..	19	Sterling Telephone Co., Ltd.	109
d.	26	Telephone Manufacturing Co., Ltd.	33
.. .. ..	28	Trader Publishing Co., Ltd.	31
.. .. ..	83	Tudor Radio Co.	70
rument Co., Ltd. ..	57	Vanstone, W., Ltd.	11
graph Co., Ltd. ..	101	Western Electric Co., Ltd.	100
graph Co., Ltd. ..	110	Wilton Wireless, Ltd.	5
Law	22	Wireless Press, Ltd.	53



The Penton Valve. Stand No. 69.

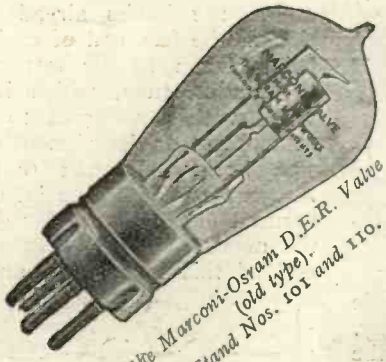


The Claratone Loud Speaker. Stand No. 84.



The B.T.H. Type B.5 Valve. Stand No. 99.

The Coomes Variometer. Stand No. 91.



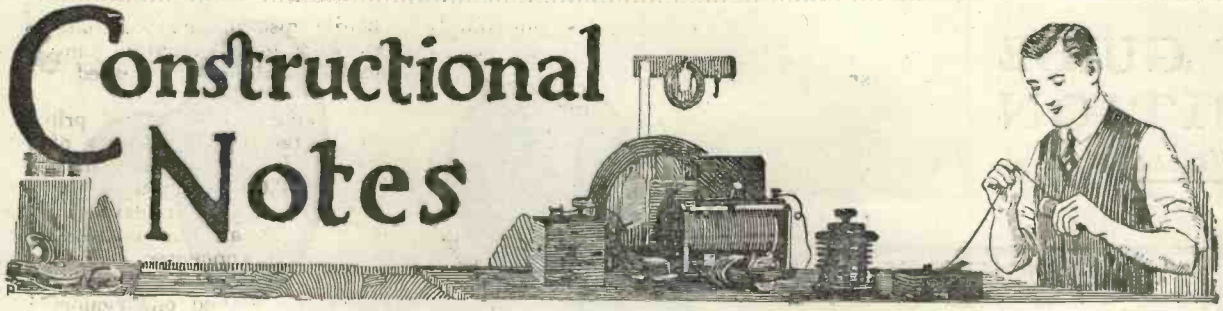
The Marconi-Osram D.E.R. Valve (old type). Stand Nos. 101 and 110.

The Edison Swan A.R.D.E. Valve. Stand No. 87.

"Exide" B.K. Type H.T. Battery. Stand No. 7.

Radio Instruments Wave-trap. Stand No. 105.

Constructional Notes



Conducted by R. W. HALLOWS, M.A., Staff Editor.

SOLVING THE COUNTERPOISE DIFFICULTY.

THE reason why the counterpoise is not more commonly used by amateurs for both transmission and reception is probably that it takes up more garden space than is usually available if fitted up in the ordinary way. Low wires hanging over flower beds, lawns and paths are more than a nuisance, and in very few cases it is possible to contrive to suspend them above a

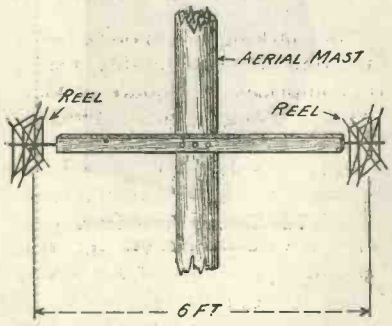


Fig. 1.—Illustrating the reels attached to aerial mast.

length of ground that is so little used that they are not in the way.

It is an accepted rule that the counterpoise must consist of as many wires as the aerial itself, and be of the same length.

Figs. 1 and 2 give a general idea of the way in which a convenient counterpoise may be made with the ability of being wound on a reel when not in use. At the house end an eyebolt for each wire is driven into the wall at a suitable height above the ground. To this two insulators in series are attached by means of cabled wire. To the insulator farthest from the house is fastened a short length of wire provided with a stout hook. An insulated lead-in tube fitted with terminals exactly like that used for the down lead of the aerial proper is fixed into the window frame.

Six feet from the end of each wire an eye is made by bending the wire back upon itself and lashing firmly. As will be seen from the drawing, these eyes fit on to the hooks already mentioned, the free end of each wire being taken to the terminal of the lead-in tube, which is provided with a wingnut to make attachment or detachment easy.

A horizontal strut 6 ft. in length made of 2 by 2 in. deal is secured firmly to the far side of the mast. (Fig. 1.) Into each end of this is screwed an 8-in.

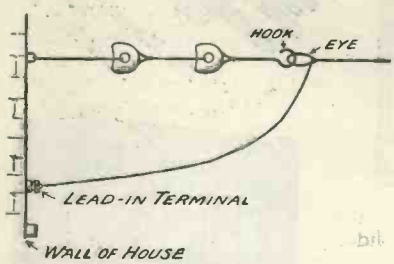


Fig. 2.—Arrangement for fixing counterpoise at house end.

length of ¼-in. round steel rod to serve as axles for the winding reels. The latter are made, as seen in Fig. 3, from Meccano parts.

To make one of these reels is a very simple business, and if it is done in the way described it will be as rigid as could be desired. Two 12-in. lengths are laid cross-

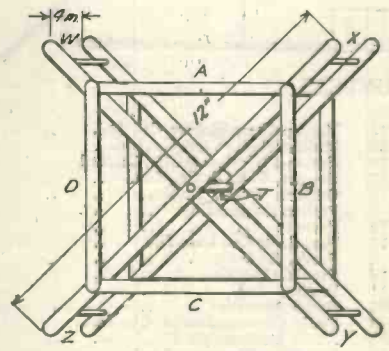


Fig. 3.—Showing details of reels.

wise to form an X, which is stayed by means of the pieces A, B, C, D. A second X is then made up and fixed to the first by means of the 4-in. distance pieces W, X, Y, Z. The holes at the points where each pair of arms cross are then drilled out to ½ in., and a 4-in. length of ½-in. diameter brass tubing (T) is soldered in position between the X's to form a bearing for the axle.

During the preliminary fitting together ordinary Meccano screws may be used, but to make the reel thoroughly stiff and strong every joint must be soldered before it is used.

The reel is now mounted between nuts on the axle. The

counterpoise wire, provided at this end also with two insulators, should be attached to the brass bearing tube, its length being so adjusted that it hangs with just the right degree of tautness between the points of suspension when it is hooked on to the insulators at the house end. The wire used should be 7/22's, which is sufficiently pliable to wind on quite easily when it is desired to take up the counterpoise. As the reel winds in about a yard to the turn it is a matter of a minute or so to take up each wire. To fix up the counterpoise one simply runs out the wires and hooks them on; to take it down one unhooks them and winds in.

The insulators at the mast end are wound on to the reel, their weight making them sag down and fall below the turns of wire.

It must be remembered that the counterpoise should not be in any way earthed. Its insulation must be of the best and the lead-in from it must be kept both outside and inside the house as carefully insulated as that from the aerial itself. R. W. H.

A SIMPLE LOOSE-COUPLER.

OF all the many forms of tuning inductance there is none that can hold a candle to the loose-coupler for use with the crystal detector. A type that is quite easy to make at home is shown in the drawing.

The primary coil consists of a former 4in. in diam. wound with 300 turns of No. 26 s.w.g. enamelled wire. It is mounted between two end pieces of the shape shown, 6½in. high and 6in. wide.

The method of mounting the coil is as follows. From one of the end pieces cut out with a fretsaw a circular piece 4in. in diameter. Fix this disc to the other end piece by means of two screws, having first sand-papered it down until it will just pass inside the coil. Secure the coil to it with glue. Push the other end of the coil former into the hole left in the second end piece and glue up. To the top of each of the end pieces fit a small block of ½in. thick ebonite, and fix a piece of ¼in. square brass rod provided with a slider across the two, taking care that the point of the slider makes firm contact with the turns of wire. Scrape off the enamel along the slider's path.

The secondary is a tube 3½in. in diameter, and 7 in length wound with 500 turns of No. 30 double cotton-covered wire. Tappings are taken in the way described recently in these columns at the 25th, 50th, 75th, 100th, 150th, 200th, 250th, 300th, and 400th turns.

One end of the tube is fitted with a wooden plug, the other receives an ebonite disc held in place by screws. This disc carries a 10-stud selector switch.

One end of the coil goes to a terminal; the tappings and the far end of the coil are taken to the studs. A lead from the spindle of the switch runs to a second terminal. Both end plugs are drilled to take the two parallel rods of ¼in.

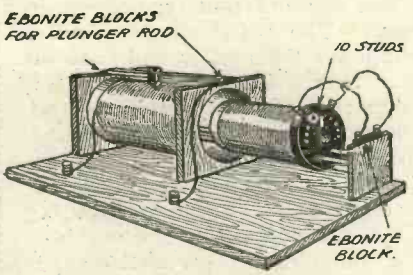


Fig. 4.—The Loose-Coupler.

round brass on which the secondary slides. These rods, 15in. in length, are threaded at both ends. One end of each is secured to the solid end-piece of the primary by means of nuts, the rods passing through the tube and the hole in the other end-piece. Their far ends are secured in the same way to a hard wood support, on which two terminals are mounted, standing on an ebonite block. Between these terminals and the pair on the ebonite disc of the secondary are flex leads long enough to allow the smaller coil to be pushed right inside the larger.

As single turns of the primary can be taken in by means of the slider it is not necessary to use a large A.T.C.; in fact, a vernier condenser of 3 or 5 plates will be found to be all that is necessary. If a larger condenser is used the slider and the condenser knob should be worked one against the other when a transmission has been picked up until the largest possible number of turns, and the least possible capacity, are in use.

The secondary should always be kept as loosely coupled as possible, for in this way the selectivity of the tuner is largely increased. It will require a variable condenser of .0005 μF to tune it. R. W. H.

USES OF A MARKING GAUGE.

For marking out ebonite panels this tool is considerably useful. It comprises a square wooden shank, along which slides a wooden block, the latter having a square centre bore to suit the shank. At one end of the shank is a fixed pin point. To mark a line round a panel, say ¼in. from the edge, the face of the sliding block is adjusted ¼in. from the pin point and tightened in position by means of a wooden thumbscrew. The face of the block is then rested against the edge of the panel, the fixed pin touching its face. By lightly drawing the block along the edge an accurate line is drawn by the fixed pin. By repeating the process along all four edges, four dead true corner points are obtained where the lines cross. A similar process is adopted for marking panel centre lines, or, in fact, any lines of centres which are required to be equi-distant or true. The process of using a marking gauge is much more satisfactory and gives a much better result than the more tedious and undependable method of marking off distances with a rule. B. H.

A SIMPLE GALVONOMETER.

ANYONE who possesses neither voltmeter nor ammeter, but desires to construct a home-made instrument for detecting a flow of current, indicating its direction and giving a rough idea of its strength, will find their requirements met by the simple galvonometer described in this note. It consists of a compass—any kind of small compass will do—placed within a coil of wire whose ends are connected to a pair of terminals.

When current flows round the wire, a magnetic field is formed which deflects the compass needle more or less violently according to the strength of the

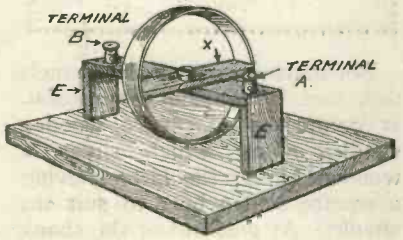


Fig. 5—The Galvonometer.

flow. The old " clock rule " tells us that if, when we look at the end of a solenoid, the flow of current is clockwise, the end viewed is the south pole. For this rule, be it noted, current is taken as flowing from positive pole to negative, not, as is now accepted, from negative to positive. If, therefore, your conception of currents is thoroughly modern, you must reverse the rule.

If, then, the windings of the coil as seen in the sketch run clockwise, and terminal A is connected to the positive pole of a battery, the side of the coil towards the eye will be the south pole, and the needle will be deflected so that its south-seeking end points towards terminal A.

The fact that there is a deflection shows the presence of a current flow, the direction of the deflection shows the direction of the current, and its magnitude gives a very rough idea of the strength of the current. Here, then, is an instrument that will be handy for testing for continuity of windings and for detecting broken leads, short circuits, and so on.

To make it obtain a two-inch length of cardboard tubing and wind on from a dozen to twenty turns of insulated wire. Across the diameter of the coil fasten the wooden strip X by glueing its ends to the cardboard.

Now cut out a baseboard four inches square. Fix to it the end pieces E, E, each 2½ inches high, by driving screws from below, and fasten another wood strip across their tops. On this strip mount two terminals, A, B, attaching the ends of the windings to them. The compass is placed on its shelf, as shown in the drawing, and the instrument is ready for use. R. W. H.

REMOVING AND REPLACING TAPPED COILS.

It is often desirous to remove tapped coils in order to substitute a coil of a different type of winding. The following device simplifies the matter and enables one to remove a coil from its supporting frame, yet leave the contact studs, switch arm, etc., intact for the replacement of another coil. The method of doing this is shown in Fig. 6. Each side supporting the coil has a wooden runner screwed on the inside on the centre line of the coil. A slot is cut at each end and on the same side of the coil in order to form a groove or guide for the runner. The coil is then pushed into position with the grooves retaining the runner, the side opposite the slot acting as a stop against the end of the runner. After pushing home the latter a small pin is then passed through each end of the coil into each runner. In Fig. (6) three methods of making the tappings easily attachable to the securing nuts of the contact studs, are shown. The first shows the wire twisted and looped at the end, to a diameter which just clears the contact

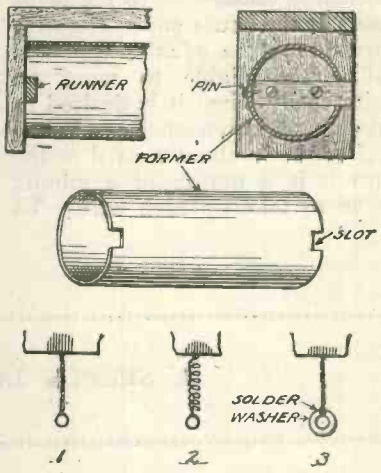


Fig. 6.—Details of the Former and Runner.

stud screw. The second form—which gives a neater finish is made in a similar manner, but the wire is wound in spiral form and pulled over to its corresponding stud. The third method is to solder a washer to the end of the wire tappings.

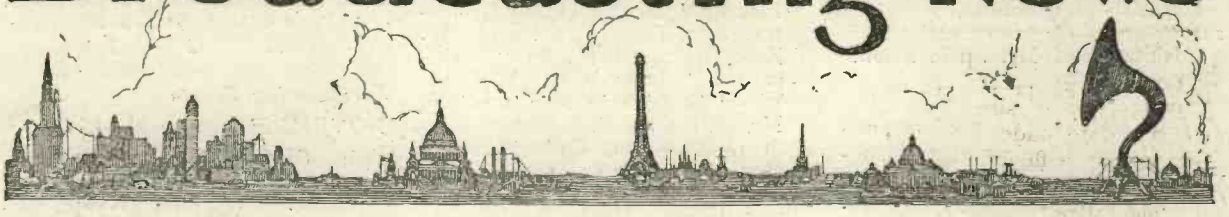
H. B.

ERRATA.

Referring to the Regenerative Reflex Receiver described in our last issue, the primary winding of the high-frequency transformer should consist of ten turns of No. 22 S.W.G. d.c.c. copper wire stuck upon the inside of the tube carrying the secondary winding. Although this is the method originally specified, the alternative plan of winding the 10-turn primary over the secondary, but insulated from it by Empire tape, may be adopted. The condenser C_3, across the primary of the reflex transformer should have a capacity of 0.001 μF.

Referring to the circuit diagram of the Five-Valve Receiving Set (Vol. 2 No. 16, page 560), the positive side of each group of grid cells should *not* be connected to the L.T. negative lead, the only connection to this lead being a variable one indicated by the arrow.

Broadcasting News



LONDON.—Experiments have been made from 2LO in transmitting from a new experimental studio. The feature of this studio is that there is very little elimination of echo. A large number of people have written in to say that they think the new studio is a big advance on the old, so it is possible that more echo will be heard in the transmissions in the future.

□ □ □

We were happy to have another opportunity of hearing the Russian tenor, M. Romano Ciaroff, and we must tend to him our best thanks and appreciation for his perfect rendering of the two items by Tosti, including, of course, the ever popular "Addio" or "Goodbye." Personally we think that M. Ciaroff is at his best in these sentimental, tender compositions; and we do not like to hear him in the heroic numbers, when he gives his apparently overwhelming exuberance full sway, at the expense of his otherwise golden voice which then seems to take on the harder quality of baser metal.

□ □ □

Forthcoming Events

NOVEMBER.

16th (FRI.).—Orchestral programme. Mr. Victor Smythe, entertainer; Miss Mabel Twemlow.

17th (SAT.).—Orchestra and dance programme. Miss Olive English, contralto; Mr. Rupert O'Hea, tenor.

18th (SUN.).—3.30, Miss Hilda Dederich, pianist; Miss Gwen Godfrey, soprano; Mr. Seth Lancaster, 'cellist; Mr. Eric Godley, baritone; Palace Instrumental Trio. 8.30, Oratorio selection. Mr. George Parker, baritone; Band of the 20th Battalion London Regiment (Queen's Own).

19th (MON.).—9.45-10.30. Orchestral music. Miss Gertrude Johnson; Mr. John Perry.

20th (TUES.).—Mr. Edward Mitchell, pianist. Russian Gypsy Songs with Guitar accompaniment, sung by Mesdames Alexeeva and Rabineck, and Messeurs Saloff, Rabineck and Volchanski; Miss May Fussell, 'cellist; Mr. Ronald Gourley, pianist. Savoy Orpheans.

21st (WED.). — Orchestral programme by Anglo Hawaiian Players. Mr. Jack Millard, entertainer.

23rd (FRI.).—Orchestra. Miss Elsie Cochrane, soprano; Mr. William Bates, humorist; Mr. Will Herbert, zither-banjo solos.

24th (SAT.).—Transmission from the "Old Vic," Act. I, "La Traviata." Mr. Fred Spencer, entertainer; Mr. Hilton Edwards, singer.

□ □ □

ABERDEEN.

Forthcoming Events

NOVEMBER.

14th (WED.). — Orchestra, Miss Nan Campbell and Miss Kathleen Morgan.

15th (THURS.).—Orchestra and vocal selections from modern operas.

17th (SAT.). — Concert by local artistes.

18th (SUN.).—Rev. A. W. Scudamore Forbes, B.D.; orchestra.

19th (MON.). — Orchestra. Miss Poppy Cooper; Messrs. Harvey McCallum.

20th (TUES.).—Mr. J. Rossetti's Trio.

21st (WED.).—Orchestral Dance Music.

□ □ □

BELFAST. — According to Prof. Stanley, this city offers few attractions for the listener-in. He considers it torture to hope for music or speech triumphing through the myriad of police, army, ship and other signals which crowd the ether over Belfast. Notwithstanding these facts wireless seems to lose nothing of its popularity.

□ □ □

BIRMINGHAM.—5IT was the pioneer in the children's Radio Circle, which has been extended to all stations, and now they have embarked upon a weekly concert by juvenile artistes of the Radio Circle. This will be given on Saturday afternoons.

□ □ □

Forthcoming Events

NOVEMBER.

14th (WED.).—Mr. Paul Rimmer's Orchestra and Station Repertory Company.

15th (THURS.). — Special station anniversary programme. M. Romano Ciaroff, tenor; Madame Alice Couchman, solo pianist, 8.5-8.15, Mr. Percy Edgar, Station Director, will address a few words of thanks to listeners. 9, Sir William Noble will make a few remarks.

17th (SAT.).—Popular concert. Mr. Philip Middlemiss, entertainer.

18th (SUN.).—The Wolseley Male Voice Choir; Miss Elsie Cochrane; Mr. Silvio Sideli; the Rev. A. Bateman.

20th (TUES.).—Birmingham Cymric Choir; Mr. Wm. Bates and Miss Elsie Wilson, soloists.

21st (WED.).—Grand Operatic Night "Cavalleria Rusticana."

□ □ □

CARDIFF.

Forthcoming Events

NOVEMBER.

14th (WED.). — General Concert. Miss Nora Delmarr and Miss Beatrice Eveline, soloists; Station Orchestra.

18th (SUN.).—Bournemouth Wireless Orchestra. Miss Hilda Rooks, soloist; Rev. J. Howell Rees.
20th (TUES.).—Mr. Phillip Wilson; Harpsichord Quintette.
21st (WED.).—Orchestra. Miss Elsie Cochrane and Mr. Silvio Sideli.

□ □ □

GLASGOW.—The performance of "Les Cloches des Corneville" by members of the Lyric Club at 5SC was signally successful and marked a new advance in the "radiation" of light opera. Listeners all over the country have testified their appreciation of the effort, and requests have been made for a repeat performance.

□ □ □

Forthcoming Events

NOVEMBER.

14th (WED.). — Parkhead Silver Band.
15th (THURS.).—"A Midsummer Night's Dream," produced by Mr. R. E. Jeffrey and adapted by Miss Cathleen Nesbitt.
17th (SAT.).—Orchestra.
20th (TUES.).—Orchestra and Vocal Concert.
21st (WED.).—Orchestra.

□ □ □

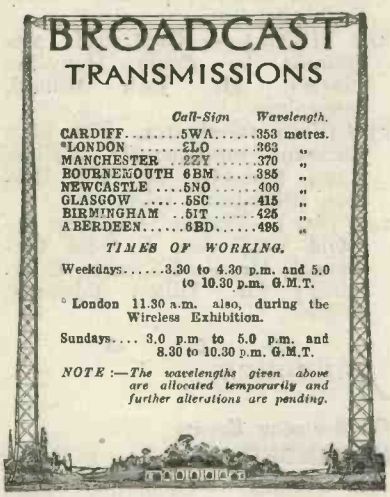
MANCHESTER.—The Piccadilly Picture House transmissions can hardly be considered satisfactory. The organ music is weak and lacks "volume." The orchestra, although clearly an excellent body of players, and ably conducted, does not show to advantage when broadcast. No doubt the defect will soon be remedied and we look forward to some good transmissions from this source.

□ □ □

Forthcoming Events

NOVEMBER.

14th (WED.).—3.30, Piccadilly Picture Pioture House Orchestra. 6.30, Organ Recital, Piccadilly Picture House. 7.45, Concert by 2ZY Orchestra. 8.20, Miss Frances Roland, contralto. 9.45, German talk. 10, Dance music.
15th (THURS.).—11.30, 2ZY Trio. 6.30, Girl Guides and Boy Scouts "pow-wow." 6.45, Spanish talk. 7.35, Concert by Besses o' th' Barn Band; Miss Helena Taylor, soprano; Mr. T. H. Morrison, solo violin.
16th (FRI.).—3.30, Reproducing Piano; Mr. T. Vernon, tenor. 6.30, 2YZ Orchestra; Miss Elsie Cochrane, soprano. 8.15, Piccadilly Picture House Orchestra. 8.45, Talk by the Rev. G. W. Keer, B.A., LL.B., on "Anticipations" or "What Will the World be Like in 2000 A.D." 9, Mr. Silvio Sideli.
17th (SAT.).—3.30, Oxford Picture House Orchestra. 6.30, Organ Recital, Piccadilly Picture House. 7.45, Concert by the Frolics Concert Party.
18th (SUN.).—8, Address to Young People by Mr. S. G. Honey. 8.30, Miss Irene Mirris, soprano. 9, Rev. Principal Moulton, M.A., of Didsbury College.
19th (MON.).—3.30, 2ZY Orchestra. 6.35, Boys' Brigade and Life Brigade Bulletins. 6.45, Spanish Talk.



20th (TUES.).—3.30, 2YZ Trio. 6.30, "Some Northumbrian Legends," by Capt. H. G. Bell. 7.45, Miss Jessie Cormack, solo piano; Mr. Sam Hempsall, tenor; Miss Molly Gray, soprano; Mr. T. H. Morrison, solo violin; Mr. Klinton Shepherd, baritone. 8.35, Mr. Victor Smythe, humorist. 9.40, Percy Phlage and Persiflage.

□ □ □

NEWCASTLE. — We have heard many complaints of interference recently, and during Lord Curzon's enjoyable speech at the dinner to Mr. T. P. O'Connor bad interference caused great annoyance to many. Interference during the concert on the following evening drew an irate letter from a coast-dweller, which appeared in the local press. A local wireless dealer promptly jumped into the breach on the next day advertising wave traps.

□ □ □

Forthcoming Events

NOVEMBER.

14th (WED.).—Miss M. Beaty, soprano. Miss Florence Farrar, pianist. Mr. John Wyatt, lecturer. Mr. Silvio Sideli. Miss Cochrane and Mme. May Grant, sopranos.
15th (THURS.).—Mr. J. Mackintosh, cornet. Miss E. D. English, contralto.
16th (FRI.).—Mme. Alec Thompson's Quartette Party. Orchestra.
17th (SAT.).—Mr. and Mrs. Jordan, vocal duets. Miss Rita Robinson, violin. Orchestra. Mr. Will Knowles, entertainer.
18th (SUN).—Rev. A. A. Lee. Elmora Choir.
19th (MON.).—Miss Florence Farrar, pianist. Mrs. Hall, soprano.
20th (TUES.).—Mr. Wm. Law's Trio. Orchestra. Mr. Wilson Beveridge, tenor. Mr. Edw. Stewart, of Newcastle Cathedral, bass. Miss E. M. Stanley, mezzo-soprano.

□ □ □

Simultaneous Broadcasting Events

NOVEMBER.

14th (WED.).—7, Mr. Archibald Haddon, Dramatic Critic. 9, B.B.C. Birthday; Mr. J. C. W. Reith on the "Year's Work." 9.20, Sir Patrick McGrath. 9.10, Senator Marconi.
15th (THURS.).—Mr. Percy Scholes, Musical Critic. Talk by the Radio Society of Great Britain. 7.35, Concert from Manchester by "Besses o' th' Barn," conductor, Mr. A. Barlow. 9.45, Mr. A. Kendrick, B.A., on "Museums and Listeners." 10, Savoy Orpheans Band.
16th (FRI.).—Mr. G. A. Atkinson, Film Critic.
18th (SUN.).—3.30, Concert.
19th (MON.).—7, Mr. John Strachey, Literary Critic. 7.30, Wagner Evening. 9.10, Lieut.-Col. A. C. Bromhead, C.B.E., "British Films for British People."
20th (TUES.).—The Right Hon. Lord Montagu of Beaulieu, K.C.I.E., C.S.I., "A Talk on Roads." 10, Savoy Orpheans.
21st (WED.).—Mr. Archibald Haddon, Dramatic Critic.

The Radio Society of Great Britain.

A SUMMARY OF THE SCHEME FOR RECONSTITUTION.

THE reorganisation of the Radio Society of Great Britain has been proceeding during the past few months, and a scheme has been evolved which will, it is thought, be appropriate to the national character of the Society and give solidarity to the amateur movement.

The old Wireless Society of London, when it resumed work after the war, found wireless transformed by the improvements in radio-telephony and other applications of the three-electrode thermionic valve. The increased interest in wireless science caused an influx of members, of whom many were resident far from London, and the title of the Society became a misnomer. As a consequence the Society was renamed last year the Radio Society of Great Britain. The new name is only one indication of its national scope, for as a fact there are now more than 200 Societies affiliated with it, and the Prince of Wales has honoured the Society by becoming its Patron.

Since the change of name took place a first draft of new Memorandum and Articles of Association has been drawn up. The new constitution takes cognisance of the facts that :

(1) The Radio Society of Great Britain as it stands has a membership extending all over the country.

(2) The Affiliated Societies ought to have a more direct voice than at present in national matters affecting them.

(3) The Affiliated Societies must have complete autonomy.

Draft copies of the new constitution will shortly be submitted to the Society in General Meeting and to the Affiliated Societies.

Meanwhile a summary of the scheme proposed may be of interest. It provides that the affairs of the Radio Society will be managed by a Council of about twenty, meeting in London, and the relations between the Affiliated Societies and the Radio Society will be managed by a General Committee of about forty members, meeting in various centres in turn. The Council will be elected partly by the members of the Radio Society (metropolitan and provincial) and partly by the General Committee. The General Committee itself will be elected mainly by the Affiliated Societies, but will comprise two or three members nominated by the Radio Society. The subscription rates will remain approximately as at present, namely a guinea per annum from each member and from each Affiliated Society. The Radio Society will be financially responsible for the administrative expenses of both bodies.

All nation-wide matters will be referred to the General Committee, and action will be taken by the Council upon the advice of the General Committee. In order to ensure singleness of purpose the Council will conduct all negotiations with the Government, or with other bodies on matters when the national unity must be preserved and emphasised.

These are times of great stress for the amateur movement. A large public is growing up which tends to be unsympathetic to the experimenter. If therefore any clash of the interests of the listener-in and the experimenter should unfortunately occur the case for the experimenter ought to be presented with a single voice. It is hoped that all experimenters will rally to the new constitution of the Radio Society of Great Britain.

W. H. ECCLES.

An informal meeting of the Radio Society of Great Britain, will be held on November 21st, at the Institute of Electrical Engineers at 6 p.m., when Mr. G. P. Mare will open a discussion on "Aerial Construction."

RANDOM TECHNICALITIES

By PERCY W. HARRIS, Assistant Editor.

A few notes regarding French Transmissions—Resistance-coupled Amplifiers and Basket Coils.

IT is rather interesting, technically, to compare the conditions under which the French broadcast public listens to its messages and music, and those under which we enjoy the programmes. There are advantages and disadvantages on both sides of the Channel. On this side we are comparatively free from interference, save when listening to distant stations which are likely to be jammed by the 450 metre directional wireless signals. Against this must be set the difficulty of amplifying, at high frequency, the relatively short wavelengths used. In France, resistance-capacity amplifiers can be used quite efficiently, for the wavelengths (save that of the School of Posts and Telegraphs) are relatively long. A well-designed resistance-capacity coupled high-frequency amplifier works perfectly satisfactorily on all wavelengths above 1,000 metres, and thus the Eiffel Tower and Radiola (the former on 2,600 and the latter on 1,780 metres) can be magnified quite easily for frame aerial reception even in the most distant part of France.

* * *

The other Sunday evening I was listening to Radiola on a new receiver with two stages of high-frequency and a detector valve, without any note-magnifying valves added, and particularly noticed the high quality of the transmission. But the interference from harmonics of high-power stations, morse on spark stations and atmospherics was peculiarly distressing. The longer the wavelength, the flatter the tuning becomes, so that stations separated by quite a considerable difference in wavelength chimed in regularly with their musical notes and buzzes. On short waves, the various forms of wave-trap I have recently described get rid of the interference quite satisfactorily, and I am now engaged in working out a scheme for an attachment to any existing amplifier, so that the French broadcasting can be received without the usual boiler shop accompaniments. It is a great disadvantage of resistance amplifiers that they magnify interference regardless of wavelength, whereas on tuned anode or tuned transformer coupling the magnification is selective.

* * *

It is very gratifying to see that makers of basket coils have realised the absurdity of winding them with the ridiculously fine wire which was the rule until recently. The fact that we can compensate for some of the resistance losses by recourse to reaction should not blind us to the fact that better signals and sharper tuning are often obtained by the use of a thicker wire. The improvement possible by using thick wire is particularly noticeable in variometers, as you will find if you compare one wound with, say, No. 22 S.W.G. wire with another of No. 28 S.W.G. The improvement in crystal receivers is especially marked.

* * *

By the time these notes appear the All-British Wireless Exhibition will be opened. Every reader who can possibly manage it should go to the Show, for I know of many novelties which will be exhibited there for the first time. The primary cells for lighting valves to which I referred in recent notes are to be shown there.

* * *

Last week I wrote of the punishment that should be meted out to some H.F. circuit-mongers. May I add that an even worse fate should befall the makers of variable condensers who sell .0003 μF as .0005 μF and .0005 μF as .001 μF. I do not believe 10 per cent. of the variable condensers now sold are accurate, and many are not within 50 per cent. of the stated figure.

Conducted by A. D. COWPER, M.A., Staff Editor.

Crystal Detector Fitting.

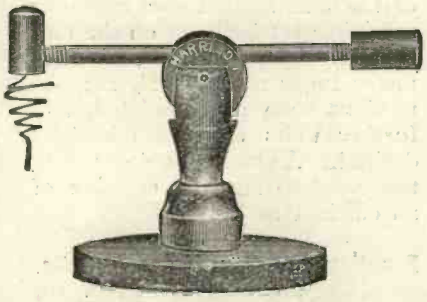
MESSRS. HARRISON MANUFACTURING CO. have forwarded a sample of their crystal detector fitting, for mounting by the amateur on his own panel. This consists of a column, with fixing screw, carrying a novel type of universal joint to which the cat's whisker arm is attached. The range of adjustment, on trial, was found to be ample, with welcome absence of back-lash and sufficient firmness. The cat's whisker was commendably fine and springy. The detector fitting, which is supplied either in lacquered brass or nickel-plate, should make up readily into a sensitive and easily adjusted unit.

Static Arrester.

A permanent safeguard against heavy " static " discharges, and, of course, the rarer phenomenon of actual lightning stroke, is provided by a " static arrester " supplied by Radio Specialities. This has a spark-gap with micrometer adjustment between a fine point, on the aerial side, and a brass ball which is earthed; thus providing an easy path to earth for any heavy discharge, at the same time giving good insulation for signal-reception. The device is mounted on a small circular composition base, and has terminal screws for connecting purposes. On test the insulation resistance was found very good, the adjustment smooth, and the appearance and finish satisfactory.

A Microphone Amplifier.

We were very glad to have an opportunity of putting to a comprehensive series of tests a microphone relay, made by Messrs. S. G. Brown, Ltd. This is an amplifying device which, when connected in place of the telephone receivers, by means of a double-acting microphone actuated by the type of reed mechanism familiar in the Brown head-



The Harrison Crystal-detector Fitting.

phones, modulates the current from a six-volt battery connected to a second pair of terminals. The modulated current, on passing through a telephone transformer incorporated in the instrument, gives a considerably enhanced audio output to high resistance phones or loud-speaker connected to a third pair of terminals. As the effective resistance, in the instrument tested, of the six-volt microphone circuit was of the order of 100 ohms, it will be seen that the demands on the accumulator (which can be the filament-lighting battery of a valve set) are extremely modest, whilst no H.T. is needed. Actually the instrument could be run off four large dry cells.

On trial as note-magnifier after a sensitive and efficient single-valve receiver, it gave most excellent loud-speaking on level transmissions. Compared directly with a one-valve note magnifier of conventional design, the amplification was favourable. As substitute for a second note-magnifying valve, it fell slightly short of the latter in intensity, but with less distortion. Used after three valves, detector and two note mags., it gave a prodigious shout, in which, however, the words of a speaker were fairly intelligible, being considerably better in this respect than most of the public exhibitions of loud speaking that are doing so much harm to the industry. As audio amplifier after crystal reception, the results were excellent. On a really efficient crystal tuner in the outer suburbs, and perikon crystal, which normally brings in 2LO at roughly " phones-on-the-table " stage with this relay and a six-volt battery, quite a nice degree of loud-speaking resulted.

Extended tests in conjunction with a single-valve receiver gave interesting demonstrations of possibilities with limited apparatus, *e.g.*, with single-valve and relay, the simultaneous broadcasting from London was obtained back again from Glasgow and Newcastle quite nicely audible on the loud-speaker in London.

Book Notes

Wireless for All. (Radio Press Series No. 1, 6d.)

This book, by John Scott-Taggart, F.Inst.P., is intended for the absolute beginner in wireless. It deals with the theory of the science in a simple and easily understood manner and, as an introductory book on wireless, has much to recommend it.

Simplified Wireless. (Radio Press Series No. 2, 1s.)

Written as a sequel to "Wireless for All," this book by the same author, practically commences where the latter leaves off, and progresses by easy stages until, in the last chapters, the reader is instructed in the making of simple and inexpensive crystal receivers. The book includes an explanation of all the electrical terms used in wireless.

How to Erect Your Wireless Aerial. (Radio Press Series No. 4, 1s.)

The author of this handbook, B. E. G. Mittell, has had an extensive experience of aerials of all types, including those of high power commercial stations, and the essentially practical details which he gives regarding the selection of a site and the actual erection of the aerial will prove particularly useful to beginners. A chapter is devoted to indoor and frame aerials.

The Construction of Wireless Receiving Apparatus. (Radio Press Series No. 5, 1s. 6d.)

This handbook, by Paul D. Tyers, gives practical details of the construction of many very useful components. It does not deal with the construction of a complete receiving set, but indicates how the components dealt with may be incorporated in sets.

How to Make a "Unit" Wireless Receiver. (Radio Press Series No. 7, 2s. 6d.)

This little handbook, by E. Redpath, Assistant Editor of *Wireless Weekly*, explains in a simple manner the essential theory of radio telephony, and gives thoroughly practical details of the construction of a complete receiving set built up on the unit system. The first unit, a variometer tuner and crystal, may be used as soon as completed, and further units may be added as desired. A chapter is devoted to the construction and erection of an efficient aerial.

Practical Wireless Valve Circuits. (Radio Press Series No. 10, 2s. 6d.)

This standard book of circuit diagrams, by John Scott-Taggart, F.Inst.P., contains about 70 different circuits, and gives typical values for condensers, grid leaks, etc. With each diagram, a brief explanation and criticism is given to guide the experimenter in making a selection.

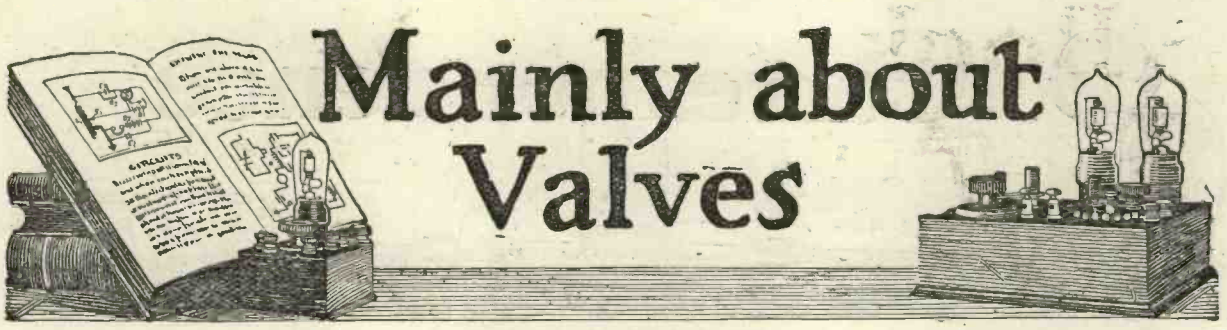
Relativity. N. R. Campbell, D.Sc. (Cambridge: Cambridge University Press, 1923.) Demy 8vo., 115 pp. 7s. 6d. net.

Dr. N. R. Campbell is well known for his physical and philosophical writings, and is one of the ablest of English authors in these subjects. So many volumes have recently appeared on the subject of Relativity, mostly in the German language, that any addition might seem superfluous. The translations of the works of Einstein himself and of Weyl are available, and Eddington has written an excellent exposition of the subject. This book, however, is one of the most interesting semi-popular treatises on this subject which we have seen. It is impossible to enter into a detailed account of the book, except to say that it deals with the First and Second Principles and their consequences, the geometrical interpretation of these principles, and the general theory of what may be called its practical application.

Questions and Solutions in Telegraphy and Telephony. H. P. Few. (London: S. Rentell and Co.) Cr. 8vo., 324 pp., 5s. 6d. net.

This volume is designed for the use of students preparing for the examinations held by the City and Guilds of London Institute in the ordinary grades of telegraphy and telephony. In the 5th edition solutions are given to the examination papers set from 1915 to 1919. The author is a first-class honoursman in telegraphy and telephony and a certificated teacher of the City and Guilds of London Institute.

The book contains questions and answers upon every conceivable aspect of telegraphy and telephony, and is liberally illustrated with circuit diagrams and pictorial representations.



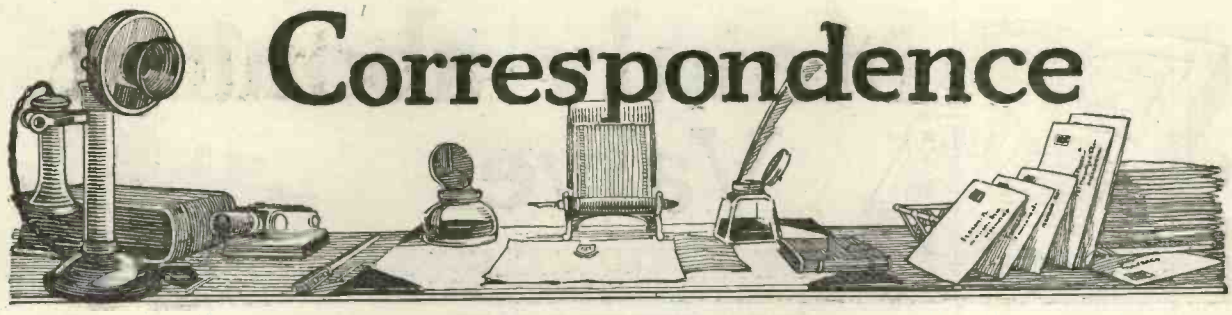
Mainly about Valves

Our Weekly Causerie written by the Editor.

SOME beginners wonder why it is that as the reaction coil is tightened a sudden "plonk" is produced in the telephone receivers. This plonk is rightly regarded as a nuisance. Instead of being able to increase the reaction slowly up to the desired point, there seem to be only two adjustments, one where the reaction has just been begun and the other, self-oscillation. The valve, apparently, for no particular reason, suddenly decides that it will no longer carry on the reaction amplification process but will go the whole hog and start oscillating. Why is this effect not so often obtained in a circuit such as the ST. 34, which uses a tuned anode circuit with reaction from the anode circuit of the second valve? Why is the effect more often obtained in a circuit where, for example, the reaction is introduced on to the aerial circuit?

The plonk is due to a sudden change in the anode current flowing through the telephone receivers. This change may be an increase or a decrease. When a grid condenser is in the grid circuit of the valve which is oscillating, and reaction is increased to such a point that the valve begins to oscillate, the plonk is usually, but not necessarily, due to a sudden drop in the mean anode current flowing through the telephones. When the valve begins to oscillate the grid has comparatively high voltage oscillations applied to it, and the positive half-cycles attract electrons to the grid. These electrons, piling up on the right-hand side of the grid condenser, cause the grid almost instantaneously to become considerably negative, and the grid potential begins to oscillate about this mean negative potential. The sudden change of the mean anode current, however, is in a downward direction, the accumulated negative charge on the grid causing a decrease in the anode current, this sudden decrease producing a plonking effect.

The plonking effect is also frequently obtained even when no grid condenser is employed, and in this case is due to the change of anode current caused by the rectification of the valve. This rectification may be due to grid current rectification, or it may be due to rectification produced through the valve operating at, or near, a bend in its characteristic curve. There is usually only one point on the grid voltage anode current characteristic curve where no rectification takes place, and this is the middle of the steep portion of the curve. Rectification here will take place, unless the curve lies to the left of the zero grid voltage ordinate or vertical axis. If the valve in which reaction is being produced is being operated under such conditions the middle point on the characteristic curve is being used, then, when the valve begins to oscillate there will be no appreciable change in the average current flowing through the telephone receivers. If, however, we make the grid potential more negative so that we approach the lower bend, the anode current will rise, due to the high-frequency currents generated by the valve being rectified by it, with the result that the rectified component adds itself to the existing steady current.



RE SINGLE-VALVE LONG-WAVE SET.

"Modern Wireless," July.

SIR,—It may interest some of our long-wave enthusiasts to hear of my experiences with the above set. The set is composed of purchased component parts, all being of British make. (I mention this after reading amusing remarks *re* " job stuff " in *Wireless Weekly*, No. 13, Vol. 2.)

Now for results, using single wire P.M.G. aerial, 28 ft. high, composed of ex-Army telephone cable (medium), Ora valve, Igranic coils and 0.001 Polar condenser. I regularly receive concerts and speech from Radiola, Eiffel Tower, Croydon Aerodrome and Königswüsterhausen, the last-named being weakest, but quite distinct.

The carrier waves of aeroplanes have also been picked up, but no telephony was heard, the reason, I suppose, being that the transmitting apparatus in use on 'planes is less powerful.

I make these few remarks in view of the fact that no mention was made of the reception of speech and music, only Morse, in the description of the above set in *Modern Wireless*.

I am hoping shortly to try out one of the 2-valve circuits for long-wave work as described in *Modern Wireless* for October.

Wishing both your journals the success they deserve.—I am, etc.,

P. J. HILLIER.

Devizes.

APPRECIATION.

SIR,—Being interested in any practical method of improving the efficiency of my set (3 V.) and reading your " Random Technicalities " of Oct. 3, I noticed the " absorption circuit " in your diagram, and it occurred to me that I might try this out on my set. I proceeded to do so, using a coil I made up from your previous article for a crystal set, and I was greatly surprised at the results. With the coil shunted by a 0.0003 μF variable condenser, I could easily cut out London and get Cardiff or any of the other stations I desired.

My set is 1 H.F., detector, 1 L.F. Marconi Osram D.E.R., 66 volts on the plate, tuned anode, reaction on the anode. This produces good results on a loud-speaker, and Glasgow is particularly good, almost as loud as London.

I enjoy your articles, and should like to congratulate you on the two papers you produce. *Wireless Weekly* and *Modern Wireless* are both saving me time and money—an important thing in these days.—I am, etc.,

B. W. KING.

Chiswick, W.4.

INTERFERENCE.

SIR,—I have read with some interest your remarks in a recent issue *re* interference from spark stations in these parts, and your suggestion for eliminating same.

I am afraid the " gadget " has yet to be found that will cut out FFU (Ushant's) spark transmission and French trawlers in the vicinity on 300 metres and enable us to hear telephony on 353 metres from Cardiff, or 363 metres from London. Or the " Lizard " on 450 metres (11 miles away), and enable us to hear telephony from Newcastle, Manchester, Birmingham, etc.

There seems to be an idea that this part of the county is " bad " for reception. I maintain that it is no worse than many other parts of the United Kingdom where there are commercial stations working with ships, etc.

I can (spark transmission permitting) get any of the B.B.C. stations on a *loud-speaker*, using three Mullard dull emitters and a Brown's Relay.

Eiffel Tower and Radiola are perfect owing to their long wavelength clear of spark interference.

No, there is nothing wrong with the reception, the trouble is that the B.B.C. (with great forethought) selected wavelengths for their transmission of concerts, etc., so close to those in use by commercial and ship stations, that in many places it is impossible to cut out *spark* interference.

The remedy lies with the B.B.C., and I suggest they stop putting up small stations or relay stations at " strategic points " all over the country, and instead instal (erect or hire) one powerful super-station which can transmit telephony on a wavelength of not less than 2,000 metres or thereabouts, anyhow, well clear of *spark* interference.

By transmitting extracts from the present stations' nightly programmes, the super-station *should* satisfy all the " programme grousers."—I am, etc.,

LIVING IN HOPES.

Marazion, Cornwall.

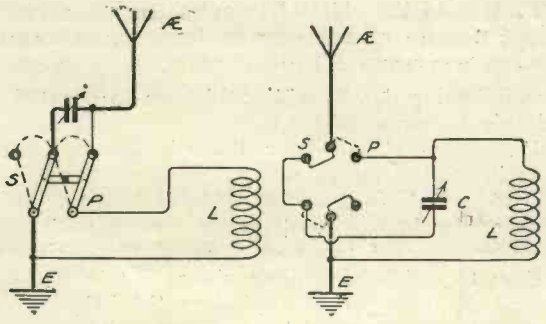
Information Department

J. W. C. S. (BOURNEMOUTH) asks how he may (a) obtain higher wavelengths and (b) employ reaction, with a unit receiving set.

In order to obtain higher wavelengths and, at the same time, employ reaction with unit receiving apparatus embracing variometers for tuning purposes, obtain a two coil-holder and connect up so that an additional plug-in coil may be connected in series with the aerial tuning variometer and another in series with the anode tuning variometer. In the case of the aerial circuit, it is important that the grid-filament connections to the valve should embrace both variometer and loading coil. Variation of the coupling between the two plug-in coils will introduce reaction between the anode and grid circuits of the first valve. If the desired effect is not obtained at first trial, reverse the connections to the reaction coil. This method is not suitable for very long wavelengths as, when large coils are added, the effective range of the variometers is considerably reduced.

P. T. (LONDON) asks for switching for series-parallel capacity arrangement.

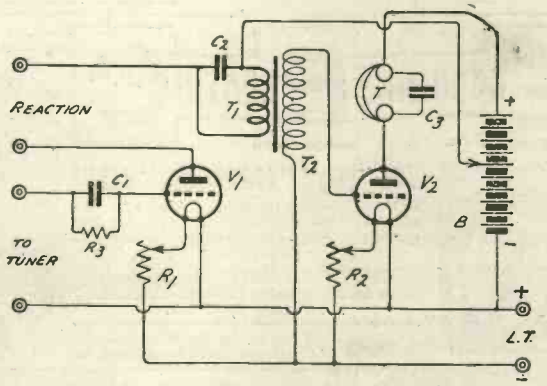
We reproduce herewith two arrangements illustrating how series-parallel capacity may be obtained, using only one condenser.



C. E. S. (SUNDERLAND) finds when using ST100 that breaking the circuit between the cat-whisker and crystal produces a prolonged shriek. He also notices that when the loud-speaker is touched a loud howl results.

The fact that the set howls when the cat-whisker is removed from the crystal is by no means abnormal, and takes place in many ST100 receivers. Proper adjustment of the crystal detector should always be made. The fact that when the loud-speaker is touched a howl results is not normal and some steps should be taken to prevent it. We would suggest connecting various values of fixed condenser in parallel across the loud-speaker winding. Suitable values to try are as follows:—0.002 μF; 0.01 μF.

A. B. (BIRMINGHAM) asks how he may use a Dutch valve for detector and Marconi Osram for low-frequency amplification, using a common H.T. battery.



The desired effect can be obtained by using a tapped H.T. battery, as shown.

H. A. L. D. (KILMARNOCK) asks for suitable values of components for ST50 circuit.

Variable condensers: C_1, 0.0005 μF; C_2 and C_3, 0.0003 μF. Coils: L_1, No. 35 or 50 Igranic, depending upon the size of your aerial. L_2, No. 75; L_3 and L_4, No. 75 Igranic. These values are suitable for the reception of broadcasting. Fixed condensers. C_4, 0.0003 μF; C_5, 0.0002 μF. The grid leak R_5 may have a resistance of 2 megohms, and we strongly advise you to buy one of reputable make. A two coil-holder will be necessary

for the coils L_3 and L_4 in order that you may adjust the amount of reaction between them. If you cannot produce reaction effects, that is, if you cannot produce oscillations in the circuits C_3, L_3, reverse the connections to the coil L_4. For Continental broadcasting choose suitable coils by means of the table given in *Modern Wireless*, No. 6.

W. G. N. (BARNSTAPLE) asks for constructional details of L.F. transformer to be wound on a former 1 9/32nds long and 27/32nds in diameter.

The former on which you propose to wind your intervalve transformer is somewhat small, but we think that the following values will make a fairly satisfactory instrument. Primary ½ ounce of No. 44 single silk covered wire; secondary 1½ ounces of No. 44 single silk covered wire.

M. J. W. (DEVON) asks for values of coils, etc., for ST45 circuit.

The following values will be suitable for ST45 : L_1, 35 turns; L_2, 50 turns; L_3, 50 turns; C_1, 0.0005 μF; C_2, 0.0003 μF; C_3, 0.0003 μF fixed; C_4, 0.002 μF.

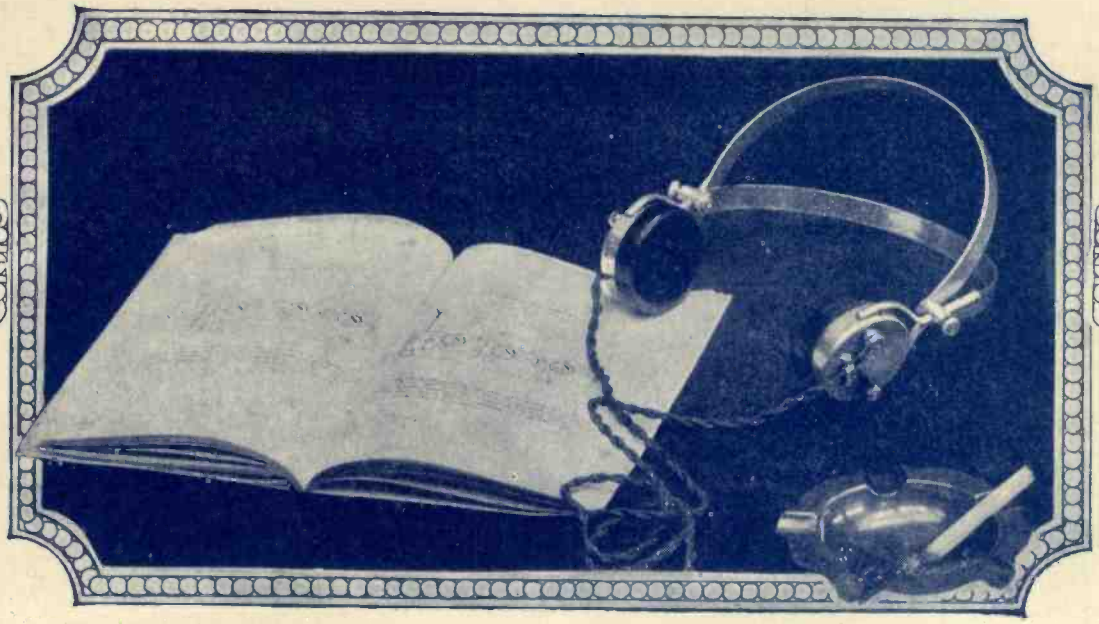
T. H. B. (HEREFORD) asks for values to enable him to make a workable circuit on the lines of that on page 206 "MODERN WIRELESS," No. 3.

Values of condenser C_1, 0.0005 μF; C_2, 0.0003 μF; C_3, 0.0003 μF fixed; C_4, 0.002 μF fixed; C_5, 0.0003 μF fixed; C_6, 0.002 μF fixed. Values of coils L_1 35 or 50 Igranic coil; L_2, 75 Igranic coil; L_3, 100 Igranic coil; L_4, 75 Igranic coil; L_5, 100 Igranic coil. R_1, R_2, R_3 are filament resistances. R_5 is a grid leak of 2 megohms resistance. B_2 should be about 60 volts. The valves should be of the hard type such as the R, Ora or A.R.

T. B. (ALEXANDRIA) asks for constructional details of tubular variometer suitable for the modified ST100 circuit.

The following details will enable you to construct suitable variometers for the circuit to which you refer. Aerial circuit inner tube 2 inches long and 3 inches in diameter wound with 40 turns of No. 26 S.W.G.-d.c.c. wire. Outer tube 2 inches long and 4 inches in diameter wound with the same number of turns of wire. Plate circuit variometers the same dimensions, but in a tube wound with 70 turns of No. 32 S.W.G.-d.c.c., outer tube to be wound in the same manner.

The National Wireless & Electric Co. ask us to announce that their advertisement appearing in the Oct. 24th issue should read "and are selling over 500 specimens per week," etc.



Dependable Books —your greatest aid

Choose your Books from this List:

	Price.
1. **Wireless for All** .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	6d.
2. **Simplified Wireless** .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	1/-
3. **How to Make Your Broadcast Receiver** .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	1/6
4. **How to Erect Your Wireless Aerial** By B. MITTELL, A.M.I.E.E.	1/-
5. **The Construction of Wireless Receiving Apparatus** .. .. .. By P. D. TYERS.	1/6
6. **The Construction of Crystal Receivers** By ALAN L. M. DOUGLAS.	1/6
7. **How to Make a "Unit" Wireless Receiver** .. .. By E. REDPATH.	2/6
8. **Pictorial Wireless Circuits** .. .. By OSWALD J. RANKIN.	1/6
9. **Wireless Valves Simply Explained** .. By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
10. **Practical Wireless Valve Circuits** .. By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
12. **Radio Valves and How to Use Them** By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
13. **500 Wireless Questions Answered** By G. P. KENDALL & E. REDPATH.	2/6
14. **12 Tested Wireless Sets** .. .. By P. W. HARRIS.	2/6
15. **More Practical Wireless Circuits** .. By JOHN SCOTT-TAGGART, F.Inst.P.	3/6
16. **Home-Built Wireless Components** ..	2/6
Elementary Text-book on Wireless Vacuum Tubes .. .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	10/- (post free).

TO attempt to understand Wireless without the aid of good books, is both foolish and shortsighted. True, you can make a certain amount of progress by your own endeavours—just as you can learn to swim without the assistance of an instructor—but in each case progress is much more rapid and pleasant if you have a helping hand to guide you.

The list of books given here comprises a complete library, dealing with every phase of Wireless. Each book is written in a masterly fashion by an authority. The fact that Radio Press, Ltd., are publishers exclusively of Wireless Books is a guarantee of their accuracy and dependability.

These books can be obtained from all booksellers or direct from publishers (postage 2d. per volume extra).

RADIO PRESS, LTD.
Devereux Court, Strand, W.C.2.

Radio Press Series.

Gilbert Ad.

Printed for the Proprietors, RADIO PRESS, LTD., Devereux Court, Strand, W.C.2, by THE AVENUE PRESS (L. Upcott Gill & Son, Ltd.), 55-57, Drury Lane, London, W.C.2. Published on Wednesday of each week at 3, Bolt Court, Fleet Street, London, E.C.4. Address for Subscriptions and Editorial Communications:—Devereux Court, Strand, London, W.C.2. Advertisement Managers:—THE SCHEFF PUBLICITY ORGANISATION, LTD., 125, Pall Mall, London, S.W.1. Registered as a newspaper and for transmission by Canadian Magazine Post. Subscription rates:—32/6 per annum, 16/3 for six months, post free. Sole Agents for Australasia:—GORDON & GOTCH (Australasia), LTD. For Canada:—IMPERIAL NEWS, LTD. For South Africa:—CENTRAL NEWS AGENCY, LTD.

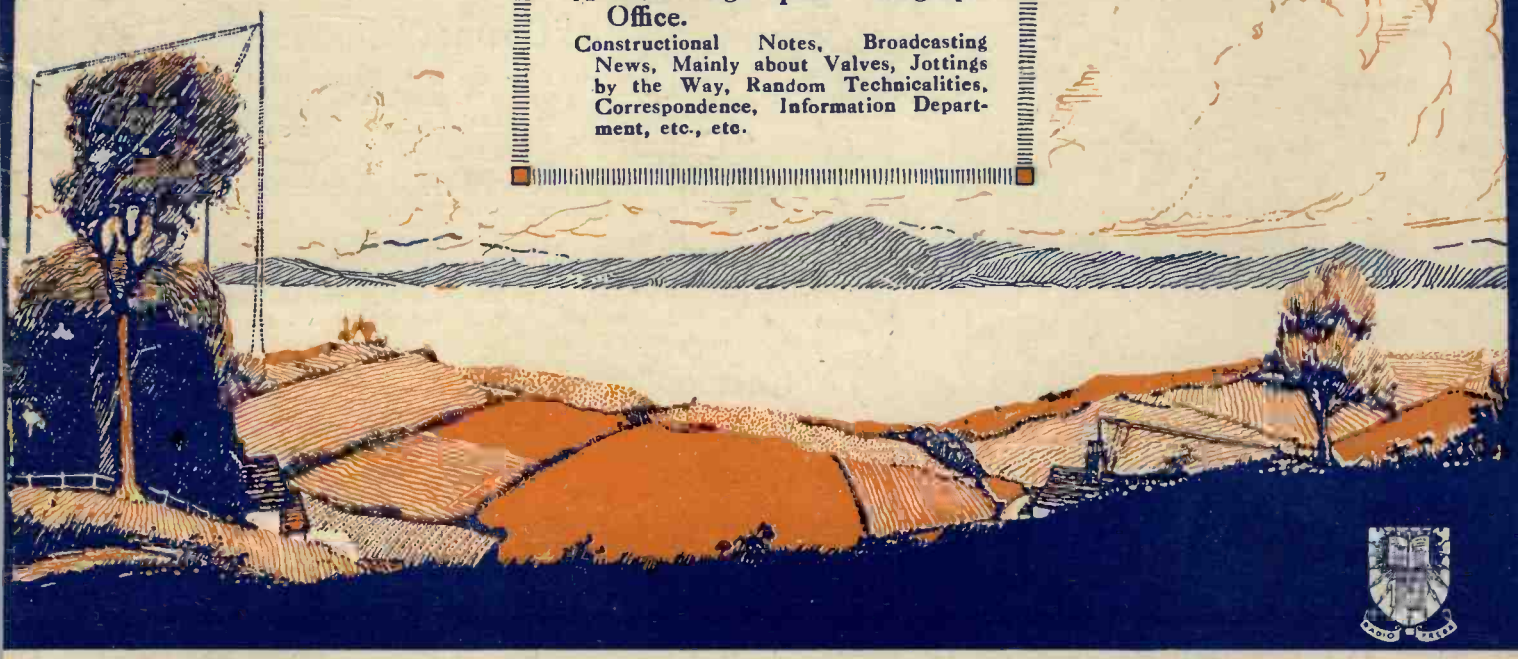
Wireless Weekly, 6d. Net. Wednesday. November 21st, 1923.

Wireless Weekly

and The Wireless Constructor.

Vol. 2.
No. 19.

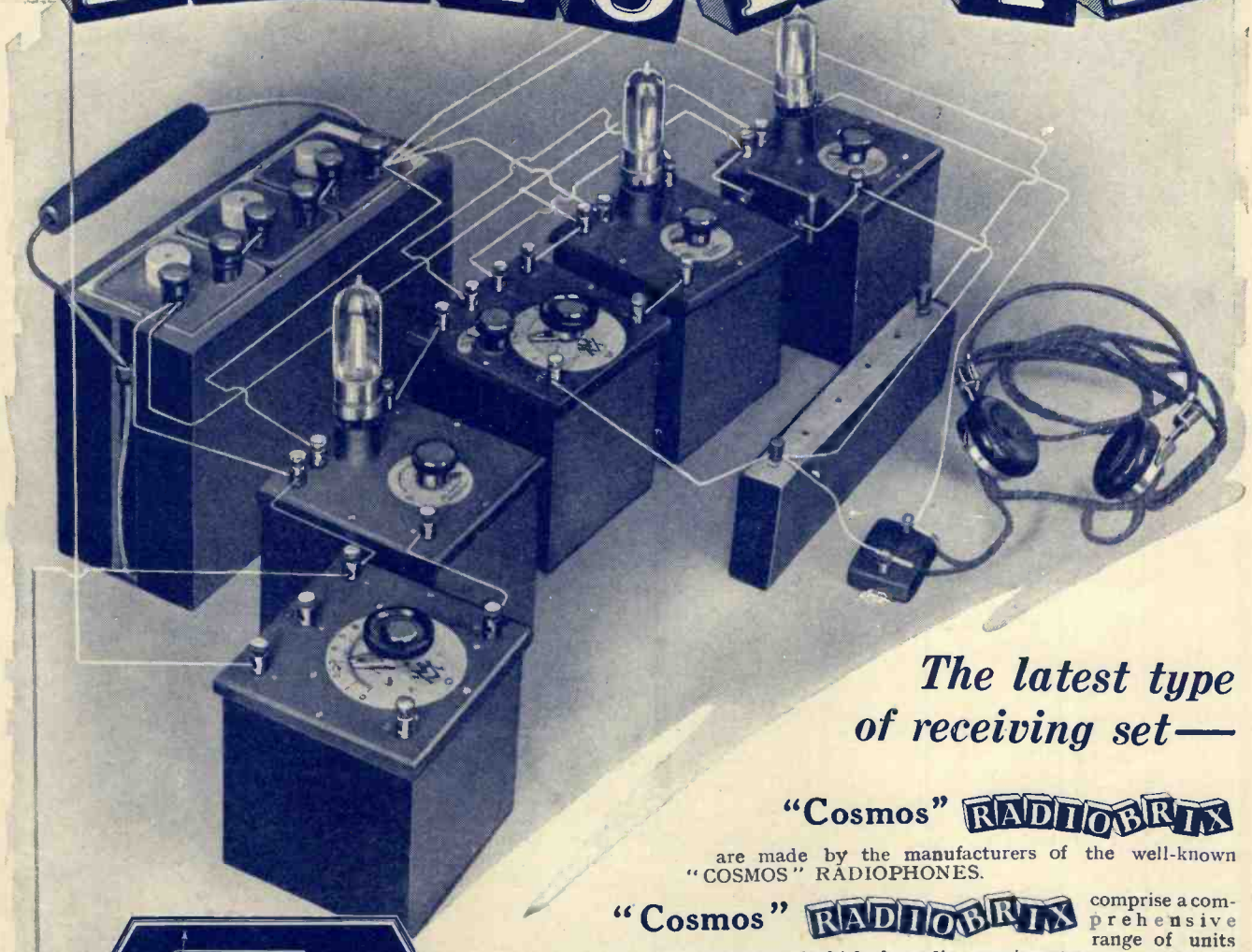
CONTENTS



A New Method of H.F. Amplification

By A. D. COWPER, M.Sc.

RADIOBRIX



The latest type of receiving set—

"Cosmos" RADIOBRIX are made by the manufacturers of the well-known "COSMOS" RADIOPHONES.

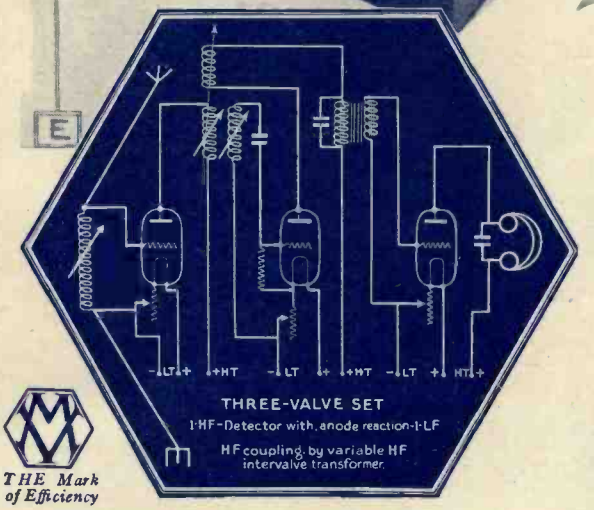
"Cosmos" RADIOBRIX comprise a comprehensive range of units by various combinations of which the radio experimenter or amateur can build up any type of receiving set or circuit.

"Cosmos" RADIOBRIX have been designed to secure the utmost flexibility. They enable the "listener" to build up his set gradually as his means allow, yet the bricks obtained at first never become useless but can be utilized as part of a more elaborate set.

"Cosmos" RADIOBRIX are thoroughly well made and moderate in price.

ASK YOUR REGULAR WIRELESS DEALER TO SHOW YOU

"Cosmos" RADIOBRIX If he has not yet obtained his stock write sending his name to the manufacturers—



THREE-VALVE SET
1-HF-Detector with anode reaction-1-LF
H.F. coupling by variable H.F. intervalve transformer.

THE Mark of Efficiency

The above illustration and diagram shows a three-valve set made up with RADIOBRIX. Get a copy of the new book "BUILDING WITH RADIOBRIX," full of useful circuits with theoretical and wiring diagrams. OBTAINABLE EVERYWHERE, ONE SHILLING POST FREE, ONE AND SIXPENCE

R
XO2

METROPOLITAN Vickers ELECTRICAL CO. LTD

WORKS: TRAFFORD PARK, MANCHESTER

BUILD YOUR RADIO SET WITH RADIOBRIX

BUY BRITISH GOODS ONLY

Wireless Weekly

Vol. 2, No. 19.
Nov. 21, 1923.

CONTENTS

Editor: JOHN SCOTT-TAGGART, F.Inst.P.

Assistant Editors { E. REDPATH. P. W. HARRIS.

Radio Press, Ltd.

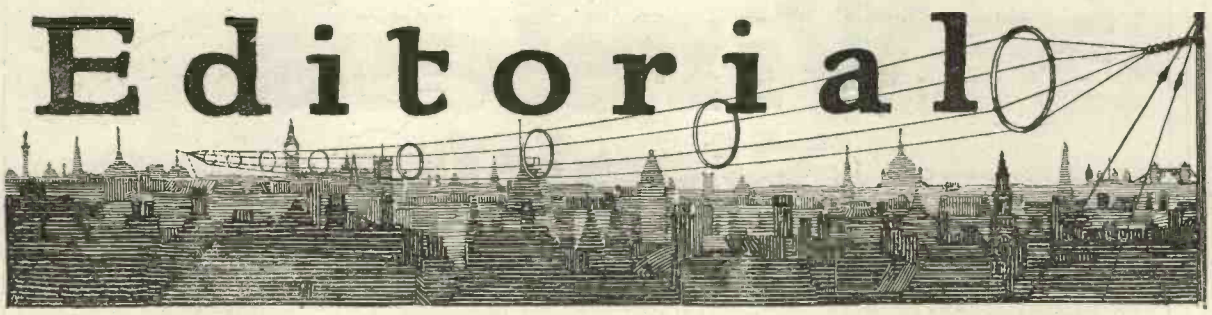
Publishers of Authoritative Wireless Literature
DEVEREUX COURT, STRAND, W.C.2
Tel.—Central 3763.

Advertisement Managers: { SCHEPP PUBLICITY ORGANIZATION, LTD., 125, Pall Mall, London, S.W.1 *Tel.—Regent* 2440.

All correspondence relating to contributions is to be addressed to the Editor of "Wireless Weekly."

Nothing contained herein is to be regarded as permission or encouragement to infringe any patent rights.

Editorial



B.B.C. Publicity.

WE have consistently advocated that the British Broadcasting Company should advertise its service to the public and not hide its light under a bushel. 500,000 licences and royalties on sets should bring in a very handsome income, but as yet the B.B.C. has not endeavoured to interest people in its programmes and work. Propaganda by wireless is like speaking to the converted, and we have always thought that the B.B.C. should begin to advertise in the daily Press and interest more and more people in the subject. This unquestionably would greatly stimulate trade, and the obvious people to popularise broadcasting are the B.B.C.

Speaking to Mr. Reith the other day, we learnt that the B.B.C. now propose to try this method of publicity. The scheme, however, should not be undertaken in a niggling manner; it must be done thoroughly, and money should not be spent sparingly on this publicity. For every convert the B.B.C. will get 10s., so that such publicity should more than pay for itself. We are told to eat more fruit, drink more milk, and to use electricity. We now want to be asked, " Are you listening to the wireless concerts? "

The Programmes.

The Anniversary impromptu concert was truly delightful. We were testing out a new circuit, but had to leave it and simply listen. The B.B.C. is to be congratulated.

With regard to another matter, however, we would like the B.B.C. to act cautiously. There is obviously a temptation to send more and more matter broadcast from London. The list of items sent broadcast was very small at first, but the increase in confidence is resulting in a bigger list of items every week. We do not wish at this stage to draw attention to any particular item, but there are certainly some which are not of such outstanding merit that they should be sent out simultaneously from all the stations.

More Relay Stations Wanted.

Having now got effectively organised, we think that the B.B.C. should make strenuous efforts to increase the number of relay stations working in the country.

If the B.B.C. is to get on with this work, it should be done forthwith, because otherwise the winter season, when most people are chiefly interested in wireless, will be over. We hope that we shall hear of rapid progress being made in this direction.

The Exhibition.

A wireless exhibition suffers from one very serious drawback. The exhibitors are selling sets, and selling the broadcast programmes. People who go to the exhibition are keen to compare the relative merits of different sets, loud-speakers, etc. This cannot be done at the exhibition for a very simple reason. Tests with telephone receivers prove perfectly inadequate and the exhibitors in general gave up attempting to demonstrate in this manner.

As regards wireless sets, therefore, the exhibition is merely an exhibition of the outside of wireless sets, loud-speakers, etc. On the other hand, of course, it is a real exhibition of component parts.

As regards the B.B.C. demonstration of broadcasting, we did not think this was by any means perfect. Perhaps we were there at an unfortunate moment, but the speech was reproduced in a very unsatisfactory manner. We were amused to hear the set oscillating, but this no doubt will be blamed upon the oscillating sets in the building! Why did not the B.B.C. demonstrate the reception of signals from all the other broadcasting stations? Is it not rather a farce to pretend that all the stations may be readily heard in the home by the average listener?

THE COWPER CIRCUIT

By A. D. COWPER, M.Sc., Staff Editor.

Full details of a New Method of High-frequency Amplification, especially suitable for short-wave reception, and particularly stable in operation.

THE attention of the radio public is very much directed just now towards the amateur trans-atlantic tests, on short wavelengths, and the consequent revival of the perennial problem of efficient high-frequency amplification on short waves. It is well

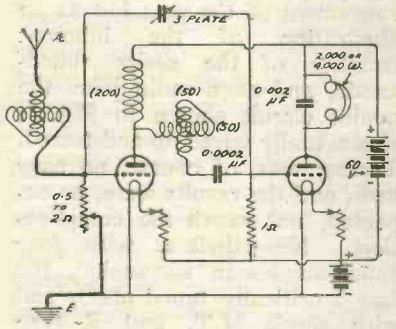


Fig. 1.—A complete short-wave receiver, 150/220 metres.

known that the main difficulties are, firstly, the increasingly serious effects of valve capacities, and, secondly, the harassing effects of self-oscillation, in a set employing critically tuned anode or H.F. transformer coupling.

In view of this, it occurred to the writer that the first effect could be minimised in tuned-anode coupling with ordinary R valves by applying the principle which has been so successful in a recognised form of short wavelength, single-valve receiver, after the manner indicated in Fig. 1. The principle is to use the grid-to-filament capacity of the valve itself as the series tuning condenser in place of introducing external capacity, tuning being carried out by means of a variometer. In the original circuit there are, of course, a grid-condenser and leak, as well as a fairly low leak-resistance across aerial and earth to complete the leak path.

By putting the tuned-anode *in series* and tuning with a variometer the same effect was sought as is given by the more customary connection of tuned-anode in parallel with the grid-to-filament and plate-to-filament capacities of the second and first valves respectively of a two-valve H.F. coupled receiver. The complete circuit is indicated in the figure. In order to allow of connection to H.T. supply, an efficient radio-choke, actually a 200-turn Igranic duolateral coil, was connected to the plate.

On practical trial, the results were extremely encouraging, short-wave Morse and amateur telegraphy being received with good strength on a "heavy" twin P.M.G. aerial. The aerial-tuning variometer should be of low-resistance—that used was the special low-resistance type made by the Bowyer-Lowe Co., of about thirty turns each, rotor and stator, of No. 20 S.W.G. wire. The variable leak across aerial and earth was a new-pattern Watmel, the plate variometer an old-pattern small Igranic, rewound with some 100 turns of No. 26 S.W.G., d.c.c. With one hand on each of the variometers, the whole apparatus permitted easy tuning over a band of 150 to 220 metres on a double 40-ft. aerial.

The most striking point that was noticed, however, was that the circuit was *absolutely stable* with critically tuned anode, and with 60 volts H.T. on good R valves with fairly bright filaments. No stabilising devices, either resistances (beyond the high static-discharge leak across the aerial and earth), or any grid bias were employed. A similar circuit with ordinary parallel-tuned-anode will oscillate most violently when the tunable plate-circuit even approaches the resonance point. As might be ex-

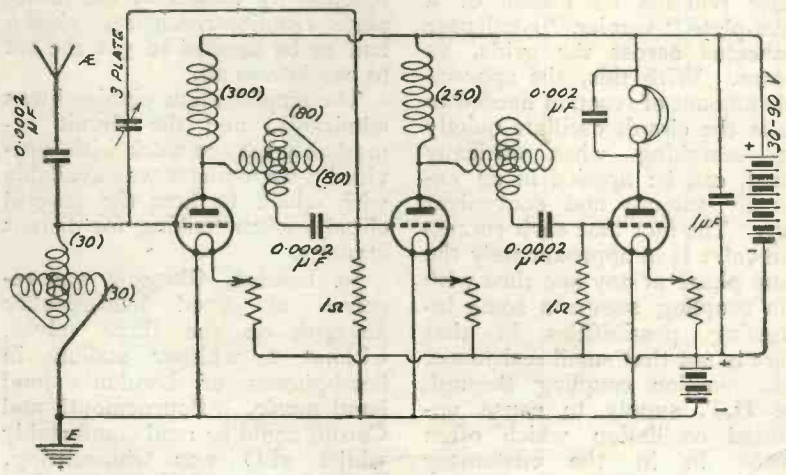


Fig. 2.—The series-tuned-anode method applied to 2 H.F. valves.

pected in the absence of the usual wasteful " stabilising " devices, the effect of which is generally to broaden tuning and lower signal-strength, excellent selective tuning and good amplification were obtained.

It will be noticed that the second grid is now connected to the opposite end of the tuned-anode inductance to that usually connected, so that with the series-tuned-anode the second grid is in the same phase as the first. There is no reversal of phase at each stage, as in ordinary H.F. coupling. This makes possible the convenient form of electrostatic reaction by means of a three-plate " vernier " condenser connected across the grids, as shown. With this, the appreciable amount of reaction needed to make the circuit oscillate quietly for searching when critically tuned, can be applied in an extremely smooth and convenient way. The fact that each successive valve is in approximately the same phase at any one time with this coupling suggests some interesting possibilities in that there is not that small resistance, etc., reaction coupling through the H.T. supply to cause unwanted oscillation which often creeps in in the customary circuits.

Following up this principle, to see if it could be applied on the broadcast wave-lengths, the circuit shown in Fig. 2 was evolved. Here we have two critically-tuned anodes in cascade, with an aerial-circuit containing a small series condenser, no fine-wire coils or similar damping devices being present. As is well known, this would give, with ordinary tuned-anode coupling, a hopelessly unstable set; yet on trial, with R valves and ample H.T. supply, and no wires of less gauge than No. 24 S.W.G., no positive grid bias, and the most critical tuning, a fair amount of electrostatic reaction by means of the three-plate reaction-condenser shown had to be applied to get the set to oscillate at all.

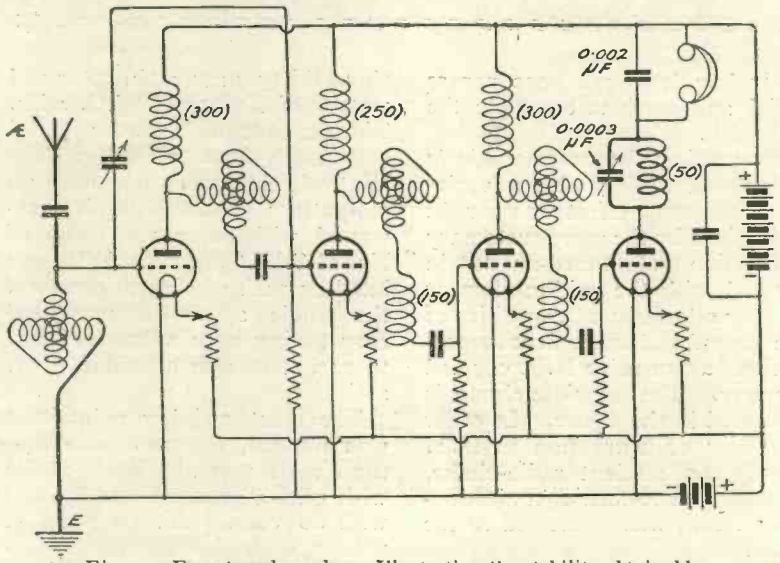


Fig. 3.—Four tuned-anodes. Illustrating the stability obtainable.

The amplification obtained was admirable, and the circuit remarkably easy to work with, provided a wave-meter was available with which to tune the several circuits when looking for distant stations.

In London, Glasgow was received at good loud-speaker strength on the three valves, without a whisper audible in head-phones of London's loud band music. Bournemouth and Cardiff could be read comfortably whilst 2LO was transmitting, but, of course, rather as a duet with London, on direct-coupled aerial. On 2LO itself, the very finest exhibition of really undistorted loud-speaking resulted that the writer has ever listened to. On "capacity aerial " alone—that is, without aerial and earth—just the casual capacities of the wiring, etc., merely the variometer and (now) a parallel condenser across the grid-circuit of the first valve, appreciable reaction had to be used to bring it to the oscillation point, and short of that, clear, steady reception was possible in the loud-speaker, at thirteen miles from 2LO.

No amateur of experience would propose to use three or more high-frequency stages for amateur reception of broadcasting in the present state of advancement of the art; but as an illustration of the inherent stability of the series tuned-anode, and as a radio joke, the quaint circuit shown in Fig. 3 was actually wired up and tested. Tuning was, of course, no easy task, and the results were, as expected, not worth the complication. Nevertheless, with *four* tuned-anodes in succession, the last a critically tuned plate, and with ample H.T. and R type valves, some little electrostatic reaction had to be used across the first valve in order to make the circuit oscillate. It is not, for one moment, suggested that so formidable a circuit has practical value.

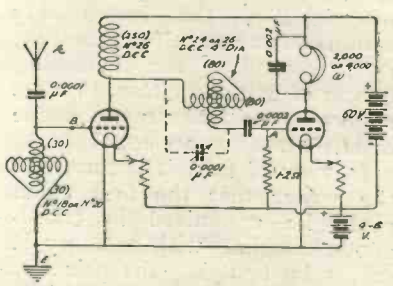


Fig. 4.—A practicable non-oscillating broadcast receiver.

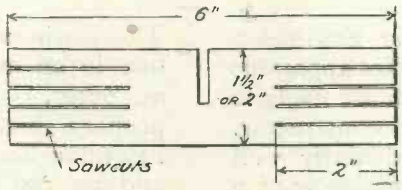
For the second and third tuned-anodes, Peto-Scott variometers were used, with a No. 150 Igranic coil as loading-coil. The

first was a large Igranic variometer, which sufficed alone.

Birmingham was tuned in during an afternoon transmission at fair strength, but, as indicated, the extra H.F. valve accomplishes but little.

As a practical broadcast receiver, using this stable H.F. amplification, the last circuit (Fig. 4) was tried, and can be thoroughly recommended to constructors. The aerial variometer must have enough wire to tune with the small series condenser, and should be wound with No. 20 or No. 18 S.W.G., d.c.c., for best results. The radio-choke must be a really good one, as distributed capacity here cuts down signal strength greatly. A No. 250 coil of one of the well-known low-capacity windings, but of fairly thick d.c.c. wire, a No. 250 Igranic, for instance, is indicated. A 600-turn coil wound in layers separated by paraffin paper with No. 28 S.W.G., s.s.c., on a small spool, gave poor results, as also did a lattice-wound coil of 400 turns of the same wire on a 1-in. former. Excellent and economical radio-chokes can be constructed in the form of miniature frame-aerials of the type described by Mr. P. W. Harris in *Wireless Weekly*, No. 16, p. 553 (October 31), but using as a former two strips of three-ply wood of the shape and dimensions given in Fig. 5, with four or more winding-grooves made with a hack-saw. About ¼ lb. No. 26 S.W.G., d.c.c., wound in these, say, sixty to seventy turns per groove, will give an ample radio-choke of very small distributed capacity. The insulation of the dry wood is quite adequate, so that terminals can be mounted direct on the arms. For a three-valve receiver (2 H.F.), two of these are required.

As the available tuning capacities are extremely small, a new scale of inductance-value has to be realised in the anode-tuning coils. The large (4 in. diameter or so) type of commercial variometer will give, in general, sufficient inductance value, but at the cost of much fine wire and distributed capacity, both of which are unfavourable for the free oscillation and consequent large voltage build-up, which is the essential feature of efficient tuned-anode coupling. By winding a variometer with a three-pile winding of some 120 turns of No. 22 S.W.G., d.c.c., on a three-inch



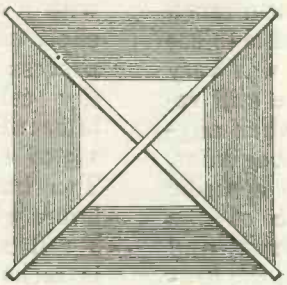


Fig. 5.

diameter former, say 4 in. long; with the usual wooden-ball rotor wound full of the same wire (about 58 turns), a variometer is obtained with fairly small distributed capacity, low resistance, and an inductance ratio which will tune on intervalve capacities from about 270 to 350 metres. With a low-minimum variable condenser of not more than 0.0001 μF capacity, connected across the plate inductance to supply a little more capacity in this oscillating circuit, tuning may be obtained up to above Aberdeen's wavelength.

Fig. 6 indicates the nature of three-pile winding, and for further particulars readers are referred to the many books which can be consulted, or, if preferred, *Modern Wireless*, Vol. I, No. 3, p. 185; No. 5, p. 321; *Wireless Weekly*, No. 15, p. 549.

If desired, a variometer similar to the one described above can be used in series in the plate-circuit of the detector-valve, to give reaction or the small reaction-condenser connected across from A to B if for use in skilled hands. A note-magnifier can be added if required.

Receiving local broadcasting in a London suburb, excellent loud-speaking on two valves resulted; and the more distant stations, together with innumerable amateurs, were picked up at will,

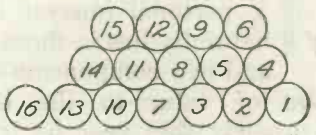


Fig. 6.

Fig. 5.—Details of the former for radiochoke coil.

Fig. 6.—Method of pile-winding.

several of the latter being at loud-speaker strength with no tuning difficulty at all; thus, in spite of marked selectivity, both ends of an animated amateur transmitter's argument could be followed, using two hands, one on each variometer. The circuit, therefore, can be thoroughly recommended as a stable sensitive, and economical one for general use, remembering, however, that great care must be taken to avoid casual magnetic or capacitative coupling between the coils or variometer if stability is to be obtained.

Whilst this form of low-resistance and critically tuneable H.F. coupling shows such remarkable inherent stability, and is able accordingly to give high amplification without approaching dangerously near to self-oscillation, it is not suitable for the longer wave-lengths as at present developed. With so small an available capacity, the amount of wire, in the form of

(*Concluded on page* 651.)

THE HOME CONSTRUCTOR AT THE EXHIBITION

By PERCY W. HARRIS, Assistant Editor.

Some interesting remarks concerning the Exhibition as affecting Home-made apparatus.

MY personal interest in the Exhibition naturally lies in those parts of apparatus and new components which are likely to prove of value to the home constructor. Fortunately this year he is particularly well catered for, and one's first impression is of a much higher grade of components at a much more reasonable price than we were able to see last year. Of gaudy rubbish there was very little, although here and there there still remained trace of the bad old times when anything was good enough to sell to the beginner. Mr. Scott-Taggart has asked me to describe to *Wireless Weekly* readers some of the exhibits which are of particular interest, and I cannot do better than to begin with the low-tension supply for valves.

We have at the Show both bright and dull emitter valves. The average bright emitter valve takes from .5 to .7 of an ampere to run it, and this current must of necessity be derived from accumulators. There were no particular novelties in accumulators at the Exhibition, although one notices that the prices are much lower than have ruled till recently. Ordinary dull emitter valves, for instance the D.E.R., A.R.D.E., and the Mullard low temperature, take roughly .3 to .4 of an ampere. Battery makers have often stated that their dry cells will run this type of dull emitters satisfactorily, but investigation of the position shows that the cells to supply such currents are unduly large and expensive. The " Pea-nut " valve takes .25 ampere and is much more of a dry cell proposition. The Ever Ready Co. and Messrs. Siemens show a number of excellent cells of varying sizes capable of supplying Pea-nuts satisfactorily. The real dry cell proposition of the Show is the new valve taking .06 of an ampere. This will run quite satisfactorily from the round dry cells commonly sold for running electric bells, but by far the most interesting battery for the purpose is the new Darimont primary cell, shown on Stand 71. The Darimont cell is filled with two liquids, one in an inner container and the other in an outer. Its voltage is very high for a primary battery, being somewhere in the neighbourhood of 1.6 volts on open circuit, and one can take the most appalling liberties with it without damaging it. Thus it can be short circuited for about 1½ to 2 minutes—a process which would irretrievably ruin any dry cell or accumulator—and immediately after this it will show a voltage reading of 1.3 to 1.4 without turning a hair. The type T30 has a capacity of 145 to 150 ampere hours when discharged down to 1 volt. Such a cell costs about 25s., and when run down is recharged by pouring out the old electrolyte and pouring in the new from a can.

The Exide Co. have produced a special accumulator for dull emitters. The makers declare it may be left for six months without recharging. This seems an important development.

The Bowyer-Lowe Co. have a complete line of wood panel mounting components ranging from bushes for the terminals up to variable condensers mounted on polished ebonite discs carrying an engraved white line to show the condenser reading. Messrs. Peto-Scott are also showing a useful and ingenious line of components for board mounting, and several other firms have something of the kind. One of the most fascinating of the newer devices for the experimenter is the Clix connector. The merits of these can only be appreciated by handling them. The plugs are slightly conical, as are the sockets. Both have a spiral screw cut in them, and if one inserts the plug into the socket and gives it a slight twist a very firm and sure grip is obtained. The plugs can be released at once by giving them a slight turn to the left. It is particularly noteworthy that several of these connectors can be plugged into the *back of one another*, thus enabling several wires to be joined to one terminal, a point of great

convenience when experimenting with a new circuit. Insulating bushes of several colours are provided so that one can choose red for positive, black for negative, green, say, for filament circuit, yellow for plate circuit, and so on.

Two variable condensers particularly interested me. The first was sold by Messrs. W. J. Henderson & Co., and was very substantially built and well finished. Its capacity was 0.0003 μF, and a vernier adjustment was provided consisting of a single plate controlled by a small knob on a spindle passing through the main knob. The price (12s. 6d.) is extremely reasonable, and I should not be surprised if this particular component attains very large popularity. It is particularly suitable for tuned anode and tuned transformer circuits. The second variable condenser was sold by the Formo Co., and had corrugated plates. These give a considerable amount of strength to the plates, and the rigidity enables them to be spaced a very small distance from one another In this way it is possible to get a large capacity in a relatively small space, the 0.001 μF condenser being no larger than many sold for 0.003 μF. Messrs. Burndept, Ltd., were also showing a very fine condenser, particularly designed to have low losses. This, although a more expensive instrument, seemed well worth the money. High tension batteries were shown on several stands, and I am glad to see that it is now possible to obtain high voltage units of satisfactory size and portability. I purchased two, of 120 volts each, from Siemen's stand, and find them very convenient in the ST100, note magnifier circuits and others where high voltages are required. These batteries are tapped at every few volts from 40 upwards. The price was £1 4s. each.

There are many readers of "Wireless Weekly" in the Colonies and hot countries. For these Messrs. Siemens provide most of their usual types of high-tension battery in the inert form. These inert cells can be kept for long periods in quite trying climatic conditions without deterioration, for until water is added to them they are completely inert in their action. One can thus order such batteries from home and only put them in use when needed. The Ever-Ready Co. also showed some fine high-tension batteries of good size.

The Marconi Scientific Instrument Co. are showing a large number of suitable high-grade components, such as their double condenser with brass plates; their single condensers of the same construction; transformers; adapters for V24 valves, etc.

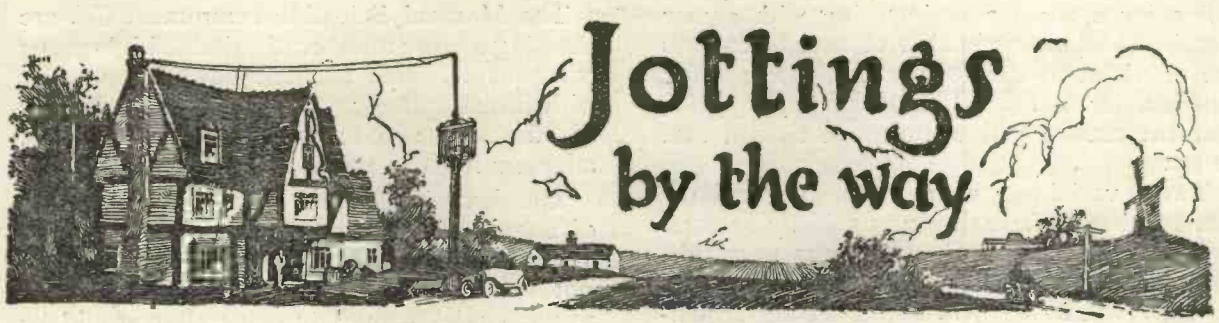
The Igranic Co. are showing a new line of short wave inductances (Nos. 1, 2, 3 and 4), to cover the broadcasting band. I have not yet tried these, but their design seems sound, and I should imagine they would be more efficient than the 25, 35 and 50 coils, which they are obviously designed to replace.

Mr. T. C. Ball is showing his new spiral filament resistance, a particularly useful component, as the space it occupies on the panel is very small. Its movement is quite smooth, and the price very reasonable.

Readers interested in new forms of loud speaker will find it worth while to examine the Frenophone, of Messrs. S. G. Brown.

The more advanced experimenter will also be interested in the "Blinker" set of the Bowyer-Lowe Stand. This set, for the measurement of high resistances, is designed on the lines described in "Modern Wireless" recently by Mr. A. D. Cowper. Until lately the home manufacture of grid leaks, anode resistances, etc., has been negligible owing to the fact that whilst it is easy to make them, most elaborate expensive instruments have been required to ascertain their values. With the Blinker set the resistance of a grid leak or an anode resistance can be found in a few moments. Such an instrument in the hands of the average Wireless Society will enable the members to test their home-made grid leaks, and incidentally to expose some of the fraudulent leaks sold by back street manufacturers. I did not notice many novel crystal detectors, but particular mention should be made of the admirable pattern now sold by Burndept, Ltd. This has a positive, yet delicate adjustment of the cat whisker, which keeps in adjustment for much longer periods than usual.

Messrs. Aucklands Wireless, Ltd., McMichael, Ltd., and A. W. Gamage, Ltd., all had most interesting stands with almost every imaginable component for the home constructor. Most of these firms will find a lasting effect from the Exhibition, as they will receive post orders from people who have found their goods to be the right kind.



The Sleuth that Wasn't.

Some people, I see, are alarmed at the activities of the sleuths who have been reported from several quarters as hot upon the trail of the few remaining pirates. Anyone who wears a prying air and is continually looking up at roofs is at once pointed out as one of the new smellers out of unlicensed sets.

I know an eminent professor of ornithology who had a terrible time some weeks ago. He was engaged in observing the habits of the orange-spotted willow burbler, a rare bird whose shyness makes him most difficult to approach. The professor therefore armed himself with a powerful pair of field glasses and lay hidden in all kinds of queer places. You would find him now swaying dizzily in the topmost branches of a tall tree; now prone upon his tummy concealed beneath an inverted cattle trough. His actions aroused the suspicions of the local wireless desperadoes, then a large band. One day they fell upon him armed with bamboo spreaders, and beat the poor man into a passable imitation of a jelly.

An Aid to Beauty.

All these rumours are quite exciting. One practical joker has rigged up an imitation aerial whose "wires" are of string, and is praying daily that he may be called upon by some minion of the law armed with a writ of habeas corpus or a mandamus or whatever such fellows do have when they burst into the Englishman's castle.

It seems to me that the best way out of the difficulty is for all wireless men to be branded with the B.B.C. stamp upon the right cheek bone. We should then know who is who, and in time the device would be recognised as a form of decoration calculated to enhance masculine beauty.

A Beautiful Derivation.

I saw a really beautiful derivation given in an American paper the other day in all seriousness. "Radiotron," it announced, "is derived from the Greek words *radio,* meaning wireless, and *tron* a valve"! Quite apart from the fact that *radius* is a latin word, I hadn't realised before that the ancients knew the pleasures of listening-in—and with valve sets too!

This is nearly as good an effort as that of the schoolboy who inquired whether wireless telephony was so called because it enabled a man to tell a funny story through the ether.

Years Ago.

Do you ever think now of your first efforts at wireless, made in the days of your youth, when apparatus was hard to come by and such books as there were on the subject seemed to be filled mainly with quaint mathematical signs and diagrams that struck terror into the young heart for all its burning desire to read, mark, learn and inwardly digest. Terrible then were the financial crises that arose, for one's school pocket money, even if one steadfastly abjured visits to the tuckshop for a season, would not run to detectors at a guinea apiece or condensers at the fabulous prices which then ruled. Even to-day the small boy who makes up his own set knows that the most difficult feat in its construction is to extract the necessary capital from the pockets of his tax-burdened sire.

My own earliest efforts were made many years ago with a wondrous outfit. Two of us formed a partnership with the object of erecting a set that would receive Paris. The only wire available for the aerial was a length of lead stuff unearthed from some corner by one or other of us. The far end of this was affixed to a jampot placed inverted over the stump of a branch on a tree at the bottom of the garden. At its other end the wire came into the toolshed through a convenient hole in a window pane—I rather fancy that that hole was "accidentally made on purpose"—and was anchored to a drainpipe standing on the table. The weather was frosty at the time, so that the wire parted in its midst with unfailing regularity every night.

A Nightmare Set.

To this aerial was attached a coil made of about five yards of bell wire, broken and repaired in many places. The first detector was a blacking tin filled with powdered coke, on the surface of which rested the point of a sewing needle suspended by a piece of copper wire. The single telephone receiver looked suspiciously like those used on the instruments of the National Telephone Company, as it then was. We acquired it, I remember, for the sum of two shillings from the local Bob Pretty, asking no questions about the manner in which he had obtained it. The earth was the gardener's watering can,

filled with water (we were always most punctilious about this) and placed upon the lawn.

Needless to say, though we spent long, cold afternoons and evenings during the Christmas holidays listening eagerly for Paris, we did not succeed in hearing even the random atmospheric that would have filled our cup of joy to overflowing.

The Wonderful Moment.

Triumph, however, came a little later, when stern fathers relented a little and the joint funds would just run to a detector. A sailor uncle of my father's who came to stay with his people helped us to wind wonderful coils on the ever-useful jampot. The set was sorted out into something like order, an ancient kettle, decently interred, replaced the watering can, and a copper wire was slung up to form a more reliable aerial.

Then one night, faint but unmistakable, came the ping, ping, ping of spark signals. It was a wonderful moment never to be forgotten. The youth of to-day has no such struggles, for he can buy parts at ridiculously cheap prices, and there are books and magazines galore to assist his first steps in wireless. But I doubt if he will ever know the thrills of expectation and the joys of realisation as we did.

A Retrospect.

You remember the old days of wireless when you, my male reader, sat with phones upon your head the livelong evening listening to the iddies and the umpties of distant stations, whilst you, dear lady, clicked knitting needles in the mazy tangles of a jumper and mentally cursed wireless as a soul-destroying pastime that made the best of husbands a mute, inglorious thing. Ah, me! What days! And then came broadcasting with music and mirth, whereupon feminine opinion veered round, as feminine opinion will, finding in wireless a heaven-sent boon instead of a thing accursed.

Helpful Hints.

One comes across some priceless little gem of advice occasionally in popular wireless articles. One of the best I've seen for a long time was a solemn note giving instructions for the making of fixed condensers. "When making condensers to go across the high-tension battery," wrote the gifted author, "take care to see that the plates do not touch each other." Now you would never have thought of that, would you? Here are a few more hints of the same kind that occur to me which you may find useful.

Barbed wire should not be used for winding basket coils, for it increases their self-capacity and has other bad "points." It seldom pays to use the high-tension battery for filament heating purposes; at least it does not pay the amateur. The valve maker has other views. Even the two megohms or more resistance of the grid leak are not sufficient to enable it to be used effectively as a centre punch. Rheostats and potentiometers for some reason are seldom really satisfactory if they are wound with copper wire. Do not these inspire you? I really think I must write some helpful little articles on these lines for the popular press.

WIRELESS WAYFARER.

SPECIAL TUNED-ANODE INDUCTANCES.

By R. W. HALLOWS, M.A. (Staff Editor).

This Article deals with a special form of plug-in tuned-anode tapped inductance.

WHEN tuned-anode coupling is employed it is important that the inductance used should be so wound that it has a very low self-capacity. Basket and De Forest coils are often employed, and are quite good to work with in that they are compact and easily interchangeable, whilst their self-capacity is not very high. Basket coils, however, suffer from the serious drawback that it is a matter of the utmost difficulty to make one exactly similar in all respects to another, a matter which assumes great importance where two tuned plates are used on the high-frequency side of the set.

For all-round efficiency on the short wavelengths the single-layer coil stands by itself. Its capacity is of the smallest, since the difference of potential between adjacent turns is very small indeed. It can be exactly duplicated without difficulty, and it is very easy to make.

For the reception of all broadcast transmissions a very handy little anode inductance can be made at small expense. The former is a 5-inch length of 3-inch diameter cardboard tubing, which should be given a thorough dressing with shellac as a preliminary. On this are wound 100 turns of No. 22 gauge copper wire, anchored in the usual way and with ends 6 inches long left within the former. Taps are taken either at every eleventh turn from the 22nd to the 88th, or at the 25th, 50th and 75th turns. The greater number of tappings gives, as we shall see presently, a distinct advantage in tuning.

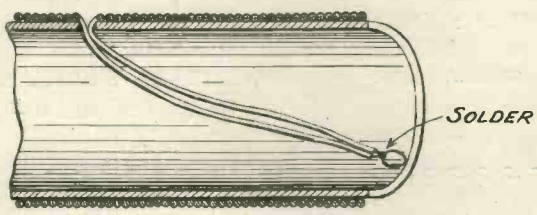


Fig. 1.

Fig. 3.

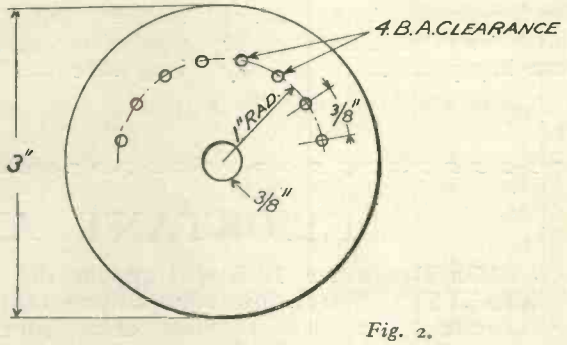


Fig. 2.

Fig. 1.—Method of winding and tapping the coil.

Fig. 2.—Details of the end-piece for switch and contact studs.

Fig. 3.—The completed coil.

The neatest way of taking the tappings is to pierce a hole in the tube with a bradawl and draw through it into the inside of the tube a loop of wire 6 inches long. The hole should be small enough to grip the two wires tightly. Continue the winding to the next tapping point then proceed as before. The length of the loops should be

shorter and shorter for succeeding tappings. When all the wire is wound on you will have the two anchored ends of the coil and either three or seven loops, according to the number of tappings made, all inside the coil.

Take one of them and stretch it out tightly. Then bare about 3/8th inch at the top of the loop. Twist the wires *once only* round each other (there is thus no danger of their breaking) to form a small loop, and solder as shown in Fig. 1. Deal with all tappings in the same way, and make small soldered loops in the free single ends of the windings.

Turn up two circular end pieces of ¼ inch ebonite so that they fit tightly into the tube. In the centre of one of these drill a 3/8 inch hole to take a laminated selector switch arm, which can be bought for a shilling or so complete with its knob, spindle and brass bush. Standard switch arms have usually a radius of 1¼ or 1½ inches. This must be shortened to 1 inch, either by making a fresh bend and trimming off the ends with a hacksaw or file, or by drilling a new 2B.A. clearance hole.

Now scribe out a segment of a circle with a radius of 1 inch and on its circumference mark off as many centres as there are tappings, *plus* one for the finishing end of the coil, 3/8 inch apart. At each of these drill a 4B.A. clearance hole, and insert a stud.

Attach the first tapping to stud No. 1, the second to No. 2, and so on until the end of the windings is secured to the last stud. Now press the end piece into the tube and secure it by 4B.A. screws.

The way in which the other end piece is drilled depends upon the type of mounting for which the coil is intended. If desired a standard plug and socket may be used. The writer prefers valve legs and prongs, which are cheaper and easier to fix, but make excellent contacts. In the case of the coil illustrated in Fig. 3 two valve prongs are mounted 1 inch apart. Whatever type of connection is chosen the starting end of the windings is taken to one and a wire from the spindle of the switch arm to the other. The lower end piece is fixed in place in the tube in the same way as the first.

The inductance is very easy to use. With the pointer of a 0.0002μ condenser at about 120 degrees, London and Cardiff will be heard on the second stud if there are seven tappings, or the first if only three are made. By advancing the switch one stud it will be found that the added capacity can be reduced considerably: upon the last stud but one in either case the same transmissions come in with the condenser pointer at about 10 or 15 degrees.

Inductance and capacity can thus be worked one against the other until the setting that gives the best results with a particular receiving apparatus is found. In this way any tendency on the part of the tuned-anode coupled valves to fall into oscillation can be checked, and the maximum signal strength may be obtained.

THE COWPER CIRCUIT.

(*Concluded from page* 645.)

variometer windings, required for much over 400 metres becomes prohibitively large. For the higher ranges, therefore, some other form of stabilising (*not* damping) device is preferable, as, for instance, the modification of the Hazeltine neutrodyne principle, adapted to parallel-tuned anodes, described by the writer in *Wireless Weekly*, Vol. 2, No. 8, September 5.

By actual critical comparison, with the aid of switches arranged to give an instantaneous changeover from the ordinary tuned-anode arrangement to this series-tuned form, with identical apparatus and conditions otherwise uniform, it was demonstrated that the latter gave stable amplification of a sensibly higher degree than was the former able to when held down on the verge of oscillation by the customary device of some 1½ volts positive on the grid. On about 360 metres, however, the former would give momentarily nearly as high amplification, immediately before bursting into violent oscillations. The amplification obtainable is, in fact, quite comparable with that in a good stage of low-frequency amplification with an iron-core transformer.

The principle is obviously capable of considerable extension, and a two-valve dual circuit, of uncommon stability, has already been worked out. Using the circuit of Fig. 4 and B.T.H. Type B5 dull-emitter valves, American broadcast reception has been obtained.

Broadcasting News

LONDON.—The broadcasting of the speeches at the Lord Mayor's Banquet seems to have given great satisfaction in Scotland, and many letters have been received stating that it was the best transmission which had yet been done. It was something new for the Scots to have the privilege of listening to the proceedings at the Guildhall.

□ □ □

Mr. Allen Walker, who is one of the most popular lecturers at 2LO, will have to be more careful as to the kind of invitations he issues. He asked those who were interested in the House of Commons to meet him on the Saturday following his lecture, and over 5,000 turned up. He did the same thing some months ago when speaking about the Southwark Cathedral, but on that occasion only 600 put in an appearance.

□ □ □

Over 500 letters were received by the B.B.C. referring to the experiments which have been made from the new temporary studio where there is a considerable amount of echo. Of that number about 30 prefer the old studio, whilst the rest advocate the new. It would seem as if the elimination of echo were better for the transmission of speech, a fair amount of echo being better for music. Experiments will be continued, and may ultimately have an important effect on simultaneous broadcasting.

□ □ □

"Mozart Night," on the 5th inst., simultaneously broadcast, gave us a very fine selection of this composer's operatic and light music. What a wealth of melody and well controlled ornamentation, to say nothing of his comprehensive beginnings and beautifully sweet cadenzas. Both vocalists and instrumentalists did full justice to this great composer's works, and Newcastle may certainly put this down as one of their great nights.

□ □ □

We seem to get a good deal of Elgar's music, and rightly, too; but why not have a Sullivan Night? Then we should like to hear Mendelssohn's "Lauda Sion," and also that splendid "Semiramis" (or Semiramide), the latter with plenty of verve would surely appeal to most of listeners. Gungli's "Soldaten Lieder" would also, we feel certain, make a strong appeal to music lovers. We enjoyed the singing of Mr. Lyell Johnstone, the baritone, his style "coming over" very well indeed.

□ □ □

Forthcoming Events

NOVEMBER.

23rd (FRI.).—Orchestra. Miss Elsie Cochrane, soprano. Mr. William Bates, humorist. Mr. Will Herbert, zith-banjo soloist.

24th (SAT.).—Mr. Hilton Edwards, Songs from "The Beggar's Opera" and "Polly." Mr. Fred Spencer as "Mrs. 'Arris."

25th (SUN.).—3.30, Orchestra; Miss Rita Sharpe, 'cellist; Mr. Cedric Sharpe, Mr. Madoc Davies, baritones. 8.30, Religious Address; H.M. Irish Guards Band; Miss Sophie Rowlands, soprano.

26th (MON.).—Symphony Concert, Orchestra conducted by Mr. Percy Pitt.

27th (TUES.).—7.15, Popular Fallacies, by Mr. A. S. E. Ackerman, B.Sc.; Crotchets' Concert Party; Savoy Orpheans.

28th (WED.).—Orchestra. Mr. Keighley Dunn, tenor. Mr. Jay Kaye, entertainer.

□ □ □

ABERDEEN.

Forthcoming Events

NOVEMBER.

22nd (THURS.).—Orchestra. Selections from "Katinka" and "Little Nelly Kelly."

23rd (FRI.).—Orchestra and Vocalists.

24th (SAT.).—Popular Concert. Orchestra and Vocalists.

25th (SUN.).—The Right Rev. Frederick Llewellyn Deane, M.A., D.D. Bishop of Aberdeen and Orkney. Beechgrove U.F. Church Choir. Mr. J. Mackenzie Forbes, bass. Mr. W. G. Smith, tenor. Miss Isabel Simpson. Miss Kathleen Morgan.

26th (MON.).—Popular Concert. Miss Marjory Lorimer, mezzo-soprano. Mr. Allan Reid, siffleur. Mr. Alex Leitch, tenor.

27th (TUES.).—Norwegian Night. Augmented Orchestra. Miss Catherine Paterson, soprano.

28th (WED.).—Aberdeen Wireless Quartette. Orchestra.

□ □ □

BELFAST.—It may be that there are diverse opinions anent the practice of simultaneous broadcasting of the London programmes, nevertheless nothing but unanimous gratification is expressed by listeners throughout Northern Ireland at the excellent transmission of the speeches at the Lord Mayor's Banquet. Even on the extreme Western sea border of Donegal every syllable was distinctly heard.

□ □ □

BIRMINGHAM.—The broadcasting of the first children's concert from 5IT was quickly

followed by many congratulatory letters, some of which came from as far away as the North of Ireland, Birkenhead, Abergavenny, Aberdovey and towns in the south. It will take the little artistes some time to realise the fame they achieve when they perform before the microphone!

□ □ □

The concerts are stimulating children's interest in broadcasting in quite a remarkable manner, and there is not the slightest doubt now that the venture is going to prove a success.

□ □ □

Forthcoming Events

NOVEMBER.

21st (WED.).—7.30, Opera, "Cavalleria Rusticana." 10.10, Mr. Sidney Grew will give his final Recital on the Works of Chopin.

22nd (THURS.).—3.30, Miss Hilda Raybould in a Song Recital, and Miss Lauri Short, Dramatic Recital.

23rd (FRI.).—3.30, Lozell's Picture House Orchestra. 8, The Orchestra, special request items. 8.45, Mr. Phillip Wilson, of London, in a Recital of Old English Period Music. 10, Mr. Jack Hancock, humorist.

27th (TUES.).—7.15, Mr. John Huntington, of London, baritone. 7.30, Mr. Raymond Green, humorist. 8, Mr. John Hendry, 'cellist. 9.15, Miss Mona Washbourne, Songs and Humour at the Piano. 9.45, Talk by the Earl of Athlone.

□ □ □

BOURNEMOUTH.

Forthcoming Events

NOVEMBER.

22nd (THURS.).—Miss Mabel Harding, contralto. Station Pianist. The Very Rev. T. C. Fry, Dean of Lincoln Cathedral.

23rd (FRI.).—The Crystals Concert Party. Mr. George Stone, entertainer.

24th (SAT.).—Mr. Hadley Watkins' Male Voice Choir. Orchestra. Mr. William Bates, entertainer. Miss Winifred Smith, soprano.

25th (SUN.).—Religious Address by Father Triggs. Mr. Ernest W. Pearson, baritone. Mr. Reginald S. Mouat, solo violin. Mr. Thomas E. Illingworth, solo 'cello.

27th (TUES.).—The Boscombe Silver Prize Band.

□ □ □

CARDIFF.

Forthcoming Events

NOVEMBER.

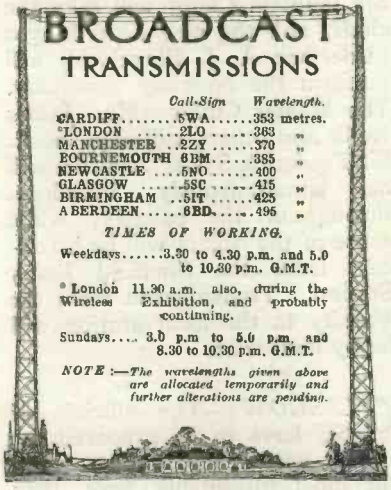
23rd (FRI.).—General Concert. Miss Marion Dawson, violin soloist. Dr. F. Harrington, singer.

24th (SAT.).—The Welsh Gleemen. Mr. Wally Leon, entertainer. Mr. T. Fisher on "Prison Life and Reform."

25th (SUN.).—Wood Street Congregational Church Choir. Rev. R. J. Cook.

27th (TUES.).—Literary Night conducted by Mr. S. B. P. Mais.

28th (WED.).—Pentyminster Quar-



tette. Mr. John Huntingdon, baritone.

□ □ □

MANCHESTER. — The brilliant series of eminent men who have broadcast recently has been much appreciated by listeners. It is fascinating to listen to the actual speech of men whose names are household words, and the latest game is to compile a list of the celebrities one has heard. 2ZY listeners were also favoured, unexpectedly, with a speech by the famous writer Mr. G. K. Chesterton, as delivered at the Manchester University. Unfortunately, however, owing to a particularly noisy land-line, the speaker's voice could only be heard with difficulty.

□ □ □

Forthcoming Events

NOVEMBER.

21st (WED.).—3.30, Piccadilly Picture House Orchestra. 6.30, Organ Recital, Piccadilly Picture House. 7.45, The 2ZY Operatic Company will present Leoncavallo's "Pagliacci." Principals: Miss Madge Taylor, Mr. Winifred Hindle, Mr. Lee Thistlethwaite, and Mr. Harold Marsden. 9.45, Chorus Items from Saint-Saëns' "Samson and Delilah."

22nd (THURS.).—11.30, 2ZY Trio. 6.30, Girl Guides' and Boy Scouts' Bulletins. 6.40, Talk by Mr. G. W. Thompson on "The Triumph of Steel and Concrete."

23rd (FRI.).—Concert by Miss L. Gunton, soprano; Miss Gladys Richards, contralto; Mr. W. Barry Griffiths, baritone, and Mr. F. Ingham Bradshaw, entertainer. 6.40, French Talk. 7.45, Garner-Schofield Dance Band. 8.15, Piccadilly P.H. Orchestra.

24th (SAT.).—3.30, Oxford Picture House Orchestra. 6.30, Organ Recital, Piccadilly Picture House. 8.15, Keyboard Kitty. 8.25, Miss Olga Telba, soprano; Mr. James Worsley (Lancashire Dialect Stories). 8.45, Balcony Scene from "Romeo and Juliet," by Mr. Ed. James and Miss Marie Gould. 9, Mr. Victor Smythe and "Algy." 10.5, Sketch, "A Happy Pair."

25th (SUN.).—Talk by Mr. S. G. Honey. 8.25, Talk by Rev. Viscount Mount-Morris of Swinton. 8.45, 2ZY Orchestra; Mr. John Huntingdon, bass; Miss Evelyn Belleisle, soprano.

26th (MON.).—3.30, Orchestra; Miss Eileen Jennings, mezzo-soprano; Miss Dorothy Ellison, elocutionist; Mr. Sidney Francis, baritone. 6.35, Boys' Brigade and Life Bulletins. 6.45, Spanish Talk.

27th (TUES.).—3.30, 2ZY Trio. 6.40, Talk on "Religious Pictures," by Mr. J. E. Phythian, M.A. 7.45, Miss Yvonne Tiano, solo piano; Miss Florence Holding, soprano; Mr. J. Morrison, solo violin; Mr. Phillip Wilson, tenor; Talk on Music, 1225-1558.

NEWCASTLE. — Protest has recently been made by certain disgruntled listeners against the frequent recurrence of certain names in the 5NO programmes. It should be borne in mind, that in cases where the same artistes appear often, it is in response to the very numerous requests received from other listeners who appreciate their services. It is the desire of the station authorities to give the greatest possible pleasure to the greatest number. Every letter received at Eldon Square obtains sympathetic attention and is answered—no light task. The remedy for those who have constructive criticism to offer is obvious.

□ □ □

Many letters appreciative of the recent simultaneous broadcast of the evening with Mozart have been received from all parts of the United Kingdom. One in particular might be mentioned, from a bed-ridden invalid, illustrating the great boon that broadcasting must be to many who have little to interest them in life.

□ □ □

Forthcoming Events

NOVEMBER.

22nd (THURS.).—Concert by Miss M. Wilkinson and A. J. Beaty, pianoforte duets. Miss Eveline Beaty, soprano, and items relayed from London.

23rd (FRI.).—Concert by Miss Florence Farrar, solo pianoforte; Miss Hattie Molineaux, soprano; Miss Doris Lear, solo 'cello; Orchestra; Miss Lilian Rowell, contralto; Mr. Harry Duxbury, entertainer; Mr. John Huntingdon, baritone.

24th (SAT.).—Concert by Miss Florence Farrar, solo pianoforte; Mr. W. A. Crosse, solo clarinet; Miss Lily Adams, contralto; Newcastle Corporation Tramways Band.

25th (SUN.).—Religious Address by the Rev. Canon Oakley and Hymns by Mr. Ernest J. Potts' Party.

26th (MON.).—Concert by Mr. Ernest Forster, cornet solo, and Greta Young, mezzo-soprano, and items relayed from London.

27th (TUES.).—The Earl of Durham's Band. Mr. Robert D. Strangeways, baritone. Madame Mabane, elocutionist. Miss Leonora Rowe, soprano.

28th (WED.).—Orchestra. Mr. John Olivere, baritone. Miss Kathlyn Birch, soprano. Mr. Philip Wilson, tenor, who will give "A Chat on Music in the Reigns of Queen Elizabeth and James I."

29th (THURS.).—"Carmen," Acts 2 and 3, relayed from London, etc.

□ □ □

SHEFFIELD. — When the Sheffield Relay Station is officially opened on Friday (November 16), Major-Gen. Sir Frederick Sykes, M.P. for the Hillsbrough Division of the city, son-in-law of the late Mr. Bonar Law, and Chairman of the departmental committee on broadcasting which sat a few weeks ago, will make a speech at the Mappin Hall of the University. Sir William Clegg will take the chair, and the new Lord Mayor (Alderman A. J. Blanchard) will perform the opening ceremony. The Master Cutler (Mr. James Neill) and others will also speak. Sir Frederick Sykes' remarks will be simultaneously broadcast throughout the country, while those of the others will be broadcast from the Sheffield Relay Station. Transmission from the Varsity to the local station will be by land wire.

□ □ □

GLASGOW.—The officials of 5SC have to be prepared for any emergency, but probably the most formidable task they have to undertake is the pronunciation of Gaelic songs. Occasionally the announcer has to apologise for his ignorance of the Gael and his "murdering" of the "soft liquid accents," and the great majority of his hearers are inclined to sympathise with him. For instance, how is it possible for any Christian gentleman not a Gaelic scholar to pronounce correctly the title of such a song as "Mo Ribhinn Chaoimhneil."?

□ □ □

For the first time in Scotland there was radioed on Tuesday, November 13, Gustav Holt's fugal concerto for flute and oboe, which were played by Mr. Alfred Picton, solo flautist of the Glasgow Wireless Orchestra, and Mr. J. S. Sinclair (oboe).

□ □ □

Forthcoming Events

NOVEMBER.

23rd (FRI.).—Wireless Quartette. Falkirk Trades Band. General Concert.

24th (SAT.).—Popular Concert. Orchestra and Vocalists.

25th (SUN.).—Rev. Wm. Simpson, M.A., of Finnieston U.F. Church. Mr. James Cottingham, bass. Mr. J. B. Dickson, 'cellist.

26th (MON.).—The Wireless Quartette.

27th (TUES.).—Orchestra. Mr. Jan Wein, zither banjoist.

28th (WED.).—Glasgow United Co-operative Bakery Silver Prize Band. Miss A. W. Young, soprano.

□ □ □

Simultaneous Broadcasting Events.

NOVEMBER.

22nd (THURS.).—7, Bulletin of the Radio Society of Great Britain. 7.35, Royal Air Force Band. Overture, "The Flying Dutchman" (Wagner); Solveig's Song, Anitra's Dance, "Peer Gynt" (Grieg); Suite in F (Holst). 9.10, Sir Edward Smith, J.P., on "The Perils of the Streets."

23rd (FRI.).—7, Mr. G. A. Atkinson, "Seen on the Screen."

24th (SAT.).—7.30, First Act of "La Traviata," from "The Old Vic" Theatre.

26th (MON.).—7, Mr. John Strachey, literary critic. "Our Weekly Book Talk." 7.30, Symphony Concert; Augmented Orchestra, conducted by Mr. Percy Pitt; Solo Pianoforte, Mr. Maurice Cole; Overture, "The Bartered Bride" (Smetana); Two Pieces (Delius); Concerto in C Minor (Beethoven); Symphony in E Flat (Schumann). 9.10, Lieut. F. W. Kealey, R.N.V.R., Secretary of the Expedition of the "St. George" to the Pacific, and great grand-nephew of Captain Cook, the Explorer, "The Scientific Voyage of the 'St George' to the Pacific."

27th (TUES.).—10, Dance Music by the Savoy Orpheans.

RANDOM TECHNICALITIES

By PERCY W. HARRIS, Assistant Editor.

A few notes of interest to home constructors.

HAVE you ever noticed a sudden "deadness" in your valve receiving apparatus, a deadness which has made you search all over the place to find the fault? I do not mean a complete disappearance of signals, such as might arise from a burn-out, a broken lead, failure of a valve, or any such simple causes. The deadness to which I refer is a reduction of perhaps 50 per cent. in the signal strength without any apparent alteration anywhere else. At first you may think that it is due to a drop in voltage of the filament battery, but you will find that by increasing the brightness of the valves you gain nothing. The trouble probably comes from a near-by continuous wave station, signals from which you will not hear as your receiver will not be in an oscillating condition. A strong current set up in the aerial will most likely force the valves to work on a different portion of their characteristics, and will perhaps saturate them making receiving almost impossible. Northolt, which is practically in sight of my house, sometimes affects me in this way. This station, by the way, although somewhat troublesome to those in the immediate vicinity, gives much less interference than its big brother Leafield. Northolt seems to be using a valve set occasionally and one day, perhaps, similar apparatus will be put in at Leafield, enabling us poor amateurs to listen to American broadcasting while Leafield is working. "G.B.L., God Bless Leafield," as Paul Godley said when he adjusted his super-heterodyne for the first time in this country.

* * *

I am glad to see that square section wires for wiring up receivers is becoming more easily obtainable in this country. The Germans were among the first to use it, and it has been popular in America for some time. Several firms here sell it, and the General Radio Co. is now marketing some particularly good stuff, better finished than any I have so far seen in this country.

* * *

A little note of warning to those readers who are in the habit of soldering every connection in their set. Some of the variable condensers on the market, fitted with ebonite end plates, make frictional contact between the moving plate spindle and a fixed brass bush. Be very careful if you are soldering a wire to metal close to, or connected with, this bush. Ebonite, as you probably know, has a nasty habit of softening with heat, and you will very likely find if you are not careful that the heat applied by the soldering iron has loosened the bush or else upset the adjustment of the bearing. I recently saw a variable condenser in which all the moving plates were touching the fixed for no other reason than the adjustment having been upset by the hot soldering iron applied to a screw in the base.

The synthetic resin products, such as Bakelite, Condensite, Formica and others, are much better in this respect than ebonite, and screws in it do not loosen to anything like the same degree when they are heated.

* * *

Newcomers to wireless do not seem to realise that ebonite discolours badly and sometimes fades to a brown or green colour when exposed to strong sunlight. Many very handsome sets bought earlier in the year and admired for their glossy black panel are now presenting a very sorry appearance for this reason. The discolouration is usually accompanied by considerable loss in insulating qualities of the surface.

THE ALL-BRITISH WIRELESS EXHIBITION

A further list of interesting apparatus shewn at the White City, Shepherd's Bush, from November 8th to 21st.

Fullers United Electric Works, Ltd. (Stand No. 25).—This firm have a good display of wireless apparatus and accessories, including their well-known "Block" accumulator batteries, the construction of which largely eliminates the risk of internal shorting and sulphating; "ironclad" transformers of patented construction; filament rheostats, designed to occupy the space equivalent to that of a valve socket; potentiometers, valve holders with special earthing clips, coil holders; condensers; insulators, etc. They are also showing special "tone-selector" devices, and loud-speakers.

General Electric Co., Ltd. (Stand No. 103), have a particularly interesting show of their well-known wireless receiving sets. They are exhibiting, for the first time, a new two-valve panel set, which may be obtained either as a complete receiving set, or in the form of component parts for home assembly.

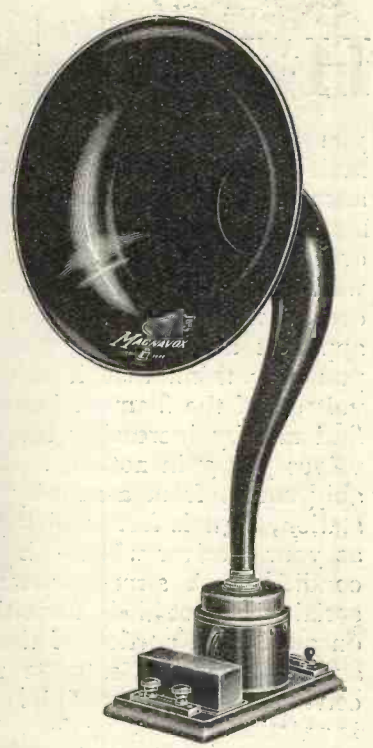
Dubilier resistance.

General Radio Co., Ltd. (Stand No. 74).—The exhibits on this stand range from four-valve to six-valve receiving sets, in cabinets complete with loud-speakers; two-valve sets and two- and three-valve note magnifiers. Amongst the components on view, the most interesting is probably their shielded variometer, which forms the standard tuning device fitted to their complete sets.

W. J. Henderson & Co. (Stand No. 2), have an interesting display of well finished valve and crystal receivers, valve amplifiers, H.F. and L.F. transformers, variable condensers, variometers and other accessories of particular interest to the home constructor and experimenter. A particular feature is the two-valve receiving set, for which it is claimed that in addition to receiving all B.B.C. stations and Continental telephony, American broadcasting may also be received under good conditions.

The Climax Monovalve Receiver.

Radiax, Ltd. (Stand No. 8).—This firm have always made a feature of apparatus for constructors, and, in addition to various arrangements of their "unit" system, they are exhibiting a complete series of receiving sets, in parts for home construction. These vary from a simple crystal set up to a four-valve set and include a new series employing dual amplification circuits. They are also showing a medium-sized loud-speaker, quite suitable for home use.



The Sterling Magnavox Senior Loud Speaker.

Siemens Bros. & Co., Ltd. (Stand No. 76).—A three-valve receiving set, designed to enable distant stations to be received without interference from the near-by broadcasting station, is one of the principal features of this firm's exhibit. In this set, the valves are fitted behind the panel and the cabinet contains the H.T. battery, so that the set is self-contained except for the accumulator battery and aerial

and earth connections. The range of wavelengths covered is from 300 metres to 2,800 metres, thus embracing all British and most of the Continental telephony transmissions. They are also showing a broadcast receiver, phones, aerial protection devices, dry cell batteries and ebonite.

Western Electric Co., Ltd. (Stand No. 100).—As patentees and manufacturers of the Weco valve (the new Pea-nut type of valve which operates from a single dry cell), this firm are making a special exhibit of the valve itself and the new Weconomy receiving sets in which it may be used. The stand has been arranged so as to provide five compartments, in each of which visitors will be able to test the apparatus by the use of telephone receivers. A complete line of new loud-speakers and cabinet receiving sets de-luxe, together with a large variety of detectors and amplifying sets, frame aerial sets and Weconomy combined crystal and amplifier sets, and the well-known Western Electric head telephones, will also be on view. Altogether this exhibit should prove extremely interesting both to the non-technical visitor and the experimenter.

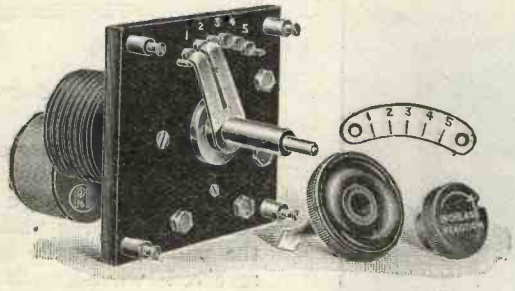


Fig. 1.

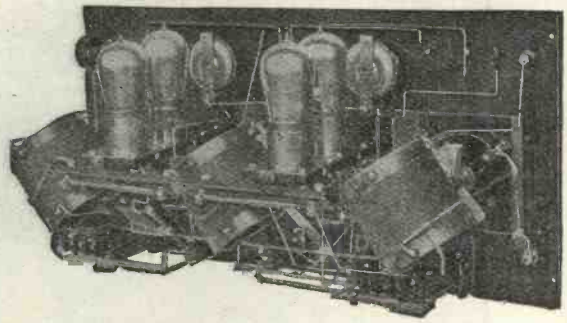


Fig. 3.

Fig. 1.—Radio Instruments Tuned-anode reaction unit.

Fig. 2.—Igranic intervalve L.F. transformer.

Fig. 3.—Back of Hazeltine Neutrodyne 4-Valve Receiver.

Fig. 4.—The Coomes A.C. "Home-Charger."

Fig. 5.—The Bowyer-Lowe Vario-coupler.

Fig. 6.—Siemens Crystal-valve Receiver.

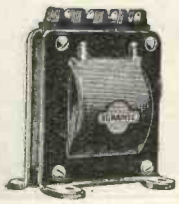


Fig. 2.

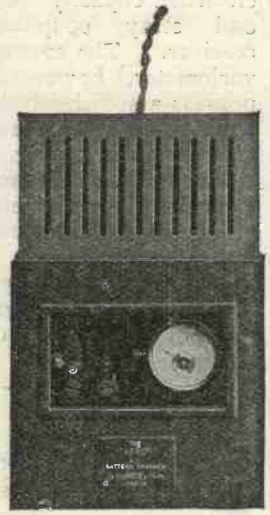


Fig. 4.

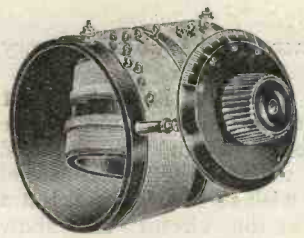


Fig. 5.

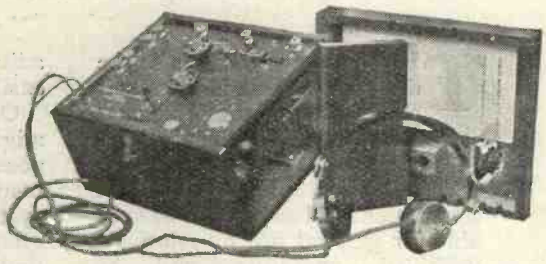


Fig. 6.

Fig. 1.—The completed instrument mounted in a cabinet.

A NEW S

The following article gives fu

THE receiver which is to be described herein is the result of an attempt to produce a set suitable for purely local broadcast reception up to distances of perhaps thirty miles from one of the stations, which should be suitable for general use by relatively unskilled operators, and be capable of dispensing with any elaborate aerial or earth arrangements. Since it is intended for quite non-technical use, the idea of using an Armstrong or Flewelling circuit was soon dropped, experience having convinced the writer that neither is really fit for use by other than fairly experienced experimenters. On the other hand, it seemed desirable that the utmost economy should be observed in the design, and to reduce the number of valves required reaction is incorporated in a manner which enables the necessary critical adjustment to be obtained very easily.

Only one valve is used, and it might seem that it would not be possible to obtain the required results without the usual aerial system with so simple a set, but a glance at the circuit will show that a method of tuning and energy collection is adopted to which the conventional rules do not apply, and which actually gives results closely approximating to those of an outdoor aerial and earth.

The circuit diagram will show that the receiver is exceedingly simple in nature, the essential feature being a tuning coil which is tapped at its centre point. The energy-collector is connected to this centre tapping through a small fixed condenser, and reaction is provided by a variometer in the manner so largely used in the United States. This method, in its original American form, depends upon the use of a variometer having a large number of turns, so that the plate circuit of the valve is actually tuned to the received wave-length and thus reaction is produced by the inter-electrode capacity of the valve and stray couplings in the receiver. The average English variometer, however, does not possess a sufficiently high inductance value to enable one to rely entirely upon tuning the anode circuit for reaction, and therefore I placed the variometer so as to produce definite inductive reaction into the tuning coil. The actual position for this purpose can be seen from the photograph of the internal arrangement of the set.

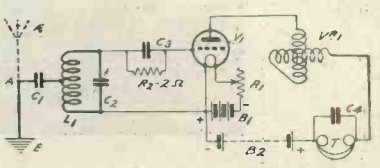


Fig. 3.—The Circuit. The alternative connection of either aerial or earth to the point A is indicated in this diagram.

So placed, the adjustment of the variometer governs the amount of reaction in much the same way as varying the coupling of an ordinary reaction coil, but with the difference that it gives a much smoother control and produces less alteration in the tuning of the main circuit. So smooth is the control, indeed, that as the reaction is increased the set slides almost imperceptibly into self-oscillation, without the slightest

INGLE-VALVE CIRCUIT.

By G. P. KENDALL, B.Sc., Staff Editor.

constructional details of a Single-Valve Receiver which may be used with an earth connection only.

click at the moment of breaking into oscillation. In this it resembles the Reinartz circuit, and possesses also the well-known virtue inherent in that circuit of being capable of adjustment to the very verge of oscillation without the slightest instability, so that the maximum benefit can be derived from the reaction.

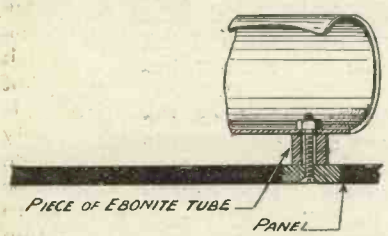


Fig 4.—Showing how the tuning coil is attached to the panel.

As will be seen, the tuning arrangements are somewhat peculiar, and I will say at the outset that I am not prepared to offer a complete explanation of their mode of operation. They certainly give remarkable results, but their exact how and why require elucidation by further experimental work, and I would strongly urge readers of *Wireless Weekly* to take up this line, for I believe that it is capable of most interesting development.

The circuit composed of the coil L_4 and the condenser C_2 tunes quite independently of whatever aerial or earth arrangement is used, as may be realised when it is stated that the wave-length range covered is no less than 230 to 500 metres, the condenser having a maximum capacity of 0.0003μF and the coil consisting of 70 turns upon a tube nearly 4 inches in diameter. Some sort of energy collector is connected to the centre point of the coil through the small fixed condenser C_1, the results being very similar whether this collector is merely an earth connection, such as a water pipe, or an aerial, or the lighting mains *vid* a Ducon. A terminal is provided upon the set to which the small fixed condenser is connected, and this may be referred to for convenience as the "collector" terminal. It is indicated by the dot "A" upon the circuit diagram. Some of the best results which I have obtained were those given by connecting this terminal to a gas pipe. With this arrangement 2LO was so strong at a distance of five miles that the addition of one low-frequency valve gave perfect loud-speaker signals, while with exceedingly critical settings of both tuning and reaction Birmingham was just audible.

Another very effective collector was found in the wiring of the electric bells, and it will be agreed that the set is extremely suitable for those would-be listeners who live at a moderate distance from one of the broadcasting stations, and who do not wish to erect an aerial or go to the expense of a multi-valve set capable of working from a frame aerial. A further virtue of the circuit is its extremely sharp tuning and high selectivity.

Those readers who desire to follow up this line of investigation will be interested to learn that the well-known American experimenter, Mr. Paul Godley, is also working on rather similar circuits, although his starting point appears to have been quite different from that at which I commenced, and some of his results are published in the November number of "Popular Radio" (U.S.A.). Mr. Redpath has also, I believe, achieved simi-

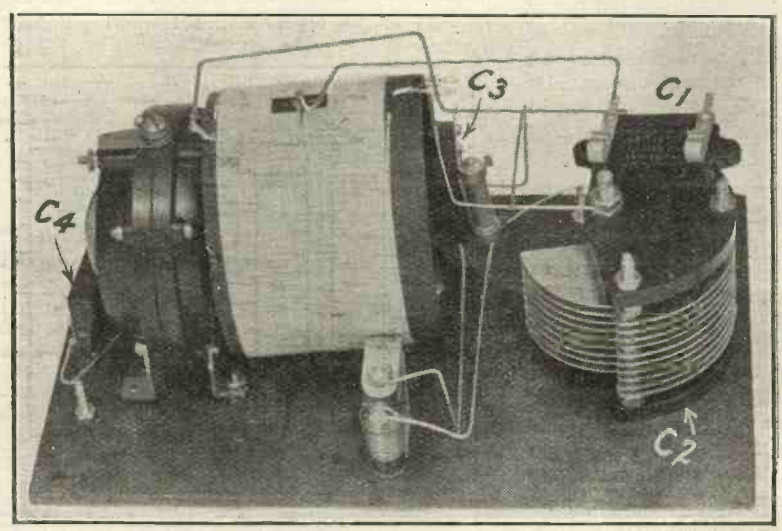


Fig 2.—A view of the internal arrangement of the set. Note the position of the centre tapping on the coil.

lar results by a somewhat different method which he will describe shortly.

The question of the amount of radiation from a set of this type in an oscillating condition has yet to be investigated, but I am inclined to think that it would be small with such energy collectors as gas pipes or lighting mains. There is no reason, however, why

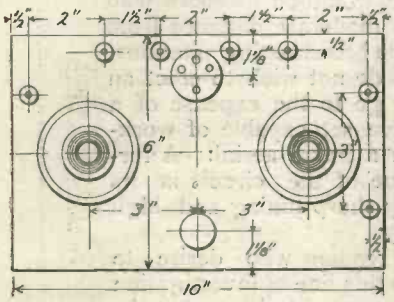


Fig. 5.—Details of Panel.

the set should ever be allowed to oscillate for more than a few seconds, and care should be taken in tuning to see that it does not do so, in order to be on the safe side.

The actual construction of the set is very simple and straightforward, and does not call for elaborate description. All the components are mounted upon a panel 10 inches by 6 inches and a ¼ of an inch thick, which forms the lid of a box 5 inches deep inside. A lay-out of the panel is given in Fig. 5, showing the positions of the various holes and the uses of the terminals.

Referring back to the photograph of the finished receiver, the dial upon the left is that of the 0.0003μF variable condenser, and that upon the right controls the variometer. The small knob at the front is that of a T.C.B. filament resistance, this pattern being chosen on account of its compactness and the small space available. The terminal on the extreme left is for the "collector," while the pair on the right are the telephone terminals. Along the back are those for the batteries, and these are marked on the wiring diagram.

The various fixed condensers C_1, C_3 and C_4 are not screwed to the panel, but are simply supported at convenient points by the stiff wire (No. 18 tinned copper) used for connections. This is visible in the photograph of the underside of the panel. The capacities of these condensers are as follow: C_1, 0.0001μF; C_3, 0.0003μF; C_4, 0.003μF. The grid leak has the conventional value of 2 megohms, and should be of reliable make.

The capacity of the variable condenser has already been given as 0.0003μF, and it is stipulated that one of the air dielectric type should be used, since it is important that it should have a low minimum value. For the same reason one should be chosen having ebonite rather than metal end plates.

The coil L_1 is a very important part of the set, and pains should be taken to follow instructions exactly in its construction. It is wound upon an ebonite tube 3¾ in. in diameter and 3 in. long, the winding consisting of 70 turns of No. 22 double silk covered wire in a single layer, with a tapping taken from the centre point (count the turns and put it on No. 35 or 36, either will serve) to the condenser C_1. I found it difficult to decide whether to shellac the winding or to leave it "dry," *i.e.*, without impregnation, since it is important that the self-capacity of the coil be kept as low as possible, to permit of the production of the maximum difference of potential across its ends when signals are received. Impregnation inevitably increases the internal capacity of a coil, yet if it is not damp-proofed it is liable to absorb moisture and become poorly insulated. Remembering also that the presence of shellac between the turns introduces dielectric losses which may be serious on the shorter waves, it seems preferable to risk dampness, and use no shellac, and therefore silk-covered wire is recommended, since silk absorbs less moisture than cotton if left exposed to the air without impregnation.

The tube is attached to the panel by means of a single screw which passes into a tapped hole in the manner shown in Fig. 4. The other end of the coil needs no support, since it rests against and partly surrounds the variometer, which should be of the moulded high-ratio type such as the Edison Bell or Igranic. The remainder of the work consists simply in wiring up the components to conform to the wiring diagram.

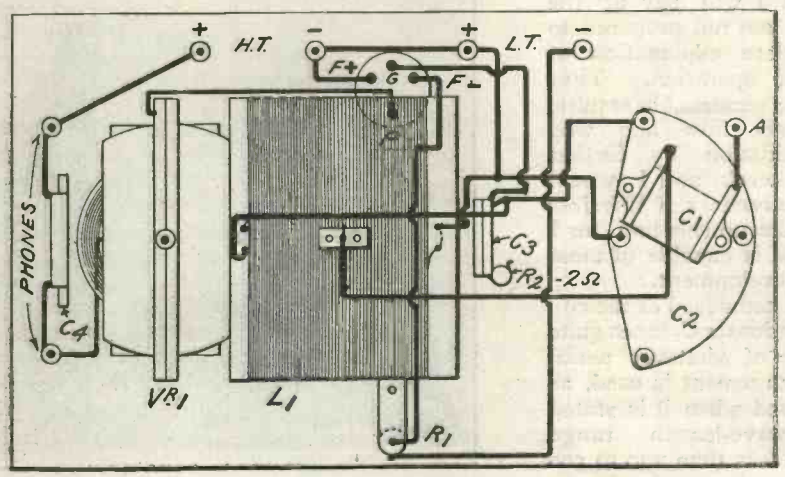


Fig. 6.—Wiring diagram of the receiver.

A NEW HIGH SPEED TELEGRAPH OFFICE

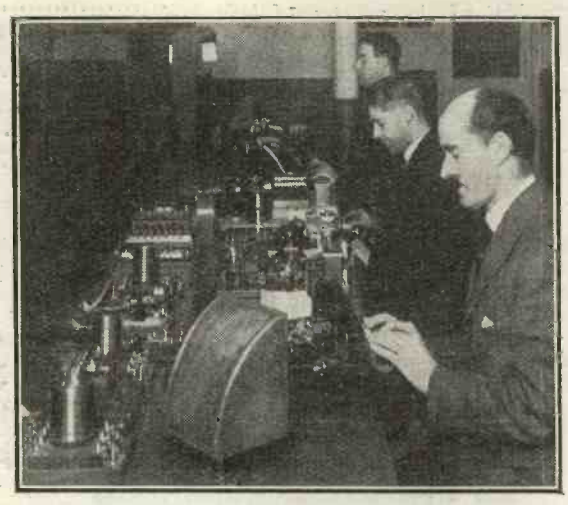
The following is a short description of a new telegraph office recently opened by Marconi's Wireless Telegraph Co., Ltd., at Liverpool.

THE opening of a Marconi telegraph office at Liverpool places at the command of Lancashire business people a wireless telegraph service similar to that enjoyed by London.

Direct communication with Radio House, London, the centre of the Marconi Company's Wireless Telegraph system, is provided by underground cable. From Radio House, which is organised to ensure the speedy and correct handling of traffic, direct wireless services are conducted with France, Spain, Switzerland, Canada and the United States of America, in addition to other parts of the World.

The Marconi transmitting stations at Ongar, in Essex, and at Carnarvon, are automatically operated from the main telegraph office. No human agency intervenes between the Radio House operators and those at the receiving office in the country with which direct services are maintained. In like manner, incoming messages received at the wireless station at Brentwood, in Essex, are transmitted automatically to Radio House.

The telegraph apparatus at Liverpool comprises typewriter keyboard perforators by means of which paper tape is prepared for the automatic transmission of messages at high speed; Marconi-Wheatstone high-speed transmitters; high-speed receiving apparatus, by means of which signals are automatically recorded on tape; Morse sounders for the aural reception of messages if this should be required. Messages handed in at the public



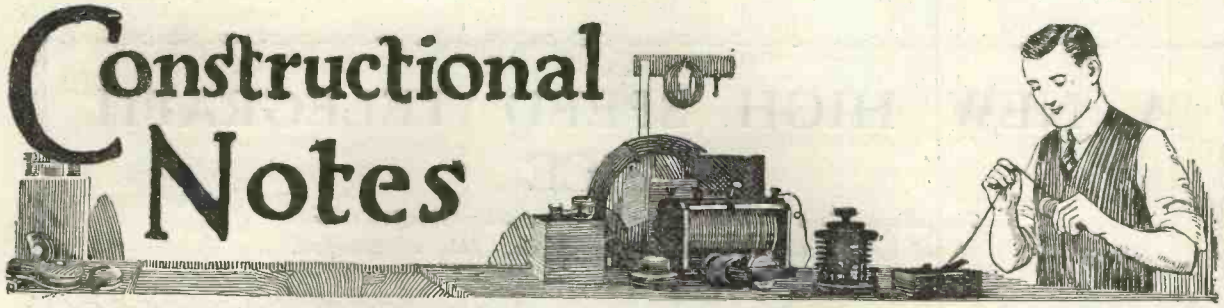
Our photograph shows some of the high-speed telegraph instruments.

counter are conveyed by special automatic carrier to the circulation table, in the instrument room, and are rapidly distributed to the transmitting circuits.

Provision is made for forty or fifty private telephone and telegraph lines, similar to those at the Radio House, London, for the use of customers who desire to have direct communication between their offices and the Marconi offices.

In addition to the public office and telegraph instrument room there is a large battery room where the electrical energy for operating the high-speed telegraph apparatus is stored; repair shops; a mess room and kitchen for the convenience of the employees.

Constructional Notes



Conducted by R. W. HALLOWS, M.A., Staff Editor.

A VARIABLE GRID BIASSING BATTERY.

ONE of the most useful fitments that the writer has ever made up is the little grid biassing battery shown in Fig 1. As the voltage at the terminals can be varied in 1½ volt steps from 0 to 9 volts one is able with its aid to find by trial exactly the negative potential required to make any valve, used as a note magnifier, function at its best with a given plate voltage. For use with power amplifiers a bigger battery should be built, for they may need a very large bias; the lines indicated in this note will, however, show the constructor the way in which to set about making a unit of any size.

The system may also be applied to high-tension batteries, the first 45 volts or so being "fixed" and the selector principle by steps of 1½, 3, or 4½ volts being used only for the last 20 or 30 as the case may be. If this is done the first part of the H.T. battery may consist of "slabs," a tapped unit being wired in series with them.

The principle of the idea as applied to grid batteries is this: Six 1½ volt dry cells of small size are contained in a box, the top of which is an ebonite panel provided with two terminals and a seven-stud selector switch. The wiring is shown in Fig. 2. Inspection of the diagram will show that when the switch arm is placed on the stud marked 0 none of the cells is in circuit. The grid is connected directly to the negative end of the filament, its potential being zero with respect to that end.

When the arm is moved to the stud marked 4½, as seen in Fig. 2, three cells are connected in series between the negative end of the filament and the grid; the grid potential is therefore 4½ volts more negative than the negative end of the filament.

Fig. 1.—The complete unit.

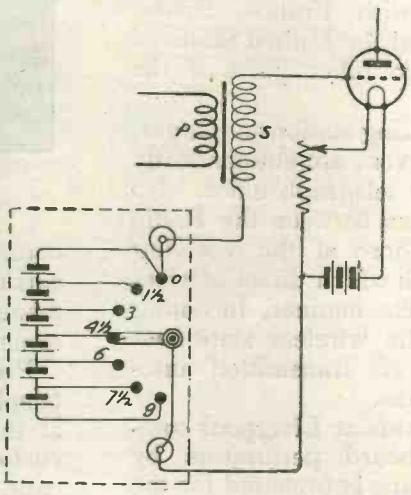


Fig. 2.—Illustrating the internal connections of the unit, together with method of its use in a low-frequency circuit.

Fig. 3 shows the layout of the top, which is made of two layers of ebonite, the upper ¼ in. and the lower ⅛ in. thick. Clamp both together and drill as shown. All holes are 4.B.A. clearance, except those for the four screws, which are, of course, tapped, and that for the bush of the selector's arm's spindle, which is ⅜ in. in diameter.

Now separate the two pieces of ebonite, and in the thicker piece pass a ¼-in. drill through each of the seven holes that lie

on the radius of the 1½-in. circle. Screw the pieces together once more.

Take seven standard studs and insert them into the ¼-in. holes, their shanks passing through the 4 B.A. clearance holes in the thin piece of ebonite. Tap them lightly home until they lie flush with the surface of the thicker panel. Then secure each with a nut. Procure, or make, a laminated arm with a radius of 1½ in. and mount it. Place two stop pins to prevent it from going beyond the end studs. Turn it backwards and forwards two or three times so that it scratches a line on the ebonite. Take a scriber and, with its point, make a slight groove along this line.

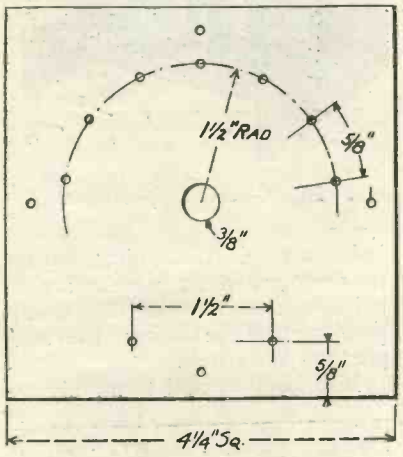


Fig. 3.—Dimensions of panel. Particulars for drilling.

It will be seen that whilst the spacing of the studs is such as to prevent the arm from short-circuiting any pair, the fact that they are mounted flush with the panel makes the action of the switch perfectly smooth.

Now obtain two good quality flashlamp cells and proceed to tap them in the following way: Chip away the pitch between the tops of the first two cells until the wire connecting them is laid bare. Make a hole in the pitch under it. Then take a 6-in. length of No. 26 copper wire provided with a systoflex sleeve, wrap its end round the inter-cell connection and solder the junction. Tap the second connection in the same way and solder a wire also to the negative (long) brass strip.

Treat the other battery similarly, except that a wire is soldered to its positive (short) strip instead of to the negative. Fold the negative strip of the second battery over and solder it to the positive of the first. Solder a wire to the junction of the two strips. Bind the batteries together with a piece of sticking plaster.

Now connect the seven leads to the studs, as shown in Fig. 2. Make a box 4¼ in. square and 2¾ in. deep. Place the batteries in it and pack them with greased cardboard. Then screw down the top and the unit is ready for use.

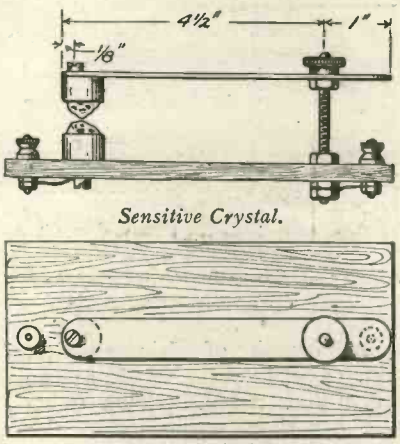
If you shirk the job of tapping flashlamp batteries, which is actually easier than it sounds, purchase a couple of those long, cylindrical batteries used for torches. The cells of these are not usually wired together, the positive of one merely pressing against the zinc pot of the next above it. If the end of the cardboard tube in which they are contained is removed they can be slipped out.

The tube should be cut into three sections and each cell fitted into one of them, for it is most important that the zincs should be insulated from one another. The cells may now be placed upright in a box upon a layer of wax and connected by soldered wires. Tapping now presents no difficulties. If torch batteries are used the box must be made deeper and a square of thick waxed cardboard with holes pierced in it to allow the seven leads to pass must be placed over the cells to keep them from coming into accidental contact with the spindle or the studs.

The current passed in the grid circuit is so tiny, amounting usually to a fraction of a micro-ampere, that a battery made in this way of either flashlamp or torch cells will last almost indefinitely. Its life is determined not by the using up of the cells, but usually by the deterioration that always occurs in them as time goes on. R. W. H.

A SIMPLE DETECTOR.

Two crystals are used, a point of bornite on a comparatively flat surface of zincite. The spring arm is of copper or brass ⅜in. wide, 5½in. long. Two holes are drilled, each ⅛in. from either end. The other hole is drilled 1in. away from an end hole. The support rod is of threaded brass 2 B.A. A rather novel idea is the eccentric mounting of the bornite. By rotating the upper cup, any part of the lower crystal can be searched for a sensitive spot. Copper pyrites can be successfully used instead of the bornite.



Sensitive Crystal.

Fig. 4.—Elevation and plan of the detector.

Both the crystals should be wrapped in tinfoil before insertion into the cups (of course, leaving the faces uncovered), as this affords better contact. The screws should not squeeze the bornite too tightly, as it crumbles very easily under pressure. To adjust the detector, the spring-arm is lifted slightly and the point of bornite allowed to rest firmly on the zincite. On no account let the bornite scrape the zincite, as the point would be soon destroyed. Certain dark patches on the zincite will prove very sensitive. The surface of the zincite should look as though it has been cut across the grain.

R. N. P.

AN EXTRA RESISTANCE FOR "PEANUTS."

An auxiliary fixed resistance for "peanuts" may be fitted to the set as shown in Fig. 5. It may be placed either between the negative leg of the filament and the rheostat, or between the rheostat and the negative terminal of the accumulator.

For the six-volt battery, its value should be about 18 ohms. A simple little device can be made as shown in Fig. 6. A

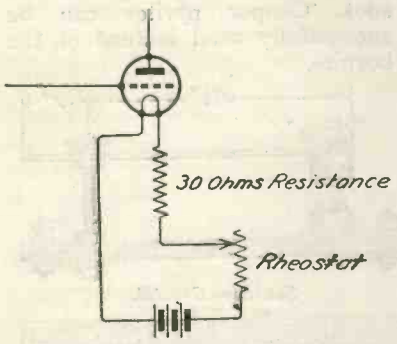


Fig. 5.—Illustrating position of the extra resistance.

2½-in. length of ¼-in. ebonite, 1 in. deep, is rounded off at the edges with a file. Two valve pins are then screwed into the lower edge 2¼ in. apart. The winding is of No. 26 enamelled Eureka resistance wire. As this wire makes 48 turns to the inch, there will be plenty of room for the 108 turns that are needed. The ends are attached to the valve prongs.

On the panel of the set, two valve legs, 2¼ in. apart, are mounted. The lead that runs from L.T. negative is disconnected from the rheostat and taken to one of them, the second being connected to the rheostat.

A piece of brass provided with two valve pins may be used to bridge the sockets when ordinary valves are used.

If the accumulator is a 4-volt one, the number of turns of resistance wire will be about 72, whilst 36 will suffice for a 2-volt cell. There is no need to count the turns. Wind 2 in. for a 6-volt battery, 1⅓ in. for a 4-volt, and ⅔ in. for a 2-volt cell. Should you find that the resistance is

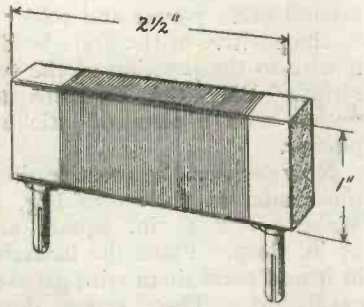


Fig. 6.—The finished resistance.

slightly greater than is needed, a few turns can easily be stripped off.

No. 26 wire has a current-carrying capacity of one ampere; these resistances can therefore be used with perfect safety in conjunction with a rheostat that is controlling the filaments of two valves performing the same duty. R. W. H.

LOW-CAPACITY VALVE-HOLDERS.

The dielectric coefficient of ebonite is about thrice that of air; hence, when stout sockets are surrounded by ebonite, the capacity between those corresponding to plate and grid is much greater than it would be if air only lay between them. Such capacity is particularly undesirable on the high-frequency side of sets used for short wave reception, for it provides a coupling between plate and grid circuits.

We cannot do away entirely with the ebonite, but we can effect a very great improvement by using separate valve sockets and mounting them so that only their thin shanks are embedded in it. The legs should be filed down as short as is consistent with good contact between them and the valve prongs. The shorter we make the thick part of the sockets, the smaller will be the capacity of the holder.

The sockets should be *screwed* into the ebonite and not fixed with nuts, for the presence of the latter will increase capacity. All valves on panels should be mounted in this way.

For experimental work upon the bench, a very handy valve-holder of low capacity is illustrated in Figs. 7 and 8. It consists of a piece of ¼-in. ebonite, 3 inches by 3½, mounted on small battens of ¼-in. hard wood. Fig. 8 shows the lay-out. All

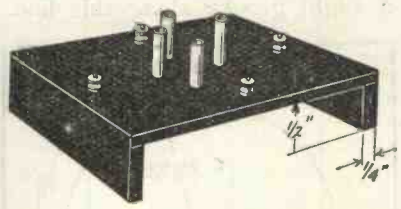


Fig. 7.—The complete unit.

holes are 4B.A. tapping, except those marked A, which are of suitable size to take the wood-screws used in fixing the supports to the panel.

Both sockets and terminals are

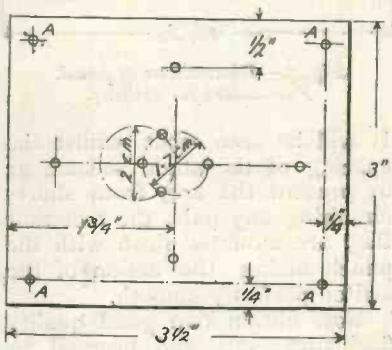


Fig. 8.—Dimensions of panel and positions of drill holes.

screwed in, their shanks being cut off so as to allow only ¼ in. or so to protrude below the surface of the panel. Connections are made by means of bare wire of No. 18 gauge firmly soldered to the shanks of both terminals and valve legs. R. W. H.

News of the Week

A WELL-ATTENDED and representative general meeting of the Radio Association of Ireland was held in Dublin on the 6th inst. The Executive Report stated that membership is increasing satisfactorily, and the Committee is in communication with interested parties at various centres with a view to forming branches of the Association. A branch has already been formed at Cork, with Mr. R. N. Halliday as Hon. Branch Secretary.

□ □ □

During the recent typhoon at Hong Kong, when great damage was done, the terrific force of the gale wrecked the masts of the local wireless station at Cape d'Aguilar and also carried away the aerials of the bigger station of the Colony. In order to maintain the necessary wireless communication with shipping while a temporary station was being erected at Cape d'Aguilar, the local Director of Public Works asked permission from the Marconi Company's representative at Hong Kong to utilise the Marconi equipment on vessels in the harbour. This permission being granted, communication was successfully maintained, first by the s.s. *Empress of Australia,* and, on that vessel's departure from Hong Kong, by the s.s. *Knut Sang.* It will be remembered by readers that an illustrated description of the Cape d'Aguilar station was given by Mr. Stanley G. Rattee in an article, entitled "Struck by Lightning," appearing in Vol. 1, No. 7.

□ □ □

Manufacturers desirous of opening business with New Zealand should communicate with Radio, Ltd., Strand Arcade, Auckland, who are, we understand, anxious to enter into the question of marketing English radio goods in New Zealand.

□ □ □

We learn that the White Star liner *Corinthic,* which arrived at Southampton recently from New Zealand, when in mid-Atlantic received a wireless call for medical assistance from the s.s. *Lombardy.* One of the crew had been taken ill, and the Captain was rather doubtful as to his condition. Wireless advice was immediately sent, and the vessels were in touch for four days, after which the man was reported to be progressing satisfactorily.

□ □ □

We are informed by the Institution of Electrical Engineers that the joint meeting with the Société des Ingenieurs Civils de France (British Section), which was to have been held on November 15, has been postponed to November 22, at 6 p.m., when M. A. Bachellery will read his paper on "The Electrification of the Midi Railway." On November 29 a joint meeting with the Physical Society of London will be held at 5.30 p.m.; the subject to be discussed will be "Loud Speakers for Wireless and other Purposes." By kind permission of the British Broadcasting Company arrangements are being made for parties, limited to 20 in number, to visit the Company's Studio at 2, Savoy Hill, at half-hourly intervals from 3 to 5 p.m.

□ □ □

When at Edmonton County Court a landlord applied for possession of three rooms on the ground that the tenant was always "messing about" with aerials, thus causing a nuisance, the judge dismissed the case with costs, stating that the applicant was not only opposing his tenant but the whole country.

□ □ □

The *Peking Leader* reports that the Chinese Cabinet, on October 23, formally sanctioned the Federal Wireless Company's contract, and that the United States Legation has been informed of this. The construction of the first wireless station at Shanghai will probably begin this winter. The newspaper states that the Japanese Legation has again protested against the scheme on the ground that it violates the Mitsui contract of 1918.

□ □ □

According to the *British Australasian,* the Postmaster-General has issued a broadcasting licence to Farmers, Limited, Sydney, who are erecting a plant to cost £16,000. Farmers also propose to establish a similar station in Victoria.

□ □ □

We understand from the B.B.C. that Mr. Lloyd George was approached with a view to his broadcasting his impressions of his visit to America, but so far he has not consented. As a supporter of British undertakings, he should certainly give an opportunity to listeners-in in this country to hear his voice, especially in view of the fact that he has already been heard all over America by means of broadcasting.

Apparatus we have tested

Conducted by A. D. COWPER, M.A., Staff Editor.

In view of their special interest to readers, we have carefully tested several of the latest types of valves and give below the results of our tests, together with some interesting characteristic curves.

The Penton Valve.

THE PENTON ENGINEERING CO. have given us an opportunity of making a thorough test of a new valve, economical in price and most moderate in its demands on the L.T. battery, which they have just placed on the market. It is not a dull-emitter, but has a slender filament which requires but .15 amperes or less to reach a white heat and some 4.5 volts. It can, therefore, be run successfully off dry cells, or if a 6-volt accumulator with filament resistance of the requisite value be used many more hours' run can be obtained than is possible with ordinary R valves.

The valve is similar in shape and size to the familiar French R, but has a spiral anode and an open type of grid. It appears to be of sturdy construction.

The characteristic curves for two taken out of stock, as determined by the writer, were very similar. One set is shown in Fig. 1. It will be noticed that the maximum filament emission is very fair, being just over 1 milliampere. The amplification factor is 7 : 1. A satisfactory straight characteristic (for distortionless amplification) is shown on 50 and 80 volts.

On actual trial in reception of local broadcasting at a dozen miles, a moderate degree of loudspeaking was obtained on the single valve with a P.M.G. aerial and an efficient circuit. With two valves, one detector, and one L.F., 40 volts H.T., and 1.5 volts negative grid bias, excellent loudspeaking was obtained. This was to be expected from the shape of the characteristic; 60 volts H.T. and 3 volts bias also gave good results. The strength of signals was not quite up to that given by two excellent French R valves consuming four

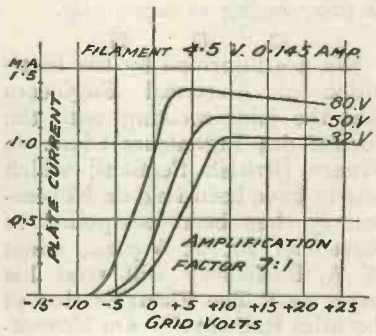


Fig. 1.—Characteristic curves of the Penton valves.

times the current. The two Penton valves were, for purposes of this test, run off three dry cells.

In a conventional two-valve circuit, one H.F. and detector, with 70 volts H.T., fairly good loudspeaking resulted, again a little short of the R valves. In simultaneous amplification (dual circuit) they operated satisfactorily.

In a later and powerful form of Armstrong super-regenerative single-valve receiver, most excellent results were obtained with a 2-ft. frame aerial, using dry cells as before as L.T., on 28 volts H.T. 2LO gave good loudspeaking for an intimate audience; Glasgow was enjoyable on the 'phones, every word of the performers in a light opera that was being performed there being plainly audible. On 8 volts H.T. the circuit would operate, and give the characteristic whistle, whilst London was comfortably readable. Without any H.T. at all, merely the three dry cells as L.T., the whistle vanished, but London could be just heard on the 2-ft. frame. On the grid-leak-howl type of super, with a high grid-leak to the L.T. plus, good reception was obtained on the frame with 40 volts H.T.

The valve was not found to be particularly microphonic, in spite of its slender filament. It is too early to make any statement as to the probable life of this thin filament.

On the whole, this type of low-consumption valve was found to be an excellent all-round utility one.

The B.T.H. Type B5 Valve.

THE BRITISH THOMSON-HOUSTON CO. have submitted for test a couple of their new dull-emitter valves, Type B5, the filament of which requires only .06 amperes at 2.4 to 3 volts, and which are there-

fore particularly suitable for running off dry cells. Two of these latter, if of reasonable size, will suffice for a two-valve set. This valve is of similar dimensions to the straight-sided type of English valve, and has the ordinary four-

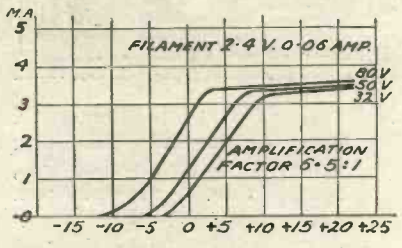


Fig. 2.—Curves given by the B5 type valve.

pin fitting. The bulb presents a peculiar appearance, as it is practically completely lined with a bright metallic mirror of magnesium, introduced into it during the process of manufacture. As a result, it is hard to see the glowing filament, although the latter reaches a bright red heat.

On determining the characteristic curves, the two tested showed very similar curves, indicating uniformity of manufacture. Saturation was reached at around 3 milliamperes (mean); the amplification factor being just over 6 : 1. A long, straight characteristic was noticeable in the 50 and 80 volts series, promising good distortionless amplification with small grid-bias.

On trial in broadcast reception excellent results were obtained with a single valve on P.M.G. aerial in a London suburb. With 30-40 volts H.T. moderate loud-speaking resulted on the one valve in an efficient circuit, and distinctly audible in loud-speaker without any H.T., showing a liberal electron emission and good grid control. On two valves, either as H.F. or L.F. amplifier, most excellent results were obtained, and in simultaneous amplification beautifully clear and distortionless loud-speaking resulted.

The Armstrong single-valve "super" operated admirably with from 4 to 80 volts H.T. On 4 volts H.T. and a pocket flash-lamp battery as L.T. supply (*i.e.*, just two such batteries as sole electric supply) London at 13 miles was clearly audible and readable on a good loud-speaker. With 1.4 volts H.T. it was audible on the 'phones. With 8 volts H.T. results were very satisfactory, being clear and steady with the 2-ft frame aerial. On the grid-leak-howl type of super good results were obtained from 12 to 80 volts and the same frame aerial.

While distinctly microphonic, particularly when used in L.F. amplification, the valves stood up well to every test imposed on them, and can be heartily recommended for general use, particularly for use with dry batteries or large wet cells of the Leclanché type. In most of the tests mentioned above, two fair-sized dry cells were used, the ordinary filament resistance being found to be sufficient to control the current. Such cells would last several months in ordinary broadcast reception with one or two valves.

The Ediswan AR 06 Valve.

THE EDISON SWAN ELECTRIC CO., LTD., have given us an opportunity of testing one of their new dull emitter valves, type AR 06, which demands but .06 amperes and 3 volts or less for filament lighting.

This is a straight tubular valve, about 3½ in. high and 1¼ in. dia., with standard four-pin fitting. The grid and plate are of approximately normal dimensions, and the glass is but slightly obscured by a metallic mirror.

On determining the characteristic curves on the sample submitted, a saturation current of less than a milliampere was observed. The 80 volts curve was very close to that obtained with 50 and 32 volts and showed saturation at nearly zero grid volts. The amplification factor came out quite high, approximately 11 to 1. The 50-volt characteristic was fairly straight and symmetrical about the line of zero grid volts, indicating good conditions for amplification.

On trial, satisfactory reception was obtained as detector and in high-frequency amplification, in spite of the low plate current available, the steep characteristic showing well here. In low-frequency amplification less satisfactory results were obtained. On the loud-speaker, with another reliable valve preceding it in a conventional two-valve circuit, a certain roughness or harshness was noticed that no variation of H.T., grid-bias, or filament temperature could cure, even in the absence of reaction. This was less noticeable in simultaneous amplification, when the strength of signals was not forced unduly.

In various types of super-regenerative circuits the valve operated satisfactorily, though, of course, the small filament emission rather handicapped it. With 80 volts H.T. on the Armstrong (with 2-ft. frame) on local transmissions some measure of loud-speaking was possible, and it operated correctly on 8 volts H.T.

The usual microphonic effects were noticed. Two fair-sized dry cells were adequate for L.T. supply, and would last for a long time when only called upon to deliver .06 amperes per valve.

Except that for L.F. amplification both careful adjustment of H.T. (best fairly high, up to 80

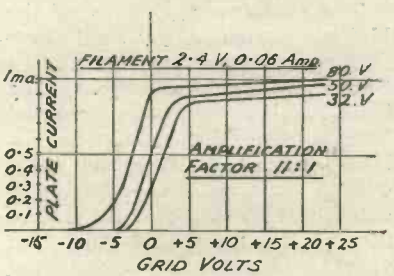


Fig. 3.—Curves obtained with the AR06 type valve.

volts), and sufficient grid-bias are quite necessary, the valve proves useful in most varied types of circuits.

(*Concluded on page 669*).

Book Notes

Wireless Component Parts, and How to Make Them. Gl. 8vo. Pp. 123. (Cassell and Co., Ltd., London.) 1s. 6d. net.

This little handbook gives instructions for making various components forming part of many kinds of wireless receiving apparatus. The object of the book is not to describe the making of any one complete receiving set, but all the parts likely to be required in any set are illustrated and their practical making explained. The contents include crystal detectors; the making and mounting of coils; condensers; variometers and variocouplers; resistances, and transformers. The book is well illustrated with dimensioned drawings.

The Elements of Electricity. W. Robinson. 3rd edition. 8vo. (London: Chapman and Hall, Ltd., 1923.) 20s. net. 600 pp.

The author is a Colonel of the United States Army and Professor of Chemistry in the United States Military Academy. The book has been primarily prepared for the use of the cadets of the latter Academy, and the third edition embodies changes indicated by experience in the use of the book during the past ten years. The work covers the usual ground of Static Electricity, Magnetism, Voltaic Electricity, and Electro-magnetics and Electro-mechanics. A considerable amount of supplementary information is given on subjects which are not commonly treated in elementary text-books of electricity as well as simple explanations of many of the more recent discoveries. The chapters dealing with Electro-magnetics and Electro-mechanics are particularly valuable, and include a variety of electrical instruments as well as electrical machinery. Two useful chapters at the end give a short but concise survey of modern electrical developments. The whole volume is well illustrated, and is a valuable handbook on the general elements of electricity.

Practical Joinery and Carpentry. R. Greenhalgh. (London: G. Routledge and Sons, Ltd.) Demy 8vo. 280 pp. Price 6s. net.

This is one of Messrs. Routledge's Modern Trade-Book Series. It is intended primarily for the artisan, but appears to us to be a valuable handbook for the wireless constructor or experimenter. The author states that it is his endeavour to produce a book which may be placed in the hands of the average apprentice with the instruction, "Read that and you have all the essentials of the trade." The subjects dealt with include tools for fixing and setting out, chisels and planes, boring tools and saws, benches and workshop appliances, workshop practice, a long list of practical joinery subjects, and some simple mensuration and calculations. The volume is profusely illustrated, and seems to cover every kind of practical woodwork which even the most ambitious wireless or other experimenter can possibly wish to undertake.

X-Rays. Fourth Edition. G. W. C. Kaye. (London: Longmans, Green and Co., 1923.) 8vo. 320 pp. 16s. net.

Dr. G. W. C. Kaye requires no introduction either to the physicist or to the engineer. His published works are a model of accuracy and painstaking compilation. The present volume is a fascinating and beautifully illustrated short compendium of the latest information on the subject of X-rays. It deals with the historical development and the phenomena of discharge-tubes, as well as with Cathode rays, Positive rays, and the numerous subsidiary investigations which are associated with the study of the same. All manner of X-ray tubes are described and illustrated, and a comprehensive chapter is included on the subject of High Potential Generators—Induction Coils, Transformers, Interrupters, Rectifiers, and so on. The various methods of measuring X-rays are described, and the practical applications of the rays in surgery, therapy and in industry are treated. The two final chapters of the book deal with the diffraction of X-rays by crystals and the investigations upon the nature of the rays, which are bound up with the developments of modern electrical theory. Lack of space prevents us from discussing this book as we should like, but we may say that it is a most interesting and condensed *résumé* of the subject, and a handbook which must be invaluable to all who are engaged in the practice of X-rays in any form, as well as to scientific investigators and those interested in modern scientific developments.

Mainly about Valves

Our Weekly Causerie written by the Editor.

THE phenomenon of "plonking" is employed in the Turner trigger relay, and the Turner trigger effect is frequently obtained in all sorts of receiving circuits unintentionally. When a valve is adjusted to a certain point near the lower bend in its characteristic curve, and reaction is employed, the slightest change in the grid potential will kick the valve into oscillation. The moment this happens the high-frequency currents generated are rectified by the valve and a very substantial sudden increase of anode current takes place, and this produces a loud plonk in the telephone receivers.

A similar phenomenon is noticed when the valve is operating near the upper bend of its characteristic curve, but this time the plonk is due to the high-frequency currents being rectified at saturation point and causing a decrease in the average anode current. This effect at saturation point is commonly obtained in a valve receiver by using too low a value of filament current, or too high an anode voltage. The result is, that although the grid potential remains about zero, we are still working the valve at the saturation bend.

It is quite likely, therefore, when a plonking noise is heard, that incorrect values of filament current and high-tension voltage are being employed, and if these are correctly adjusted the plonking noise becomes almost inaudible and reaction may be gradually applied without the valve suddenly bursting into self-oscillation. One of the secrets, therefore, is to see that the proper values of high-tension voltage and filament current are used.

APPARATUS WE HAVE TESTED.

(*Concluded from page* 667).

The D.E.3 Valve.

THE GENERAL ELECTRIC CO., LTD., have put at our disposal for test two of their D.E.3 type of dull-emitter valves, requiring .06 amperes at about 2.4 to 3 volts for filament heating. This is of tubular type, with four-pin fitting and some 3 in. high and 1 in. diameter.

The characteristic curves as determined by the writer on the two valves submitted, and the general behaviour in practical tests, all showed an exceedingly close resemblance to the B.T.H. B5 just described. In fact, the characteristics of the two D.E.3 valves differed from one another more than the one differed from the B5 valve characteristic.

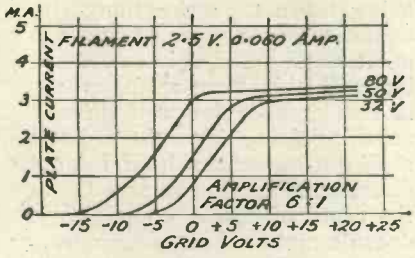
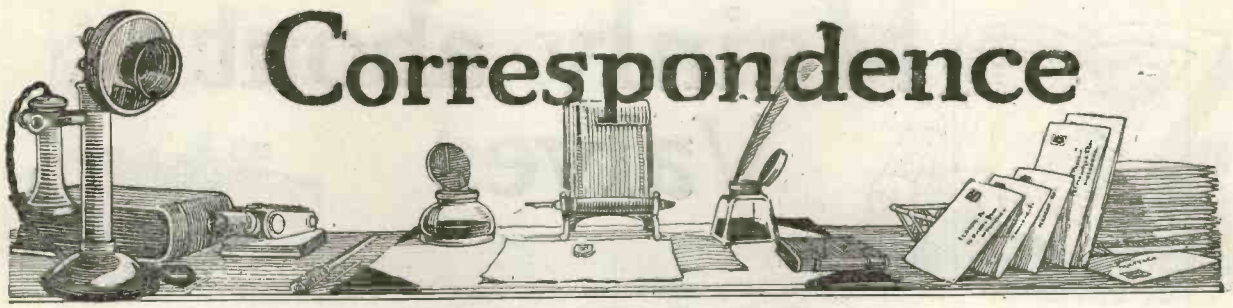


Fig. 4.—Characteristic Curves of the D.E.3-type valve.

In plain single-valve reception, as note magnifier, or as H.F. amplifier, also in dual amplification, the D.E.3 valves gave satisfactory results. On the Armstrong super it operated well on from 8 volts H.T. up, signals being audible on the loud-speaker on local transmissions with 8 volts; with 4 volts it whistled feebly. It also operated satisfactorily on the other forms of super with from 12 to 80 volts H.T., and could be run successfully off a single flash-lamp battery for L.T. supply. The same microphonic effect was also observed.

The remarks made anent the B5 valve as to economy of L.T. consumption, etc., apply to this valve with equal force.



CRYSTAL RECEPTION.

SIR,—As the crystal set described in Vol. 2, No. 10, of *Wireless Weekly* is rather novel, you may be interested to hear of my experiences with it. I have made one of these, and at a distance of twenty-two miles the results are excellent. Speech and music are perfectly clear and at times surprisingly loud. I have a good aerial 50 ft. high.

I also installed one of these for a friend in London. He is on the first floor and his aerial consists of three wires across the ceiling, not more than ten feet long, and the set is earthed on the gas bracket. The results here are excellent, being just as good with the aerial disconnected. I tried the aerial winding with 15 turns instead of 8, with possibly a very slight increase in signal strength, though the tuning seemed just as sharp.—I am., etc.,

P. A. SYER.

Sevenoaks.

SINGLE OR DOUBLE WIRE AERIAL.

SIR,—You invite readers' criticisms on the subject of "Single or Double Wire Aerial," as treated by Mr. A. W. Speckley in your issue—Vol. 2, No. 9.

Firstly, I would point out that we are not limited under the present P.M.G. regulations to the previous total of 140 feet for a multi-wire aerial; the present aerial may have a combined height and length of 100 feet, and may be of one or a hundred wires if desired, so the question really becomes "Single or Multi-Wire Aerial."

I do not think the double 70-foot wire was adopted in preference to the single 100-foot without question by experimenters before short waves became the fashion. Two lengths of 70 feet have very little more capacity than one of 100 feet, and the difference in tuning and results was trifling; most people of those days had a feeling that two wires looked more businesslike, but those who troubled to make comparative tests found that there was not enough difference to justify pulling down the second one tried (whichever it was) in order to go back to the first. As a single wire was usually tried first of the two, those who fixed up both kept the double.

At present I am in the position that my masts, though high, are too slender to support properly more than a single wire (T with 60-foot top, 40-foot down lead). I am, however, hoping to change before long to a 4- or 6-wire cage of the same length, every care being taken to make the wires equal in length, which I agree is necessary. Now, I intend working with this down as far as 150 metres or even lower if there is anything doing down there, but I shall not expect results if I adopt direct coupling to the aerial. In the case of loose coupling, it doesn't matter how few microhenries we have in the aerial coil, so long as it is physically large enough to couple with the secondary. An aerial with good capacity picks up far more energy than one of smaller size, and providing this energy is handled properly in the tuner, we can get louder signals with a two or more wire aerial, well spaced, than with a single of the same length. A single 100-foot wire has a capacity round 0.00025 or 0.0003 μF; a four-wire cage, wires 6 feet apart, would have about twice this capacity, and the total energy picked up would be at least $1\frac{1}{2}$ times that of the single wire. Capacity across the secondary may be kept as low as one likes, within reason. I usually make it a rule to use a maximum of 0.0001 μF for waves up to 300 metres, 0.00025 for 300-3,000, and above that 0.0005 to 0.001μF. Mr. Speckley would probably adopt loose-coupling if he lived down here or in any similar situation, and he would then find that the erection of a multi-wire aerial would be as good as another valve.

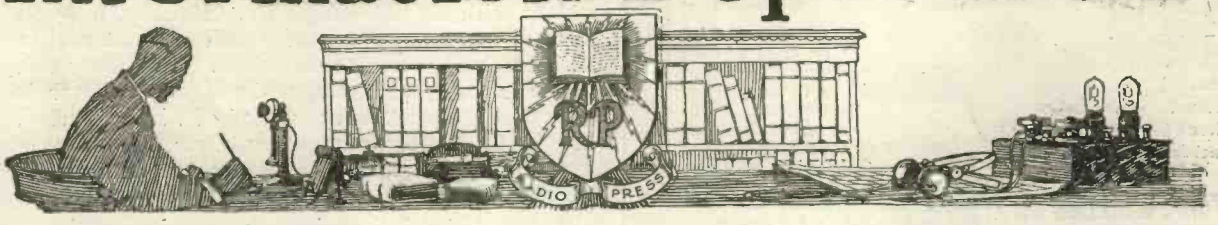
There is no optinum proportion between capacity and inductance in a circuit across which we have a valve or crystal, the voltage must be as high as possible; therefore we aim at the very best capacity and the greatest inductance giving the right tune. We must also consider selectivity, and this keeps us from having quite as small a condenser as we should otherwise. It is all a matter of compromise. Why not a 50-foot single to get louder signals still?

As to the series condenser, unless a rejector is to be used, giving a conducting path to earth, it is always preferable to adopt variometer or parallel condenser working so as to keep the aerial from acquiring a charge either from electricity already in the atmosphere hail, etc., as, as frequently happens, from the friction of the wind.—I am, etc.,

LEONARD J. VOSS.

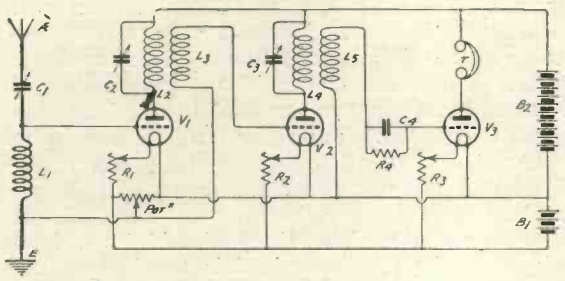
Devon.

Information Department



J. H. R. (LEEDS) experiences difficulty in the persistent self-oscillation of his high-frequency amplifier, and asks advice.

Assuming that the amplifier has been properly designed and that the wiring has been carried out so as to separate the various circuits as much as possible, the addition of a potentiometer, as shown in the accompanying diagram, and by



means of which a positive potential can be applied to the grids of the high-frequency valves, will probably effect a cure. Alternatively, the method known as reversed reaction may be used. This consists in using a reaction coil so connected that it damps the oscillations in the aerial circuit, instead of assisting them.

D. K. (ABERDEEN) asks several questions regarding the reception of continuous waves by means of a crystal detector.

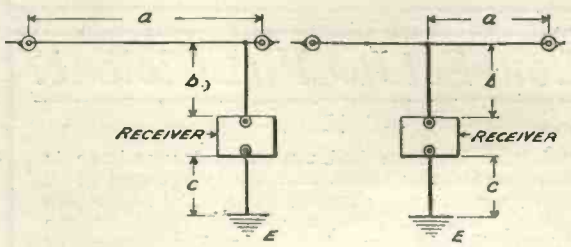
If the signals are transmitted with pure continuous waves, they cannot be received upon a crystal detector without some outside aid, such as the carrier wave of a broadcasting station, which often renders C.W. audible by heterodyning. In certain circumstances, the radiation from a near-by oscillating valve receiver may produce a similar effect. If the transmitting station is not too far away C.W. signals can sometimes be heard upon a crystal set, as a result of the fact that the waves carry a ripple of audio-frequency, proceeding from the use of rectified alternating current for the H.T. supply to the transmitting valve. To enable C.W. to be properly received on a crystal, it is necessary to use either an oscillating valve circuit acting as a local heterodyne, or some form of interrupter to separate the waves into groups at audible frequency.

P. D. (CARNARVON) asks what is meant by "super-heterodyne."

The amplification of short-wave signals is a difficult matter, on account of the high frequencies involved, and the super-heterodyne is an ingenious method of overcoming the difficulty. The short-wave signals are heterodyned by local oscillations of such a frequency that the beats which result are still at *radio* frequency, corresponding usually to a wavelength of about 3,000 metres. These beats are then regarded as signals of 3,000 metre wavelength (and corresponding frequency), and can be effectively amplified with a simple resistance-capacity amplifier, and heterodyned again to produce audible beats.

R. B. (CHISWICK) asks how to ascertain approximately the natural wave-length of an aerial.

The natural wave length of a single- or double-wire aerial is approximately four times the electrical length of the aerial, down lead and earth lead. The accompanying diagram will make this clear. In the case of an inverted L-type aerial, as shown on the left, it will be four times (a+b



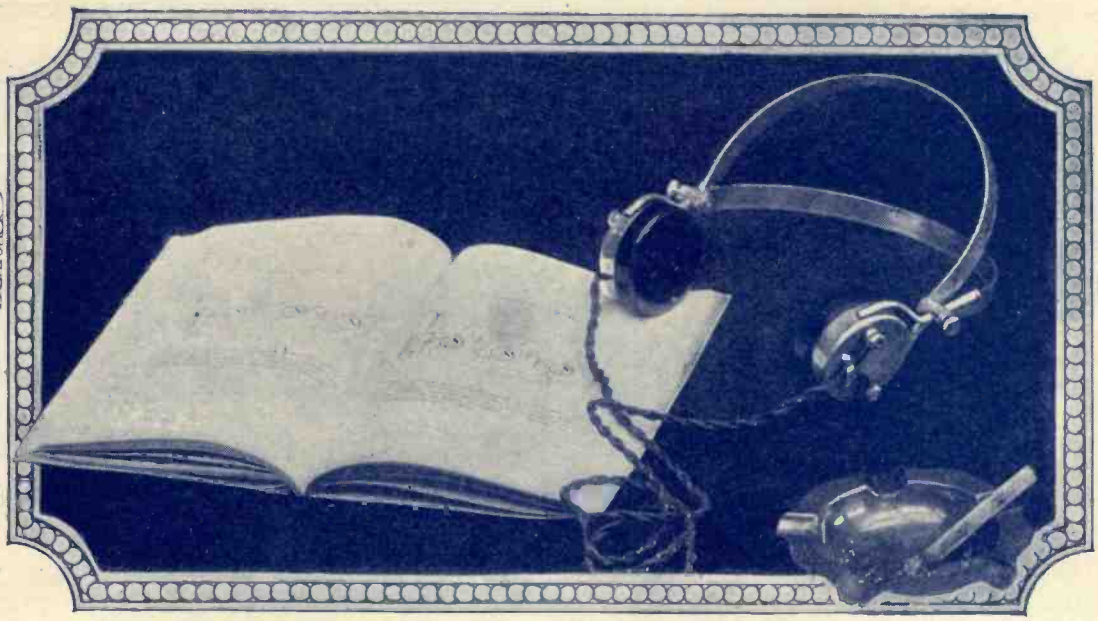
+c), the length "a" being that of the horizontal part of the aerial. In the right-hand figure the natural wave length will be four times (a+b+c), but note that in this case "a" represents only half of the horizontal length of the aerial.

J. F. (ELTHAM). The following are replies to your questions.

(1.) A 4-volt accumulator can frequently be used without detriment in the circuit provided the circuit consists of a high-frequency and detector valves with no note-magnifier. Equally, a 4-volt battery can be used with the reflex circuit subject to there being no note-magnifier. Whenever this latter is used, however, a 6-volt accumulator is essential if the ordinary method of wiring is used, for in this latter case one utilises the drop in voltage in the filament resistance to obtain grid bias.

(2.) "Redpath" variometers are in practically all cases equal to ordinary inductance coils with variable condensers. However, on the lowest range of inductance you will probably find that a fixed inductance coil with a very small variable condenser in parallel would give better results. These variometers can be used quite successfully in the ST100 circuit.

(3.) Owing to the very high resistance of the winding of intervalve transformers, it is quite impossible to light a flashlamp through them with the ordinary battery. A simple way to test continuity of winding is as follows. Take a single dry cell (it does not matter if it is practically run down) and connect one terminal to one lead of a pair of telephones. The other terminal should be connected first of all to one of the primary terminals and the remaining telephone lead should then be tapped on the other primary terminal. If the winding is perfect, there should be a loud click when the telephone lead is touched *on* the terminal and when it is *removed*. If the winding is broken there will be a click when contact is made, but *no click* when the lead is *removed*. A similar test should be given to the secondary winding, not forgetting that there should be a click at the "on" and "off" connections.



Good Books are more than half the battle

Choose your Books from this List :

	Price.
1. **Wireless for All** .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	6d.
2. **Simplified Wireless** .. .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	1/-
3. **How to Make Your Broadcast Receiver** .. .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	1/6
4. **How to Erect Your Wireless Aerial** By B. MITTELL, A.M.I.E.E.	1/-
5. **The Construction of Wireless Receiving Apparatus** .. .. .. By P. D. TYERS.	1/6
6. **The Construction of Crystal Receivers** By ALAN L. M. DOUGLAS.	1/6
7. **How to Make a "Unit" Wireless Receiver** .. .. By E. REDPATH.	2/6
8. **Pictorial Wireless Circuits** .. .. By OSWALD J. RANKIN.	1/6
9. **Wireless Valves Simply Explained** .. By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
10. **Practical Wireless Valve Circuits** .. By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
12. **Radio Valves and How to Use Them** By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
13. **500 Wireless Questions Answered** By G. P. KENDALL & E. REDPATH.	2/6
14. **12 Tested Wireless Sets** .. .. By P. W. HARRIS.	2/6
15. **More Practical Valve Circuits** .. By JOHN SCOTT-TAGGART, F.Inst.P.	3/6
16. **Home-Built Wireless Components** ..	2/6
Elementary Text-book on Wireless Vacuum Tubes .. .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	10/-

(post free.)

IT is only when you begin to take a keen interest in Wireless that you feel the need for a guiding hand. There are two ways in which you can pick up reliable Radio knowledge—one is to join your local Radio Society and the other is to read helpful and interesting books.

Both of these methods should be adopted. The Books issued by Radio Press Ltd. and shown in the adjoining columns are recognised as forming a complete Wireless Library. Each is part of a definite series and none overlap.

Make a start with your Library to-day by buying the first three or four books—the extra information you will gain about Wireless will more than recompense you for the small outlay.

From all Booksellers or sent direct from publishers (postage 2d. per book extra).

RADIO PRESS, LTD.
Devereux Court, Strand, W.C.2.

Radio Press Series.

Gilbert Ad.

Printed for the Proprietors, RADIO PRESS, LTD., Devereux Court, Strand, W.C.2, by THE AVENUE PRESS (L. Upcott Gill & Son, Ltd.). 55-57, Drury Lane, London, W.C.2. Published on Wednesday of each week at 3, Bolt Court, Fleet Street, London, E.C.4. Address for Subscriptions and Editorial Communications:—Devereux Court, Strand, London, W.C.2. Advertisement Managers:—THE SCHEFF PUBLICITY ORGANISATION, LTD., 125, Pall Mall, London, S.W.1. Registered as a newspaper and for transmission by Canadian Magazine Post. Subscription rates:—32/6 per annum, 16/3 for six months, post free. Sole Agents for Australasia:—GORDON & GOTCH (Australasia), LTD. For Canada:—IMPERIAL NEWS, LTD. For South Africa:—CENTRAL NEWS AGENCY, LTD.

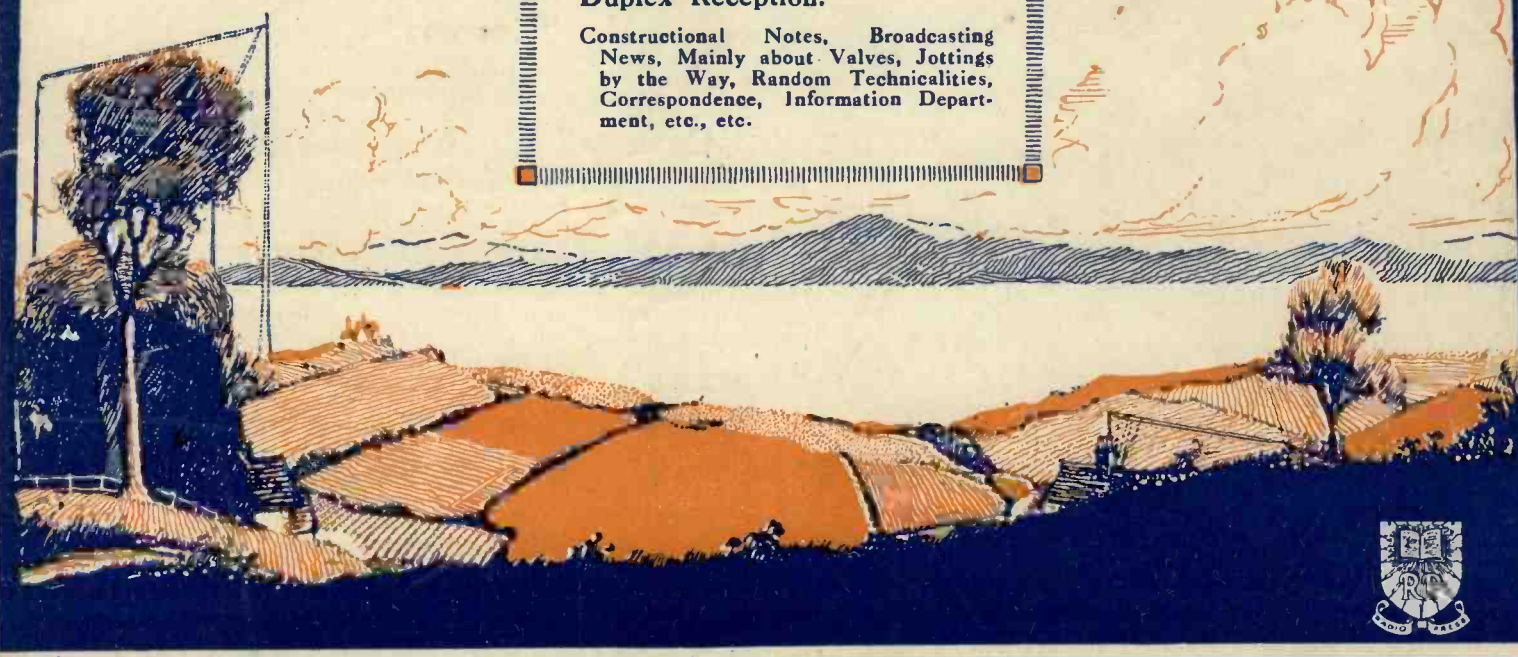
Wireless Weekly, 6d. Net. Wednesday. November 28th, 1923.

Wireless Weekly

and The Wireless Constructor

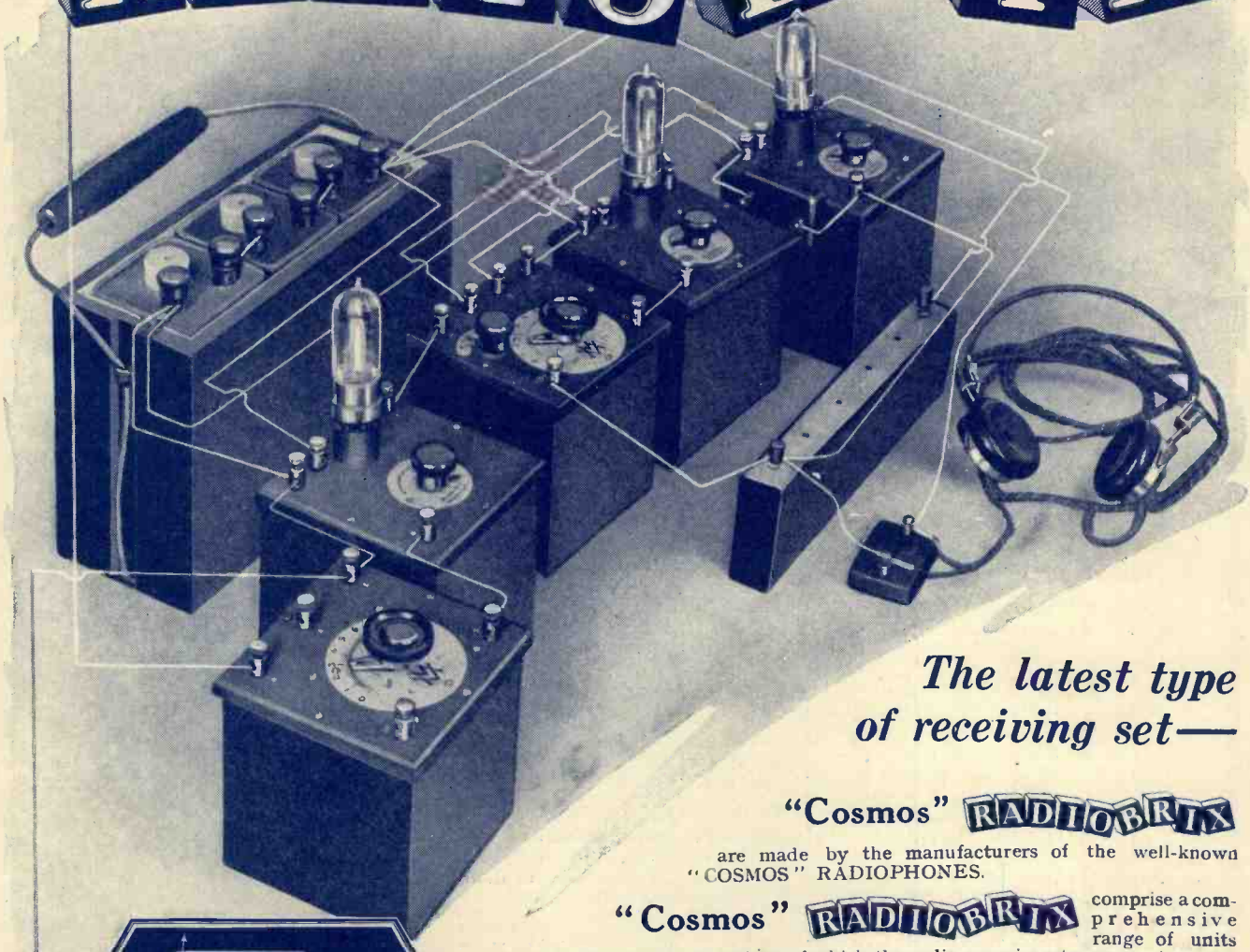
Vol. 2.
No. 20.

CONTENTS



The ST150 Circuit

RADIOBRIX



The latest type of receiving set—

"Cosmos" RADIOBRIX are made by the manufacturers of the well-known "COSMOS" RADIOPHONES.

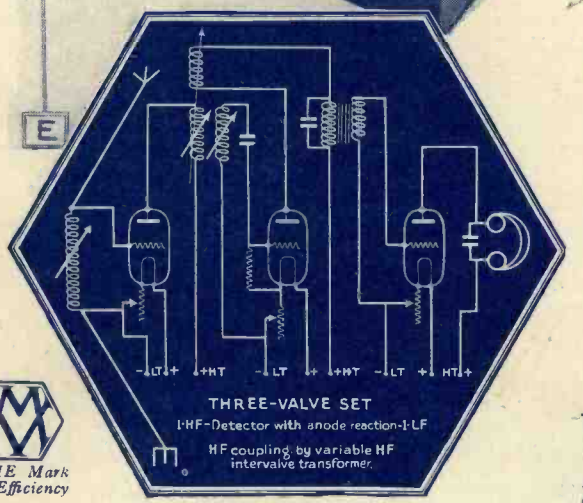
"Cosmos" RADIOBRIX comprise a comprehensive range of units by various combinations of which the radio experimenter or amateur can build up any type of receiving set or circuit.

"Cosmos" RADIOBRIX have been designed to secure the utmost flexibility. They enable the "listener" to build up his set gradually as his means allow, yet the bricks obtained at first never become useless but can be utilized as part of a more elaborate set.

"Cosmos" RADIOBRIX are thoroughly well made and moderate in price.

ASK YOUR REGULAR WIRELESS DEALER TO SHOW YOU

"Cosmos" RADIOBRIX If he has not yet obtained his stock write, sending his name to the manufacturers—



THE Mark of Efficiency

The above illustration and diagram shows a three-valve set made up with RADIOBRIX. Get a copy of the new book "BUILDING WITH RADIOBRIX," full of useful circuits with theoretical and wiring diagrams. OBTAINABLE EVERYWHERE, ONE SHILLING, OR POST FREE, ONE AND FIVEPENCE.

R
XO2A

METROPOLITAN Vickers ELECTRICAL CO. LTD

WORKS: TRAFFORD PARK, MANCHESTER

BUY BRITISH GOODS ONLY

BUILD YOUR RADIO SET WITH RADIOBRIX

Wireless Weekly

Vol. 2, No. 20.
Nov. 28, 1923.

CONTENTS

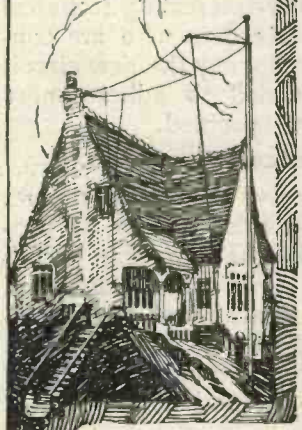
Editor: JOHN SCOTT-TAGGART, F.Inst.P.

Assistant Editors { E. REDPATH. P. W. HARRIS.

Radio Press, Ltd.

Publishers of Authoritative Wireless Literature
DEVEREUX COURT, STRAND, W.C.2
Tel.—Central 3763.

Advertisement Managers: { SCHEFF PUBLICITY ORGANIZATION, LTD., 125, Pall Mall, London, S.W.1
Tel.—Regent 2440.



All correspondence relating to contributions is to be addressed to the Editor of "Wireless Weekly."

Nothing contained herein is to be regarded as permission or encouragement to infringe any patent rights.

Editorial

A Special Announcement.

WE take this opportunity of informing all our readers that we are arranging to produce a series of six especially attractive numbers commencing with the issue of December 12. Not only will our policy of having the real value in the journal be followed, and even improved upon, but, in connection with the six special numbers, there will be a unique scheme of free gifts for readers, full details of which will appear next week.

Our next issue concludes the second volume. New readers therefore may commence with No. 1 of Volume 3, and the first of the six special numbers, simultaneously. If our regular readers will kindly inform their friends accordingly, their courtesy will be much appreciated. It may be mentioned here that the " free gift " scheme necessitates the purchase of all the six special issues, and, as a great demand is anticipated, the desirability of ordering the six issues in advance will be recognised.

The Broadcasting of Plays.

We learn that Mr. C. B. Cochran has decided to permit the broadcasting of the play " Little Nellie Kelly," and according to the daily Press, there is a probability of controversy if not an actual legal case arising in consequence. Our views in this matter, as previously expressed, are that provided the play is suitably chosen there is every likelihood of its producers benefiting considerably as a result of broadcasting portions of it, but that anything which affords the Press an opportunity of fanning the flame of controversy, and alluding to broadcasting as being " banned by the theatrical managers," is to be avoided at all costs.

If an amicable arrangement can be made for a play to be broadcast, by all means let us have it, otherwise it is better not to make any attempt in this direction at all.

The Cowper Circuit.

The article by Mr. A. D. Cowper, M.Sc., describing his newly invented " series tuned-anode " circuit, published in our last issue, is exciting considerable interest amongst experimenters, and no doubt its efficiency and, equally important, its stability, will be tested in connection with the forthcoming Franco-British tests, details of which are given elsewhere in this issue.

The time for the Transatlantic tests is approaching, and these Franco-British tests will form a useful and interesting preliminary.

The Cowper circuit is an extremely important development in the use of high-frequency amplification, especially on the short wavelengths, and several very interesting technical points are involved. Readers who are constructing apparatus employing the new circuit are strongly recommended to adhere most carefully to the values specified.

American Broadcast Reception.

We continue to receive numerous reports regarding reception in this country of programmes transmitted by the American broadcasting stations. We invite such reports, and will endeavour to find space for their publication. It is interesting to note how reception results vary over different periods. From September 16 to 26 reception was fairly general, being effected in several cases upon a detector valve alone. Throughout October not a single report has been received until, commencing on November 11, reception is obtained again, and we learn of experimenters who, upon a three-valve set, obtained loud-speaker results audible over a fair-sized room, the receiving set being connected to a good average aerial. In another case, clear reception was obtained in telephones with the set connected to a 2-foot square frame aerial. We think this is certainly extraordinary and must have been due to unusually favourable atmospheric conditions.

NOTES ON THE AUTOPLEX CIRCUIT

By CLAUDE LYONS.

In response to our invitation, we have received the following very interesting letter. We are at all times pleased to hear from experimenters who try the novel circuits published in this journal.

I HAVE read with very considerable interest your article on the " Autoplex Circuit " appearing in the current issue.

I say " with considerable interest " because

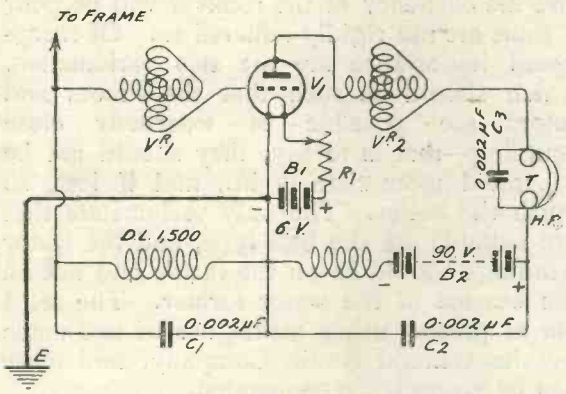


Fig. 1.—The Circuit " A," a modification of the original Armstrong Super.

I have been experimenting with this particular circuit for some considerable time and because I was probably the first amateur experimenter, in this country at any rate, to employ same.

This circuit is, of course, a modification by simplification of the original Armstrong Single Valve Super-regenerative Receiver, a typical circuit of which I give in diagram " A," which circuit utilises Tuned Anode Regeneration. I originally made up this circuit and found, by further experimentation, that better results by far could be obtained by the elimination of all lump capacities; this resulted in circuit " B." It was now found that whereas the coupling of the two low-frequency oscillation inductances was of very considerable importance, it was now of only minor importance; tuning was considerably sharper and reception possible over greater distances with good audibility.

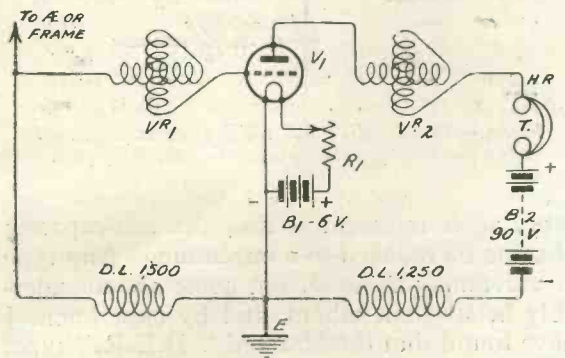


Fig. 2.—The Circuit " B," which is an improvement upon the last arrangement.

The minor importance, with circuit " B," of the coupling between the two low-frequency inductances, led me to try the effects of entirely dispensing with one or other of them,

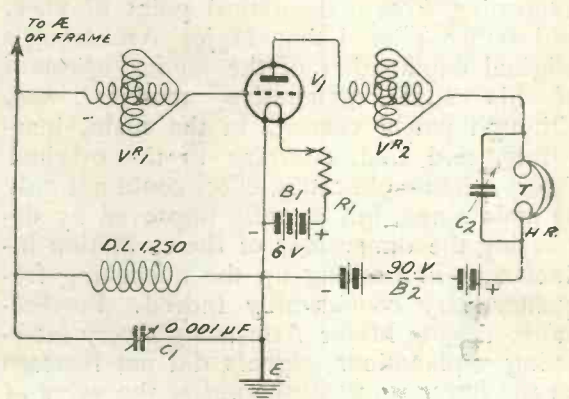


Fig. 3.—The Circuit " C," illustrating a further development.

and, after considerable experimentation, I decided to eliminate the one in the anode circuit, and to shunt the grid coil and the telephones with variable condensers of 0.001 μF capacity. This circuit, " C," will clearly show what wiring was arrived at. The efficiency of the receiver was much improved and still further distance covered with the same degree of audibility. However, it was unsatisfactory for a very strange reason, namely, that it was impossible to eliminate

the high-power, long-wave arc stations, particularly the American stations. The large low-frequency oscillation inductance was evidently responding to those wavelengths, to which either a D.L. 1,250 or a D.L. 1,500 coil, tuned by a 0.001 μF condenser, would be in resonance.

In order to eliminate these interferences,

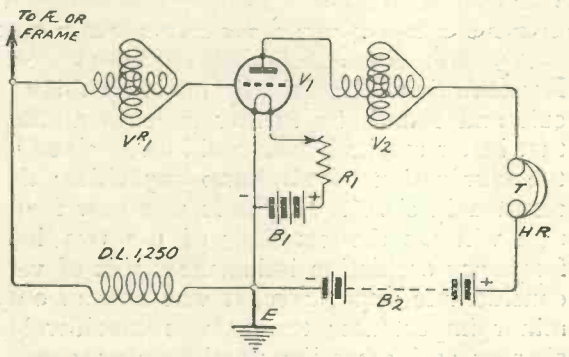


Fig. 4.—The Circuit "D" a replica of the Autoplex Circuit.

without affecting the efficiency, further experiments were indulged in, which, apart from a satisfactory outcome, were exceedingly interesting from a theoretical point of view, and rather proved that Major Armstrong's original explanation of the *modus operandi* of his super-regenerative receiver was, although partly correct, in the main, inaccurate, and that, contrary to the original theory, the amplification effect could not only be maintained, but actually improved by decreasing the dimensions of the oscillation inductance—*i.e.*, taking up the quenching frequency very considerably indeed. Furthermore, despite Major Armstrong's very interesting explanations, signals did not increase on the *lower* wavelengths *unless* the value of the oscillation inductances were reduced in approximate proportion. In fact, these must be absurdly small if the best results are to be obtained on the broadcast band of wavelengths. After still further experimentation the 0.001 μF variable condenser was eliminated from the grid circuit and also the variable condenser across the telephones. This resulted in circuit "D," which, strangely enough, is a replica of the "Autoplex Circuit."

Still more gratifying results, however, can be obtained with the last circuit I have arrived at, namely, circuit "E," where a variable condenser of 0.0005 μF is placed in the earth lead. The apparatus must now be used with the usual earth, which must be good, and with a frame aerial connected to the point A, and, in place of the D.L. 1,250 or 1,500 oscillation coil, a Burndept S4 coil will give most gratifying results. Of course, off the broadcast waveband an outside aerial can be connected to point Æ, with improved volume of sound and real "D.X." reception. The 0.0005 μF variable condenser should preferably be of the Sterling Square Law type, and "vernier" control of this condenser is practically essential.

The values of the circuit are very important, and the efficiency of the receiver will be poor if same are not rigidly adhered to. Of exceptional importance are the two variometers, which should be such that the stators and rotors are possible of extremely close coupling—that is to say, they should not be separated more than $\frac{1}{8}$ in., and if less, so much the better. The only variometers that are suitable are the ball type, and the stator windings should be on the *inside* and not on the outside of the stator former. The set I am at present using makes use of two made by the General Radio Company, and these can be strongly recommended.

The inductance *must* be of the honeycomb

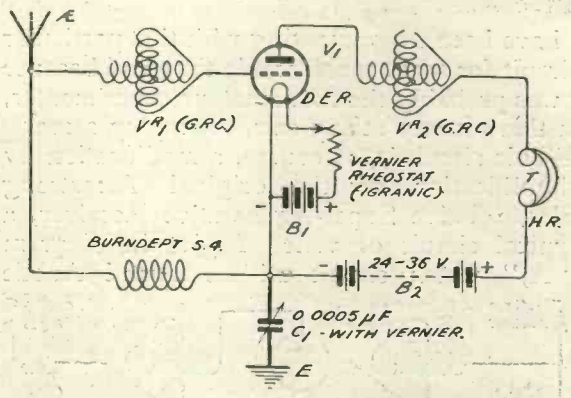


Fig. 5.—The Circuit "E," which is an improvement upon the arrangement illustrated in the last figure.

type, as it is essential that the self-capacity of same be reduced to a minimum. Any type of valve may be used, but some are considerably better than others, and by experiment I have found that the Marconi "D.E.R." type, with not more than a maximum of 36 volts H.T., is considerably better than any other

type. Various valves were tried, including M.O. " R.," Ediswan " A.R.," " V.24," French " R.," Telefunken " K.T.D." and " E.V.N.," etc., and it is interesting to note here that excellent results were also obtained when using a Marconi " R." valve that had been repaired by Messrs. Radions, Ltd.

The tuning is somewhat strange, but even a novice can learn to handle this receiver in an hour or so. The procedure is as follows:— Firstly, the earth variable condenser must be set at its minimum capacity and the variometer in the anode circuit, at minimum coupling. (The variometers must be mounted so that they have scales and pointers, and that the 90° of the scale is *for both* at the minimum of coupling between rotor and stator.)

The variometer in the grid circuit should then be set to full coupling and very slowly varied between this position and 90°; if no carrier waves be picked up, the anode variometer can be advanced by 5-10°, and if still no results, can be advanced by 5° at a time, whilst the grid variometer is varied through 90° for each occasion.

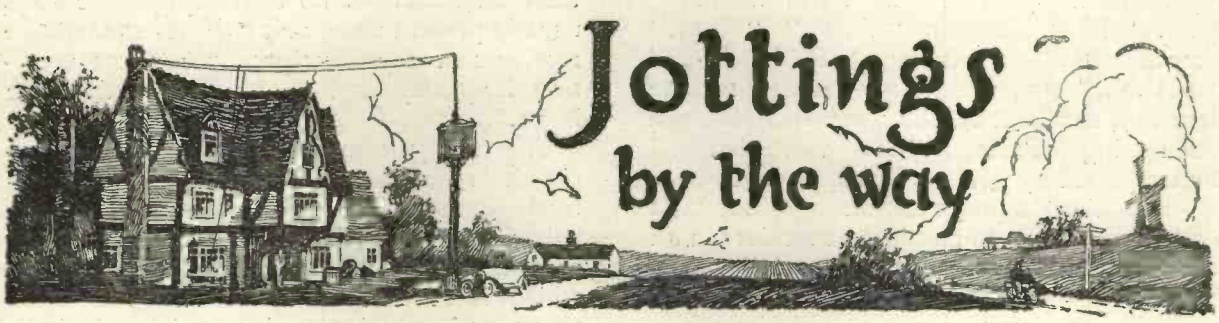
As soon as a carrier wave is located, the filament should be increased until a rushing sound is heard in the telephones, culminating in a sudden plucking sound. The filament control (same should have a dial from 0.-300 degrees) should be carefully noted. The filament rheostat is then eased about one degree until the rushing sound again commences and the two variometers simultaneously adjusted until the carrier wave is heard at maximum intensity; the carrier should be tuned down in pitch until speech comes in, *distorted and very strong*. The filament current should then be increased until the speech suddenly vanishes *entirely* and the whole receiver appears " dead." The earth variable condenser is now employed, and on turning same slowly towards its maximum point, speech will come in, without any of the violent oscillations so usual with this type of receiver, and may be very sharply tuned with the vernier control.

With regard to results, all the B.B.C. stations may be comfortably heard in the telephones, and stations within 60/70 miles on two pairs connected in parallel. Manchester B.B.C. (about 45 miles from here) can almost be reproduced on a loud-speaker. The variation frequency of the S4 oscillation inductance is, of course, far above the audibility limit, and there is, therefore, no distracting noise as is usually present when using super-regenerative receivers of any description where the variation frequency is low, i.e., the inductance large.

The tuning, compared to a standard three-circuit regenerative receiver, is comparatively broad, and experiments are therefore being conducted with regard to the addition of a stage of *high-frequency* amplification, which is of the description that permits of sharp and selective tuning. This is indicated as necessary on account of the fact that with the final circuit (E) it has been noted that the tuning becomes sharper as the variation frequency is increased (*i.e.*, the size of the coil *diminished*); but this procedure is, as far as general reception is concerned, a disadvantage, because each inductance is best suited for a certain waveband. It has therefore been found *essential*, if all wavelengths are to be covered, that the inductance be mounted in a coil holder, on the panel, so as to allow for change at will, according to the waveband upon which reception is desired. That is to say, the variation frequency can be easily varied in steps.

The experiments are not yet complete, but they indicate that high-frequency amplification will be far more satisfactory, for certain reasons, than low-frequency magnification, unless the transformer of the latter be especially wound to match the impedance of the valve used. The writer has worked a *large* " Brown " loud-speaker with one stage of high-frequency preceding the circuit " E," followed by a Brown microphone amplifier, which instrument may be relied upon to give *distortionless* amplification approximately equivalent to two stages of low-frequency magnification, with, of course, the additional saving of cost in valve renewals and current consumption. The necessary 6 volts required for this amplifier can be tapped off one end of the H.T. battery, which, to allow for same, must exceed 36 volts by at least 12.

The amplification on 2LO (190 miles) with 1 H.F. valve, combined with circuit " E " and the microphone amplifier, is greater than that obtained with another instrument employing two stages of transformer-coupled H.F. valve rectification and two-note magnifiers. The cost, of course, is far more than halved, as is also the cost of upkeep.



Under Difficulties.

EVER tried to be merry and bright with a broken arm and a pate as shrewdly cracked as ever was Jack's after he and Jill had done their historic act on the hillside with a pail of water? No? Then let me crave your indulgence, for that is my sad state. If you think that I have been carrying my imitation of Jack so far as to come home with the milk you do me a great injustice. Kinder men have looked sympathetically upon my slings and bandages and, knowing my devotion to wireless, have acclaimed me as one of the first martyrs in the cause of the newest of sciences. One rumour has it that having scaled the dizzy heights of my aerial to effect some ingenious improvement I lost my hold and was promptly earthed. Another runs that I am suffering from the kick of a galvanometer. A third that I attempted single-handed to chastise Radiating Rupert, a hefty fellow, as he so well deserves.

Alas, 'twas not in the service of fair mistress Radio that I collected my wounds. I cannot claim to be a martyr for the noble cause. To confess the truth I was engaged in the brutal and degrading sport of chasing the fox, when my gee-gee and I came to grief over an overgrown fence with a blind ditch beyond it. Naturally it was the right arm that went. Believe me or not writing with one's left hand is an overrated amusement.

One-Handed Tuning.

But the most difficult thing of all is to tune one's receiving set properly. When working with tuned anodes I have always felt that two hands were a very poor allowance for one wireless enthusiast. But how in the name of goodness you are to adjust five condensers, two potentiometers and a brace of couplings with *one* hand is a problem that I am still trying to solve. You get one or two of the things just right, then something else at the far end of the set cries aloud for attention; you turn to it and twiddle it as it would be twiddled. By so doing you upset the balance of those first attended to. You say things and begin again.

Then comes an inspiration. You enlist the services of your better half, telling her the names of the knobs that are to be her "pidgin." So far so good. You get primary and secondary carefully adjusted and ask her to move the condenser knob of tuned anode No. 2 just as you move No. 1. "Why, of course, I'll help," she cries; "I'll just move this silly little coil out of the way so that I can get at it better." So saying, she pushes aside your carefully adjusted secondary and you bite back a bitter word before starting all over again. Or you may go one better (or worse) by entrusting the entire set to her. . . . There are times when women must work and men must weep, and this is one of them.

X-Ray Atmospherics.

I've often wondered where the weird cracklings come from that the set sometimes brings in in Little Puddleton when there is no apparent reason for the presence of even the mildest and most subdued atmospherics: but now I know. We have no trains; there is no electric railway within half a score miles of us; no power cables are draped about our highways or our byways, we have not even a generating station. But we have an X-ray plant.

When my doctor who is always looking for trouble took me there to-day in the hope that he might find one or two more breakages calling for medical plumbing, the secret was revealed. The fellow in charge turned over a thingamejig and straightway a 12-inch spark leapt over a gap in front of the gigantic induction coil. It flew across with a zipping noise as long as the tube was working —the tube was a little hard the operator explained — and my heart went out to those who were listening to the early part of 2L.O.'s programme. If you have a nearby hospital with an X-ray plant it is very possibly the source of those occasional "atmospherics" of high power that make you rend your hair.

A Felt Want.

There have been quite a lot of little paragraphs neatly tucked away in odd corners of the papers about some marvellous new wireless device of the Hun's for

bringing anything mechanically propelled to an instantaneous full stop. Motor cars have been brought up short on the roads; aeroplanes were forced to descend from the blue into the very hands of the authorities waiting to confiscate them; fishing smacks found themselves suddenly like the Ancient Mariner's craft as idle as a painted ship upon a painted ocean. Whether these things be very truth or the merest of rumours I do not know. Probably they are a mixture of both in about equal proportions.

Still the fact remains that they point the way for some of our fertile inventors—inventors of gadgets not of tales. What I want, as I am sure you do too, is a neat little attachment to the set that will enable us to mete out condign punishment to those disturbers of the peace who will chirp and squeal and squeak through the best of broadcast programmes. Do you see the idea? As soon as Squeaking Sam gets to work you turn over switch No. 1, the device then automatically D.F.'s Sam. That done you press switch No. 2 with a quiet smile of satisfaction. . . . In Sam's distant den all is confusion. Sparks fly from his 'phones like those from the village blacksmith's anvil. His inductances are undone, his condensers dismembered. A little later the jury returns a prompt verdict of justifiable oscillatoricide; you receive the grateful thanks of all your fellow sufferers and all is peace. Yes, there is a wonderful future for this invention. I shall have one, no matter what it costs; so if you live and howl within striking range of Little Puddleton, beware!

A Weird Prospect.

They tell me that wireless is catching on just as widely abroad as it is in this country. France was, of course, the pioneer of broadcasting—how we used to bless FL's afternoon transmissions in the old B.B.C.-less days—and Italy was not far behind with ICD working on 3,200 metres. Sweden and some of the Central European countries are shortly to have full broadcasting services.

It is to be hoped that some kind of agreement will be reached as regards suitable wavelengths, and that there will be a general policy of live and let live; otherwise confusion may become worse and worse confounded as Europe gets under way with broadcasting. Do you remember what a search 2LO had some months ago to track down a perfectly poisonous heterodyne whistle that accompanied his evening transmissions without a moment's respite? It was eventually traced to a harmonic of Radiola, then working on 1,550 metres. Both stations subsequently changed their wavelength and all was well. This is merely a sample of what might happen if there were no sort of co-operation. Things would of course be far worse if a very powerful station were created in, say, Belgium to transmit upon 369 metres. Then we should have ethereal struggles for the mastery between the orchestras of London and Brussels, and we might even find a singer in one city warbling to the unwelcome accompaniment of a ukulele or a balalaika played in quite a different key in the other. That would be a pretty pass, would it not? We might even find the diplomats growing heated over the question of the ownership of the ether and the rights of foreigners to trouble our portion of it.

WIRELESS WAYFARER.

AMERICAN BROADCAST RECEPTION.

Further reports received from our readers.

Date.	Call Sign.	Wave-length in metres	Name.	Town.	Receiver.	G.M.T.
9-9-23	WGY	380	T.A.St.J.	Chingford, Essex	1 H.F.—Detector—2 L.F. ..	2.40—4.25
11-9-23	,,	,,	J.G.G.	Holland Park ..	Inverse Duplex Circuit	3.0 —3.30
16-9-23	,,	,,	T.A.St.J.	Chingford, Essex	1 H.F.—Detector—2 L.F. ..	3.10—3.20
,,	WMAF	360	V.D.B.	Reading, Berks.	,, ,, ..	12.30—1.45
19-9-23	WGY	380	H.G.E.	Islington, N.1 ..	2 H.F.—Detector—2 L.F. ..	1.55—2.45
,,	WMAF	360	,,	,,	,, ,,	1.55—2.20
21-9-23	WGY	380	E.J.S.	Lincoln ..	H.F.—Detector—L.F.	1.30—3.0
23-9-23	WBZ	400	R.L.K.C.	Stirling	2 H.F.—Detector—2 L.F. ..	11.45—2.0
25-9-23	,,	,,	H.G.E.	Islington, N.1 ..	,, ,, ..	1.40
,,	WMAF	360	,,	,,	,, ,, ..	1.35
11-11-23	WGY	380	F.D.	Cupar, Fife ..	1 H.F. Detector—1 L.F. ..	1.22—2.30
18-11-23	,,	,,	J.P.B.	Southwell, Notts	1 H.F.—Detector	3.15—4.45
19-11-23	,,	,,	J.W.T.	London, S.E. ..	All Concert Receiver	1.48
20-11-23	,,	,,	,,	,, ,,	,, ,, ,,	—

DUPLEX RECEPTION

By R. E. SABIN.

We shall be pleased to hear from readers who try the arrangement described in the following article.

THE problem of the simultaneous operation of two or more sets upon one aerial, without interference, has been a matter of idle speculation on the part of the writer for some time. With the advent, into the broadcasting reception field, of the Reinartz tuner and all its myriad variations, a way to the solution of this problem has been indicated. The partial tuning of the aerial circuits of these sets has, however, militated seriously against their satisfactory operation when connected to the same aerial.

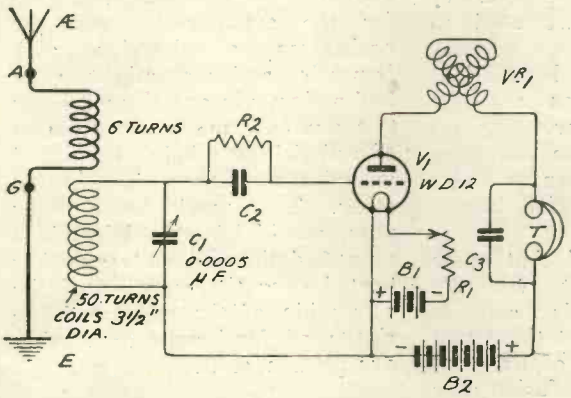


Fig. 1.—The circuit arrangement referred to by the author.

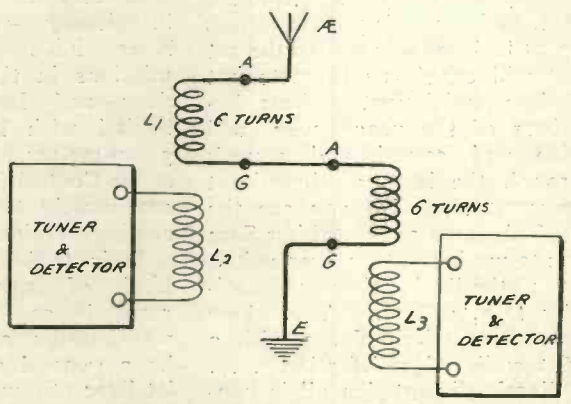


Fig. 2.—Indicating the manner in which the two sets were connected.

Recently there has been introduced a radically new and different tuner in which the aerial circuit remains untuned. In view of this development the problem presents itself in a much simpler light. Here we have a circuit containing no tuning capacity or inductance, in which case we may conceive that the sets in question act as wave traps inductively coupled to the aerial, each set absorbing the impulses of the frequency to which the tuning units are adjusted. At first blush it would seem that connecting sets in either series or parallel would make little difference in their operation; but, such is not the case, as closer analysis will show and subsequent experiments prove.

Following somewhat closely a circuit recently recommended, the writer made two sets. One of these was a single-valve set and the other included a detector valve and two-note magnifiers for operating a loud-speaker. These sets were connected in series. The single-valve set in its cabinet was placed directly on top of the three-valve set. The aerial, an inverted L, consisting of two parallel wires each 75 ft. long and 6 ft. apart with a 35-ft. lead-in, was connected to the single-valve set. From the earth terminal a short lead was connected to the aerial terminal of the three-valve set and the earth of this set was connected in the usual manner. Much to the writer's delight the sets operated absolutely independently of each other. While one station was being received on the loud-speaker, one could at will bring in others on the headphones with the other set. In fact, it was possible to get a combination of any two at pleasure. However, when one tried to get the same station on both sets at the same time, it was found that the set which was tuned the more closely received the signals at the expense of the other. Ordinarily when these sets were used singly they were not particularly sensitive to body capacity, but when connected in tandem and tuned to as near the same wave-length as possible, the removal of the hand from the neighbourhood of either one of the sets would cause the reception to shift from one to the other; in fact, there would be a sort of fluttering effect as one or the other brought in the signals.

(Concluded on page 688).

A LONG WAVE CRYSTAL RECEIVER

By E. REDPATH, Assistant Editor.

A complete set capable of receiving on wavelengths between 300 and about 3,000 metres, which may also be used as a tuner preceding a valve amplifier.

HAVING constructed a crystal receiving set and satisfactorily received the transmissions from the most conveniently situated broadcasting station, many readers are no doubt looking for fresh fields to conquer. When this stage is arrived at, the usual thing is to contemplate the construction of a valve receiving set of some description, principally with a view to the reception of more distant stations.

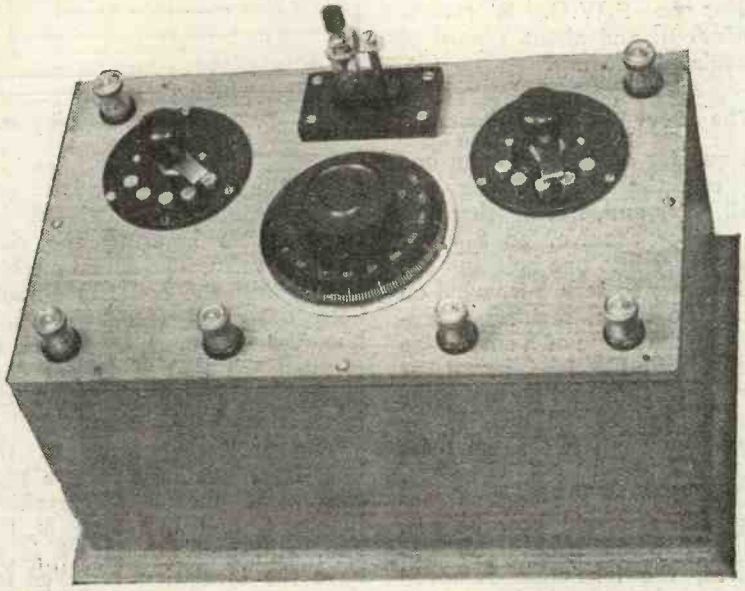


Fig 1.—The complete set.

The usual course, however, does not commend itself to everyone, and the simple receiving set now to be described will, it is hoped, appeal to those who will find interest in the reception of "spark" signals on the longer wavelengths.

It will be noted that "spark" signals are specified, as, of course, the crystal receiver alone will not enable C.W. signals to be received, but those who wish to include the continuous wave stations between 300 and 3,000 metres in their "receiving repertoire" may do so by the use of a separate heterodyne, that is to say, a single valve self-oscillating set, such as that described by Mr. Alan L. M. Douglas in the current issue of *Modern Wireless*.

Those who are learning the Morse code and wish to obtain practice therein will appreciate the freedom from interference and the comparatively slow sending of some of the longer wave stations, particularly Eiffel Tower on 2,600 metres, whilst to those who are interested in accurate time keeping, the various time signal transmissions from the same station, receivable upon the crystal set alone, will prove distinctly useful.

The General Arrangement.

The photograph, Fig. 1, shows the completed set with the aerial and earth terminals upon the left, a crystal detector (of the plug-in type made by Messrs. Cutters) at the centre back, the two tuning switches to the right and left of the detector and the tuning condenser, with knob and engraved dial, in the centre. The telephone terminals are immediately in front of the variable condenser dial, whilst the two terminals to the right are connected to the aerial and earth terminals respectively, to form a convenient means of connecting the set when used as a tuner preceding a valve amplifier.

Of the two tuning switches, the left-hand one, connected to a 60-turn solenoid inductance to be described in detail presently,

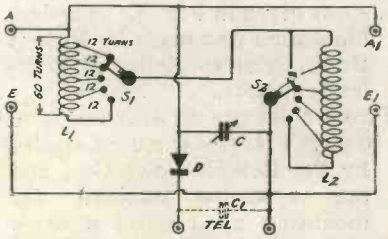


Fig. 2.—Theoretical circuit diagram.

varies the inductance in steps of 12 turns at a time and, in conjunction with the 0.0005 μF variable condenser, varies the tuning between 300 and about

800 metres, and may be regarded as the "fine" tuning switch.

The right-hand tuning switch, is connected to tappings taken from a multi-layer coil of the lattice type (also to be described in detail presently), increases the wavelength in fairly equal steps, to 3,000 metres, intermediate tuning being effected by means of the fine tuning switch and the variable condenser.

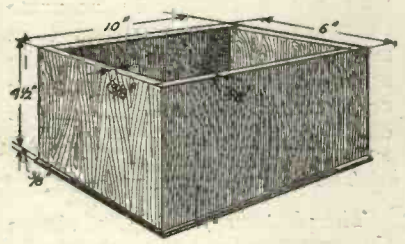


Fig. 3.—The containing box.

The complete circuit diagram is shown in Fig. 2, in which A, E, are the aerial and earth terminals; A_1, E_1, the output terminals when the set is used merely as a tuner; L_1, the 60-turn solenoid inductance; L_2, the tapped multi-layer coil; C, the 0.0005 μF variable condenser; S_1, S_2, the short wave and long wave tuning switches; D, the crystal detector and TEL, the telephone terminals. No telephone condenser is fitted in the original set, but the effect of adding one, as shown at C_1 in the diagram, may be tried.

Materials Required.

One containing box, to the dimensions given in Fig. 3. The box illustrated was made by Pickett Bros., who specialise in wireless cabinets.

Two 5-point tuning switches, and 6 terminals (these were supplied by the Bowyer-Lowe Co., and are specially adapted for mounting upon wood panels).

One variable condenser, capacity 0.0005 μF (that fitted to the original set is a Fallon condenser, a ½-inch hole being drilled in the wooden panel so that the spindle does not make contact with the wood). The Bowyer-Lowe Co. supply variable condensers mounted in a manner similar to the switches).

One crystal detector, upon an ebonite base, and either of the fine wire and crystal or zincite bornite type.

One cardboard tube (preferably wax impregnated), 4 inches in diameter by 4¼ inches long, and about 4 ounces No. 20 S.W.G.-d.c.c. copper wire.

One 250-turn lattice coil complete, or

One ebonite ring, 2 inches inside diameter by ¾ inch wide by ⅛ inch thick, and approximately 8 ounces, No. 31 S.W.G.-d.c.c. copper wire.

A supply of tinned copper wire (No. 20 S.W.G. is recommended), and about 1 yard of insulated sleeving.

The Short Wave Inductance.

A quarter of an inch from one end of the tube pierce two small holes and, having threaded the end of the No. 20 S.W.G. copper wire into one hole and out of the other to secure it, wind on closely 60 turns, making a tapping, in the shape of a small loop twisted round a lead pencil, at every 12th turn and securing the finishing end of the winding by passing through two small holes in the cardboard tube, as before.

The loops at the various tapping points should now be cut, and the wires should be untwisted, the insulation removed and the wires should be cleaned and twisted together again in readiness for subsequent soldering. If the winding has been done carefully, shellac varnish will not be necessary, but a thin coat can be applied at this stage if considered desirable. Its effect upon the wavelength will only be small and it certainly affords protection against the subsequent absorption of moisture.

The Long Wave Inductance.

This inductance, as already mentioned, consists of a multi-layer lattice coil. The coil actually fitted in the set now being described, consists of No. 31 S.W.G.-d.c.c. copper wire, wound in nine layers, each containing 25 turns, upon an ebonite tube or foundation ring, ¾ inch wide. A wooden mandrel, 2 inches in diameter, has two circles of holes (nine holes in each circle), drilled radially and fitted with 18, 1 inch diameter, brass or steel spokes. All the spokes in one circle are inserted, then the ebonite foundation ring is

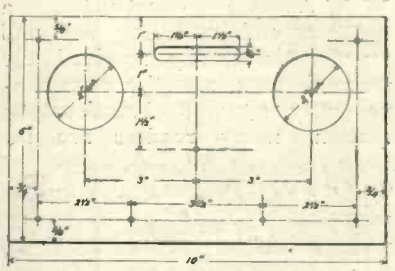


Fig. 4.—Drilling plan of wooden panel.

slipped upon the mandrel, and the remaining spokes are inserted, thus securing the ring between them. The actual method of winding the coil has already been described (*Modern Wireless*, Vol. I, No. 4), by Mr. G. P. Kendall, so that it is not considered necessary to repeat the instructions here.

The projecting loops of the inter-layer windings form a very convenient means for making tappings, and one loop in the 2nd, 4th, and 6th layers is to have the insulation removed for the purpose. If a bought lattice coil is used, the nearest available will probably be a 250-turn coil, and should be tapped so as to include sections of 50, 55, 65 and 80 turns.

Assembling and Wiring Up.

Fig. 4 shows how the top panel of the containing box is to be drilled and cut out for mounting the various components, which are shown assembled in place in the photograph, Fig. 5. The short wave inductance, it will be observed, surrounds the variable condenser and is secured in place by means of two small brass clips passing over the ends of the

No. 2 B.A. screwed brass rod which carries the fixed condenser vanes, and secured in place by means of two extra No. 2 B.A. brass nuts. The coil should be so arranged that the tappings are conveniently situated above the fine tuning switch, to the respective contact studs of which they are to be connected by means of the tinned copper wire.

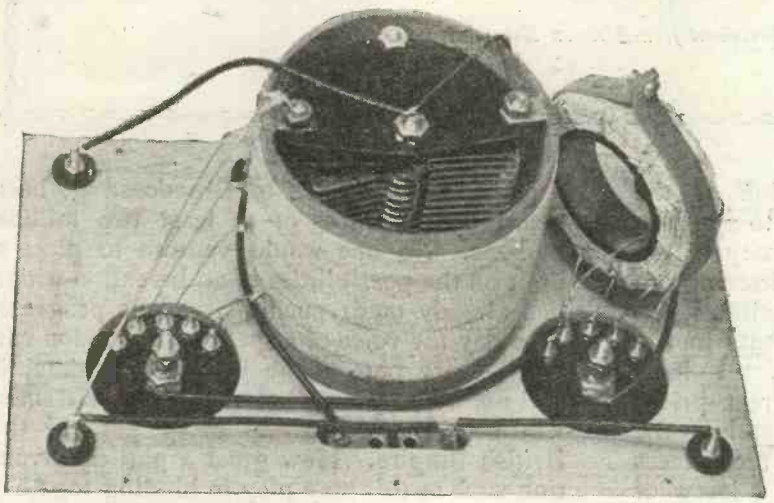


Fig. 5.—Back view of top panel, showing arrangement of components.

The method of securing the lattice coil is very simple, and consists in screwing to the underside of the panel a strip of ½ inch wide by 1/16 inch thick red fibre, sufficiently long to surround the coil. Between the fibre and the wood panel itself, is placed a small block of wood with a hole through it, to raise the coil slightly and, between the coil and the fibre, is placed a small piece of felt, to increase the grip of the fibre upon the coil and to prevent the latter being injured by the screw head. The extremities of the fibre strip are then to be bent, drilled, and bolted together so as to grip the coil securely.

The arrangement will be seen on reference to Fig. 5.

The wiring of the set is really very simple and will be readily followed by referring to the "back-of-panel" wiring diagram, Fig. 6, in conjunction with the theoretical circuit diagram, Fig. 2. The short wire connections between the coil tappings and the contact studs are left bare, insulated sleeving being employed only upon the longer leads.

Results Obtained.

Upon the short wave inductance alone, numerous signals were received, immediately the set was completed, upon 300, 450 and 600 metres, whilst with half of the short wave inductance in circuit and the long wave switch upon the third stud, and very little of the variable condenser, excellent signals were received from Nordeich. With all of the inductance in circuit and the variable condenser at about 30°, Eiffel Tower time signals were received, and upon a subsequent evening the 6.10 p.m. telephony concert from this last-named station was clearly heard, although, of course, it could not be called loud, and required the addition of a single valve low-frequency amplifier to render it comfortably audible in two pairs of telephone receivers

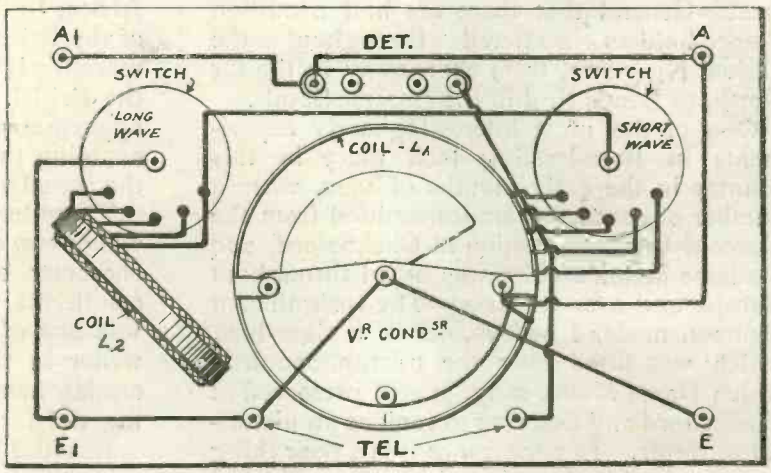


Fig. 6.—A "back-of-panel" wiring diagram.

THE CHRISTMAS NUMBER OF "MODERN WIRELESS"

This issue will contain, together with other interesting contributions, the following:—"A Cabinet 2-valve magnifier," by Percy W. Harris. "What to do with three Valves," by John Scott-Taggart. "Loud-speakers and How they Work," by E. Alexander. "Some new American Single-valve Circuits," by A. D. Cowper.

A TALK ON WIRELESS

By SENATORE G. MARCONI, G.C.V.O., LL.D., D.Sc., M.I.E.E.

A Speech broadcast from 2LO on November 14th, 1923.

I GLADLY accept the invitation of the British Broadcasting Company to speak to listeners-in on the first anniversary of the official commencement of Broadcasting in Great Britain. Broadcasting constitutes one of the most interesting developments in the science of radio communication. I have watched its rapid growth with great pride. There is every reason to congratulate the British Broadcasting Company on the success which has attended their efforts. I know of hardly any other form of human activity in which such marked progress has been made in so short a time.

Twelve months ago listeners-in in Great Britain consisted of a small band of amateur wireless enthusiasts, numbering some 7,000. To-day we know on the authority of the Postmaster-General that there are half a million licence-holders scattered throughout the United Kingdom, from Stornoway in the far North, to Lands End in the extreme South.

One of the most interesting early experiments in Broadcasting took place in this country in the early months of 1920, when a number of concerts were transmitted from the Marconi Wireless Station at Chelmsford, and Madame Melba's voice was heard throughout Europe and even in Asia. The insignificant trumpet, made, I believe, out of a cigar-box, which was fitted over the microphone into which Dame Melba sang, is still preserved at Chelmsford and deserves to rank as an historical souvenir. In appearance it is a poor thing compared with the microphone into which I am now speaking, but the path of invention is strewn with these apparently small things, which events prove to be of great importance.

Only three years separate us from that novel and interesting experiment, and yet to-night the managers of the B.B.C. inform me that important speeches like those recently delivered by General Smuts and by Lord Curzon have, thanks to Broadcasting, been heard by audiences of at least two million persons. No one would venture to place a limit on the possibilities of an invention which has already made such marvellous progress. If to-day the voice of a speaker in London can reach every part of the United Kingdom, it will not be very long before British statesmen will be able to address every part of the British Empire. How great a part an invention such as this may play in binding together great communities! It may be that the time is not far distant when His Majesty the King, on some great occasion like the opening of Parliament, may be heard delivering his address from the throne, not only by the people of these islands, but by millions of the population of Canada, Australia, South Africa, India, and all the scattered possessions of the British Crown. I can imagine nothing more likely to strengthen the ties which bind the British people to their Monarch than the opportunity which Broadcasting will afford of enabling the people of the Empire to listen to the actual voice of their King and Emperor.

There have been in the history of invention one or two discoveries which have changed the character of peoples and revolutionised the conditions under which they live. Printing was one of them; wireless is another. As a writer in the *Times* said recently, "Broadcasting has done for human speech what printing did for the written word."

I should like to say a few words more on the subject of wireless telegraphy. It is of all forms of communication the swiftest and the most flexible. The general public did not perhaps realise its value as a practical means of communication at sea until 1912, when, on the occasion of the loss of the Titanic, the lives of 700 people were saved by the wireless call for assistance. To-day no vessel over a certain tonnage puts to sea without the means

of communication by wireless. That sense of isolation, which was one of the disadvantages of the seaman's life, has been destroyed. Not a month, hardly a day passes without some seafaring men owing their safety and their lives to the fact that wireless has provided them with the means of keeping in touch with their fellow-men.

Some interesting experiments now being made lead me to hope that before very long the miner working in the bowels of the earth, and the sailor in the submarine on the bed of the ocean, will be able to keep in communication by wireless with their fellows on the surface of the earth. I do not wish to put our expectations too high, but we cannot but be moved by the prospect that wireless may be able to do for the miner and for the men in our submarines what it has already done for the sailor and for the airman.

I hope I shall not be thought egotistical if I make a very brief reference to my own work in connection with wireless.

In 1895 I commenced my first experiments with electric waves in my father's house, near Bologna. My first experiments were across distances of only a few yards from room to room. The next step was to try longer distances in the garden. At about that time I made the discovery that by means of elevated wires or aerials attached to both the transmitting and the receiving instruments, communication over what were then reckoned considerable distances could be carried out—that is, up to nearly two miles.

Although the apparatus which I employed in those experiments was very simple, all present long-distance apparatus is a direct evolution from it.

In 1896 I came to England, and the first British patent for wireless telegraphy was taken out. Sir William Preece, who was then Chief Electrical Engineer of the Post Office, gave me an opportunity of giving a demonstration before officials of the G.P.O., and successful tests were carried out between St. Martins-le-Grand and the Thames Embankment. I remember very well the excitement which was created when we succeeded in obtaining effective signals over that distance. Shortly afterwards, on Salisbury Plain, distances of 1¾ miles and then of 4 miles were obtained. From that time onwards rapid progress was made in the improvement of apparatus and the distance covered, and in 1897 the Wireless Telegraph and Signal Co. was formed, which in 1900 became Marconi's Wireless Telegraph Co.

There is a great deal that I should like to say about the different stages in the development of wireless telegraphy. I can only now refer to one. On December 12, 1900, I succeeded in sending out from Poldhu, Cornwall, across the Atlantic, a succession of s's, represented in the Morse code by three dots, and these signals were distinctly heard in America. From these experiments we were able rapidly to proceed to the establishment of a trans-atlantic service, first, between Poldhu and Glace Bay, Canada, and afterwards between Clifden, Ireland and Glace Bay, Canada, the first long-distance wireless telegraph service of the world.

Of the future of wireless telegraphy I have not the time to speak; I can only say this, that recent experiments between Cape Verde Islands and this country, which I carried out, have entirely revolutionised our ideas, both of the power and of the wavelength required for clear and effective signalling. Working with only 1 kilowatt and on a wavelength of a hundred metres, I was able over this distance of 2,250 miles to maintain effective communication between Poldhu, Cornwall and my yacht *Elettra*.

One other interesting result was achieved by these experiments—we were able to confine our signals to a narrow belt between the two points of communication, instead of radiating them in all directions. The advantage of this in securing secrecy of communication will be obvious.

I do not yet know how long it will be before the British Empire is provided with a system of wireless communication adequate to its needs. This I do know: that private enterprise is ready to undertake the work, as it has been ready for the past fourteen years. All that is wanted is the permission of the Government to go ahead. Every day that passes increases the handicap which Great Britain is already suffering in comparison with its great commercial rivals like France, Germany and the United States.

Ladies and gentlemen, I am glad to have had this opportunity of speaking to you. I hope that your interest in wireless will grow day by day and keep pace with the practice of it.

A WALL BRACKET FRAME AERIAL

By. H. BRAMFORD.

Constructional details of a compact and effective arrangement.

THERE is room for improvement in the construction and mechanical design of frame aerials, and, where space is limited, an efficient one of the following type is of considerable advantage. The frame described in this article is of simple construction, and is adapted as a wall bracket giving quite a presentable appearance when in or out of use.

The general arrangement is shown in Fig. 1, in which (A) shows the frame aerial closed, and (B) open. The first thing to construct is the frame itself. This is to be made of some hard wood, for preference $\frac{7}{8}$ in. thick by 3 in. wide. First cut off four pieces 2 ft. long, or a greater length if a larger frame is desired. Bevel both ends of each piece at an angle of 45 deg., by the use of a mitre-box. This completes the four sides of the frame, and they are to be hinged together, as shown in Fig. 2. Two hinges are placed with their pivots on the *inside*, and the other two with their pivots on the outside. This has the result of maintaining the frame in a correct position when open, without having to devise any mechanical device for this purpose, as the bevel joints resting on each other make an automatic lock. At the same time, by merely pushing the frame towards the wall, it closes. Four pins are now inserted, in the positions shown, two on each side. These may be ordinary wood screws about 2 in. long, and may be of a fairly substantial nature, as they bear the whole weight of the frame. It will be seen that one works as a bearing in the bracket, and the other provides a means of holding the arm in a vertical position when both open and closed, by working in a slot in the bracket.

To carry the winding upon the frame, four pieces of ebonite, one on each side of the frame, are to be fixed, as shown in Fig. 5. These may be made from some angle ebonite, cut off in pieces 3 in. long and screwed on to the sides. They should be cut with a number of slots through which the wire may pass, and the number of slots, and, of course, the length of the ebonite pieces, will depend upon the number of turns of wire which it is desired to employ.

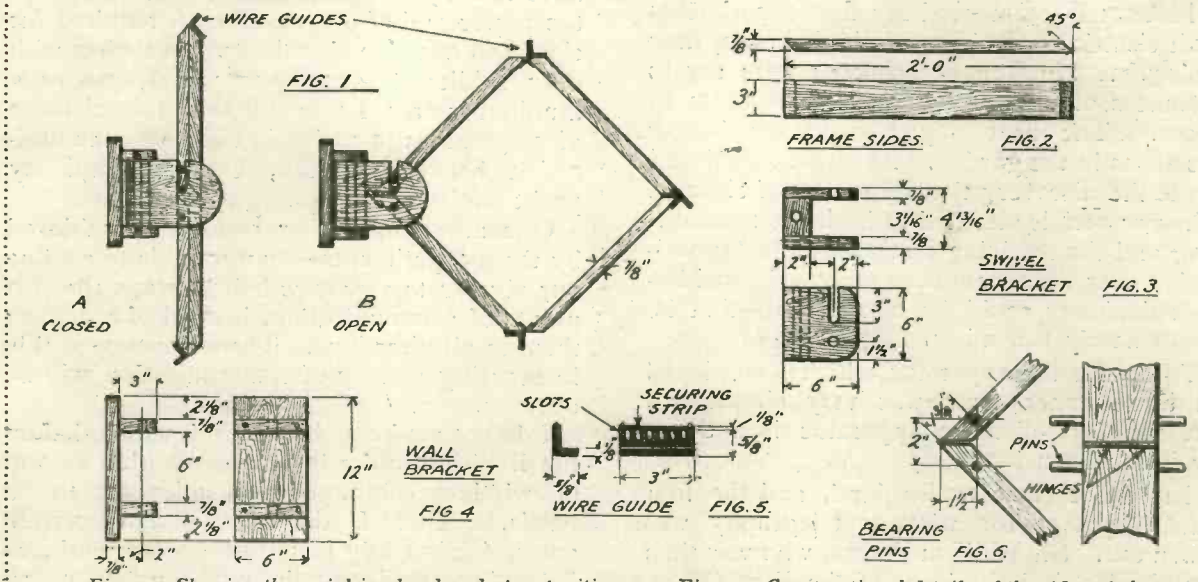


Fig. 1.—Showing the aerial in closed and open positions. Fig. 2.—Constructional details of the sides of the frame. Fig. 3.—The swivel bracket. Fig. 4.—Details of the wall bracket. Fig. 5.—Constructional details of the guides securing the aerial winding. Fig. 6.—Dimensions, etc., of the bearing pins.

Concluded on page 700.

SUPER-HETERODYNE RECEIVERS

By F. de WILLY and R. E. LACAULT.

The following article deals with the theory and construction of this useful apparatus.

THE super-heterodyne method of reception presents all the advantages that are desirable for long range reception. It has been called the Rolls-Royce of radio and justly deserves this name, for no other system can compare with it for selectivity, range and ease of control.

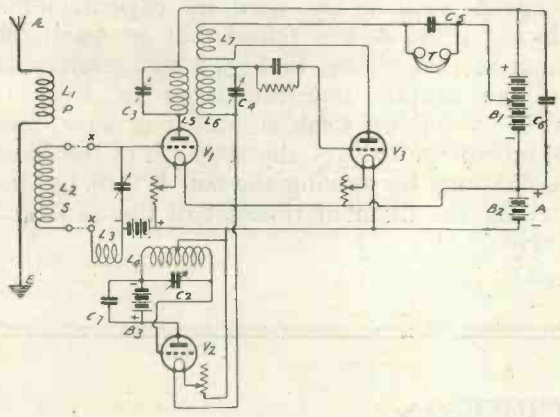


Fig. 1.—Three-valve Super-Heterodyne circuit.

The method consists in lowering the frequency of the incoming signals which may then be efficiently amplified at radio frequency. Since all the signals received are reduced to the same frequency, the amplifier may be so designed that it will give very high amplification at this particular frequency. Either tuned circuits, transformers or choke coils are suitable for amplifying the long wave signals; if untuned radio frequency transformers are employed, tuned circuits connected between the last amplifier valve and detector provide selectivity. These may be connected between the first detector, or rather, frequency changer and the first amplifying valve, but since at this point the energy is weaker, a loss occurs which can only be gained by an additional stage of radio frequency amplification.

How it Works.

The lowering of the incoming signal frequency is accomplished by means of an oscillator or heterodyne, as it is called, coupled to the tuning system, which may be a loop or an aerial with vario-coupler. When the signal is received, the local oscillations interfering with it produce beats, and it is these beats occurring at a certain frequency, which are amplified and detected in the usual manner.

For instance, if the radio frequency amplifier is permanently tuned to 50,000 cycles (6,000 metres), it is necessary to produce 50,000 beats, and to accomplish this, when receiving a 1,000,000-cycle (300 metres) signal, the heterodyne must be tuned to either 1,050,000 or 950,000 cycles (285.7 or 315.7 metres). This is readily accomplished by adjusting the variable condenser of the oscillator circuit, once the tuning circuit has been adjusted to the proper wave-length. This produces very sharp tuning and results in extreme sensitiveness, for the incoming signal is heterodyned.

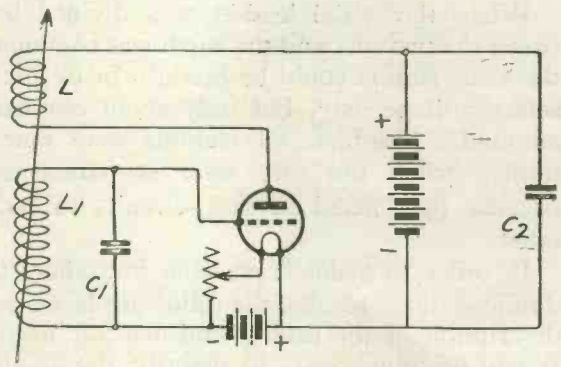


Fig. 2.—A modified form of the oscillator for short waves.

The tuning of a super-heterodyne receiver is easy, for only two controls are necessary, one condenser for tuning the frame aerial, or

secondary circuit, which may be coupled to an aperiodic or " untuned " aerial, and another to vary the frequency of the local oscillations produced by the heterodyne. If desired, tuned circuits may be used in order to obtain greater selectivity through very heavy interference, but in practice it has been found that two controls are all that are needed.

A Simplified Super-Heterodyne.

One may obtain a very good idea of the selectivity and efficiency of the super-heterodyne method by using an ordinary long wave receiver with duo-lateral or honeycomb coils and an oscillator which may be built according to the particulars here given. The diagram, Fig. 1, shows the connections of a three-valve super-heterodyne, with which we have obtained very good results. The first valve, T1, is the frequency changer which may be equipped with a grid condenser and grid leak, as a detector. The valve, T2, is the oscillator, and T3 is an ordinary detector valve connected to the long wave regenerative receiver.

The tuning circuit consists of a fixed coupler that may be replaced by a frame aerial connected in place of the secondary at the points marked " XX." The coupling between the coil L3 and the oscillator should be adjusted on a given signal for maximum audibility in the receivers. Once it is adjusted, it may be left fixed. The coils L5, L6 and L7 are plugged into a standard three-coil holder and constitute the transfer circuit between the frequency changer and the detector, which may be made to oscillate for the reception of C.W. by coupling the reaction coil, L7, to the secondary, L6. When receiving telephony, regeneration is accomplished in the usual manner by moving L7 toward L6 for maximum signal strength. If desired, the condensers C3 and C4 may be fixed and of the same capacity if L5 and L6 are of the same size.

For the reception of very short wavelengths, such as are used by experimenters during tests, it was found that an oscillator such as that shown in Fig. 2 was preferable to the simpler one illustrated in Fig. 1. When receiving weak signals it is sometimes of advantage to vary the strength of the local oscillations by moving the coil L3, or by adjusting the filament rheostat of the oscillator valve.

(To be concluded.)

DUPLEX RECEPTION

(Concluded from Page 680.)

When the aerial lead-in was divided between the two sets and the earth was common, the same station could be brought in by both sets simultaneously, but only about one-half as loud. In fact, all stations were much fainter when the sets were so connected because they acted as short-circuits to each other.

In order to make it possible for others to duplicate these results, the following is a brief description of the tuning and detector units. It will be unnecessary to describe the amplifiers, as they are standard.

The aerial or primary coil consisted of six turns of No. 22 d.c.c. wire on a 3½-in. cardboard tube 3 in. long. The secondary inductance consisted of fifty turns of the same wire on the same tube and spaced about ¼ in. from the primary. The secondary inductance is tuned with a 23-plate condenser across it, while regeneration is obtained by the use of a standard plate variometer.

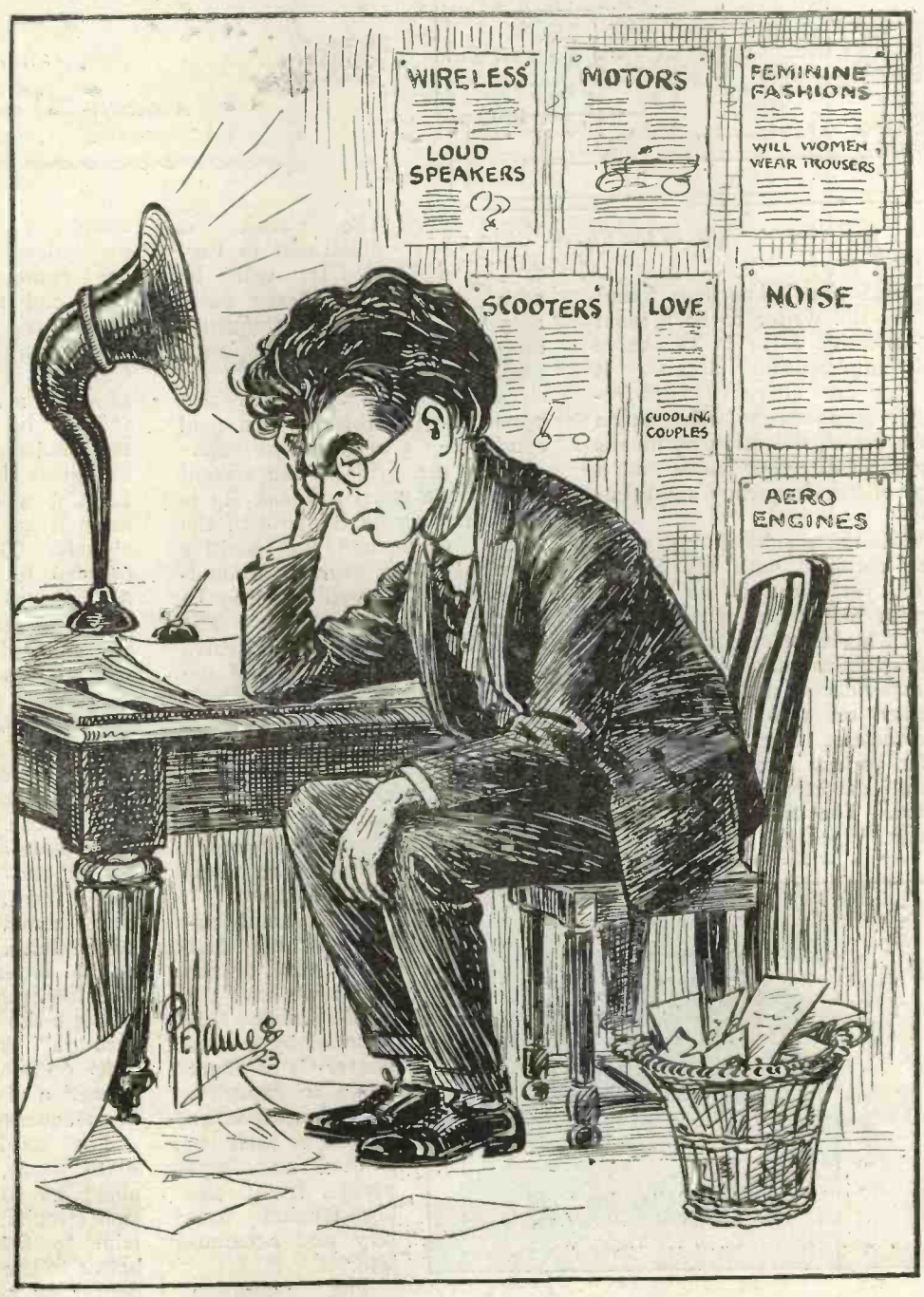
This arrangement gave sharp tuning from 215 to 600 metres, although regeneration was not effective at about 400 metres without further loading the plate circuit or using a larger variometer than was then at hand.

Fig. 1 shows the circuit arrangement as used in both sets.

The points A and E represent the aerial and earth terminals and indicate the points where the sets were connected. Diagrammatically indicating the coupling units and omitting the tuning, the sets were connected in the manner shown in Fig. 2.

EVENTS WE NEVER EXPECT TO WITNESS

No. 4.



Prof. A. M. Low runs dry.

THE ST15

By JOHN SCOTT

A description of one of the circuits in the qu

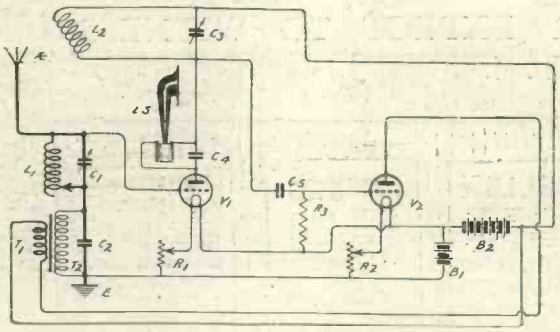


Fig. 1.—The ST150 Circuit.

THIS circuit has been found by the writer to be a most effective form of two-valve dual amplification circuit. It involves one stage of high-frequency amplification, reaction on to the aerial, detection by means of a three-electrode valve and a stage of low-frequency amplification.

While the results do not equal those obtained with the ST100 circuit, yet there is no crystal detector to get out of order. If a right make of crystal detector is used no trouble whatever will be experienced with the ST100 receiver on this account, but nevertheless, there are some who prefer to use circuits in which crystal detectors are not employed. The ST150 is one of these.

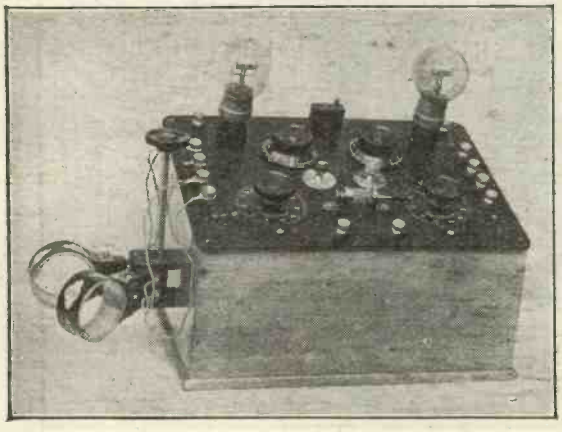


Fig. 3.—An ST150 Receiver in panel form.

The circuit is illustrated in Fig. 1. It will be seen that the first valve acts as a high-frequency amplifier, the high-frequency oscillations appearing in the circuit L2, C3. These are communicated through the grid condenser C5 of 0.0003 μF capacity to the grid of the second valve; the usual gridleak R3 is connected across the grid of the second valve, and the positive terminal of the filament accumulator B1. This gridleak may be of the variable pattern. The anode circuit of the second valve contains the primary T1 of the step-up intervalve transformer T1, T2. The secondary T2 is included both in the aerial circuit and in the grid circuit of the first valve, a condenser C2 of 0.001 μF capacity being shunted across T2 to permit the high-frequency currents to pass through it.

In the anode circuit of the first valve next to the anode we have the loud-speaker LS shunted by a condenser C4 of about 0.002 μF capacity. This loud-speaker should be well insulated and kept away from the high-tension battery and accumulator.

The operation of the circuit is simple. The high-frequency oscillations in the aerial circuit are communicated across the grid and filament of the first valve; the high-frequency currents pass through the condenser C4, or if this condenser is absent, across the condenser formed by the self-capacity of the loud-speaker windings, and energise the oscillatory circuit L2 C3, which is tuned to the same frequency as the incoming signals. The reaction coil L2 is coupled to the coil L1 in such a direction as to produce a reaction effect, and the leads to L2 should be changed round to find out which gives the best effect. The oscillating potentials across the circuit L2 C3 are communicated to the grid of the second valve, which acts as a detector, the rectified currents passing through T1. These low-frequency currents have their voltage stepped-up by the transformer T1 T2, the low-frequency potentials being communicated to the grid of the first valve, which now acts as a low-frequency amplifier. The low-frequency currents pass through the loud-speaker LS and through the inductance L2. They do not, however, affect the operation of the first valve as the low-frequency amplifier.

The condenser C4 will, in many cases, be found dispensable; as in all dual amplification circuits, it is a matter of trial to find out whether it is better to use a fixed by-pass condenser or not. Telephone receivers may be used instead of

50 CIRCUIT

TAGGART, F.Inst.P.

hor's new book "More Practical Valve Circuits."

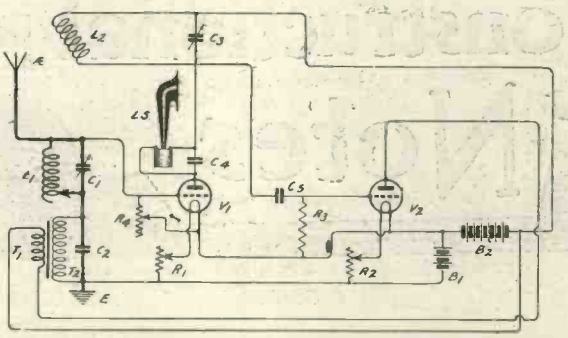


Fig. 2.—The ST150 Circuit with the stabilising resistance shown between grid and filament of the first valve.

the loud-speaker, but in this case the telephone terminals should not be touched with the hands, and the telephones should be well insulated. It will be found when telephones are used that the circuit is more difficult to tune on faint signals, owing to the fact that the telephones will have a capacity to earth which will be continually varying slightly, and when the reaction between L2 and L1 is set to a critical adjustment, the first valve may begin to oscillate. Methods of preventing this are described in the article on the ST150 circuit, which will appear in the Christmas number of *Modern Wireless*.

Use of Stabilising Resistance.

Fig. 2 shows the ST150 provided with a stabilising high resistance connected across the grid and filament of the first valve. This resistance, which may have a value from 50,000 to 100,000 ohms, and is preferably variable, serves the same purpose as the resistance in the ST100 receiver. In nearly all cases, except when the reaction is made very tight, the resistance will not be necessary.

Reaction on to the aerial is now permitted by the Postmaster-General, but nevertheless, when used, the privilege should be exercised with the very greatest care to avoid self-oscillation.

The Apparatus Used.

Fig. 3 shows a panel set which has been made up in accordance with the ST150 circuit. The two plug-in coils are mounted in the left-hand side of the set, one of the coils being movable relative to the other. The coil-holder, which is fixed at the back of the set, is for a special purpose, which is not necessary to describe here.

Fig. 4 shows how the different components are connected up. The valve panels are of the type advocated in this journal recently, and which are manufactured by N. V. Webber; the step-up inter-valve transformer may be of any pattern, and there does not appear to be any material difference between different types.

Plug-in coils are to be recommended, and the inductance L1 in Fig. 1 may have anything from 25 to 50 turns, according to the size of aerial used and the wavelength of the station to be received. Most coil manufacturers issue four coils for the broadcast wavelength, and the size of the aerial will govern the size of the coil used. The inductance L1, if it consists of a cylindrical coil, may be composed of 50 turns of No. 26 double cotton-covered wire wound on a cardboard tube 3½in. in diameter. Tappings may be taken at the 10th, 15th, 20th, 25th, 30th, 35th, 40th, and 50th turns. Reaction coil L2 may consist of a plug-in coil having 50 turns. If a tubular coil is used, it may consist of 70 turns of No. 26 gauge double cotton-covered wire wound on a 3-in. tube, tappings being taken at the 30th, 50th and 70th turns.

The condensers C1 and C2 are of 0.0005 μF capacity. The condenser C1 should be tried connected in series with the aerial. In this case, of course, the inductance L1 will require to be larger; a coil having 50 to 70 turns will be necessary. The condenser C3 may be a variable one having a maximum capacity of 0.001 μF, but a fixed condenser will do quite well.

The high-tension voltage may be anything from 60 to 100 volts, or even more.

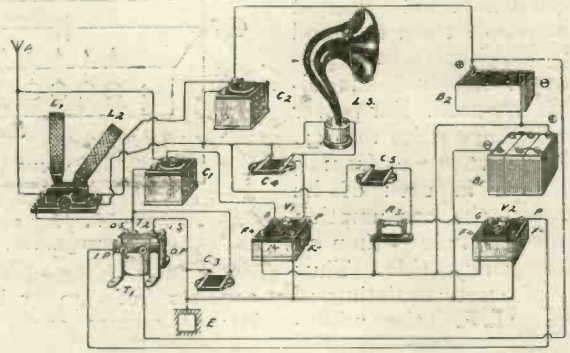
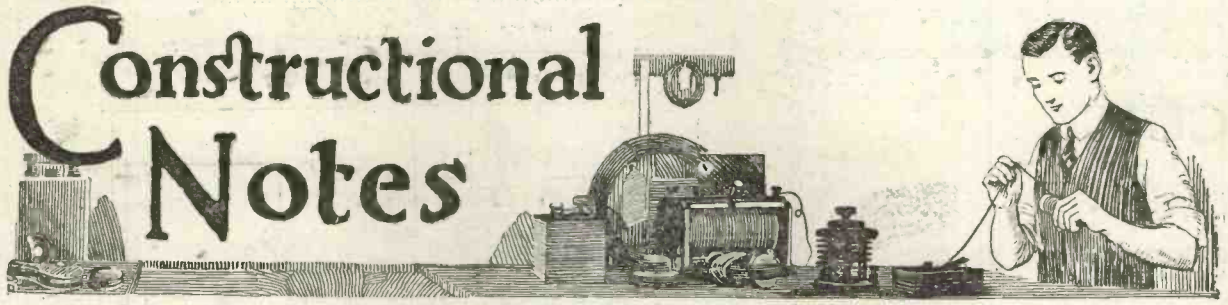


Fig. 4.—A pictorial representation of the ST150 Circuit.

Constructional Notes



Conducted by R. W. HALLOWS, M.A., Staff Editor.

AN H.T. BATTERY OF LARGE CAPACITY.

HIGH-TENSION batteries made up of cells of about the same size as those used for pocket flash lamp batteries, embedded in pitch or wax and provided with sockets

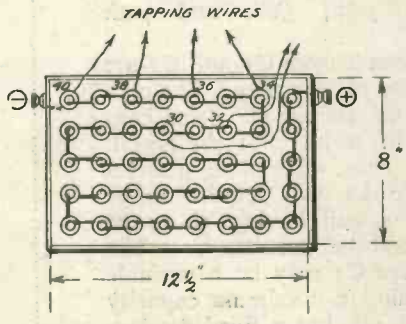


Fig. 1.—Showing method of connecting the cells.

giving 3- or 6-volt steps, are excellent for one, two or three-valve sets, but have not sufficient capacity to enable them to stand up to a big multi-valve set, especially if two or more note-magnifying stages are used. For power amplifiers they are quite useless.

The average set passes from .5 to 2 milliamps in each of its anode circuits, the consumption being higher on the low- than on the high-frequency side. Thus for a five-valve set consisting of 3H.F., R., 1L.F., the milliameter would probably show a total high-tension current of five or six milliamperes. The writer's six valves (2H.F., D., 3L.F.) using D.E.Q.'s for high-frequency amplication and for rectification, and D.E.V.'s for the note-magnifiers shows an actual reading of 10 milliamperes. A power amplifier may call upon the battery to supply as much as 30 milliamperes.

Even the 10-milliampere load is too much for the small cells, with the result that if high-tension batteries of the stock pattern are used they become noisy very quickly and their useful life is short.

A battery that will give excellent service with either the multi-valve set or with the power amplifier can be made up at home from separate cells of comparatively large size at little more cost than that of the ready-made article. A good 66-volt battery, with tapping points, costs about 16s.; the one to be described

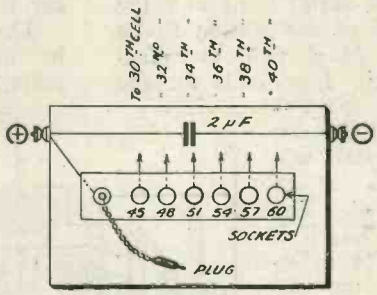


Fig. 2.—The plug and socket arrangement.

consists of 40 cells weighing 3½ ounces each, which are sold retail at 7½d. apiece. It, therefore, gives 60 volts, at a cost, excluding the box, which most amateurs will make, of £1 5s. Its cost is thus 5d. a volt, as against about 3d. for the ready-made battery. The difference in price is small, and as the larger battery has four or five times the life of the smaller it is a far better investment.

The cells chosen should be of a type specially designed for use in large numbers in series. The writer uses the type known as U.W.1, made by the Ever-Ready

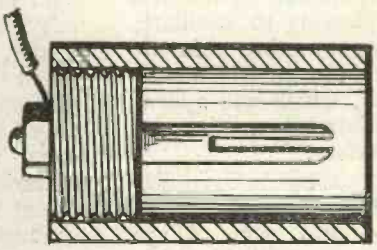


Fig. 3.—Illustrating the plug.

Company, which are extra well insulated in order to be able to stand high voltages. These are round cells about 1.5in. in diameter and 2.7/8in. high. The positive pole is provided with a terminal, the negative with a wire at whose end is a loop. Connections can therefore be made without the use of a soldering iron.

The box to take the 40 cells should be 8in. by 12½in. inside; this will allow plenty of room between the cells, for it is not desirable that they should touch. Its depth should be 3½in. It is provided with a hinged lid, and with two terminals mounted on the wood by the ebonite bushing method which has already been described in these columns.

Fig. 1 shows the way in which the cells are connected when they have been placed in the box. They should stand on a layer of wax, obtained by melting down one or more old H.T. batteries and run whilst hot into the box. The rows are separated from one another by means of waxed cardboard strips, long ones being used for the 8-cell rows and short pieces for the 5-cell rows.

It will not usually be necessary to take less than 45 volts from the battery, nor will steps of smaller than 3 volts be needed. it will, therefore, be sufficient if we tap off from the 30th, 32nd, 34th, 36th, 38th and 40th cells.

The lid is made to open on hinges. In the middle of it (Fig. 2) is a strip of ebonite 1½ in. wide by 6 in. long. On this are mounted one terminal and six ordinary valve legs. The wood below the strip is cut away with a fretsaw.

The negative lead from cell No. 1 is taken direct to the negative terminal which is mounted on one side of the box. From the positive terminal a flex wire lead runs to the lower end of the terminal upon the lid. To the upper side of this terminal is attached a plug, the construction of which we shall come to in a moment, with an 8-in. length of single flex. Flex leads are taken from the positive terminals of the even-numbered cells from 30 to 40 to the shanks of the six sockets, to which they are secured either by soldering or by means of nuts.

Below the lid is mounted a 2 μF. fixed condenser, wired again by flex leads, straight across the terminals.

Fig. 3 shows how the plug is made. Into a 1¼-in. length of ⅜in. diameter ebonite tubing is screwed a small end piece, in the centre of which is a 4B.A. tapped hole. A valve pin is screwed into this and fixed by a nut, which also secures the flex lead. With this plug there is absolutely no danger of short circuiting the battery by touching two sockets at the same time.

R. W. H.

MAKING NEW 'PHONE LEADS.

TELEPHONE leads are always apt to "go" just when least expected. It may happen that a sudden jerk caused by moving from the set without remembering that one is wearing the telephones breaks them, or it may be that they simply wear out through the constant bending and twisting that they have to endure.

The symptoms of a broken lead are the total or partial failure of signals when the wires are pulled or shaken, or a considerable amount of crackling noises when the telephones are placed in certain positions.

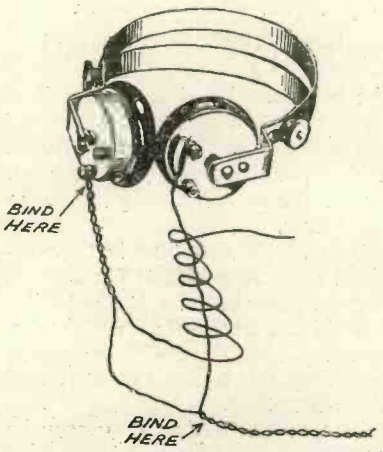


Fig. 4.—Illustrating the method of connecting the 'phones.

To make new leads is a very easy business, and it is generally better to do so than to attempt to locate a fault and repair it. If the wires have given way in one place, they are probably weak all over.

The first essential is a 3-yard length of really good flex. Remember that some of the material sold as flex is practically useless, being made up of few comparatively stout strands of wire of poor quality and far too hard for the purpose. Good flex should consist of a great many very fine strands. It should feel soft and be even more pliable than cord of the same diameter. Flex for telephone leads should be trebly insulated with an inner silk covering, a layer of good rubber (see that this has not perished), and an outer covering of plaited silk.

Cut off 2 ft. from your length. Untwist this short piece and make loops at either end of one of its wires in the following way. Bare an inch of the wire carefully, and twist the strands tightly together. Take a turn round the shank of a 3B.A. drill and twist the wire two or three times. Plunge the loop so made into molten solder so as to make it solid.

Now untwist 12 in. of the long wire, and make loops as before in each of its four ends. It must be remembered that the receivers are to be wired in series; hence care must be taken to attach the leads to the right terminals. In high-resistance telephones the positive terminal will usually be marked. If it is not, it will be necessary to find it by the use of a flashlamp cell in the way described in these notes in a previous issue. Both ends of one wire in the long leads are then bound with red silk to distinguish them, the arm of the Y so marked being taken to the positive terminal of one receiver, and the other to the opposite (*not* the positive) terminal of the second.

Looking at the base of the receiver, attach one arm of the Y to the *left*-hand terminal. Then turn the 'phones round and fasten the other arm to the *right*-hand terminal of the second.

Now take the short piece and attach it to the vacant terminal of one receiver. Twist it neatly down the arm of the Y, as shown in the drawing, until the fork is reached. Then proceed up the other arm and attach to the disengaged terminal of the second receiver.

The junctions of the wires should be bound with silk thread.

R. W. H.

WIRING YOUR PANELS.

ONE'S main objects when wiring up a panel should be to eliminate unnecessary resistance and to avoid so far as is possible the effects of capacity between leads. At the same time, one wishes to make a neat job that pleases the eye, for the true wireless enthusiast is not satisfied unless his panels are as well finished underneath as they are upon the surface.

By far the easiest system of wiring is to use insulated sleeving and to run the wires as directly as possible from terminal to terminal. This, however, has the drawback, especially for high-frequency amplifiers, that, owing to the proximity of the wires and to the excellence of the dielectric provided by the sleeving, there may be a considerable amount of inter-lead capacity, which will make its presence felt when short-wave reception is in progress.

It is desirable, therefore, that the insulating material between wires should have the lowest possible dielectric coefficient, and for this we must rely upon air. We can do so by using *bare* wire.

Fig. 5.—Showing method of connecting.

The " bridge " method of wiring with stiff bare wire has everything to recommend it. It is thoroughly efficient, and, if well done, makes a neat workmanlike job of which the constructor may be justly proud.

Here is the way which the writer has found best for carrying it out. When the panel has been finished so far as the mounting of all parts—terminals, rheostat, valve legs, and so on—is concerned, a drawing very roughly to scale should be made. One then draws in, first of all, all the leads that can be on the same level, such as those of the filament circuit, and others that are in different portions of the panel and do not have to cross them or each other.

The first series of crossing leads is then put in in broken lines; these will rise ½ in. above

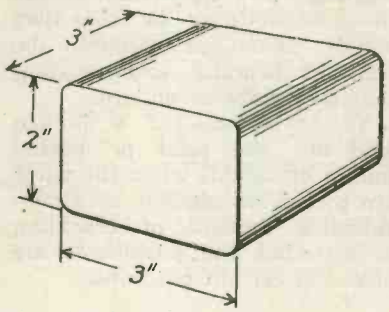


Fig. 6.—The wood former.

the others. Lastly, wires which have to cross both the first and the second series are put in with a blue pencil; these will be 1 in. above the former and ½ in. above the latter.

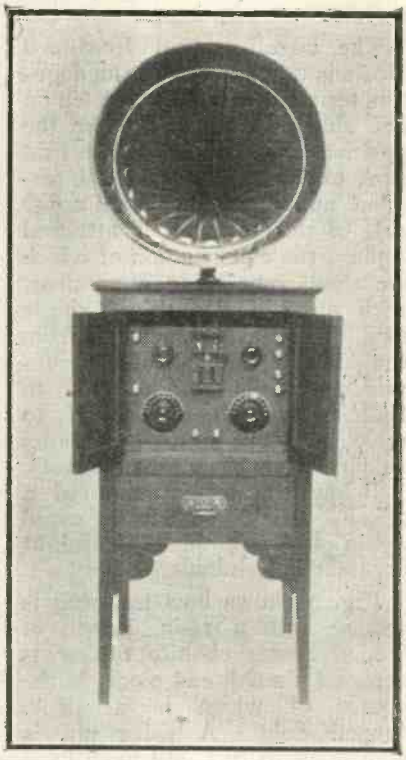
The rough drawing is then revised so that grid and plate leads in particular are as far apart as possible, and any wires at different potentials are so arranged that they do not run parallel and close together.

The actual wiring may now be proceeded with. We begin of course with the lowest layer. Let us suppose that two terminals, as seen in Fig. 5 have to be joined. The distance between them is measured roughly, and a piece of stiff tinned-copper connecting wire about 1 in. longer is snipped off. Its ends are bent on the hard wood former seen in Fig. 6. Square corners are avoided, since if wire is bent at right angles its skin is apt to crack, and it must be remembered that high-frequency currents flow only over the skin of conductors, a crack therefore offers a fairly high resistance. The wire is then soldered to the terminals.

When the first layer is complete the second is tackled, and finally one comes to the third. The fact that a drawing is made and that the wiring is planned out—a matter of a few minutes—mean that the whole process is systematic. If one goes slap-dash at the job it may be found when it is half done that something does not work out properly, so that much of the work must be done over again.

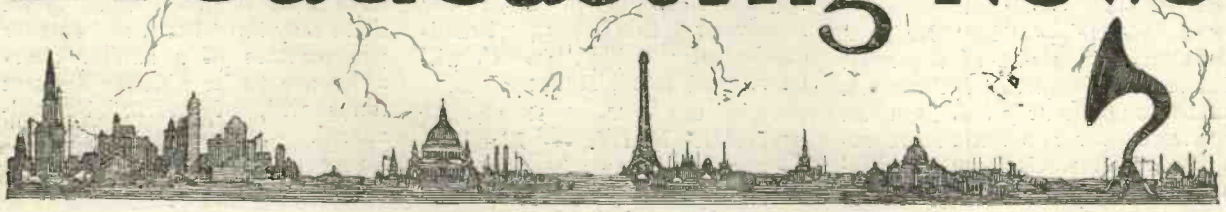
One last point. Every connection *must* be soldered. If you have ever seen a tightly-clamped join under high-power magnification you will realise that no matter how hard you screw down nuts on to wires the resulting connection is a very poor and patchy one. When solder is used there is an actual blending of metals; hence perfect contact with low-resistance results.

R. W. H.



A neat and handsome ST100 set made by Mr. Newman, a very capable experimenter.

Broadcasting News



LONDON.—Wednesday, November 14, marked the first anniversary of 2LO broadcasting, and the night's programme was excellent and well conceived. The talk by Senatore Marconi was of great interest, and is reproduced elsewhere in this issue. We were charmed with the excessively Canadian accent of Sir Patrick McGrath, and with his interesting and straightforward little chat about the beginning of wireless long-distance reception. We also thought Mr. Reith spoke exceedingly well, and the little prelude to these speakers was a very happy one.

□ □ □

We really must express our appreciation of the ever-improving 2LO Wireless Orchestra. Mr. L. Stanton Jeffreys seems to believe in Coueism, and to take for his motto, "better and better."

□ □ □

The General Election will provide another opportunity for broadcasting to perform an interesting and popular service.

□ □ □

On the nights of December 6 and 7, between 10 p.m. and 12 o'clock midnight, it has been arranged to broadcast the results of such political contests as those in which Ministers, ex-Ministers and other well-known politicians are engaged. These announcements will be made from the London Studio at the conclusion of the Musical Items by the Savoy Orpheans. In addition, the state of parties will be broadcast every hour until midnight.

□ □ □

In those towns where a British Broadcasting Station is erected the local results will be given.

Mr. C. B. Cochran has decided to allow the broadcasting of his play "Little Nelly Kelly," now running at the New Oxford Theatre. This will take place in the early days of December.

□ □ □

Forthcoming Events

NOVEMBER.

29th (THURS.).—Musical Talk by "Auntie Hilda" and "Uncle Humpty Dumpty" for Tiny Tots. Mr. Dettmar Dressel, violinist. Milton Rosmer and Co., performing in "Five Birds in a Cage," by Gertrude Jennings. "Carmen" from the "Old Vic" Theatre. Dance Music from the Savoy Hotel.

30th (FRI.).—Special Scotch programme in recognition of Saint Andrew's Day. Orchestra. Miss Carmen Hill, singer. Mr. Andrew McIntosh, selections on the Pipes. Mr. Willie Cochrane, "mystery" singer.

DECEMBER.

1st (SAT.).—Orchestra and Dance Programme. Miss Linda Brooks, comedienne. Mr. Charles Grant, baritone.

2nd (SUN.).—Balalaika Orchestra. Miss Marguerita Davis, soprano. Miss Constance Izard, violinist. Miss Beatrice Bellini, pianist. Mr. David Openshaw, baritone. Miss Catherine Aulsebrooke, contralto. Mr. John Collinson, tenor. Orchestra.

3rd (MON.).—Performance of "The Tales of Hoffmann."

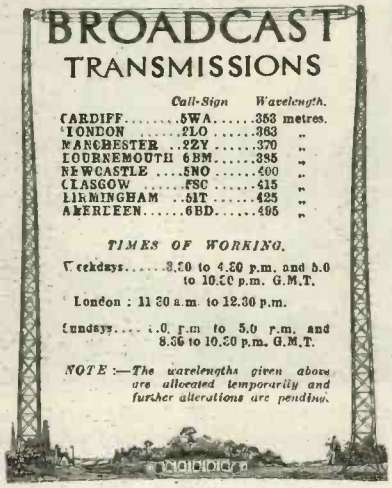
4th (TUES.).—Mr. G. Wenger, Talk in French. Band of H.M. Grenadier Guards. Selection from the "Beggar's Opera." Mr. Tom Kenniburgh, baritone, and Mr. George Lumb, entertainer.

5th (WED.).—Miss Florence Jenkins, soprano. Mr. Pollard Crowther, "Reminiscences of Japanese Customs and Folklore." Canterbury Tales, by Mr. Leonard Badman. Wireless Orchestra. Syncopated Songs, by Miss Margot D'Arvis and Mr. Fred Spencer as "Mrs. 'Arris."

6th (THURS.).—Musical Programme. "Maritana" from the "Old Vic." Savoy Orpheans' Dance Music. Savoy Havanna Band.

7th (FRI.).—Orchestra. Signor Silvio Sideli, baritone. Mr. Ronald Gourley, inimitable blind entertainer, pianist and siffleur.

8th (SAT.).—The Elite Concert Party. Capt. Peter Cheyney, entertainer.



□ □ □

BELFAST.—Glasgow is the favourite station with most Northern Ireland listeners, by reason of its nearness. Hence those who tuned in 5 SC recently, in hopes of hearing the simultaneous broadcasting of the Besses o' the Barn Band concert, experienced dissatisfaction because of the breakdown, under weather conditions, of the Manchester-Glasgow land line. However, those who tuned in Manchester direct were able to receive the music with every satisfaction, thus proving that in re-

gard to reliability wireless far excels its predecessor, the ordinary telegraphic system.

□ □ □

GLASGOW.—The "Kiddies' Corner" is one of the most interesting features of the work of the officials at 5 SC. On an average over 200 letters are received each week from youthful correspondents in connection with the various competitions, or requesting a particular item to be broadcast, or even desiring a message to be radioed for the benefit of their guests at a children's party. Mr. Carruthers and his staff are always willing to oblige, as a result of which there has now grown up a close bond of friendship between the "uncles" and their thousands of little "nephews" and "nieces."

□ □ □

An enterprising "turn" on the programme recently was the production of "A Midsummer Night's Dream," under the directorship of Mrs. R. E. Jeffrey, wife of the popular Aberdeen station director. The artistes acquitted themselves with the greatest credit, and the performance was a brilliant success alike from the technical and the artistic point of view. Another special treat is in store for December 6, this being the broadcasting of "Trilby," which will be relayed to all stations.

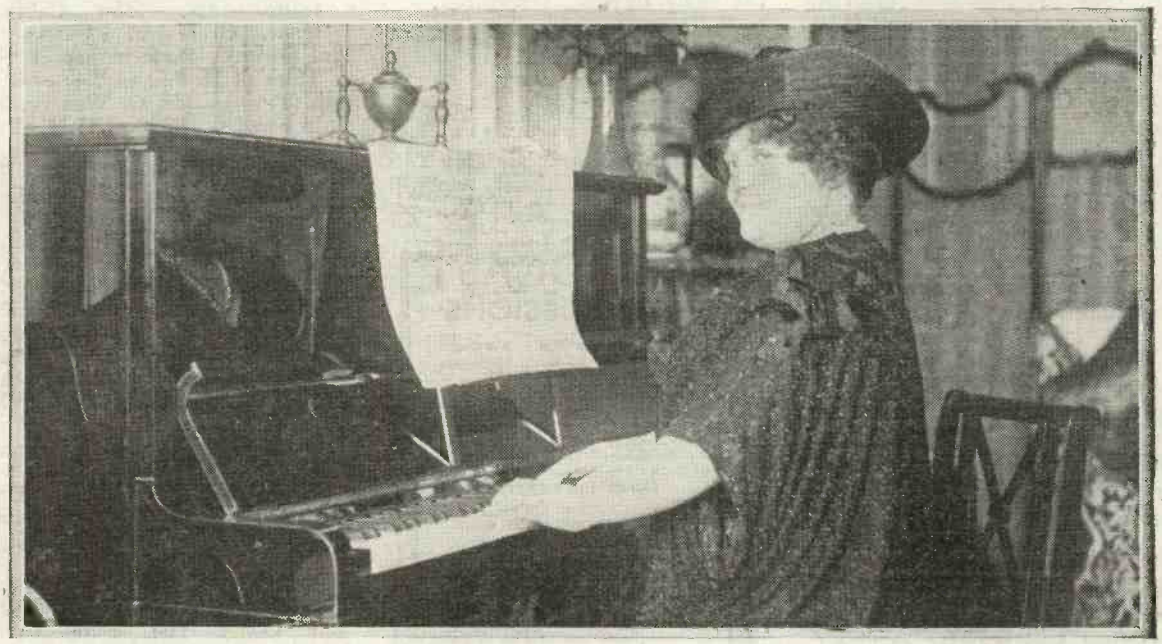
□ □ □

BIRMINGHAM. — Birmingham had its own Station anniversary on the Friday following the birthday of the B.B.C., and a splendid programme was arranged for that night, including the names of Romano Ciaroff, the distinguished tenor singer, who is now becoming so popular with listeners, and Sir William Noble, a director of the B.B.C., made a happy speech towards the end of the evening. General Sir Ian Hamilton was also present, and made an appropriate speech.

□ □ □

By way of a change from the usual kind of programme, 5IT's Repertory Choir recently gave a recital of "songs of the past"—a miscellany of some of the songs which have delighted generation after generation, and seem never to lessen in their appeal. It was not known whether such a programme would find wide appreciation, but the correspondence of the next few days soon dispelled what doubt there may have been, and further programmes of a similar character are to be given. Request items will, of course, be welcomed.

□ □ □



Our photograph shows Madame Tetrazzini, who is to sing at 2LO in January, when her performance will be simultaneously broadcast from all stations.

Forthcoming Events

NOVEMBER.

28th (WED.).—7.30 to 9.30, Special repeat performance of the Opera, "The Magic Flute."

29th (THURS.).—3.30 to 4.30, Miss Lilian Clutterbuck, contralto; Miss Isabel Tabbs, soprano. 9.45 to 10, Miss Alice Pardoe in Humorous Recitals at the Piano.

30th (FRI.).—7.30 to 9.30, Station Orchestra in special request items. 10 to 10.15, Messrs. Joe Longmore and Neville Bosworth in 15 Minutes' Mirth.

DECEMBER.

3rd (MON.).—3.30 to 4.30, Miss Alice Vaughan, contralto, in a Song Recital; Selections by the Lozells Picture House Orchestra. The Opera, "Tales of Hoffman."

4th (TUES.).—3.30 to 4.30, Mr. Alfred Richards, solo violinist; Picture House Orchestra. 7.15 to 9.30, The Greys Concert Party.

MANCHESTER.—The Manchester station celebrated its first anniversary on Thursday, the 15th inst., with a musical programme by the famous Lancashire band, the "Besses o' the Barn." It was much to be regretted that the stormy weather prevailing at the time interfered with the land-line transmissions to the other stations. This is a factor which is difficult to guard against so long as overhead land-line are employed, and is one which will have to be reckoned with in arranging simultaneous transmissions as a regular feature.

□ □ □

An interesting item in the musical programme rendered by the 2ZY augmented orchestra on Wednesday last was the Russian symphony by Glieve, which has never been performed in Manchester before, and probably not more than thrice in this country.

□ □ □

Forthcoming Events

NOVEMBER.

28th (WED.).—3.30, Piccadilly Picture Orchestra. 6.30, Organ Recital, Piccadilly Picture House. 7.45, Shakespeare's "A Midsummer Night's Dream"; Mendelssohn's Incidental Music by 2ZY Augmented Orchestra.

29th (THURS.).—11.30, 2ZY Trio. 6.40, Girl Guides' and Boy Scouts' Bulletins. 7.45, Apollo Glee Club. 9.45, Spanish Talk.

30th (FRI.).—3.30, Concert by Miss Florence Holding, soprano; Mr. Wm. Watson, elocutionist, and Mr. A. Porter, tenor. 6.40, Spanish Talk. 7.45, Scotch Songs and Music (St. Andrew's Day); Miss Jeannie Copeland, soprano. 8.45, Talk on "Robert Burns."

DECEMBER.

1st (SAT.).—3.30, Oxford Picture House Orchestra. 5.10, Talk on "Flowering Plants for Table Decoration." 6.30, Organ Recital, Piccadilly Picture House. 7.45, Keyboard Kitty. 8, Mr. Foden Williams, entertainer; Miss Agnes Clarke, soprano; Mr. Steven Williams, baritone. 8.45, Mr. Victor Smythe and "Algy."

2nd (SUN.).—3, Organ Recital, Piccadilly Picture House; Mr. Fred Brough and Miss Daisy Shorrocks, violin solos and duets. 8, Talk to Young People, by Mr. S. G. Honey. 8.30, Talk by Rev. T. L. Parker, M.A., of St. Bede's College. 8.45, 2ZY Orchestra.

3rd (MON.).—3.30, 2ZY Trio. 6.35, Boys' Brigade Bulletin. 6.40, Spanish Talk.

4th (TUES.).—3.30, Concert by Miss Muriel Hargreaves, solo pianist; Miss Gladys Filchett, soprano; Mr. A. Brough, bass-baritone; Mr. S. Lomas, tenor. 7.45, Altrincham Primitive Methodist Choir. 8.45, Mr. Percy Phlage and persiflage. 9.40, Spanish Talk.

□ □ □

NEWCASTLE.—Apropos of our remarks last week, we are pleased to announce that the circle from which artistes figuring in the 5NO programme are drawn has been considerably widened, and the changes will be evident in the near future. The desire to present the greatest possible variety, compatible with a high standard, has always been felt by the Station directorate, but it is more difficult to carry this out than might be imagined, as out of the many who receive auditions only a small percentage prove suitable for broadcasting.

□ □ □

Great regret was felt in this district that what appeared to be such an excellent concert simultaneously broadcast from Manchester should have been so marred in land-line transmission as a result of the previous day's storm.

□ □ □

Forthcoming Events

NOVEMBER.

28th (WED.).—3.45, Mr. W. A. Grosse, clarionet; Mr. Jacobson, 'cello; Mr. Geo. Gibson, baritone. 7.30, Orchestra; Miss Kathlyn Birch, soprano; Mr. Philip Wilson, tenor, illustrating music of the times of Elizabeth and James I.

29th (THURS.).—3.45, Miss Mabel Offer, mezzo-soprano; Miss Rosina Wall, violinist.

30th (FRI.).—3.45, The Herman McLeod Quartette; Miss Norah Studley, mezzo-soprano. 7.30, Scottish Night; Orchestra; Miss May Osborne, mezzo-soprano; Mr. David Macfadzean, baritone; Mr. Ernest Sharp, violin; Mr. W. A. Crosse, clarionet.

DECEMBER.

1st (SAT.).—3.45, Mme. Maud Jaukes, violinist; Miss Jennie Gardner, soprano. 7.30, St. Hilda's Colliery Band; Mr. C. A. Vincent Jones, baritone; Miss Norah Wiggins, soprano; Mr. W. A. Bates, entertainer.

2nd (SUN.).—8.30, Rev. H. G. Absalom, address; Mr. Ernest Sharpe's Trio; Mr. Geo. Tindle; Mme. Ethel Fowkes, soprano.

3rd (MON.).—3.45, Mr. Wm. Laws' Trio.

4th (TUES.).—3.45, 5NO Bijou Orchestra; Miss Phyllis Rickard. 7.30, Station Orchestra; Messrs. Charlton and Wright, entertainers; Mr. T. Heenan, tenor; Miss Erica King, soprano.

□ □ □

Simultaneous Broadcasting Events.

NOVEMBER.

28th (WED.).—Mr. Archibald Haddon, Dramatic Critic. "A Midsummer Night's Dream.

29th (THURS.).—Mr. Percy A. Scholes, Music Critic. Talk by the Radio Society of Great Britain. Mr. Dettmar Dressel, Short Violin Recital. "Five Birds in a Cage," produced by Milton Rosmer. "Carmen," Act 2, from the "Old Vic" Theatre. Mr. Anthony Bertram, Talk on "The History and Meaning of Modern Painting." "Carmen," Act 3. Savoy Orpheans and Savoy Havanna Bands.

30th (FRI.).—Mr. G. A. Atkinson, Film Critic.

DECEMBER.

1st (SAT.).—Wireless Orchestra. Mr. Dave Thompson, baritone. The Empire Male Voice Quartette of Kilmarnock. Short Talk on "Modern Literature," by Mr. J. R. Peddie, M.A., of Glasgow University.

2nd (SUN.).—Balalaika Orchestra.

3rd (MON.).—Mr. John Strachy, Literary Critic. "Tales of Hoffmann," Acts 1 and 2. Mr. A. G. Haslam on "Hockey." "Tales of Hoffmann," Act 3.

4th (TUES.).—Grenadier Guards Band.

6th (THURS.).—"Trilby." Savoy Orpheans and Savoy Havanna Bands. Election Results.

RANDOM TECHNICALITIES

By PERCY W. HARRIS, Assistant Editor.

A few notes of interest to home constructors.

THE other day a young wireless enthusiast brought to me a home-made variable condenser consisting of two tubes, sliding one within the other. He was interested to know what its capacity might be, and as I had the requisite facilities I measured it. The tube was about 6 inches long and an inch in diameter, whilst the inner tube was of such a size that when one layer of Empire cloth was wrapped around it, it would just slide inside the larger tube. I thought the capacity would be about 0.0001 μF, but on testing it I found that it was no less than 0.0003 μF—a particularly useful size for tuning anode coils. When it is remembered that such a variable condenser can be made up for a few pence, it is surprising that more are not used. Empire cloth is not perhaps the best material to use as the dielectric, but there is no reason why thin mica should not be fastened to the inner tube. An advantage not to be despised in such condensers is their low minimum.

* * *

Experimenters who have had a good deal of experience in winding their own high-frequency transformers might try their hand at making vario-transformers. These I believe were invented by Stuart Ballantine, the Author of the text book, "Radio Telephony for Amateurs." These vario-transformers, which I see are now being placed on the American market, are wound on a similar principle to the variometer, but instead of one winding, two wires are used. In this way we can obtain the advantages of a variometer in tuning without shunted capacity (other than that of the valve), together with the advantages of the transformer. Well-designed high-frequency transformers certainly seem to give good results, and I can see a great future for the new type.

It is surprising how some of the bigger firms sometimes make stupid blunders with their components. A well-known firm which sells clips for holding tubular valves of the V24 and QX type has recently been selling them with the metal covered with a thin, practically invisible, layer of lacquer. The result is that when the clips are mounted and the valves placed between them a high resistance is interposed in the plate and grid circuits. Signals are obtainable with this film in place, but they are only a fraction of the strength they should be. A remedy, of course, is to rub the clips with emery paper to remove the lacquer, and I would recommend this course to any reader who is using these clips in his own set. Several readers of my *Modern Wireless* article on a "Transatlantic" Receiver have had trouble with this instrument until they had rubbed the clips with emery.

* * *

To give another example, a well-known make of plug-in coil of excellent quality is fitted with plugs of first quality ebonite much superior to those of a rival make. In securing the coils to this plug a strip of fibre is used, the terminal screws passing through this fibre in two places. Now fibre has insulating qualities much inferior to that of ebonite and suffers from the disadvantage of absorbing moisture. Again, take the case of the adaptors sold for fitting V24 valves in the ordinary 4-pin socket. These valves are much more expensive than the ordinary 4-pin variety, and practically the only advantage (an important one) they possess over the other type is the low capacity due to the absence of any bunching of wires in the base. Every adaptor I have seen has been so constructed that it possesses a large capacity between pins, thus effectively nullifying the virtues of the valve.

Apparatus we have tested

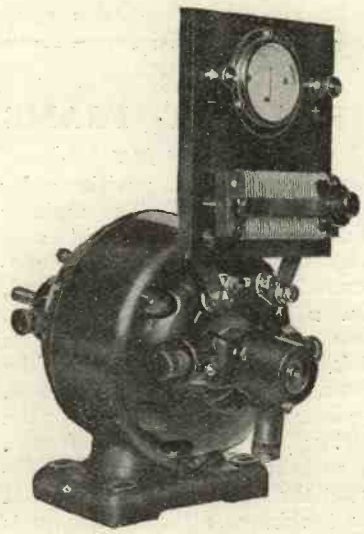
Conducted by A. D. COWPER, M.Sc., Staff Editor.

An Accumulator-Charging Set for D.C. Mains.

Messrs. Lionel Robinson & Co. have afforded us an opportunity of closely examining, and viewing in actual operation in accumulator-charging and on test-load, a rotary converter, the "Ella," for operating off the ordinary direct-current 100 to 250-volt lighting-mains. This is a small machine weighing 15 lbs., which resembles very closely a small fan-motor on which, indeed, the design and type of equipment of this converter are actually based. It should, accordingly, be just as easy to operate, and as trouble-proof as are those highly-developed pieces of domestic machinery. This instrument has ample plain white-metal bearings, grease-lubricated; the two commutators (one at each end of the armature shaft) necessitated by the principle of the rotary converter are of substantial design, and are fitted with standard types of interchangeable carbon brushes. We understand that spare parts are kept in stock and obtainable at a reasonable price when, after extensive use, any replacements may be necessary.

The machine ran extremely steadily and quietly, and delivered its full output of 5 amperes without sparking at the commutators or other signs of distress. It is started by simply plugging an adapter into the nearest lamp-holder, and gives up to 9 volts at the secondary terminals. The cost of charging a 6-volt 40 ampere-hour (actual) accumulator is given as approximately that of one unit, say 8d., or according to locality.

It is also supplied with a removable control panel, fitted with rheostat and voltmeter, if required. We are of the opinion, after close examination of this sturdy little machine, that at the reasonable price asked for it, it represents good value, and will prove a good investment to those who possess a valve set and have access to a D.C. supply.



The Ella home-charger for D.C. mains.

A 9-Plate Variable Condenser with Vernier.

The Sterling Telephone & Electric Co., Ltd., have submitted for test a 9-plate variable condenser, for panel-mounting, provided with a 2-plate "vernier" controlled by a small knob co-axial with the main control knob and having a specially-shaped contour for the moving plates. This has the effect of providing a more nearly linear adjustment of wave-length throughout the scale than is obtained with the ordinary type—when used as a parallel tuning-adjustment; thus the plates are given a spiral or snail-cam form, so that the variation of capacity for a given angular movement is much greater towards the end of the scale. As wave-length (with a given inductance) varies as the square-root of the capacity associated with the inductance, this device gives a more regular increase in wave-length, so facilitating setting to a particular wave-length desired and making the instrument particularly suitable for use in wave-meters, etc.

The condenser is arranged for fixing behind the panel by three small screws; a high-class bevel scale and knobs being provided.

The plates are of brass with small clearance and are rigidly fixed in a brass and moulded composition frame, and on a stout spindle rotating in substantial metal bearings, respectively. Good silent contact is ensured by a spring friction device on the moving spindle.

On test, the minimum capacity was approximately 0.00001 μF; the vernier gave about 0.000007 μF for fine adjustment and the maximum total capacity was 0.00028 μF; though at 90 degrees of the scale—apparently half-way—the capacity was only 0.00008 μF.

The Radio Society of Great Britain.

FRANCO-BRITISH TESTS ON ABOUT 200 METRES WAVELENGTH.

THE following arrangements have been made in consultation with the President of the Joint French Committee :—

The tests will take place between November 26 and December 9, 1923; French amateurs will transmit on November 26, 28, and 30, and December 2, 4, 6, and 8. British amateurs will transmit on November 27 and 29, and December 1, 3, 5, 7, and 9; all between the hours of 23.00 and 24.00.

French amateurs whose call signs begin with the letters 8A will transmit from 23.00 to 23.15; those whose sign begins with 8B from 23.15 to 23.30; those whose sign begins with 8C from 23.30 to 23.45; those whose sign begins with 8D or 8E from 23.45 to 24.00. The text transmitted will consist of the letters R.S.G.B. repeated three times, followed by the word "de" and by the call sign of the station calling, repeated three times; the whole being repeated throughout the fifteen minutes allotted.

British amateurs will transmit as follows :—The Southern group from 23.00 to 23.15; the Midland group from 23.15 to 23.30; the North of England group from 23.30 to 23.45; and the Scottish group from 23.45 to 24.00. The text should consist merely of a series of Vs with the occasional interpolation of the call sign of the station calling. Precise instructions will be posted to the members of the T. & R. Section.

British amateurs who succeed in picking up any of the French signals are requested to report immediately to the Hon. Secretary of the T. & R. Section, Finsbury Technical College, Leonard Street, London, E.C.2. Other British amateurs who are not taking part in these tests are requested to be so courteous as to refrain from unnecessary jamming. The French and British organisations will in due course exchange reports regarding the successful receptions in the two countries.

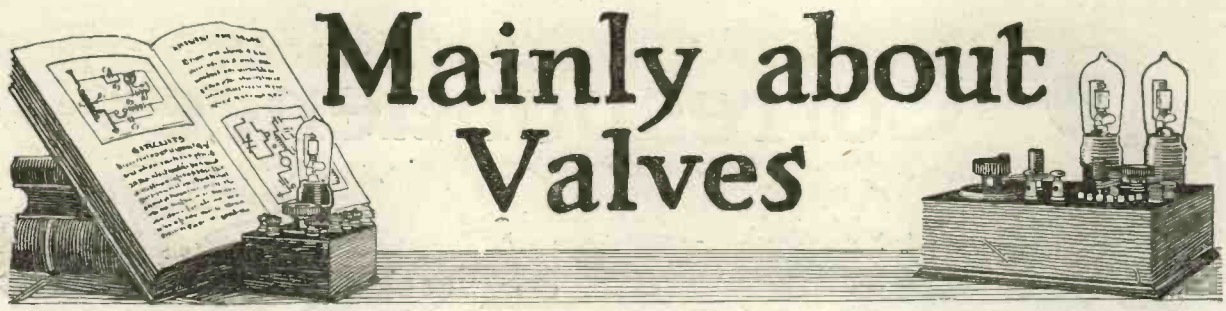
A WALL BRACKET FRAME AERIAL.

(*Concluded from page* 686.)

For broadcast reception six turns will be found satisfactory. To remove all possibility of the wires slipping out of place when the frame is folded, thin strips of ebonite may be fastened over the slots when the wires are all in position.

The next item to receive attention is the construction of the wall bracket itself. To make the part which is fixed to the wall, procure a piece of hard wood 12 in. x 6 in. x $\frac{7}{8}$ in. Next cut two further pieces of wood 6 in. x 3 in. x $\frac{7}{8}$ in., having a hole drilled in the centre of each, as shown in the diagram (Fig. 4). This hole should be made to clear a $\frac{5}{8}$-in. dowel rod. Screw these pieces on to the back board in the positions shown, by means of four stout screws. Make a further four holes in the back board in suitable positions for fixing to the wall. The making of the swivel bracket will now complete the frame. This is constructed from two pieces of wood, 6 in. x 6 in. x $\frac{7}{8}$ in., and one piece 3 1-16 in. x 3 in. x 2 in. thick. In making the two side-pieces, a hole is drilled in each, as shown in Fig. 3, to clear the bearing screws on the frame. These bearing screws may be inserted through the swivel bracket into the frame after the swivel is completed. Next cut a slot in each, as shown, to a depth of $1\frac{1}{2}$ in., of sufficient width to clear the other two screws in the frame. Four holes are now drilled to receive screws to fix the two side-pieces to the back piece of the swivel. The construction of these two side-pieces may be quickly and accurately done by clamping two pieces of wood together and drilling and slotting in one operation. The back piece has a hole drilled right through the centre of the 2-in. side, to clear a $\frac{5}{8}$-in. dowel rod. The sides are then fixed to this piece, as described. Now fix the swivel bracket into the wall bracket by passing a piece of $\frac{5}{8}$-in. dowel rod ($4\frac{7}{8}$ in. long) right through the three pivot holes. Fix the dowel rod by pinning through the upper and lower pieces of the wall bracket.

To wind the frame, pass the wire through the holes in the ebonite brackets in one direction, and finish by connecting the beginning and the end of the winding to the terminals, which are mounted upon ebonite, one on each side of the swivel bracket. This frame will open and close without interfering with the winding in any way.



Mainly about Valves

Our Weekly Causerie written by the Editor.

THE great majority of experimenters join up their reaction coils by trial. Either the reaction coil may be reversed, or the leads to the reaction coil may be reversed; the latter process is necessary when using plug-in coils because if the plug-in coil is taken out, turned the other way round, and put into the sockets again, we are exactly where we stood, because although we have reversed the coil we have also reversed the leads going to it, the leads, of course, being the pins and sockets—even though the leads going to the coil-holder terminals remain exactly as they were.

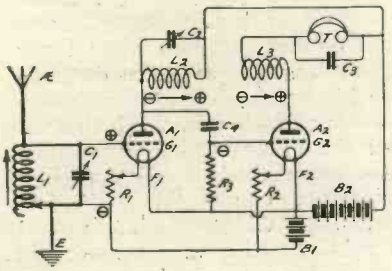


Fig. 1.

There is, however, rarely any necessity for a trial and error method of connecting the leads to the reaction coil, and such a method is often inconvenient when a panel set is being constructed, and may be obviated by noting the following rules which are based on the two coils which are to be coupled being wound in the same direction.

Assuming that the two inductances are wound in the same direction, we can say that if the two coils are coupled end to end the grid of the valve which is providing the reaction may be connected to one extreme end of one of the coils and the other to the extreme end of the other coil. Alternatively, the grid and anode may be connected to the two inside ends of the coils respectively.

Fig. 1 shows the first possible arrangement. The coils L2 and L3 are wound in the same direction, and the anode of the first valve is connected to the left-hand side of L2; this left-hand side is connected to the grid of the second valve which is providing the reaction. This reaction, of course, would be obtained even if the first valve were not alight. The right-hand side of the coil L3 is connected to the anode. By coupling L3 to L2, a reaction effect is introduced by the second valve into the tuned anode circuit L2 C2, which is, in effect; really the tuned grid circuit of the second valve.

The potentials at different points of the circuit are given in Fig. 1, and these provide a rough and ready explanation of the phenomenon. It will be seen that the first grid is positive; this causes an increase of anode current, which means that more electrons are flowing from the left-hand side of L2 to the right-hand side. The left-hand side of L2 is therefore negative and the right-hand side positive. As the left-hand side is connected to the grid of the second valve, G2 is also negative; this causes a decrease of anode current of the second valve. A decrease in current from the right-hand side of L3 to the left-hand side is equivalent to a flow of electrons from the left-hand side to the right-hand side, and the right-hand side is therefore positive while the left-hand side is negative. The magnetic fields produced by the currents in L2 and L3 therefore assist each other and a reaction effect is obtained.

Fig. 2 shows another method of connecting the two inductance coils so that a reaction effect is still obtained. This time the anode of the first valve is connected to the right-hand side of the coil L2 instead of to the left-hand side. The right-hand side therefore now becomes negative

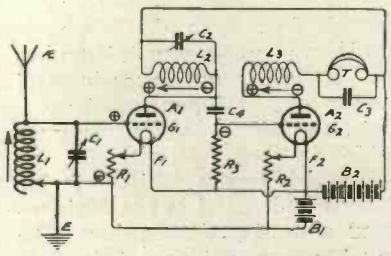
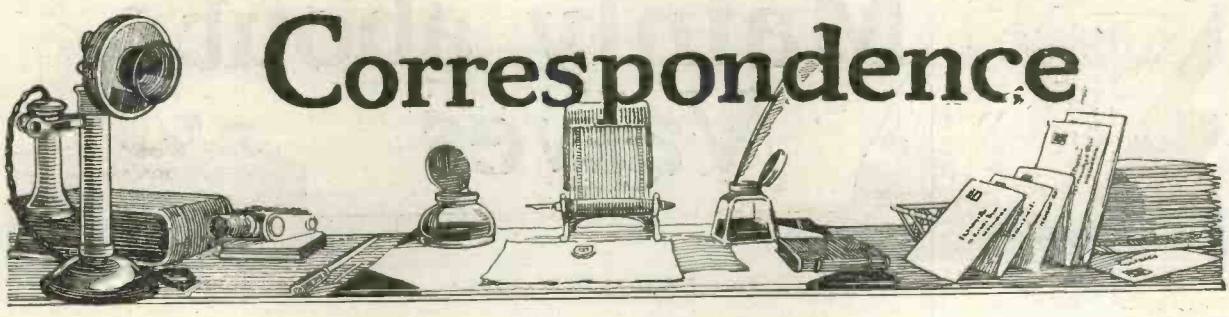


Fig. 2.

while the left-hand side is positive, and there is an electron flow from right to left. The connections to the reaction coil L3 are also reversed so that we have what is equivalent to a flow of electrons from the right-hand side of L3 to the left-hand side. Once again the two arrows underneath L2 and L3 point in the same direction and the magnetic fields help each other.

If reaction is being obtained, it is always possible to reverse both sets of leads without interfering with the phenomenon.



DUAL AMPLIFICATION.

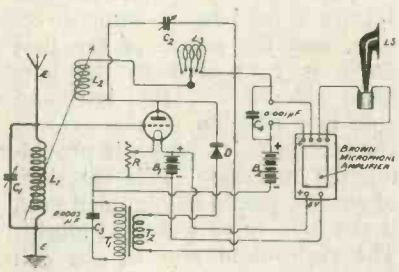
SIR,—I send you herewith a single-valve dual amplification circuit which I employ most satisfactorily for loud-speaker work, in the hope that it may be of interest to readers of your excellent paper. The circuit, as you see, is an extremely easy one to connect up, and it is equally simple to handle, proving with me very stable, and not subject to howling or to influence by body capacity.

My chief aim in wireless reception is always to eliminate distortion, and at the same time to ensure an adequate volume of sound. "Thin" music, even though free from distortion, is not in my opinion worth listening to. I have an experimental licence and have connected up a great number of circuits, using up to four valves, but with the circuit which is the subject of this letter I find that I get at Maidenhead a power of reception quite equal to three valves and singular freedom from distortion.

I employ a multiple cats-whisker instead of the single wire, and find that the circuit works well with Cossor, Ediswan or D.E. valves. Ediswan are perhaps the best, in that they give a better tone. The Brown Microphone Amplifier, when carefully adjusted and left alone, is a beautiful instrument, but it does not like being banged about.

I find that the values of condensers across the 'phones and secondary of the transformer are not at all critical, and that one across the primary of the transformer reduces signal strength with no compensating advantages. Potentiometer control of the grid has so far failed to improve matters — rather the reverse.

I show a part of the anode tuning inductance loose coupled to the aerial circuit, but the alteration of this coupling only appears to alter the tuning, doubtless due to a change of mutual inductance between the coils and the circuit works equally well, and with practically the same signal strength, without any reaction at all.—I am, etc.,



The circuit referred to by Mr. Horsburgh.

G. D. L. HORSBURGH.

Cannon Street, E.C.4.

H. F. STAGE TO ST100.

SIR,—Reading Mr. Cowper's article in *Modern Wireless* on "Adding a High-Frequency Stage to ST100," I found I could make the alteration to my previous circuit quite simply by purchasing another variable condenser 0.0005 μF, and a small Vernier for capacity coupling between the anode of the first valve to the grid of the second. I might say I experienced a little difficulty at first due to the set oscillating, but overcame this by a little judicious use of a potentiometer controlling the grid of the first H.F. valve. For the choke coil I use a basket coil consisting of 200 turns. The aerial and tuned anode coils are all basket coils of suitable size tuned with variable condensers. I use about 70 volts on the anodes of both valves.

As to results, nothing to my mind could be better; London comes in at terrific strength, and it is no exaggeration when I say I can hear the orchestra down in the kitchen with my set upstairs (about 30 stairs) in the bedroom. All the other stations are tuned in comparatively easily and Birmingham comes in with fine strength. Glasgow is quite good providing the atmosphere is favourable. There is not much to choose between Birmingham and Newcastle as regards strength of signals.

By the above you will see I am very delighted with this circuit and recommend it to all I know who are interested.—I am, etc.,

J. F. SPARROW.

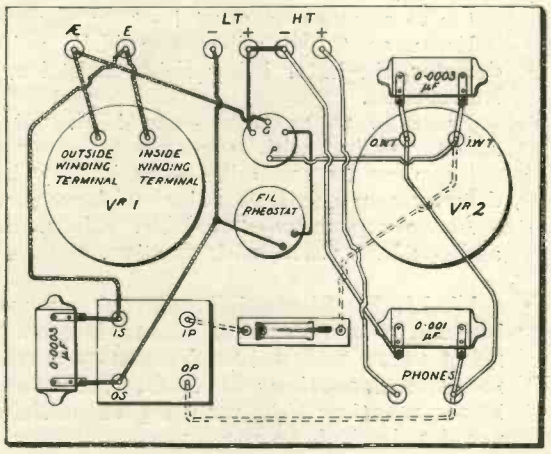
Gravesend, Kent.

The Editor regrets that owing to the demands upon our space a number of letters are unavoidably held over.

Information Department

F. L. E. (LONDON) asks for a wiring diagram of the "WIRELESS WEEKLY" Reflex Receiver described in our issue of Sept. 12th.

We reproduce herewith an illustration of the components with their individual connections.

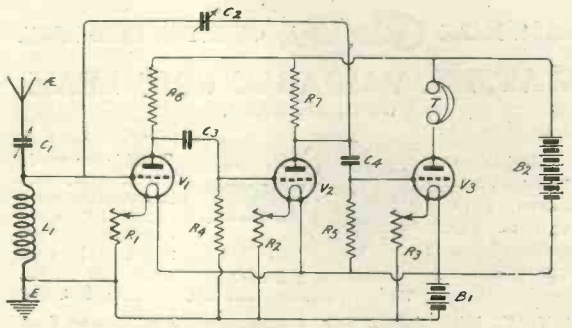


D. P. (CLAPTON) asks what are the present regulations regarding the dimensions of an aerial.

The regulations permit the use of an aerial, the combined length and height of which must not exceed 100 ft., irrespective of the number of wires employed. It is further understood that the height really refers to the length of the down-lead. An aerial 80 ft. in length with a down-lead of 20 ft., or one having a length of 50 ft. and a 50-ft. down-lead, would comply with the regulations, and either aerial could consist of a single wire, two or three wires upon spreaders, say 6 ft. in length, or even 4 or 6 wires arranged upon circular hoops.

S. T. (BOURNEMOUTH) asks what is meant by electro-static reaction, and how is it applied in a circuit.

In the case of electro-static reaction, the desired result is obtained by the use of a variable condenser, connected between the anode and grid circuit, as shown in the accompanying diagram. This method is also commonly called "capacity reaction."



B. K. (GRAVESEND) asks what is meant by the amplification factor of a valve.

This is perhaps best illustrated by means of an example. Suppose a change of 1 volt in the grid potential of a valve produces a change in anode current equal to that which would be produced by increasing the anode voltage to 10 volts, the amplification factor would be said to be 10.

J. G. G. (BIRMINGHAM) is experiencing trouble with his low-frequency amplifier, due to "howling."

Space out all the internal wiring of the set as much as possible to reduce inductive effects, placing the intervalve transformers as far from one another as possible and arranging their windings at right angles. Try also (1) reversing the connections to one or more of the primary windings of your low-frequency transformers, (2) connecting the iron cores together, and (3) connecting the iron cores either to earth or to the positive side of the high-tension battery.

F. D. (NEWCASTLE) inquires regarding the probable cause of his valve receiving set being noisy.

The crackling noises complained of may be due to faulty high- or low-tension batteries, to a faulty

connection inside the set, to poor contact at one of your tuning switches, condenser spindles or filament rheostats, or to a dirty or badly fitted valve pin. Disconnect the aerial lead from the set and note whether the noises continue, as possibly they may be due to atmospherics. Remove the earth lead and again note the effect. If the noises now stop, they are probably due to induction from local electrical machinery, power lines, etc. If on examination all the foregoing points appear to be in order, a more serious breakdown is indicated, such as the winding of the telephones or transformers, and it will be necessary to test the components separately.

B. L. (CHESTER) asks what type of apparatus is recommended for good reliable reception in telephones, from the British broadcasting stations.

Under average conditions, the following are the results which may be relied upon with the apparatus specified :—

Up to 20 miles—a crystal set.

From 20 to 50 miles—one H.F. valve and detector, the latter being either crystal or valve. No reaction.

From 40 to 70 miles—one H.F. valve and detector (valve) with reaction.

From 70 to 100 miles—one H.F. valve and detector plus one L.F. valve, with reaction.

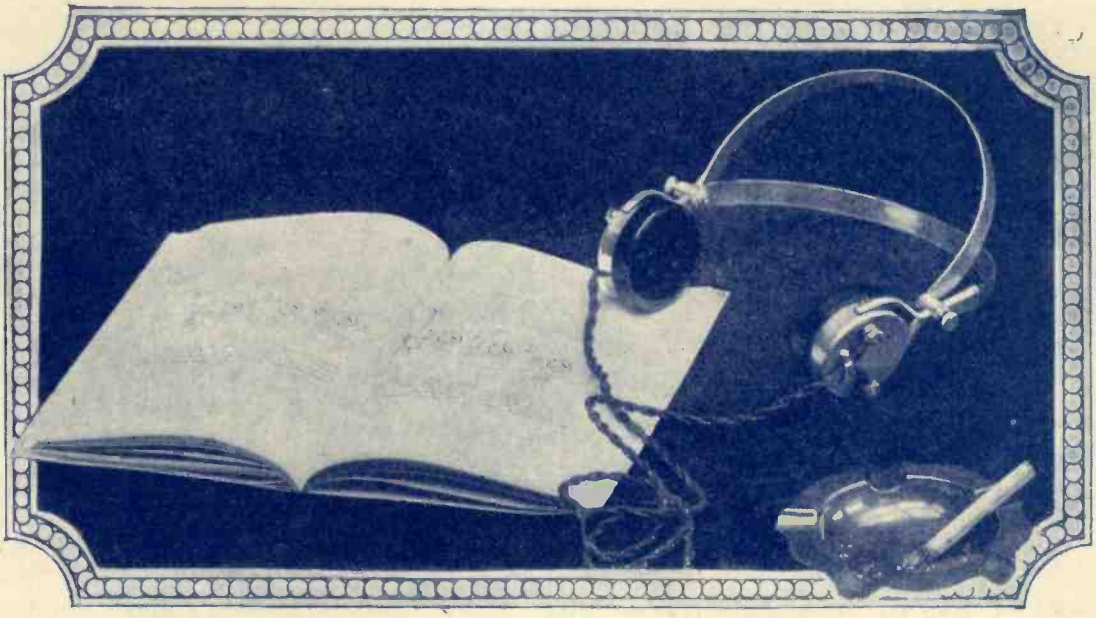
Above 100 miles—two H.F. valves, detector and one L.F. valve, with reaction.

W. M. F. (Shorncliffe Camp) proposes to build a two-valve set, comprising a rectifying valve and a low-frequency amplifier, for the reception of 2LO. He wishes to know whether this would give satisfactory results in Folkestone.

Though you may expect to receive 2LO with fair strength we suggest that the addition of a high-frequency valve on the lines of circuit ST45 "Practical Wireless Valve Circuits," Radio Press, Ltd., would greatly increase the range of your apparatus, adding considerably to the pleasure and interest of your proposed receiver.

BOOKS.

From the number of queries we receive from readers it would seem that it is not known how adequately do Radio Press books deal with the subject of wireless. A full list of our Publications together with prices, etc., may be found on the inside of the cover of this issue.



Good Books are more than half the battle

Choose your Books from this List :

	Price.
1. **Wireless for All** .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	6d.
2. **Simplified Wireless** .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	1/-
3. **How to Make Your Own Broadcast Receiver** .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	1/6
4. **How to Erect Your Wireless Aerial** By B. MITTELL, A.M.I.E.E.	1/-
5. **The Construction of Wireless Receiving Apparatus** .. .. .. By P. D. TYERS.	1/6
6. **The Construction of Crystal Receivers** By ALAN L. M. DOUGLAS.	1/6
7. **How to Make a "Unit" Wireless Receiver** .. .. By E. REDPATH.	2/6
8. **Pictorial Wireless Circuits** .. .. By OSWALD J. RANKIN.	1/6
9. **Wireless Valves Simply Explained** .. By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
10. **Practical Wireless Valve Circuits** .. By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
12. **Radio Valves and How to Use Them** By JOHN SCOTT-TAGGART, F.Inst.P.	2/6
13. **500 Wireless Questions Answered** By G. P. KENDALL & E. REDPATH.	2/6
14. **12 Tested Wireless Sets** .. .. By P. W. HARRIS.	2/6
15. **More Practical Valve Circuits** .. By JOHN SCOTT-TAGGART, F.Inst.P.	3/6
16. **Home-Built Wireless Components** ..	2/6
Elementary Text-book on Wireless Vacuum Tubes .. .. .. By JOHN SCOTT-TAGGART, F.Inst.P.	10/-
(post free.)	

IT is only when you begin to take a keen interest in Wireless that you feel the need for a guiding hand. There are two ways in which you can pick up reliable Radio knowledge—one is to join your local Radio Society and the other is to read helpful and interesting books.

Both of these methods should be adopted. The Books issued by Radio Press Ltd. and shown in the adjoining columns are recognised as forming a complete Wireless Library. Each is part of a definite series and none overlap.

Make a start with your Library to-day by buying the first three or four books—the extra information you will gain about Wireless will more than recompense you for the small outlay.

From all Booksellers or sent direct from publishers (postage 2d. per book extra).

RADIO PRESS, LTD.
Devereux Court, Strand, W.C.2.

Radio Press Series.

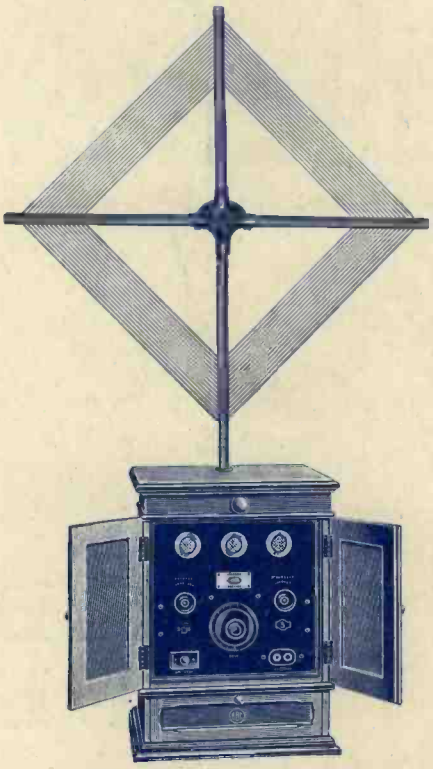
STERLING

STERLING FLEX THREEFLEX

THREEFLEX
Radio Receiving Set

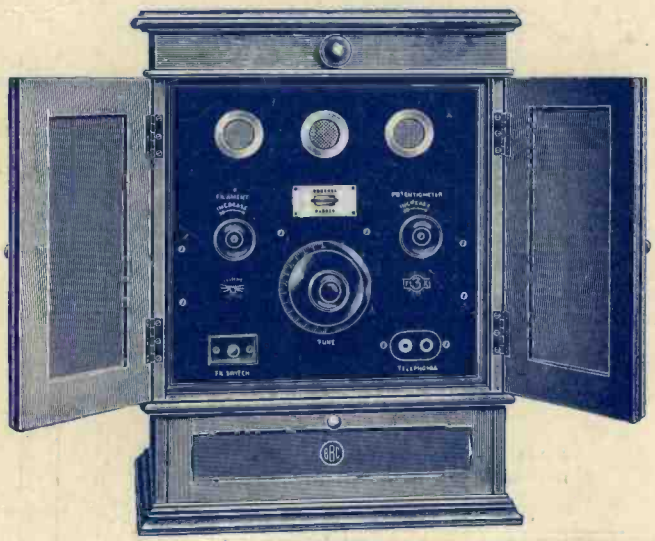
WHOLLY BRITISH MANUFACTURE.

THIS super reflex instrument requires NO OUTDOOR AERIAL or EARTH and WILL RECEIVE ALL B.B.C. STATIONS. It will give AMPLE LOUD SPEAKER VOLUME for average requirements within 25 miles of a station. The THREEFLEX reproduces with remarkable clarity; it is tuned with a single control and can be erected ANYWHERE, ready to receive, in a few seconds.



The "STERLING" THREEFLEX Ready to Receive.

The D.E.3 Valves employed in this set consume less than one-quarter the current required by other types, and will run six months with average use from the battery supplied.



No. R1590

Complete in highly finished walnut cabinet with loop aerial, one pair of "Sterling" super quality headphones, high and low tension dry batteries, a small grid battery, and plug and lead for a loud speaker ... ... Price **£31 10 0**

EXTRAS:

Three D.E.3 valves at 30/- each **£4 10 0**

B.B.C. Tariff 16/- extra net.

Write for Publication No. 382

Obtainable from all Electrical Dealers and Stores.

STERLING TELEPHONE & ELECTRIC CO., LTD.

Manufacturers of Telephones and Radio Apparatus, etc.

(WHOLESALE ONLY).

Telephone House, 210-212, Tottenham Court Rd., LONDON, W.1

Telegrams: "Cucumis, Wesdo, London." *Telephone:* Museum 4144 (7 lines).

BIRMINGHAM — 150, Edmund Street; CARDIFF — 10, Park Place. GLASGOW—33, Robertson Street; MANCHESTER—14, St. Peter's Square. NEWCASTLE-ON-TYNE—21, Mosley Street. Works - DAGENHAM, ESSEX.

Showing "Loop" Aerial folded

Printed for the Proprietors, RADIO PRESS, LTD., Devereux Court, Strand, W.C.2, by THE AVENUE PRESS (L. Upcott Gill & Son, Ltd.), 55-57, Drury Lane, London, W.C.2. Published on Wednesday of each week at 3, Bolt Court, Fleet Street, London, E.C.4. Address for Subscriptions and Editorial Communications:—Devereux Court, Strand, London, W.C.2. Advertisement Managers:—THE SCHEPP PUBLICITY ORGANISATION, LTD., 125, Pall Mall, London, S.W.1. Registered as a newspaper and for transmission by Canadian Magazine Post. Subscription rates:—32/6 per annum, 16/3 for six months, post free. Sole Agents for Australasia:—GORDON & GOTCH (Australasia), LTD. For Canada:—IMPERIAL NEWS, LTD. For South Africa:—CENTRAL NEWS AGENCY, LTD.