Wireless Weekly, 6d. Net. Wednesday March 4th, 1925

Wireless Weekly

Vol. 5. No. 20.

DETAILED PROGRAMMES OF CONTINENTAL AND AMERICAN BROADCASTING STATIONS

NEW REGULAR FEATURE

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No. 222. Burndept Dual Rheostat, 5-30 ohm. Suitable for a DE3 valve (4½ *v.*) or an R4 or R5 valve (6*v.*), **7s. 6d.**

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Wireless Weekly

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"The Foreign Radio Times"

A New "Wireless Weekly" Feature

READERS of *Wireless Weekly* will be interested to find in the present issue a new feature of immense value to all who like to listen to broadcasting programmes other than those transmitted by the British Broadcasting Company.

As the journal which first published accurate, detailed, and up-to-date time tables of Continental and American broadcasting, we feel great pleasure in being able to present to our readers detailed programmes of many of these stations, in such a form that at a glance it is possible to identify a large number of foreign broadcasting stations by the items they happen to be broadcasting at the moment.

That such programmes are of wide interest is shown by the fact that we receive numerous enquiries asking us to identify particular stations by the song, tune or lecture that happened to be broadcast at the time our correspondents were listening. In future a reference to "The Foreign Radio Times" will solve the problem. It will be found, for example, that at 7.30 p.m. to-day the Zurich station is sending out a programme of English music, including such old favourites as "My Mother Bids Me Bind My Hair"—a tune that thousands will recognise at once. Several German stations are in the habit of giving occasional lessons in English, and sometimes parts of the news bulletin are given out in this language.

It is not generally realised that many foreign programmes are available to the listener who possesses quite a modest set.

CONTENTS

Occasionally, and in favourable conditions, one or two Continental stations can be heard in southern England by the aid of a crystal set, but such instances are comparatively rare. With the owner of a single valve set, however, the chance of his hearing several foreign stations is high, while an efficient two-valve set comprising a stage of high-frequency and a detector will often bring in on the same evening fifteen or twenty European stations.

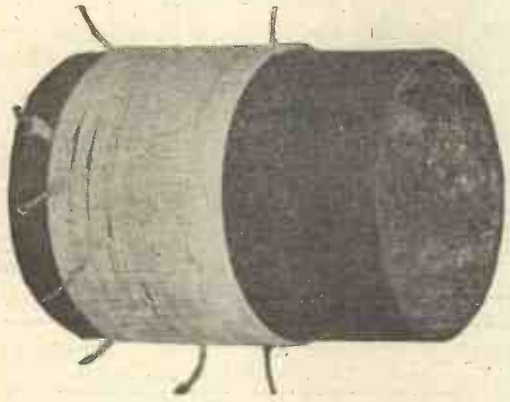
"The Foreign Radio Times," which will be published each week as a special supplement, exclusive to *Wireless Weekly*, will give the full programmes of the most important Continental and American broadcasting stations. Our readers will appreciate the many difficulties involved in compiling a supplement of this character, and will realise that, owing to such difficulties, we are unable, at present, to publish programmes extending beyond the Sunday following date of publication, but we have every hope of so doing in the near future. We have concluded arrangements which ensure our copyright in this country of most of the programmes.

As it will not always be possible to devote more than four pages to "The Foreign Radio Times," we invite opinions and suggestions from our readers as to which of the stations prove to be the most useful, whether or not they are included in our present list.

The title of our supplement "The Foreign Radio Times," is copyright, and we hope to make the feature permanent. This, however, readers will realise, depends solely on the interest created, and we ask therefore that you send us your views.

SOME MEASUREMENTS IN AN AUTO-COUPLED CIRCUIT

By G. P. KENDALL, B.Sc., Staff Editor.



The coil used for the series of simple tests described in this article was of the single layer variety with a number of tapping points.

THE circuit illustrated in Fig. 1 is a typical example of a general type which appears to be very little used by the majority of experimenters, for the sole reason, I believe, that its merits are not sufficiently widely appreciated. The arrangement is quite a well-known one, and has only to be tried for its advantages to be realised, since one is immediately struck by the selectivity which it gives, yet it does not introduce any complications into the operation of the circuit, nor does it involve any reduction in the simplicity of construction of the receiver, since there are no variable couplings to arrange, double windings to insert in the coils, and so on. I have used this circuit in one form or other to a considerable extent of late, particularly for very short wave reception, and have found the selectivity extreme and its simplicity most attractive, and have noticed at times several somewhat peculiar phenomena, which seemed worthy of investigation. In an endeavour to clear up some of these points I have carried out a series of simple experiments upon one of these circuits, the results of which may prove of interest.

The Coil Used

The coil upon which the first experiments were carried out may be seen in one of the illustrations accompanying this article, and it will be observed that it consists of a single layer winding upon a 3-in. diameter ebonite tube, a series of tappings being prepared by the rather crude method of twisted loops at intervals. The winding actually consists of 50 turns of No. 24 d.c.c. wire, no shellac or wax impregnation being used, and tappings are taken at 6, 12, 18, 24, 30 and 40 turns. The

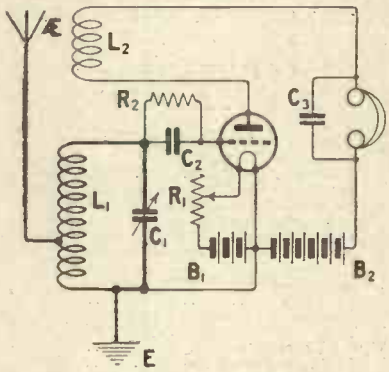


Fig. 1.—A simple auto-coupled circuit in which the aerial is not separately tuned.

coil was connected in circuit as shown in Fig. 2, and a preliminary test was made to determine the actual signal strength when the aerial was connected to the various tapping points, the results being as follows: With the aerial connected to the tapping point which included six turns only in the aerial circuit, a reading of 3.2 was obtained.

Measurements

Upon the twelve-turn point the reading was 5.8; upon the eighteen-turn connection it was 6.3; while upon the twenty-four-turn point it had fallen once more to 5.8. It was impossible to obtain a reading upon either the thirty- or forty-turn points, because the secondary circuit then refused to tune down to the wavelength of 2LO, whose carrier wave was being used for the measurements. In this connection it should perhaps be explained that it is commonly noticed in the case of these coils that upon increasing the number of turns in the aerial circuit there is a reduction in the condenser reading of any given station in the secondary circuit, the effect being much as though the capacity of the aerial-earth system was being added across larger and larger portions of the secondary circuit, so affecting the tuning more and more. Thus, when the six-turn tapping was used the reading for 2LO was 50 deg. on a 180 deg. dial of a .0005 μF square-law condenser, while upon the twenty-four-turn tapping the reading was reduced to 14 deg.

Observations

It is interesting to observe that upon increasing the number of aerial turns it was found that signal strength increased up to a certain definite number, beyond which it diminished, thus bearing out the results obtained by rough experiments of the "make an alteration and then listen to signals" variety. I should perhaps have mentioned here, for the benefit of those who are not very familiar with this type of circuit, that it is a matter of some debate as to whether the aerial circuit really functions in an aperiodic manner, in favour of which hypothesis may be adduced the observed fact that the number of turns included in the aerial circuit are not in themselves sufficient to produce resonance with the received wavelength, or whether the aerial is brought into resonance by the tuning of the

The subject of auto-coupling is one of increasing interest, and in the following article Mr. Kendall gives some simple measurements upon one of its uses.

secondary circuit, to which it is so tightly coupled that the tuning of one circuit affects that of the other. In the case of the coil under consideration, the maximum signal strength was obtained when only eighteen turns were included in the aerial circuit, which represents a quite inadequate amount of inductance to bring the aerial, when considered as a separate circuit, up to anything like the broadcast wavelengths.

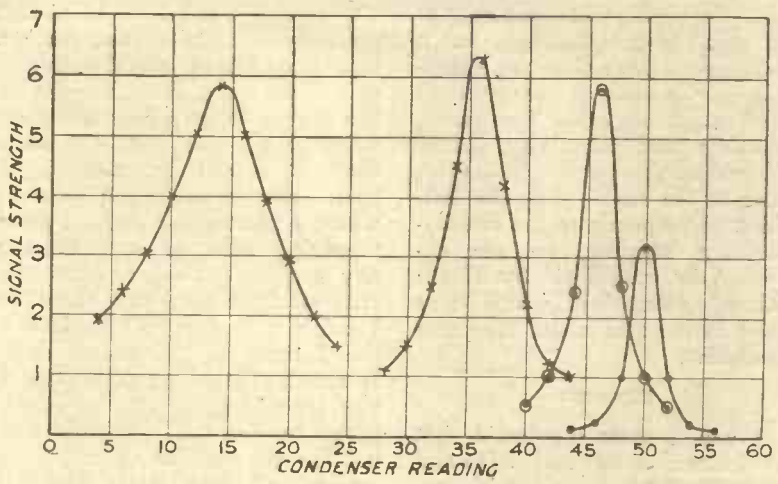


Fig. 3.—These curves express the results obtained by varying the aerial tapping point.

Optimum Value

Having decided that there was a fairly well-defined optimum value for the aerial coupling turns, which in the case of my own particular aerial and earth was in the neighbourhood of eighteen turns, so far as the rough preliminary experiment showed, the next question concerned the selectivity obtained with varying numbers of aerial turns. The coil was therefore connected into circuit, with a three-stage H.F. amplifier-detector to complete the receiving equipment, and some time was spent observing the degree of selectivity obtained when receiving Newcastle, the "background" of London being estimated in a rough manner by ear. This was done purely as a check upon the resonance curves which were to follow, since I wished to obtain as unprejudiced an opinion as possible by this preliminary method, such an unprejudiced opinion being almost impossible to obtain if I had previously plotted resonance curves and obtained a result in that way. Signals were naturally poor upon the six-turn tapping, but selectivity seemed very high, as was also the case when the twelve-turn tapping was used, signals with this latter arrangement being, of course, very much louder. Upon passing on to the eighteen-turn tapping, there was no perceptible improvement in signal strength, and selectivity seemed to have fallen off slightly, though not sufficiently to lead to a definite opinion being formed. Upon changing over to the twenty-four-turn tapping, however, the

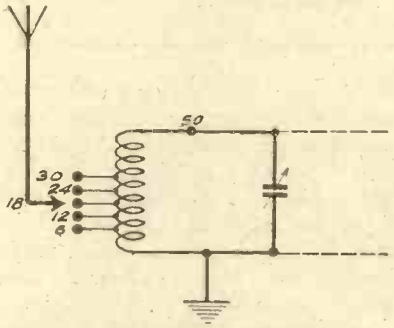


Fig. 2.—The actual connections of the coil.

difference was most marked, and it was possible to say that this tapping was definitely unsuitable upon the score of lack of sharpness of tuning.

Preliminary Results

With these preliminary results in mind, resonance curves were the next experiment to be undertaken, and it was proposed to plot a curve for each of the tapping points which had been tried, and it seemed feasible to do this in view of the fact that a square-law condenser was being employed, so that an equal change in dial reading should represent an equal change in wavelength, in which case resonance curves occurring at different places upon the dial should be truly comparative as regards the sharpness of their peaks. Such a state of affairs, of course, represents an ideal rather than an actual case, and with a view to ascertaining how much departure there might be from a true square law state of affairs, resulting from the connection of the aerial and earth across a part of the coil, a "wavelength against dial reading" curve was plotted for each tap in a rough manner, taking five points only, and it was found that a practically straight line was obtained in each case. This being so, it seemed that there was a chance of really comparable resonance curves being obtained regardless of the actual dial reading at which full resonance occurred, and therefore the actual plotting was undertaken.

Resonance Curves

The results are expressed in Fig. 3, and it will be seen that they bear out extremely well the opinions formed as the result of the preliminary test. Thus, the resonance curve given at the six-turn point, namely the curve upon the right, is quite low but sharply peaked, indicating poor signal strength but good selectivity, while the next, counting to the left, which corresponds to the twelve-turn tapping, is practically as sharply peaked, although very much higher. The highest point reached is

that given by the third curve from the right, corresponding to the eighteen-turn tapping, but it will be seen here that the sharpness of the peak is not quite so great as in the other two cases, denoting that selectivity should not be quite so good. When we come to the curve upon the left, which corresponds to the twenty-four-turn tapping, we see expressed in graphical form the lack of selectivity which was noted in the test under reception conditions.

Flatness

It would seem inevitable that the bluntness of this left-hand curve should be considerably exaggerated by the fact that we now have across a larger part of the coil the capacity of the aerial system, making itself felt to a greater extent than before, and thereby upsetting the square-law variations given by the condenser. Thus, to compare this curve with the others is almost certainly not quite fair, since a true comparison would only result if we were able to make all the curves centre about the same point on the dial. At the same time, it should be remembered that the wavelength curves which I plotted for each of these tapping-points do not indicate any serious variation from the true straight line, and therefore I think it is fair to take it that the flatness of the fourth curve is substantially representative of the true degree of selectivity given by the coil. In this connection we see the value of the preliminary test made, since it provides us with independent corroboration of the curves. We then see that, although not strictly comparative, the curves do tell us that there is a definite correct number of turns which should be included in the aerial circuit upon any given aerial and earth for the maximum signal strength, and also for the best conditions in regard to selectivity. Thus, in my own case, with this particular coil, I should choose the twelve-turn tapping, since this gives almost the best signal strength, and certainly the greatest selectivity.

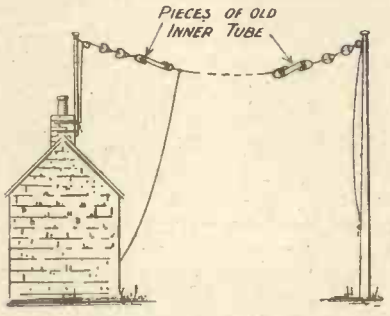
There is obviously a good deal more to be done upon coils of this type, even when confining ourselves to purely elementary considerations such as these, and I hope to contribute further notes at an early date. One word of warning in conclusion: I do not think that my results should be regarded as being of universal applicability, since experience seems to show that different aerials require different treatment in the matter of auto-coupled circuits, where the aerial circuit as such is not intentionally tuned.

□ □ □

Aerial Shock Absorbers

AERIALS erected on high ground have to withstand considerable pressure when the high winds of spring and autumn are blowing. If a wire is suspended in the usual way with insulators and halliards and nothing at all to take up the shock of a sudden jerk, a very severe strain may be placed both upon the masts and upon the chimneys or other supports for them when a sudden gust blows athwart the aerial. What is wanted is a spring of some kind between the wire and the halliards to absorb the fiercest part of the shock. A very simple way of providing this is shown in the drawing. Two pieces, each about one foot in length, are cut from an old bicycle inner tube. Both ends are turned back and bound with wire, a loop in which allows the shock absorber to be attached easily at one end to the aerial wire and at the other to the halliards. As rubber is a good insulator this arrangement has the additional advantage of improving the insulation of the aerial at both ends. It will be found that tubes which are so far gone that they are of no further use in tyres will give service for many months as aerial shock absorbers. Rubber will perish in time under the effects of strong sunlight and of bad weather, but it is an easy business and a very inexpensive one to renew the elastic links from time to time.

A more permanent shock absorber can be made by using metal springs instead of lengths of rubber. Springs such as those used in the door closing de-



The idea illustrated.

vices which can be bought very cheaply from any ironmonger are suitable for the purpose; they have, however, the disadvantage, as compared with lengths of inner tube, that they are conductors and not insulators. If springs are used it is best to connect them between the end of the suspended wire and the first insulator. It must not be forgotten that springs made of steel suffer considerably from weathering if any of the surface of the metal is exposed. They should, therefore, be heavily enamelled to protect them. If the springs are brushed over with japan enamel once or twice a year they will last indefinitely.

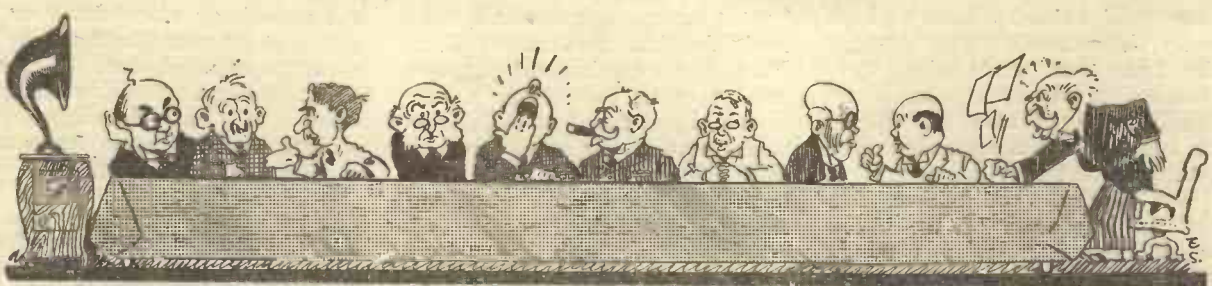
R. W. H.

IMPORTANT NOTICE

RADIO PRESS TEST DEPT.

Owing to the increasing popularity of this Department, it has been found necessary to increase considerably the testing staff, together with the number of standard measuring instruments involved, and though the Department was never intended to cover its expenses (nor is this now intended), it has been found necessary to increase the cost of testing sets to five shillings per valve in the case of a "straight" receiver and ten shillings in the case of dual valves.

No sets which have been modified from the original design will in any circumstances be accepted for test.



JOTTINGS BY THE WAY

By Wireless Wayfarer

A Blow

THE coming of the cross-word puzzle was a sad blow to wireless in Little Puddleton, for a while sadly thinning our ranks at meetings of the club. Recently influenza has made matters worse, even the General having succumbed to it. He used to walk about the place in the rudest of health, slapping hopeless "influenziacs" like Poddleby and myself heartily upon the back and telling us that if we would only adopt his own tip for scaring the germ away we would never be ill. As the

. . . *slapping us heartily on the back* . . .

prophylactic diet that he recommended appeared to consist mainly of bananas and paraffin, we felt that, in this case at any rate, the disease was to be preferred. Anyhow, in spite of his precautions, the General has fallen a victim at last. Poddleby and I, now restored to health, have just visited him, and have had the utmost satisfaction in slapping his back and recommending all kinds of horrible cures.

A Nastier Knock

But if both of the things that I have mentioned have been blows to wireless in this locality, it has received a third and much nastier knock from another direction. In the days before broadcasting began the enthusiast sustained his interest in wireless mainly on a diet of Morse messages, which were seldom of a very thrilling kind, even if you managed to get them down right. Sometimes one tumbled across little gems from the ether, such as a message that I intercepted one day on its way from the shores of France to a liner in mid-Atlantic. In it an anxious wife inquired whether her husband was wearing his thick vest. I waited for hours to try and get the reply, but it never came my way.

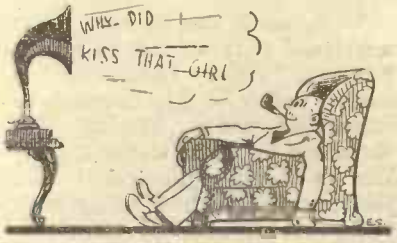
Real Wireless Men

The coming of broadcasting made but little difference to us enthusiastic amateurs, if you were to believe what we said, as, of course, nobody did. We spoke with kindly pity of the benighted "broadcatcher," the fellow who actually made a set for the purpose of listening to musical programmes or talks on how to fatten pigs, and things like that. The fact that high-power telephonic transmissions were available was naturally useful for testing purposes, but nobody with a real soul could possibly use his receiving set for the pleasure of listening to bands and things.

Scorn

Some people even went so far as to scorn everything below 4,000 metres—at least, they kept sets with coils of the proper size for the wavelengths unsullied by broadcasting permanently fixed to show to their visitors. I had a set of that kind myself for serious wireless work, but it is obviously of no use to undertake deep experimental work unless you feel in the right mood, and I find that with advancing years—or possibly with advancing broadcasting—that the right mood comes at rarer and rarer intervals. Of course, I would not admit this for a moment, except in the strictest confidence to a fellow like yourself. At the Little Puddleton club, for instance, no one ever speaks of broadcast reception; we all try to make each other believe that if we do listen to it we do so merely as a matter of duty, in order to be able to point out the imperfections in its quality. Still, I find upon inquiry at the wireless shops in the town that the sales figures of No. 50 and No. 75 coils put all the rest in the shade.

To tell the truth, every one of us, though wild horses would not



. . . *Our "serious experimental work"* . . .

tear the admission from him, is a secret broadcatcher. Though we babble of the wonderful work that we do upon the ultra-short waves and the extra long ones, most of our "serious experimental work" now consists in lying back in arm chairs whilst the loud-speaker charms our ears with the delightful strains that come from the nearest station.

Visitors

If there is a ring at the front-door bell we uproot at once the coils in use, installing others in their stead, and by the time that the visitor is shown in we are busily engaged in receiving time signals from Annapolis or a weather report from some dreary station in a distant country. The visitor pretends to be enormously interested and we play our part

very well indeed. Last night it was Gubbsworthy who dropped in upon me, and being forewarned of his approach, I was busily engaged when he entered in taking down a report upon the state of the safety-match market from Sweden. We followed this by hearing news of the bacon trade from America, and things of that kind. Gubbsworthy was, I thought, rather skilful. "Don't you think," he said, "that you are getting just a tiny bit of distortion in your note magnifiers? Of course, you can hardly tell on telegraphy. How would it be to switch over to a telephonic transmission just to see. It must be a loud one or the distortion will not be brought out. What about 2LO?" Shrugging my shoulders and saying that a host must, of course, obey the behests of his guest, I replaced the original coils and tuned in. Somehow, Gubbsworthy quite forgot the distortion problem, and for the next two hours we thoroughly enjoyed ourselves.

All Broadcatchers—and Worse

Well, as I was saying, I am convinced that we are all broadcatchers, either openly or in secret, and it is this listening to something worth hearing that threatens to undo serious wireless in Little Puddleton. Can you imagine such a thing as a real wireless man spending his evening at a dance? You can? Well, I am sorry. It just shows that you were not brought up in a sound atmosphere, such as that of Little Puddleton. If you had asked me that question six months ago, or if you had put it to any member of our renowned club, you would have been requested not to be silly, not to talk lightly of serious things, and not to show yourself to be a bigger ass than you could help.

A Discovery

But to-day I have made a discovery. The reason why so many of our members fail to attend meetings at the club-house is not that they are doing cross-words or that they are suffering from influenza, or even that they are broadcatching in secret. The real truth is that many of them have become jazz-addicts. My suspicions were first aroused some time ago now, when Poddleby was round at my place. Purely for experimental purposes and in order to try out a new circuit, I had tuned in 2LO, from which station the catchy strains of the Savoy Havana Band were being transmitted. Looking across at Poddleby I noticed that he was sitting with an ecstatic smile upon his fat face and—horror of horrors—that his foot was going tap, tap, tap on the carpet. I immediately tuned to

. . . *he detected a slight over-emphasis of D sharp* . . .

the shipping waveband and produced a writing pad, but Poddleby begged me to return for a moment to 2LO, explaining that he thought that he detected just the slightest over-emphasis whenever a high D sharp occurred, and begging me to allow him to verify his impression. I tuned to Birmingham and heard the finish of an oratorio, but Poddleby explained that the saxophone brought out the slightest distortion much better, and beseeched me to return to London. Though I saw through his vicious cravings, I did so; but I did not admit that

. . . *"May I have the pleasure?"* . . .

I was jolly glad to get back again to something with a real zip in it.

The Last Straw.

The climax came a few nights later. There was a meeting of the wireless club, of which a notification had been duly sent to all members. When I arrived at the hut I found that the assembly consisted of Admiral Whiskerton Cuttle and myself. We waited for some little time, and as nobody else turned up I agreed to go round to Poddleby's house to dig him out. Arrived there, I thought that I would go round to the drawing-room window and tap upon it, so as to give him a mild start.

Fancy Steps

The blind of that window was not quite drawn down. There was a gap of about an inch at its lower edge. I looked through. What, ah, what, did I see? Opposite me, on top of the piano, was an outsize in loud-speakers. Cavorting round the room and doing all sorts of fancy steps were Poddleby and Mrs. Poddleby, Gubbsworthy and Mrs. Gubbsworthy, Bumpleby Brown and Mrs. Bumpleby Brown, Snaggsby and Mrs. Snaggsby, and last, worst of all . . . . . no, I do not think I can tell you. Yes, I suppose I must; at last my eyes fell upon Professor and Mrs. Goop gliding and chasséeing and reversing and doing fancy stunts with the rest of them. Can you wonder that I swooned upon Poddleby's prize tulips? At length I awakened from my stupor and I ran round to the front door, rang the bell, and then dashed back to the window.

Jazz Mania

I was just in time to see Poddleby doing things with the set, whilst the rest composed themselves in chairs and began what, though I could not hear it, was obviously an earnest discussion upon some abstruse wireless problem. Tearing round once more to the door, I was upon the step when the maid opened it. On being shown into the drawing-room I advanced towards Mrs. Goop and said, "May I have the pleasure of the next dance?" They all saw that the game was up, and we spent a very jolly evening—though what the Admiral did at the wireless club I really neither know nor care. By an overwhelming majority at the next meeting it was decided that no further papers should be read before the club for some time, and that in place of the usual Wednesday evening meeting there should be a wireless dance open to members and their friends.

WIRELESS WAYFARER.

THE FOREIGN RADIO TIMES

Edited by Captain L. F. PLUGGE, B.Sc., F.R.Ae.S., F.R.Met.S.

MARCH 4, 1925.

All Hours of Transmissions reduced to Greenwich Mean Time.

WEDNESDAY, MARCH 4th.

FRANCE.

PARIS.—*Station :* Eiffel Tower—FL.
Wavelength : 2,600 metres—5 kw.

6 p.m.—Concert.

Artists : M. Pierre Menard, M. Guy de Lioncourt, Mlle. G. Parodi, Mme. A. Guyonnet (Violiniste), M. Taillardat and Mme. Andree Sauraly-Thivet (Pianist).

PROGRAMME.

1. Lecture—L'immoralite des Contes de Fees de Parault. M. le Docteur Pierre Menard.
2. La Belle au Bois Dormant (Lioncourt). Mlle. Parodi, M. Taillardat and the composer.
3. Reverie of Cendrillon (Fourdrain). Mlle. Guyonnet.
4. Entr'acte from Cendrillon. (Massenet). Mlle. Simonet.
5. Conte de Ma Mere l'Oye (a) Petit Poucet (Ravel); (b) La Belle au Bois Dormant. Mlle. Sauraly-Thivet.
6. Cendrillon. Mmes. Guyonnet, Simonet and Sauraly-Thivet.

6.55 p.m.—News Bulletin and Weather Forecast.

7.10 p.m. End of transmission.

PARIS.—*Station :* Radio-Paris — SFR.
Wavelength : 1,780 metres—8 kw.

12.30 p.m.—Concert by the Orchestra of Radio-Paris.

1. Danse des Patagons (Chapelle and Hovelaque).
2. A Une Etoile—Melodie (Andrieu).
3. Petite Miss (Porrey).
4. Pierrot S'Amuse (Dela).
5. Souvenir—Violin (Astresse).
6. Le Ruisseau Clair (Astresse).
7. Badinage (Mommaert).
8. Les Cloches du Soir (Eilenberg.)
9. Mazurka des Tcherkess (Zamor Fils).
10. Serenade Espagnole (Glazounow).
11. Anona (Grey and Salabert).
12. El Matador (Dacette).
13. Scenes Hongroises (Lederer).
14. Chicas Bornitas (Petit).
15. Romance—Violin (Svendsen).
16. Radames—Egyptienne Danse (Guttinguer).
17. Tzergina—Czardas (Michiesl).
18. Sous les Etoiles (Kufferath).
19. Joyeux Pantins (Coda).
20. Scherzando—Cello (Guiraud).
21. Dede Fantasie (Christine).

1.45 p.m.—News Bulletin and Close Down.

4.45 p.m.—Concert by Artists of the Radio-Paris Station.

1. Mazurka—Trio (Chopin).
2. Berceuse—Violin (Faure).
3. Allegro du concerto en si bemol—Piano (Dussek).
4. Menuett and Allegro—Violoncello (Loeillet-Salmon).
5. Les Chanteurs—Monologue (Thinet).
6. Poeme Hongrois (Lederer).
7. Adoration—Trio (Filippucci).
8. Minuetto—Piano (Diemer).
9. Humoresque—Violoncello (Jullien)
10. Sonatine—Trio (Schubert).

5.45 p.m.—News Bulletin and Close Down.

8.30 p.m.—News Bulletin.

8.45 p.m.—Concert.
Selections from "La Tosca" (Puccini).

10.0 p.m.—End of transmission.

PARIS.—*Station :* l'Ecole Superieure.
Wavelength : 450 metres—500 watts.

9.0 p.m.—Concert.

Artists : Mlle. A. Bouquillon (Vocalist), Mlle. Marcelle Heuclin (Pianist), M. Leon Coupleux (Organist), M. Hecquet and M. H. Dubois.

PROGRAMME.

1. Hymns of Noel (Guilmont). M. Leon Coupleux.
2. Two pieces for piano. M. H. Dubois.
3. Concerto (Adagio and Finale) (Bruch). M. R. Hecquet.
4. Selection on the Organ. M. Coupleux.
5. Selection from "Samson and Delilah" (St. Saens). Mlle. Bouquillon.
6. Grand Choeur (Guilmont). M. Coupleux.
7. (a) Rondino (Beethoven), (b) Liebeslied (Kreissler). M. Hecquet (Violoniste).
8. (a) Air de Mithrane (Rossi), (b) La Solitaire (St. Saens). Mlle. Bouquillon, accompanied by M. Dubois.
9. Nocturne for Organ (Foote). M. Coupleux.
10. Concerto (Adagio and Finale) (Grieg). Mlle. Heuclin and M. Coupleux.

SWITZERLAND.

ZURICH.—*Station :* Radio - Genossenschaft.
Wavelength : 515 metres—500 watts.

7.15 p.m.—Talk by Frl. Emmy Bloch "Freiwillehe vor."

7.30 p.m.—Concert of English Music.

1. Orpheus and His Lute (Sullivan). L. Zwingli (Soprano) and Max Siegrist.
2. Orchestra.
3. (a) My Mother Bids Me Bind my Hair (Haydn); (b) May Dew (Bennet). L. Zwingli and Max Siegrist.
4. Orchestra.
5. (a) Rose Softly Blooming; (b) I Wandered Down the Mountain Side. L. Zwingli and Max Siegrist.
6. Orchestra.

9.0 p.m.—Weather Forecast and Close Down.

AUSTRIA.

VIENNA.—*Station :* Radio-Wien.
Wavelength : 530 metres—1.71 kw.

5.0 p.m.—Women's Hour. Talk by Frau Else.

6.45—7.15 p.m.—English Lesson for Beginners.
Prof. T. W. MacCallum, M.A., Lecturer at the Viennese University.

7.30 p.m.—Programme of Chamber Music.

Artists : Prof. Van Lier (Flute); Prof. Alex. Wunderer (Oboe); Prof. Stiegler

(Horn); Karl Romagnoli (2nd Horn); and Prof. Stix (Bass), of the State Opera.
Prof. Franz Schmidt (Pianist).
The Sedlak-Winkler String Quartette.

PROGRAMME.

1. Scherzando in A sharp (Haydn). For Oboe, Horns and String Quartette.
2. Septett, D minor, Opus 74 (Hummel). For Piano, Flute, Oboe, Horn, Viola, 'Cello and Bass.

ITALY.

ROME.—*Station:* Radiofonica Italiana. *Wavelength:* 425 metres—3 kw.

7.35—10.0 p.m.—Grand Concert with Sig. A. Sernicoli (Tenor); Evelina Levi (Soprano); and Maris Lazzari (Contralto).
Lecture on Gioachino Rossini by Sig. Alberto Gasco.
Selections by Sig. Ugo Donarelli (Baritone).

GERMANY.

BERLIN.—*Station:* Sendegesellschaft (Voxhaus).
Wavelength: 505 metres—1.5 kw.

3.30—5.0 p.m.—Concert by the Berlin Station Orchestra.
1. March (Eilenberg).
2. Ouverture—Rakoczy (Keler-Bela).
3. Waltz (Waldteufel).
4. Serenade (Renee).
5. 2nd L'Arlesienne Suite (Bizet).
6. Dance of the Butterfly (Kockert).
7. Potpourri—Schlager-Echo (Lindsay-Theimer).
8. Ja, so ein Rutscher (Leopoldi).

7.30 p.m.—Evening Concert.
1. (a) Sonata in A Sharp (Wagner), (b) Waltz (Wagner). Mathilde Wesendonck.
2. (a) Abendemfindung (Mozart), (b) Der Sylphe des Freidens (Mozart), (c) Einsam ging ich jungst am Hain (Mozart). Bertha v. Voss (Soprano).
3. Concert in D Flat (Wieniawski). Maurits v. d. Berg.
4. Selection from "Figaro" (Mozart). Selection from "Don Juan" (Mozart). Selection from "Figaro" (Mozart). Bertha v. Voss.
5. Under the Cypress of the Ville D'Este (Liszt), Canzonetta (Liszt), Nocturne (Liszt). Dr. Rich H. Stein.
6. (a) Caprice Venois (Kreisler), (b) Ballad and Polonaise (Vieuxtemps). Maurits v. d. Berg.

HAMBURG.—*Station:* Nordische Rundfunk A.G. (Norag).
Wavelength: 395 metres—71.5 kw.

5.0 p.m.—The Children's Wondergarden.
Directed by Carl Pundter.
1. Marrionettes (Lederer). The Norag Orchestra.
2. Folk Marche "The State Musicians of Bremen."
3. (a) Der gestiefelte Kater (Tschaikowsky); (b) Dance of the Lilac Fairy (Tschaikowsky); (c) Waltz (Tschaikowsky).
4. Where the Golden Flowers Come From (C. von Pundter).
5. Ein Vogel Geflogen (Ochs).

7.0 p.m.—Selections from Puccini.
Artists: Erna Kroll-Lange (Soloiste); Ferdinand Schneider (Pianist); A. Seeker (Conductor).

PROGRAMME.

1. Selections from "Boheme." Station Orchestra.
2. Waltz de Nusette from "Boheme." Erna Kroll-Lange.
3. Duet Scene, Final of Act II, from "Boheme." E. Kroll-Lange and F. Schneider.
4. Fantasie from "Tosca." Station Orchestra.
5. Selection from "Tosca." F. Schneider.
6. Selection from "Madame Butterfly." Station Orchestra.
7. Duet from Act I of "Madame Butterfly." E. Kroll-Lange and F. Schneider.
8. Aria from "Madame Butterfly." Station Orchestra.
9. The Maid of the Golden West. Station Orchestra.

9.30 p.m.—News Bulletin given partly in English. Dance Music.

LEIPZIG.—*Station:* Mitteldeutsche Rundfunk A.G. (Mirag).
Wavelength: 454 metres—700 watts.

5.30—5.45 p.m.—Wireless Constructor's Hour.

6.0—6.30 p.m.—Lecture by H. Gentzsch, "Carrier Pigeons; Their Habits and Training."

7.15 p.m.—Grand Orchestral Evening.
Artists: Karl Kessler (Raconteur); Willy Hoyer (Pianist); and the Station Orchestra.

PROGRAMME.

1. 2nd Suite from "Kaukasischen Suite" (Ipolitow Iwanov). Station Orchestra.
2. Die Babies—from Mark Twain. Die erste Beichte—from Karl Schonherr. Karl Kessler.
3. Grotesque March for Piano (Sinding). Willy Hoyer.
4. Der Mamorakt—from Hellmuth Unger. Dr. Lederer—from Gustav Meyrick. Die vorzugliche Kaffeemaschine—from Schmitz. Karl Kessler.
5. Selections from "Tales of Hoffmann" (Offenbach). Station Orchestra.

9.0 10.30 p.m.—Dance Music by the Station Orchestra. News Bulletin towards 9.20 p.m.

MUNICH.—*Station:* Deutsche Stunde-in-Bayern.
Wavelength: 485 metres—71 kw.

3.30—4.0 p.m.—Chamber Music by the Anna Rosenberger Quartett.
1. Finale in G sharp (Haydn).
2. Potpourri from "Puppenfee" (Bayer).
3. Selections from "Konigs Nachbarin" (Jessel).
4. Rose of the Rio Grande (Leslie).

5.0—5.30 p.m.—Children's Hour.

7.30—8.30 p.m.—Concert by the Station Orchestra, conducted by Hans Winter. Soloist: Willy Stuhlfauth.
1. Short Address.
2. Violin Concert. (Dvorak).
3. VI. Symphonie h. minor (Beethoven.

9.15—10.0 p.m.—The Muse Serene— Original Act by Papa Geis, assisted by Ludwig Born (Zylophon) and George Weinschutz (Bandonium).

UNITED STATES.

DETROIT.—*Station:* Detroit News.—WWJ.
Wavelength: 352.7 metres.

5.5 p.m.—Jules Klein's Hotel Statler Orchestra.

8.0 p.m.—"Detroit News" Orchestra.

1 a.m. (Thurs., 5th)—"Detroit News" Orchestra.

3.0 a.m. (Thurs., 5th)—Jean Golkette's Victor Recording Orchestra.

PITTSBURG.—*Station:* Pittsburg Press.
Wavelength: 462 metres.

11.30 p.m.—Dinner Concert by William Penn Hotel.

1.30 a.m. (Thurs., 5th—Concert by Keystone Male Chorus.

MICHIGAN.—*Station:* Radio Light house—WEMC.
Wavelength: 286 metres—500 watts.

1.15 a.m. (Thurs., 5th)—Programme by the Ladies of Birch Hall.

THURSDAY, MARCH 5th.

FRANCE.

PARIS—*Station:* Eiffel Tower.
Wavelength: 2,600 metres—5 kw.

6.0 p.m.—Concert.
Artists: M. Jean Haudebert (Composer); M. Jean Kling (Baritone); Mlle. Vaurabourg (Pianist); and M. Trembelland (Flutist).

PROGRAMME.

1. Sonata for Flute and Piano (Bach) M. Trembellan and Mlle. Vaurabourg.
2. Trois soli de Dieu Vainqueur (Haudebert). M. Ling and the Composer.
3. Pieces for Piano. Mlle. Vaurabourg.
4. Prelude and Variations for Flute and Piano (Haudebert). M. Trembelland and Mlle. Vaurabourg.
5. Elege (Haudebert). M. Kling and the Composer.

6.55 p.m.—News Bulletins.

7.10 p.m.—End of transmission.

PARIS.—*Station:* Radio-Paris.—SFR.
Wavelength: 1,780 metres—8 kw.

12.30 p.m.—Orchestral Concert.
1. The Black Panther (E. Zamor Fils).
2. Romance (V. Staub).
3. Fete au Harem (M. Duhamel).
4. Starry Night (Schumann).
5. Violoncello Solo (H. Fevrier).
6. Sevillè-Spanish Waltz (A. Barbot).
7. Springtime Dream (L. Balleron-Leduic).
8. Watchers of Night, Nocturne (A. Bosc).
9. Close to You, Ballet Air (Barbirolli-Mouton).
10. Violin Solo (Wieniawski).

11. Les enfants des Douars—Fantaisie (M. Gracey).
12. Springtime on the Riviera (M. Pesse).
13. Sidi Tam Tam (A. Gauwin).
14. Souvenir Lointain Melody (E. Nerini).
15. Rigaudon — Violoncello (Forqueray-Feuillard).
16. Pour Colombine—Serenade (Hauchard).
17. In the Land of the Sphinx (Barbirolli-Mouton).
18. Winter Evening—Waltz (Kufferath).
19. Violin Solo (Rubinstein).
20. Love Masqued (A. Messager).

1.45 p.m.—News Bulletin and Close Down.

8.30 p.m.—News Bulletin.

8.45 p.m.—Concert of Russian Music and Dance Music.

Artists: Mr. John Neago and Mons. Lazarowski (with Orchestra).

PROGRAMME.

1. Sheherazade (Parts 1 and 2) (Rimsky-Korsakoff).
2. Russian Cradle Song.
3. Village Dance (Dumetresco).
4. Selections from the Opera "Eugene Oneguine" (Trio) (Tchaikowski).
5. Two Guitars.
6. Caucasia Suite (Parts 1 and 2) (Ipolitoff-Ivanoff).
7. The Shadow of the Pass—Russian Romance.
8. The Lark—Roumanian Folk Song.
9. The Night (Rubinstein).
10. Popular Roumanian Dance.
11. Song without Words (Tchaikowski)
12. Russian Village Dance.

PARIS.—*Station:* L'Ecole Superieure.
Wavelength: 450 metres—500 watts.

8.0 p.m.—Shorthand Class by Maurice Blanc.

8.30 p.m.—Lecture by M. Israelowitz, "The Diamond Industrie."

9.0. p.m.—Lecture by M. Daniel Berthelot, "Le Problems des Carburants Nationaux."

PARIS.—*Station:* Petit Parisien.
Wavelength: 345 metres—500 watts.

9.30 p.m.—Concert.

PROGRAMME.

1. Prelude d'Helene (Messager).
2. Valse de Joycelyn (Godard).
3. Romance—Violin (Swensen).
4. Herodiade (Massenet).
5. La Colombe—Entr'acte (Gounod).
6. Bourree — Violoncello (Handel).
7. La Feria (Lacome).
8. Appassionato (Filippucci).
9. Liebeslied—Violin (Kreissler).
10. Ivana (Tosti).
11. Strutter's Ball (Brook).
12. Italian Dance (Gounod).

SWITZERLAND.

ZURICH.—*Station:* Radio Genossenschaft.
Wavelength: 515 metres—500 watts.

7.15 p.m.—Symphonie Concert by the Station Orchestra.

1. Symphonie No. 2 (Haydn). (Adagio, Allegro, Andante, Menuette).
2. Violin Concert (Mendelssohn). (Allegro molto appassionato, Andante Allegretto non troppo Allegro molto vivaca).
3. Selection from "Mastersingers of Nuremberg" (Wagner).
4. Valse Caprice (Rubinstein).
5. March (Grieg).

AUSTRIA.

VIENNA.—*Station:* Radio-Wien.
Wavelength: 530 metres—1 kw.

5.0 p.m.—Musical Evening. German Ballades.

Artists; August von Platen, Moritz Graf Strachwitz, Friedrich von Schack, Emanuel Geibel and Theodor Fontane.

7.0—8.0 p.m.—Concert by the German Folksong Vocalists.

1. (a) The Children of the King; (b) Ade o Frau. By the Choir.
2. (a) Wach auf; (b) Good Night. Herr Josef Volk.
3. Instrumental Music.
4. (a) An Old German Love Song; (b) Liebeszweifel and Liebestrost. The Choir.
5. (a) Remember Me; (b) The Soldier.
6. Instrumental Music.

8.0 p.m.—Concert. Programme by the following artists: Anton Arnold (State Opera); Edith van Aust (Vocalist); and Klein Quartett (State Opera).

ITALY.

ROME.—*Station:* Radiofonica Italiana.
Wavelength: 425 metres—3 kw.

7.35—10.0 p.m.—Selections of Popular Music. Neapolitain and Sicilian Songs by Lidia Seielette (Soprano); Enza Messina (Soprano); and Sig. Marie Cetogni.

GERMANY.

BERLIN.—*Station:* Sendedesellschaft (Voxhaus).
Wavelength: 505 metres—1.5 kw.

3.30 p.m.—5.0 p.m.—Concert by the Berlin Station Orchestra.

1. March (Kockert).
2. Ouverture from "Oberon" (Weber).
3. Waltz (Strauss).
4. (a) The Murmur of Spring (Sinding); (b) Romance (Sibelius).
5. Selection from "The Flying Dutchman" (Wagner).
6. Musette (Offenbach).
7. Schweden in Lied und Tanz (Page).
8. Knowest Thou the Land? (Brasen).

9.30—11.0 p.m.—Dance Music.

HAMBURG.—*Station:* Nordische Rundfunk.
Wavelength: 395 metres—1.5 kw.

5.0 p.m.—Concert.

Artists: Reinhold Booker and Carl Martens.

1. Als ich einmal reiste (Thuringen). Schneiders Hollenfahrt (Folk Song).
2. Der Alte Battler (Keller). Stromer (Claudius). De Mann ut'n Paradies (Wisser). C. Martens
3. Fuhrmannslied (Folk Song). Dagdeef (Becker).
4. Our Good Old Duke Carl (Thomas). C. Martens.
5. (a) Folk Song; (b) The Grand Monarch (Garbe).

7.0 p.m.—Opera. "Carmen" (Bizet).

LEIPSIC.—
Wavelength: 454 metres—700 watts.

3.30—5.0 p.m.—Concert by the Station Orchestra.

6.0—7.30 p.m.—Lecture by Max Schiel.

MUNICH.—*Station:* Deutsche Stunde-in-Bayern.
Wavelength: 485 metres—1 kw.

3.30—4.30 p.m.—Concert. Anna Rosenberger Quartette.

1. Ouverture Maritana (Wallace).
2. Selection from "Der Freischutz" (Weber).
3. Love Waltz (Moskowski).
4. Violin-Solo (a) Romance (Svendsen); (b) Polonchinelle (Kreisler); (c) Regina Engelschalk (Kreisler).
5. Herbstraum (Joyce).
6. Ein Blasserl immitten von Reben (Ascher).
7. Rendel (Speilanski).

5.30—6.30 p.m.—Concert.

1. Boris Godunow (Muffergski).
2. Slavonic Dance (Dvorak).
3. Violon Solo—(a) Canzonetta d'Ambrosio; (b) The Bee (Schubert). Kurt Brummen.
4. Potpourri (Drescher).
5. Anna Maria (Olfa).
6. March (Hery).

7.30—8.0 p.m.—Esperanto Class.

9.0 p.m.—Weather Forecast.

9.15 p.m.—Lecture by Tony Kellen.

9.0—10.0 p.m.—Concert.

1. Ouverture "Bhadra" (Massenet).
2. Ouverture "Martha" (Flotow).
3. Nocturne in D Sharp (Chopin); Willy Palmedo (Violonist).
4. Potpourri "Vienna by Night" (Kemzak).
5. Rauschende Donau (Kerner).
6. March (Strauss).

UNITED STATES.

DETROIT.—Station: Detroit News WWJ.
Wavelength: 352.7 metres.

5.5. p.m.—Jules Klein's Hotel Statler Orchestra.

8.0 p.m.—"Detroit News" Orchestra.

1 a.m. (Fri. 6th).—Concert Broadcast from New York.

PITTSBURG.—*Station:* Pittsburg Press—WCAE.
Wavelength: 462 metres

11.30 p.m.—Dinner Concert by William Penn Hotel

2 a.m. (Friday 6th).—Concert by the Atwater Kent Radio Artists.

FRIDAY, MARCH 6th.

FRANCE.

PARIS.—*Station:* Eiffel Tower—FL.
Wavelength: 2,600 metres—5 kw.

6.0 p.m.—Concert.

Artists: Mme. Segond-Weber and M. Fresnay; Mlle. Odette Chalanda (Pianiste) and M. Gravel (Baritone).

PROGRAMME.

1. Priere a Cypris (Bertrand). l'Eternelle Emotion (Baron). M. Fresnay.
2. L'Horizon Chimerique (Faure). M. Gravel.
3. Force and Liberty (Charden). Colere (Puget). Mme. Segond-Webert.
4. Promenades (a) Envoi; (b) St. Cloud (Magnard). Mlle. Chalanda.
5. La Priere des Tranches (Roye). Le sourire de l'Ile de France (Bengoecha) M. Fresnay.
6. Danse (Grenades) Chalanda.
7. J'aurai Rendez-vous avec la Mort (Seeger). La Cri de la Terre (Battanthen). Les mois qui suivirent (Cahn). Mme. Segond-Webert.

6.55 p.m.—News Bulletin and Weather Forecast.

7.10 p.m.—End of Transmission.

PARIS.—*Station:* Radio-Paris. SFR.
Wavelength: 1,780 metres—8 kw.

12.30 p.m.—Orchestral Concert:—

1. Petite Potins (Barbirolli).
2. Love Nest—American Romance (L. Hirch).
3. Eleonore (A. Chantrier).
4. Vertige (G. Beaume).
5. Hindu Song — Violin (Rimsky-Korsakow).
6. Jealous Love (Astresse).
7. Napolitain Dance (P. Fosse).
8. The Laughing Marquise (Noe Faure).
9. Song Without Words (P. Destombes.
10. Old Song — Cello—(Droeghmans).
11. Ballet Music—Winter (Dufrenne).
12. Cocodette (A. Barbot).
13. Dream of Orient (Dardany).
14. Winnie Wilkle (Clikus).
15. Serenade—Violin (Pierne).
16. Flemish Kermesse (D'Aubel).
17. Gavotte Tendre (Gluck-Salabert).
18. Reverie—Cello (Dunkler).
19. Thais—Trio by Adler—(Massenet).

1.45 p.m.—News Bulletin and Close Down.

8.30 p.m.—News Bulletin.

8.45 p.m.—Concert. Selections from "Don Quichotte"—Comic Opera by Massenet.

Artists: Madame Nadia Martel and Monsieur Murano.

PARIS.—*Station:* L'Ecole Superieure.
Wavelength: 450 metres—500 watts.

8.45 p.m.— Talk—"The French Renaissance." M. Schmitt.

9.0 p.m.—Concert.
Artists: Mme. Myriel-Perpignan, Mme. Magde Vellac, MM. Ferval, Francois Perpignan (Composer) and Maurice Julien

PROGRAMME.

1. Le Jongleur de Notre Dame (Massenet). Three Little Boys (Urgel). M. Ferval.
2. The Little Singer (Manuel). Mme. Magde Vellac.
3. Selection from Il Peme d'Ore (Cesti), Acis et Galanthee (Handel) Mme. Perpignan.
4. Le Savetier and the Financier (La Fontane). M. Julien.
5. Ne m'oubliez pas (Bernheim), Berceuse (Tremisot). M. Ferval.
6. Le Colibri (Chausson), Les Cigales (Chabrier). M. Perpignan.
7. The Young Man and the Old (Florian), Non, Paris ce n'est pas ca (Cor). M. Julien.
8. I Have Seen Thine Eyes (Pfister), Christ of Calvary (Davranchos). M. Ferval.
9. Berceuse (Perpignan), La Legende du Ver luisant (Perpignan). Mme. Perpignan, accompanied by the author.
10. Le Fuseau of my Grandmother, The Menuett (Coppee). Mme Vellac.
11. Duke of Veronica (Messager). Mme. Perpignan and M. Ferval.
12. One Act Comedy—"Le Baiser." (De Banville). Mme. Vellac and M. Julien.

SWITZERLAND.

ZURICH.—*Station:* Radio Genossenschaft.
Wavelength: 515 metres—500 watts.

7.15—9.0 p.m.—Concert by the Charbeli Quartette of Baden and Station Orchestra

1. Charbeli Quartette.
2. Orchestra.
3. Charbeli Quartette.
4. Orchestra.
5. Charbeli Quartette.
6. Orchestra.

AUSTRIA.

VIENNA.—*Station:* Radio-Wien—IKL.
Wavelength: 530 metres—1 kw.

7.0 p.m.—Evening of One-Act Comedies. By the Humorists of the World of Literature.

FRANCE, Georges Courteline; **HUNGARY,** Franz Molnar; **AUSTRIA,** Arthur Schnitzler.

ITALY.

ROME.—*Station:* Radiofonica Italiana.
Wavelength: 425 metres—3 kw.

8.30 p.m.—Commemorative Concert of the Fourth Century of the Birth of Giovanni Pierluigi de Palestrina by the Vocal Quartette of Rome, under the direction of Sig. Domenico Alaleona.

GERMANY.

BERLIN.—*Station:* Sendegesellschaft (Voxhaus).
Wavelength: 505 metres—1.5 kw.

3.30—5.0 p.m.—Concert by the Station Orchestra.

1. March (Mischke).
2. Ouverture from "Zampa" (Herold).
3. Waltz (Waldteufel).
4. (a) Vision, (Hellermann) (b) Arietta (Friedl).
5. Selections (Urbach).
6. Ballgefluster (Meyer-Hellmund).
7. Potpourri (Mannfred).
8. Selection from "The Duke of Cagliostro" (Zorlig).

7.30 p.m.—Variety Evening.

1. Four songs from Enders. Rudolf Zank (Tenor).
2. (a) I Love—Foxtrot (Archer), (b) Du Geheimnis der Nacht (Herbert), (c) Sonja—Russian Ballad (Partes). Bud Gamble, Eugen Feurer (Violin), and Fritz Schulz (Pianist).
3. Selections from Schaale, Selections from Mendelssohn. Robert Koppel.
4. Four Songs from Enders. Rudolf Zank.
5. (a) Foxtrot (Rose), (b) Dream Kiss—Boston (Rienze), (c) Shimmylied (Kahn u. Lew Gold). Bud Gamble, Eugen Feurer, Fritz Schulz.
6. (a) General Major Johann Keifer (Roda Roda), (b) Berlin (Graeser). Robert Koppel.

HAMBURG.—*Station:* NordischeRundfunk.
Wavelength: 395 metres—1.5 kw.

7 p.m. Play—"The First Guest" (Heinrich Behnken).

Act I.

Angelus Tobaben (Herman Moller), Cord (Dr. Richard Ohnsorg). Gerd (Dr. Bass), Aleid Vichbrock (Kathe Alving), Angreet (Magda Baumken).

Act II.

Peter Timm (Dr. R. Ohnsorg), Sanna Timm (Magda Baumken), Grete Timm (Erna Schumacher), Fritz (Herman Moller), Jan Bredehoft (Hans Wernicke), Wilhelm Bosch (Kurt Kurtow), Friedrich Studt (Julius Fels), Hannes Meier (Bernard Jackschat), Hans Perchers (Dr. Bass).

LEIPSIG. — *Station:* Mitteldeutsche Rundfunk.
Wavelength: 454 metres—700 watts.

7.15—8.30 p.m.—Military Concert.

1. Army March.
2. Ouverture from "William Tell" (Rossini).
3. Parade March.
4. Selection from "Lohengrin" (Wagner).
5. Army March.
6. Rosencavalier (Strauss).
7. Parade March.

MUNICH.—*Station:* Deutsche Stunde in Bayern.
Wavelength: 485 metres—1 kw.

3.30—4.30 p.m.—Concert.

1. Selection from "Evangelimann" (Kienzl).
2. Sea Breezes (Leoncavallo).
3. Viennese Music (Kemzak).
4. Waltz (Strauss).
5. Standchen (Heykens).

5.0—5.15 p.m.—Women's Hour. Frau Elfriede Tessen.

6.0 p.m.—Agricultural News.

6.30—7.30 p.m.—Light Concert.

7.30—8.0 p.m.—English Lesson.

8.0 p.m.—8.30 p.m.—Talk by Dr. Fritz Gerathewohl on Poetry.

8.45—9.45 p.m.—Military Concert under the direction of Music Master Brathuhn.

UNITED STATES.

DETROIT.—*Station:* Detroit News WWJ
Wavelength: 352.7 metres.

5.5. p.m.—Jukes Klein's Hotel Statler Orchestra.

8.0 p.m.—The Detroit News Orchestra.

11.0 p.m.—Dinner Concert.

1.0 a.m. (Sat., 7th.)—Concert broadcast from New York.

PITTSBURG.—*Station :* Pittsburg Press —WCAE.
Wavelength : 462 metres.

11.30. p.m.—Dinner Concert by William Penn Hotel.

2.30 a.m. (Sat. 7th).—Concert by H. A. Ludenstadt (Baritone).

BERRION SPRINGS, MICHIGAN.—*Station:* Radio Lighthouse.—WEMC.
Wavelength : 286 metres—500 watts.

2.0 a.m. (Sat., 7th).—Sacred Music by the Radio Lighthouse Choir, Miss Martha Hutchison (Soprano); Mrs. L. Bouchell (Contralto); M. R. Fairchild (Violinist).

SATURDAY, MARCH 7th.

FRANCE.

PARIS.—*Station*: Eiffel Tower—FL.
Wavelength: 2,600 metres—5 kw.

6.0 p.m.—Concert.
Artists : Mlle. Gilberte Wullens (Violioniste); Mlle. Jeanne Etienne (Vocalist); and Mmme. Andree Sauraly-Thivet (Pianiste).

PROGRAMME.

1. Sonato for Piano (Chopin). Mme. Sauraly-Thivet.
2. O Nuit Enchanteresse — "The Marriage of Figaro" (Mozart). Mlle. Etienne.
3. Chacune (Mouret). Mlle. Wullens.
4. Il était nuit déja (Duprato). Mlle. Etienne.
5. Czardas (Monti). Mlle. Wullens.
6. Dances Sacrées (Debussy). Mme. Sauraly-Thivet.
7. Serenade (Drala). Mlle. Wullens.

6.55 p.m.—News Bulletins.

7.10 p.m.—End of Transmission.

PARIS.—*Station :* Radio-Paris.—SFR.
Wavelength: 1,780 metres—8 kw.

12.30 p.m. — Orchestral Concert :—
1. Three Pieces for Orchestra (A. D'Ambrosio).
2. Landler (P. Lacombe).
3. Berceuse—Violin (Heurteur).
4. Valse (Larmanjot).
5. Gaiety (Filippucci).
6. Past and Present (E. Gillet).
7. Passepied (Heurteur).
8. The Dream—Cello (J. Dantin).
9. Country Procession (Andrieu-Jacquemont).
10. If I were Gardener (Chaminade).
11. Suite. Entree—Intermede — Idyll —Danse. (Gabriel-Marie).
12. Humoresque (R. Huguett).
13. Virelai d'Alsace (M. Legay-Charmettes).
14. Insoucieuse (D'Ambrosio-Heurteur).
15. Interlude from Pepita Jemenez (Albeniz-Letorey).
16. Fragrance (Ch. Ancliffe).
17. Caquetage—Cello (Domerc).
18. Come to Montparnasse (V. Scotto).
19. La Haut (N. Yvain).

1.45 p.m.—News Bulletin and Close Down.

4.0 p.m.—Concert :—
1. Gothic Minuet (Boellmann).
2. Spanish Dance—Violin (Sarasate).
3. Les Commeres sous. Louis XV—Flute (Pugnani-Kreissler).
4. Romance—Cello (G. Hue).
5. Cooking Lesson by Radiolo (Galipaux).
6. Dance Rituelle de Feu — Piano (De Falla).
7. Concerto—Violin (Mendelssohn).
8. Song.
9. Romance—Violin (Faure).
10. Fantaisie de Concert—Cello (A. St. Andre).
11. Allegro Appassionato — Cello (St. Saens).
12. The Nations—Trio (Couperin).

5.45.—News Bulletin and Close Down.

8.30 p.m.—News Bulletin.

8.45 p.m.—Gala Concert, organised by "Le Matin" in honour of the Anniversary of His Excellence Monsieur Mazarik, President of the Tcheco Slovac Republic.
Tcheco Slovac Hymn (F. Skroup), La Marseillaise (Rouget de L'Isle.).
Speech by M. Ossuski, Minister of Tcheco Slovacia.
Speech by H. Marcel Knecht, Secretary of "Le Matin."
1. (a) Slovac Songs (Dedecek-Dostal), (b) Bohemia (Country Scenes by the Radio-Paris Orchestra, under the direction of Victor Charpentier).
2. (a) History (Paul Bilhaud), (b) Profil Parisian (Paul Bilhaud), Mlle. Renee d'Andriessens, First Prize of the Brussels Conservatoire.
3. (a) Rustic Song (R. Lepeltier-Valsien), (b) The Story of the Harvest (R. Deroissi-P. Codini and Ch. Laurent).
H. Belmon, Tenor of Olympia.
4. Leon Berton, of the Cabaret du Coucou will recite Comic Stories.
5. (a) Romance (Swendsen), (b) Apateado (Spanish) Dance—Violin Solo—Sarasate.
6. (a) Czaras (V. Monti), (b) Good Night (Moletti).
Cariolato, The King of the Xilophonistes.
7. (a) Serenade of Flowers (Mario Cazes), (b) Serenade (Toi) (Mario Cazes). Mario Cazes.
8. (a) Springtime Calls (Curty), (b) Disillusion of Tango (Malderen), (c) The Tempest (Persiani). M. Henri Coignac.
9. (a) Under the Shadow (R. Sarvil, Ferney and Choura), (b) Night (R. Sarvil, P. Chabron). Mme. Stephany Darmand.
10. (a) Pierrot's Tears (Bixio), (b) Flowers of Love (J. Padilla), Mlle. Gina Floriani.
11. (a) The Grasshopper (Rene Paul Groffe), (b) Souvenir of Paris (Rene Paul Groffe).
12. (a) Come Back (Emile Nerini), (b) Roses of Soadi (Emile Nerini). Mme. Ketty Delorme.
13. (a) In My Dream I Wept (Georges Hue), (b) The Kiss (Goring-Thomas). Mlle. Anne Mirian.
14. (a) The Winding Path (G. Berthier) (b) Decave (Dombel - R. Deschoulin). M. Monty.
15. (a) Antoinette (Bousquet and Ouvard Fils), (b) With my 100 Sous (Ouvard Fils). Ouvard.
16. (a) Fashion (Amelet-P. Chagnon), (b) Eviva la Raquella (Marc-Hely-Izoird). Perchicot.
17. (a) Muleteer's Song (Victor Staub), (b) Piano Solo by Prof. Victor Staub.
18. (a) Violin Solo (Mario Cazes), (b) Lovely Venice (Jean Daris). Mlle. Rose Temps.

PARIS.—*Station :* L'Ecole Superieure.
Wavelength : 458 metres—500 watts.

9.0 p.m.—Program given by the Society Artistique and Literary of the West.
Lecture—Breton in Legende and History, by M. A. Chaboseau.
Musical Audition.
1. Chanson De Patre; Chanson de de Cloarec (Duhamel), La Pluie et le Vent (Hure), Au bord de la Fontaine (Hure). Mme. Marthe Comelis and M. Hure.
2. Legend of Ille and Vilaine-Franson-Ar-Mor (Sauvreeis). M. G. Paulet, Mme. Cornelis, and Chorus.
3. Suite Breton (de Gibbon). (a) Melancolie d'un Soir, (b) Noce au Village M. Gontran Dessagnos.
4. Hours of Summer (Baton). M. Cornelis.

PARIS.—*Station*: Petit Parisien.
Wavelength :: 345 metres—500 watts.

9.30 p.m.—Concert.
Dance music by the Jazz Orchestra of Petit Parisien.

SWITZERLAND.

ZURICH.—*Station*: Radio Genossenschaft.
Wavelength : 515 metres—500 watts.

7.30—9.0 p.m.—Dance evening.
1. Man braucht nicht erst in dem Himmel (One-step).
2. Pasadena (Foxtrot).
3. Das Eine (Foxtrot).
4. Sleep (Waltz).
5. Somebody's Wrong (Blues).
6. I Love You (Foxtrot).
7. Women, Wine and Song (Waltz).
8. Elle s'etait fait Couper les Cheveux (One-step).
9. Wer Keine Tant Hat (Foxtrot).
10. Bagdad (Foxtrot).
11. Eva (Waltz).

AUSTRIA.

VIENNA.—*Station*: Radio-Wien.
Wavelength: 530 metres—1 kw.

5.30 p.m.—Lecture by Dr. J. Lamberg.

8 p.m.—9 p.m. Orchestra Concert.
Selections from Mozart.
1. Overture from "Marriage of Figaro."
2. Quartette for Oboe, Clarinet, Bassoon and Orchestra.
3. Selection for piano and Orchestra.
4. Serenade in D Sharp.

9.0 p.m.—Light Orchestral Music.

ITALY.

ROME.—*Station :* Radiofonica Italiana.
Wavelength : 425 metres — 3 kw.

7.35—10.0 p.m.—Second Concert by Sig. Raimondi (Violinist).

GERMANY.

BERLIN.—*Station:* Sendegesellschaft (Voxhaus)
Wavelength: 505 metres—1.5 k.w.

3.30—5.0 p.m.—Concert by the Berlin Station Orchestra.

1. March (Heinecke).
2. Ouverture from "Prince Methusaleh" (Strauss).
3. Waltz (Hellerman).
4. Sextette from "Carmen" (Bizet)
5. Fantasie from "Die Afrikanerin" (Meyerbeer).
6. Northern Wedding (Brase).
7. Potpourri (Thiele).
8. Heimat am Rhein, Lied (Stauch).

8.30. p.m.—Concert. — Selections from Beethoven.

1. Ouverture from "Fidelio."
2. Piano Concert in C. Minor. Joseph Schwartz.
3. VII. Symphonie. The Berlin Philharmonic Orchestra.

9.30—11.0. p.m.—Dance Music.

HAMBURG.—*Station:* Nordische Runfunk.
Wavelength: 395 metres—1.5 kw.

5.0—6.0 p.m.—Concert.

1. The Maiden of the Black Forest (Jessel).
2. The Rose of Stamboul (Fall).
3. The Geisha (S. Jones).
4. The Czardasfurstin (Kalmann).
5. The Duke of Luxemburg (Lehar.)
6. The Trifling Student (Millocker).
7. The Bird Fancier (Jeller).
8. The Field Mouse (Strauss).

6.0 p.m.—Opera "Peer Gynt" (Ibsen). Music by Gricg.

CAST:

Aase (Kathe Wittenberg), Peer Gynt (Ernst Sattler), Solveig (Kathe Schmidt-Steiner), Peasant (Hans Langmaack), Ingrid (Kathe Franck-Witt), Dovrealte (Hans Langmaack), Captain (Johannes Berhardi), Master Cotton (Hermann Beyer), His Wife (Lotte Schlosse), The Father (Hans Langmaack), M. Ballon (Eugen Moebius).

LEIPZIG. — *Station:* Mitteldeutsche Rundfunk.
Wavelength: 454 metres—700 watts.

7.15—8.30 p.m.—Selections from Operas, Artists: Margaret Rossner, Hans Lippert-Schroth, Friedbert Sammler and the Station Orchestra.

PROGRAMME.

1. Overture—(Suppe) Orchestra.
2. Selection—"Boy or Girl," Hans Lippert-Schroth.
3. Selection from "Der Gottergatte," (Lehar). Margaret Rossner.
4. Duet from "The Overseer" (Zeller). M. Rossner and H. Lippert-Schroth.
5. Selection—(Strauss) Orchestra.
6. Selection from "Grafin Maritza" (Kalmen). Hans Lippert-Schroth.
7. Senora (Hirsch). Margaret Rossner.
8. Duet from "Opernball" (Heuberger). M. Rossner and H. Lippert-Schroth.
9. Waltz—(Benayxky) Orchestra.

MUNICH.—*Station:* Deutsche Stunde-in-Bayern.
Wavelength: 485 metres—1 kw.

3.30—4.30 p.m.—Concert by the Anna Rosenberger Quartette.

1. Selection from "Mignonne" (Thomas).
2. Peer Gynt (Grieg).
3. Gebet (Bruch).
4. Waltz (Strauss.)
5. Hot Lips (Davis).

6.30—7.0 p.m.—Light Concert.

1. Military March (Schubert).
2. Scandinavian Suite (Frederissen).
3. Polonaise (Chopin).
4. Hungarian Fantasie (Doppler).
5. Waltz (Strauss).
6. Dreams of India (Wenrich).

UNITED STATES.

DETROIT.—*Station:* Detroit News. WWJ. *Wavelength:* 352.7 metres.

5.5 p.m.—Jules Klein's Hotel Statler Orchestra.

8.0 p.m.—"Detroit News" Orchestra.

11.0 p.m.—Dinner Concert.

1.0 a.m. (Sunday, 8th).—Concert broadcast from New York.

PITTSBURG.—*Station:* Pittsburg Press. WCAE. *Wavelength:* 462 metres.

7.30 p.m.—Dansant Music from Nixon Restaurant.

9.30 p.m.—Orchestral Programme by Ed. Lally's Rendezvous Cabaret Orchestra.

11.30 p.m.—Dinner Music by William Penn Hotel.

1.30 a.m. (Sunday, 8th)—Concert by Artists of Chasle Sueur Studio.

SUNDAY, MARCH 8th.

FRANCE.

PARIS.—*Station:* Eiffel Tower.—FL.
Wavelength: 2,600 metres—5 kw.

Concert with the following artists: Mlles. Josee Heylerts (Violoniste), Andree Segard (Pianiste) and Lucette Couleru (Vocalist).

PROGRAMME.

1. Sonate a Kreutzer 1st. Mouvement (Beethoven). Mlles. Heylaerts and Segard.
2. L'Aube (Pesse). Mlle. Couleru.
3. Serenata (Moszkowski). Mlle. Heylaerts.
4. Les Jeau d'Eau de la Ville d'Este (Liszt). Mlle. Segard.
5. Air de Cinq-Mars (Gounod). Mlle. Couleru.
6. Scherze-Tarentelle (Wieniawski). Mlle. Heylaerts.

6.55 p.m.—News Bulletin.

7.10 p.m.—End of Transmission.

PARIS.—*Station:* Radio-Paris. SFR.
Wavelength: 1,780 metres. 8 kw.

12.45 p.m.—Concert by the Radio-Paris Orchestra.

1.45 p.m.—News Bulletin and Close Down.

4.30 p.m.—Concert by Dejoix, Roubeix and Fretry.

1. Country Scene from "La Noce Villageoise" (B. Godard).
2. (a) Polka (M. Dejoix), (b) Suzette's Windmill (Fretry), (c) General Finfin, Wedding March.
3. Dance Montagnard (Fourdrain).
4. Legend of the Mountain Flute (Walter).
5. Rural — Monologue by Radiolo (E. Depre).
6. Breton Wedding (Violin Solo) (G. Willaume).
7. La Bourree (Dance Song) (A. Bruneau).
8. Spring Song (Violoncello) (P. Vical).
9. (a) Bourree Carre, (b) La Tyrolienne (Roubeix), (c) The Blue Ribbon.
10. Carillon—Pastorale and Farandole from the Arlesienne by Bizet.

5.45 p.m.—News Bulletin and Close Down.

8.30 p.m.—News Bulletin.

8.45 p.m.—Jazz Music by Mario Cazes and his Orchestra from the Chateau Caucasien Montmartre.

ITALY.

ROME.—*Station:* Radiofonica Italiana.
Wavelength: 425 metres—3 kw.

7.35—10.0 p.m.—Sacred Music by the Vocal Quartette of Rome. Third Concert by Sig. Raimondi (Violinist).

GERMANY.

LEIPZIG. — *Station:* Mitteldeutsche Rundfunk A.G. (Mirag).
Wavelength: 454 metres—700 watts.

7.15—8.30 p.m.—Drama "Hanneles Himmelfaart."

CAST.

Hannele (Lina Monard), Gottwald (Hans Moserbegr), Martha (Traude Alsen), Mother (Elionor Orf), Father Mattern (Karl Kessler), Tulpe (Hedda Wardegg), Fleschke (Paul Neuglas), Hanke (Ernst Koch), Scidel (Arthur Wedlich), Berger (Golditz), Dr. Wachler (Oscar Kreuzberger).
Music by the Station Orchestra.

MUNICH. — *Station:* Deutsche Stunde in-Bayern.
Wavelength: 485 metres—1 kw.

10.30—11.30 p.m.—Morning Concert.

3—4 p.m.—Concert by the Anna Rosenberger Quartette.

1. Selections from Mozart.
2. Traume (Wagner).
3. Spanish Dance (Kienzl).
4. Adagio and Menuett (Beethoven).
5. Rosensavalier (Waltz) (Strauss).
6. The Standard (Furnari).

4—5 p.m.—The Poet of Munich.

5—6 p.m.—Light Concert.

7.30—8.30 p.m.—Orchestra Concert.

9.10 p.m.—Concert.

1. Ouverture from Raymond (Thomas).
2. Waltz (Brahms).
3. The Beauty from the Bath (Tet).
4. Serenade (Braga).
5. Waltz (Gungl).
6. The Wedding of the Rose (Teffel).

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TABLE I. Wavelength range when used as Primary Coils with Standard P.M.G. Aerial and .001 mfd. condenser in parallel.			TABLE II. Wavelength range when used as Secondary Coils with .001 mfd. condenser in parallel.		
No. of Coil.	Minimum Wave-length.	Maximum Wave-length.	Minimum Wave-length.	Maximum Wave-length.	PRICE.
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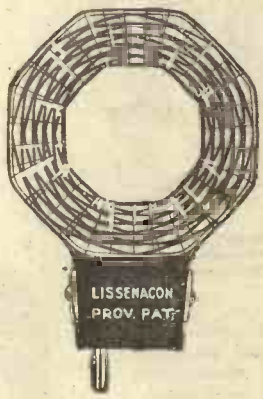
30	235	440	130	425	4/10
35	285	530	160	490	4/10
40	360	675	200	635	4/10
50	480	850	250	800	5/-
60	500	950	295	900	5/4
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/9
150	965	2,300	700	2,150	7/7
200	1,885	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/2



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Brandes Superior *Matched Tone* Headphones are admirably versatile. It's hard to imagine them fitting snugly to the tenderest curly head and yet fulfilling their duty on the head of the expert who sits down to long hours of serious experiment. So comfortable and with a rugged strength of construction to protect their delicate adjustment, they are excellent for family use. Primarily designed for long-range telephony from expert technical knowledge, their *Matched Tone* feature brings in the most distant signals with purity and strength. The experimenter finds that they bring the best results in trans-Atlantic and trans-Continental reception. One gentleman writes from Walton-on-Thames: "I received Australia on Brandes, and consider they are the most sensitive 'phones I have used. I am much pleased with their general performance." *Ask your Dealer for Brandes.*

.....every one of these advertisements will show an added advantage in the construction of Brandes Headphones.

Look at the illustration above. See how snugly the 'phones fit the head. A gentle pressure on the crown, a firm clasp to the ears, and the rest of the headband is held well away from the hair. This means long-wearing comfort and the shutting out of extraneous sounds. Strength and firm beauty of lines typifies their finished construction.

Table-Talker 42/-

The *Table-Talker* is another Brandes quality product at moderate price. Its full round tones are wonderfully clear and pleasing. The horn is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound balance. Gracefully simple of line, it is finished a shade of neutral brown and is twenty-one inches high.

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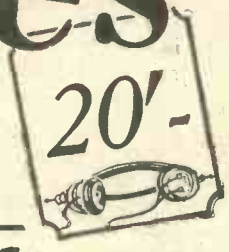
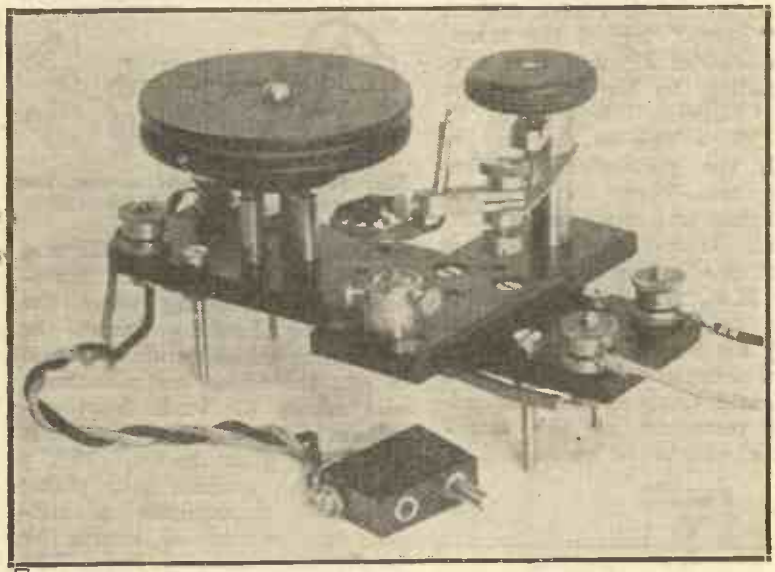


Superior Matched Tone Headphones

TRADE MARK

Crystal or Valve Detector at Will

Some notes together with constructional details of how the valve detector in a straight multi-valve receiver may be replaced by a crystal at a moment's notice, without any serious alterations to the design of the instrument.



The general appearance and easy construction of the unit may be seen from this photograph.

RECENTLY I have been using a crystal rectifier in a multi-valve set in place of the more usual valve. With a valve as rectifier reception is good, for every care has been taken in this particular set to avoid all possible sources of distortion when the loud-speaker is in use. There is no harshness or woolliness, yet there is a little something which makes the reproduction not quite so good in quality as a crystal receiver.

Crystal Rectification

When the crystal is used in place of the valve, the circuit of my receiver resulting as in Fig. 1, a considerable improvement takes place. Speech is now absolutely natural without the slightest suggestion of "throatiness." Music is mellower and individual instruments in the orchestra are heard more clearly. The valve when used as rectifier acts also to some extent as an amplifier; I expected therefore that when the crystal was substituted there would be a considerable difference in the volume of sound obtainable in the loud-speaker. As a matter of fact, the use of the crystal leads surprisingly enough to a reduction in range and in signal strength which is very small indeed, and one is amply compensated by the gain in purity. It must not be forgotten, too, that the crystal detector is one of the few pieces of apparatus that works for nothing; it requires no current, and a good piece of crystal, properly used, will be effective for a very long time. The substitution of the crystal detector for the valve means therefore, amongst other things, a saving in filament current which may be more than half an ampere where bright emitter valves are used.

Many readers would probably give crystal rectification in the valve set a trial if it were not for the difficulty of fixing up the necessary apparatus. To substitute a crystal for the valve in a cabinet set looks at first sight rather a serious business entailing a good many alterations in the wiring.

Practical Details

With the little piece of apparatus to be described, the crystal can be used in place of the valve in any tuned anode set in a matter of a few moments. The only permanent alteration necessary in the set is to fit two pairs of terminals as shown in Fig. 2. To Nos. 2 and 3 are connected leads from OP and IP of the first low-frequency inter-valve transformer. No. 1

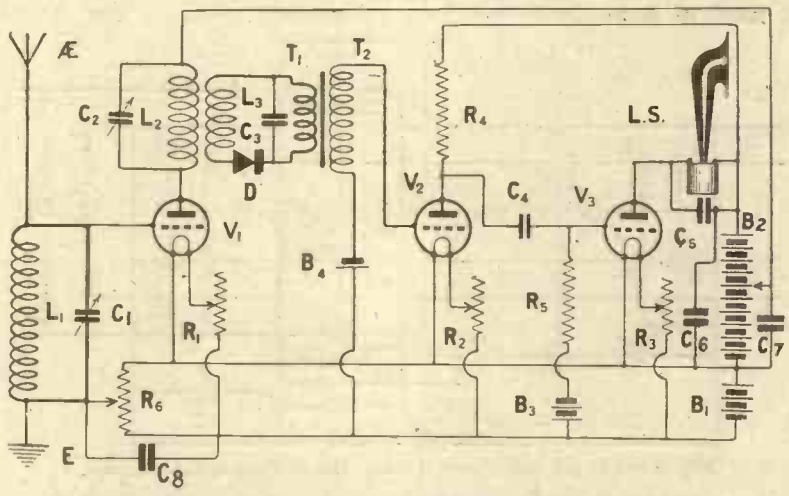


Fig. 1.—In the author's case, the replacing of the valve detector by a crystal results in the circuit shown above.

is connected to high-tension plus, and is provided with a swing hook so that contact between it and the OP terminal can be made

or broken as desired. No. 4 is connected to the plate of the rectifying valve, and has also a swing hook to enable its connection with No. 3 to be severed at will.

The apparatus is extremely simple to make. The materials

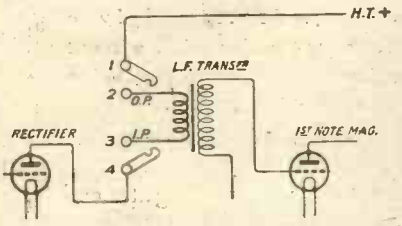


Fig. 2.—Illustrating how the four terminals added to the receiver panel should be connected.

required are two pieces of ¼-in. ebonite, one 6 in. in length and 1¾ in. wide and the other 3½ in. in length by 1¼ in. in width. These are fixed together to form a cross, as is shown in Fig. 3, by a couple of countersunk 4 B.A. screws. The dimensions of the cross-piece are those which fit the detector that I generally use. This is an old-fashioned pattern which I have had for a good many years, but I have never found anything more satisfactory to use. If the constructor uses a detector of different design he can vary the dimensions of the cross-piece to suit it, or even do without this piece altogether. The larger piece of ebonite is drilled as shown. Separate valve legs may be used to form the holder for the H.F. transformer, or a ready-made valve-holder may be mounted. The holes marked A, B, C, and D are intended for the terminals. The other four, E, F, G and H, are intended to take the 4 B.A. screws 1 in. or ¾ in. in length which act as the legs upon which the unit stands.

Fig. 4 shows the wiring connections, and here a word of caution is needed. I have marked the "plate" leg of the transformer-holder IP and that corresponding to the grid OP the two "filament" legs being IS and OS. This is the way in which the particular high-frequency transformer for which the apparatus was designed is connected. Unfortunately there is no standardisation in mushroom-type H.F. transformer connections, so that the reader must verify his own, and then wire up in accordance with them. The important thing is that the primary terminals of the transformer should be connected to

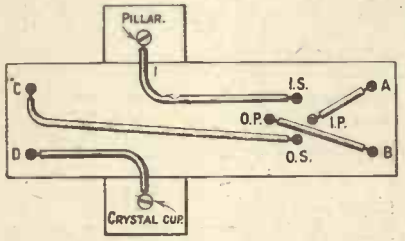


Fig. 4.—How the unit is wired up.

terminals A and B. It does not matter in the least whether IP goes to A or B, as we shall see in a moment.

Connections

The apparatus is now complete, with the exception of its connecting wires. For those which are attached to terminals A and B we use two flex connections provided with an ordinary plug and socket fitting. The connections to terminals C and D may be made with another short piece of double flex, but without the plug and socket. To connect up we proceed as follows: Remove the anode coil and the rectifying valve. Disconnect ter-

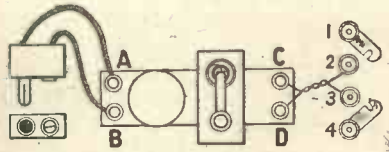


Fig. 5.—The external connections when the unit is used in the set.

minals No. 1 and 4 from OP and IP of the low-frequency transformer by swinging away the connecting hooks. Insert the plug attached to terminals A and B into the anode coil mounting, and attach the leads from terminals C and D to terminals No. 2 and 3 on the set. Fig. 5 makes the process quite plain; a plug-in transformer of suitable size should of course be used in the unit. The resulting circuit is that shown in Fig. 6. The fact that the grid-leak and condenser of the rectifying valve were still connected up made no difference at all to results in the author's case, but the effect of breaking one of the connections to the grid-leak may be tried. In the case where the grid-leak is mounted in clips it may, of course, be removed.

A Suggestion

When the apparatus is first connected up, as shown in Fig. 5, it may be found that results are not very good. In this case, try the effect of reversing first the leads to terminals A and B, and then those to C and D. After a little experimenting the best connections for the four leads for any particular receiver will be found.

R. W. H.

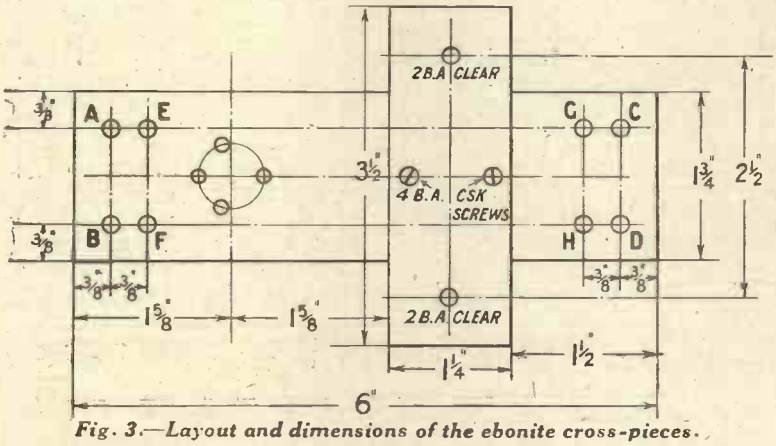


Fig. 3.—Layout and dimensions of the ebonite cross-pieces.

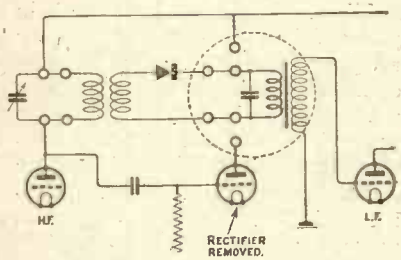


Fig. 6.—The resulting circuit when the crystal is used in place of the valve detector.

Dead Reckoning

TO make a long flight by "dead reckoning," to cross islands and seas without reference to land-marks or other visible guides, and finally to break through the clouds exactly above the intended spot—it is here that the pilot displays his utmost skill.

It is here, too, that he needs to feel complete confidence in the accuracy of his instruments. If he knows that they are designed and chosen with great care, then he can safely entrust his machine and himself to their unfailing performance. If not ——

* * * *

This is only another instance which shows the vital importance of selecting the component parts of a machine with the utmost care.

And it is so with your wireless set.

If you desire good results and freedom from trouble, choose your components—especially your condensers—with great care.

It is certainly worth the small extra outlay to

Specify Dubilier.

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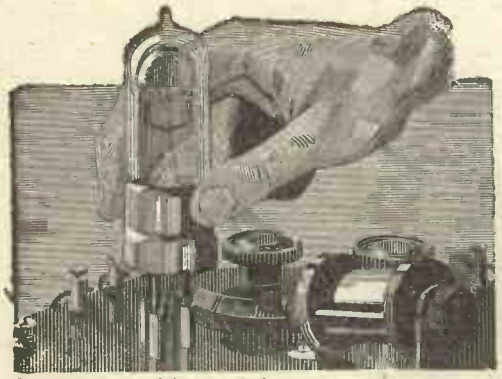
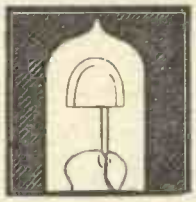


Wuncell exclusive advantages featured:

No. 2



THE patent features which have built up such a reputation for Cossor Bright Emitter Valves are fully retained in the Wuncell. As every experimenter knows, the whole secret of valve reception depends on the correct use being made of the electron emission from the heated filament. In Valves with ordinary straight filaments much of this emission escapes from each end of the tubular Anode. In the Cossor, however, the hood-shaped Anode almost entirely encloses the Grid and the arched filament. Little, if any, of the electron stream can escape.

Obviously this increased efficiency means louder signals and reception over longer distances through the use of a more sensitive valve.

Prices:

W.1 For Detector or L.F. Amplifier

W.2 (With red top) for long distance reception

18/- each

*W.R.1 Corresponding to W.1

*W.R.2 Corresponding to W.2

20/- each

**Fitted with internal resistance so that Valve can be used with 2-, 4-, or 6-volt Accumulator without alteration to Set.*

TEMPERATURE —and length of life

THE one principal factor that determines the length of life of any valve is the temperature at which the filament is run. If such a discovery were possible, a "cold" valve requiring no heat—from electric batteries or otherwise—to drive off its electron stream would possess an indefinite life.

* * * * * *

It was with this thought at the back of our minds that we set about designing the Wuncell Valve. *At all costs filament temperature must be kept down to the very minimum.* That our efforts have been crowned with complete success can be gauged from the fact that when the Wuncell is working in daylight its glow is practically invisible—while even in the dark it is merely comparable to the dull red embers of a dying match.

* * * * * *

But filament temperature is closely related to filament thickness. The coated filament of the Wuncell Dull Emitter is exceptionally stout—in fact the eye will hardly perceive any difference between the thickness of the Wuncell filament and that of a Cossor Bright Emitter, for example. But compare it with the filament used in other Dull Emitters and you will immediately appreciate the fact that its robustness obviously means a much longer life. Pyrometer tests, indeed, have proved that while many Dull Emitters function at a filament temperature of 2,000 degrees, the Wuncell working point is approximately 800 degrees—or much less than half the temperature.

* * * * * *

The Wuncell Valve gives exceptional results because it has been built upon radically different lines. Instead of obtaining low consumption by thinning down the wire used in the filament at the risk of fragility, the Wuncell filament has been specially manufactured to throw off a greatly increased electron emission. As a result, considerably less heat (or battery current) is required to operate it.

* * * * * *

Before you buy your next Valve be sure to see the Wuncell. Examine the filament for yourself—compare it with any other Dull Emitter and you will readily understand why it has such a phenomenally long life. After all, it is the length of time that a valve lasts that will count most with you.

Cossor Wuncell Valves

THE ONLY DULL-EMITTER VALVES SOLD IN SEALED BOXES

Advertisement of A. C. Cossor Ltd., Highbury Grove, N.5

Gilbert Ad. 2368.

Random Technicalities

By PERCY W. HARRIS, M.I.R.E.
Assistant Editor.

I HAVE just been carrying out some experiments which throw interesting light upon a problem which affects most of us—*i.e.*, the strange variation in signal strength in a given locality. I do not refer to what is commonly called "fading," which affects the reception of signals over long distances, but to those changes which frequently take place in the reception conditions connected with the local station.

* * *

For several weeks I have been puzzled by strange variation in the aerial current of my transmitting apparatus, although the input and wavelength have remained constant. A few simple experiments ruled out such matters as faulty connections in the aerial circuit, bad insulation or variations in ground conditions, for the change in aerial current would sometimes take place during a wet evening and sometimes during a dry evening. Sometimes the aerial current would be greater on a dry evening and sometimes greater on a wet evening. When the current was at its maximum the figure reached was far in excess of that I had been led to expect by the input power on that particular wavelength, and reports from distant stations that my signals were strong removed any doubt that the energy was "getting away."

* * *

Early the other evening I started the generator, pressed the key, noticed that the aerial current was in the neighbourhood of .4 of an ampere, and made a note to try some long-distance experiments as soon as broadcasting shut down. Soon after eleven I donned the 'phones, listened in, and made preparations to call a friend. On starting the machine and pressing the key, I found that the aerial current had dropped to something under .1 of an ampere, while the input had slightly increased. Not a wire had been touched since early in the evening, the transmitting wavemeter showed the wavelength had not varied, and the weather conditions were, so far as I could judge, precisely the same throughout. (It had been raining steadily.)

* * *

I may as well confess that this constant variation of aerial current had got on my nerves to an extent that you may scarcely imagine. Nothing is more irritating than some inexplicable phenomena. This time I determined that I would not rest until I had found the cause of the variation, and, considering the matter analytically, I decided to examine everything and every item that had been changed in the room during the evening. I even went so far as to move the chairs to their original positions.

The outdoor aerial is rarely used for reception, and the broadcast concerts from the London station are received on a small indoor aerial connected to a suitable receiver. The receiver is in the same room as the transmitter, but on the other side, and a system of wiring and switches connect this room with a dining-room where a loud-speaker is situated. Arrangements are made so that the receiver can be connected to a loud-speaker downstairs, to one in the instrument room, or to both of these in parallel.

* * *

During the evening this receiver had been tuned-in and the switches manipulated in the usual way. It occurred to me that possibly here might be a solution to the problem, and arranging the transmitter to send a continuous dash so that I could observe the aerial thermo-ammeter from any position in the room, I made a few tests on this receiver. I immediately found that as the aerial tuning condenser of the re-

The workshop of the Hounslow and District Wireless Society, with members busily constructing their apparatus.

ceiver was varied so the aerial current in the transmitting set varied. The wavelength of the transmitter was well below 200 metres, and I found that an optimum point was reached when the receiver was tuned to a wavelength of somewhere in the neighbourhood of 400 metres. Above this the aerial current started to fall once more. This optimum, however, was by no means so high as the highest reading previously obtained.

* * *

The next experiment was to disconnect the loud-speaker downstairs by opening the double-pole double-throw switch connected to it. Immediately the aerial current in the transmitter shot up and reached a figure higher than I had previously obtained (somewhere in the neighbourhood of .5 of an ampere—no mean current for an input of 10 watts). Disconnecting the indoor aerial from the receiver and leaving it free sent the aerial current back to about .15 of an ampere, and reinserting the loud-speaker switch depressed it still further. So here at last was the source of the changes. The lack of constancy in the receiver-setting was due to the fact that when London had shut down I had frequently listened in to foreign stations that may be working, and the chances of the receiver being left at any one wavelength are small.

* * *

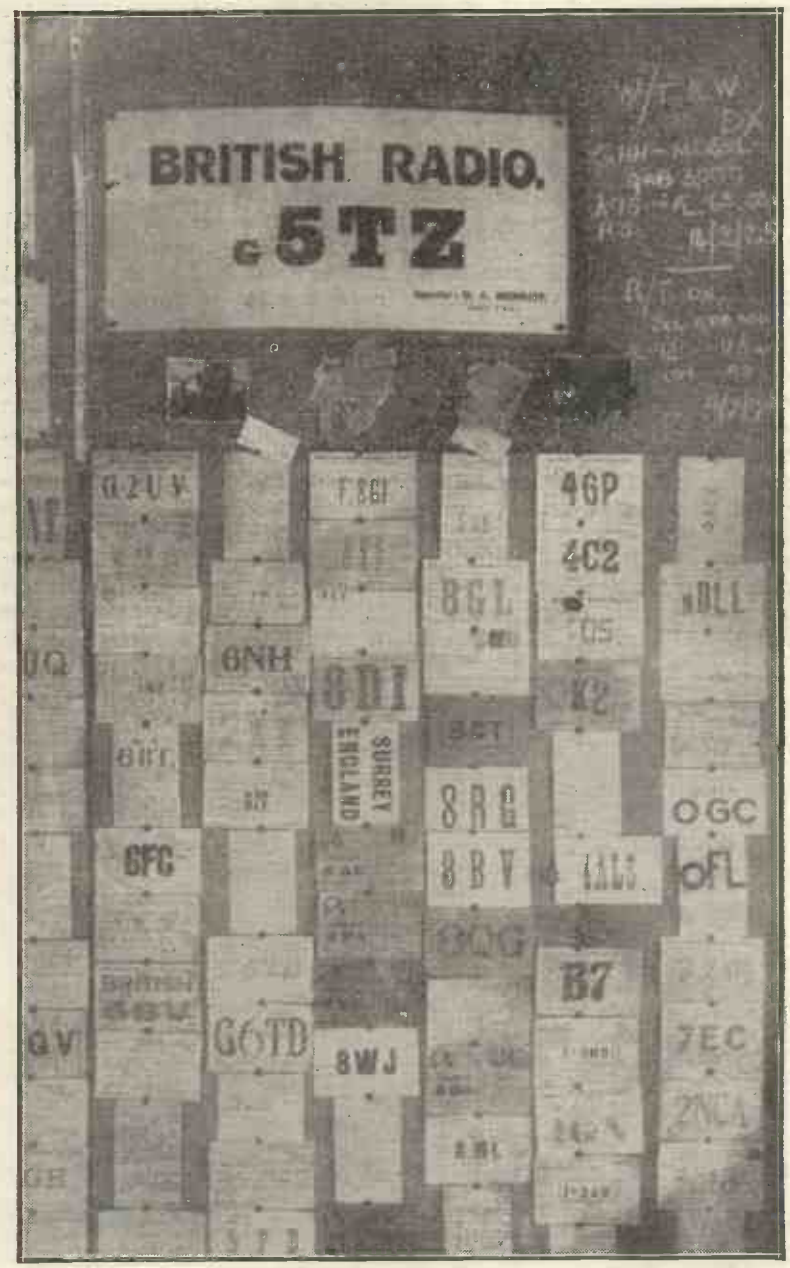
It is interesting to speculate what may happen in receivers if such interactions are possible. It is quite conceivable that switching on an additional light in a large house might connect up a chain of separate links in such a way as to effect a reduction in signal strength in a receiver—particularly one connected to an indoor aerial. I had previously noticed that switching the electric light off at the main switch affected the tuning of the receiving set on the indoor aerial, and, of course, we all know the effect of two aerials close to one another being tuned in such a way as to influence each other. If any readers have had experiences similar to mine I should be glad to hear of them.

* * *

Another matter which is most perplexing, and for which I can see no reasonable explanation anywhere, is the variation in selectivity from night to night. I am afraid that it is one of the many things in wireless which is erroneously ascribed to certain causes and promptly ignored. My own experience in these matters is confirmed by a number of friends who are not at all likely to be misled by unskilful handling, and who take into account the various known factors which influence selectivity. I have, for example, a receiver permanently in position and of such sensitivity that it can be relied on to bring in any of the stations in this country which happen to be working.

* * *

On some evenings there is no difficulty (without wave-traps or other external devices) in eliminating London completely when receiving Bournemouth. On other nights London, while its strength can be reduced considerably, is still plainly audible in the background.



In "Random Technicalities" some weeks ago Mr. Harris made some remarks relative to QSL cards and their popularity. Here we see Mr. Sherratt's collection.

Europe—on a Loud Speaker

GREAT potentialities are shut up into this handsome cabinet. Long range reception becomes independent of "freak" conditions. In a moment you *know* you will be listening in to Vienna, Rome, Paris, Aberdeen, Manchester.

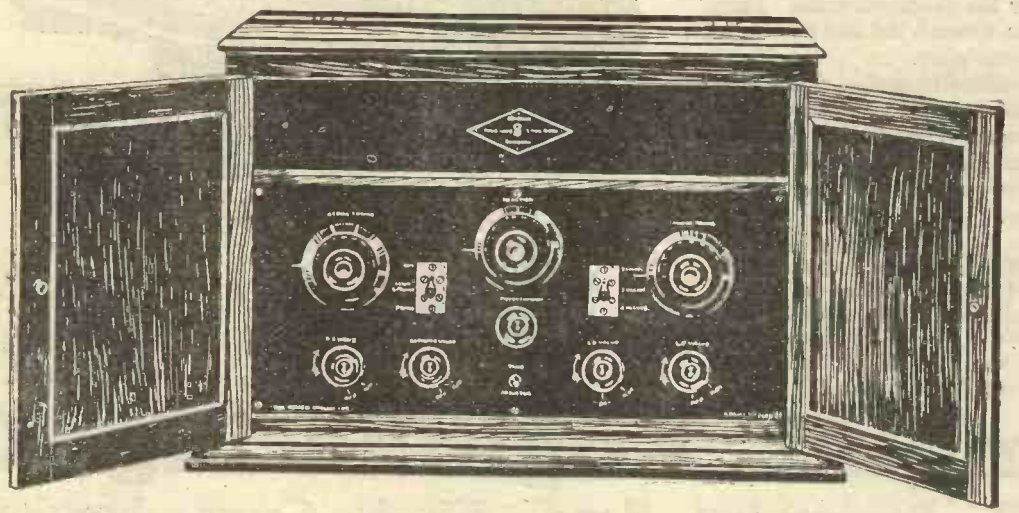
The special improved construction of the set embodies a dual type super-circuit giving the equivalent power of five valves. By this means it is actually possible to receive continental transmission on a loud speaker.

The best results from this set are obtained by using Ediswan PV5DE for valves one and four and Ediswan AR for valves two and three. Televox or Dulcivox loud speakers give effective interpretation of broadcasting from any part of the Continent.

EDISWAN SUPER LONG RANGE RECEIVER

The valves include one high frequency and low frequency amplifier; one detector and two low frequency amplifiers, the last of which is resistance capacity coupled. Capacity reaction is obtained by a variable condenser. The plate voltage of LF valves is 120. Fixed bias potential is applied to the grid of the first valve and variable bias to the grid of the last two valves. All valves are totally enclosed in separate compartments. Connections are made to terminals at the back of the instrument and H.T. and grid batteries are accommodated on a shelf inside the cabinet.

Price *Instrument only, including H.T. and bias batteries and one pair of range blocks* **£30**
(Extra range blocks ... per pair £1)



EDISON SWAN ELECTRIC CO., LTD. 123-5, Queen Victoria Street, LONDON, E.C.4.

RADIO NOTES AND NEWS

Some brief particulars concerning what is happening in the wireless world.

Above may be seen a photograph of some of the members of the Hounslow and District Wireless Society.

A TOTALLY new principle is involved in experiments which the Telefunken Laboratory is now making in Berlin, with the purpose of improving the fineness and exactness of tone in broadcast transmissions. This principle is the basis of a new modulation system, which renders a transmission practically exempt from distortion of any sort.

Transmissions are usually made just after the Berlin station has finished broadcasting, when Telefunken breaks in on 290 metres. The power used for these experiments is 100 watts.

* * *

Two new examples of the interference of the broadcasts of one nation's radio stations with that of another have cropped up within the last week. The new German station at Cassel, which relays the Frankfurt programmes, experimented for a while with transmissions on 292 metres, but finally settled on a wavelength of 288 metres. Since the station is a powerful one, operating on 1 kilowatt, Parisians have difficulty in tuning it out when they want to listen to the programmes of Radio-Lyon which broadcasts on 287 metres. They have also been deprived of the Chelmsford transmissions by the Eiffel Tower working on 1,500 metres in recent experiments.

* * *

We understand that Mr. P. F. Rowell, secretary of the Institution of Electrical Engineers, has sent a letter to the Postmaster-General with reference to the Wireless Telegraphy and Signalling Bill. The letter states that the council of the institution considers that "there are new provisions in the Bill, as compared with the Act of 1904, which are likely to prove detrimental to the progress of wireless telegraphy, of radio science generally, and of other electrical matters," and asks him to defer any immediate further proceedings with the Bill so that the council may have time to give careful consideration to its provisions, and an opportunity of submitting to him its representations.

* * *

Clear two-way speech with the United States has taken place during recent wireless telephony experiments at the Post Office 200-kilowatt plant at Rugby.

In the opinion of Post Office engineers it is now practically certain that within a year London subscribers will be able to speak to New York.

With the thermionic valve and improved apparatus now in use, it has been possible almost to overcome atmospherics during daylight.

Procedure in Transatlantic conversations will be the same as for a trunk call. When the number has been given, the subscriber will hang up his receiver, and when a clear line through from the New York exchange to the American subscriber has been established he will be called and will then be in direct communication.

The Post Office aims to connect subscribers to New York within five minutes. Conversations to Chicago will mean relaying from New York.

* * *

We understand that the German Postal Ministry intends to build new broadcasting stations at Kiel, Dortmund, and Stettin. The cost is estimated at £50,000. The Dresden relay station is so advanced in building that trials can be made. The wavelength will be 292 metres.

According to official statistics, the number of German listeners-in at the end of January was 650,000, or 100,000 more than at the end of last year.

* * *

The air will be a good deal freer in Poland shortly than in the past few years, when the new executive order pertaining to wireless regulations which the Polish Ministry of Industry and Commerce is preparing is passed. There is a considerable amount of restriction in the use of private radio receiving sets, which will probably be lifted, and in addition the order may provide for a limited amount of private broadcasting transmission.

The Government, however, will retain a strong control over wireless telephony for the time being, although Polish amateurs have hopes that even greater opportunities and freedom will be allowed them in the future.

The compact and handsome appearance of the receiver is easily conveyed by this photograph.

An Attractive Three-Valve Receiver

By STANLEY G. RATTEE, M.I.R.E., Staff Editor.

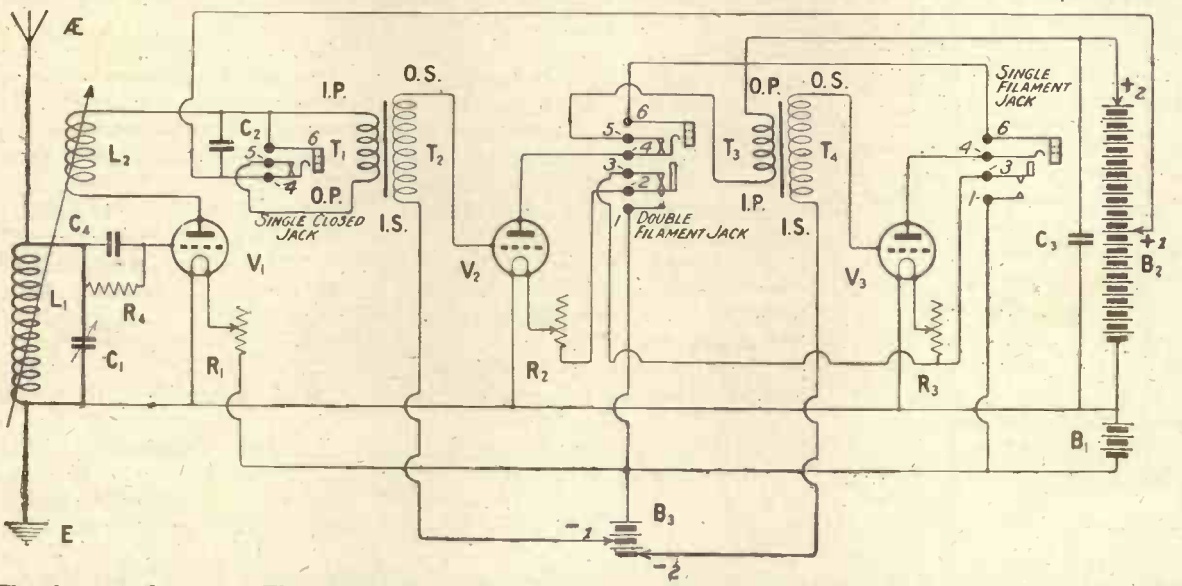
ONE of the simplest three-valve receivers which may be operated is that incorporating a valve detector and two low-frequency amplifiers, so that with such an arrangement the number of tuning controls is brought down to a minimum. In spite of the simplicity of the circuit, however, most of the B.B.C. and Continental stations may be received without difficulty, and in some cases at loud-speaker strength.

The construction of the receiver under description is such that either one, two or three valves may be used, the actual circuit arrangements necessary in such circumstances being controlled by the use of jacks, the filament lighting circuit also being controlled by this means.

Power Valves

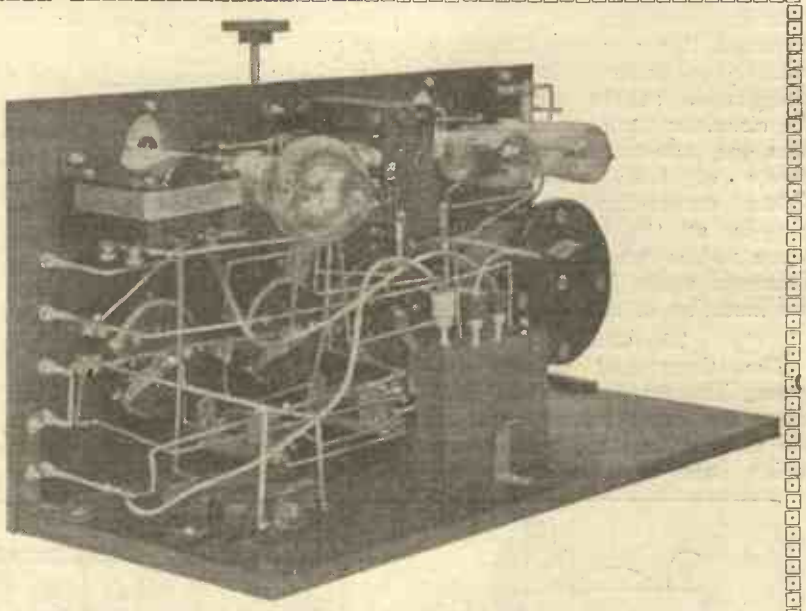
Allowance is made for the use of power-valves in the low-frequency stages, when desired, by the inclusion of special H.T. terminals to take the additional voltage required; provision is also made for grid-bias when necessary.

The photographs of the receiver show that plug-in coils are used in the conventional two-way coil-holder, allowing, therefore, a wide band of wavelengths to be covered. The valves, it will be observed, are situated at the back of the panel, inspection windows being provided for any observations which may be deemed necessary with regard to filament brilliancy. In order that either bright- or dull-emitter valves may be used the receiver is also fitted with dual filament resistances, and it may be of interest to readers to know that with the receiver connected to a poor aerial about eight miles S.E. from the Royal Exchange, using two .06 valves for the detector and first low-frequency stage, 2LO is uncomfortably loud on a loud-speaker when used in a small room, whilst with the same two .06 valves and a B4 in the last



The theoretical circuit. The connections to the jacks should be carefully noted, the numbers corresponding with those given in the wiring diagram.

Full constructional details are here given for the building of a three-valve receiver which will give really loud signals from the local station. The receiver is so constructed that either bright or dull-emitter valves may be used, with a power valve as the last stage.



This photograph, showing the wiring, also indicates how the grid battery is mounted.

stage, 5IT is a really pleasing strength.

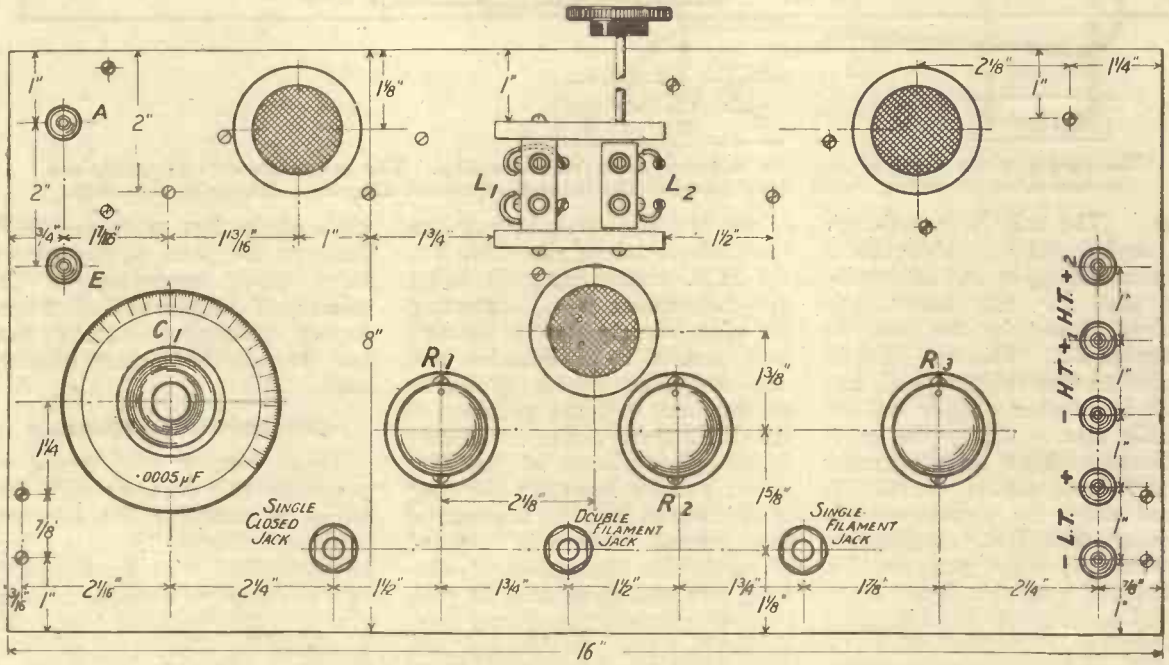
Terminals

The photograph showing the face of the panel will indicate the simple yet effective layout of the components. The two terminals seen to the left of the panel are for the aerial and earth connections, whilst those on the right, reading from the bottom upwards, are the L.T. negative, the L.T. positive, the H.T. negative, the H.T. positive for the detector valve, and lastly, the H.T. positive for the two low-frequency valves; the telephones are, of course, connected into the circuit by means of the plug which is inserted in the jack giving the required number of valves.

The Grid Battery

It will be observed from the terminals indicated that there are no terminal connections for the grid battery. Provision is made for these by the inclusion of flexible leads fitted with wander-plugs contained within the box, which proceed from the secondaries of the two L.F. transformers and L.T. negative for plugging into the usual tapped type grid battery, which is now procurable; access to this battery for the quick adjustment of grid-battery voltages is given by lifting the hinged lid of the containing box.

Referring once again to the photograph showing the face of the panel, the jacks previously mentioned will be seen along the base line of the panel, and reading from left to right, serve the following uses:—By plugging-in at the first jack the receiver be-



The layout of the panel and drilling dimensions. Blueprint No. 102a.

comes a simple single-valve reaction arrangement, the filaments of the two low-frequency valves not being lighted. By plugging-in at the second jack the circuit is the same as before, plus one note-magnifier, the filaments of both valves being lighted automatically. By plugging-in at the third jack all three valves are in circuit, the filaments again being lit up by the insertion of the plug.

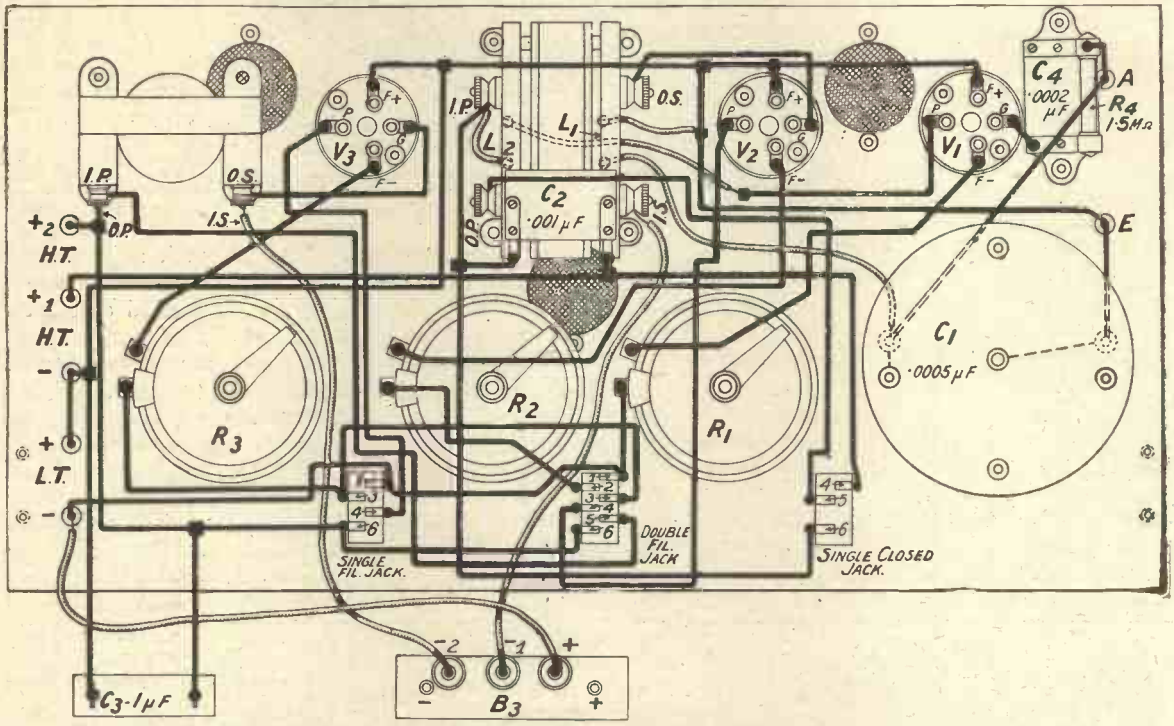
The Circuit

The theoretical circuit diagram, illustrated herewith, indicates the exact arrangement of the receiver and the connections which have to be made to the jacks. The coil L1 constitutes the aerial tuning inductance, which is a plug-in coil of a suitable size for the wavelength required, tuned by the variable condenser C1. This coil (L1) is coupled to the reaction coil L2, which is another plug-in coil of suitable size. C4 is the grid-condenser, whilst R4 represents the grid-leak across it; C2 is across either the phones or primary of the first transformer. The working of the jacks may be understood from this figure by a careful reading of the following explanation, together with an equally careful observation of the contacts involved, numbers being given to these for purposes of clarity.

Using the detector-valve alone we insert the plug, which has the telephones across it, in the single closed jack, with the result that contacts four and five are broken and connection is made between four and six, thereby placing the telephones in the plate-circuit of the first valve in the usual manner of a single-valve circuit, the H.T. connection being made via contact four of the same jack.

By removing the plug from the single closed jack contacts four and five are again brought together, introducing the primary of the first L.F. transformer into the plate circuit of the valve V1, the H.T. connection still being via the contact four. Inserting the plug into the double filament jack results in a detector and note-magnifier circuit by virtue of the fact that the primary of the L.F. transformer is already in the plate circuit of the first valve, and by inserting the plug in the second jack the filament of the second valve is lighted through the separating of contacts two and three and the connecting of contacts one and two; similarly, the telephones are introduced into the plate circuit of the second valve by the breaking of contacts four and five and the connecting of four and six.

On removing the plug from the double filament jack contacts two and three again make connection, as do also contacts four and five, and by plugging-in at the third or single-filament jack, contacts one and three come together to light the filament of the third valve, and similarly, light the filament of the second valve via the contacts two and three of the double-filament jack. In the same manner contacts four and six complete, through the telephones connected to the plug, the circuit to the plate of the last valve and H.T. battery; the plate of the second valve being connected to the primary of the second L.F. transformer through contacts four and five of the double filament jack.



The wiring of the receiver may be followed from this drawing. The connections to the jacks are numbered in accordance with those given in the theoretical circuit diagram. Blueprint No. 102b.

Components and Materials

Those readers who desire to construct this receiver will find below a complete list of components embodied in the receiver photographed, and for the guidance of those who desire to copy exactly the original set, the names of manufacturers are also given, though this must not be

understood to imply that other makes will not work in the same circuit with equal satisfaction. On the contrary, any good make of component may be substituted without fear or hesitation as to results, so long as the values and instructions given are respected.

Transformers

In the matter of the transformers, however, these should not be chosen at random, but should be of types which go well together in harness, and since most of the better makes offer no difficulty in this respect, after a little experimenting as to which should follow the other, the reader should soon be able to decide upon a pair to best suit his needs. A point worthy of mention, by the way, is that, with a given pair of transformers the changing of valves in either L.F. stage, or even both, very often gives improved results both with respect to volume and clearness of reproduction.

One ebonite panel, measuring 16 in. by 8 in. by ¼ in. (Britannia Rubber Co.).

One containing box (Camco).

Three valve windows (Aermonics).

Seven terminals.

One two-way coil holder (Polar).

One variable square law condenser .0005 μF (Peto Scott).

Three valve sockets for panel mounting (Peto Scott).

Three dual filament resistances (Burndept).

One grid condenser .0002 μF (Dubilier).

One fixed condenser .001 μF (Dubilier).

One grid-leak of 1½ megohms (Dubilier).

One fixed condenser of 1 μF (T.C.C.).

Two low-frequency transformers (those illustrated are an "R.I." and a "Royal").

One single closed jack (Rothermel).

One double-filament jack (Rothermel).

One single-filament jack (Rothermel).

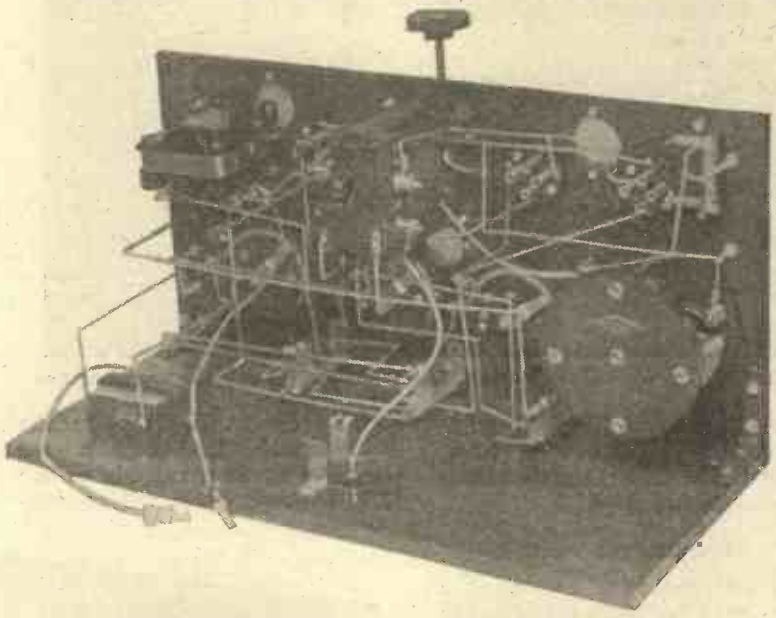
One plug (Rothermel).

Quantity of square rod wire.

Two angle brackets for securing the panel to the baseboard.

The Panel

As there are now so many ebonites procurable which are guaranteed to be free from surface leakage it seems neither necessary to buy the inferior quality nor to instruct readers as to the treatment which should be given to such material. The drilling of the panel should be carried out in accordance with the particulars given in that figure illustrating the layout, and after all counter-sinkings have been made where necessary the components may be mounted. In connection with this part of the constructional work readers will save themselves a very considerable amount of trouble if they mount the two-way coil-holder in the position indicated before mounting the first low-frequency transformer. Again, mounting the centre valve window prior to mounting the middle filament rheostat further simplifies this work; further than this, the components may be mounted as best suits the constructor's desire or convenience.



The neat arrangement of the wiring may be here seen.

Wiring the Components

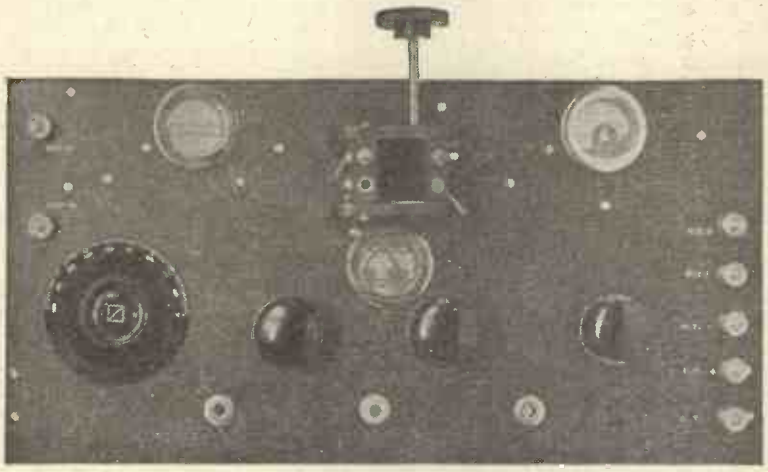
The connections in a receiver of this type are necessarily many in view of the contacts involved in including the three jacks, and in this respect the work will be greatly simplified if the jack connections are proceeded with in the first place, freedom from entanglement with other wires being thus secured.

The various connections necessary may be followed from the practical wiring diagram, whilst for simplicity the connections to the jacks are shown separated in the circuit diagram, the numbers on the contacts corresponding in the two illustrations. In wiring-up this receiver it is recommended that all connections be soldered and all leads be kept as short as possible; further, where leads run parallel they should be well spaced, and where leads cross they should do so at right angles.

Preliminary Testing

With the wiring of the components completed it is suggested that the filament resistances be turned to the off position, the valves inserted in their sockets, and the accumulator connected, when, by inserting the plug into each of the jacks in turn, the filament lighting circuit of each valve may be tested by means of the filament resistances. If all is well join the terminals H.T.1 and H.T.2 together by means of a piece of wire and connect them to the positive of the H.T. battery, the H.T. negative being connected to the terminal intended for it and as marked in the illustration of the panel layout. Connect the aerial and earth to their respective terminals and insert a No. 100 coil in the fixed socket of the two-way coil-holder with a No. 150 coil in the moving socket, and endeavour to receive some sort of signal, noting

whether the set oscillates as the moving coil is brought nearer to the fixed. In the event of no oscillation taking place the connections on the moving socket of the coil-holder should be reversed and searching again tried. If no success is attained in this direction the connections should be very carefully checked with those given in the wiring diagram, still more care being taken to see that the connections themselves are good.



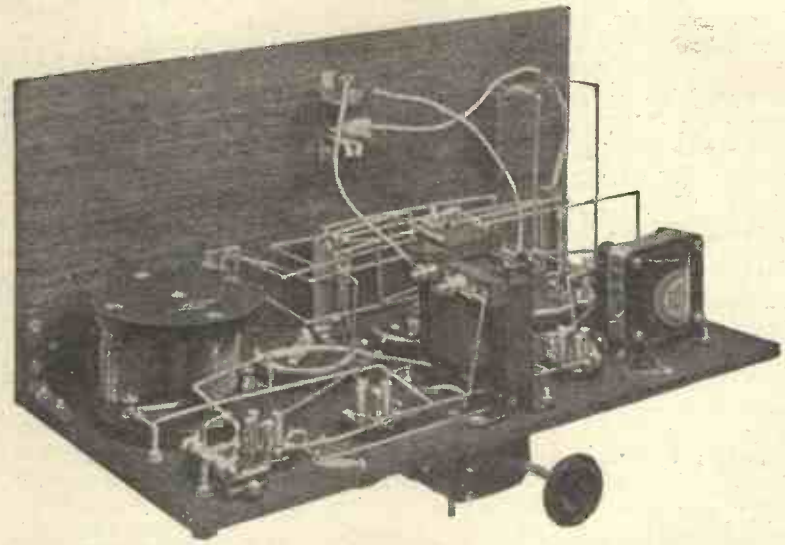
This full-face view of the panel shows the disposition of the components.

Mounting the Panel

Assuming that all is well the panel may be mounted to the baseboard by means of the angle brackets mentioned in the list of components. Upon this baseboard, as the back of panel photographs show, are mounted the condenser which goes across the H.T. battery, and also the grid battery. The method of securing this latter is that of employing two clips such as those used for mounting anode resistances, the battery being wedged between the clips. A simpler method than that illustrated for securing to the baseboard the condenser across the H.T. is to screw it to the baseboard by means of wood screws through the two small holes in the feet of the condenser.

Valves

The receiver will work with practically any type of valve exclusive of special valves for H.F. work, including the dull-emitter types. Irrespective of what valve may be chosen particular care should be taken to see that the proper H.T. voltage is applied, this information being obtained from the wrapper of the valve chosen; the same remarks apply also to grid bias. The manner in which the H.T. connections should be made is to first remove the joining wire between H.T.1 and H.T.2, and with the H.T. negative still connected, connect H.T.1 by means of a flexible lead and a red wander-plug to a tapping of the H.T. battery, which will be suitable for detecting purposes, the exact value being found by experiment in conjunction with information given by the manufacturers of the valve. The terminal H.T.2 should be similarly connected to another tapping of the H.T. battery of a higher value also found by experiment, based upon the information supplied by the manufacturer.



A further view of the wiring showing how the grid connections are made.

Grid Battery Connections

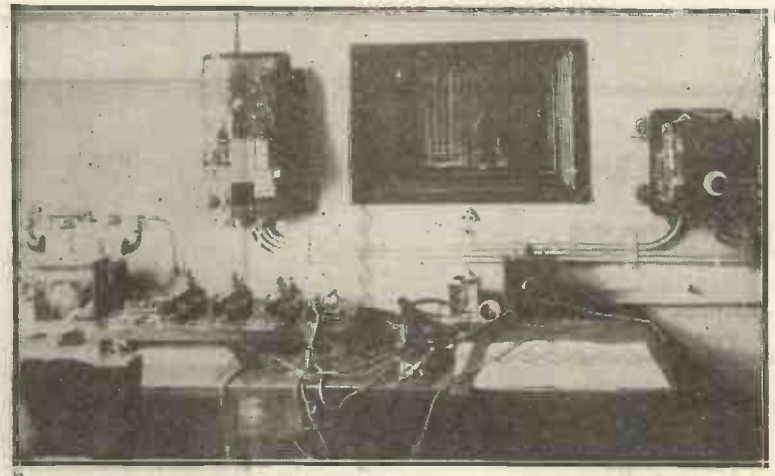
The flexible lead which is connected to the L.T negative should be fitted with a red wander-plug and connected to the positive of the grid battery, whilst the two flexible leads from the secondaries of the transformers should be fitted with black wander-plugs and that lead which is connected to the first transformer plugged into, say, the 1½-volt tapping of the grid battery, with the lead from the second transformer plugged into the 3-volt tapping.

Operating the Receiver

To use the receiver for the first time it is probably better to insert the plug in the first jack, thus using the set as a single valve arrangement without the necessity of adjusting the extra H.T. voltages. In order to tune the B.B.C. stations using wavelengths up to 400 metres, a No. 25 or 35 coil should be used in the fixed-coil socket with a No. 50 in the moving socket. For wavelengths above 400 metres, yet below 600 metres, a No. 50 coil should be used in the fixed-coil socket with a No. 75 in the moving. For the reception of 5XX or Radio-Paris, a No. 150 coil is necessary in the first socket with a No. 200 as the moving coil. The Eiffel Tower may be received with a No. 250 as the fixed coil with a No. 300 as the moving.

Having chosen suitable coils they should be separated as far

(*Concluded on page 768.*)



The control room at the Breslau station. The "pigeon hole" may be seen in the centre of the photograph.

Reception Conditions Week by Week

By W. K. ALFORD.

Review of reception conditions, week ending February 28, 1925.

WE seem to have passed the winter period when conditions for good reception are maintained for several nights in succession and when the reception of long-distance stations is so easy and certain as to become monotonous.

The conditions existing this week have been particularly and continuously exasperating, owing to the bad conditions as regards "X's," which were particularly heavy during the earlier part of the week, and the simultaneous good conditions as regards the reception of long-distance stations.

Mush

Curiously enough, when conditions such as these exist, the presence of specially manufactured "mush" from some of our national achievements, in the way of high-power stations, is particularly accentuated, and reaches such a pitch, at times, that the longer wave B.B.C. stations are almost completely "submerged," making their reception a very trying performance.

"Whys and Wherefores"

While we are discussing this interesting subject it might be as well to go a little more deeply into the "whys and wherefores." Basically, the presence of this "mush," which is nothing more than a welter of uncontrolled harmonics, is quite inexcusable and can only be answered for by those responsible, in terms of "it can't be helped"—a type of excuse often resorted to in scientific circles for inability to modify certain conditions without sacrificing more important ones.

By far the greatest offenders as regards the production of "mush" are wireless stations employing the "Poulsen" arc as a generator of oscillations.

Impure Wave Trains

The wave trains sent out by these stations are of very impure form, and, in radio transmission, whenever this impure form exists, harmonics are at once generated, and, in the case of the "arc," heterodyne and re-heterodyne each other till a species of destructive interference appears which is very accurately described in the word "mush."

It is only fair to note, however, that the total elimination of harmonics from either "arc" or "valve" transmitters can not be looked for, as a station which did not emit any would be hopelessly inefficient, but there is no excuse for the continued use of high-power arc stations which are, happily, giving way to the vastly more efficient "valve" stations.

We look with interest, not unmingled with apprehension, as to what will happen to some of the B.B.C. stations when the vast "ether shaker" at Rugby gets going; but whatever happens we are consoled that he will never achieve the notoriety of Leafield as a "mush" producer, because of the use of "valve" generators.

Personal Experience

From personal experience it is amazing the large number of people who blame either the B.B.C., their own sets, or the longsuffering experimental transmitter, for interference traceable to the above cause, and it is hoped that these remarks will help to enlighten them.

With regard to reception through "mush" it may be stated that quite frequently the voltage applied to the grid of a valve by this interference is very much greater than that applied by strong broadcast stations, and it only makes matters worse if stages of H.F. amplification are added with the idea that the increased selectivity will get rid of the trouble.

The thing to do under these circumstances is to use a rectifying valve followed by note-magnifiers, if desired, and use reaction into the aerial circuit, with, needless to say, scrupulous care! I had intended to go into the question of "fading," which affects long-distance listeners to such an extent, but owing to lack of space I must hold it over till a later date.

Fading

In the meantime, I may suggest to those interested, that fading has been proved to be quite periodic; in other words, to take place at perfectly equal intervals.

Considerable interest can be gained by observing a transmission and timing the intervals of maximum fading with a watch. Notice the period on a station at a certain distance and then get on to another station at a greater distance. It will be noticed that the periods are different.

In this kind of experimenting, on a subject about which extremely little is known, the interest and value are very considerable, and widespread co-operation would be of inestimable importance to the wireless science.

How to Use High-tension Accumulators

By PERCY W. HARRIS, M.I.R.E., Assistant Editor.

IF you go to a shop and buy a six- or eight-valve wireless receiver, it is unlikely that the assistant who serves you will make any reference to troubles you may experience with the high-tension battery. To him, and to you, the high-tension battery may seem nothing but an ordinary accessory, which, so long as it possesses the required voltage, need not be worried over. If you should be curious enough to ask how long it is likely to last, you will probably be told—"Oh! six to nine months!"

Fig. 1.—An Exide 24-volt H.T. unit complete.

If, as often happens, you find after about a couple of months' running that the set is rather disappointing, and does not bring in stations as it used to do, you can probably trace the trouble to the high-tension battery. Bangs, crashes, crackles, and rattles which are often claimed to be the result of run-down high-tension batteries, are far less frequent an occurrence than is often suggested by those who wish to decry the use of any high-tension whatever. It is probable that I have used as many high-tension dry batteries as anyone, and with the good makes I have very rarely found any noises which can be traced to this source. In my experience the chief trouble is in the reduction of voltage and the increase in internal resistance setting up a "feed-back" action between the various stages.

Fig. 2.—A single "Oldham" H... its

Where Dry Batteries are Quite Satisfactory

For one, two, or three-valve sets (save where one of the valves is a power valve), good high-tension dry batteries will give quite satisfactory service, but for multi-valve sets, such as super-heterodynes, even the large sizes of dry cells are apt to prove unsatisfactory. In the past many sets and circuits have been wrongfully condemned, when the sole source of trouble lay in an inadequate high-tension battery, and I am sure many sets which are now considered to give moderately satisfactory results would be found to be far more efficient if the high-tension supply were carefully examined and improved.

The Milliammeter

On occasions too numerous to mention, it has been pointed out that a milliammeter is a most valuable addition to the kit of the

T. cell with a matchbox to show size.

wireless experimenter. By placing such an instrument in the common negative lead of his high-tension battery, and, in a multi-valve set, not omitting to shunt the milliammeter with a fixed condenser of 1 μF or so, a reading can be taken showing the total consumption of the set. If this figure exceeds three milliamperes, then you can take it that this is too great a load for a small high-tension battery, and if above six or eight milliamperes the bigger size is also inadequate.

Dry Cell Sizes

By " small " and " big " sizes I refer not to the total voltage but to the size of the individual cells used. In the smaller type of high-tension batteries the cells are practically identical in size with those used in the pocket flash-lamp batteries, while in the larger size of battery the units are as big in diameter as a penny and sometimes even larger. If you periodically test the voltage of your high-tension battery, *while it is supplying current to the set,* and provided the voltmeter you use is of the high-resistance variety, you will get a

With the growth in popularity of multi-valve sets, both commercial and home constructed, the problem of high-tension supply has become acute. In this article Mr. Harris describes how accumulators can conveniently be used in place of dry batteries.

fairly accurate indication of the state of the battery from time to time. Generally speaking, it may be taken that when the voltage of a battery drops to two-thirds of its initial value, it should be discarded.

Some readers may think that if, for example, they have a 100-volt battery and are using, say, sixty volts, as the voltage of the whole battery falls they can increase the voltage applied to the set by tapping at higher figures. In this way it might be thought that satisfactory service could be obtained from the battery until the actual voltage across the " hundred " tapping is not lower than that originally used, *i.e.*, 60 volts. In a small set using one or two valves, and provided that the battery is still quiet at this advanced stage of

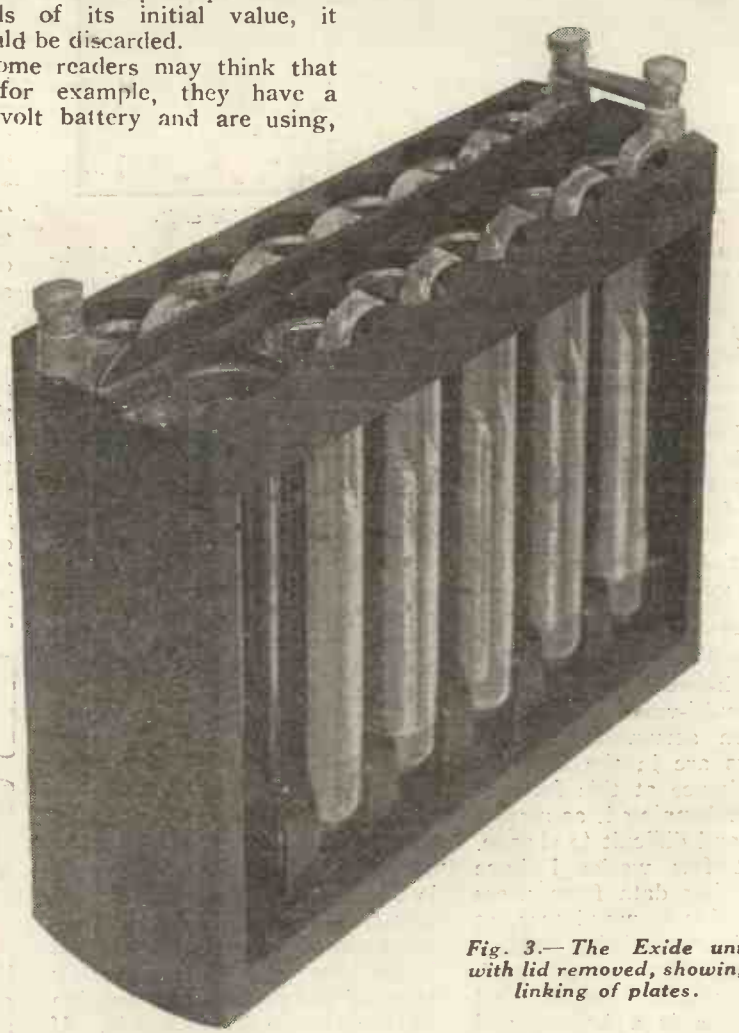


Fig. 3.—The Exide unit with lid removed, showing linking of plates.

its life, it may be quite satisfactory to act in this way, but in a multi-valve set 50 volts from a new battery will give far better

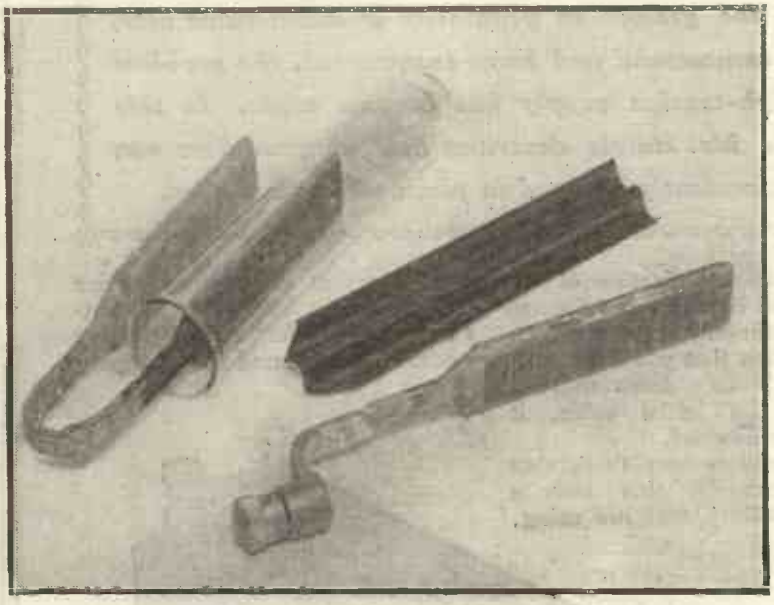


Fig. 4.—Plates, separator and test tube of an Exide unit.

results than 50 from an old one. The reason for this is that the high internal resistance of the old battery may set up a greater or lesser degree of low-frequency reaction between the note-magnifying stages, giving distortion or even a howl. To some extent this trouble may be remedied by connecting large condensers of the value of 1 μF or so across the high-tension leads, but this is only a partial remedy, and often does little good.

The Accumulator

Undoubtedly the best solution of the high-tension supply problem in multi-valve sets is the high-tension accumulator. Experimenters are in the habit of looking askance at this form of battery, condemning it as messy, expensive and difficult to charge. In the last few weeks I have been collecting data from users of high-tension accumulators, at the same time submitting a set of H.T. accumulators to a thorough test. As a result, I can say that the messiness is a bogey, and that, so far as the expense is concerned, this is not formidable. The charging is sometimes a problem, but in many cases will be found quite easy, as I shall endeavour to show.

Dealing first of all with the question of expense, this is by no means so high as would first appear, or, more accurately expressed, the cost of high-tension dry batteries is not so low as many people imagine. A high-tension battery to give satisfactory service with, say, a six- or eight-valve super-heterodyne receiver, will cost about a couple of pounds, and if the set is used at all regularly will probably cease to give efficient service after a few months. I have known the big batteries to run out in less than this time. If we buy two of these batteries a year then our annual expenditure on high tension will be about four pounds, not forgetting that for at least a portion of the year the voltage will be considerably lower than that we really desire owing to the steady deterioration.

First Cost

Now an excellent high-tension accumulator giving 96 volts can be bought for £4 16s. If the owner has a direct current supply in his house the charging will cost him practically nothing, as the apparatus can be improvised in an hour or so from existing material and current consumption on the charge is negligible. If alternating current supply is laid on then a special battery charger is needed, but as this same charger can be used for charging the low-tension accumulators, the whole cost should not be debited to the high-tension side of the set. If there is no current in the house then the battery must be taken to some charging station. Unfortunately at the present time the average garage cannot be relied upon to charge high-tension accumulators, but no doubt when these batteries come into more general use adequate facilities will be made available.

Test Tube Types

A high-tension accumulator differs from a low-tension accumulator only in the size of its units. One well-known commercial make, the Exide, is shown in Fig. 1. The 24-volt unit consists of twelve test tubes in two rows of six, each test tube containing a positive and a negative plate with the two plates separated by an ebonite strip to prevent short circuits. The test tubes are held in a specially-moulded case with lid, and in addition to the two terminals of each 24-volt unit, clips are provided so that tappings can be taken at every two volts. To obtain higher voltages it is, of course, only necessary to join up several of these units in series.

The First Charge

When received from the makers the battery is dry, and the test tubes need to be filled with ordinary accumulator acid to about half an inch above the plates. A first charge is then given, the charging rate being one-tenth of an ampere. The total capacity is about one ampere hour. As we take not amperes but milliamperes from a

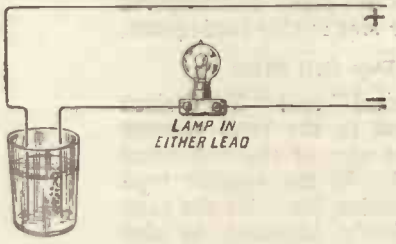


Fig. 5.—How to test polarity of D.C. mains.

high-tension accumulator, and as quite a large set will not take more than 10 milliamperes, you can see that such a battery will run a multi-valve set for a long period. If, for example, the set takes 10 milliamperes, then this high-tension accumulator will give 100 hours' service before the voltage begins to drop. The makers, in the instructions

moulded into the lid of each unit, recommend that a charge be given once a fortnight, and if you do the battery will be kept perfectly fresh.

Larger Units

The same makers also manufacture a larger type of unit at 2s. 6d. per volt (the price of that just shown is 1s. per volt). Excellent high-tension accumulators are also made by Hart, Oldham, and other well-known makers. A single unit of an Oldham high-tension accumulator, both complete and in unassembled form, is shown in Fig. 2. In this case, instead of a test tube, which is perhaps more fragile than many care to handle, a moulded glass box is provided, with a sealed-in lid and vent plug of rubber. Sockets in the bus-bars connecting the various cells allow wander plugs to be inserted where necessary, so that tappings can be taken off at desired points.

Low Charging Rate

One-tenth of an ampere is the correct charging rate for most high-tension accumulators, and if direct current is available it is very simple to fix up the arrangement shown in Fig. 6, which consists merely of a switch and a lamp. The size of the lamp

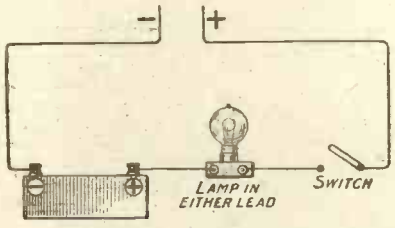


Fig. 6.—How to charge the H.T. accumulator from D.C. mains.

determines the current flowing, and the following table will serve as a guide.

No. of Cells in Series.	Voltage of Battery or Batteries (at 2 volts per cell).	SIZE OF LAMP. LINE VOLTAGE. 100/110	200/220
12	24	15 watts	25 watts
16	32	15 ,,	25 ,,
24	48	25 ,,	30 ,,
32	64	40 ,,	30 ,,
36	72	70 ,,	40 ,,
48	96	—	50 ,,
60	120	—	80 ,,

Solving a Problem

The only problem in this arrangement is to find which is the positive lead and which is the negative from the mains, for if the battery is connected the wrong way round serious injury will be done to it. To test which is the positive and which is the negative wire, put some salt water into a tumbler, connect a small lamp in series with one wire (it does not matter which), and dip the two ends of the wire into the tumbler, as shown in Fig. 5. In a few moments bubbles will form on the negative wire, the positive being practically free from them.

A Check

If you have a milliammeter with a suitable scale you can connect this in series with the battery when charging to prove to yourself you are applying the correct charging current.

With alternating current supply you will need some special rectifier, perhaps the simplest being a single electrolytic cell. These can be made up quite cheaply, and full instructions for constructing one will be given in an early issue. Meanwhile I believe that they can be obtained commercially from one or two firms, such as the Zenith Manufacturing Co., of Willesden. When the demand increases no doubt others will be made available very quickly.

A.C. Chargers

In the United States, where the high-tension accumulator is rapidly coming into general use, there are a number of battery chargers available for both high- and low-tension voltages. For example, high-tension charging attachments can be purchased for the well-known "Tungar" rectifier, for the "Homcharger," and others widely used. In this country the British Thomson-Houston Company, who market the Tungar, are at present unable to supply high-tension attachments, and, so far as I know, at the present time there is but a single battery charger—the Valley (sold by the General Electric Company)—which is suitable for the purpose described. This charger, which I have had under personal test for several weeks, is of the vibratory type, but is commendably free from the defects which are usually associated with this type of rectifier. The noise, for example, which is such a drawback in most cases, has been reduced to a minimum, and if the apparatus is placed in a spare room with the door shut the noise cannot be heard outside that room. It charges 2-, 6-, 12-, or 24-volt batteries, according to which terminals are

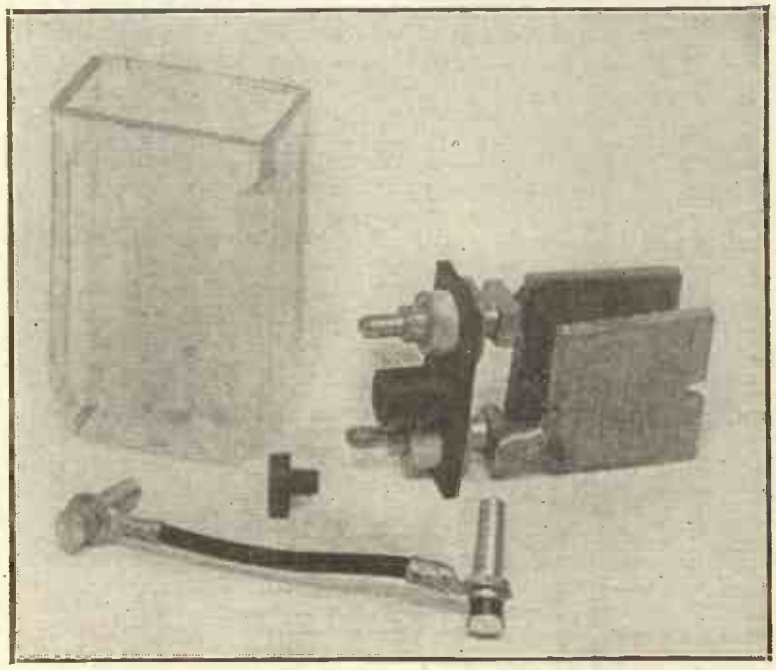


Fig. 7.—An Oldham H.T. unit before assembly.

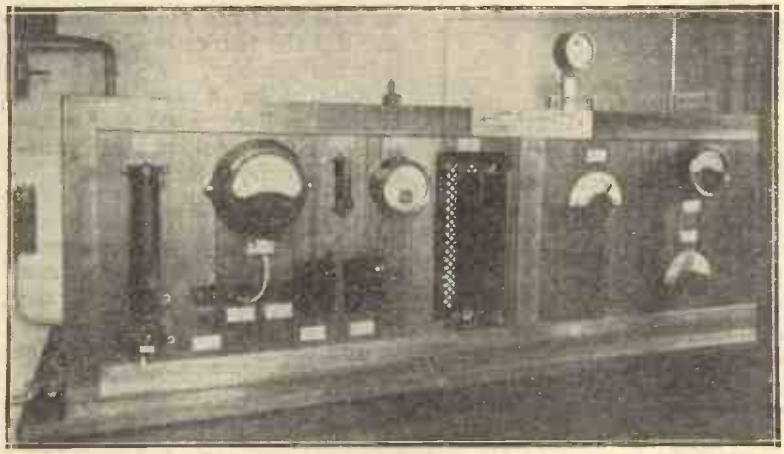
used. Two- and 6-volt batteries are charged at 6 amperes, 12-volt at 3 amperes, and 24-volt batteries (high-tension units) at one-tenth of an ampere. The charging rate for the low-tension accumulator can, of course, be cut down by the use of a series resistance, and it is advisable to do so if the size of the battery is less than 60-ampere hours actual. It is not generally advisable to charge an accumulator at a rate greater than a tenth of its actual capacity. Thus, a 40-ampere hour battery should not be charged at a higher rate than 4 amperes. Even at the 6-ampere charging rate there is practically no sparking at the contacts, which are of carbon and silver.

Our photograph shows the emergency studio of the Zenith Portable Broadcasting Station, which was erected in three hours in a shop window in Escanaba, Mich., for the purpose of making tests during the eclipse of the sun on January 24.

Experiences in Charging

On receiving my first high-tension battery I filled it with acid and connected with four 24-volt units in parallel. The Valley charger has a switch for charging one, two, three or four 24-volt units at a tenth of an ampere each in parallel, so that a 96-volt battery can be charged as one unit. After a 36-hour first charge, the batteries were put into service and showed 103-volts for an hour or two. After a fortnight's continuous working with a load of about 8 or 9 milliamps the voltage was still 99.

The first effect of substituting high-tension accumulators for dry batteries was the distinct improvement in the purity of reproduction, even though the high-tension batteries had previously been shunted at each stage with 2 μF condensers. It is rather difficult to account for this improvement, but it has been noticed by a large number of users of high-tension accumulators when they have made the change from dry cells.



Part of the apparatus in use in the transmission room at the Breslau Broadcasting Station.

With reference to the alleged objection of "messiness," I think this has been largely exaggerated, as the small units are made up in such a fashion as to be quite clean in use, and during charge they do not gas excessively. The space occupied by high-tension accumulators is, of course, greater than that taken up by the dry-cell type of supply, but it is not so large as some people imagine. Thus, the floor space taken by the 96-volt H.T. accumulator of the test-tube type is almost exactly the same as that occupied by a 120-volt dry battery using the larger units.

Tappings

It is unusual for high-tension batteries to be tapped at anything less than three volts, and on the 120-volt units the first tapping is generally at about 40 volts. With high-tension accumulators tappings can be taken at every two volts throughout the battery.

A further advantage, but one of comparatively limited appeal, is that high-tension accumulators can be used for low-power transmitter experiments, when similar experiments with the high-tension dry batteries would ruin them in a short time.

Power Valves

Finally, if you want to use power valves for note magnification, and to use them regularly, you must give up the idea of trying to use dry batteries for this purpose, unless expense is no object to you.

It will thus be seen that high-tension accumulators are worthy of careful consideration by every serious experimenter. While their first cost is high, compared with that of H.T. dry batteries, the upkeep and depreciation are both low, and worked out on the basis of annual expenditure the H.T. accumulator wins rapidly with multivalve sets.

Analysis of Condenser Resistance

By SYLVAN HARRIS.

(Concluded from Vol. 5, No. 19, page 703.)

WE have always been told to use the greatest amount of inductance possible, so as to obtain the greatest voltages possible on the grid of the valve used in the radio set. The voltage across the inductance, however, is a function of the current in it, and if this is kept low by reason of high resistance, we shall be no better off by reason of the higher inductance. It will be found that with proper coil design the resistance can be *more* than cut in half when we build a coil of half the inductance. Furthermore, low resistance coils of high inductances are too large, so generally better results will be obtained with coils of lower inductance of proper design. More will be said about this in a succeeding paragraph.

Resistance Variation

In connection with the variation of resistance with the dial setting of a condenser we may point out here the advantage of the low-loss condenser, that is, the condenser which has the lower resistance at a dial setting of 100. It would be expected that the resistance of condensers having higher resistances at 100 on the dial would increase more rapidly as the plates are turned out than would be the case with condensers of lower resistances at 100 on the dial. The difference in resistance between the two types is not large, and the most important thing to consider in a well-made condenser is its mechanical construction. Of course, we are not considering condensers that are not worth using.

Average Reduction

The average reduction of resistance from the old style type of condenser to the low-loss type is about $\frac{1}{4}$ of an ohm for the 0.0005 size, and about 2/10 of an ohm for the 0.001 size.

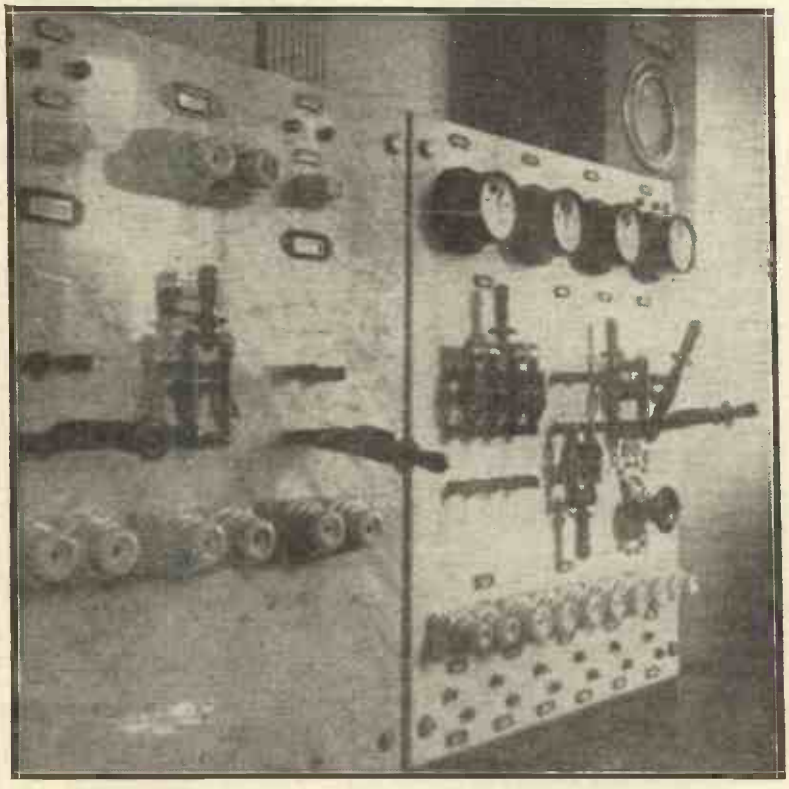
An interesting thing in connection with the test is the result of measurements made on a condenser when enclosed in a metal container and when used without any shield. The resistance of the condenser was increased by the container or shield by as much as from 20 per cent. to 50 per cent., depending upon the size of the condenser. This seems to indicate that some of the gain expected in condensers which have eliminated the end-plate of insulating material, and replaced it by metal end-plates, may be offset by losses due to the formation of eddy-currents in the metal end-plate, and may at the same time be another reason why the resistances of all the condensers did not vary much. About 200 condensers were measured, representing 60 different makes; the highest resistance obtained was about 2 ohms, and the lowest about $\frac{1}{2}$ ohm. As said before, the average resistance of them all was less than an ohm.

Eddy Currents

It must not be forgotten that while dielectric losses decrease as the frequency increases (or as the wavelength decreases), eddy-current losses in metal end-plates and other parts of the metallic structure increase. This may seem to indicate that condensers with metal end-plates may be less efficient on the ultra-short wavelengths than those having end-plates of dielectric material. However, there is reason to believe that the losses in the end-plates are small as compared with the losses in the condenser plates themselves, and also that there may be an optimum wavelength at which the resistance of a condenser will be least. As the frequency increases, dielectric losses decrease while skin-effect increases. At extremely high frequencies, the skin-effect may increase faster than the dielectric absorption decreases, so that up to a certain frequency the condenser resistance would decrease, beyond which it may rise again.

Bureau of Standards

For the benefit of those who may feel inclined to question the accuracy of these measurements, in spite of the check measurements that were made, there is another proof of the validity of



Our photograph shows the main switchboard at the Breslau Broadcasting Station.

the method which is conclusive as the check measurements. Quoting from Circular 74 of the U.S. Bureau of Standards, page 196, "For a variable air condenser with semi-circular plates having a small resistance mainly due to dielectric absorption in the separating insulators, the resistance is inversely proportional to the square of the setting, at constant frequency." The curve in Fig. 2 showing the actual variation of the resistance with the dial setting has been plotted on logarithmic co-ordinates in Fig. 3. The upper part of the curve turns out to be a straight line, having a slope of —2, showing exact agreement with the above quotation. In other words, for the small dial settings, at a constant frequency or wavelength:

$$r \propto \frac{1}{D^2}$$

However, if we should assume the only losses in the condenser to be those due to absorption in the dielectrics, the point where the dotted continuation of this straight line cuts the ordinate for a dial setting of 100 will give the dielectric loss at this frequency and at a dial setting of 100. In this particular case it happens to be 0.09 ohm.

Dielectric Loss

It will be remembered that the resistance of this condenser measured at 1,000 cycles is 278 ohms, at a dial setting of 100. If now we again assume the whole resistance of the condenser to be due to dielectric absorption, the dielectric loss at 100 on the dial and the same frequency (96 metres or 3,125 kilocycles) that applies in the above paragraph (and to Figs. 2 and 3), it will be

$$\frac{1,000}{3,125,000} \times 278 = 0.09 \text{ ohm}$$

which agrees exactly with the value obtained before.

We have thus determined the dielectric losses both from the viewpoint of variation with dial setting and variation with frequency, and the values obtained are in exact agreement. Furthermore, the measurement of resistance at 1,000 cycles was made by an uninterested party, viz., the Bureau of Standards.

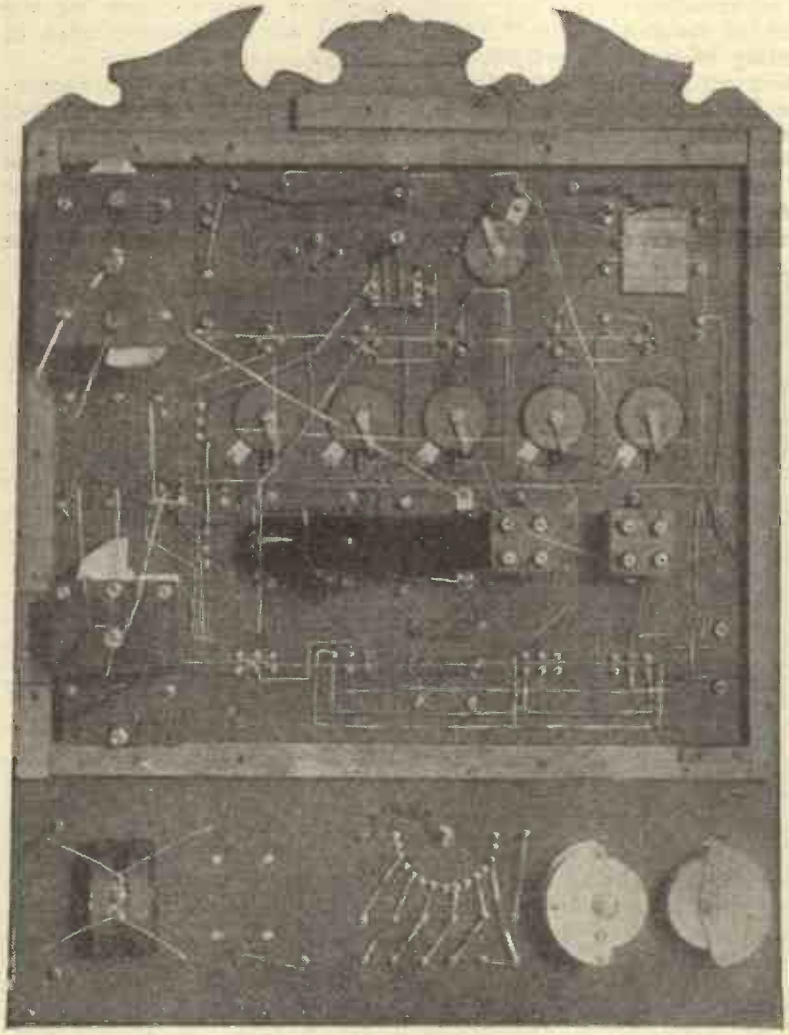
In this particular condenser, therefore, the dielectric losses at 96 metres are only equivalent to 0.09 ohm, while the total resistance of the condenser at that wavelength is 1.25 ohms (see Fig. 3). The dielectric loss, therefore, is only 7 per cent. of the total condenser resistance.

Enlarging Odd Size Clearance Holes

SEVERAL constructors have no doubt found that on drilling, say, a No. 0 B.A. clearance hole for panel mounting of some component, a fit does not result. This may possibly be due to a slight inaccuracy in the construction of the component, or more possibly due to another standard being used other than the British Association Standard.

A simple method of slightly enlarging the hole drilled is to insert a square or round tapered file of suitable size into a brace and use it in the same manner as a drill. Having given the brace two or three turns, the component fitment should be tried in the hole, as it is easy to make the hole too large. The file will be found to give a perfectly round cut with a smooth finish.

H. B.



Our photograph shows the careful layout of a "Wireless Weekly" reader's five-valve receiver, a front-of-panel photograph of which was given in our last issue.

The International Aspect of Broadcasting

By Capt. L. F. PLUGGE, B.Sc., F.R.Ae.S., F.R.Met.S.

The following is an extract of the talk given by our Continental correspondent from 2LO on February 26th.

IN America broadcasting started some two years before it did in this country, and consequently we in England had the advantage of looking back to what had been done over there before facing our problems. This advance trial, as it were, was certainly very useful to us in many spheres.

The Language Problem

There was one problem, however, with which America was not faced, and with this problem we in Europe are the first to grapple. I refer to the difficulty arising from the close neighbourhood of so many countries in which different languages are spoken and in which different laws prevail. Except for Havana, United States radio amateurs have practically only one language and one law to contend with. The South American stations, separated by land from the States, have been received only in very exceptional circumstances.

Chaos

In Europe things are quite different. Here we have a large number of countries very close to one another; in fact, a twenty-four hours' journey can hardly ever be made in a straight line without visiting three of them. They each have different languages and different laws, and it is beginning to dawn on us that our centralisation of broadcasting, as compared to America, is a myth, and that the chaos which we tried to avoid is growing greater every day. Wireless knows no frontiers; it is useless for a geographically small country like England to hope that its own centralisation is going to avoid this chaos so detrimental to good reception.

Our photograph shows Mr. H. W. Litt, who has been appointed engineer-in-charge of the high-powered station at Daventry, now in process of erection.

Then there is the question of law. Some of these countries have laws quite different from our own. Nothing can stop them from building high-powered stations within very short range of foreign countries, powerful enough to interfere with the home stations. There is a common danger here, on which many views might be taken.

Co-ordination

The centralisation of commercial broadcasting which the B.B.C. have achieved in England should, in the largest measure possible, be extended to the whole of Europe. Co-ordination should exist among the various broadcasting organisations. They should come to some understanding with reference to the numerous points which are at present looked at from so many different angles.

Wavelengths

Another question to examine is that of the allotment of wavelengths. At present, when new broadcasting stations are erected, wavelengths are only considered with regard to the stations in the near vicinity or in the same country. This has caused much interference in the past, and among these we might mention the time when Madrid and Hamburg were both sending out on 392 metres. It was impossible for any listener stationed anywhere throughout the breadth of Europe to tune in one station without tuning in the other, with the result that one could

listen to neither. Other cases could be mentioned, such as the interference which the Petit Parisian, Paris, caused for some time to the London Station. At present, unless one possesses one of the latest highly-selective sets, it is impossible in the North and East of England to listen to Radio Paris without also hearing something of Chelmsford. The allotment of wavelengths is an important question.

As an international point of view, there is also the question of hours of transmission. No doubt stations are mainly concerned with their nearby listeners, but they sometimes forget that these same listeners are very likely to become wireless enthusiasts, and to pay their licence fee so as to be able to listen to distant stations. In other words, the position is very much like foreign postage at present. A man in England pays the B.B.C. for his licence, but listens to a German station to which he does not pay. As against this, a man living in Germany pays the German broadcasting station and occasionally listens to the British concerts, and everybody is, as it were, quits. But this is not really the case; Great Britain is situated on the western edge of Europe, consequently, its time—Greenwich Mean Time—is ahead of the other times in the centre and the eastern part of Europe which use Central European Time, one hour behind our own, and Eastern European Time, two hours behind our own. For a man living in Budapest, the Savoy Bands go on, on Saturdays, until 2 in the morning, whereas his own stations, which close down at 10 o'clock in his country, cannot be heard later than 8 o'clock in England. There is obviously an unfairness here, since at that time the British stations are working on full power and the British listeners consequently have not so good an opportunity to tune in the Hungarian station. How can this be remedied?

Basket Coil Adaptors

A SIMPLE type of quick adjustment basket coil adaptor is described in this article. All that is necessary for the construction is an ordinary ebonite coil plug in which the connections are made to screws at the sides, two small pillar terminals, some stout copper wire of No. 16 gauge, and some ebonite, $\frac{1}{8}$ or 3/16 in. thick.

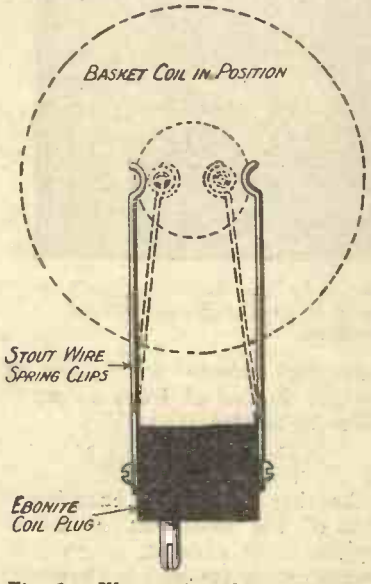


Fig. 1.—Illustrating the principle.

The principle of the idea is clearly shown in Fig. 1. Two stout wire spring clips are secured to the ebonite coil plug, as shown, by means of the side screws. Details and dimensions of these wire spring clips are shown in Fig. 2.

The portion of this component which holds the basket coil is shown in Fig. 3. This is made from two circular pieces of thin ebonite cut to the dimensions given. Each piece has two holes

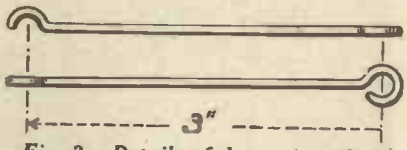


Fig. 2.—Details of the spring clips.

drilled to clear the shanks of 4B.A. terminal screws. The simplest method of making the drillings in both pieces perfectly true is to clamp the pieces together and drill in one operation. The basket coil is secured by clamping between the two ebonite pieces. The beginning of the coil winding is connected to one terminal and the end of the winding to the other terminal.

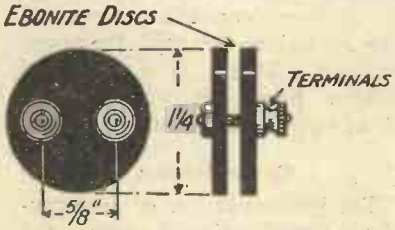


Fig. 3.—The coil holder.

The coil is now inserted between the two wire spring clips on the adaptor, as shown in dotted lines in Fig. 1, the terminals acting as a hold for the spring clips to grip.

H. B.

WIRELESS NEWS

The problem of the nature and the cause of atmospheric disturbances which have proved such a bane to radio since the earliest days of the science is the subject of a report which was presented by General Ferrié, the Inspector of the Military Telegraph Service at the Paris Academy of Sciences. The report contains the results obtained by the National Meteorological Office under the direction of Captain Bureau, in their long search to learn the causes of parasitic disturbances, and to classify them.

According to this report parasitic noises of the first type (migratory atmospherics) follow the cold banks, and strong centres of high barometric pressure, and can be detected indistinctly at any hour of the day or night. Stationary atmospherics, the second type, are not noticeable except between the hours of 11 a.m. and 9 p.m., and are extremely violent. Lastly come anticyclonic atmospherics, which are observed only at night.

* * *

The new Austrian radio station at Gratz is now beginning its first experiments in transmission. A provisional wavelength of 700 metres will be used by this station for the present. It is probable that the official opening, when Gratz will actually be ushered into service, will take place at the end of this month.

A Multi-purpose H.F. Unit

By C. P. ALLINSON.

(Concluded from Vol. 5, No. 19, page 718.)

Results

The following results were obtained with a short screened aerial about five miles N.W. of 2LO, and may prove an indication of what this high-frequency unit is capable.

Using a crystal detector and tuned anode amplification, the tuned anode coil being coupled to the aerial coil, and series tuning being employed, 2LO of course was loud, 5IT was received at fair headphone strength and several other B.B.C. stations were received, but not identified. Two German stations were also heard, weakly but clearly. Ships' Morse came in at great strength. Using tuned transformer and getting the set to oscillate by using a fairly high potential on the plate, the above results were duplicated at slightly reduced strength, while control of oscillation was critical.

Tuned Anode

Using tuned anode with a valve-detector 5IT Birmingham was audible on the loud-speaker several feet away, as were two other B.B.C. stations. Four or five German stations were heard; Radio Belge came in at good strength, as did Postes et Télégraphes. Several relay stations were also heard, but not identified. Madrid was received quite well without interference from Newcastle and only a little from 2LO, series tuning being used.

C.A.T.

Radiofonica Italiana was also heard, and the set proved delightfully easy to handle, reaction being used from the detector valve. The above results were duplicated, using tuned transformer coupling, the only difference noticed being that in selectivity, which did not appear to be quite as good, 2LO coming through rather more strongly on the wavelengths of Madrid and Glasgow. Parallel tuning also was found to be not quite so selective, while C.A.T. was more so. A curious point noticed was that when changing over from tuned anode to transformer coupling it was necessary to reverse the reaction coil. On the higher waves Chelmsford was very loud, while Radio Paris came in at good strength with only a little interference from the former station. The coils used for series tuning and C.A.T. were L1 50, L2 50 and L5 35, for wavelengths up to about Newcastle, while above this L1 and L2 were 75 each, the same value reaction coil as before being found suitable. For parallel tuning L1 and L2 were 35 and 50 respectively for the lower broadcast band, and 50 and 75 for the higher, a No. 50 reaction coil being used in both cases.

On Chelmsford parallel tuning was used with a No. 150 in the aerial and a 200 in the tuned anode, a 100 being found suitable for reaction. These coils also brought in Radio Paris.

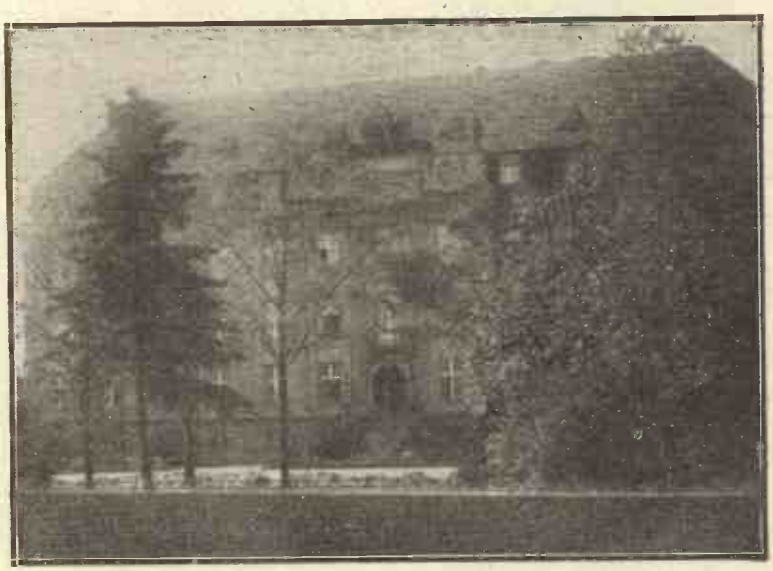
Reflexing

The receiver was next connected as a reflex unit, and 2LO was received on the loud-speaker at good strength. Postes et Télégraphes was tuned in at fair headphone strength, while 5IT was rather louder. A German station or two were also heard, but not identified, as well as two other B.B.C. transmissions. Series tuning was used with the earth connected to E. Using tuned transformer coupling 2LO was not quite as loud, and as time was limited other stations were not searched for. On the long waves 5XX came in well on the loud-speaker, and was, if anything, a trifle louder than London, while Radio Paris came in at good strength on the headphones, and was weak but clear in the loud-speaker.

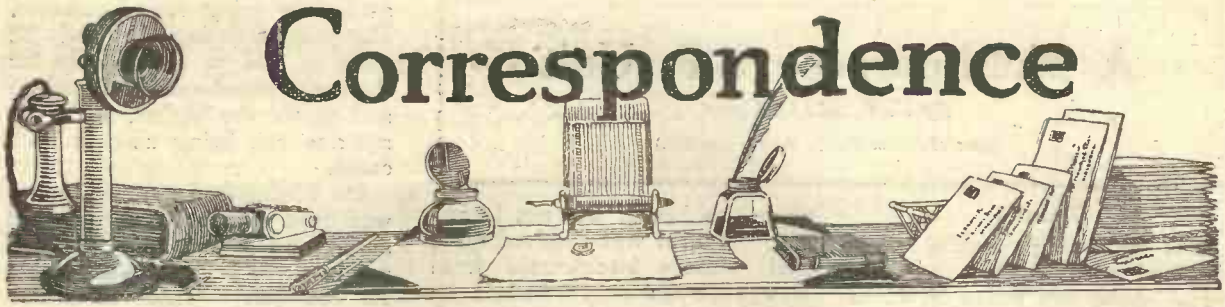
The unit was also tried on a frame aerial and proved very efficient, bringing in 2LO at good strength, while several other transmissions were also heard fairly clearly, though, of course, somewhat weak.

Removing Burred Edges from Drilled Holes

AFTER a panel has been drilled, it is often seen to have slightly burred edges around the holes. This is due to the sudden breaking through of the drill, especially where the work has been hurried. This burr is easily and quickly removed by taking a countersink bit in the hand and inserting it in each hole, giving it one sharp turn. This should be done each side of the panel where a neat finish is desired. The chief objection to burred holes is the fact that they often prevent a good, flat contact where nuts and washers, etc., are assembled upon the panel.



An exterior view of the Breslau broadcasting station, whose transmissions are frequently heard in this country.



LOW-LOSS CONDENSERS

SIR,—With reference to Mr. Philip Coursey's article on "Low-Loss Condensers," which appears in your issue of February 18, attention is drawn to the statement made at the top of the third column on page 654.

Mr. Coursey seems to imply that the determination of "losses" by bridge methods is not to be relied upon, because it is necessary to assume that the standard condenser against which the unknown condenser is balanced has zero losses.

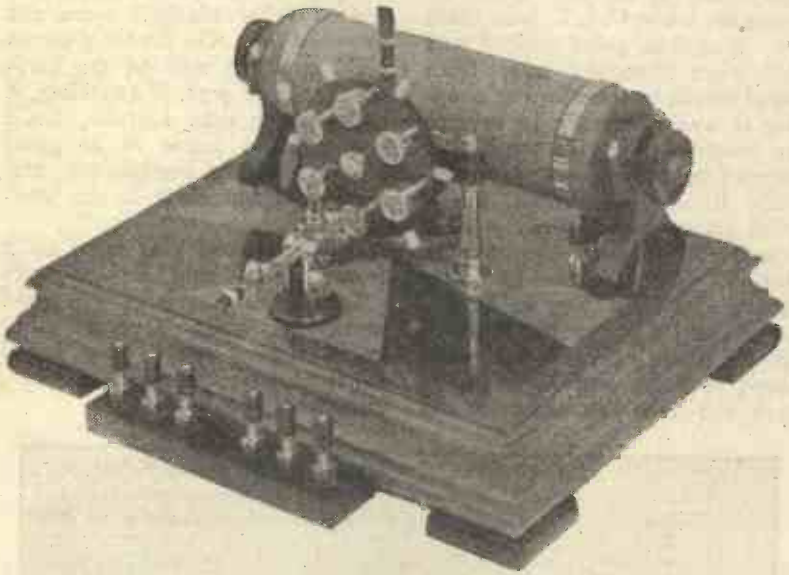
There is, however, a well-known and quite reliable method of measurement in which the "losses" of the standard condenser do not affect the results, the only assumption made being that the losses of the Standard condenser remain sensibly the *same* at all scale settings. The bridge is balanced with two reasonably good condensers, one being a Standard condenser (called "S"), each set to a fairly high reading, say, .001 mfds. or more; the condenser under test (called "X") is now placed in parallel with "S," and the bridge re-balanced by reducing the reading of "S" and re-adjusting the balancing resistance. The capacity of "X" is the amount by which "S" had to be reduced, and the equivalent resistance of "X" is the amount by which the balancing resistance had to be varied.—Yours faithfully,

FRANK PHILLIPS, M.I.E.E.
Chief Engineer, Burndept, Ltd.

AN IMPROVED TWO-VALVE RECEIVER

SIR,—I constructed the "Improved Two-Valve" set by Stanley G. Rattee a few days after publication in *Modern Wireless* for January last.

I am using a D.E.R. detecting and a D.E.6 as amplification valve.



A most handsome crystal receiver made by Mr. T. Orton, a member of the T.O.T. Radio Association of the Underground, before which Mr. Harris recently delivered a lecture. Note the commutator method of tuning on the right hand side.

In the first I am using 26-36 volts with 54 volts H.T. on the second valve. I have used 4½ volts (flash-lamp) grid battery, but have discarded it and gone direct from grid-leak to L.T., with no perceptible difference.

For Chelmsford (135 miles) I use a 150 and a 200 coil made from No. 26 wire. For the B.B.C. wavelengths I use, in the aerial socket, 45 turns of No. 18 wound on a 2-in. cardboard tube 1½ in. wide, the first 25 turns wound side by side in a single layer, over which is laid a piece of well-shellaced corrugated cardboard (from an electric bulb wrapper), and the remaining turns are wound side by side over this. This coil I find far more efficient than 15's wound on the duolateral principle to the same wavelength value. For reaction with my 18's coil I use 45 turns of 26's.

With the above two 45-turn coils I have heard, on a good, clear 90-ft. aerial 30 ft. high, 17 different stations with clarity by simply slowly rotating the tuning condenser, the reaction coil being set well below oscillation and left untouched. These stations, identified and unidentified, range from Hull, the nearest (16 miles) to Vienna. The earth is a counterpoise 12 ft. high.

The set is beautifully pure and is stability itself.—Yours faithfully,

G. P.

Grimsby.

A FOUR-VALVE T.A.T. RECEIVER

SIR,—In response to your invitation to give results obtained with the circuits published from time to time in your valuable papers, I have great pleasure in informing you that I have constructed a 4-valve T.A.T. receiver (December *Modern Wireless*), and have found it to be the best and the most stable set I have ever used. The nearest broadcasting station is Calcutta, over 600 miles from here, using 1-1½ k.w. on 425 metres. With the above set I can receive the music and telephony on a loud-speaker with perfect stability and clearness.

I am now trying the 7-valve T.A.T. receiver (January *Modern Wireless*), the result of which I shall report later on.

I may add that on certain favourable occasions I have received Chelmsford on the "All Concert" set. With this set I have received Bombay music (distance over 900 miles). This is remarkable, as the power used at the transmitting station is only 50 watts.—Yours faithfully,

WALI MOHAMMAD.

Lucknow.

THE ST41 IN EGYPT

SIR,—As I know that you are interested to hear of the success or otherwise of your various circuits, I am writing this letter to let you

A.R. 110—111

Following the recognised "Dragon" principle of construction in every detail the "New" Junior design provides the improved non-resonating Sound Conduit hinged to a weighted electro-plated base. The electro-magnetic unit embodies the most advanced features including the "floating" diaphragm and consequently affords "Better Radio Reproduction."

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THE ELWYN RADIO-FREQUENCY INSTRUMENTS CO., CHURCH LANE, OLDHAM.

know of the wonderful results I am obtaining with your ST41. I have wired this set as a fixed receiver, as all my other experimenting is done on the "Omni Receiver."

My results with the ST41, using an aerial composed of an uninsulated piece of Electron wire thrown out of my window (my flat being situated some 35 feet high) are as follows:—

Bournemouth.—Very loud and clear.

Newcastle.—Very loud and clear.

London, 2LO.—Clear music; words a little difficult to follow.

Chelmsford.—Clear, but fading very noticeable.

Rome.—Very loud and clear.

A Yugo Slavia station, but I was unable to get the station call.

All the above stations were heard on two pairs of 'phones, and were so loud that a loud-speaker could have been worked. I am now rewiring parts of the set in order to make it as perfect as possible, and even hope to improve on the above.

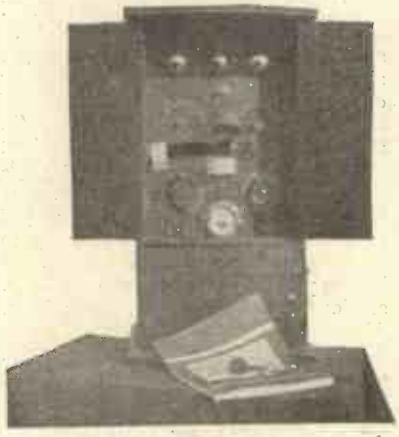
With my best thanks for a really good and reliable circuit, and with best wishes for success to Radio Press,—Yours faithfully,

J. GANDY.

Port Said.

A FOUR-VALVE T.A.T. IN OSLO

SIR,—You might be interested to hear what results I have obtained with your T.A.T. 4-valve set, which I have just recently built. I have made up the set exactly to Mr.



A compact receiver made by Mr. C. Wellman, a reader of "Wireless Weekly."

Scott-Taggart's specification, with the exception of the transformer, which is a Peto-Scott new type. My aerial is rather inefficient and only some 65 ft. long, yet in spite of this I have brought in the majority of the B.B.C. and Continental stations on a loud-speaker. Curiously enough, Zürich is one of the loudest, and comes in with a roar. Altogether I think the T.A.T. is marvellous, and after having constructed and discarded a good many sets, I shall now be settling down with my T.A.T. 4, and let my soldering iron have a good rest.—Yours faithfully,

E. STORM ROSLIE.

Oslo.

AN EFFICIENT MULTI-LAYER COIL

SIR,—May I be permitted to write and thank you and Mr. G. P. Kendall for the results I have obtained with my one-valve set?

The circuit is the ST78 and the coil is made to the design of Mr. Kendall's "Efficient Multi-Layer Coil" in *Wireless Weekly* for February 11.

As I have only mounted this set quite lately—February 21, to be exact—the results obtained so far are very good. In two nights (Sunday and Monday—I was out on Saturday night) I have had 5NO, 6BM, 2ZY, 2LO, 5WA and Petit Parisien, all at really good phone strength, and 2BD, 5SC, Rome and two B.B.C. relay (?) stations very easily readable.

The set is very easy to tune, as I am using two Naylor Fulstop condensers and a Colvern vernier on closed circuit condenser with complete absence of hand capacity effects.

I may add that my "bag" contains at least 15 other Continental stations besides the two mentioned.

Wishing your papers every success.—Yours faithfully,

FRED STACEY HALL.

Chichester.

THE "TRANSATLANTIC 4"

SIR,—I feel I must write and tell you how pleased I am with the "Transatlantic Four." I have built a good few sets now, including ST100, the 3-valve Dual and the Puriflex, but this one, in my opinion, beats them all. On Saturday morning, at 3 a.m., December 20, I received three American stations, KDKA, WGY and WBZ, the latter on a loud-speaker plainly audible all over the house, every word coming through quite distinctly, with very little fading.

I am delighted with the set, and I wish your papers, of which I am a constant reader, still greater success.—Yours faithfully,

DISNEY CRAN.

Banchory.

A DISTINCTIVE TWO-VALVE RECEIVER

SIR,—Having just completed the Two-Valve Distinctive Receiver given by Mr. Stanley G. Rattee in the August number of *Modern Wireless*, I thought you might be interested in the results obtained. I have built the set with parts as specified; the only difference is, I am using a Sterling Square Law condenser with vernier instead of the Bowyer Lowe. I have a twin aerial 40 ft. long and 16 ft. high, with a 4-ft. down lead. I am delighted with the results. Within five minutes of making the last soldered joint I was listening to Bournemouth, good and strong. I have picked up all the B.B.C. stations, including all the relays. Also Madrid and two French stations. I picked up KDKA direct recently at 10.45. These stations all come through perfectly, and the volume is tremendous from Bournemouth, Manchester, London and Madrid. KDKA, of course, was not so strong, but I could hear comfortably what the announcer said. I think it is a wonderful little set, and I am very pleased with it. I must congratulate Mr. Rattee. I can get all stations, using tuned anode coupling, up to Newcastle with a No. 35 coil, and the remainder up to 500 with a No. 50. I will try later for 5XX when I get another coil or two, and I will let you know how I get on with the circuit. This is the first set I have built, although I have been interested in wireless since last March. I have a two-valve Marconiphone, on which I have picked up my experience. I am a regular reader of *Modern Wireless* and *The Wireless Constructor*.—Yours faithfully,

FRED W. JOHNSEN.

Tullamore, Ireland.

P.S.—I forgot to say that the set is very selective, easy to control, and there is no difficulty in picking up stations.

WGY ON TYPE W.1 SET (PANEL CARD No. 1)

SIR,—In October last I constructed the three-valve set issued on Panel Card No. 1, this being my first experience with valve sets, and have pleasure in sending report of working of same.

I use dull-emitter valves, B.T.H. B5, for detector, and Marconi Osram D.E. 3 for the two-note magnifiers, and run same from two, and sometimes three, Columbia dry batteries.

Until recently the only aerial used was a single wire about 75 ft. long, with maximum height of 15 ft., 22 ft. of which was in the house,

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THERE'S an indescribable feeling of pride awaiting every purchaser of a Eureka Transformer. Considerable prestige is attached to the use of a Transformer found in some of the best known Broadcast Receivers. The knowledge that it is the instrument selected—almost without exception—by the leading technical men of the day for their most important experiments is a continual safeguard of quality. And the feeling that it is bought principally by those whose experience enables them to judge the merits of a Transformer has ever been a remarkable stimulus to its popularity.

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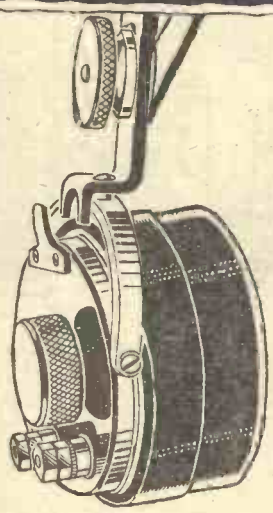

A Tribute

NO greater tribute could be paid to any Headphone than to specify it for use on passenger-carrying ships. When efficiency and sensitiveness are put before initial cost it is a remarkable fact that in every case Brown A Headphones are selected. You will never have to listen anxiously for a response to an S.O.S.—in your case the safety of hundreds does not depend upon your Headphones—but you should own at least one pair of the super-sensitive Brown A Headphones in order to be able to pick up far-distant Broadcasting inaudible in ordinary telephones.

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the earth lead to tap being about 20 ft. in length.

Liverpool relay station, about 3¾ to 4 miles away, came in very loud on loud-speaker, also Manchester, 33 miles away. All B.B.C. stations were heard on phones, and Belfast moderately loud on the loud-speaker. Brussels, Petit Parisien and Madrid could be easily heard on phones.

In November last I tried an aerial consisting of 40 ft. of tinned copper wire wound on a frame and suspended from a bedroom window, at a height of about 20 ft., with about 25 ft. lead in. This answered well, and all stations previously heard were logged.

On this aerial I picked up the transmission from the s.s. *Leviathan* when 750 miles off Cherbourg, and in response to the request of the Chief Wireless Operator, sent in a full report of the times and items heard from the orchestra and the various barometer and thermometer readings which were announced from time to time.

I have now erected a pole ready for a higher aerial, and last week tried set with single wire of about 66 ft. running from top of 33-ft. pole direct down and into the house; 22 ft. of aerial is actually in the house.

I also fitted a "Climax" earth tube, the earth wire now being about 24 ft. long. This aerial and new earth has made a wonderful difference, and last week, after Manchester and Liverpool had closed down, I obtained dance music from Bournemouth at quite fair volume on loud-speaker.

On Friday night, February 20, reception seemed to be so good I was encouraged to try further afield, and at 12.15 a.m. Saturday morning I tuned-in a station giving market prices, stocks and shares. At 12.30 a.m. I got on to another station, but could not get the speaking clear until I adjusted the "Watmel" grid-leak and reduced the H.T. to about 18 volts. At 12.42 a.m. I heard quite clearly "This is WGY, General Electric, Schenectady, calling." The items for the evening were announced, and a musical piece played by the American Instrumental Trio. I was using parallel tuning with Igranic coils Nos. 40 and 100, and the condenser reading was 60°.

I then tuned-in another station at 32°, and heard a talk to children on "Jungle Life," with very realistic imitations of wild animals.

Another station was tuned-in at 24°, and a talk was in progress which appeared to be about the benefits of colonies and their help to the Motherland. Morse was very bad at this time, which was about 1 a.m. I then went back to the station at 32°, and heard music, which appeared to be from a harp and a piano. After hearing WGY announced again, and listening to some music, I gave in, being very well satisfied to have heard America direct for the first time, and at the first attempt.

For readers who are unable to erect a very efficient aerial, this seems to be a very good set, judging from the following, as I can get Liverpool full volume on loud-speaker with no aerial, but by attaching earth wire to aerial terminal; Manchester very loud on phones, moderate on loud-speaker. On Saturday last, about 8.30 p.m., I tried again with no aerial, and heard John Henry's melodious voice. According to the programme, this should be Birmingham, but I had no time to wait to hear the station announced. The condenser reading also pointed to the station being Birmingham.

I have now fitted two extra terminals on the panel connected to the first transformer, to enable me to use the set as a double note-magnifier.

With all best wishes for the even greater success of your three journals.—Yours faithfully,

E. W. MELKSHAM.

Birkenhead.

Apparatus we have tested

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

"Macondo" Ear-Pads

Samples of their "Macondo" pneumatic ear-pads have been submitted by Messrs. McLeod & McLeod. These consist of an inflated annular cushion of thin corrugated rubber, fitted over the ordinary ear pieces of a head-set by means of a rubber flange at the back, and while actually about 2⅜ in. diameter are adjustable on any of the ordinary sizes of ear pieces.

On trial, a considerable improvement in comfort was noticeable, and the headphones could be endured continuously for considerably longer periods without respite than usual. External noises were excluded to an unusual extent, though a slight rustling was noticeable when the head was moved, but not of a significant order. It was necessary to remove and dry out the ear pieces at intervals on account of the condensation of perspiration within them, there being no free escape when these pads are applied. We believe that with the aid of these pneumatic pads many listeners will find a considerable relief from the usual acute discomfort experienced with headphones when worn continuously.

"Grelco" L.F. Transformers

Samples of their new large types of L.F. intervalve transformers, suitable for power amplification and for general use, have been submitted by Messrs. Grafton Electric Co., and have been subjected to extensive trial. These are made in three ratios, following the most modern practice. Those tested were the 4 : 1 ratio, for first stage or second stage with valves of medium impedance, and the 6 : 1, for power amplification stages following small power-valves of comparatively low impedance. There is made in addition one of low ratio for use when desired in the first stage, following a detector-valve of high impedance.

These transformers are obviously instruments of scientific design, in which the provision of an ample iron magnetic circuit, sufficient turns in the primaries, and those factors in general which contribute to high efficiency and freedom from distortion have not been sacrificed to other considerations. The results obtained on practical trial certainly

FALLON SQUARE LAW CONDENSER

FEATURES
One hole fixing, tag connections, heavy aluminium top and bottom plates.

FEATURES
Metal to metal adjustable bearings, stout, well-cut aluminium vanes. Complete as illustration.

The new Fallon Square Law Condenser is absolutely the last word in perfect condenser construction.
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Price.		Price.	
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·0005 ..	7/-	·0002 ..	5/6
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E.P.S. 231

justified the design; for whether as coupling-device for a single note-magnifier or as one of a chain of three successive stages of L.F. amplification (an exceedingly severe and unusual test), the 4:1 instrument showed excellent amplification and a freedom from distortion, with proper equipment elsewhere, which compared favourably with the best of other large instruments; and the 6:1 gave really excellent service in extremely powerful power-amplification when using low-impedance valves. As a first transformer the 6:1 is not recommended, as there is no particular gain in its use, and the tone is not so good, on test. The two together, used in the last stages of a three-stage L.F. amplifier, gave surprisingly fine results, and very powerful loud-speaking with the minimum of distortion when the rest of the equipment was able to handle the energy. Naturally, with ordinary D.E. valves, the two stages alone would overrun the characteristic and produce distortion which must not be blamed on the transformers.

The different types are superficially identical; they stand 4½ in. high, with a very heavy iron core of extraordinarily generous cross-section, and innocent of any cross bolts to short-circuit the laminations for eddy-currents. The terminals are arranged in most accessible fashion on the top, and clearly marked. The vertical coil is of generous dimensions also. The feet are drilled for holding-down bolts. No particular signs were noticed of direct magnetic interaction between two stages when the transformers stood close together, but there was the usual effect of inherent low-frequency reaction with more than one stage in use, independent of the relative position of the transformers and resistant to the usual expedients suggested for prevention of whistling under these circumstances. One immediate cure for this (which is commonly observed in efficient L.F. amplification chains) was the rather unusual but exceedingly effective device of a 70,000-ohm resistance across the anode-connection and the "O.S." of the second-stage transformer. Complete stability then ensued, and most powerful loud-speaking was obtained without further difficulty from low-frequency reaction effects.

We can strongly recommend these fine large transformers when properly adjusted to the valves used and supplied with the necessary grid-bias and high plate-potential to give an available grid-volt-swing corresponding to their power for distortion-free reception. They are not cheap instruments, but we feel assured that their price would prove to be a good investment.

"E.M.C." Micrometer Variable Grid-leak

We have received from Messrs. Enterprise Manufacturing Co., Ltd., samples of their micrometer variable grid-leak. These have the usual one-hole fixing for panels up to 5-16 in. in thickness, and are controlled by the customary small knob on the projecting spindle. The device is contained in an insulating tube measuring, with the brass end pieces, about 2 in. below the collar, and of some ⅝ in. diameter. Small screws with soldering tags provide the necessary connections.

As in a very similar device recently reviewed in these columns, for filament control in that case, the resistance element in these grid-leaks is contained in a small cartridge, which slips into the body of the instrument and contains the carbonaceous powder. The cartridge is in the form of a short rubber tube, ¾ in. long and ½ in. diameter, with brass end-plugs, and is compressed between the cap of the mount and the end of the micrometer spindle when operating the instrument.

In the half-dozen instruments tested, the range of resistance available was from about 50 megohms (in one from about 25 megohms) down to a minimum which varied between 0.1 and 1 megohm approximately, with the spindle screwed

hard home. The useful range was obtained in about half a turn of the knob, and included the values mostly in demand in practice, i.e., from about 1 to 4 megohms. Over this range, and in actual trial in reception under reasonably critical conditions (Nottingham relay at about 100 miles in the morning transmission, on the single valve), good control was obtained, and a satisfactory elimination of oscillation back-lash, without any difficulty. The resistance values appeared to be reproducible with sufficient accuracy for practical purposes.

A Plug-in Coil-holder

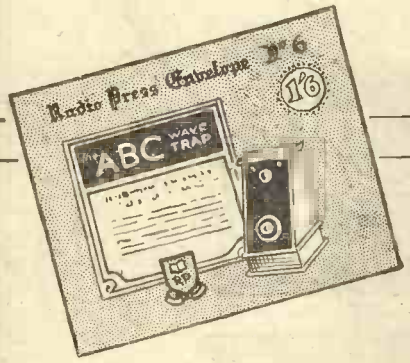
An original type of two-coil holder, which is actually arranged to plug-in a valve socket of the ordinary four-pin type, has been submitted by Messrs. Morris Golf Ball Manufacturing Co., Ltd. In this, an ebonite pillar, in sections, which can rotate on a common axis, and about 3 in. high, has a four-pin base arranged in the ordinary valve-leg pattern, so that the whole instrument can be mounted in a valve-holder on the panel top. The connections to the two coils are taken by short pieces of flex, which allow a limited angular movement, to the "filament" and "grid-anode" terminals respectively. A short knob-ended handle is provided, to screw into the side of the uppermost section, in order to control the upper coil-plug. The lower section, carrying the lower coil-plug, was found to rotate stiffly on the central axis, and apparently no method of fixing this definitely was provided. The upper fitting rotated above this fairly easily, so that when the whole device was plugged into a vertical valve-holder, with the usual size of plug-in coil inserted in both holders, the upper coil could be moved around to positions of varying degree of magnetic coupling with the lower, though the latter showed some tendency to shift round (as far as the flexible connections allowed) of its own account during the adjustments. The flex connections appeared to be somewhat frail and likely to give unwanted casual capacities relative to one another. It is evidently an advantage to be able to place the "fixed" coil in any desired orientation, when the valve socket into which it is plugged is fixed.

There are evidently some occasions where a device of this kind has an application, as in certain experimental work. For regular use in reception it appeared to us to be somewhat wanting in stability. Where space is limited on the panel, as where a tuned-anode coil with reaction from the following, detector valve is required; or for experiments in, *e.g.*, H.F. amplification stages, using loose-coupled transformers on an instrument wired for the use of the ordinary mushroom plug-in type of transformer, there is quite a scope for a similar compact, manageable device.

A Basket-Coil Holder.

A plug-in basket-coil holder of neat design has been sent to us by Messrs. London Electric Stores, Ltd. This has the usual plug and socket fitting attached to a standard of thin ebonite about 3 in. high and 1 in. wide, at the top of which is provided a short horizontal axis, of No. 4B.A. size apparently, on which screws a milled-headed nut. An ebonite disc 1½ in. diameter is also provided. The basket coil is evidently intended to be placed concentrically over this axis, and to be secured between the disc and the standard by tightening up the milled-headed nut. Small terminal screws are provided on the plug itself for connecting the ends of the basket coil to the corresponding plug members. The fitting will accommodate basket coils of the largest diameters generally met with in practice (such as the common 5XX basket loading coil), and of a thickness up to about ¼ in. It appeared to be well finished, and the insulation resistance was satisfactory.

BUYING A SHIP'S TRANSMITTER



There is a story current from over the Atlantic of how New York listeners are suffering from severe interference from a ship station using an old-type spark transmitter. Rather than have their reception jammed continually, these enthusiasts propose to start a local fund with the object of purchasing for the offending ship a new and modern C.W. set.

* * * * *

Interference presents an apparently insurmountable obstacle to a great many wireless enthusiasts. How to tune-in a distant station while the local B.B.C. station is working has caused many a listener a deal of unavailing trouble.

Radio Press Envelope No. 6 contains the answer to the problem, full details for the construction of the A B C Wave Trap. This instrument—the outcome of much experimental research work by G. P. Kendall, B.Sc., who is well known to readers of "Modern Wireless" and the other R.P. publications as a wireless authority—definitely succeeds as an eliminator of undesired signals. It incorporates three distinct types of wave traps, any one of which can be brought into operation at will.

R.P. Envelope No. 6 contains full and complete instructions for building the A B C Wave Trap, including blueprints and photographic illustrations.

With this aid you will find the Wave Trap as simple as the alphabet itself to make.

On test, the A B C Wave Trap enabled Bournemouth to be tuned-in with 2LO working on full power only three miles distant, the London station being completely cut out.

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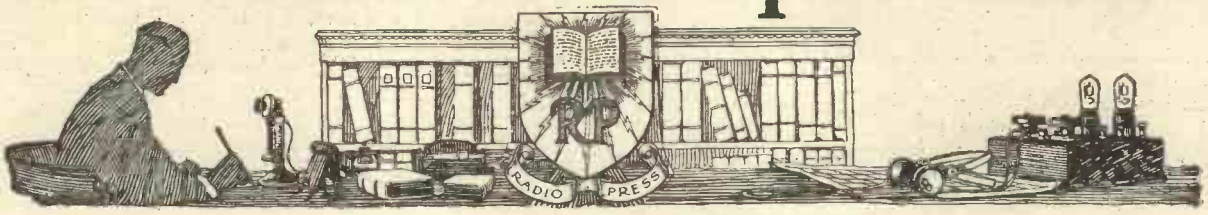

SUPPLIED BY RADIO PRESS SERVICE DEPT., LTD.

C. I. C. (ST. IVES) asks for information concerning the method of rating accumulators, referring to the figure given in "ampere-hours" for the actual capacity of the battery.

The method of rating an accumulator depends upon the area of the positive plates, counting both sides, and the actual figure obtained varies very much with different makes. The actual capacity of the accumulator will depend upon the amount of active material upon the positive plates, and this varies according to the method of manufacture, so that it is quite a common thing to find a very large variation between the ratios of capacity to positive plate area in different types. In one common type it is in the neighbourhood of 15 ampere-hours per square foot.

A. M. (WESTMINSTER) asks us to tell him how to alter an ordinary variometer tuned crystal set to enable him to receive 5XX. He is within two miles of 2LO, and recently bought a loading coil of the basket type which he was assured would enable him to receive Chelmsford, the coil being of 100 turns, with an inside diameter of 1¾ in. He fails to obtain any results whatever with this coil, other than hearing 2LO rather faintly.

We fear that at so short a distance from 2LO he will have considerable difficulty in receiving 5XX upon so unselective a receiver as a crystal set, unless he uses a wave-trap. In any case, he would probably need a larger coil than the one which he has obtained, a standard No. 150 being suggested. The exact size will depend upon the dimensions of his aerial, and since the variometer included in the set is the only means of adjustment, it may be necessary to hit upon the correct size of loading coil with some accuracy. It is possible that a No. 150 will not be large enough, and the best method would be to make up for himself a basket coil with a few tappings for a preliminary test. The coil should have the same diameter as the one which you purchased, with a maximum of 180 turns with tappings at 170, 160, 150 and 140 turns. The gauge of wire to be employed will depend upon the limits of space upon the former, No. 30 d.c.c. being suggested.

An Attractive Three-Valve Receiver

(Concluded from page 748)

as they will go before pushing in the plug and lighting the valve, after which slowly turn the condenser, at the same time bringing the coils near together until the desired signals are heard, being extremely careful meanwhile that the set is not made to oscillate. Once the signals have been adjusted to their loudest by the careful and deliberate adjustment of both condenser and reaction coil, the plug may be removed from the first jack and inserted in the second, when the filament temperature of the second valve should be adjusted for the best results. With these obtained, vary the position of the H.T.2 wander-plug for the loudest signals consistent with clearness, and also vary the amount of grid-bias by means of the plug from the first L.F. transformer for distortionless results. In the same way plug-in the third valve, again varying the H.T. voltage. Also vary the grid-bias by means of the plug from the second L.F. transformer or from both transformers as experiment and results indicate.

Results Obtained

The receiver when first tried was used as a three-valve set, with coils Nos. 250 and 300, and within the minute really good loud-speaker signals were obtained from the Eiffel Tower, the aerial to which the set was connected being in S.E. London.

Though this instrument is not advocated as one capable of long-distance work, excellent reception is obtained from most of the Continental stations in addition to the provincial B.B.C. stations, Birmingham and Bournemouth both being particularly good.

So far as London is concerned, with the three valves in use loud-speaker signals are far too loud to be of use without annoyance to everyone in the house. Radio-Paris, Petit Parisien, Postes des Telegraphes, Madrid, and 5XX are also received at excellent loud-speaker strength, whilst 5WA, 5NO, and a number of German stations are too loud for the telephones but below that standard advocated for loud-speaker strength.

As previously stated, it is not suggested that this receiver is a long-range instrument, but those readers who, having constructed such a set, endeavour to tune the more distant stations, will be surprised at the sensitivity of such a simple circuit with its remarkably easy tuning facilities.

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Designed by John Scott-Taggart, F.Inst.P., A.M.I.E.E.

A CABINET 3-VALVE NEUTRODYNE RECEIVER (Free Blueprint of this).
By Percy W. Harris, Member I.R.E.

A VISIT TO THE EIFFEL TOWER STATION.
By Capt. L. F. Plugge, B.Sc.

CHOKE AND TRANSFORMER AMPLIFIERS.
By Capt. H. J. Round.

MORE TRAP CIRCUITS.
By John Scott-Taggart, F.Inst.P., A.M.I.E.E.

POSTBAG PUZZLES.
By Arthur R. Burrows, Assistant Controller and Director of B.B.C. Programmes.

FRAME AERIALS.
By A. D. Cowper, M.Sc.

HOW TO MAKE A NOVEL CRYSTAL RECEIVER.
By John Underdown.

A SHORT WAVE SINGLE VALVE SET.
By Stanley G. Rattee, Member I.R.E.

A TWO-VALVE TRI-COIL RECEIVER.
By John W. Barber.

A NEW FOUR-VALVE SET.
By A. J. Randall

And numerous other well Illustrated articles of interest

This, our first DOUBLE NUMBER for 1925, is fully in keeping with the policy of Radio Press, Ltd., which is to be well up with the times and to keep its readers abreast of the advancements which are always taking place in this interesting, instructive and fascinating science. This issue contains no less than 156 pages of authoritative and reliable articles appealing to all grades of enthusiasts.

The great popularity of these Special Double Numbers of MODERN WIRELESS is proved by the fact that they are invariably sold out immediately after publication. Some idea of the great scope of this Double Number can be gained from the partial list of contents given.

Two very fine articles on 3-Valve Receivers are contributed by the Editor, John Scott-Taggart, F.Inst.P., A.M.I.E.E., and by Percy W. Harris, Member I.R.E., while a Free Blueprint and full instructions for the building of the set described by Mr. Harris is included in every copy.

For the benefit of new readers, we would point out that owing to the clear and concise methods employed in describing and illustrating in detail the construction of sets (every one of which is tested and guaranteed by the Radio Press to be highly efficient), readers can be certain that provided they follow the instructions carefully, when building the set, success is assured.

There are many other articles of interest, including POSTBAG PUZZLES, which ARTHUR R. BURROWS, Director of Programmes of the British Broadcasting Company, has to solve, are dealt with in a very human and humorous article which he has written for this Special Double Number.

CAPT. H. J. ROUND, the famous expert of the Marconi Company, and co-inventor of the Sykes-Round Microphone used so extensively in the studios of broadcasting stations, has written a special article on Choke and Transformer Amplifiers; this will be greatly appreciated by the more advanced section of our readers.

Make certain of your copy, buy one AT ONCE from your Newsagent, Wireless Dealer, or from any Bookstall. If unable to obtain locally, send 1/10 direct to Dept. S., Radio Press, Ltd., Bush House, Strand, London, W.C.2, and a copy will be sent to you by return.

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DOUBLE NUMBER

MODERN WIRELESS 1/6

Barclays 1240

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A LABORATORY in a single cabinet. These few words sum up the Omni Receiver, full constructional details of which appear in the Radio Press Envelope No. S5.

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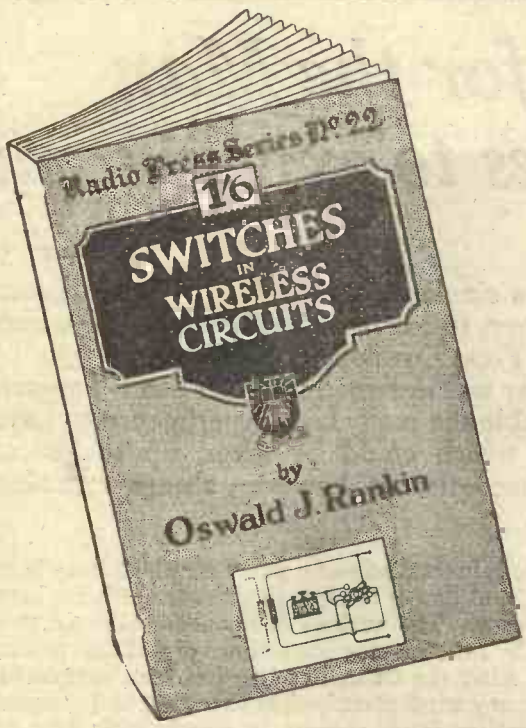

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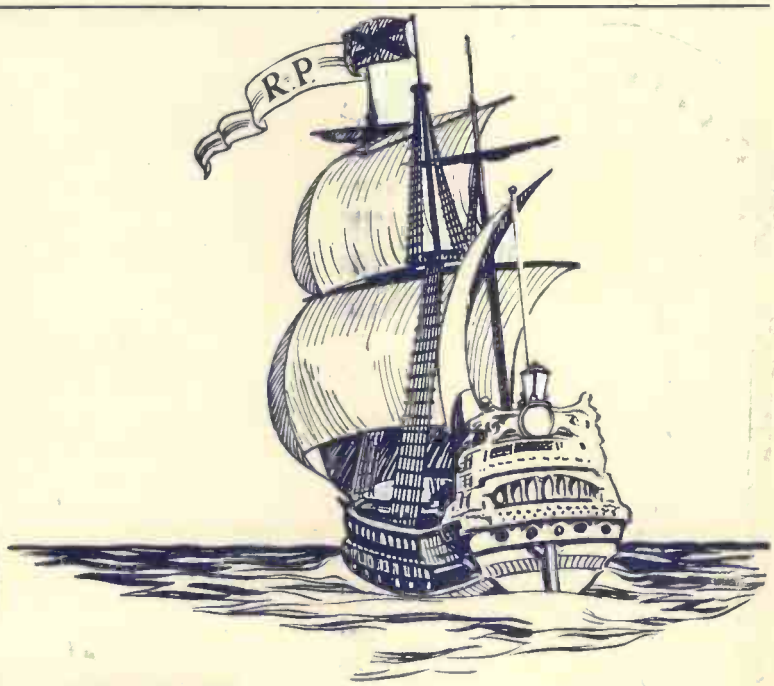

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Wireless Weekly

Vol. 5. No. 21.

A NEW METHOD OF RECTIFICATION

By JOHN SCOTT-TAGGART, F.Inst.P., A.M.I.E.E., Editor

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EDITED BY JOHN SCOTT-TAGGART, F.Inst.P., A.M.I.E.E.

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Fewer Restrictions, Lower Fees and More Representation.

THE opposition to the Wireless Telegraphy and Signalling Bill is increasing, and we ourselves are leaving no stone unturned to place members of Parliament and the Press generally in full possession of the facts.

As will be noticed from a report appearing elsewhere in this issue, the Postmaster-General, at a dinner given by the B.B.C. Director, Sir William Bull, threw out what looks very much like a bribe when he suggested that if everybody were made to pay up the licence fee might be reduced to 5s. The great amount of limelight which has been thrown on the receipts of the B.B.C. makes it quite clear that the time is not far off when the B.B.C. will have to accept a lower fee from each listener, but we are of opinion that this reduction in fees will not in any way result in a diminution of revenue, but that probably the exact reverse will take place.

The Right of Search

Meanwhile, the threat of searching private houses has, we read, "caused such a huge increase in the sale of licences that the Post Office have had to issue dog licences instead, and that this is the cause of much of the howling heard recently." However this may be, it is an undoubted fact that certain clauses in the Bill have interested members of Parliament and others, not because of the plaint of the wireless enthusiast but because of the serious infringement of personal liberty which would result if the Bill were passed in its present form. We refer particularly to the clauses relating to the right of search. We have, in our issue of February 25, exposed the fallacy that these rights of search were formerly enjoyed and that there is nothing new. We say categorically again that the right of search should either be omitted altogether, or should be confined to serious cases where spying or illicit transmission is believed to be in progress. To retain one's tongue in one's cheek is dignified and successful only when the other party is not enlightened. A clear admission from the Postmaster-General that he is out for the 7s. 6d. to give to the B.B.C. would at least obtain for him the respect given to those who are frank and sincere.

Penalties

As regards the penalties, these also must be reduced. A threat of hard labour is absurd when used against the broadcast listener. If it is to be used against worse malefactors, let the penalty be restricted to these. The Postmaster-General surely does not think that in these enlightened days, when literally millions have wireless sets, he can slip through Parliament a Bill based on conditions as they were in 1904, when wireless was regarded as a dangerous military weapon, whereas now a set is a household article which is even more common than a vacuum cleaner or electric toaster.

Defiance

Mr. Ford has applied to the Courts for an injunction to restrain the Postmaster-General from handing over to the B.B.C. sums obtained from licences. Mr. Ford, it will be remembered, defied the Postmaster-General to take action against him for operating a wireless receiver without a licence, and his action has disconcerted the Post Office to no small extent.

CONTENTS

The constitutional aspects of licence fees have been a delicate point for a long time past, and the P.M.G. is apparently desirous of setting matters right by his new Wireless Bill, which ignores skilfully the whole question of the B.B.C., while subtly enabling the P.M.G. to give legal effect to any departmental regulations he may make.

A Vital Clause

The objections to the Bill are by no means restricted to those outlined in our previous leading articles. There is one vital clause which says :—

> **"the Postmaster-General may make regulations.**
>
> **(*a*) as to the terms, conditions, and restrictions on or subject to which licences or any class of licences under this Act are to be granted, renewed, suspended or withdrawn."**

These regulations, it must be remembered, while not embodied in the Bill, almost automatically become law by laying them before both Houses of Parliament, a technical procedure which involves no publicity and which is almost equivalent to the automatic turning into law of regulations which, if merely issued from the General Post Office, can be upset by any magistrate.

The Post Office Record

Judging by our previous experience of the kind of terms and conditions and restrictions on which licences are granted, we can imagine the stranglehold which the Postmaster-General will have over the whole movement if his ridiculous regulations and onerous restrictions cannot be defied. We ourselves, in the past, have offered to support anyone who will defy some of the stupid and ignorant regulations regarding transmitting licences, but if these regulations become law that is the end of the matter; there is no disputing them. It is not as though the Post Office record was a sane one, a sympathetic one, a reasonable one. It is the reverse of all these things. Every responsible scientific worker, the leading scientific societies, the home constructors, have all raised protests more or less ineffectual during the past five years. Now is the great opportunity, not merely to prevent any increase of power of the P.M.G., but to see that he is not given facilities for repeating his past record.

By moving amendments to this Bill, we will see that full light is thrown on the Postmaster-General's past record, and we are making arrangements for these amendments to be placed before the House of Commons.

Test Cases

Recent events have made it quite clear that many aspects of broadcasting will require revision before long. At a time when the P.M.G. is seeking to search houses of miscreants who are receiving B.B.C. programmes for nothing, the general public have no say in how their money shall be spent. It is astonishing the hardness and lack of sympathy exhibited by the Post Office when the whole legal and constitutional situation is so involved. Anyone would imagine that the position was as clear as daylight. We make no comment at this stage on Mr. Ford's actions as the matter may be *sub judice* when this appears, but we do say that the past independent and uncompromising attitude of the Post Office is the very attitude which will encourage people to test the legality of every step that is taken, not only in connection with broadcasting, but with wireless experimenting generally. We ourselves are in the position to create several distinctly unpleasant situations, and have the financial resources to test the legality of actions of the Postmaster-General or the B.B.C. if necessary, and we shall unquestionably use these resources if it becomes necessary to do so, and the attendant publicity, quite apart from the result of any legal action, will do much to clear up present abuses.

It must be remembered that it is public money that is being handled, and it is the public who, in the long run, say what they shall pay, how they shall pay it, and what representation they shall receive.

Representation

The Postmaster-General has appointed a Committee to advise him, and he himself is the arbiter as to how the money from licence fees will be spent. He has firmly refused to have on his Advisory Committee any representative of the wireless papers, individually or collectively, although their intimate contact with the public justifies their representation on the Broadcasting Advisory Board. We ourselves possess journals having a joint net circulation of over 400,000 copies, and we, with other wireless papers, have been refused any kind of representation at all, unless it is that of Lord Burnham, a newspaper proprietor whom we know only by name and who is apparently interested only in the relationship of broadcasting to the dissemination of news items.

Clearing the Air

The present is obviously the time to rectify many anomalies and illegalities. If the P.M.G. is desirous of clearing the air with his Signalling Bill, let us have the air cleared thoroughly. The wireless public will be neither bullied nor bribed, and Post Office autocracy, since it is not benevolent, will have to go the way of all autocracies which exceed their functions.

The Postmaster-General, we hear, is astonished at the amount of opposition to his Bill. We shall be very much surprised if his Bill is not entirely altered in the very near future.

The S.S. "Leviathan" and Broadcasting

When the big liner *Leviathan* makes her first trip from New York to Southampton and Cherbourg after her winter rest, she will transmit concerts from her bands and orchestras, and possibly talks and performances by famous passengers who are making the trip. The ship's station will not begin its transmissions until after most of the Continental and British stations have closed down for the night.

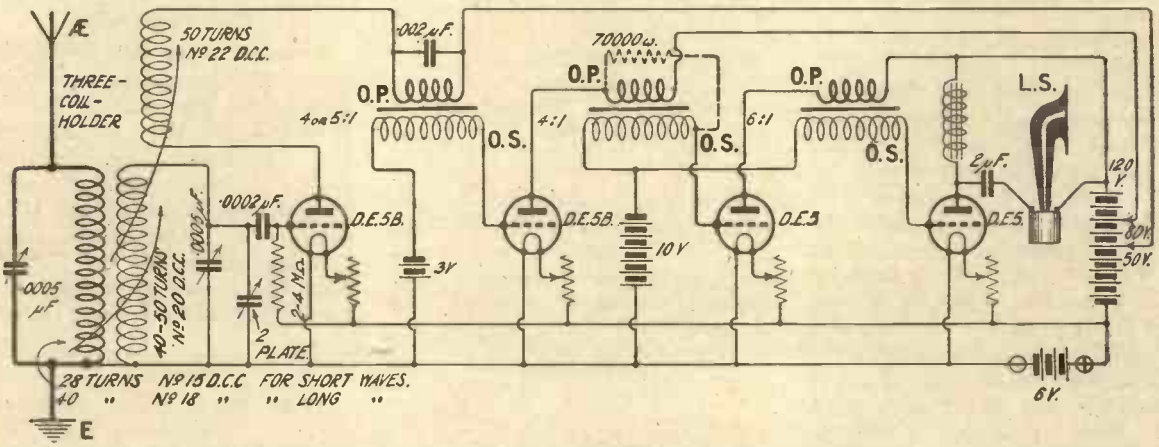
The transmissions will probably be made on a wavelength of 317 metres, although it may vary at times between 200 and 545.

Volume Without Distortion

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

Experimenters are familiar with the difficulties experienced with the use of three transformer - coupled low frequency stages, and in the following article Mr. Cowper describes how such an arrangement may be used with success so long as certain precautions are observed.

THE really ambitious broadcast listener, who desires to get *powerful* loud-speaking from all of the two-score or more available short-wave European broadcast stations now giving regular programmes (to say nothing of occasional reception of KDKA, WBZ, WGY, etc., on favourable nights), will find that the arrangement indicated here will satisfy his most sanguine expectations as to range and noise, given a moderately good outside aerial in a not too congested district. The cost of the necessary equipment is naturally not modest (valves and transformers alone will account for some £12 or more), and the tuning required for the more distant stations, and to cut out local interference, is of a degree of fineness which can only be achieved by much practice and patience. As selectivity is the *sine qua non* of long-distance telephony work, a loose-coupled circuit is used, together with very low-loss inductances, to give both sharpness of tuning and that light reaction requirement which is quite as essential in order to avoid prohibitively elusive tuning adjustments.



This circuit, in which three stages of transformer-coupled low frequency amplification are employed, gives signals of very commendable quality with great volume. Suitable turn numbers are given for the coils, for covering both the higher and lower sections of the 300-600 metre wave band.

Difficulties

The three-coil tuner is notoriously difficult and tricky in operation, and quite unsuited for other than the expert who has a wavemeter available for tuning in, and who understands something of the mutual effects of the four simultaneously variable adjustments required, namely, primary and secondary condensers, secondary coupling and reaction coupling. There are also many pitfalls for the unwary in setting up three stages of high-ratio transformer-coupled low-frequency amplification, particularly that of the L.F. reaction which produces buzzing. However, the results obtainable from such a circuit (using the new types of practically distortion-free large L.F. transformers, power valves, ample H.T., and proper grid bias) are so magnificent that the trouble implied in the adjustment and tuning of this receiver is well worth the while of anyone who is keen on really efficient reception and on powerful signals.

The use of more than two stages of transformer-coupled L.F. valves has generally been discountenanced in the past, but with modern transformers and small power valves, however, the objection largely disappears.

Quality with Volume

Actually a receiver set up just as shown here gave the whole piano scale (embodied in the new "tuning signal" of 2LO) at very good quality, little woodenness being noticeable in the highest note, and the deep bass coming out well; Big Ben also maintained his impressive dignity. It is impossible to judge the quality on local transmissions (say up to one hundred or so miles) at full power, on account of the hopeless overloading produced on the last valve; it is hard enough to use two stages of really efficient transformer-coupled L.F. amplification at short range, let alone three. and quite impossible with the usual type of D.E. valve. The D.E.5.B. valves are used in the first two stages as detector and first note-magnifier, on account of their fine detecting qualities and smooth reaction, as well as the high amplifying factor of M=20. As the last two valves have to handle considerable power, D.E.5 (or similar small power valves of low impedance but of fairly high M) are specified.

The H.T. and grid bias are adjusted for the conditions met with at each stage, 10 volts or more negative bias and 120 volts H.T. being required to give room for the large grid-volts swing on the last valve. In actual operation quite noticeable shocks can be obtained from the secondary of the third intervalve transformer.

The H.T. Problem

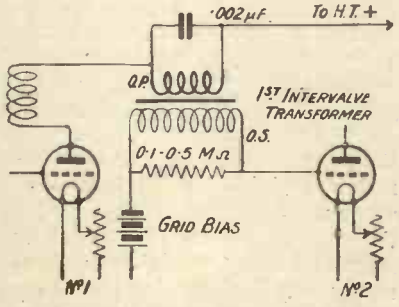
A plate milliammeter should be included in circuit to watch for rectification effects and resulting distortion in the L.F. stages. As the plate current demands are severe it is preferable to use separate H.T. batteries for the different stages, as suggested recently by Mr. Percy W. Harris, with 2 μF condensers across each, so as to distribute the load. On the author's receiver the actual plate current was around 10-15 milliamperes, which the small flash-lamp type of H.T. battery could not supply for long without distress; a silent H.T. battery is quite essential.

Whistling

The tendency towards L.F. oscillation and buzzing or whistling is controlled to a large extent by proper adjustment of grid-bias and H.T., particularly on the second valve, rather than by any special arrangement or "earthing" of the transformer bodies. Different combinations of "OP" and "IP" must be tried when this difficulty is met with (as it probably will be), and the maximum allowable negative bias applied on the second grid; a dull filament in the first valve will often produce whistling. Finally, when other remedies fail, the usual expedients of a damping resistance across the secondary of the first intervalve transformer, etc., can be tried.

Obtaining Stability

The writer obtained complete stability without any excessive loss of power by connecting a 70,000-ohm Dubilier anode resistance across OP (connected to the anode) and OS (to following grid) on the *second* intervalve transformer; this was in conjunction with the Grafton Electric Co.'s new 4.1 and 6.1 large-power transformers. In any case, the combination should be tried. With the Marconi "Ideal" 6.1 in the third stage, and the Marconi 4.1 or other makes of large transformers suitable for use in the second stage (such as the Pye No. 1, C.A.V., or U.S. "Super"), other modes of introducing the necessary damping may be preferable. This is a matter for simple practical experiment, and should be determined before the

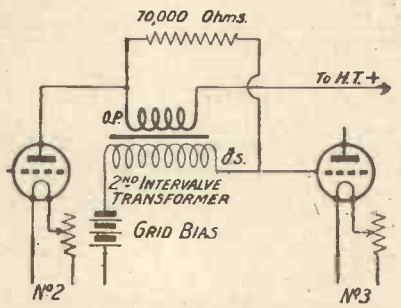


The use of a stabilising resistance across the secondary of the first L.F. transformer may prevent whistling.

receiver is permanently set up. The first transformer should be of the modern large type, of fairly high ratio, and, as a matter of interest, a C.A.V. gave excellent service here on trial.

Protecting the Loud Speaker

In order to protect the windings of the loud-speaker, a choke-capacity coupling is indicated. The Grafton Electric Co., Pye, of Cambridge, and some other firms make suitable L.F. chokes, otherwise one may be



Another stabilising arrangement which has proved very effective.

wound with 2 oz. of No. 40 enamel insulated wire on a ⅝-in. iron-wire hedgehog core. An L.F. transformer winding should not be used, as it was not designed for this service. An ordinary 2 μF Mansbridge condenser completes the filter, as indicated. No provision is made for telephones, as they cannot be used safely in such a powerful circuit, and are in any case unnecessary.

H.F. Equipment

On the H.F. side the main point resides in the inductances. These *must* be made for the lowest possible high-frequency losses, to give the necessary sharp selective tuning and fine reaction control. Ordinary types of commercial fine-wire plug-in coils are therefore not recommended here. The primary (for shorter B.B.C. waves) should be wound on an air-core or on a skeleton former with 28 turns of No. 15 d.c.c. wire, *e.g.*, as a basket-coil (of the missing-two-spokes variety) on a 2-in. former, the latter and the spokes being removed subsequently. For longer waves 40 turns of No. 18 or 20 d.c.c. may be used. The skeleton basket-coil plug-in mount of Messrs. Scientific Supply Stores proved very suitable to hold the resulting large heavy coil.

Coil Treatment

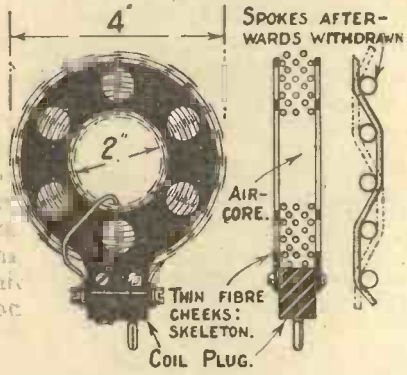
The secondary is a similar coil of 50 (or 40) turns of No. 20 d.c.c., and the reaction coil can have conveniently 50 turns of No. 22 d.c.c. wire. All are lightly varnished (any excess of varnish being driven out before drying by centrifugal force), and well baked to the smoking point before use to exclude moisture; they should then be *kept dry*.

Tuning

With these coils, condensers of low minimum and low-loss should be used, preferably of the ebonite-end type. The two-plate fine adjustment condenser in parallel with the .0005 μF condenser just referred to is quite necessary, and the writer used a Colvern two-plate "Neutrodyne" here, with long extension handle. The final fine adjustment was made by slight alteration of the aerial coupling, using a three-coil holder with long handles. The coupling is seldom closer than about 45 degrees, if operating correctly.

The grid-leak should be adjusted by trial (by introducing in turn fixed leaks of 1, 2, or 4 megohms, rather than by a

variable grid-leak) to eliminate all "floppiness," with optimum values of H.T. and filament temperature. This is best done with



Illustrating the construction of the coil former and method of winding the turns.

a pair of 'phones temporally connected across the second L.F. transformer primary.

Searching

The experienced will need no detailed instruction as to tuning in. A wave-meter is, of course, essential for locating and recognising the many foreign stations; a tuning scale can then be calibrated for the secondary tuning condenser. In searching, a rather closer primary coupling than usual, with the primary A.T.C. at a minimum, will facilitate matters. The coupling is then cautiously loosened, together with the reaction coupling, whilst following up with the secondary condenser and primary tuning.

Results

All B.B.C. short-wave stations and relays (barring mutual heterodyning effects which no receiver can eliminate), and a score of the Continental stations, came in each at a strength audible 50 yards away from the building in which the loud-speaker was operating, with closed windows.

Individual Cases

The aerial was 70 ft. by 20 ft., single wire, and in the country at a good point for reception. Rome was largely marred by Morse at times, in spite of the selective coupling, but as loud as the rest; Aberdeen was overpowering, whilst the other B.B.C. main stations, Brussels and Paris, produced heavy blasting. The poorest was Vienna, whose long wavelength was unfavourable for reception on the low aerial. Barcelona and Seville were very effective; Nuremberg relay station, the higher B.B.C. relays, Cardiff, and Manchester were obtained free from 2LO, at 35 miles from the latter station. Hanover was particularly good amongst the many German stations.

Possibilities

For local stations the fourth valve should, of course, be cut out in practice.

The equipment was not tested on American transmissions, but I am of the opinion that on favourable nights very loud results should be obtained, as it is not a matter of any great difficulty for the experienced to pick up the louder stations on such a selective arrangement. Even Oakland, Cal. (KGO), comes in in broad daylight, in favourable circumstances, on a similar selective circuit with but three valves.

Look After Your Crystal

ONE of the things most detrimental to the sensitiveness of wireless crystals is dust. A very good specimen of crystal may become absolutely ineffective when covered with a film of dust. If your detector has an exposed crystal in it, and the set is kept in a living room, you will probably find that a new crystal is required fairly frequently, and this, although not a great expense, is an entirely unnecessary one. If possible, one of the numerous types of glass-encased detectors on the market should be fitted in place of the ordinary one.

Should you not desire to do this, however, and if the crystal cup is in a horizontal plane, the crystal may very easily be protected from dust in the following manner: A deep pill-box, or one of the boxes in which crystals are now sold, should be kept by the set and placed over the crystal cup when it is not in use. This will in most cases be found possible when the cat-whisker has been removed as far from the crystal as possible. The observance of this little tip, while not taking any appreciable time, will completely keep dust from the sensitive crystal when the set is not in use, and when an extra good piece of crystal is found it should be looked after very carefully. Another point to remember in connection with crystals is never to handle them with the fingers, as a thin film of grease, which is very injurious to any crystal, will always be left behind.

Our photograph shows the 4-valve receiver presented by the King and Viscount Lascelles to the stable lads at Egerton House.

Another point in connection with crystals is never to scrape the surface with a knife in order to expose a fresh sensitive surface. If a convenient method can be devised for actually splintering or fracturing off a layer from the surface it may be attempted.

A. S. C.

Radio Notes and News

Some brief notes of what is happening in the wireless world.

ACCORDING to the Press, Sir William Mitchell Thomson, the Postmaster-General, is resigned to the necessity of making some considerable concessions in the terms of the Wireless Bill.

He is, however, adamant with regard to maintaining the powers of search. At present he is understood to be contemplating :—

(1) A modification of the penalties which the Bill proposes ; and

(2) The possibility of reducing the price of the licence.

A private dinner given by Sir William Bull was held in the House of Commons on Monday night, March 2, at which 30 M.P.s—principally opponents of the wide powers sought in the Bill—were present, and the Postmaster-General heard in considerable detail all the arguments against his measure.

The chief complaints centred round the invasion of the sanctity of the home by officials ; and the interference with genuine experimenters.

Despite a long speech couched in his most persuasive accents, the Postmaster-General, it is understood, failed to mollify his critics.

* * *

Representations have been made to the P.M.G. to allow weekly wage-earners to pay for their licences—which are described as being too expensive—by instalments.

Sir William Mitchell Thomson's reply to that was in effect that if everyone would pay up he would consider reducing the price of the licence to five shillings.

* * *

The Radio Society of Great Britain held its fifth annual dinner at the Waldorf Hotel on March 4. The President (Sir Oliver Lodge) was in the chair.

The toast of " The President " was proposed by Mr. A. A. Campbell-Swinton, who recalled the fact that as far back as 1894 Sir Oliver Lodge had interested himself in wireless telegraphy, and had in that year lectured at the Royal Institution on the work of Hertz and his successors.

Sir Oliver Lodge, in responding to the toast, dealt with the work of the amateur in the development of wireless. It was marvellous, said Sir Oliver, what the amateurs had done for wireless. Amateurs in Great Britain had always been remarkable in science. " The difficulty of carrying on research work with Government funds," said Sir Oliver, " is to do the work without being hampered. When the Government helps it calls for a programme. It wants to know what you are going to do and what you are going to discover. (Laughter.) Madame Curie, our greatest woman scientist, could not have discovered radium under those conditions ; she had never heard the word. Rontgen didn't set out to discover the X-rays. He was simply messing about with a vacuum tube. That is what amateurs are always doing. They are always messing about. They are always experimenting and thinking about the subject night and day. It's a good thing that the youth of the country have something to think about." In conclusion, Sir Oliver said that great discoveries would be made in science by those who had come into it by the curious side-door, wireless.

Dr. W. H. Eccles (past president), in dealing with the work of the society in the future, said that up to the present they had been fighting an old Act of Parliament, and it seemed to him the immediate work before the society would consist in fighting the new Act of Parliament, which threatened to be even harder on the experimenter than the old Act. They should have been a scientific society teaching newcomers the principles of wireless, but instead of that they had been leading a cat-and-dog life fighting the enactments of Parliament.

Mr. R. J. Hibberd dealt with the work of the schools section of the society.

Mr. G. Marcuse spoke on the subject of long-distance way working, and Mr. W. H. Alford mentioned that records had been established by members of the society in long-distance communication, and that commercial enterprise was following in the wake of amateur effort.

* * *

A matter of interest to wireless enthusiasts was raised in the High Court on Tuesday, March 3, when Mr. Robert Moffat Ford, of East Lodge, Park Row, Albert Gate, London, appearing in person, moved *ex parte* before Mr. Justice Astbury in the Chancery Division for an injunction to restrain the Postmaster-General from parting with the sum of £350,000 to the British Broadcasting Company, Ltd. Mr. Ford said the matter was one of great urgency, and asked for leave to serve the motion with the writ. It is understood that the motion was ordered to stand over until Friday, March 6, and at the time of going to press we have no information of further developments.

Mr. Robert M. Ford who has sought an injunction to restrain the P.M.G. handing over £350,000 to the B.B.C.

The FOREIGN RADIO TIMES

Edited by Captain L. F. PLUGGE, B.Sc., F.R.Ae.S., F.R.Met.S.

MARCH 11, 1925.

All Hours of Transmission reduced to Greenwich Mean Time.

WEDNESDAY, MARCH 11th

FRANCE.

PARIS.—*Station :* Eiffel Tower—FL.
Wavelength : 2,600 metres—5 kw.

6.0 p.m.—Concert.

Artists : M. Rene de Buxeuil (Composer), Mlle. Ariane Janer (Soprano), M. Henry Auge-Gary, Mlle. Jane Marsan, Mlle. Jane Dory and Mlle. Suzette Rufflet (child-artist).

1. (a) Selection in L Minor (Hummel), (b) Anitra—Dance from "Peer Gynt" (Grieg). Mlle. Suzette Rufflet.
2. (a) Sapins (Dupont)., (b) Lady's Letter (Puget), (c) Listen to the Chimes (Buxeuil). Mlle. Janer.
3. (a) I Will Be (Buxeuil), (b) Naples (Malderin), (c) My Mother (Herpin). M. Henry Auge-Gary.
4. (a) Love's Desire (Buxeuil), (b) I Believe (Buxeuil). Mlle. Jane Marsan.
5. (a) Midnight Dream, (b) Tannhauser (Wagner).

6.55 p.m.—News Bulletin and Weather Forecast.

7.10 p.m.—End of transmission.

PARIS (Clichy).—*Station :* Radio Paris.—SFR.
Wavelength : 1,780 metres—8 kw.

12.30 p.m.—Orchestral Concert.

1. Legende Mignonne (Galudi).
2. En Matinee (Broustet).
3. Zeila (Ferevana).
4. The Pages of the Queen (Montagne).
5. Gavotte (Bachmann).
6. March of Joy (Boischet).
7. Passionate Cajolery (Barbirolli).
8. Mello Cello (Moret).
9. Menuett (Register).
10. Canzonetta (d'Ambrosio).
11. Mosaic of Gounod (Tavan).
12. Scherzo (Pesse).
13. Aquarelles Musicale (Missa).
14. The Porter's Chair (Chaminade).
15. If My Verses had Wings (Hahn-Mouton)
16. The Unbelievers (Wachs).
17. Pavane (Scassola).
18. Serenade (Drigo).
19. Fantasie (Szule).

1.45 p.m.—News Bulletin and Close Down.

4.45 p.m.—Concert.

Artists : Mme. Renee Maes.

1. Trio (St. Saens).
2. Russian Airs (Wieniawsky).
3. The Trout (Schubert). Mme. Maes.
4. Meditation (Papin).
5. The Diner in Town (Monologue) (Zamacois).
6. Contemplation (Mazellier).
7. Chinese Tambourin (Kreisler).
8. The Wave and the Clock (Dupare).
9. Selection in G Minor—Violoncello (Pierne).
10. Selection in A Minor (Bach).

5.45 p.m.—News Bulletin and Close Down.

8.15 p.m.—Board of Agriculture.

8.30 p.m.—News Bulletin.

8.45 p.m.—"Some Spiritualistic Writers and Musicians."
Lecture by M. Pascal Forthuny, Writer and General Secretary of L'Union Spirite Français, on "Spiritualism : Its Real Nature, Its Past, The Part it Plays at the Present Time, and Its Future."

PARIS.—*Station :* Ecole Superieure des P.T.T.

Wavelength : 450 metres—500 watts.

9.0 p.m.—Concert.

Artists : Mmes. Louise Sauval (Vocalist), Genevieve de Wandre (Violinist), Mlles. M. Denis (Pianist), A. Sauvrezis (Composer), Mme. Jacqueline Chaumont-Guedy and M. Dufont.

1. The Fowl (Rameau).
   Romance (Schumann).
   Mlle. Madeleine Denis.
2. Song (Renaud).
   Mlle. Sauvrezis and M. Dufont.
3. Selections from old music.
   Mme. G. de Wandre.
4. Poems. Mme. J. Chaumont-Guedy.
5. Selection. Mlle. Sauvrezis. (The Composer).
6. Poem—"The Rest" (J. Treve).
   Mme. L. Sauval.
7. Sonata. Mme. de Wandre. (The Composer).
8. A Breton Song. M. Dufont.
9. Le Vitrail. Mme. L. Sauval.
10. Night Time—Duet.
    Mme. Sauval M. Dufont.
11. Poems (Pierre Guedy).
    Mme. J. Chaumont-Guedy.
12. The Nightingale (Alabioff Liszt).
    Mlle. M. Denis.

SWITZERLAND.

ZURICH.—*Station :* Radio-Genossenschaft.

Wavelength : 515 metres—500 w.

7.15 p.m.—8.50 p.m.—Orchestral Concert.

1. Overture from "Phedre" (Massenet).
2. Spring Song (Lacombe).
3. L'Arlesienne (Bizet).
4. Yolande (Bijacco).
   Station Orchestra Gilbert.
5. English Humour read by Francis Gschwind, M.A. (Liverpool).
6. The Beautiful Galanthe (Suppe).
7. Selection (d'Albert).
8. Waltz (Gilbert).
   Station Orchestra Gilbert.

LAUSANNE.—*Station :* Societe Romande de Radiophonie.—HB2.

Wavelength : 850 metres—300 w.

4.0 p.m.—Children's Hour by M. le Pasteur Pidoux.

AUSTRIA.

VIENNA.—*Station :* Radio-Wien.
Wavelength : 530 metres—1.5 kw.

3.0—5.0 p.m.—Concert

1. Hebrides (Mendelssohn).
2. Selection for Violin (Bach).
3. Nocturne in D (Chopin).
4. Symphony No. 3 (Beethoven).
5. Quintet from "The Mastersingers" (Wagner).
6. Dream (Wagner).
7. Ariadne (Strauss).
9. Thais (Massenet).
10. Mignon (Thomas).
11. Cavalleria Rusticana (Mascagni).

5.30 p.m.—Gulliver's Travels.
Aurel Nowotny (from Reinhart's Theatre).

6.45—7.15 p.m.—English Lesson.
Prof. Th. W. MacCallum, M.A.

7.30 p.m.—Concert.

1. Op. 77 No. 1. — String Quartet (Haydn).
2. Folk Songs
3. Op. 77 No. 2.—String Quartet.

8.30 p.m.—Light Music.

ITALY.

ROME.—*Station:* Radiofonica Italiana *Wavelength:* 425 metres—3 kw.

7.35—10.0 p.m.—Dance Music by the Station's Jazz Band.

GERMANY.

HAMBURG.—*Station:* Nordische Rundfunk.

Wavelength: 395 metres—1.5 kw.

5.0 p.m.—Concert.
Artists: Isa Roland and Erwin Bolt.

1. Selections from "Countess Marizza" (Kalmann). Norag Orchestra.
2. Song from "Countess Marizza" (Kalmann). Isa Roland.
3. Selection from "Above and Below" (Kollo). Norag Orchestra.
4. Duet from "The Swallow's Wedding (Jessel). Isa Roland and Erwin Bolt.
5. Potpourri from "The Swallow's Wedding" (Jessel). Norag Orchestra.
6. The Maiden's Dream (Hirsch). Isa Roland.
7. Potpourri from "Senora" (Hirsch). Norag Orchestra.

6.30 p.m.—Symphony Concert, by the Hamburg Musical Friends.

1. Selections for Soprano and Contralto (Bach). Adelheid Armhold and Edith Niemeyer.
2. Concert for Cymbals and Orchestra (Bach).
3. Overture and Ballet Music (Hasse).

8.30 p.m.—Weather Report and News Bulletin, given partly in English.

KONIGSBERG.—*Station:* Ostmarken-Rundfunk.

Wavelength: 464 metres—1.5 kw.

3.30—5.0 p.m.—Concert by the Station Orchestra.

7.8 p.m.—Concert.

1. Overture from "Rienzi" (Wagner).
2. Selection from "Rienzi." Carl Martell.
3. (a) Sorrow (Wagner), (b) Dream, (c) Stand Still. Elsa Solland.
4. Idylle of Siegfried.
5. Duet from Siegfried. Carl Martell and Elsa Solland.

8.15—9.0 p.m.—Dance Music by the Station Orchestra.

MUNICH.—*Station:* Deutsche Stunde-in-Bayern.

Wavelength: 485 metres—1.5 kw.

3.30—4.0 p.m.—Chamber Music by the Anna Rosenberger Quartet.

1. Potpourri from "Trifling Student" (Millocker).
2. (a) March, (b) Waltz (Komzak).
3. Edmeer—Boston (Spoliansky).
4. What Flowers Dream (Translator).
5. When the Jazzband Plays (Leopold).

5.30—6.30 p.m.—Concert.

1. Overture from "Marinarella" (Fucik).
2. Ballet Suite from "Sylvia" (Delibes).
3. Serenade (Strecker).
4. Potpourri from "The Fieldmouse" (Strauss).
5. Waltz (Strauss).
6. Old Heidelberg—March (Herzer).

7.0—8.0 p.m.—Play.
"Erda" (V. Schonherr).

UNITED STATES.

PITTSBURG.—*Station:* Pittsburg Press.—WCAE.

Wavelength: 462 metres.

6.30 p.m.—News. Weather Reports. Reading of Programme for the day.

9.30 p.m.—Stock Markets Reports.

11.30 p.m.—Dinner Concert transmitted from William Penn Hotel.

12.30 a.m. (Thurs., 12th).—"The Sunshine Girl."

1.30 a.m.—Recital by Miss Marie Beitler (Contralto), William E. Staiger (Pianist and Accompanist).

2.0 a.m.—Concert by the Atwater Kent Orchestra.

3.30 a.m.—Concert by the Nixon Restaurant Orchestra.

MICHIGAN.—*Station:* Radio Lighthouse.—WEMC.

Wavelength: 286 metres—500 watts.

1.15 a.m. (Thurs., 12th).—Concert.
Miss Ardice Bentley (Pianist).
Miss Marguerite Bordeau (Reader).
"The Cardinal Ladies' Quartet."
Talk: "What Books do You Enjoy?" by Lyndon L. Skinner.

WASHINGTON.—*Station:* State College of Washington, Pullman, Washington.

Wavelength: 330 metres.

3.30—5.0 a.m. (Thurs., 12th).—Concert.

1. Violin Solos, and Duets by Gladys Fraser and the Waterville and Severn Suite.
2. Piano Solos by Lillian Pettibone: (a) Nocturne in F Minor (Chopin), (b) Ballade in A Flat Minor (Chopin), (c) Venetian Barcarole (Godard).
3. Radio Talk—"The Vacuum Tube," by Dean H. V. Carpenter.
4. Oats and Barley for the Palouse.
5. Pointers on Dairy Farming, by Prof. E. V. Ellington.

THURSDAY, MARCH 12th

FRANCE.

PARIS.—*Station:* Eiffel Tower.—FL.
Wavelength: 2,600 metres—5 kw.

6.0 p.m.—Concert.

Artists: Madame Olanda Molloy (Vocalist), Mlles. Simone Harley, Marthe Lecerf, Magdeleine de Campoenia (Violin cellists).

1. Adagio and Allegro (Marcello). Mlles. Harley, de Campoenia and Lecerf.
2. Aria from Romeo and Juliette. (Gounod). Mme. Olanda Molloy.
3. Aria (Stradella). Mlles. Campoenia, Harley and Lecerf.
4. Caro Mio Ben (Giordani). Mme. Olanda Molloy.
5. Minuet (Valensin). Mlles. Campoenia, Harley and Lecerf.
6. Berceuse (Mozart). "The Last Rose of Summer," sung in English, by Mme. Olanda Molloy.

6.55 p.m.—News Bulletin and Weather Forecast.

7.10 p.m.—End of transmission.

PARIS (Clichy).—*Station:* Radio-Paris.—SFR.

Wavelength: 1,780 metres—8 kw.

12.30 p.m.—Orchestral Concert.

1. The Lady and the Rose (Caryll).
2. Gavotte (Broustet).
3. Melody of the Birds (Gumbert-Mouton).
4. Katinka (Michiels).
6. Hymn to the Sun (Rimsky-Korsakow)
7. Passepied of the Queen (Haring).
8. Something (Panella-Boyer).
9. To Guard You Always (Roget).
10. Aubade (Braga).
11. Poem of Eve (Molinetti).
12. Spanish Dance (Ferevana).
13. Menuett (Andrieu).
14. It's Funny (Hennisson-Cadin).
15. Kuyawiak (Wieniawsky).
16. Pavane to the Moon (Brun).
17. Esmeralda, Tango (Denisty).
18. Rajah (Hekenian).
19. Cajolery (Bilhaud).
20. Cavalleria Rusticana—Trio by Alder (Mascagni).

1.15 p.m.—News Bulletin and Close Down.

4.45 p.m.—Concert.

1. Romance (Faure).
2. Selection for Flute (Kayser).
3. Lay, Violoncello (d'Indy).
4. Song.
5. Song of the Rain (Duplant).
6. Suite (Godard).
7. Varied Symphonies (Boellman).
8. Monologue by "Radiola" (Loury).
9. In the Ruins (Coye).
10. Song.
11. Serenade for Flute (Hillemacher).
12. Adagio and Allegro (Cervette-Salmon)
13. Finale of the Sonate in D Minor (Haydn).

5.45 p.m.—News Bulletin and Close Down.

8.30 p.m.—News Bulletin.

8.45 p.m.—Concert of Russian Music and Dances.

Artists: M. Jean Neago, M. Lazarewski and their Kasbek Orchestra.

1. Andante of the 5th Symphony (Tschaikowsky).
2. Valse (Sibelius).
3. Poeme (Fibich).
4. Berceuse (Erinfield).
5. (a) Troika, (b) Les Bateliers de la Volga.
6. Little Talk (Ockialbi).
7. Trio (Glinka).

8. Canari—Solo.
10. Melancholy Serenade (Tschaikowsky).
11. Popular Dance.
12. The White Night (Romance).

PARIS.—*Station :* Ecole Superieure des P.T.T.

Wavelength : 450 metres—500 watts.

8.45 p.m.—Concert.

Artists : Mlle. A. Arnitz, Mlle. Lebard (Vocalist), and M. Noel Gallon.

1. Symphony — The New World (Dvorak). Organ Solo.
2. (a) Nocturne (Chopin), (b) Impromptu (Borowsky).
3. (a) Spanish Symphony—Andante (Lalo), (b) The Bee (Schubert). Mlle. Arnitz, accompanied by the Organ.
4. (a) Agnus Dei (Bizet), (b) Herod (Air from Salome) (Massenet). Mlle. Lebard.
5. Selection for Piano and Orchestra (Weber). M. Noel and the Orchestra.
6. (a) Spanish Dance (Granados), (b) Slave Dance. Mlles. Rose and Ottilie Sutro.
7. (a) Serenade (Pierne), (b) Prelude and Rondi Caprice (Saint Saens). Mlle. Arnitz.
8. (a) The Lotus (Schumann), (b) Carmen (Bizet). Mlle. Lebard.
9. Selections (Gallon). By the Composer.
10. Organ Solo (Dubois).

PARIS.—*Station :* Petit Parisien.
Wavelength : 345 metres—500 watts.

9.30 p.m.—Concert.

1. Overture from "The Barber of Seville" (Rossini).
2. Waltz—Flirtation (Steck).
3. Quartette and Violin—Prelude from Deluge (Saint Saens).
4. Song—"Good-Bye" (Tosti).
6. 'Cello Solo—Oriental (Cesar Cui).
7. Gitanilla (Lacome).
8. Arabian Dance (Volpatti).
9. Violin Solo (d'Ambrosio).
10. Berceuse (Dacette).
11. Jicky—Foxtrot (Rudd).
12. Paysannerie (Hedwige Chretien).

SWITZERLAND.

ZURICH.—*Station :* Radio-Genossenschaft.

Wavelength : 515 metres—500 watts.

7.15 p.m.—Relaying of the Opera, "Tannhauser," by Wagner. Played at the Zurich Theatre. Followed by Selections by the Station Orchestra, Gilbert.

LAUSANNE.—*Station :* Societe Romande de Radiophonie.—HB.2.

Wavelength : 850 metres—300 w.

7.0 p.m.—Concert.
Artists : M. Giroud, Prof. of the Conservatoire, and Mlle. Irene Hortig.

AUSTRIA.

VIENNA.—*Station :* Radio-Wien.
Wavelength : 530 metres—1.5 kw.

8.0—5.0 p.m.—Concert.

1. The Birth of Pierrot (Monti).
2. The Conqueror (Tschaikowsky).
3. Cinderella—Reading from Act III (Strauss).
4. Legend (Wieniawsky).
5. Selection from "The War Goddess" (Wagner).
6. Celebrated Aria (Bach).
7. Lullaby (Strauss).
8. Potpourri (Morena).
9. Wild Roses (Lehar).
10. Easy Melody (Conley).

5.30 p.m.—Lecture by Dr. J. Lamberg. First Aid in Cases of Poisoning.
7.0 p.m.—Selections from "Manfred" (Schumann). Station Orchestra.

ITALY.

ROME.—*Station :* Radiofonica Italiana.
Wavelength : 425 metres—3 kw.
7.35—10.0 p.m.—Popular Concert.
Soloist : Sig. Ettore Fiorini.

GERMANY.

HAMBURG.—*Station :* Nordische Rundfunk.
Wavelength : 395 metres—1.5 kw.

5.0 p.m.—Concert.

1. Ouverture from "Undine" (Lortzing). Norag Orchestra.
2. (a) Two Men, (b) Der Klabauter. Read by Hans Langmaack.
3. The Sea (Schubert). Norag Orchestra.
4. (a) Smiet, (b) Die Schifferfrau. Reading.
5. Overture from "The Flying Dutchman" (Wagner). Norag Orchestra.

6.30—Spanish Lesson.
Hans Bredow-Schule.

7.0 p.m.—The Rathje Quartet.
Artists : Karl Grotsch (1st Violin), S. Wolf (2nd Violin), Anton Grunsfelder (Viola) and Paul Moth ('Cello).

1. String Quartet C. Major (Haydn).
2. String Quartet in C Major (Mozart).
3. String Quartet in A Minor (Kreisler).

9.0 p.m.—News Bulletin given partly in English. Dance Music by the Norag Orchestra.

KONIGSBERG.—*Station :* Ostmarken-Rundfunk.
Wavelength : 464 metres—1.5 kw.

4.0—5.0 p.m.— Concert by the Station Orchestra.

6.7 p.m.—Instrumental Evening "The Flute."
Artists : August Nothling (Solo-Flutist), Hermann Drichel ('Cello) and Elise Flecker (Pianist).

1. Composition for Flute and Piano (Mittmann), (a) Romance, (b) Capriccio, (c) Barcarolle, (d) Canon, (e) Elegie, (f) Scherzino.
2. Rhapsodie in C Minor.
3. Selection for Flute, 'Cello and Piano (Weber).

8.15—10.0 p.m.—Light Music by the Station Orchestra.

MUNICH.—*Station :* Deutsche Stunde-in-Bayern.
Wavelength : 485 metres—1.5 k.w.

3.30—4.0 p.m.—Concert by the Anna Rosenberg Quartett.

1. Ouverture from "William Tell" (Rossini).
2. Selection on Melodien (Grieg).
3. 'Cello-Solos : (a) Adagio (Haydn), (b) Musette (Offenbach).
4. Selection (Beethoven).
5. The Third Song (Brahms).
6. Wedding March from "Summernight's Dream" (Mendelssohn).

5.30—6.30 p.m.—Concert.

1. Overture from "Euryanthe" (Weber).
2. Selection from Bulgarian Folksongs (Weninger).
3. Hungarian Dances—Violin Solo (Brahms-Joachim).
4. (a) Reverie (Burmeister), (b) Barcarolle (Niemann), (c) Menuett (Niemann).
5. Waltz (Strauss).
6. Zeppelin—Waltz (Brosete).

7.45—9.0 p.m.—Concert by the Station Orchestra.

Artists : Frieda Klinck (Contralto), Emmeram Rieder (Horn).

1. Selections for Horn (Mozart).
2. Cantata for Contralto (Bach).
3. Concerto in D Minor (Handel).

UNITED STATES.

PITTSBURGH.—*Station* : Pittsburg Press.—WCAE.

Wavelength : 462 metres.

5.30 p.m.—News. Weather Reports. Reading of Programme for the day.

9.30 p.m.—Stock Market Reports. The Sunshine Girl.

11.30 p.m.—Dinner Concert transmitted from the William Penn Hotel.

12.45 a.m. (Fri., 13th).—Special feature.

1.0 a.m.—Programme from New York.

2.0 a.m.—Concert by Victor Recording artists.

3.0 a.m.—Concert by the Goodrich Silvertown Cord Orchestra, sponsored by the B.F. Goodrich Rubber Co.

STATEN ISLAND (N.Y.) — *Station :* Watchtower.—WBBR.

Wavelength : 272.6 metres—500 watts.

1.0 a.m. (Fri., 13th).—Concert.
Flute Solos by Mr. Frank Wood.

1.10 a.m.—Soprano Solos, by Mrs. L. M. Brown.

1.20 a.m.—International Sunday School Lesson for March 15th, by Mrs. S. M. Van Sipma.

1.40 a.m.—Soprano.

1.50 a.m.—Flute Solos.

FRIDAY, MARCH 13th

FRANCE.

PARIS.—*Station :* Eiffel Tower—FL.
Wavelength : 2,600 metres—5 kw.

6.0 p.m.—Concert.

Artists : Mmes. Dhamarys, Georgette Simon and Jane Couderc, M. Robert Jysor, Henry Jullien, and M. Andre Sauzede (pianiste compositeur).

1. Selection from "The Hazard," the principal airs of (Faurdrain).
M. Andre Sauzede (Accompanist).

6.55 p.m.—News Bulletin and Weather Forecast.

7.10 p.m.—End of Transmission.

PARIS (Clichy).—*Station :* Radio-Paris—SFR.

Wavelength : 1,780 metres—8 kw.

12.30 p.m.—Orchestral Concert.

1. Perfume of Roses (Barbirelli).
2. The Whip (Cribeillet).
3. Mystery (Bocchierai).
4. Urchin of Paris (Balleron).
5. Reverie after the Ball (Broustet).
6. Happy Moments (Rogister).
7. Gigue (Borchard).
8. Patchoum (Panella).
9. Distractedly (Denisty).
10. Prelude and Allegro (Pugnani).
11. The Sky of Cortelli (Ferre).
12. Song of May (Labis-Daras).
13. In Play (Lanini).
14. Plaspigal (Boischet).
15. Valse Caprice (Bizetzka).
16. Andalouse Song (Ferre).
17. The Festival of the Vignerons (Doret).
18. Nina Pancha (Romea & Valverde).
19. Provencale Aubade (Couperin).
20. Fantasie (Yvain).

1.45 p.m.—News Bulletin and Close Down.

4.45 p.m.—Literary Afternoon. Selections from "L'Adieu," by Louis Vaunois (Author) and Mme. Mary Marquet and M. Jacques Guilhene.

5.45 p.m.—News Bulletin and Close Down.

8.30 p.m.—News Bulletin.

8.45 p.m.—Concert. Selections from "Songs of a Night of Spring," by Ambroise Thomas.

CAST :
Elizabeth (Mme. Andree Cortyl), Shakespeare (M. Ferney).

10.0 p.m.—Close Down.

PARIS.—*Station :* Ecole Superieure—des PTT.

Wavelength : 450 metres—500 watts.

5.30 p.m.—Lecture.: "The International Organisation of Work" (Prof. Julliot de la Morandiere).

8.45 p.m.—Address : "The Liberated Regions of France" (M. Lucien Hubert)
Address : "The Dual Aspects of Peace" (M. Armbruster).

9.0 p.m.—Concert.

1. Sonate—for Violon and Piano (Debussy). Mlle. Pelliet and M. Remy.
2. (a) Opium Dreams (Remy), (b) Punch and Judy Show (Remy). (You, She and the Devil.)
3. (a) Thoughts (Remy), (b) The Snow (Remy). Mlle. Grandpierre.
4. Spanish Follies (Corelli). M. Remy and Mlle. Pelliet.
5. (a) The Rain (Remy), (b) I Dream of Sweet Worlds (Remy). Mlle. Grandpierre.
6. (a) Nocturne in F Minor (Chopin), (b) Toccato (Gedalge). Mlle. Pelliot.
7. First Movement of the Symphonie in F. (Lalo). M. Remy.

SWITZERLAND.

ZURICH. — *Station :* Radio-Genossenschaft.

Wavelength : 515 metres—500 watts.

7.30 p.m.—Concert.

1. Selections by the Station Orchestra.
2. Recitation, "A Message from God." A. Schneider.
3. Selections by the Station Orchestra.
4. Recitation, "The Robber of Graves." A. Schneider.
5. Selections by the Station Orchestra.
6. Recitation, "The Madonna of the House of Penitence." A. Schneider.
7. Selections by the Station Orchestra.

LAUSANNE.—*Station :* Societe Romande de Radiophonie.—HB.2.

Wavelength : 850 metres—300 w.

Silent Night.

AUSTRIA.

VIENNA.—*Station :* Radio-Wien.

Wavelength : 530 metres—1.5 kw.

3.0—4.0 p.m.—Stories for the Children.

4.10—5.0 p.m.—Concert.

1. Overture (Suppe).
2. The Model (Schubert).
3. A morning, afternoon and evening in Vienna.
4. Light Cavalier.
5. Poet and Peasant.

7.0 p.m.—Comedy by Franz Keim.

The last adventure of Baron Munchhausen.

CAST :

Pump von Pumpenstein (Fritz Daghofer), Laurenza (Ady Halm), Cyprian (Paul Pranger), Freiherr von Munchhausen (Viktor Hutschera), Pamflius Schluck (A. V. Blum), Rumpel (Karl Kneidinger), Pitschenender (Hans Kainz), Schropf (Franz Staude), Frau Baldrian (Gertrud Lasch), Gretel (Lia Landt).

ITALY.

ROME.—*Station :* Radiofonica Italiana.
Wavelength : 425 metres—3 kw.

7.35—10.0 p.m.—Concert in Memoriam of Sig. Puccini. Baritone Solos by Sig. Ugo Donarelli.
Short Lecture by Maestro Alberto Gasco on "Giacomo Puccini and his Works."

GERMANY.

HAMBURG.—*Station :* Nordische Rundfunk.

Wavelength : 395 metres—1.5 kw.

5.0 p.m.—Talk : "Pictures of N. Germany Cities" (Hildesheim). Kurt Siemers.

6.30 p.m.—English Lesson.
Hans Bredlow-Schule.

7.0 p.m.—Concert.

1. Overture "William Tell" (Rossini).
2. Folk Song and March (Komzak).
3. Women, Wine and Song (Strauss).
4. The Merry Wives of Windsor (Nikolai).
5. Potpourri from "Rigolette" (Verdi).
6. Polonaise (Wieniawsky).
7. The Marksman (Weber).
8. Overture from "Poet and Peasant" (Suppe).
9. The Post (Schaffer).
10. Thousand and one nights (Strauss).
11. Solo (Strauss).
12. March.

9.0 p.m.—News Bulletin given partly in English.
Dance Music by the Norag Orchestra.

KONIGSBERG. — *Station :* Ostmarken-Rundfunk.

Wavelength : 464 metres—1.5 kw.

3.30—5.0 p.m.—Concert by the Station Orchestra.

7.0—10.0 p.m.—Concert by the Station Orchestra.

1. Overture from "William Tell" (Rossini).
2. Fantasie (Andram).
3. Spanish Dance (Moszkowsky).
4. Slav Rhapsodie (Friedemann).

Weather Report.
A Five Minutes' Talk to Housewives.

5. Three Songs in Esperanto. Walter Olitzki.
6. Ball Dance (Strauss).
7. Potpourri (Gilbert).
8. Selection (Jessel).

MUNICH.—*Station :* Deutsche Stunde-in-Bayern.

Wavelength : 485 metres—1.5 kw.

3.30—4.30 p.m.—Concert by the Anna Rosenberger Quartet.

1. Selection from Tannhauser (Wagner).
2. Dance Music (Gluck).
3. Celebration of Love (Weingartner).
4. Greet Me (Kalman).
5. Whispering Flower (Blonn).
6. Manon's Letter (Oillets).
7. Cleopatra (Strauss).

6.45—7.30 p.m.—Concert.

1. Overture from "Raymond" (Thomass).
2. Reminiscence of a Troubadour (Tetras).
3. Romance—Violin Solo (Carasate).
4. Gypsy Idyll (Pierey).
5. Waltz—My Dream (Waldteufel).
6. One-Step (Prossen).

7.45—9.45 p.m.—Chamber Music.

1. Octette for Brass Band (Schubert).
2. March for Clarinet (Tetras).

9.0—9.30 p.m.—Lecture by Dr. Fritz Gerathewohl.

UNITED STATES.

PITTSBURG.—*Station :* Pittsburg Press—WCAE.

Wavelength : 462 metres.

5.30 p.m.—Weather Reports.
Reading of programme for the day.
Latest News Bulletins.

9.30 p.m.—Sunshine Girl. Stock Market Reports.

11.30 p.m.—Dinner Concert transmitted from the William Penn Hotel.

12.30 a.m. (Sat. 14th).—Uncle Kaybee.

1.30 a.m.—Concert by artists co-operating with Malate Post No. 285, Veterans of Foreign Wars.

MICHIGAN.—*Station :* Radio Lighthouse —WEMC.
Wavelength : 286 metres—500 watts.

2.0 a.m. (Sat. 14th)—Radio Lighthouse Choir in a Group of Old English Hymns. Programme of Negro Spirituals by Mrs. Sidney A. Smith (Soprano).

WASHINGTON.—*Station :* State College of Washington, Pullman, Washington.
Wavelength : 330 metres.

3.30—5.0 a.m. (Sat. 14th).—Concert : Baritone Solos by Prof. Hever Nasmyth. Piano Solos by Mrs. Louise Nasmyth. Health Talk by the U.S. Public Health Bureau. Talk on New Books by Miss Alice L. Webb.

SATURDAY, MARCH 14th

FRANCE.

PARIS.—*Station :* Eiffel Tower—FL.
Wavelength : 2,600 metres—5 kw.

6.0 p m.—Concert.

Artists : Mme. Madeleine Allart (Vocalist), Mlles. Madeleine Millochau (Violinist), Suzanne de Chaumesnil (Violincellist), Jeanne Lemardeley (Pianist) and M. Gadenna (Pianist).

1. A Talk on Edward Lalo, by M. Andre Delcour.
2. Trio for the Violin, Violincello and Piano. Mlles. Millochau, de Chaumesnil and M. Gardenne.
3. Air from "Fiesque." Mme. Madeleine Allart.
4. Scherzando of the Espagnole symphony. Mlle. Millochau and M. Gardenne.
5. Air from "The King of 'Ys." Mme. Madeleine Allart.
6. Russian Airs. Mlle. de Chaumesnil.
7. Air from "La Jacquerie." Mme. Madeleine Allart, Mlle. Jeanue Lemardeley (Accompanist).

6.55 p.m.—News Bulletin and Weather Forecast.

7.10 p.m.—End of Transmission.

PARIS (Clichy).—*Station :* Radio-Paris—SFR.
Wavelength : 1,780 metres—8 kw.

12.30 p.m.—Orchestral Concert.

1. Mazurka (Bernard).
2. The Song of the Bells (Bure).
3. The Brook (Aokermans).
4. The King of the Aulnes (Schubert-Salabert).
5. Song of the Morning (Abbiate).
6. Extract from the Festival of the Andalouses (Eenhaes).
7. Pavane (Dulaurens).
8. Little Cupid (Loudet).
9. Passion (Quef).
10. The Precious (Couperin).
11. Reverie (Hahn).
12. Punch (de Perryl).
13. The Playing of the Orchestra (Scotto).
14. Rosa (Guiliani).
15. Serenade (Borodine).
16. Menuett (Rico).
17. Beside the Sea (Bernard).
18. Song of Arlette (de Taye).
19. Humoresque (Dvorak).
20. La Traviata—Trio by Alder (Verdi).

1.45 p.m.—News Bulletin and Close Down.

4.45 p.m.—Concert : Festival "La Champagne." Address by M. Jean Nesmy.

6.0 p.m.—Close Down.

8.30 p.m.—News Bulletin.

8.45 p.m.—Concert organised by "Le Matin."

PARIS.—*Station :* Ecole Superieure des P.T.T.
Wavelength : 450 metres—500 watts.

8.30 p.m.—Musical Talk by M. Etienne Royor.

8.45 p.m.—Literary Evening "L'Exaltation de l'Ile de France :" Extracts from "Nuits de Versailles." M. Pierre Polbert.
First evenings of the Moliere Cycle. M. Jacob will give an address on Moliere's youth and debut as a playwright.
Audition of the principal scenes of "Medecin Volant" and of the "Jalousie du Barbouille," presented by the Alec Barthus Company :—Mlles. Lucienne Mignon, Jeanne Preval Odette Dalmont, MM. Marcel Roma, Louis Chacoune, Louis Breze and Alec Barthus.
Morse signals for the study of "Fading."

PARIS.—*Station :* Petit Parisien.
Wavelength : 345 metres—500 watts.

9.30 p.m.—Concert of Jazz Music by the Orchestra of Petit Parisien.

SWITZERLAND.

ZURICH.—*Station :* Radio-Genossenschaft.
Wavelength : 515 metres—500 watts.

7.30 p.m.—Concert by the Station Orchestra.

1. Ernestine (One-Step).
2. June Night (Foxtrot).
3. Blowing Bubbles (Valse).
4. Bagdad (Foxtrot).
5. Fozpagnol (Retan).
6. Waltz.
7. Mano Santo (Tango).
8. There's Yes ! in Your Eyes.
9. It Had to Be You
10. Waltz.

9.0 p.m.

1. I Love You.
2. Chili Bom Bom
3. Moon River.
4. Isabelle.
5. Red Hot Mama.
6. Pasadena.
7. Milonga.
8. Waltz (Strauss).
9. Selection from "Grafin Mariaza."
10. Selection from "Dolly."
11. Selection from "Madi."

LAUSANNE.—*Station :* Societe Romande de Radiophonie.—HB.2.
Wavelength : 850 metres—300 watts.

7.0 p.m.—Dance Music by the Station Orchestra, under the direction of Chas. Pilet.

1. Little Black Boddie (Foxtrot).
2. Sunday Mary (Foxtrot).
3. All Alone (Boston).
4. I Loved, I Lost (Foxtrot).
5. Rosa de Tuego (Tango).
6. Too Tired (Foxtrot).
7. Mistinguett (Blues).
8. On My Ukelele (Foxtrot).

AUSTRIA.

VIENNA.—*Station :* Radio-Wien.
Wavelength : 530 metres—1.5 kw.

3.10—5.0. p.m.—Concert.

1. March (Strecker).
2. Dance (Stolz).
3. Semiramis (Rossini).
4. Romance in F. (Beethoven).
5. Romantic Ballad (Bass. Rod). Selection (Bass. Rod).
6. Waltz (Kraus).
7. Dance (Urbach).
8. Flower Waltz (Tschaikowsky).
9. Hulahu (Engel-Berger).

5.30 p.m.—Lecture "The Right Profession," Dr. Robert Kauer.

7.0 p.m.—Opera, "Das Dreimaderlhaus" (Strauss)

CAST :

Operatic Singer Preuss : Herr F, Glawatsch, Victor Fleming, Otto Langer. and Fraulein Anny Rainer.

ITALY.

ROME.—*Station :* Radiofonica Italiana.
Wavelength : 425 metres—3 kw.

7.35—10.0 p.m.—Variety Programme. Concert of French Pastoral Songs, by Signorina Evelina Levi (Soprano).

GERMANY.

HAMBURG.—*Station :* Nordische Rundfunk.
Wavelength : 395 metres—1.5 kw.

5.0 p.m.—Concert.

1. (a) Song from Thuringen, (b) Folksong.
2. (a) The Old Beggar (Keller), (b) The Stream (Claudius), (c) The Man from Paradise (Wisser). C. Martens.
3. (a) Folksong, (b) Dagdeef (Becker). R. Becker.
4. Our Good Old Karl (Thomass). C. Martens.
5. (a) Folksong, (b) The Grand Monarch (Garbe). R. Becker.

7.0 p.m.—Play : "The Rape of the Sabines" (Schonthan).

CAST :

Martin Gallwitz (Karl Pundter), Friderike (Lotte Schloss), Paula (Eva Forster), Dr. Neumbeister (Eugen Moebius), Marianne (Kathe Schmidt-Steiner), Karl Gross (Hans Freundt), Emil Gross (Max Praatsch), Emanuel Striese (Hermann Beyer), Rosa (Edith Scholz), Meissner (Erwin Bolt).

9.0 p.m.—News Bulletin given partly in English. Dance Music, by the Norag Orchestra.

KONIGSBERG. — *Station :* Ostmarken-Rundfunk.

Wavelength : 464 metres—1.5 kw.

4.15—5.0 p.m.—Concert by the Station Orchestra.

7.0—8.0 p.m.—An Hour of East Prussian Humour.

Artists : Oscar Schwonder, Gustav Adolf, J. Wernek, Emmy Mertsch.

8.15—9.15 p.m.—Weather Report, and Dance Music by the Station Orchestra.

MUNICH.—*Station :* Deutsche Stunde-in-Bayern.

Wavelength : 485 metres—1.5 kw.

3.30—4.30 p.m.—Concert by the Anna Rosenberger Quartette.

1. Selections from "Tales of Hoffman" (Offenbach).
2. Ave Maria (Bach–Gounod).
3. Menuett (Boccherini).
4. Waltz (Strauss).
5. Potpourri from "Old Heidelberg" (Klose).
6. Saying Why (Hollander).
7. Sentimental Tango (Joves).

5.15—6.15 p.m.—Concert.

1. Selections (d'Albert).
2. Serenade (Strauss).
   Dance (Korngold).
3. Angels Dream (Rubinstein).
4. Waltz from "Rosenkavalier" (Strauss).
5. Cello Solo (Brahms).
6. March (Strauss).

UNITED STATES.

PITTSBURG.—*Station :* Pittsburg Press—WCAE.

Wavelength : 462 metres.

5.30 p.m.—News. Weather Reports. Reading of Programme for the Day.

7.30 p.m.—Tea-Dansant Music transmitted direct from the Nixon Restaurant, Sixth Ave., Pittsburg.

9.30 p.m.—Orchestral Programme by Ed Lally's Rendezvous Cabaret Orchestra.

11.30 p.m.—Dinner Concert transmitted from the William Penn Hotel.

12.30 a.m. (Sun. 15th).—**Uncle Kaybee.**

12.45 a.m.—Special Feature.

1.30 a.m.—Concert by Artist-Students from the studios of Charles le Sueur.

STATEN ISLAND (N.Y.).— *Station :* Watchtower—WBBR.

Wavelength : 272.6 metres—500 watts.

1 a.m. (Sun. 15th).—**Concert : Syrian Oriental Musicians.** Mr. Toufie, Moubbaid and Miss Elizabeth Awad.

1.15 a.m.—Bible Questions and Answers by Judge Rutherford.

1.45 a.m.—Syrian Oriental Musicians.

SUNDAY, MARCH 15th

FRANCE.

PARIS.—*Station :* Radio-Paris—SFR.

Wavelength : 1,780 metres—8 kw.

12.45 p.m.—Orchestral Concert.

1.45 p.m.—News Bulletin and Close Down.

4.30 p.m.—Concert by the Soloists of Radio-Paris.

8.15 p.m.—Address by Dr. Frumusan. News Bulletin.

8.45 p.m. Jazz Music by Mario Cazes and his Orchestra, Chateau Caucasien.

10.30 p.m.—Close Down.

ITALY.

ROME.—*Station :* Radiofonica Italiana.

Wavelength : 425 metres—3 kw.

7.35—10.0 p.m.—Concert by 4 Cellos. Selections from the Works of Bach Forino-Setaccioli.

GERMANY.

HAMBURG.—*Station :* Nordische Rundfunk.

Wavelength : 395 metres—1.15 kw.

10.15 p.m.—Concert.

1. The Sea Is Still (Mendelssohn).
2. Song (Fliegel–Bodenstedt).
   By the Composer.
3. (a) The Fisherman's Daughter (Liszt), (b) The Hutte (Grieg). F. Schneider.
4. Selection (Weber). Fritz Gartz.
5. The Bells of Marling (Liszt).
   F. Schneider.
6. The Flying Dutchman (Wagner).
   Norag Orchestra.

4.45 p.m.—Concert.

1. March (Suppe).
2. Idylle (Aletter).
3. Selection from "The Kitten" (Felix).
4. Waltz (Strauss).
5. The Nightingale (Popp).
6. Hamburg Gavotte (Czibulka).
7. Waltz (Eilenberg)
8. Idylle (Eilenberg).
9. Semper Vivum (Larcher).

7.0 p.m.—Opera : "The Postmistress" (August Neidhardt).
Music by Leon Jessel.
Directed by Hermann Beyer.

CAST :

Magdalena (Isa Roland), Prince Louis (Schneider), Virvaux (Kurt Rodeck), Pauline Wiesel (Thea Valeen), Der Pfarrer (Karl Pundter), Jeremias (Karl Freundt), Fritz (B. Jacksthtat), Reinold (Max Praatsch), Karoline (Edith Scholz).

9.0 p.m.—News Bulletin given partly in English. Dance Music by the Norag Orchestra.

KONIGSBERG.—*Station :* Ostmarken Rundfunk.

Wavelength : 464 metres—1.5 kw.

3.30—5.0 p.m.—Concert.

Artists : Hedi Kettner and Joseph Christean.

7.8 p.m.—Evening Concert of Herman Len's Compositions.

1. (a) Rose Red, Rose White, (b) Heart of the Linden Tree, (c) The Departure, (d) Expectation, (e) Warning. Hans Elbe.
2. (a) Maiensegen, (b) March, (c) Dorothy, (d) Suzanne, (e) The Fern Land. Elli Kursch.
3. (a) A Low Song, (b) Rosemarie, (c) The Watch Tower, (d) The Spectre, (e) The Garden. Eva Berthold.
4. (a) The Bittersweet Song, (b) The Shepherds' Song, (c) The Still Water, (d) The Little Window, (e) The Cuckoo. Hans Elbe.
5. (a) Jeduch, (b) The Picture of Pharoh. Eli Kursch.
6. (a) The Kiss, (b) Liebesklage, (c) Liebessuche, (d) Thousand Beauties, (e) Good-bye.

8.30—9.15 p.m.—Light Music by the Station Orchestra.

MUNICH.—*Station :* Deutsche Stunde in-Bayern.

Wavelength : 485 metres—1.7 kw.

3.0—4.0 p.m.—Concert by the Anna Rosenberger Quartette.

1. Symphony Prologue (Schllings).
2. Andante (Beethoven).
3. Selection for Cello and Violin (Handel–Halversen).
4. Spanish Dance (Strecker).
5. Keler-Bela Pearl (Rhode).
6. Moonlight (Tetras).

6.0 p.m. Orchestra Concert.

Artists : R. Snoeck (Violin), Elsa Wiechert (Soprano), W. Bauer (Baritone), and the Station Orchestra.

1. Violin Concert in D Minor (Bruch).
2. Aria from "Euryanthe" (Weber).
3. Selection (Wagner).

9.15 p.m.—Selection on Flute.

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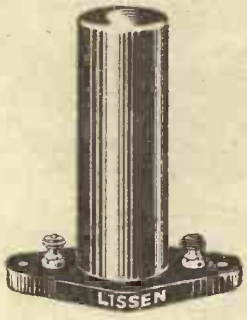

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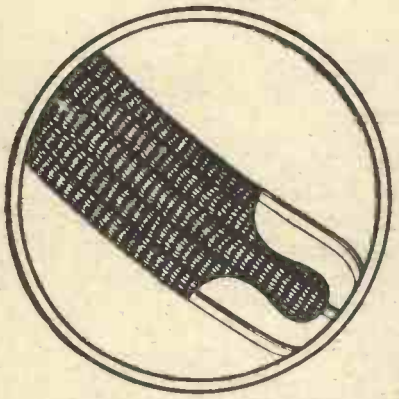

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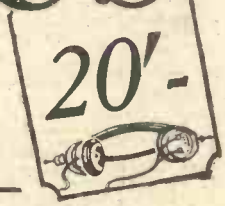

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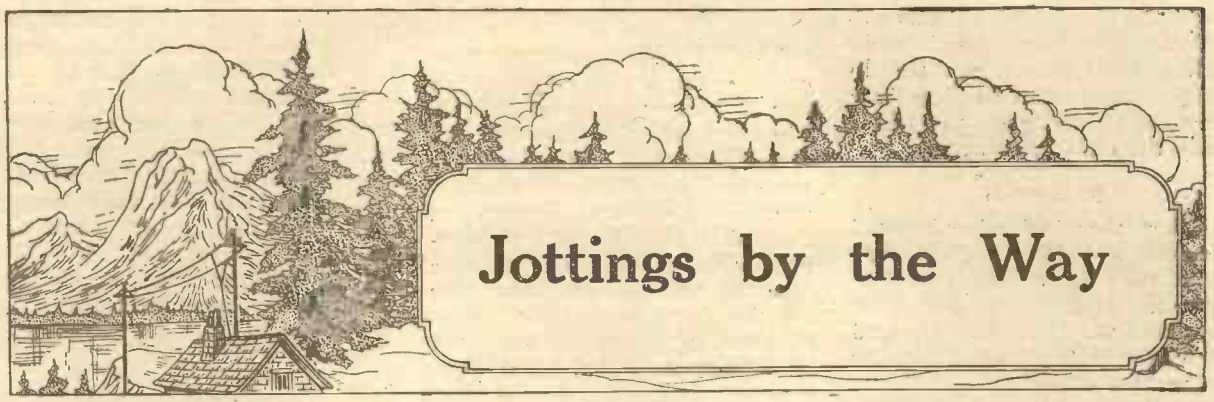

Jottings by the Way

Hard-up

AT the last meeting of the Little Puddleton wireless club General Blood Thunderby, our respected President, made an announcement which came as a stunning blow to all of us. The club's finances, he told us, were in a dreadfully dicky condition; in fact, the contents of the war chest consisted, at the time when he broke the sad news at the meeting, of ninepence in coin of the realm and a one-franc note issued by the town of Amiens and presented as a war relic by Gubbsworthy, once a very dashing Second Loot. Some members present, he said, had omitted to pay their subscriptions.

A Hasty Exit

At this moment I was about to make a hasty but graceful exit when the warrior's eye caught mine, and like the Ancient Mariners of old, kept his victim spellbound. Such was its effect that I sat perfectly still, even though Poddleby and Snaggsby on either side of me and Bumpleby Brown opposite were all engaged in kicking my shins under the table in an effort, I imagine, to make me realise that I was one of the black sheep. I am going to wear shin-guards and smoked spectacles at all future meetings of the club when the chairman is billed to make an announcement.

If I had not paid the paltry sum demanded in actual cash, had I not given many times its value in the form of strenuous and unremitting toil on behalf of the club? And who, I ask you, was it who spent his entire legacy of 18,000 roubles in buying the ungrateful pigs a brand new terminal? Ah me, as Shakespeare might have said, 'tis sharper than a neighbour's howls to have a thankless club.

Resourcefulness

But to return to the General's speech. He went on to say that other members had done little or nothing to further the interests of the club. Determined that

. . . *A resounding smack upon Poddleby's bald head* . . .

neither my neighbours nor my *vis-à-vis* should fail to notice that this was a dig at them, I caught Poddleby a left hook in the ribs, bit Snaggsby in the neck, and threw an inkstand at Bumpleby Brown. When the uproar had subsided I was fished out from under the table, and was just about to be properly told off by the General

. . . *I ought to have sat on the floor* . . .

when I craved permission to rise on a point of order. I told the story of the brutal assault made upon my shins by those three hulking brutes so skilfully that there was hardly a dry eye when I had finished, and when I emphasised one of my points by bringing my hand down with a resounding smack upon Poddleby's bald head I was cheered to the echo. I have always found that to carry off any situation, no matter how difficult, all that is required is energetic action coupled with tact.

Speech-making

The General meandered on for some time, for he is one of those people who simply cannot stop once they have got on to their hind legs. He told us no less than seven times about the ninepence and the one-franc note, and in the end I think that even Poddleby must have grasped what was the sum total of our resources. The only way to get the General back into his seat on these occasions is to start coughing. As everyone present either had just had or was just going to have a dose of 'flu there was no great difficulty about this, and when I started with a resounding "honk" the rest played up manfully. In about a minute the club house sounded like the sea-lions' pond at feeding time. The General subsided. At this point, having passed round a tin of cough lozenges, I rose to my feet and asked what they meant to do about it.

Common-sense

Of course I *ought* to have sat down on the floor, and I should probably have done so if I had not noticed Bumbleby Brown's face. He was manifesting those nods and becks and wreathed smiles which betoken that he is expecting shortly to be amused by something. Observing this I turned round before sitting down and carefully replaced my chair, which by the agency of a hidden hand had been moved about a yard to the rear. Mine was what you may call a leading question. It set them all going.

Everyone had suggestions to make, whilst most people were calling upon the committee to resign at once and to show how they had managed to fritter away the club's resources.

Precaution

When they had all exhausted themselves I felt that it was about time for a little common-sense to be brought to bear upon the situation. This time I placed my chair in front of me, using its back as a rest. I told them that they had not properly worked the vice-president idea. This is one of the very best ways of setting any club upon its legs. When I say any club I mean any one which has achieved a certain amount of fame. Little Puddleton I told them had a club better known than any other in the world. Wherever the English language is spoken, said I, there is the Little Puddleton club well known. All you have to do is to select a certain number of people of eminence in the wireless world, and having previously ascertained that their bank balances are satisfactory, to write them well worded letters informing them that they have been elected vice-presidents of the club. You will receive in return letters conveying in the warmest terms their appreciation of this signal honour.

Fame

A little later the secretary can write saying that it is customary for each vice-president to hand out a fiver upon election.

. . . *They were all offering raffle tickets* . . .

This idea met with an excellent reception. We are preparing now to write to the twenty-five most eminent men in the wireless world announcing their election. If you, reader, receive one of these communications you will know that it will cost you a fiver, but it is surely worth that to find yourself included in the list of the five-and-twenty most expert "radiacs" of the day.

Good Company

You probably will not get your communication for a month or two, for we are starting with the Big Names. If they do not respond we shall work down the scale until eventually we come to you. I can, however, guarantee that the printed list of vice-presidents will contain in large type the announcement that they are the twenty-five finest brains in the world. As a matter of fact there will only be twenty-four paying members, for the club were so pleased with my suggestion that they promptly elected me to fill the first place upon the list free of charge. You see, therefore, that you are in good company.

Junk

A great idea? I am modest by nature, but I agree, and really the next suggestion made by Admiral Whiskerton Cuttle was not too bad. He proposed that we should have a jumble sale. I suppose that all of us who go in for wireless are rather trying to our wives, owing to the way in which we stake out a claim to the shelves of every possible cupboard. You know what I mean. We buy a component; we use it; we do not like it. We remove it from the receiving set and buy another. We cannot part with a faulty one, for we have an idea that it might possibly come in useful some day. It is therefore stored away upon a shelf. Personally, I can never bring myself to dismantle a receiving set when I want to build a new one. At the moment when the Admiral lifted up his voice I had cupboarded seven complete sets, twenty-three variable condensers, nineteen low-frequency transformers, thirty-five rheostats, eight pairs of telephones, nine loud-speakers, sixty-two valves (mostly burnt out), and Heaven alone knows how many bits, pieces and gadgets. Your position is much the same, only more so? I thought as much. Let us shake hands.

The Sale

The Admiral's brain-wave then was that we should clear our shelves and send their contents down in carts, barrows, waggons, or lorries to the wireless hut. There they would be valued by the committee and priced. A gigantic jumble sale open to the world would then take place and the club's funds would swell to such proportions as bespeak affluence. When the great day came the club-house presented the most alluring spectacle. Arranged upon the stalls tastefully decorated by the wives of members, and presided over by them, was the most wonderful selection of components that you can imagine. We put an advertisement of the sale in the local paper, and as the circulation of the Little Puddleton Gazette seldom fails to run to less than three figures, we expected something of a crowd. There was a crowd, certainly, but I must confess that it consisted chiefly of members of the club.

. . . *My purchases were conveyed home in a pantechnicon* . . .

Raffle Tickets

When I entered I was approached at once by Mrs. Goop, who begged me to take a six-penny ticket in a raffle for a loud-speaker. I consented, of course. I was then attacked in turn by Mrs. Poddleby, Mrs. Bumpleby Brown, Mrs. Blood Thunderby, Mrs. Whiskerton Cuttle, Mrs. Snaggsby, and by other better halves, who were offering raffle tickets for various bits and pieces. In each case, being a very "parfit gentle knight," I succumbed to their blandishments. I wandered round the stalls, and reflecting that I now had empty shelves at home, and therefore plenty of room for a few things, purchased liberally. Being one of the lucky ones I won eleven raffles, and when my purchases had been conveyed home the next day in a pantechnicon I found that not only were all the former shelves filled to overflowing, but that in future I should require both the linen cupboard and the larder as storage places.

WIRELESS WAYFARER.

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Realising the need for a thoroughly reliable Neutrodyne Condenser of high-class finish at a reasonable price, we have introduced the LISSEN NEUTRODYNE CONDENSER.

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The ranges covered by the transformers are as follows :—

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LISSEN PARTS—WELL THOUGHT OUT—THEN WELL MADE.

Cossor discards the Dry Battery

THEORY and practice—even in wireless—cannot always be said to progress hand in hand. Apparatus or circuits which according to all the laws of physics or electricity should perform perfectly frequently fail to function as they should. Such a case in point is the use of Dry Batteries with Dull Emitters.

* * * * * *

When the first Dull Emitters were placed on the market a new era was prophesied in which dry batteries would take the place of accumulators. That, at present, there is no likelihood of this being realised must be apparent to all clear-thinking wireless enthusiasts.

* * * * * *

Time and again it has been proved that unless the dry battery is very large—and consequently expensive—it cannot possibly cope with the requirements of several Dull Emitters in use at one time. You should remember that the working of a Valve—whether rectifying or amplifying—is a very delicate operation. The filament current must be absolutely constant, otherwise electron emission will vary and upset the whole balance of the Receiver.

* * * * * *

Dry batteries are not built to give a constant output—they were originally developed for ringing bells and other intermittent work. They have to generate their own electricity, and in so doing are apt to polarise. Their output fluctuates: at first it is high and then it falls off. All the time you need to keep constantly adjusting the rheostats to be getting the best results.

* * * * * *

But compare them with the small accumulator. No matter whether you use an accumulator for five minutes or five hours its output is perfectly constant. It does not generate its own electricity—it merely stores it against demand. For economy, too, the little portable accumulator stands supreme. A small initial cost and a few coppers every few weeks is all you need to spend if your Set is equipped with Wuncells.

* * * * * *

On every side there is marked evidence that the most popular type of Dull Emitter is the new Wuncell—the Dull Emitter that does not rely on an excessively fine filament and a dry battery of uncertain reliability; the Dull Emitter that possesses a filament every whit as robust as that used in a bright emitter—a filament, moreover, that operates at the dullest of dull red heat; the nearest approach, in fact, to the cold valve that has yet been evolved.

Wuncell exclusive advantages featured: *No. 3*

AN inherent disadvantage of all Dull Emitters—previous to the introduction of the Wuncell—has always been the annoyance of microphonic noises. A touch on the receiver, a tap on the table, or even footsteps across the room, have often caused the valves to transmit loud ringing noises to the phones or loud speaker.

This cannot happen with the Wuncell. Its rigid filament—arched and supported at its centre by an additional electrode—in combination with the world-famed Cossor Grid precludes the possibility of any undesirable noises being created.

This is but one of the many exclusive Wuncell advantages fully described in the large illustrated Folder to be obtained free of charge from any dealer—or from us on receipt of a postcard.

Prices:

W.1 For Detector or L.F. Amplifier

W.2 (With red top) for long distance reception

18/- each

*W.R.1 Corresponding to W.1

*W.R.2 Corresponding to W.2

20/- each

**Fitted with internal resistance so that Valve can be used with 2-, 4-, or 6-volt Accumulator without alteration to Set.*

Cossor Wuncell Valves

THE ONLY DULL-EMITTER VALVES SOLD IN SEALED BOXES

Advertisement of A. C. Cossor Ltd., Highbury Grove, N.5

Gilbert Ad. 2397

Random Technicalities

By PERCY W. HARRIS, M.I.R.E.
Assistant Editor

AS these notes are being prepared before the publication of last week's *Wireless Weekly*, there is not yet time to know whether any readers have noticed the same effect in variation of aerial current of a transmitter as that to which I referred in my last notes under this heading. A friend of mine has just installed a receiver in similar conditions and finds precisely the same variation of aerial current with his transmitter. The interesting point about these experiments is that tests with different stations show that an increase in aerial current when the receiver is adjusted brings about an increase of signal strength at the distant station. Furthermore, it must be remembered that the receiver is tuned to an entirely different wavelength to that used on transmission.

* * *

Mr. Scott-Taggart tells me that during the war, when he was in charge of a number of transmitting sets, he found that where several aerials were led into the same room, some being for transmission and others for reception, the bringing into tune of the receiving aerial with the transmitters brought about a considerable increase in aerial current of the transmitter, and that contrary to his expectations the increase of aerial current gave an increase of signal strength at the distant station. This, of course, is confirmed by my own experience.

* * *

I am receiving complaints from several quarters regarding the marking of components with makers' names and trade marks in such a fashion that the finished receiver constitutes an advertisement for one or more manufacturers. I quite agree it is most irritating to have the appearance of the set completely spoiled by the obtrusive name of some particular component. A well-known grid-leak, for example, excellent in other respects, has its name moulded on the knob in such large letters that they seem to shout at you. I know of more than one case where a home constructor has refused to use this component for no other reason than his objection to carrying advertisements on his panel. Another well-known maker takes great care to have the name of his company very plainly indicated on every knob. Of course, there are many advantages in having makers' names clearly indicated on the articles, and I can see no objection to such markings on components which are hidden behind the panel, but knobs and dials for the front of the panel should, in my opinion, be free from advertising matter.

* * *

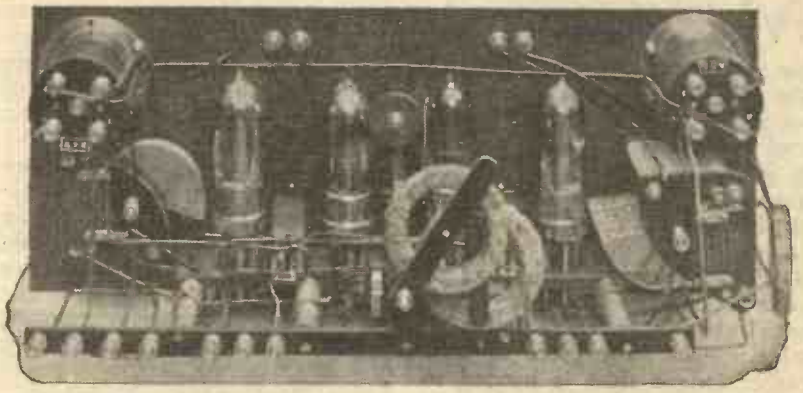
It is also time condenser dials were standardised. At the present time some read from 0 to 100 degrees, some from 0 to 180, some from left to right, and some from right to left, irrespective of whether they are the old pattern or square law. Personally I am all for the 0 to 100 scale, whether it reads from the right or from the left. The 0 to 180 degrees scale is a snare and a delusion. First of all, if you look at the dial, you will find that each degree marking stands not for one but for two degrees: thus in the half circle there are 90 and not 180 degrees. In the 0 to 100 scale each division is marked, and much confusion thereby obviated.

* * *

Wireless component manufacturers seem strangely blind to some aspects of the art. Take filament resistances, for instance. The wire round the resistance unit itself, together with the finger which slides over it, are both mounted behind the panel, and the only portion showing on the front of the panel is the knob. Many filament resistances have no mark on the knob to indicate the position of the moving arm behind, and thus it is impossible to tell at a glance whether the resistance is on or off. Even a firm of the standing of the Radio Communication Company have no indicator (not even a small white dot) on the knobs of their otherwise excellent filament resistance.

* * *

I wonder what constitutes a good aerial! I often get letters



On another page will be found a photograph of a four-valve set presented by the King and Viscount Lascelles to the stable staff at Egerton House. The wiring of the receiver may be here seen.

from readers speaking of the results they get on my sets, which start off something after this style: "Although I have a very poor aerial running ten feet above a metal roof I manage to get all stations . . . . etc.," or "My aerial is so badly screened, yet I get . . . . etc." After trying a number of different aerials in different localities, I am inclined to believe that reception conditions depend more on the locality than on the actual disposition of the aerial wires. In many cases the same set has been tried on two aerials, one appearing to be excellent in every way and the other disobeying all the rules usually laid down, yet receptions on the alleged poor aerial have been far better than on the supposedly good one. Some months ago, as I think I mentioned in these columns, I ran down the Strand to Wimbledon in a friend's car and listened to 2LO the whole way. There were surprising and indeed enormous changes in signal strength from time to time, and sometimes signals would disappear entirely. At others they would come up to a remarkable strength, yet it was impossible to associate these increases and decreases with what we can see with the eye in the way of screening. Signals varied quite considerably on the top of Wimbledon Common, which, as readers will know, is high ground and very open.

* * *

Now that the home charging of accumulators is becoming very popular, it is as well to remind readers who are just embarking upon this economical fashion that the gases given off when an accumulator is being charged are explosive. Accumulators should not be allowed to gas in a confined space without ventilation.

□ □ □

STRAIGHTENING WIRE

MANY constructors find it difficult to straighten the heavy gauge wire used for making connections beneath the panels of wireless sets. This wire is usually sold on spools, and when a length is unwound it assumes naturally a curved shape. The best way of straightening the heavy wire such as No. 18 or No. 16 S.W.G. is this. At one end of your bench clamp a piece of soft wood about 1 in. thick and 2 in. wide. Cut off a piece of wire rather longer than is needed to make the required connection, and grasp its ends with your hands. Stretch it tight, and draw it two or three times across the edge of the soft wood block, holding the wire so that when it is slackened the convex curve is towards the wood. It will be found that this method enables any piece of wire to be straightened very quickly. The portions at the ends which are held by the fingers should be cut off; about an inch or so at either end has to be wasted, but this is no great matter.

Square Wire

The square-section tinned copper wire or rod of which so much use is now made presents a rather more difficult problem. Those who can obtain it direct from a wireless shop may be able to get 24-in. lengths which are pretty straight; but if it has travelled through the post, or if it has previously been bent or kinked, it may defy all efforts at straightening unless you know the right method. The one method is to use two pairs of flat-nosed pliers. Take one pair in the left hand, and hold the length of square wire between the jaws. With the other pair grasped in the right hand run along the wire, giving a little tweak here and a little tweak

The presentation plate of the 4-valve receiver shown on the previous page.

there until most of the bends have been removed. The pliers held in the left hand should follow those grasped by the right, the distance between the two being never more than two or three inches. When you have straightened the rod in one direction turn it over and repeat the process.

A More Satisfactory Method

A more satisfactory method consists in clamping one end of the length of square wire in a vice, gripping the other end firmly, say, with a pair of pliers, and pulling on the wire until it just "gives." The wire is thus stretched slightly, and it will be found that a perfectly straight length is the result.

If square wire has been bent at right angles at a certain point which is afterwards found not to be quite the right one, it is possible to straighten it out with two pairs of pliers and to make *one* fresh bend. It is not usually advisable to repeat the process, for stiff copper will not stand much bending, and if a crack occurs at the corner in the wire there may be considerable high-frequency resistance owing to the destruction of the outer surface, whilst the lead will be permanently weakened. Usually it is best to discard a piece incorrectly bent—the straight portion of it may come in useful later on for a short lead. But if, as sometimes happens, you have barely enough to go round, and therefore cannot afford to discard a piece, you can prevent any tendency to cracking by "letting down" or softening the copper.

Softening

To do this heat it and plunge it rapidly into water. This treatment softens it and allows it to be bent many times without cracking.

Cracking

Should a crack occur at a bend in a piece of square wire it can be repaired by running in a little solder. To do this job neatly a perfectly clean and very hot soldering iron is required. The presence of the solder evens up the surface and removes any undue resistance which might otherwise be present, besides giving mechanical strength to the lead.

Our good name is your safeguard

THE price you pay for running your Valve Receiver depends on two factors—the original cost of your Accumulator and the annual cost of chargings. Obviously the actual first cost of the Accumulator becomes a small portion of the whole when you think of those very frequent journeys to the charging stations. Perhaps that is where false economy sometimes steps in. A cheap Accumulator cannot hold its charge as long as a high-grade product such as the Oldham.

The special Activation Process which has built up a wonderful reputation for Oldham Accumulators effects a very considerable annual saving for all Oldham users.

An Accumulator that will last for three weeks instead of two on a charge is obviously a much better investment even if it may cost half-a-crown more in the first place. See an Oldham Accumulator at your Dealers—you'll recognise immediately its obvious superiority in design and manufacture.

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SPECIAL ACTIVATION PROCESS

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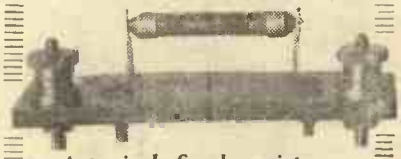
Gilbert Ad. 2444.

Grid-Choke Rectification

By JOHN SCOTT-TAGGART, F.Inst.P., A.M.I.E.E., Editor.

Though the detector is probably the most sensitive link in any circuit to improper adjustment or inefficiency, the improvement of the leaky-grid method of detection has received little attention, and in the following article Mr. Scott-Taggart describes another method of interest.

A common form of choke.



A typical fixed resistance grid-leak.

THE recognised method of rectification is undoubtedly that employing a grid condenser and gridleak, and it is rather unfortunate that research has not been directed to a greater extent towards the improvement of the rectification process.

The signal strength of the receiver, and particularly its range, depends, very largely, upon the efficiency of a single element in the receiver—namely, the detector.

Importance of the Detector

The detector is only part of the whole receiving system, and it may be preceded by one or more stages of radio frequency amplification, and followed by one or more stages of low-frequency amplification. Whatever the arrangement may be, there is always a link in the whole chain, which is most sensitive to improper adjustment or inefficiency.

This is why so many receivers have their power output controlled by simply varying the filament current of the detector valve. It is possible, by this means, to obtain a fine adjustment of the output signal strength, and no amount of high-frequency amplification before the detector or low-frequency amplification after it, will prove nearly as effective as improving the detector itself.

Some valves work better as detectors than others, and here again valve manufacturers have done nothing to develop a good rectifier and make it known to the public. One of the best rectifying valves which has been on the market is, I understand, being taken off the market as the demand for it is insufficient.

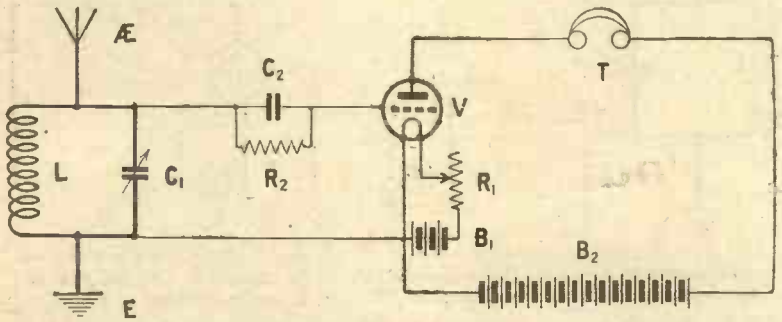


Fig. 1.—A circuit in which the valve V acts as a detector on the leaky-grid condenser principle.

The question of rectification has always interested me to a very great extent, because when the output of the detector varies as the square of the input voltage, it is obvious that even the smallest improvement in the detector will give a considerable improvement in signal strength.

Drawbacks to Multi-stage H.F. Amplification

Efforts are now being chiefly directed towards increasing the voltages applied to the detector, and the process of detection is itself ignored. This appears to be a wrong method of procedure, because in any case there is a decided limit to the amount of high-frequency amplification that may be employed. Questions of stability arise, and whether or not a multi-stage high-frequency amplifier is sufficiently easy to handle. The supersonic heterodyne receiver is, on the other

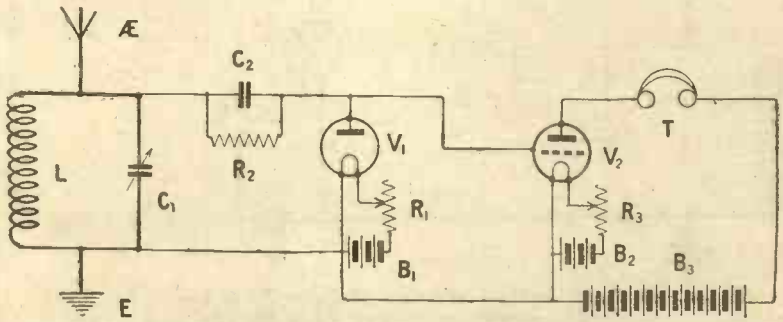


Fig. 2.—In this illustration the detector is a Fleming two-electrode valve followed by a three-electrode valve acting purely as an amplifier and serves to explain the function of the Fig. 1 circuit.

hand, a step in the right direction, as less reliance is placed on high-frequency amplification and more on the detection process.

The Usual Method

The usual method of rectification is that illustrated in Fig. 1,

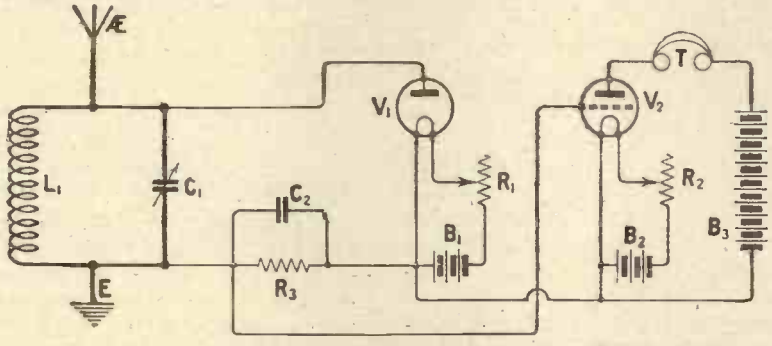


Fig. 3.—Showing a modification of Fig. 2 so that the H.F. component applied to the grid of V2 is eliminated.

which shows a simple single-valve detector working on the leaky grid condenser principle. It is astonishing, the number of people who are continually operating wireless receivers who have not even the most elementary knowledge of how this circuit works. Before actually describing the method which is the subject of this article, it will be as well to outline briefly the simplest way of regarding the operation of the Fig. 1 circuit. The explanation is that contained in my "Elementary Text - Book on Wireless Vacuum Tubes," and forms a good rough and ready explanation of what is happening, without the necessity of graphical

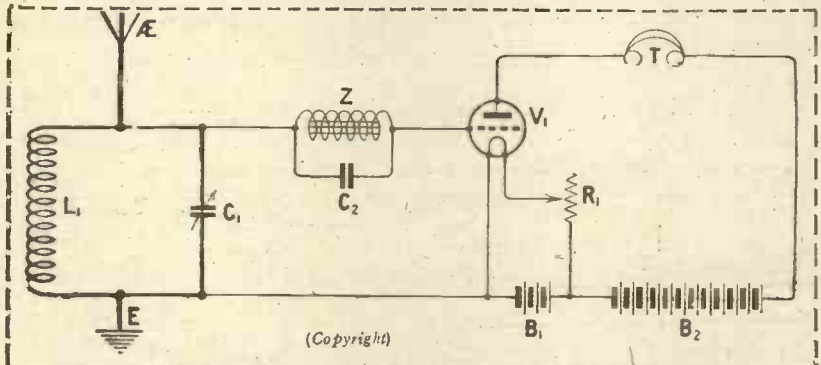


Fig. 4.—In this circuit an iron core choke coil Z is seen substituted for the non-inductive leak R2 in Fig. 1.

methods of showing what is occurring at a given moment.

A Simple Explanation

This method of explaining grid condenser rectification is best illustrated by Fig. 2, which shows that I have resolved the three-electrode valve of Fig. 1 into two valves, V1 and V2, the first being an ordinary two-electrode valve like a Fleming valve, and the second a three-electrode valve acting purely as a low-frequency amplifier. Contrary to popular belief, in many cases, the rectification process goes on while operating at a point on the straight portion of the grid potential anode current characteristic curve. The three-electrode valve in Fig. 1 is really acting as an ordinary low-frequency amplifier, while the grid and filament of the valve are also acting as a two-electrode Fleming valve. By the use of the grid condenser and leak the two imaginary valves are combined into one, but we can easily separate them out by using a separate valve to get the same results. This separation, of course, is not an economic procedure in actual practice, but it is convenient to show the separate functions by means of two valves, as illustrated in Fig. 2.

If we consider Fig. 1 and disconnect the anode altogether, leaving the rest of the circuit as it stands, rectification will take place in the grid circuit. The reason for this is that the grid now acts as an anode of a two-electrode valve consisting of the grid and filament of the valve.

The Rectification Process

When the grid, or small anode as it now becomes, is made positive, electrons flow from the filament to this grid and charge up

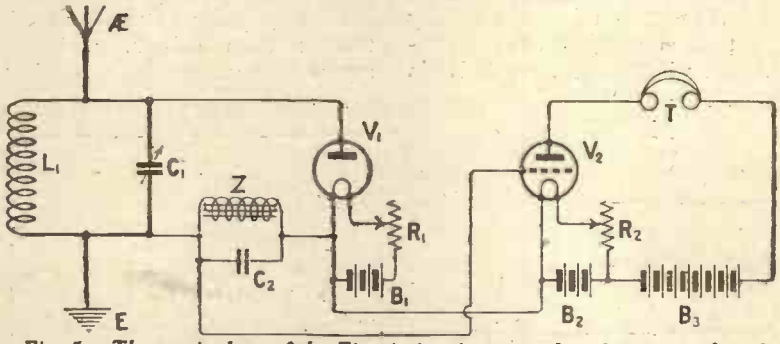


Fig. 5.—The equivalent of the Fig. 4 circuit, two valves being employed in this case to perform the separate functions required. Z, C2 are at the bottom of the anode circuit of V1 for the reasons stated in Fig. 3.

the condenser C2, the grid and right-hand side of the condenser C2 being, roughly speaking, partially filled with electrons from the filament. When the grid is made negative by the negative half-cycle of the oscillations in the circuit L C1, the grid becomes momentarily negative, but when the next positive half-cycle comes along, more electrons are drawn up to the grid, and this process is repeated until a large number of electrons are collected on the right-hand side of the condenser C2 and the grid. If no grid-leak R2 were present, the electrons on the grid and the right-hand side of the condenser C2 would remain there indefinitely if there were no leakage, and the grid would become more and more negative with respect to the filament until the incoming positive half-cycle could not overcome the accumulated negative

potential on the grid. This would mean that the grid would not become positive with respect to the filament, and there would no longer be any flow of electrons to the grid. This stabilised result would mean that the grid would have fallen to a negative value, equal to the amplitude of the positive half-cycle of the incoming current, and no further drop in potential would be obtained.

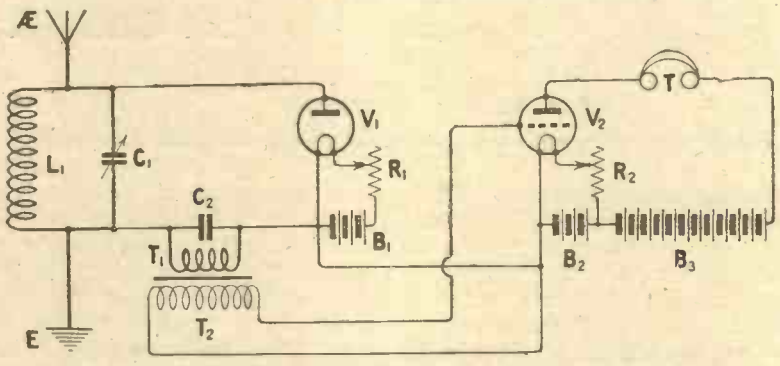
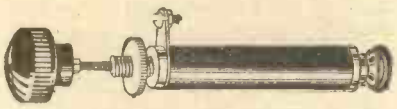


Fig. 6.—A step-up transformer T1 T2 has been substituted here for the choke Z in Fig. 5.

It is perfectly clear that the whole rectification process would cease under these conditions, and in order to enable the grid never to become so negative we provide a leak R2. It should be quite clear that there will be a potential difference established across R2, which if the incoming signals are modulated signals will be of low-frequency.

It is a very simple matter to show that rectification is taking place in the grid circuit, quite apart from the anode circuit, by simply connecting telephone receivers at any point in the grid circuit of the valve. When receiving telephony there will be low-frequency currents passing through the telephones, and, of course, there will be low-frequency potentials on the grid even when no telephones are in the grid circuit. The reason for these low-frequency potentials on the grid is that the grid and one side of the condenser have on them a varying charge. A certain looseness of language is almost inevitable if the process is to be explained as simply as possible, and many would find it still easier to understand if I were to say that the rectified currents in the grid circuit, by passing through the high-resistance R2 set up low-frequency potentials across this resistance, the condenser C2 serving as a means of



A well-known make of variable grid-leak.

by-passing the high-frequency currents to the grid.

A Separate Low-Frequency Amplifier

In Fig. 2 the variations of grid potential are variations of the anode potential of V1, the anode

Another type of variable grid-leak.

of this valve representing the grid in Fig. 1. The varying potential across the resistance R2 is communicated across the grid and filament of a second valve V2 of the three-electrode type, this being a plain low-frequency amplifier. It will, of course, be appreciated that the high-frequency potentials across the circuit L C1 are also communicated across the grid and filament of the second valve, and are consequently amplified by this valve. No advantage, however, in the circuit given is taken. The same remark, of course, applies to Fig. 1, where high-frequency currents most certainly appear in the anode circuit of the valve, but are not utilised in this particular circuit, although they would be utilised if a reaction coil were employed.

Eliminating the H.F. Component

If we desire to cut out the high-frequency part, we can do so almost entirely by arranging a circuit as in Fig. 3, where the grid-leak and condenser are connected on the filament side of the oscillatory circuit. The effect is the same as that given by Fig. 2, except that the high-frequency currents are not then applied to the grid circuit of the amplifying valve.

The Grid Choke Method

The method of rectification which is the subject of this article involves the use of an iron-core choke coil shunted by a condenser. I have found that this arrangement results in very effective rectification, although it is too early at the time of writing to say whether or not, in all cases, the results are the same, or better, than when the conventional gridleak is employed. I have not, hitherto, seen the use of a choke coil for this purpose, and some might at first imagine

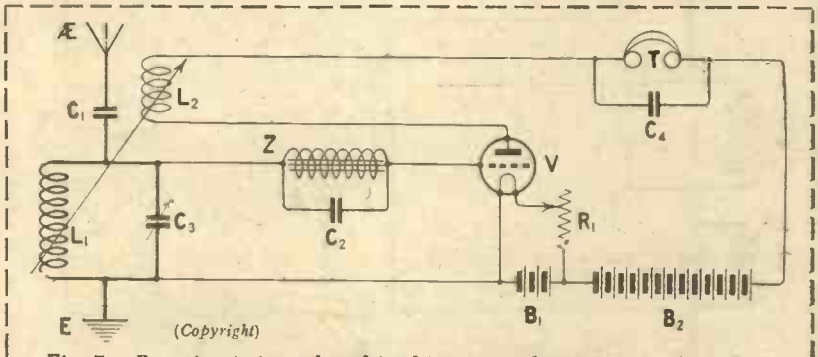


Fig. 7.—Reaction is introduced in this circuit by means of the coil L2 coupled to L1.

that being of negligible resistance the choke would be no improvement over a circuit in which the choke and condenser were cut out altogether. This, however, is not so; the grid choke method of

rectification works very effectively, and the reason is probably that the choke Z in Fig. 4 is dealing with two important forms of current, one of high-frequency and one of low-frequency. The high-frequency currents are those due to the incoming signals, and the low-frequency currents are due to the rectification effect on the Fleming valve principle in the grid circuit of the valve. When the grid of the valve is made positive, a grid current is set up, but when the grid is made negative there is no electron flow from filament to grid. The non-return properties of the filament to grid circuit result in a rectified current flowing through the choke Z and setting up low-frequency potentials across it which will, of course, cause the grid potential to vary at audio-frequency. These audio-frequency currents are now amplified by the valve. The choke coil Z would, therefore, act in much the same way as regards its choking effect as a high ohmic resistance, such as the usual gridleak. There is one difference between the choke and the leak, and that is in respect of the steady normal potential of the grid as applied to it by the filament battery through the leak, or choke, as the case may be. In the case of the choke, there will be virtually no steady potential drop across it because of its low resistance, whereas in the case of a gridleak there may be a substantial drop of potential across this leak, due to the establishment of a steady grid current, even when no signals are being received.

Effect on Grid Potential

Put in another way, we may say that any potential applied to the grid will be applied almost to the full extent by using a choke, whereas when there is a high ohmic resistance in the grid circuit, as in Fig. 1, the steady grid potential will be less subject to variations. It will not, for example, make a serious difference to the normal grid potential, whether we connect the bottom of the grid circuit to the positive or negative side of the filament. In the case of the grid-choke method of rectification described, almost the full potential of the filament battery may be communicated to the grid. It is, therefore, a matter for experiment to see to which side of the filament battery or the filament itself the bottom end of the grid circuit should be connected.

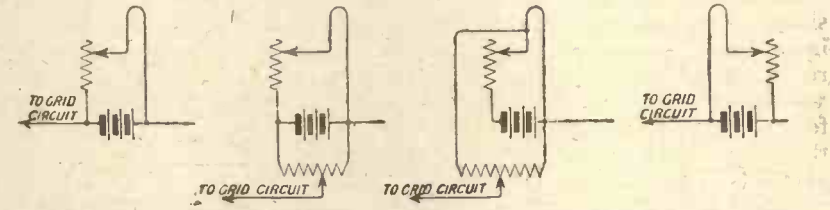


Fig. 9.—Four different connections to the grid circuit which may be tried.

A grid condenser fitted with clips for taking the gridleak.

In Fig. 4 the grid circuit is connected to the negative end of the filament, which is also the negative terminal of the filament battery B1. The best rectification effects, however, may not necessarily be obtained with the grid at this particular potential, and in the case of weak signals, especially, a potentiometer would be an improvement, in which case I would prefer to connect the filament rheostat in the negative lead instead of the positive lead as shown, the bottom of the grid circuit being then connected to a slider of a potentiometer resistance connected across the filament accumulator. I have, in fact, often used the grid choke method of rectification, with the circuit the same as in Fig. 4, but the rheostat R1 in the negative lead to the battery B1, the bottom of the grid circuit, as before, being connected to the negative terminal of the filament accumulator B1.

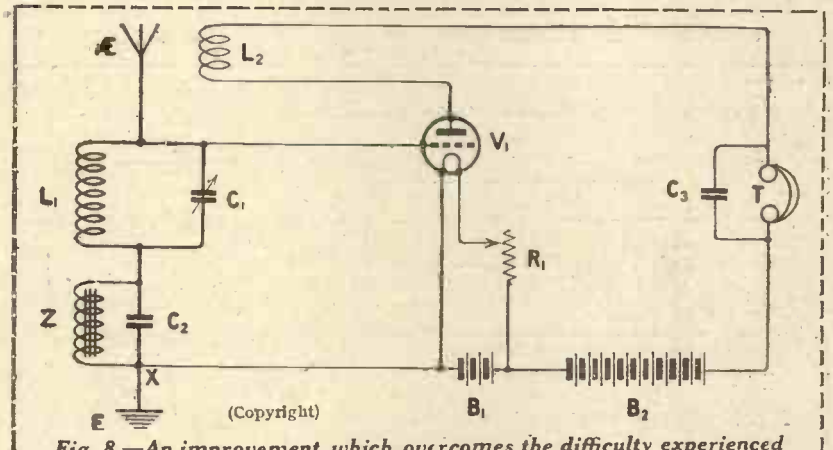


Fig. 8.—An improvement which overcomes the difficulty experienced with large choke coils.

Similarity of Grid-Choke and Grid-Leak Method

We could do the same for Fig. 4 as was done in the case of Fig. 1, and we can separate the grid filament valve from the three-electrode valve. We then arrive at a circuit similar to Fig. 5, in which circuit V1 is the two-electrode valve which takes the place of the filament and grid of Fig. 4 and the three-electrode valve V2, which is the valve of Fig. 4, acting as an ordinary low-frequency amplifier.

In Fig. 5 I have placed a choke Z and the choke condenser C2 at the bottom of the anode circuit of V1 to avoid applying high-frequency potentials to the grid of V2. In the case of Fig. 4, however, it will be understood that there are high-frequency currents in the anode circuit of the valve, which, however, in this particular circuit are not used.

Grid-Choke compared with Grid-leak Method

A reason for the success of the grid-choke method of detection,

in some cases, may be found, perhaps, in the fact that low-frequency currents passing through a choke coil will produce greater E.M.F.'s across it than if similar currents are passed through a plain ohmic resistance. It is, for example, well known that in low-frequency amplifiers of the impedance-coupled type, an iron-core choke coil will give louder signals than the type of amplifier in which a plain non-inductive resistance is used to couple one valve to the next. It may therefore be reasonable to suggest that an iron-core choke coil would serve as a better means of coupling a Fleming valve to a three-electrode valve amplifier than a resistance, and that Fig. 5 therefore possesses advantages over Fig. 3, and therefore Fig. 4 over Fig. 1. The proof of the pudding, however, is in the eating, and it will be interesting to have reports from readers as to their own experiences of the grid-choke method, as compared to the grid-leak arrangement.

It is interesting to compare the Fig. 5 arrangement with that of Fig. 6, where, in place of an iron-core choke Z, a step-up transformer T1 T2 is used. Fig. 6 may appear to be, at first sight, a big departure from Fig. 4, but the circuits are very similar in their actions.

Useful Circuits

Fig. 7 shows a useful single-valve receiving circuit in which the choke Z is shunted by the grid condenser C2, a reaction coil L2 being coupled to the aerial coil L1. The condenser C2 may have a value of from

A tapped type of gridleak.

.0001 μF to .002 μF, according to the kind of choke used, although the lower capacities will usually be preferable.

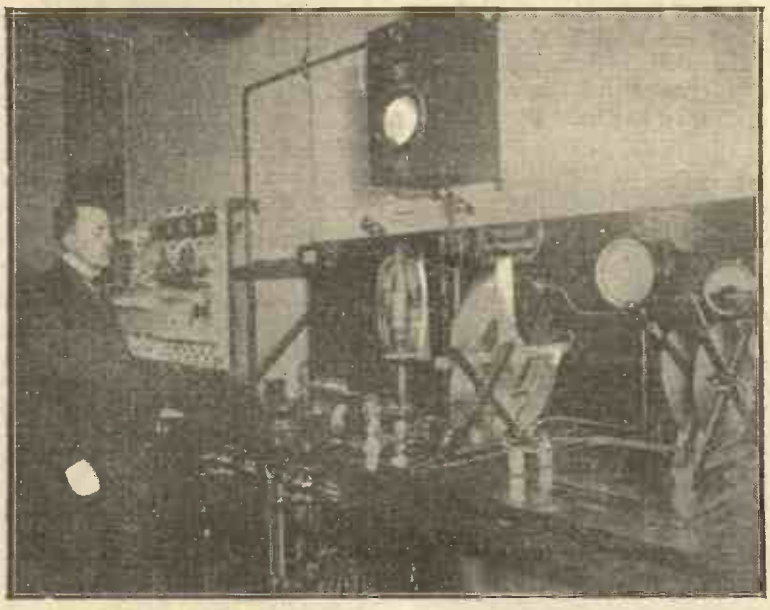
As regards the actual circuit employed, secondaries of iron-core transformers may be used, or any other iron-core impedance which is at hand. Even telephones may be tried.

A disadvantage of the arrangement of Fig. 7, when a large choke, such as the secondary of an iron-core transformer is employed, is that a large bulk may damp down the high-frequency potentials applied to the grid. I have therefore used the circuit of Fig. 8 with great success and overcome this difficulty in respect of large choke coils. The choke Z is now in the aerial circuit, and also in the grid circuit, as it is shunted by a condenser C2, having a capacity of, say, .0003 μF. The point of the connection between the bottom of the choke X and the filament is not important, as in all these grid-choke circuits for the reasons already explained. The circuit, however, will work excellently, and in some cases seems to give better results than the usual leaky grid condenser method.

The actual point of connection on the filament, or filament battery, is a matter of experiment, and I have shown in Fig. 9 four different connections to the grid circuit which may be tried with the particular valve employed.

In conclusion, it is needless to say that this method of rectification may be applied to any kind of a circuit where leaky grid condenser rectification is employed, and I shall be pleased to hear from any reader regarding his experiences.

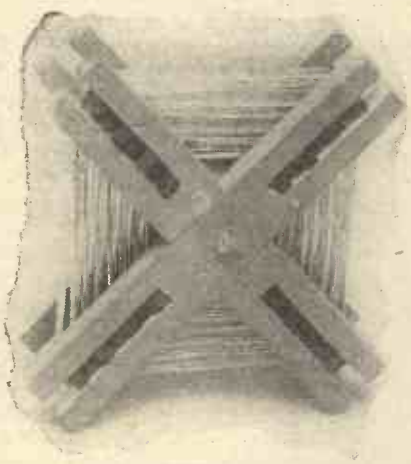
The arrangement is certainly not without technical interest, quite apart from any merits which the arrangement may, or may not, be found to have by the general mass of home constructors and experimenters.



A view of the interior of the Hamburg broadcasting station, which transmits on a wavelength of 395 metres.

A Compact Low-Loss Coil

By C. E. LOTCHO.



The finished coil is both neat and compact.

Constructional details are here given of how to build a low-loss coil using bare wire, both turns and layers being air-spaced.

The coil laid upon its side to show how the turns are spaced. Ebonite strips wedged between layers separate these latter in such a way that both turns and layers are air-spaced.

MANY wireless enthusiasts are always on the lookout for schemes whereby they may improve their reception, more particularly in the matter of range and selectivity. Different circuits are always being tried out with a view to attaining this end, but it does not appear to be realised generally what an important bearing tuning coils have upon the efficiency of any circuit. Experiments have shown, however, that reception may vary from poor to very good, according to the efficiency of the coils employed, and it was this fact which led to the production of the coil illustrated. The constructional details with respect to the spacing of the turns are much the same as those obtaining in the Morecroft coil.

Arrangement of Turns

In making this coil the main point to receive consideration was the reduction of the more usual losses, whilst retaining reasonable compactness. Ease of construction was also observed, and the detailed instruction given will be found adequate for even the beginner to follow.

It will be seen that a multi-layer form of winding has been adopted, this being enforced by consideration of space. Serious capacity effects have been eliminated, however, by the ample spacing provided between the separate layers, and also by staggering the layers in such a manner that the turns in alternate layers do not come opposite one another. This point is made clearer in a later paragraph.

Fig. 1.—This is the first step in the construction of the coil. Adhere carefully to the measurements given.

Each turn is also well spaced by air from its neighbour in every layer, thus making possible the use of bare wire, and a consequent reduction in the capacity of the coil. Actually a fairly heavy gauge of bare tinned copper wire has been used with a view to overcoming to some extent H.F. losses, which might otherwise be present in a smaller gauge.

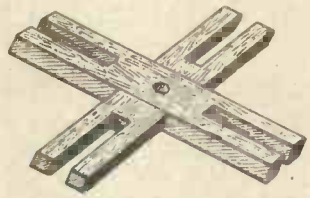


Fig. 2.—A completed cross made from two pieces of wood similar to that shown in Fig. 1.

Admittedly a few points could be mentioned which do not make for absolute perfection; this fact must be borne in mind.

Constructing the Former

Some conception of the appearance of the finished former may be gathered from the photographs. The construction is shown in Figs. 1, 2, and 3. Two wooden crosses are required, the construction of each being identical. For each cross two pieces of wood are needed, cut as shown in Fig. 1. This figure gives all the necessary measurements. It was found advisable to cut the slots first, a small rip-saw making this work quite easy; the trench was then made with the aid of a tenon-saw and chisel. If care is exercised in the latter, it will be found that strong crosses may be made as illustrated in Fig. 2. If you are not expert in woodworking, however, rigidity is easily obtained in the final assembly of the former.

Completing the Former

Fig. 3 illustrates the "hub" which controls the distance between the two crosses. In the present case each layer of the coil consists of five turns of wire spaced $\frac{1}{8}$ in. apart, for which conditions a hub $\frac{13}{16}$ in. wide, as shown, was chosen, there being seven layers in all. The same figure makes clear the method of securing together the cross-pieces and hub, a threaded brass rod passing through the centre of each and having a nut screwed down tightly at each end.

Spacing Strips

We now come to the construction of the ebonite strips which serve to space both the layers and the separate turns in each layer. These, when finished, should be as shown in Fig. 4, and although it is improbable that any difficulty would be experienced in their construction, a description of the method adopted by the author may be of use. Since the coil in this case is one of 35 turns (you will have gathered this from the foregoing), and each layer consists of five turns, a total of seven layers was wound, necessitating 28 strips (four for each layer). A piece of ebonite was therefore purchased, something over 8 in. long by 1½ in. wide by $\frac{3}{16}$ in. thick. This was marked off in lines ¼ in. apart and parallel with the ends, while five more lines were drawn from end to end ⅛ in. apart as in Fig. 4, the centre line being ¾ in. from either side.

This done, a tenon-saw was brought into service and the necessary 28 strips cut off. This, of course, left on one side of each strip five lines which were to serve as guides when sawing the little grooves for spacing the turns of the coil. Care should be taken to saw these accurately, as otherwise poor spacing may result.

The Winding Process

When the foregoing has been carried out we are ready to commence the actual winding, No. 18 gauge tinned copper being employed for this purpose. Less than half a pound of wire is required, but it is worth while to purchase a half-pound reel, since the surplus can always be put to other uses.

Method Employed

The method of winding is for the most part fairly obvious. To commence, place in each opposite pair of slots a spacing strip with its grooves on the upper side. The wire is secured at the commencement by threading through a small hole drilled in one of the spacing strips next to the first groove cut in it, or by any other convenient method. Now wind the five turns of the first layer over the four strips, using the grooves to space the turns. It is desirable to keep a certain amount of tension on the wire throughout the process of winding.

Points to Note

Two important points should be observed after winding the first layer. Four more strips must be inserted over the turns already wound, in such positions that the turns of the second layer come above the spaces between the wires in the first layer. The other point is that, after completing the fifth turn, the sixth turn

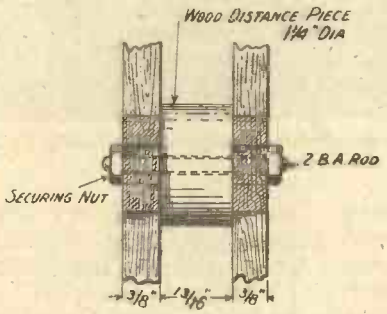


Fig. 3.—The cross-pieces and hub are secured together in a very simple manner.

(*i.e.*, the first of the second layer) should be wound on the side from which the winding was started: that is, the sixth turn comes nearly above the first, seventh above second, etc.

The coil may be completed in this manner, bearing in mind the two points stressed above. It will be found that the wires which join first and second, and second and third layers, etc., touch neighbouring turns, but this may be ignored until the whole winding is completed; the judicious use of a penknife or

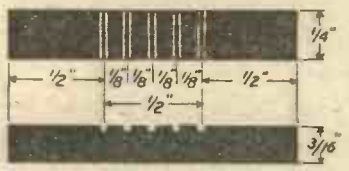


Fig. 4.—Details of the ebonite spacing strips.

similar article will then enable these crossing wires to be separated with no fear of their subsequent relapse again.

Some Results

The results obtained with the coil undoubtedly justify its construction. Using it as an aerial coil in a crystal set, with a variable condenser of .0005 μF in parallel, unusual signal strength was obtained from the nearest broadcasting station, and during a special test faint but quite distinct instrumental music and singing was heard from another broadcasting station on the same set.

The coil was also employed in the aerial circuit of a single-valve set (detector with reaction), and a general increase in efficiency was observed, especially as regards range.

Final Remarks

Several modifications may occur to the reader, such as the introduction of more turns of wire per layer and *vice versa*. In any case, it should not be taken for granted that a 35-turn coil as described is suitable for your aerial, even though a No. 35 plug-in coil has been found correct, for the coil described has a greater inductance than the usual multi-layer plug-in coil having a similar number of turns.

Unsuitable Fluxes

NOT every compound which renders soldering easy is suitable for wireless work. This fact was brought home recently to the writer by his set suddenly failing to give its usual results.

Nothing had come adrift and no change of any kind had been made in the circuit. The whole trouble was eventually traced to corrosion at the soldered joints. The flux used had certainly made soldering as simple in the first instance as rolling off the proverbial log, but it had failed to stand the test of time. When a few of the joints which showed the worst signs of corrosion were re-made the set worked as well as ever.

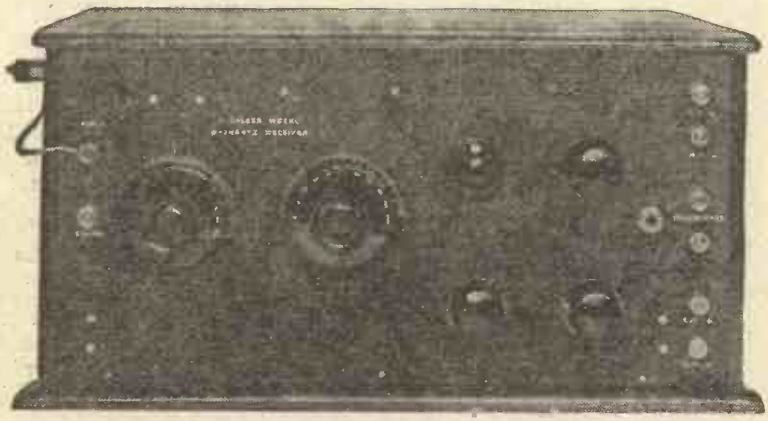
Before you select a soldering flux it is always as well to make sure that it is not of the kind which contains acid, and has a strong reaction upon metals. This you can easily do by purchasing from any chemist a book of blue litmus paper. If when immersed in the flux the paper immediately turns red you may feel sure that acid is present, and that if you use it trouble will follow sooner or later.

R. W. H.

A Cabinet Sho for Wavelength 210

By PERCY W. HARRIS

Ease of handling, high efficienc usual hand capacity effects are interestin

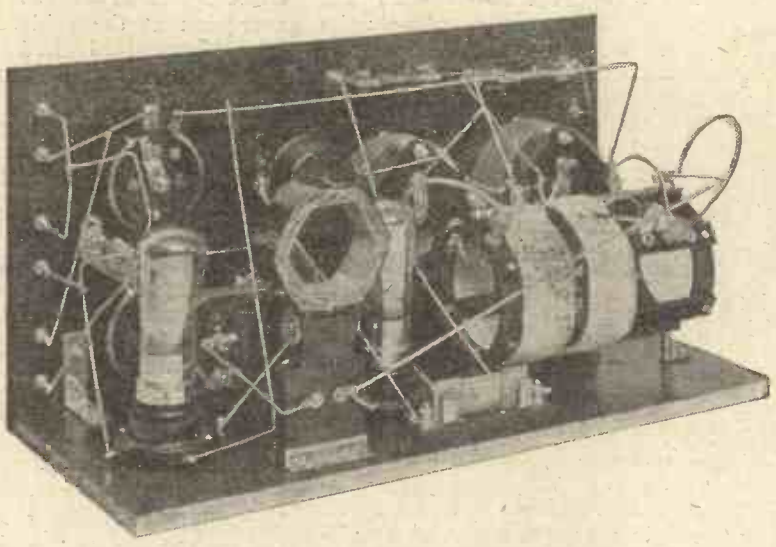


The valves of the receiver are enclosed, accessibility being given by the hinged lid.

THE receiver I am about to describe is designed primarily for the amateur transmitter who must keep an efficient, simple and easily-handled instrument for every-day use in conjunction with his transmitting experiments. The requirements of such a receiver are somewhat different from those of an instrument to be used for reception purposes in the ordinary way, or rather, more correctly expressed, such a receiver must have several features over and above those which are commonly required.

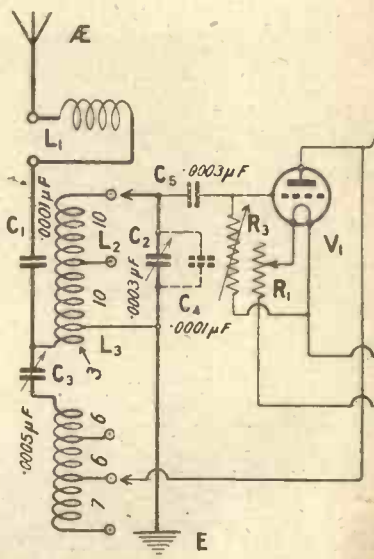
Transmitter's Requirements

The requirements of the amateur transmitter in regard to his receiver are, over and above those obviously required in a good receiver, the following :— (1) Ability to find a desired wavelength quickly. (2) Facilities for rapid changes over a band of wavelengths commonly used by amateur transmitters—150 to 200 metres, 80 to 100 metres and from 40 metres upwards. (3) Perfect control of self-oscillation, so that reception of C.W. by the authorised method with a minimum of radiation can be effected. (4) An on- and off-switch which will not impose undue strain upon the valve filaments (the amount of on-and-off switching in such circumstances is very heavy as the receiver must generally be turned off during every transmission).



The wiring is well spaced, short and easily carried out.

(5) Means of rapidly disconnecting telephones without the need of removing them from the head when it is desired to go across the room to adjust the transmitter. (6) Freedom from hand-capacity effects so that once a station has been found on its



The theoretical c

heterodyne note it is not lost by removing the hands from the dial.

Special Reinartz Tuning

As a matter of fact, very few receivers used by amateur transmitters fulfil all of these conditions, although I can safely claim that the special form of Reinartz receiver to be described fulfils all of them adequately. Its sensitiveness is at least equal to that of the "Low Loss Tuner for Short Waves," which I

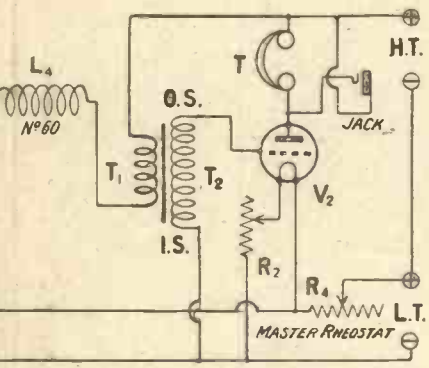
rt-Wave Receiver s between 40 and Metres

, M.I.R.E., Assistant Editor.

y and remarkable freedom from the some of the characteristics of this g instrument.

The handsome and compact arrangement of the receiver may be gathered from this photograph.

described in *Wireless Weekly* for November 19, 1924, and which has proved very popular. Its freedom from hand capacity effects is such that on 150-200 metres band no alteration in beat note is made by removing the hand from the dial, while on the 80 to 100 metres band only a slight alteration of the note is so produced.

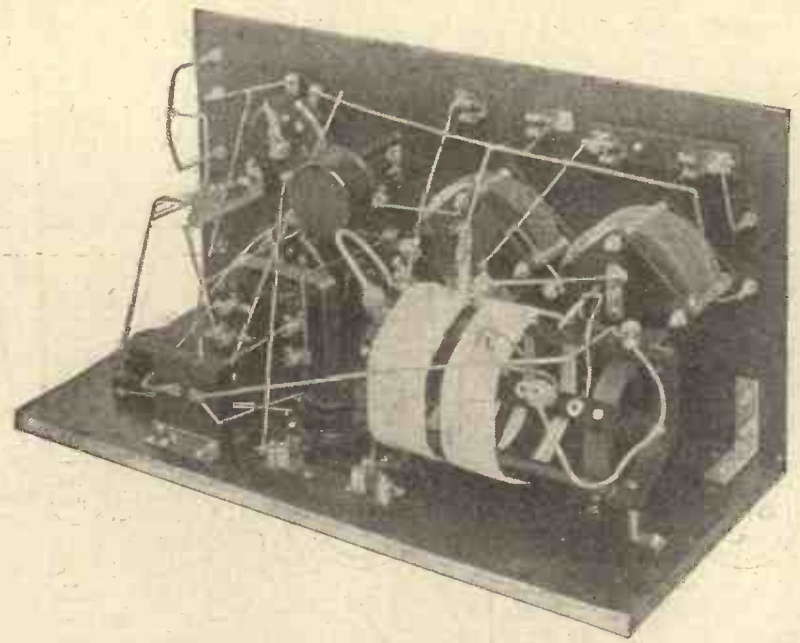


ircuit of the receiver.

The Circuit

The circuit which is shown above is in its main essential the Reinartz. The grid-coil is tapped so that either 20 or 10 turns can be used at will, the windings being made on a low-loss coil former with a minimum of solid dielectric. Three turns only are included in the aerial circuit and the plate coil is tapped so that a varying number of turns can be used at will. The main novelty lies in the aerial circuit, which has a coil L1 and a fixed condenser C1 in series with the three turns just referred to. L1 can be a number 35 or 50 coil of any of the well-known makes. Its purpose is to keep the natural wavelength of aerial circuit well away from the wavelength it is desired to receive, and the use of this coil considerably facilitates the reaction control. It also seems an advantage in practice to reduce the total aerial capacity by a fixed condenser C1 of .0001 μF. Reaction is obtained by the condenser C3 working in conjunction with the plate coil. All values are given in the diagram. It should be noted that the value of the radio-frequency choke is important, and I have found that a No. 60 Lissen coil is as good as anything here. Coils of higher number seem less efficient in this particular short-wave receiver.

The rest of the circuit calls for



This photograph of the wiring of the receiver also shows the coil with its connections. Note the low-loss former.

little comment, there being a single stage of low-frequency amplification following the detector. It is in the actual constructional details that the interest of the instrument lies.

Looking at the front of the panel you will see two condensers, being respectively reaction on the left and grid tuning on the right, the knob of the variable grid-leak and three filament resistance knobs. The two lower filament resistance knobs are for the detector and the low-frequency valves respectively, whilst the top knob is of a filament resistance in the positive lead which acts as a gradual on-and-off switch. It is bad practice to be constantly turning the filaments on and off, and such practice imposes undue strain upon them. If, however, the filaments are gradually lit and gradually turned off the life of the valves will be increased considerably. This is provided for by the use of the master rheostat which lights up the valve filaments or extinguishes them quite gradually compared with the ordinary snap switch. A telephone jack is also seen, and the usual H.T. and L.T. terminals. Connected across the telephone jack is a pair of terminals; thus, if a friend desires to listen in, it is only necessary to connect an extra pair of telephones to these terminals. The operator himself will always use the plug and jack method, which enables him to disconnect the telephones from the set very rapidly without the need of removing the telephones from his head. The disadvantage of taking the telephones from the ears is that once you have become accustomed to them you will hear sounds more easily. If you are continually removing and putting them back again, the nice fit and the accompanying sensitiveness will be lost.

Absence of Hand Capacity Effects

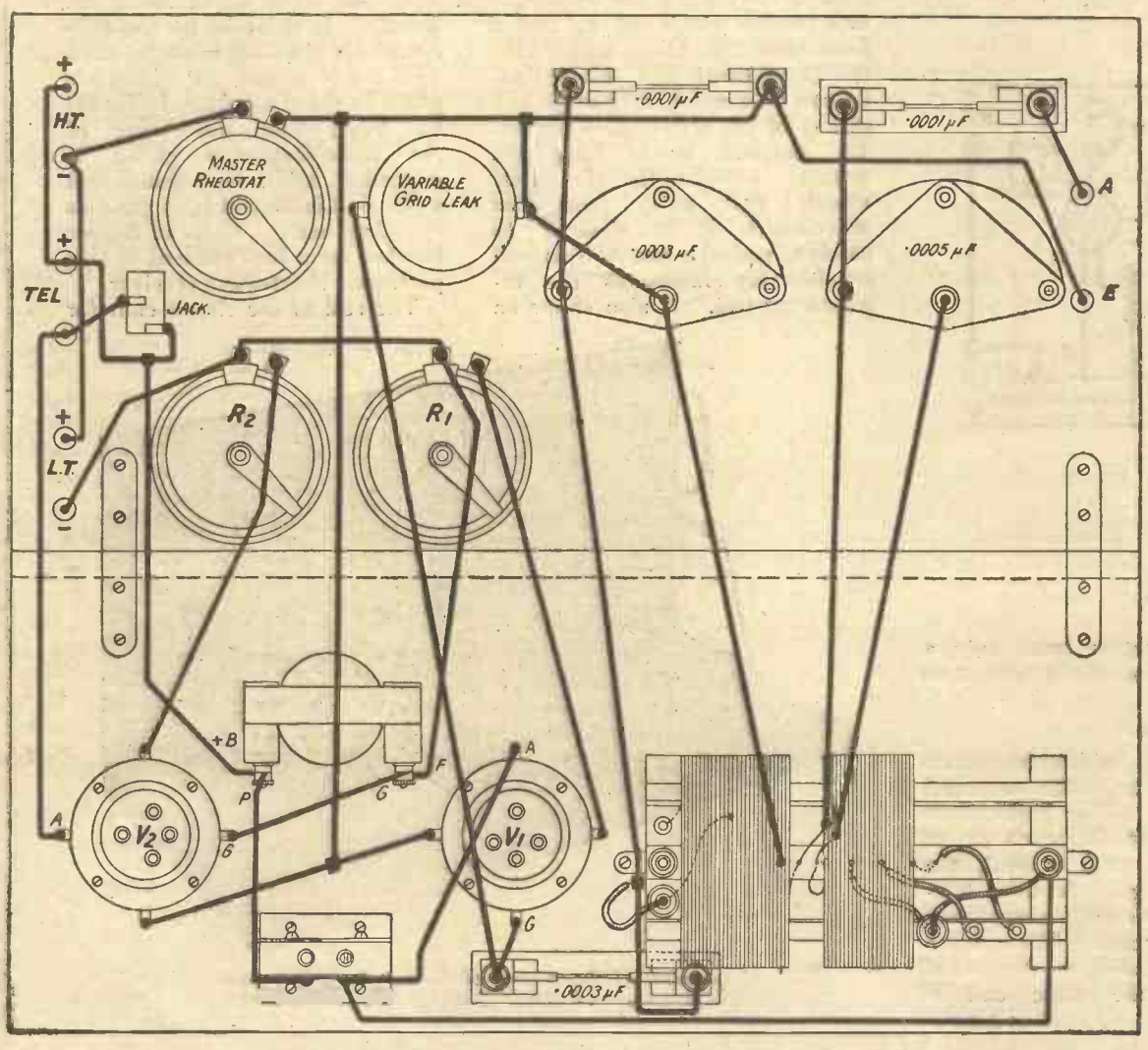
The relative absence of hand capacity effects is accounted for by the fact that the earth wiring is carried along the back of the panel in such a way as to act as a screen. The components are also arranged carefully with a view to efficiency.

Components Required

One "All-Concert" cabinet, inside measurements being 16 × 8 × 7 in.

One ebonite panel, 16 × 8 × ¼ in. A guaranteed ebonite should be used here.

Eight terminals.



A practical wiring diagram of the receiver. Blueprint No. 103b.

One square law variable condenser, .0005 μF.

One square law variable condenser, .0003 μF. (The variable condensers must be of good quality in this set and relatively few makes are of good enough quality to use here. Those shown are of Bowyer - Lowe manufacture).

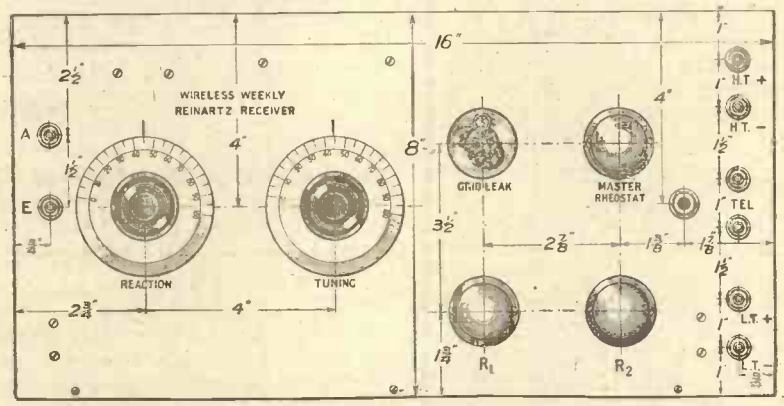
No. 16 square-sectioned tinned copper wire for wiring up.

A few short lengths of flexible rubber covered wire.

Two brackets for holding the ebonite panel to baseboard.

A baseboard of suitable dimensions.

Set of Radio Press panel transfers.



The layout of the panel showing dimensions. Blueprint No. 103a.

Three filament resistances for bright or dull emitters. Those illustrated are of the Burndept Dual type.

One variable grid-leak. This is one of the few cases where a variable grid-leak is distinctly preferable to the fixed kind. That shown is the new pattern Igranic.

One telephone jack.

One plug.

Two fixed condensers, clip in type with clips, .0001 μF each. (McMichael.)

One fixed condenser, clip in type with clips, .0003 μF. (McMichael.)

Two valve sockets. Those shown are Burndept Antiphonic.

Two coil sockets for board mounting. One of those shown (outside) is a Success by Beard & Fitch and the other (inside) is a Magnum. It is essential that the external socket should be mounted in a strip of ebonite with two terminals.

One low-loss coil former (Bowyer-Lowe).

One good quality low-frequency intervalve transformer. You have a wide choice of make here. That illustrated is a Royal.

Five Clix sockets.

Two Clix plugs.

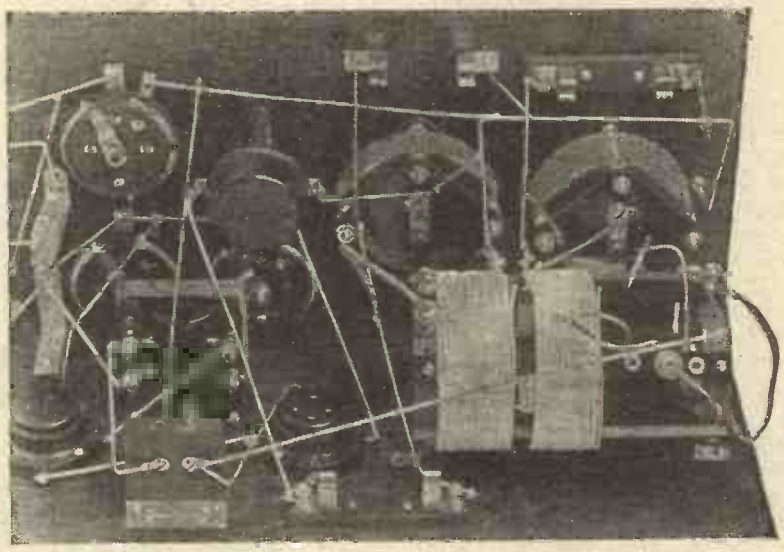
No. 18 d.c.c. wire for the coil.

Construction

The actual constructional work will be obvious from the drawings, and I suggest that you begin with the low-loss coil. In winding this, remember that both the grid-coil and the plate-coil are wound in the same direction, although they are separated from each other. Commence by drilling holes and fitting the Clix sockets, as shown. Two are fitted on one end ring, suitably spaced, and the other three on one of the horizontal strips at suitable distances from the opposite end.

The Clix Connections

The photograph will make this quite clear. Secure the beginning of the grid-coil to one of the Clix sockets on the end ring, and wind on ten turns of the No. 18 d.c.c. wire with turns tapped. At the tenth turn bare the wire for a small space, secure a tapping to it, and take this tapping to the other Clix socket on the end ring. Carry on with your winding until the 20th turn, solder a short length of wire to this and carry on with three more turns, securing the end of the wire by passing it through two holes in one of the horizontal strips and leaving this end for subsequent connection. Now, at about half an inch from the first coil, start winding the plate coil in the same direction, securing the end by passing through a couple of holes in one of the horizontal strips. Wind on six turns, take a tapping, carry on for another six, take a second tapping, and conclude the coil after winding another seven turns. There are thus nineteen turns on this coil. The three tappings are secured to the three Clix sockets on the horizontal strip.



This photograph shows the well-spaced wiring and connections to the Clix.

Wiring Up

In wiring up you will see how connections are made by examining the drawings. Two terminals

are fitted to the low-loss coil former, and the one at the grid end of the windings is not used. The other terminal at the opposite end of the former is used for securing the wire which comes from the plate socket of the detector valve, and also for holding one end of the flexible lead which terminates in a Clix socket for plugging into one of the sockets for the plate coil.

The Variable Condenser

You will notice that provision is made for placing a small fixed condenser in parallel with the .0003 μF variable condenser used for tuning the grid coil. The purpose of this is for increasing the maximum up to .0004 μF when it is desired to receive wavelengths round about the 200 metre mark. Without this condenser and using the whole grid coil the maximum is about 190 metres. With the .0001 μF fixed condenser in parallel the wavelength is brought up to 215 metres maximum. The advantage of using this fixed condenser in parallel is that for shorter waves we have only .0003 μF variable condenser to manipulate, which facilitates tuning, and furthermore we get the advantage of the low minimum of the .0003 μF variable condenser. If a .0004 μF condenser or a .0005 μF were used, then tuning would not be so easy, as we should not get so low a minimum value. Using half the coil the maximum is about 102 metres, while the minimum is in the neighbourhood of 40 metres or so. KDKA on its 68 metres wavelength, will be found about half way round the dial, using half of the coil. The best reaction coil value will be found by trial, and depends to some extent upon the valves used. Personally, I am very fond of the .06 type of dull emitter on short-wave reception with telephones, and can recommend any of the well-known makes in the set shown. With such valves it will generally be found that 12 turns of reaction coil will be about right, while for the longer wavelengths it may be advisable to use all of the coil. About 36 or 40 volts high-tension suits these valves in the circumstances, and when the correct value has been found it will be indicated by the fact that the reaction control is so very smooth that you can scarcely tell when the set passes into oscillation.

Use of Set

To use the set the aerial wire is taken to one terminal of the fixed coil socket mounted on the outside of the instrument, the other terminal of which is taken to the upper front terminal, as shown. Plug in a 35, 50 or 75 coil (the value is not critical) and connect the earth to the lower left hand terminal. A .0001 μF fixed condenser should be placed in series with the aerial by inserting it in the clips provided. The reaction condenser should be set at zero and Clix plugged into the correct socket for the wavelength range required. It will be found that turning the reaction condenser will gradually bring the set into oscillation. If it is desired to search for C.W. stations over a particular band of wavelengths, it will be found easy to make the set just oscillate and then to do the whole searching on the right-hand tuning condenser. As indicated above, the set will be found to be perfectly free from hand capacities effects. The fixed condenser across the tuning condenser should be used only when it is desired to receive wavelengths above 150 metres or so.

Test Report

I have been using this receiver for some weeks now in conjunction with my own transmitting set, and the ease of tuning makes it possible for me to find at once whether anybody is answering my test call. It is a great convenience to be able to pull out the telephone plug when I adjust the transmitter, and the use of the master rheostat enables me to turn the whole set on and off without placing undue strain on the valves. The control of oscillation is very simple, and enables short-wave telephony to be listened to with ease and without oscillation. A short extension handle can be fitted if desired to facilitate tuning on the very short waves, but I do not recommend the use of a single-plate vernier on these short wavelengths, as there are comparatively few makes really satisfactory, and the best are rather noisy. The extension handle is a far more satisfactory way of tackling the problem.

French and American amateurs have been heard on wavelengths below KDKA, and the usual run of American transmitters on the 70-80 metres band come in extraordinarily well, even quite early in the evening. On several occasions short-wave transmissions from French and Italian amateurs have been so loud as to be audible five feet from the telephones.

The Radio Society of Great Britain

An Informal Meeting of the Society will be held at the Institute of Electrical Engineers at 6 p.m. to-day, when Mr. P. R. Coursey will open a discussion.

The studio at the Breslau Broadcasting Station. Note the microphone on the left.

Australian Amateur Call-Signs

With the popularity of short-wave work and the successful reception of Australian amateurs in this country, we have pleasure in giving below the call-signs of the principal Australian experimental stations, together with their addresses. This list is copyright by Radio Press, Ltd.

New South Wales

2AJ Short, W., Queenscliff Road, Manly.
2AL Cooper, A. E. C., "Edale," Cecil Street, Ashfield.
2AR Hudson, W. H., 1, Terrace Road, Dulwich Hill.
2AS Grigg, H. E., 370, Military Road, Mosman.
2AT Swinburne, E. C. R., 39, Parkview Road, Manly.
2AY Curston, J. C., "Maruna," Burwood Road, Burwood.
2BB Crocker, E. B., 14, Roseby Street, Marrickville.
2BC Huril, N. J., "Strathcona," Northcote Avenue, Killara.
2BF Forsythe, L. E., Sailor Bay Road, Northbridge.
2BK Leverrier, F. N., "Lorette," Wentworth Road, Vaucluse.
2BM Vears, E. T., "Pipitea," Cross Street, Leaura.
2BV Waverley Amateur Radio Club, 42, Evans Street, Waverley.
2BY Arnold, E C., Carthage Street, Tamworth.
2CA Bonwill, E. W., Cowra.
2CH Henry, C. H., Bridge Street, Uralla.
2CI Charlesworth, R. H., 173, Parramatta Road, Haberfield.
2CL Caletti, G., 114, Baptist Street, Redfern.
2CJ Sewell, P. L., 12, Dillon Street, Paddington.
2CM Maclurean, C. D., "Namunula," Agnes Street, Strathfield.
2CR Todd, L. V. G., Dennison Street, West Tamworth.
2CS Swain, L. T., 49, Everton Street, Hamilton.
2CW Beer, J., 42, Thomas Street, Ashfield.
2CX Stowe, H. A., "Rawane," Royal Street, Chatswood.
2CY Parker, P. S., 12, Weldon Street, Burwood.
2CZ Exton, G. W., Lismore.
2DE Renshaw, R. P., "Waimea," Lord Street, Roseville.
2DH Mawson, E. R., "Daisydale," Wonga Street, Campsie.
2DJ David Jones, Ltd., 22, York Street, Sydney.
2DK Whitburn, R. P., 7, Hatheon Street, Leichhardt.
2DN Blachard, G. E. H., 60, Bligh Street, Newton.
2DS Davis. R. R., Fisher Avenue, Vaucluse.
2EC Gorman, C. A., 31, "Segenhee," Arncliffe.
2ED Gregory, H. R., "Gerrobbar," Walton Crescent, Abbotsford.
2EM Moore, E. J. T., 6, Lower Wycombe Road, Neutral Bay.
2FA Colville, S. V., 10, Rowe Street, Sydney.
2FB Bishop, F. E., 7, Ellamang Avenue, Kirribilli.
2FF Western Suburbs Radio Association, 77, Park Road, Auburn.
2FP Baker, E. J., 62, Estell Street, Marysville.
2FS Smith, A. C., 38, Cheltenham Road, Croydon.
2GC Challenger, G. R., 77, Park Road, Auburn.
2GF Chilton, G. F., Radio Station Enclosure.
2GM Cutts, G. M., "Carwell," Highbury Street, Croydon.
2GP Mackay, C. S., Urunga.
2GQ Barlow, E., Faulkner Street, Armidale.
2GR Marks, J. S., Ritz Flats, Salisbury Road, Rose Bay.
2GU Dunn, R., 324, Anzac Parade, South Kensington.
2HB Botton, H. W., 350, George Street, Sydney.
2HF Thompson, F., 12, Pearson Street, East Balmain.
2HH Wireless Institute, N.S.W. Division, 82, Pitt Street, Sydney.
2HM Marshall, H. A., Allington Street, Armidale.
2HS Fagan, R. J., Sunny Bridge, Mandurama.
2HY Bongers, G. S., "Marmora," Rawsonn Street, Rockdale.
2IJ Gray, A. H., Florence Street, Killara.
2IJ Payne, J., 143, Avoca Street, Randwick.
2JC Fraser, H., Roderick Street, Tamworth.
2JI Wilson, W. A., Archbold Street, Roseville.
2JM Marsden, R. C., Victoria Road, Edgecliffe.
2JS Stanley, J. M., Northcote Street, Crow's Nest.
2JT Luckman, C., 14, Queen Street, Croydon.
2KC Fry, R. H., Brighton Street, Croydon.
2LF Ginger, L. V., 93, Middle Head Road, Mosman.
2LQ Schultz, L. N., "Waraba," Burns Bay Road, Lane Cove.
2LR Lismore and District Radio Club (R. Atkinson), 12, Park Street, Ashfield.
2LY Shaw, R. H., 129, Grafton Street, Woollahra.
2MA Amalgamated Wireless, Ltd., 97, Clarence Street, Sydney.
2MB Amalgamated Wireless, Ltd., 97, Clarence Street, Sydney.
2MC Amalgamated Wireless, Ltd., 97, Clarence Street, Sydney.
2MD Amalgamated Wireless, Ltd., 97, Clarence Street, Sydney.
2MJ Newman, W. H., Cooney Road, Artarmon.
2MR Stewart, J. E., Carrick Street, Mayfield, Newcastle.
2MU Nangle, J., Nupper Street, Marrickville.
2OI Whitaker, A. T., 31, Railway Crescent, Banksia.
2QV Williams, E. A., Crown Street, Wollongong.
2RA Vickery, K. J., Kilbridge Street, Hurlstone Park.
2SO Newcastle Radio Club, 25, Winship Street, Hamilton.
2RY Volkman, Reg., Post Office, South Grafton.
2SP Evans, R., "Carth Craig," 6, Flood Street, Clovelly.
2SS Wright, A. E., Main Street, Scarborough.
2SX Slade, H. C., "Rockleigh," Lang Street, Croydon.
2ST Tatham, S. E., "Kulmura," 72, Thrupp Street, Neutral Bay.
2TS Gill, A. W., "Illaroo," Greengate, Killgaar.
2UI Illawarra Radio Club, 75, Montgomerie Street, Kogarah.
2UR Creamer, A. H., 10, Hereford Street, Glebe Point.
2UU Roberts, R. G., 9, Church Street, Ashfield.
2UW Sandel, O., Mooramie Avenue, Kensington.
2VM Derrick, V. M., 3, Birriga Road, Bellevue Hill, Woollahra.
2VX McIntyre, D. G., Livingstone Avenue, Pymbie.
2WU Morley, W. H., Rangers Avenue, Watersleigh.
2WV Burgin Electric Co., 352, Kent Street, Sydney.
2XA James, H. K., 12, Rosemount Avenue, Summer Hill.
2XI Craig, W. A., 11, Rockleigh Street, Croydon.
2XX Mingay, O. F., Kuring-gai, Chase Road, Turramurra.
2YA Haynes, B. L., Sumarez Station, Armidale.
2YB Croydon Radio Station (Cutto), Land Street, Croydon.
2YC Crawford, C. T., 18, Lindsay Street, Burwood.
2YE Manly and District Radio Club (Swinburne), Wentworth Street, Manly.
2YF Clarke, F. P., "Winona," Lauderdale Avenue, Manly.
2YG Allsop, R. C., "Moondah," Bent Street, Lindfield.
2YH Hannan, W. E., 449, Darling Street, Balmain.
2YI Nolan, P. S., 152, Bellevue Road, Double Bay.
2YJ Sainsbury, R. E., "Kermanshah," Sainsbury Road, Concord West.
2YK Olson, N. P., 18, Hunter Street, Newcastle.
2YL Lendrum, A., 220, Doncaster Avenue, Kensington.
2YM Scott, J. L., 80, Hunter Street, Sydney.
2YN Thomas, C. P., 71, Nelson Street, Annandale.

2YP Bergin, M. W., "Keera," West Maitland.
2ZA Keagh, W. G., 24, Harrow Street, Stanford.
2ZB Balmain District Radio Club, 29A, Ballast Road, Balmain.
2ZD Brain, S. F., 85, Bland Street, Ashfield.
2Z Lavington, E., Bennet Street, Bondi.
2ZE Laker, F. J., Harfleur Street, Deniliquin.
2ZH New Systems Telephones Co., 280, Castlereagh Street, Sydney.
2ZI Dixon, R. H., c/o C.S.R. Co., Condong Tweed River.
2ZK Marsh, S., Carrington Street, West Wallsend.
2ZL Deane, P. M., Clarence Street, Burwood.
2ZN Cottrell, J. W. M., 23, Dolphin Street, Randwick.
2ZR Perdriau, W. J., East Esplanade, Manly.
2ZT Bean, L. P., 86, Muston Street, Mosman.
2ZU Gilmour, N. G., 156, Kurraba Road, Neutral Bay.
2ZV Universal Electric Co., 19, Royal Arcade, Sydney.
2ZW Huggins, D. R., 13, Yeo Street, Neutral Bay.
2ZX Olsen, N. P., "Normanhurst," Macquarie Street, Waratah.
2ZY Sidey, R. L., Highfield Street, Lindfield.
2ZZ Smith, C. P., 83, Cabramatta Road, Cremona.
2ZFJ Newton District Radio Club (Celetti), 83, King Street, Newton.
2ZGT McIntosh, R., Burns Bay Road, Lane Cove.

Victoria

3AB Weatherson, W. A., 23, Melby Street, E. St. Kilda.
3AG Gurr, A. F., 224, McKillop Street, Geelong East.
3AM Dohrmann, G. S., 2, Hopetoun Avenue, Canterbury.
3AP Morris, R. D., 6, Bealiba Road, Caulfield.
3AU Milligan, S. H., 117, Autumn Street, Geelong.
3AY Jenvy, W. W., 12, Lord Street, East Caulfield.
3BC Brighton Radio Club (R. P. Whalley), Wilson Hall, Brighton.
3BD Cox, E. H., 5, Gibson Street, Elsternwick.
3BG Osborne, L., Terang.
3BH Whitelaw, C. R., Mooroolbark.
3BK Cumming, W. H., 50, Kooyong Road, Armadale.
3BL Fitchett, J. C., Salisbury Street, Balwyn.
3BM Love, H. K., "Lindum," Ferncroft Avenue, East Malvern
3BP Hood, J. H., 6, Alexandra Street, East St. Kilda.
3BQ Howden, W., Hill Street, Box Hill.
3BU Conelly, D. A., "Larnokk," Balaclava Road, East St. Kilda.
3BV Holst, H., 27, Bambra Road, Caulfield.
3CA Dorward, W. H., 44, Orlando Street, Hampden.
3CB Sievers, W. F., 30, Leaney Street, East Richmond.
3CC University of Melbourne, Melbourne.
3CD Corbett Derham & Co., Pty., Ltd. (R. Hall), 573, Lonsdale Street.
3CH Clarke, F. W., 165, Cardigna Street, Carlton.
3CP Philpott, C. H., 16, Glenleith Avenue, Geelong.
3DB Hobart-Duff, 27, Westgarth Street, East Malvern.
3DD Osborne, L. F., "Louisville," Darling Road, East Malvern.
3DF Short, F. D., 2, Mozart Street, East St. Kilda.
3DL Fells, L. C., North Road, Caulfield.
3DM Cambers & Co. (N. Culliver), 57, Simpson Street, East Melbourne.
3DV Beattie, H. S., 1, Bishop Street, Box Hill.
3DX Van Cooth, J. R., Wattletree Road, East Malvern.
3EC Y.M.C.A. Amateur Wireless Society, Cr. Short and High Street, Bendigo.
3EL Boyd, N. J., 100, Orrong Road, Elsternwick.
3EM Doudney, H., Holy Trinity Vicarage, 7, Dickens Street, Balaclava.
3EN Leonard, A. B., Drouin.
3EP Givens, J., 19, Logan Street, Canterbury.
3ER Rivers, E. R., St. Kinnord Street, Essendon.
3FA Abrahams, —, c/o Mrs. Solomons, Murphy Street, St. Yarra.
3FH Hall, F., Glindabourn Avenue, Toorak.
3FM Decrespyny, R. C., 26, Black Street, Middle Brighton.
3GB Glover, M. A., 24, Victoria Road, Camberwell.
3GH Hale, W. M., "Ben Nevis," Harvey Street, Essendon.
3GI Creswell, Commander F. G., 2, Balmoral Avenue, East Kew.
3HE Kruger, F., Camp Street, Carlton.
3HH Maughan, F. H., 15, Staniland Avenue, Malvern.
3HQ Good, E. J., "Rock Grove," Private Mail, Glenrowan.
3H Miles, G. T., Highfield Road, East Camberwell.
3JD Dane, J. E., Toorak, Hawthorn.
3JH Holland, F. H., "Cotswold," St. Kinnord Street, Essendon.
3JP Mitchell, Kean Street, Caulfield.
3JR Dunstan, W. J., 7, Cameron Street, Ballarat East.
3JU Hull, R. A., 38, Charnwood Road, St. Kilda.
3JZ Whalley, R. P., "Enmore," Bridge Street, Sandringham.
3KF Harkin, D. J., 68, Hardiman Street, Kensington.
3LM Malvern District Branch Wireless Institute (E. J. Masters), 18, Sutherland Road, Armadale.
3LQ Downey, W. E., Hopkins House, Hopkins River, Warnambool.
3LS Busch, R. T., Wordsworth Street, Moonee Ponds.
3MA Amalgamated Wireless Ltd., 422, Little Collins Street, Melbourne.
3MC Amalgamated Wireless Ltd., 422, Little Collins Street, Melbourne.
3ME Amalgamated Wireless, Ltd., in the vicinity of Melbourne.
3MP Hosken, S. V., Melville Street, Geelong West.
3NN Brown, H. R., Yanac.
3NS Norris & Skelley, 211, Elizabeth Street, Melbourne
3OK Conry, W. H., 32, Irving Avenue, Armadale.
3PJ Smyth, B. L., 10, Keera Street, Geelong West.
3PO Roberts, A. H., 103, Bent Street, Northcote.
3QW Muir, 10, Young Street, Brighton.
3RF Cordingly, C. H., 77, Bank Street, E. Ascot Vale.
3RG Homberg, S. G., Waverley Road, East Malvern.
3RY Wilson, W. A., 4, Webster Street, Ballarat.
3SJ Mitchell, S. J., 5, Brandon Street, Brighton.
3SK Short, O., 10, Redan Street, St. Kilda.
3SL Southwell, L. W., c/o Mrs. Neal, High Street, Seymour.
3SM Gay, A. H., Warragul.
3SW Gadsden, S. W., 5, Miller Grove, Kew.
3TK Kinsella, T. W., Mayo Park, Lubeck.
3TM Buck, A. H., 750, Glenhuntly Road, Glen Huntly.
3TU Leckie, R. C., Banfield Street, Sandringham.
3UL Dalton, R. M., San Mateo Avenue, Mildura.
3UX Steane, G. W., Earle Street, Mont Albert.
3UY Oliver, J. Nilsen, 90, Tyrie Street, Geelong.
3VR Abbot, R. N., "Fleur-de-lis," St. Elmo Avenue, Alphington.
3VS Philpott, O. J., 26, Lumeah Road, Caulfield.
3WT Tressider, W. L., 13, Nettle Street, Bendigo.
3XC Xavier College (Rev. Baker), Kew.
3XF Chaffer, M., 41, Norwood Crescent, Moonee Ponds.
3YA Geelong Wireless Club, Guild Hall, Myers Street, Geelong.
3XN Leaney, W. G., 12, Henry Street, Northcote.
3YW Edgar, J. M., 12, Henry Street, East Geelong.
3YY Bush, A. M., 54, Brougham Street, Bendigo.
3YZ McKeown, A., 534, Yarra Street, Alphington.
3ZA Bardin, W. F., 226, Station Street, North Carlton.
3ZC Brock, H. E. E., 8, Ngarveno Street, Moonee Ponds.
3ZD Taylor, C. F., 133, High Street, Kew.
3ZE McGregor, K. W. A., 23, Molesworth Street, Armadale.
3ZI Barbour, K. H., 1, Irving Avenue, Armadale.
3ZJ Lempriere, C. L., Terrara Road, Vermont.
3ZK Bradley, P. R., Beach Crescent, Sandringham.
3ZL New System Wireless, 25-27, Queen's Bridge Street, South Melbourne.
3ZM Owen C., 22, Kendall Street, South St. Kilda.
3ZN Israel, M. S., 53, Blessington Street, St. Kilda.
3ZO Johnson, E. H., 105, Moorabool Street, Geelong.
3ZP George, H. A., 195, Ballarat Street, Footscray.
3ZQ Ballarat Radio Club (J. Mathews), Y.M.C.A., Ballarat.
3ZR Smaith, S. L., 1, Byron Street, Footscray.
3ZS McMahon, G., Edinburgh Street, Diamond Creek.
No. 2430, Kells, A. C. E., 366, Ascot Vale Road, Moonee Ponds.

Queensland

4AC Walters, L., Rankin Street, Innisfail.
4AE Wireless Institute (Queensland Division), Edward Street, Brisbane.

4AK Milner, J., "Beswich," Kelvin Grove, Brisbane.
4AN Gibson, E. McL., Kirkland Avenue, Greenslopes, Brisbane.
4AU Finney, M., Arthur Terrace, Red Hill, Brisbane.
4BI Junction Park Radio Club, "Carlisle," Long Street, Fairfield.
4BO Odgers, N. F., Anne Street, Charters Towers.
4BW Cooper, A., jun., Byrne Street, Mareeba.
4CC Isles, C. W., Charlton Street, Ascot, Brisbane.
4CG Stephens, A. N., Railway Parade, Clayfield, Brisbane.
4CH Dillon, A. E., Brown Street, New Farm.
4CK Norris, E. L., Hume Street, Toowoomba.
4CM McDowall, V., Preston House, Queen's Street, Brisbane.
4CS Geraghty, J. A., St. Joseph's College, Nudgee.
4CV Husband, N. C., Aland Street, Charters Towers.
4EG Gold, E. E., Lindsay Street, Toowoomba.
4EH Miller, H., "Broadway," Kitchener's Road, Ascot.
4EI State Engineer (J. W. Sutton), G.P.O., Brisbane.
4EZ Queensland Institute of Radio Engineers, Bowen Terrace, New Farm.
4FA Wright, W. H. H., Hume Street, North Toowoomba.
4FE Y.M.C.A. (A. L. Hinds), Edward Street, Brisbane.
4FJ Price, J. C., Bardin Estate, Paddington Heights.
4FK Mathews, F. T., 57, Ann Street, New Farm.
4GC Maryborough Wireless Club (T. T. McCoy), Richmond Street, Maryborough.
4GE Fortescue, C., Arthur Street, Toowoomba.
No. 1217, Hobler, H. L., Lennox Street, Rockhampton.

South Australia

5AC Cook, J. R. P., 37, John's Road, Prospect.
5AD Snoswell, A. R., Harris Street, Exeter.
5AE Honnor, J. H., Alpha Road, Prospect.
5AH Williamson, F. L., 25, Dequetteville Terrace, Kent Town.
5AI Lloyd, H. B., 16, Trinity Street, College Town.
5AQ Brother Joseph, Sacred Heart College, Glenelg.
5AV Wireless Institute (S.A. Division), 20, Grange Road, Hindmarsh.
5BF Miller, F. G., Murray Bridge.
5BG Kauper, H. A., 20, Gourney Street, Dulwich.
5BN Bald Motor and Elec. Works (E. A. Cooper), 31, Pulteney Street, Adelaide.
5BP Caldwell, W. A., 53, Hughes Street, Unley North.
5BQ Jones, L. C., Carlisle Road, Westbourne Park.
5CN Sagar, E. N., Railway Terrace, Largs Bay.
5DA Buckerfield, S. R., 4, Regent Street, Park Side.
5DN Jones, L. C., 146, Rundle Street, Adelaide.
5DO St. Peter's College Radio Club (F. B. Oldfield), Adelaide.
5FT Fitzmaurice, J. S., St. Andrew's Street, North Walkerville.
5GB Bailey, G., Commercial Street, Mount Gambier.
5HR Rhodes, N., 12, Goyden Street, Kadina.
5RB Bedford, R., Cottage Hospital, Kyancutta.

Western Australia

6AB Cecil, C., 75, Duggan Street, Kalgoorlie.
6AC Spark, J., 23, Mount Street, Perth.
6AF Sibly, A., Third Avenue, Inglewood.
6AK University of Western Australia, Perth.
6AM Kennedy, P., 210, Walcott Street, Mount Lawley.
6AQ Mathews, V. J., Beachboro' Road, Bayswater.
6BB Park, J. C. W., 29, Suburban Road, South Perth.
6BG Technical School (W. G. Hayman), Perth.
6BH Burrows, F. H., 9, John Street, Claremont.
6BP Stotts' Business College, 81, George's Terrace, Perth.
6BR Wireless Institute (W. A. Division), Central Fire Station, Perth.
6CJ Darley, E. J., Darley Street, South Perth.
6DA Saw, F. W., Cr. Bedfordale and Benbury Roads, Armadale.
6DY Thomas, H., 26, Third Avenue, Inglewood.
6WP Phipps, W. R., 97, Rupert Street, Subiaco.

Tasmania

7AA Watkins, W. T., 146, Warwich Street, Hobart.
7AB Smith, A. C., "Beulah," 21, High Street, Launceston.
7AK Deegan, S. E., St. Virgil's College, Hobart.
7AL Scanlan, W. L., 37, Hill Street, West Hobart.
7AQ McCabe, W. B., Clarence Point, West Tamar.
7AR Johnson, C. F., 33, Hill Street, West Hobart.
7BE Stipek, J., St. Helens' Hotel, St. Helens.
7BN Wills & Co., Pty., Ltd. (A. Smith), 65, George Street, Launceston.
7BX Preston, T. A. C., Railway Row, Queenstown.
7FP Philbin, F. T., Box 29, Queenstown (Orr Street).
7OM O'May, R. D., Elourea Esplanade, Bellerive.

THE 2LO ORCHESTRA

Our photograph shows the well-known orchestra which is attached to the London station and which so often contributes to the S.B. programmes. The chimes which old listeners will associate with the time signals in the early days of broadcasting may be seen in the background. The "peep hole" for the engineer in the control room may be also seen.

Reception Conditions Week by Week

By W. K. ALFORD.

Review of reception for week ending March 1.

Our photograph shows Mr. W. R. Emery (6QZ) delivering a lecture recently before the members of the Hounslow and District Wireless Society.

THE extremely unsettled conditions existing in the meteorological direction during the last seven days are fully reflected in the conditions affecting Radio. Extreme instability of reception from one day to another has been experienced, marked by a display of "X's" of very remarkable intensity for this time of the year. They have taken the form of sharp, clear-cut cracks in a background of silence in the majority of cases, and have made reception particularly difficult and trying.

On one or two evenings the "mush" trouble was particularly present, and on Thursday (February 26) was of sufficient intensity even to affect the reception of 2LO at 35 miles.

KDKA

The most consistent long-distance station during the week was, as usual, KDKA, on his 68-metres transmission. It is particularly interesting to notice that this station can very often be received at good strength on one or two valves on his short wave, and yet his simultaneous transmission on 353 metres is totally inaudible. This is, of course, further testimony to the extraordinary behaviour of these short waves, although how far we can look ahead to greater achievements in the way of long-distance transmission and reception by the use of even shorter waves is somewhat put out of focus by the latest discovery by John Reinartz and other American experimenters that waves of less than 30 metres will not travel in the dark!

This discovery is backed up by the fact that Reinartz communicated, in broad daylight, with a station right on the other side of the American continent, and kept it up, till, as the report put it—"darkness killed communication."

Amateur Investigation

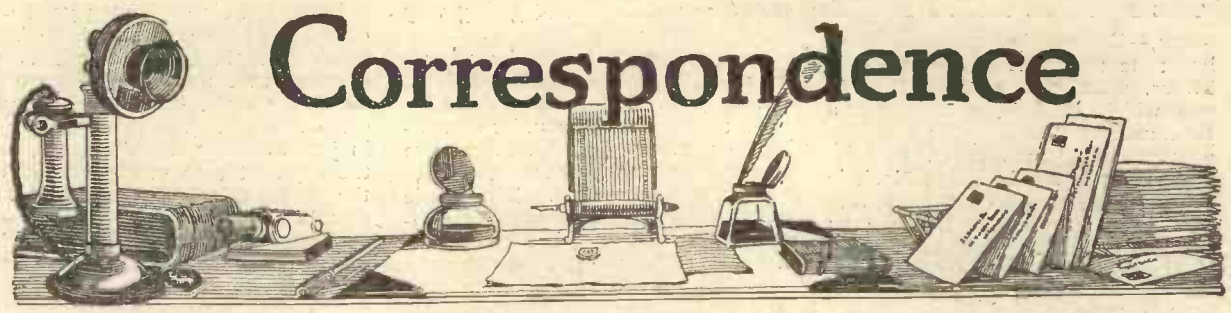
This fact has provided much speculative thought for amateurs and professionals alike, and it is interesting to note that once again amateur investigation is laying the way for commercial enterprise in exploiting what is a very new development in the wireless science. Last week I made reference to the phenomenon of "fading," and indicated how the ordinary individual could interest himself in the subject. I now propose to endeavour to explain, or rather put forward some views, of the phenomena which brings about this curious effect of "fading."

At the commencement it is useful to remember that "wireless" signalling is really a sort of "heliograph" or light signalling, and that "wireless" waves undergo the same reflections, refractions, and absorptions, as light waves, only to different extents. Now the great "mirror" for wireless waves is known as the "Heaviside" layer, and is thought to surround the earth at a height of about thirty miles. This layer is quite impervious to wireless waves, and when waves from the earth strike it they are completely reflected just as a ray of light is reflected by a mirror.

The "Heaviside" Layer

Now, if the surface of the "Heaviside" layer is irregular, and constantly changing its height from the earth, reflected waves from its surface will not all strike the earth at the same point, and will periodically add and subtract from the energy which is being received as a direct ray, *i.e.*, a ray which goes directly from the transmitting to the receiving station without being reflected at the "Heaviside" layer. The result may be a continuous swaying of the signals in a perfectly periodic way, the time period being perhaps a function of the wavelength used, and the distance apart of the stations.

It must be realised that the whole matter is based on the wonderful hypothesis laid down by Professor Heaviside, and our knowledge is based only on "proof by experiment" of what happens to observed wireless signals at observed distances, and, as has been stated previously, our knowledge in this direction will, undoubtedly, be greatly augmented when the phenomena connected with the new ultra-short-wave transmissions have been fully investigated.



THE OMNI RECEIVER

SIR,—I am glad to inform you that I have been using the Omni receiver since September of last year, and that I am fully satisfied with the results obtained on same.

Besides your various circuits, I have made up the coils for the Reinartz "All-Wave Tuner," described in *Wireless Weekly* last year, and with his circuit I am able to pick up many amateurs on the lower wavelengths, and with a larger coil for the broadcast band. I get almost all of the English and German stations regularly (several on the loud-speaker) with two valves. I also receive Brussels and Petit Parisien regularly, the latter on an indoor aerial.

I have also tried the "Neutral-grid method," described in *Wireless Weekly* by Mr. Cowper, and with this coupling I have obtained the best results with three valves, though this circuit is a little difficult to tune. I now intend to try same with aperiodic aerial tuning.

Wishing *Wireless Weekly, Modern Wireless* and *The Wireless Constructor* every success.—Yours faithfully,

H. WAHLGREN.

Appelviken, Stockholm, Sweden.

PANEL TRANSFERS

SIR,—I thought you might be interested in the following improved method of applying Radio Press panel transfers on wireless panels which does away with the hot-pad business. Place the transfer on panel and moisten the back with methylated spirits, press down with thumb and then apply cold water to remove paper by slowly drawing this away, leaving the transfer on panel intact.

I found that the above method takes about a third of the time occupied by adhering to the printed instructions.—Yours faithfully,

Chester. GEORGE J. PULLEN.

AN IMPROVED TWO-VALVE RECEIVER

SIR,—May I warmly congratulate Mr. Rattee on an excellent set, "An Improved Two-Valve Receiver" in the January issue of *Modern Wireless*? My experience of set making up to the time of building this two-valver has consisted of crystal sets. I built the said two-valver and the first night logged the following stations: All the B.B.C. main stations, four relays, Radio Paris, Radio Iberica, Hamburg and four other stations which, by the language, I judged to be German. Elated with the success, I stayed up and tuned in four American stations, WGY loud and clear enough to write down every item, WOR, WBZ and KYW. The last-named three loud and clear at intervals. I also received music from two other foreign stations. One call sign I missed and the other sounded like WPT or WPG. I have been unable to trace this last station, so perhaps I have not got the correct letters. I am more than satisfied with the set, and consider it an instrument worthy of the book that contains it.

Once again accept my congratulations, thanks and best wishes for your success and that of your valuable journals.—Yours faithfully,

Liverpool. A. E. SIMM.

ENVELOPE No. 2

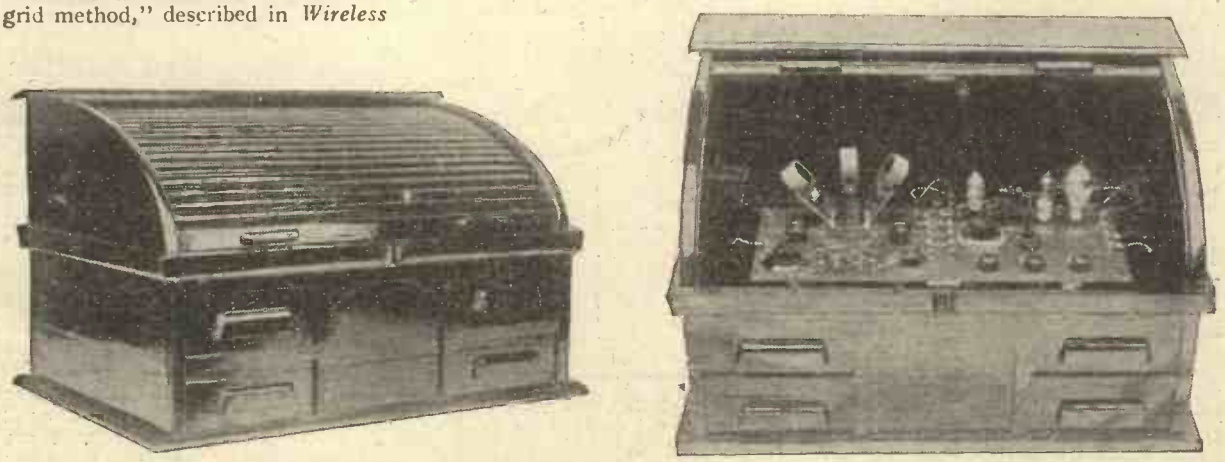
SIR,—I have constructed a four-valve set from the instructions in the Radio Press Envelope No. 2, by Percy W. Harris.

My aerial is 140 ft., two wires 20 ft. above the ground and 300 yards from a power station and 50 yards from and running parallel to the overhead high-tension cables which carry A.C.

I put the valves in for the first time (having never worked a set before) on the evening of February 2, and within half a minute was listening to Johannesburg quite plainly. I also picked up Cape Town, which is eight to nine hundred miles away, and received the concert beautifully.—Yours faithfully,

O. J. HAMMERICH.

Durban, South Africa.



Our photograph shows a Three-valve Loose-coupled Neutrodyne Receiver made by Mr. N. Behar.

THE FOREIGN RADIO TIMES

SIR,—Congratulations on your latest feature, *The Foreign Radio Times*, which fills a long-felt want and which, I hope, will remain a permanent feature of your excellent journal, *Wireless Weekly*.

I trust you will be able to include "Madrid" programmes, as this appears to be a station that is very familiar with English listeners.—Yours faithfully,

J. W. WYER.

West Ham,
London, E.15.

SIR,—*The Foreign Radio Times* is one of the best things you have included in *Wireless Weekly*, but I regret to note that Radio-Belgique (Brussels) is not included. That station works a loud-speaker on H.F., Det. and 1L.F. on the "Four-Valve Family Receiver" better than any British station in this district. Also they appear to have English vocalists occasionally and popular English songs.—Yours faithfully,

J. B. WARD.

Dewsbury, Yorks.

SIR,—I note you are publishing in *Wireless Weekly* a supplement, *The Foreign Radio Times*, which I have now seen. Such a feature should fill a great want amongst thousands of listeners in this country, and also be a great help to those endeavouring to identify some of the Continental stations. I don't know whether it is possible for you to publish programmes for Radio-Belgique, Hilversum and Radio-Iberica, which seem to come through very well.—Yours faithfully,

F. RHODES.

Oldham.

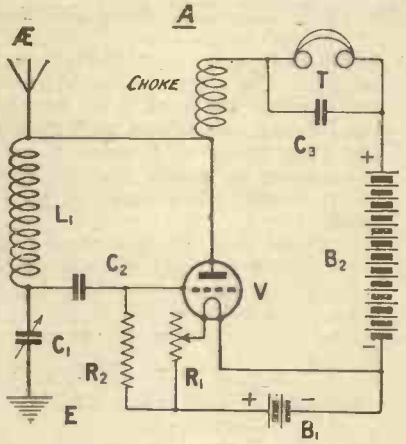
[The selection of programmes which we publish in our Supplement, *The Foreign Radio Times*, is largely dependent upon the opinions of our readers as to which are the most popular stations. Further correspondence on this subject is therefore invited.—ED.]

SOME EXPERIMENTS WITH AN ULTRAUDION RECEIVER

SIR,—I was extremely interested in the article which appeared in the *Wireless Weekly* of January 14, entitled "Some Experiments with an Ultraudion Receiver," by Stanley G. Rattee, because at the time the article appeared I was myself experimenting with some variants of the Ultraudion circuit.

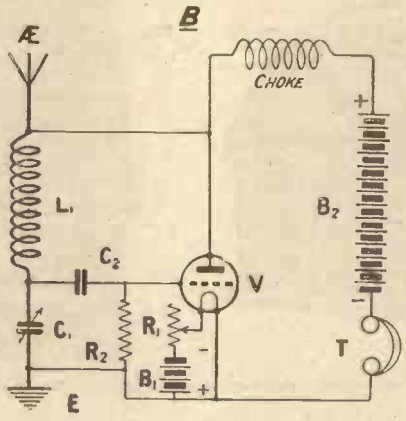
I have pleasure in enclosing herewith diagrams showing the two circuits marked A and B, which I was trying. The circuit marked B I found to be far the best, being very easy to handle and giving very strong signals.

On reading the article I made up my mind to try the circuit described, and as you ask for readers' results I am taking the opportunity of writing to you. At first I almost gave up the circuit as hopeless, so far as my experiments went. The whole solution lay in the constant experimenting to find out the exact size of the coils to get satisfactory



One of the circuits used by Mr. Ross.

results. After many trials I found the coils that best suited my aerial were aerial coil 40-turns, secondary coil 75-turns, and choke coil 400-turns. For instance, in the aerial



Another circuit which has been experimented with by Mr. Ross.

circuit I found that both the 50-turn and the 30-turn coils gave weak signals. It was only when using a coil of 40-turns I found the set gave satisfactory results. I tried a number of coils for the choke, but found the 250-turn coil recommended the most satisfactory, until I plugged in the 400-turn coil, which gave better results.

My own experiments bear out most of what Mr. Rattee wrote in the article. The only variant which I made was, instead of using the choke coil in the position shown, I used a three-coil holder.

I find the circuit a very good one once the above problems have been solved. In fact, the circuit is so selective that until the coils are in about the right position no signals come through. The great danger is in just over-stepping the mark, and the slightest turn of the vernier on the condenser will almost cut out signals altogether.

My aerial is a 100-ft. indoor aerial under the roof, earth, to water pipe, Phillips' valve, H.T. about 40 volts, coils are home-made, spider and honeycomb.

The above remarks refer to the reception of 2LO. I have not yet solved the problem of the proper coils for Chelmsford, as my stock of coils in the larger sizes are at present somewhat limited, and the signals are, up to the present, rather weak.

I should like to take the opportunity of saying how much I appreciate the various constructional articles coming from Mr. Rattee's pen, and I always look eagerly for fresh contributions, as a regular reader of the three papers published by Radio Press. I think the Spring Double Number of *Modern Wireless* is splendid.—Yours faithfully,

CHAS. P. ROSS.

Penge, S.E.20.

A SINGLE-VALVE RECEIVER FOR KDKA

SIR,—I am pleased to inform you that I have constructed the single-valve set for KDKA described by Mr. Stanley G. Rattee in March *Modern Wireless*, exactly per specification, and as a result brought in KDKA of Pittsburg on a 20-ft. indoor aerial. Reaction control was exceedingly good, but perhaps you could explain to me one point: that is, that I find practically the same condenser reading at the above station whatever length of aerial I am using, whether 100-ft. outdoor or the above-named 20-ft. indoor. I may also say that I received the aforementioned station with only a yard and half lead-in wire as an aerial. Perhaps this may interest you. Your comments would oblige me.—Yours faithfully,

BASIL E. RÖNAASEN.

London, E.C.3.

[As aperiodic coupling is employed the size of aerial used will have little effect upon secondary tuning.—S. G. R.]

"WHAT IS LOUD-SPEAKER STRENGTH?"

SIR, — I quite agree with "R. W. H." in the February 18 issue of *Wireless Weekly* on "What is Loud-speaker Strength?" and would suggest the following code be added to his suggestion and used by

Dead Reckoning

TO make a long flight by "dead reckoning," to cross islands and seas without reference to land-marks or other visible guides, and finally to break through the clouds exactly above the intended spot—it is here that the pilot displays his utmost skill.

It is here, too, that he needs to feel complete confidence in the accuracy of his instruments. If he knows that they are designed and chosen with great care, then he can safely entrust his machine and himself to their unfailing performance. If not ——

* * * *

This is only another instance which shows the vital importance of selecting the component parts of a machine with the utmost care.

And it is so with your wireless set.

If you desire good results and freedom from trouble, choose your components—especially your condensers—with great care.

It is certainly worth the small extra outlay to

Specify Dubilier.

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Advt. of the Dubilier Condenser Co., Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

Telephone: Chiswick 2241-2-3.

all readers of your journals when reporting signal strength :—

Code.	Strength.	Speech audible at
L.S.1	Bare L.S.	8 feet.
L.S.2	Weak L.S.	6 yds.
L.S.3	Moderate L.S.	20 yds.
L.S.4	Full L.S.	30 yds.

You will, of course, appreciate I have only suggested the code. The

An underside of Mr. Seigfried's set.

" strength " and " speech audible at " are " R. W. H.'s " suggestions with which, as previously stated, I agree.—Yours faithfully,
Ealing, W.13. HARRY C. COVE.

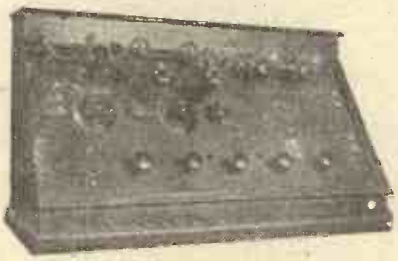
THE TRANSATLANTIC FIVE IN SWITZERLAND

SIR,—I avail myself of this opportunity to tell you how delighted I am with Mr. Percy W. Harris's " Transatlantic V." which I constructed a few weeks ago.

The receiver was completed one Saturday evening about 11.30 p.m., and within a very few minutes I had tuned in several B.B.C. stations. Since then I have tuned in all the main B.B.C. stations, including Belfast, and one or two relay stations, all German main and several relay stations, Radio-Paris, Eiffel Tower, P.T.T., and Petit Parisien, Rome, Madrid, and Lausanne (very seldom received in Zürich), and rather too much of the local station—all on a Brown loud-speaker, large type. Although the Zürich Broadcasting Station is only about three miles away, I can receive all wavelengths up to 420 metres without serious interference and without a wavetrap. I have had over twelve months' experience listening-in to stations of all nationalities, but I can say without the slightest hesitation that the B.B.C. stations are by far the best. Particularly interesting are the concerts given by the " Roosters," as I was a frequent member of their audiences whilst on active service with the 60th Division in Salonica and Palestine.

With regard to components, I used those specified with the exception of a 2 mfd. condenser, which was unobtainable at the time. I find a reaction coil unnecessary even for the longer wavelengths.

Enclosed I am sending you two photographs of the receiver, and in conclusion, express my appreciation of your splendid and unrivalled journals.—Yours faithfully,
WILLIAM MARTIN SEIGFRIED.
Zürich, Switzerland.



The Transatlantic V. made by Mr. Seigfried.

WKAQ

SIR,—The Department of Commerce has assigned us a wavelength of 340.7 metres corresponding to 880 kilocycles.

We hope that you will give the necessary publicity to this change in our wavelength for the benefit of your readers and our listeners in your locality.

WKAQ were heard in Czecho-Slovakia and most of the Western part of Europe while we were using the 360 metres wavelength.

We are broadcasting regular concerts every Tuesday from 9 to 10.30 p.m. from our studio; Wednesday from 8 to 10 p.m. from the Plaza Baldoricty de Castro; and Thursday from 8.30 to 10 p.m. from the restaurant "La Cafetera." The time specified is Porto Rico time, four hours earlier than G.M.T.

Yours faithfully,

J. AGUSTY,
Manager, Radio Corporation of Porto Rico and Announcer of WKAQ.

San Juan, P.R.,
South America.

A READER'S EXPERIENCE

SIR,—I recently found when attempting to use my receiver that I could not get any results.

I thought it meant a thorough overhaul of same, but before doing this I had a thorough examination of my batteries.

I use a safety bulb on my H.T. lead, and found on testing the lead on a small battery that the bulb would not light up. On substituting a new bulb all again worked sweetly.

I am sending my little experience thinking that it might interest your readers. Wishing your three magazines increased popularity and success,—I am, dear sir, yours faithfully,

Tonbridge. GEO. A. SKINNER.

AIDS TO SOLDERING!

SIR,—Yet another Heterodyne Switch (see *Wireless Weekly*, February 25)
Appears with fresh poetic-prosy tongue
And sends you on a "Flagrant Moment" which
Perchance may give amusement to the young.
If 'neath your favouring eye my verse should come
And seem light-hearted reader's proper fare,
I can produce such things "ad libitum."
—Yours faithfully,

JULIAN WERE.

I'm very fond of soldering with iron nice and hot. It really is a simple thing, though some declare it's not. So let me give some sound advice to all who would aspire to make a really lasting splice 'twixt terminals and wire.

In one hand hold the iron and the solder in your teeth; then melt it while your other hand retains the bits beneath: some solder then is sure to fall upon the proper spot; you scrape away the rest—that's all. Quite simple, is it not?

J. W.

ENVELOPE NO. 2

SIR,—In these days of picking up Timbuctoo on a piece of string and no aerial, valves or crystal, I thought perhaps you would like to know what I can do with an indoor aerial and the Family four-valve set. I have built up at different times, thanks to your publications, *Wireless Weekly*, *Modern Wireless* and *The Wireless Constructor*, not forgetting your Radio Press Envelopes, crystal sets, one-valve sets, amplifiers, ST100, three-valve dual, etc., but I think that the Family four-valve is quite the best. On December 5 last I picked up WGY, General Electric Co., Schenectady, N.Y., and listened to a selection of Verdi's works played by an orchestra, also a selection on the organ of Sullivan's "Lost Chord," quite clearly and comfortably, no mush or fading on three valves, 1H.F., Det., 1L.F. at 4.55 a.m. in the morning. The strength was about the same that you would receive London, 2LO, on a crystal set; these results have since been verified by letter com-

SOLUTION OF THE R.C.C. CROSS WORD PUZZLE

PUBLISHED IN "WIRELESS WEEKLY" ON THE 11th FEBRUARY 1925.

A list of successful Competitors is given below together with the names of their Wireless Dealers.

Each successful Competitor has received 3 R.C.C. Units and every Wireless Dealer named below has received a Special Award.

USE

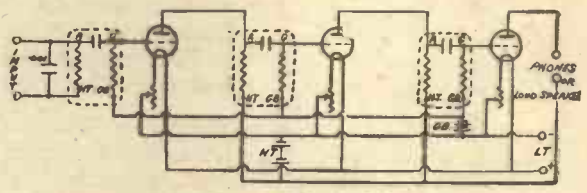
POLAR
RESISTANCE CAPACITY
COUPLING UNIT
PRICE 15/-

UNITS

TRY THEM AND THEREAFTER YOU WILL NEVER HAVE A "CROSS WORD" FOR YOUR WIRELESS SET.

Successful Competitors :	Their Wireless Dealers :
(1) W. H. PRYCE, Esq. The White House, The Hague, Mottram, nr. Manchester.	(1) F. G. RIDE & CO., LTD., 3, Hardman Street, Deansgate, Manchester.
(2) H. J. BATTEN, Esq., 44, Eastbourne Terrace, London, W.2.	(2) HENDERSON & LAWSON, 10, Spring Street, W.2.
(3) B. W. HENDERSON, Esq., 28, Alder Avenue, Widnes, Lancs.	(3) J. W. TOWERS & CO., LTD., Victoria House, Widnes.
(4) E. T. LANCASTER, Esq., M.A. St. Paul's School, W.14.	(4) SANSOM, 4, The Broadway, St. Margarets, London.
(5) S. M. FOWLER, Esq., 7, Russellcroft Road, Welwyn Garden City, Herts.	(5) WELWYN STORES, LTD., Welwyn Garden City, Herts.
(6) H. KIRKBY, Esq., 246, Chorley New Road, Horwich, Lancs.	(6) TURNER & BOOTH, 53, Church Street, Radcliffe, Lancs.
(7) W. S. GRAFF BAKER, Esq., 15, Queen's Road, Ealing, W.5	(7) ARTHUR SCOTT, 31, Haven Green, Ealing, W.5.
(8) R. H. WHITE, Esq., 46, Leamington Gardens, Seven Kings.	(8) MESSRS. BARNETT, 331, Romford Road, E.7.
(9) R. GRIMMER, Esq., 119, Cornwall Road, W.11.	(9) WOODMANCY & SON, Folly Mews, Portobello Road, W.11.
(10) A. W. M. MAWBY, Esq., 7, Cross Deep Gardens, Twickenham, Middlesex.	(10) J. W. CARPENTER & CO., Earl's Court Road, S.W.5.

THE METHOD OF CONNECTING R.C.C. UNITS



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GLASGOW .. .. 125, Hope Street.
NEWCASTLE .. .. 23, Collingwood Street.
LIVERPOOL .. South East Corner, Princes Dock.

BRANCHES :

MANCHESTER .. .. .. 66, Oxford Road.
CARDIFF .. Atlantic House, St. Mary Street.
SOUTHAMPTON .. .. 19, Queen's Terrace.

It will pay you always to watch WIRELESS WEEKLY *Advertisements.*

munication with WGY. When you consider that my accumulator was giving out at the time, I think it was a very good performance indeed. I can also get Radio-Paris, loud-speaker strength; Brussels, Eiffel Tower, Holland, Newcastle, Birmingham, Aberdeen, Glasgow, Bournemouth, Chelmsford, Manchester, etc., practically all of them at loud-speaker strength, Petit Parisien also.

Thanking you for an extremely efficient receiver.—Yours faithfully,

A. E. D.

London, N.

A 3-VALVE LOOSE-COUPLED NEUTRODYNE RECEIVER

SIR,—I have pleasure in enclosing herewith photographs (page 795) of the "Neutrodyne Set," as described by Percy W. Harris in the first issue of *The Wireless Constructor*, which I have recently completed.

You will observe that the panel is mounted into a miniature rolltop desk and is entirely self-contained, the only wires seen externally being the aerial and the earth leads. The "desk" is capable of holding all accessories, such as phones, coils, accumulator and H.T. batteries.

As regards the disposition of components, I have kept strictly to the design, and the components themselves are all of absolutely the very best manufacture.

Although the set has only been in use a week, it might interest your readers to know of the excellent results I have obtained so far. I have received all the B.B.C. stations at various times and most of the principal Continental stations. The local station comes in at good strength on three pairs of phones without aerial or earth. The set is so selective that "Radiola," Paris, can be heard without any interference from 5XX. I have also received dance music from WGY (Schenectady, N.Y.), coming in at times as loud as the Savoy Bands.

Being of Spanish origin, I am very much interested in listening every evening to the transmissions of Radio-Iberica, Madrid. As Madrid is over 700 miles away "as the crow flies," it is interesting to hear the announcer advertising Spanish goods, etc., after every musical item, also to hear the Spanish National Anthem at the end of the programme.

I feel greatly indebted to Mr. Harris for designing such an excellent set and wish *The Wireless Constructor* every success.

Leeds. N. BEHAR.

A SINGLE-VALVE RECEIVER FOR BRIGHT OR DULL EMITTER VALVES

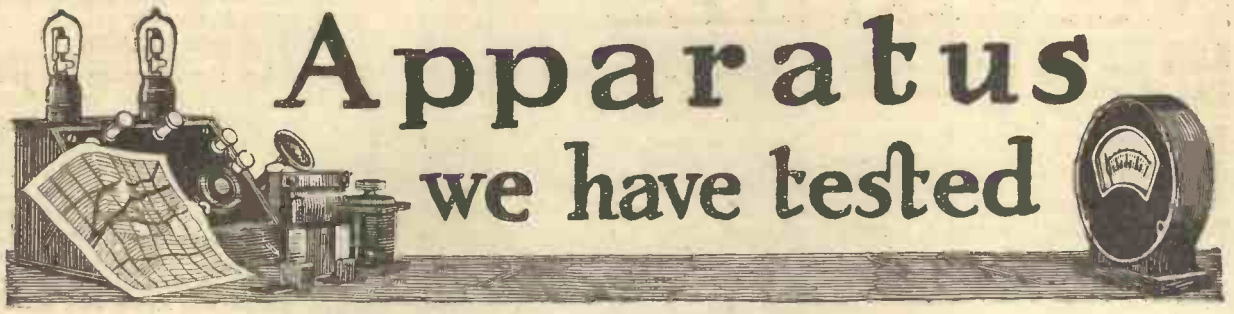
SIR,—I feel I must write and tell you about the "Single Valve Receiver for Bright or Dull Emitter Valves" which I have made from Mr. Stanley G. Rattee's description in *Wireless Weekly*, Vol. 4, No. 24. I should like Mr. Rattee himself to hear the results obtained from this wonderful circuit.

I am sorry to say that using a No. 50 aerial coil with the aerial connected to terminal A, the earth to E, and terminals A1 and E linked, I get poor results, but when I use the series connections with the same coil in the aerial socket I obtain loud-speaker results from the Leeds and Bradford Station, 12 miles distant. In addition, I have received up to the present London, Edinburgh, and Manchester on the 'phones; also three Continental stations, whose call signs I could not identify.

Wishing Mr. Rattee and the *Wireless Weekly* staff every success,—Yours faithfully,

Saltaire, Yorks. H. BONE.

[When using the connection for parallel tuning the use of a smaller aerial coil, say No. 35, will in all probability enable you to obtain good results.—S. G. R.]



Apparatus we have tested

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

Radio Choke

A compact form of radio-choke coil, adapted for mounting directly on the centre terminal of the reaction-condenser, or on the panel itself by means of a No. 2 or No. 4 B.A. bolt passing through a drilled centre bush, in modern types of Reinartz receivers where a radio-choke is interposed between the anode and the telephones or inter-valve transformer primary, has been submitted by Messrs. Fowler & Brigden.

This is in the form of a very narrow slab coil of many turns and of low-effective capacity between ebonite discs just under 2½ in. diameter, with a brass bush in the centre (which forms one terminal connection), and with an ordinary terminal on the periphery for the second connection. On trial, in a Reinartz type of receiver, it proved to have the necessary large inductance, and low-distributed capacity for sensitive reaction-control without the usual difficulty of that shift of wavelength with small alterations of reaction-coupling which makes reception of distant stations so arduous a task. Using a .0001 μF reaction-condenser and a No. 35 or 50 reaction-coil in the Reinartz manner, with fixed magnetic coupling, and for the usual broadcast range, the choke sufficed up to about 1,000 metres wavelength with but the impedance of the telephones in series with it.

For such purposes, for use in certain types of dual circuits, and in general wherever a radio-choke is needed, effective on the short broadcast wavelengths, this compact type can be recommended.

Earth Pipe Connection

We have received from F. Hubbard a form of earthing-clip especially suited for making a permanent low-resistance connection to a water or gas pipe. This is a substantial metal device consisting essentially of a metal strap in two sections, which can be passed round a pipe of up to nearly 1-in. diameter, the two sections being then connected by three tags which pass through slots and are then bent back on themselves. The whole is tightened on the pipe (which should, of course, be thoroughly cleaned from rust, etc., before the operation) by a large nut

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S.T. 100, 12½ x 9¾ x ¼ ...	7/-	Neutrodyne Receiver 12 x 10 x ¼	7/6
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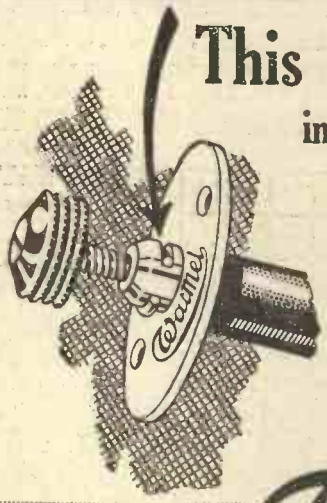

Those experimenters who favour the use of the variable grid leak appreciate how it gives the final touch—clearing reception to make it rich, pure and round in tonal quality. The WATMEL is well known as the first variable grid leak which became available to the home constructor, and its consistent record for reliability to get the best out of the detector valve is without compeer.

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working on a bolt through the solid ends of the clip, and provided with stout, rectangular washers. The connecting wire is apparently to be nipped under this nut. By using either of two sets of slots the clip will accommodate itself to an ordinary size of water (or gas) pipe, or to a small gas-fitting in a room where a water pipe earth is not available.

The fitting appeared to be strongly made and suitable for its purpose.

A "Low-Capacity" Valve-holder

Messrs. Enterprise Manufacturing Co., Ltd., have sent for review samples of the Barrie "low-capacity" valve-holder. This is in the form of an ebonite disc, 1⅛ in. diameter and about ⅜ in. thick, carrying short brass sockets for the valve legs, and radial terminal-screws connecting with the former and provided with soldering tags. Thus the usual casual capacities between the sockets (and back nuts), which are accentuated in the high types of solid ebonite valve-holders, are kept at a lower figure, which is advantageous in certain circuits and particularly in very short-wave work. The fitting is to be mounted on a panel or base-board by a single small central screw. The makers have apparently ignored the very considerable increase in effective capacity between the sockets produced by the presence of this metal screw.

On trial, the insulation-resistance proved excellent; the fitting is well made and neatly finished.

Coil Plugs for Panel Mounting

Compact types of coil plugs for mounting directly on the panel, but with sub-panel connections, have been submitted by Messrs. London Electric Stores, Ltd. In the one type, in which the body stands about ¾ in. above the panel surface, two 4B.A. bolts, supplied with back-nuts for electrical connections at the rear, pass through the panel, and at the same time provide the necessary fixing device. Only two 4B.A. clearance holes are therefore required in the panel.

In the other, flush mounting type, a small ebonite base carries the brass plug and socket, and clearance holes have to be made in the ¼-in. panel for these to come up flush with the outer surface of it. A small central screw, between the other brass parts, is provided for fixing the device. It is evident that this feature will somewhat increase the casual capacity of the mount. Small terminal screws are provided on the side of the lower body for electrical connections.

On test, the insulation resistance proved satisfactory, and the fittings appeared to be well made and finished.

"Alto" L.F. Transformers

From Messrs. W. F. Co., Ltd., we have received samples of their shrouded low-frequency inter-valve transformers for first and second stage respectively. These are small instruments, measuring only 2 in. by 2½ in. and 1⅞ in. over the coil, with an iron core rather on the light side. They are enclosed in a metal casing, the small terminal screws being arranged close together on an insulating strip at the top. These small screws are rather crowded, so that some care has to be taken to avoid a disastrous short circuit between the H.T. primary connection and the secondary earth connection.

On practical trial under favourable conditions, with a small power valve, ample H.T. and proper grid bias, etc., in direct comparison with a number of other types of known performance, the No. 1 gave a really good performance for a small instrument. The build-up, both by actual measurement and by aural observation, fell a little short of that given by large, expensive instruments of moderately high ratio (the ratio of these instruments is not given), and there was the expected loss in the lower frequencies which

is generally observed in a miniature transformer. These, however, were not serious.

The Second Stage Transformer

With the No. 2 instrument in the second stage of a three-valve receiver, using again the most favourable combination of valves, etc., and in comparison with other standard instruments, the No. 2 gave results which were very fair for its size, but there was a marked fall off in the signal-strength compared with a large, high ratio instrument. Presumably this second stage transformer was constructed with a small-step up turns ratio, a practice which does not appear to have much to commend itself, as there was no difficulty with low-frequency oscillation when proper valves and grid bias values were used, and the impedance of modern L.F. valves is generally lower than that of a detector valve. Beyond the same effect of raising the so-called "pitch" of the transmission slightly, by giving less amplification of the lowest frequencies, there was no noticeable distortion with this instrument when used with a bright emitter power valve capable of handling the energy.

The insulation resistance of these instruments was excellent on test, and they appeared to be soundly constructed.

The Radio Instruments Crystal Detector.

Messrs. Radio Instruments, Ltd., have submitted for test several specimens of their new "Permanent Mineral" crystal detector. These are of tubular form, provided with strong terminals at the ends by means of which connection may be made either to the clips provided or to wires taken to other parts of the circuit. A small adjusting knob is provided at one end of the detector, operated by an internal spring. Two right-angle clips are provided, the bases having the corners turned down to prevent rotation when screwed to the panel. Fixing screws and washers are also supplied. A test was made at 4½ miles from 2LO, using a standard P.M.G. aerial; the circuit consisted of a plug-in coil of well-known make, with a parallel tuning condenser. On a Weston Galvanometer, Model 375, a deflection of 13 degrees was obtained at the best setting, signals being loud and clear in the telephones. A slight external pressure upon the adjusting knob resulted in an additional degree of deflection, thus suggesting that a stronger internal spring might be an advantage. We understand that this feature is now being incorporated.

The detector was then raised from the table and banged down several times in order that the stability might be tested. The galvanometer deflection was now 11 degrees, indicating a wonderful improvement in stability over the more common forms of crystal detectors. In comparison with a standard crystal receiver, using catwhisker and galena (many treated forms of which are sold under the familiar termination of "ite"), or a "Perikon" combination, the new detector showed a marked increase both in deflection and sharpness of tuning.

The detector needs noticeably little adjustment, in marked contrast to the more conventional forms; in fact, very little was to be gained by "fiddling" with the knob. We should point out that any adjusting should be carried out by movement of the adjuster in a longitudinal direction; in no case should a rotational adjustment be made, as the minerals may thereby be damaged.

The Savoy Bands from 2LO were audible at 4 ft. from an Ultra Hornless Loud-speaker, and at 10 ft. from a standard O.A.V. model, in a quiet room, a performance not previously equalled in the writer's case.

We can thoroughly recommend this detector to our readers as being a distinct step forward toward the ultimate aim of all listeners—wireless without worry.

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Information Department

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K. E. R. (STOCKPORT) writes to say that he is having much trouble in receiving short waves (70–150 metres), as a result of the swaying of his aerial. He has tried a number of devices for steadying the aerial, but without success, the main difficulty arising from the fact that he is compelled to use a tree to support the further end of the horizontal span. He asks for suggestions regarding possible modifications in either his aerial or receiver.

If our correspondent is strictly limited to the swaying tree for his aerial suspension probably the best expedient to adopt is to so modify his circuit as to remove as far as possible the effect of the capacity of the aerial from the tuned circuit. We suggest that he abandons his present loose-coupled circuit, in which provision is made for tuning both primary and secondary, in favour of one of the arrangements in which the aerial circuit is not separately tuned, and has little effect upon the tuning of the "secondary" circuit. Such a circuit was illustrated in our last issue in the article by Mr. Kendall on measurements in an auto-coupled circuit, and it will be seen that the aerial-earth circuit includes a few turns of the secondary winding. In this circuit the effect of a swaying aerial is considerably reduced, provided that the number of turns in the aerial circuit is kept small, and very good results can be obtained with the minimum of difficulty in operating.

The secondary coil may conveniently be wound in a single layer upon a tube of 2½ in. diameter, and may consist of ten turns of No. 22 d.c.c., with a tapping at the sixth turn so that the secondary circuit may comprise either six turns or the full ten, and another at the third turn to which the aerial is to be connected. The reaction coil should consist of a ten-turn winding of No. 30 d.c.c. upon a 2-in. tube arranged to slide within the other, unless it can be made to rotate within the other upon a spindle, which is much to be preferred on the ground of convenience of adjustment.

A variable condenser of .0005 μF may be used, with a two-plate "vernier" in parallel for fine adjustment purposes.

G. J. F. (RAMSGATE) asks for a four-valve circuit consisting of one high-frequency valve with neutrodyne coupling, detector and two low-frequency stages. He wishes to have switches to use any combination of valves, or the option of using either direct or inductive coupling, and further switching device in which the reaction coil can be coupled to either the reaction, the secondary coil, and the high-frequency transformer. He also stipulates a series-parallel switch in the aerial circuit, and also an earthing switch.

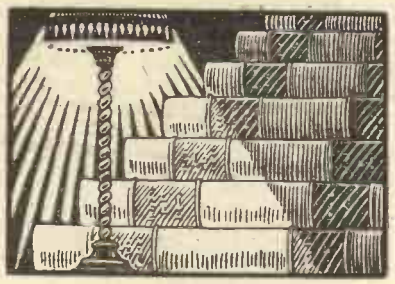
The whole question of the use of switches is a somewhat debatable one, in the sense that it is generally accepted that the use of a large number of switches reduces the overall efficiency of the receiver, yet a moderate number undoubtedly confer sufficient advantage to make the average experimenter prefer to sacrifice a little efficiency. In the present case, however, we think our correspondent is going much too far, and that such a circuit as he requires would be a good example of an excess of switching. It is very difficult to decide where to stop in a case like this, and we should recommend the omission of the switches for cutting out the high-frequency valve and altering the reaction coil arrangements. The reaction arrangement is not, we think, in any case a very practical one; to couple a reaction coil to the high-frequency transformer would almost upset the behaviour of the receiver as a neutrodyne, and would make it extremely difficult to operate. Since our correspondent's requirements seem to be fairly crude, in that he is prepared to modify them very considerably according to our advice, we think that he could not do better than obtain a copy of "Switches in Wireless Circuit" (Radio Press, Ltd., 1s. 8d. post free) in which he will find a variety of circuits in each of which a reasonable number of switches have been inserted, in a manner which leads to the smallest possible loss of efficiency.

T. S. H. (CUPAR) has built a super-heterodyne receiver, in which he has followed an American design, so far as the tuner and oscillator are concerned, but as he was unable to obtain the correct type of H.F. transformer for the intermediate frequency amplifier, he is attempting to use the tuned anode method. He finds it impossible to use more than two stages of amplification, and although he obtains quite promising results with the set, it does not possess the sensitiveness which he expected, and signals are much distorted. The effect, he reports, is much the same as that which is produced by the use of a reaction set finely adjusted to the verge of self-oscillation.

The exclusive use of so sharply-tuned an intervalve coupling as the tuned anode method is considered by most authorities to be unsuitable on the long-wave side of a super-heterodyne receiver, partly because the inherent tendency to self-oscillation is so strong as to render the use of more than two stages extremely difficult, and partly because such an amplifier is too selective to respond sufficiently uniformly over the band of frequencies which a modulated carrier wave covers when converted to a long wavelength.

Better results would probably be obtained by the use of two stages of resistance-capacity coupling in place of one of the tuned anode stages, arranging the amplifier on the T.A.T. principle. A fairly high resistance (*i.e.*, fine wire) coil should then be used for the remaining tuned coupling.

Special transformers with a suitable degree of damping will, no doubt, appear on the British market before long, but at the present time one of the problems in the building of a super-heterodyne lies in the provision of the desired degree of selectivity in the intermediate frequency input coupling and amplifier.



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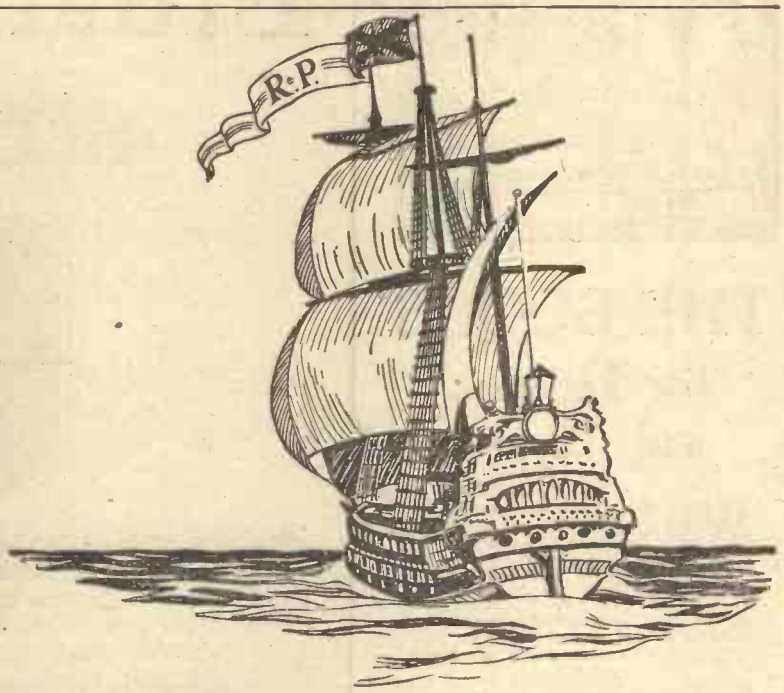

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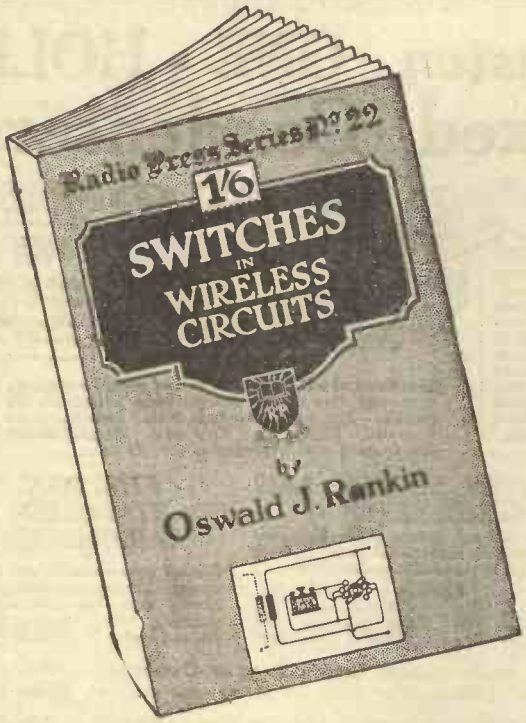

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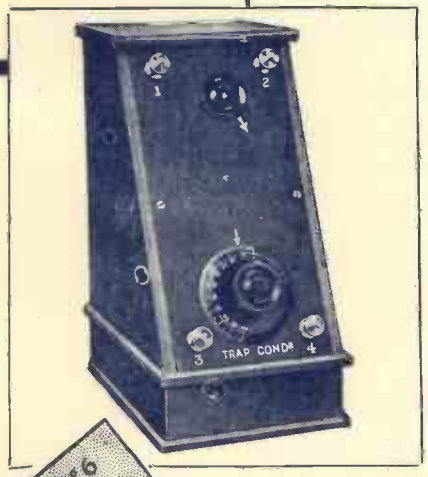

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Wireless Weekly, 6d. Net. Wednesday March 18th, 1925

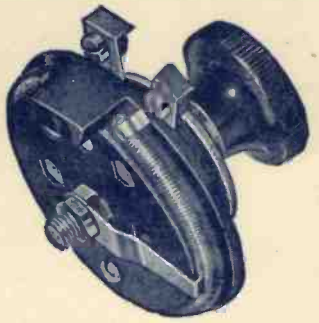
Wireless Weekly

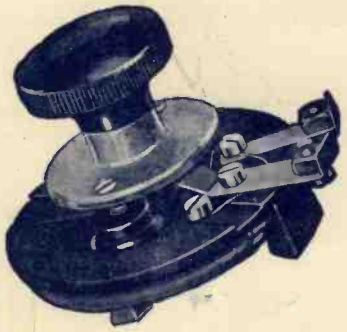
Vol. 5. No. 22.

FORTY METRES AND BELOW

By JOHN L. REINARTZ.
(Inventor of the Reinartz Tuner.)

Really reliable Rheostats—British-made by BURNDEPT





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EDITED BY JOHN SCOTT-TAGGART, F.Inst.P., A.M.I.E.E.

Vol. 5, No. 22 MARCH 18, 1925 Price 6d. net.

Programmes Good and Bad.

NOT long ago we commented in these columns on the appearance of a new type of broadcasting programme—that presented through the British Broadcasting Company's stations by an outside organisation, which is content to foot the bill for the direct or indirect advertising value such a programme can give. A start was made by a well known morning newspaper and the artists chosen were certainly well above the average presented by the B.B.C. in their own programmes. Just recently we have listened to a still better programme, including such internationally famous artists as Tetrazzini and Lamond, the entertainment on this occasion being provided by an enterprising London evening journal. There is no need to comment upon the excellence of this last programme, for it must have been heard by a large percentage of our readers, and the praise ungrudgingly awarded to it by the Press generally was certainly a noteworthy feature.

It will readily be admitted that in the past the British Broadcasting Company has been hampered by the attitude adopted by certain concert agencies who would not allow their artists to broadcast in any circumstances. Yet it is disturbing to find that a newspaper can manage to give a better programme than the Broadcasting Company itself has so far presented. It is not suggested for one moment that it is possible, even with the funds that the B.B.C. has at its disposal, to give nightly programmes of such excellence as that we were treated to on March 10, but surely it should be within the abilities of the B.B.C. to provide such a programme at least occasionally. Unless they do this, the opinion will take root among listeners that if a really first-class programme is required it is necessary to look to some outside organisation to give it.

The B.B.C. is mistaken if it relies too much upon the proportion of letters received from those who like and those who do not like the programmes presented. With the huge army of listeners now making use of the entertainment facilities provided, there is no difficulty in getting praise for any kind of programme, and it must not be forgotten that the different sections of the listening public vary considerably in their inclination to write letters. The average listener, whilst prepared to express his opinions quite freely among his friends, can be persuaded only with the greatest difficulty to put his views on paper. Although the Broadcasting Company have frequently asked for opinions by letter, it is only a great surge of feeling which will impel the average man to write to them.

On the other hand, the cranks, the ardent disciples of various cults, the propagandists, the adherents of strange faiths and the pseudo-superior people who praise anything that is beyond their mental grasp, are all willing to fill the letter-boxes of the B.B.C. at the sightest provocation. A large proportion of those who enjoy, for example, a Wagner concert, would be quite willing to write and say so, while admirers of the Savoy Bands do not all care to admit that they enjoy such music in preference to that of great composers.

A great deal of the criticism we have heard lately centres round the choice of the lectures and talks. In this particular field the B.B.C. should have an almost unhampered choice, yet in far too many cases the speakers are people unknown to listeners, speaking on subjects of very limited interest. Frequently, too, these talks take place at a time when light music would be better enjoyed, and it happens all too frequently that visitors arrive just as the news bulletins, weather forecasts and talks are beginning, and leave before they have finished, thus gaining the impression that broadcasting is, on the whole, a "dry-as-dust" affair, providing little that appeals to the average man or woman.

CONTENTS

Forty Metres and Below

By JOHN L. REINARTZ.

John L. Reinartz, IXAM.

THE amateur is never satisfied long; his receiver, his transmitter or the wavelength is always being changed. This is just as it should be if the wireless art is to advance. Who can say that the amateur is not responsible for some of its progress? And now it seems that the amateur may again be useful while exploring the short waves below 40 metres. A year has passed during which 1XAM has, with the co-operation of the Naval Research Laboratory at Bellevue and a host of amateurs, explored the regions below 40 metres. Great credit is due Dr. Hoyt A. Taylor, Leo. C. Young, H. T. Dalrymple, 8XC, Can. 9AV, Can. 3BP, 4XE, 9AXX, 9EK, 9DFH, 6TS and others whom I may not have mentioned, but who in many ways have helped me to obtain the information which I was seeking, the results of which are very interesting.

The First 50-Metre Tests

Soon after communicating with France on 100 metres, the next thing to do was to see just how far down it was possible to go and still maintain two-way contact. The farthest drop was to 50 metres, with PCII in Holland, who reported the signals during the test as being better than 60, 70, or 100 metres, PCII also being able to drop to 78 metres and still stay in perfect contact with 1XAM. Soon after that PCII got into trouble with the Dutch Government and the tests stopped.

Further Reductions

That not being a satisfactory situation, 1XAM got busy and broadcast the information that short-wave tests would be conducted with any station which would be willing to test. The first station to comply was 8CU (now 8XC), who spent many hours recording test signals on 40 metres. Then word was received that the Naval Research Laboratory at Bellevue, D.C., under the direction of Dr. H. A. Taylor, wished to do some work on waves in the region above 100 metres. Trial tests during the noon hour quickly proved that waves below 100 metres would come through much better than waves above 100 metres. By

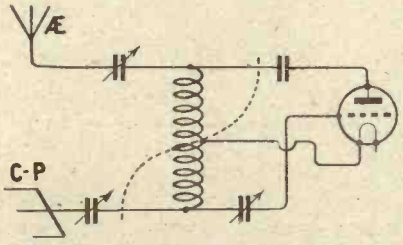


Fig. 1.—The circuit first used in 1923. It gave trouble, due to external high voltage at the valve elements.

March 26, 1924, the Naval Laboratory (NKF) had permanently dropped to 51 metres, while 1XAM had not lifted its head above 44 metres for some weeks, and was even creeping down a few metres daily, reaching 23 metres in one test on March 16, 1924.

Strange Variations

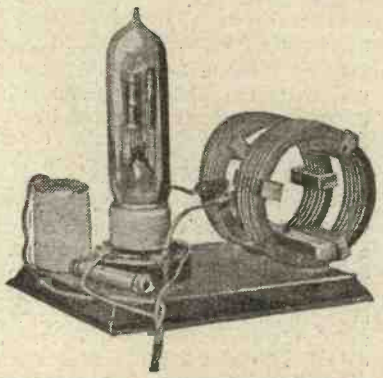
Then began a series of tests lasting through the year, which seemed like a game of tag. One day 1XAM could go to 23 metres and be heard and another day only to 30 or 27 metres. At first cloud formations were blamed for the inability of the shorter wave to get to NKF, but now we know better; the sun is to blame.

Sunlight Effects

The first inkling that the sun was going to make us sit up and take notice was when L. C. Young, the operator at NKF, reported that he could not find 1XAM at night when he attempted to listen while at his home. We decided at once to make a test from noon until night on March 29, 1924. The result was that NKF could be heard for a longer period after the sun had gone down than could 1XAM on 40 metres. This seemed odd and did not look just right, so other daylight to dark tests followed, but with the same result for all.

New Allotments

On top of that, Mr. H. T. Dalrymple, of Akron, Ohio, began to report that he could find 1XAM on the shorter waves around 22 metres during the noon hour tests when NKF said nil, even remarking that perhaps NKF needed a good receiver, and to mix things up still more, 4XE reported that he could hear 1XAM perfectly after dark when NKF could not find a trace of the signals. When 9BRI reported the same results that 4XE did, we began to wonder and to think. By that time it was summer and the Department of Commerce decided to allow the amateur the use of 4 to 5, 20 to 22, 40 to 43 and 75 to 80 metres. Within a few months, thereafter, quite a number of amateurs got busy on the 40-metre band and more information



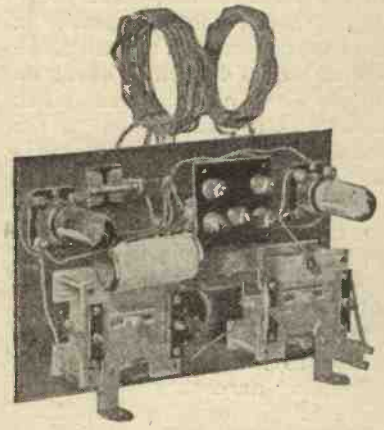
The 20-metre transmitter, including grid and plate inductance, plate choke coil and gridleak.

Mr. Reinartz is as famous for his short-wave experiments as for his remarkable tuner circuits. This article describes a year's work in the fascinating realm of short-wave transmission. The circuits shown, are of course simplified, such details as filament resistances being omitted for clearness.

was gathered, among which was that 1XAM could be heard by stations outside of a 500-mile radius at noon on 21 metres when NKF, 8XC and Dalrymple reported " no sigs." Also that the signals were being copied on the west coast and in Europe nightly from 7 to 8 p.m., EST., on 40 metres during which period 1XAM was sending test signals. To this were added 21 metres from 6 to 7 p.m., EST., from which nothing was heard. Taking all the past test information and piecing it together finally pointed to a solution.

Wave Reflection

Marconi in his work had pointed out that very short waves, less than one metre, could be reflected at will with the proper type of reflector, and at present is doing it on longer waves. This reflection is man-made. In our short-wave tests we were being troubled with reflection also, but it was due to the sun's influence and could be put to a useful service. I told you how the signals on 21 metres could be found at one distance, but not at a shorter distance. It must be that the short waves are at once propagated into our higher atmosphere, and upon reaching a given height are reflected from a layer of our atmosphere back to earth. The radius at which they are initially reflected is that place inside of the circle where the signal is a minus quantity, and outside of which it can be found. The reason for this is the capability of the sun to ionize our atmosphere. The depth to which this ionization is possible depends on the position of the sun with respect to any locality on earth, changing with every position of the sun during 24 hours with respect to a transmitting station located at one place. Also, the shorter the wave the higher its initial reflecting height for the same time of day and, therefore, the greater its initial radius to which it is reflected on earth. As the sun goes west with respect to a transmitting station, the station has to use a longer and longer wave to maintain contact with a given station, say, 300 miles away. This was proved in tests with NKF, in which 1XAM had to move up the wavelength scale as the sun went down. The abruptness at which the shorter wave went out of range tended to show that it was at the same speed at which the sun was going west, only a second or two being the time between strong signals and no signals. Knowing that the very short waves are subject to absorption in a greater degree than are the long waves was then the reason why the short waves did not carry far when travelling over the earth's surface after being reflected from the higher atmosphere. Also it was evident that but little initial power was lost during this sojourn to and from the ionized layer so that by using the proper wavelength it would be possible to transmit to the west coast at noon EST. Acting upon this reasoning,



A rear view of the short-wave receiver. Notice the low-loss condensers.

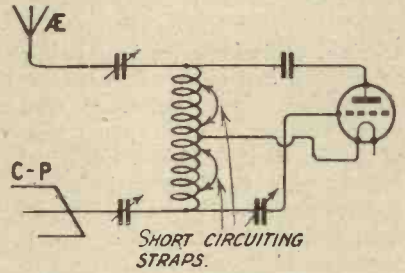
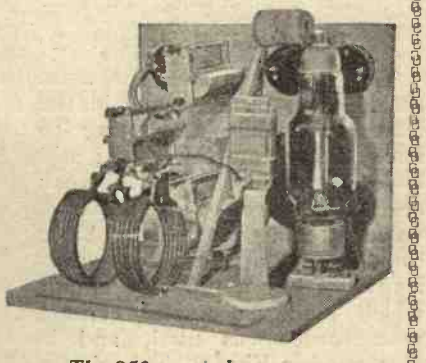


Fig. 2.— Circuit used in the early part of 1924. A splendid circuit



The 250-watt short-wave transmitter.

1XAM began to transmit on 20 metres each Sunday from 8 a.m. until 6 p.m., which bore fruit on December 21, 1924, when reports came from the west coast that three amateurs had copied 1XAM solid on 21 metres, in the meantime working 9EG and 9AXX and finally 6TS and 4XE at noon EST on 21 metres.

Absorption at Short Wave-lengths

Proof that absorption is great on the shorter waves is obtained from tests with 6TS, who cannot hear 1XAM until 7 p.m. EST. on 40 metres and who loses 1XAM on 20 metres at 6.30 p.m. EST. The 40-metre wave just comes near enough to gain sufficient strength to be received while the 20-metre wave is reaching that reflecting height which brings it back to earth at a radius which makes a greater circle than the bounds of the United States, and therefore beyond the west coast, probably reaching Australia soon after. And who can say that we will not be able to use such a proper wavelength and at the proper time of day which will allow contact with Australian amateurs while it is still early afternoon on the east coast of the United States? At present 6TS can copy 1XAM on 40 metres until 9.30 p.m. EST. This time will grow later as summer comes on and the sun reaches a higher point, gradually shortening as next winter approaches.

The Transmitter Circuits

Needless to say, the discoveries of the past year have been worth while, and should give the amateur a future right

to short waves, even if only to try out transmitting circuits.

Practical Difficulties

This brings us to the troubles that had to be overcome in the transmitter while attempting to make it oscillate lower and still lower until now the set will work on four metres with a 204-A valve, it being possible to obtain rated output at even that wavelength. For a time the circuit which made successful contact with Europe was used, and is illustrated in Fig. 1. This circuit worked very well to the 50-metre point with several valves in parallel, and down to 30 metres with single valves. Below that there was considerable trouble with excessive grid voltages and parasitic valve frequencies, which would break the valve insulation down very readily. Even the 204-A valve with its high insulation value was not capable of standing the strain for long periods of transmission; hysteresis losses in the glass supporting the grid mounting would

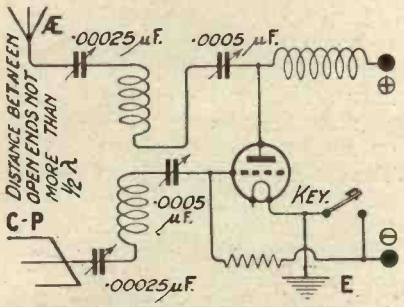


Fig. 3.—Final circuit which met requirements and will oscillate at less than 5 metres.

finally make the glass a conductor and a bad valve was the result. Evidently high voltage high frequency was responsible for that trouble, and in the endeavour to find a remedy it was reasoned that if a method could be found which would reduce the high-frequency voltage at the grid and plate element of the valve and yet allow proper operating conditions to exist, all the trouble would end. Various methods were tried, among which was one which, while not getting rid of the trouble, provided a circuit arrangement which tended to stabilise the frequency at which it was oscillating to the extent that any size or type or other variation in the radiating system had no effect on its operation whatsoever; in fact, transmission through a two-wire cable 50 feet long to an aerial 50 feet from the transmitter was possible, and was actually done for long periods when in contact with NKF.

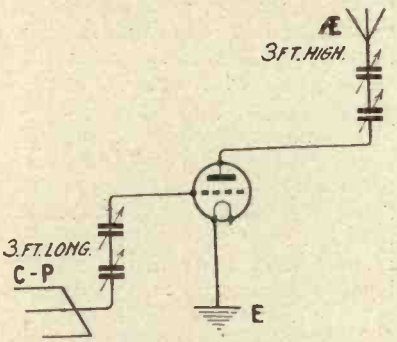


Fig. 3a.—The arrangement as used for less than 15 metres. The dimensions given are for 4 metres.

The frequency never shifted, whether the aerial was connected to one or the other wire in the cable; not even raising and lowering the aerial would cause the frequency to shift. This circuit is shown in Fig. 2. It will be noticed that the inductance to which the valve is connected is shunted in two places with a connection, this connection being equally spaced from the filament connection and shunting the same number of turns each side of the filament. This established full wavelength circuits, independent of the aerial or radiating circuit, and were in effect large tank circuits which, when connected to a radiating circuit which could not withdraw from this tank circuit as much energy as was being supplied to the tank circuit, would never have any effect on the frequency the tank circuit was operating at, nor did the radiation circuit have to be tuned to it.

Improvised Circuit

But this circuit did not get rid of the valve troubles, though it would oscillate at 10 metres. It was evident that any circuit which used an inductance to which was connected the filament and the grid and plate elements must always have a more or less high voltage at the grid and plate of the valve. What was wanted was a circuit which would allow the elements of the valve to be so connected that they were at nearly the potential of the filament with sufficient voltage for proper operation. To find such a circuit, use was made of a dummy aerial system, low power and safe voltages. The circuit finally evolved met all these desirable conditions, and is shown in Fig. 3. It will be seen that the grid and plate are so connected that their potential is but little more than zero, the circuit being so proportioned that sufficient voltage is procured for the proper operation of the valve. The circuit adapts itself to either capacity or inductive coupling. In the former case the size of the aerial has very little to do with its operation other than that there must be not more than one-half wavelength spacing between the far ends or open ends of the radiation system for proper electro-static coupling. The radiating system being one condenser of the whole circuit, it can be nearly any length, experiments up to 80 feet long for the aerial and 65 feet long for the counterpoise having given excellent results on 20 metres, it merely being necessary to proportion the aerial and counterpoise so that they would have the same capa-

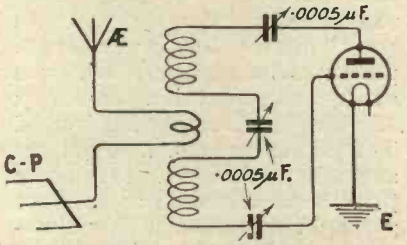


Fig. 3b.—An excellent circuit for short wave work.

city to earth, and being separated at the open or far end not more than one-half wavelength to obtain the proper electro-static coupling. The radiating system in this case is merely a capacity, the size of which has little effect on the wavelength of the transmitter as long as it is connected to the transmitter by a minimum capacity coupling which is not to exceed 100 $\mu\mu$F. If more capacity is used the aerial system will tend to alter the frequency at which the tube circuit was oscillating; this is made use of when it is desired to shift from 40 metres to the 75-metre band, it only being necessary to shift the value of the aerial and counterpoise condensers from the 50 $\mu\mu$F. value to 500 $\mu\mu$F., no

other adjustments being necessary. The aerial current is practically the same for any wavelength, if the input is kept constant, provided that the aerial system used has a fundamental wavelength greater than the highest wavelength that is to be used. That is, the radiating system should have a fundamental period above 80 metres, if the highest wave to be used is nearly that. If a radiating system is used, the period of which is less than the wavelength it is desired to use, the aerial current will differ with the different wavelengths when the input remains constant.

The Inductances

The inductances used in the circuit can be cut from the standard R.C.A. inductance, two sections of five turns each being suitable for the 20-metre band and two sections of 10 turns each being suitable for the 40- and 75-metre band. When it is desired to operate lower than 15 metres, the two 15-turn coils are removed entirely and the clips which were connected to the coils are connected to each other. A shorter aerial system is then desirable, as the radiating system is then in control of the frequency at which the valve will oscillate, there being no local circuit to determine the frequency, as the grid of the valve is connected by a short lead to the counterpoise series condenser and from that directly to the counterpoise. Also, the plate of the valve is connected by a short lead directly to the plate blocking condenser, and from that by a short lead to the aerial series condenser, and from that directly to the aerial. The 4-metre band can be reached very readily when the aerial is a 3-foot vertical

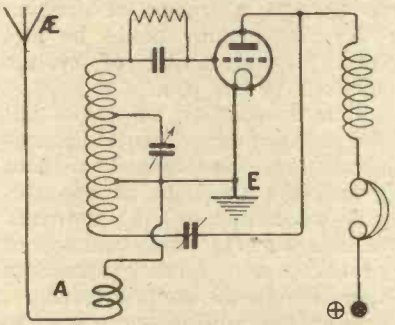


Fig. 4.—The short-wave receiving circuit. The manner in which coil A is connected increases selectivity. This coil in the improved Reinartz circuit was the aerial detuning coil, and in this case is used to couple the aerial coil to the tuner.

copper tube and the counterpoise is of the same length downward.

To use the circuit as an inductively-coupled circuit it is only necessary to substitute a variable condenser for the aerial and counterpoise, and coupling the radiating system to the oscillatory circuit, as shown in Fig. 3B.

A Radio Conference

We understand that over fifty nations, all interested in radio communication, have received from the State Department of the United States an invitation to attend the International Radio Conference, which is to be held in Washington, D.C, next September.

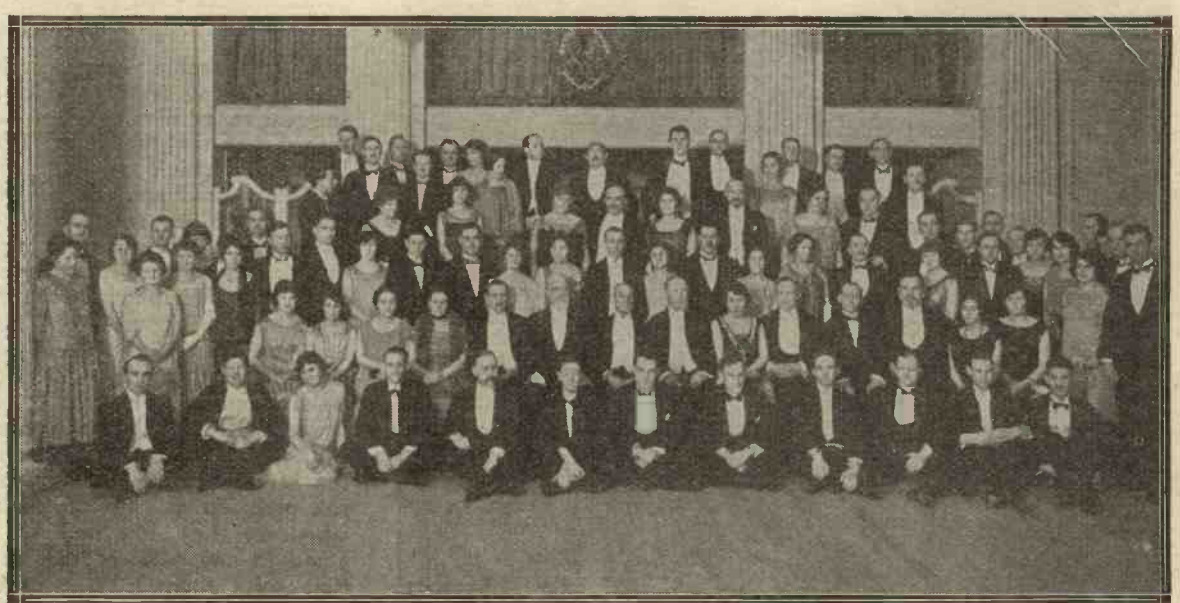
* * *

The necessity of calling the World Radio Conference is due to the fact that the old regulations comprised in the London Convention of 1912 are inadequate to cope with communication problems brought out by the modern radio apparatus and the development of radio telephony and broadcasting.

It is important, therefore, for contracting parties to reach an agreement for the expeditious and efficient handing of radio messages which, if pursued according to the terms of present international law and regulations, would hamper considerably efficient traffic handling by radio.

Many important new laws and regulations are sure to emanate from this Conference, which will take in broadcasting, short and long waves, power for transmitters, amateur communication, and other points that have developed since 1912, with the onward progress of radio communication.

THE R.S.G.B. ANNUAL DINNER.



The Annual Dinner of the Radio Society of Great Britain, held at the Waldorf Hotel on Wednesday, March 4, was a very successful affair. Sir Oliver Lodge, the president, is seen seated in the middle, with Professor Eccles, past president, and Admiral Sir Henry Jackson on his right and left respectively.

Radio Notes and News

Some brief notes upon things in general, which are of special interest to wireless enthusiasts.

THE Radio Association, of which the Hon. Sir Arthur Stanley is the president, have addressed a memorandum to his Majesty's Postmaster-General on the subject of amendment to the Wireless Bill, in which they claim that the Bill does not sufficiently distinguish between the transmitter and the broadcast listener. The association appreciates the necessity for Government control of transmitters and the necessity of penalties in case of failure to observe the regulations in their case. They feel, however, that the large mass of ordinary licence-holders who simply receive the matter sent from the British Broadcasting Company and other stations are neither desirous nor capable of interfering to any appreciable extent with the convenience of others or inflicting any harm on any person or body. If this view is accepted it follows that the penalties which are contemplated in the case of transmitters who fail to observe the regulations are excessive when applied to the broadcast listener.

In cases of emergency, such as war, it is conceivable that listeners may be able in some way to become a source of danger. This contingency could be met by the transposition of certain sections of the Bill.

The association suggests that the grant of experimental licences should not be refused without giving the applicant an opportunity to submit to an approved examination in radio science or practice, and further considers the Bill should contain a clause giving the authorities power to compel persons or bodies wilfully interfering with broadcast reception to take such measures as may be required to put a stop to such interference.

* * *

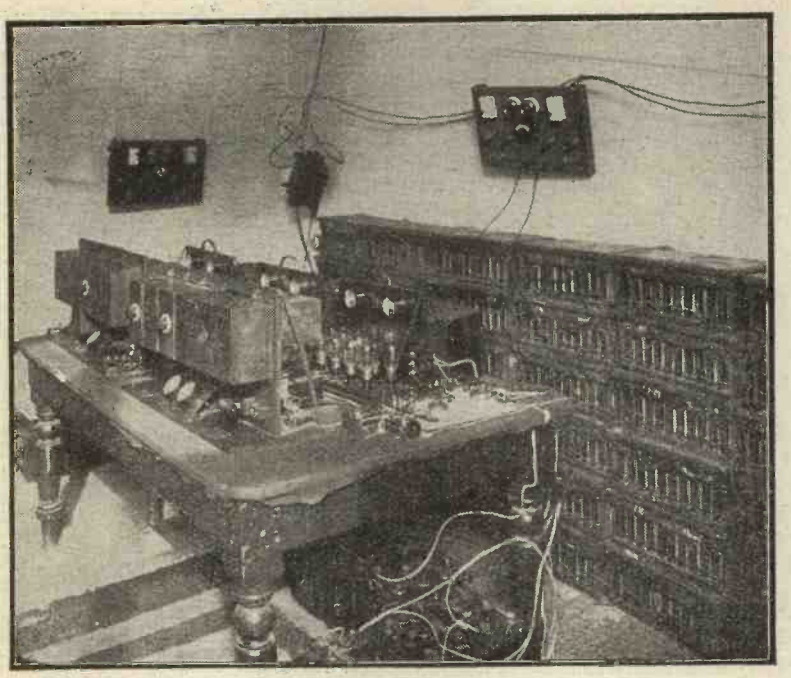
In addition, it is pointed out that the 1904 Act continued in force for two years only unless Parliament otherwise determined, and in view of the rapidity with which radio science is growing the association believe it would be desirable to limit the present Bill to two years with the same proviso.

Mr. Stillman Kelley, the composer who set "Pilgrim's Progress" to music the miracle play which was S.B. from Covent Garden on March 12.

We understand that, in a written reply to Sir H. Brittain, M.P., who asked what was the present position with regard to the Empire Wireless Chain, Sir W. Mitchell - Thomson (Postmaster-General) says that the high-power station which is in course of erection at Rugby is expected to be completed in about eight months' time. A smaller station for communication on the "beam" system, with a similar station in Canada, is expected to be completed in September or October next. Orders will be given for the erection of additional beam stations for communication with India, South Africa, and Australia as soon as definite arrangements have been made.

* * *

A remarkable new wireless system, having features which are suggestive of a magazine story rather than real life, is the Hale-Lyle, in which no telephone cords are used and the user can walk about the room with the 'phones on his head, listening to the broadcast programmes perfectly. The headphones externally resemble the conventional kind, and are worn in the usual way, and the receiving apparatus can be situated in any part of the house that may be convenient. Clubs in particular will welcome the invention, for the members can pick up a pair of 'phones whenever they like and sit or stand in any part of the room that suits them. Illustrations and full technical particulars are published in this month's *Wireless Constructor.*



The apparatus at the Ideal Home Exhibition, Olympia, London, which is used for receiving the B.B.C. programme.

A Condenser Unit for H.T. Batteries

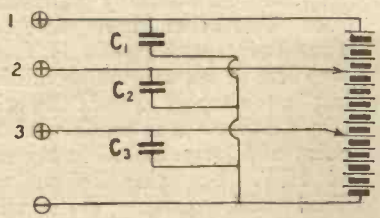


Fig. 1.—The idea illustrated in theoretical form.

A neat unit which may be used with any valve receiver with a view to avoiding expense in the purchasing of condensers for connecting across the H.T. terminals of every set.

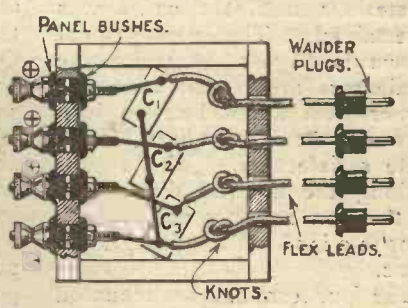


Fig. 2.—Showing how the unit should be wired up.

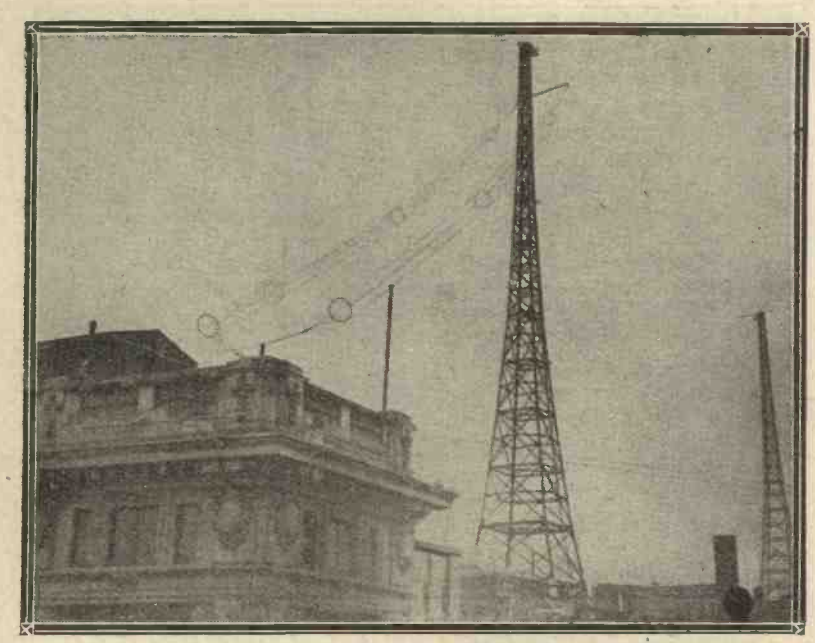
IT has been pointed out recently that it is an excellent plan to mount the high-tension battery condenser outside the set altogether. The reason for this suggestion is that it makes for convenience, since a single condenser will suffice for any number of receiving sets provided that the same high-tension voltage is used for all their valves. Besides reducing one's expenditure upon condensers this means that any set or "hook-up" can be tried out with the minimum of trouble, and with the assurance that there is a condenser in shunt with the high-tension supply. If there is already a condenser incorporated in a set under trial it does not matter in the least, for it means simply that the capacity across the high-tension battery is increased, which is all to the good.

The Unit

The writer has lately made up a distributing box for the high-tension battery on the lines suggested by Mr. Percy W. Harris in an article in *Wireless Weekly*. This has proved to be a most useful fitting for the wireless table, and any experimenter who constructs it will find it a most handy addition to his outfit. The box, which is screwed to the underside of the wireless table close to one end, contains three condensers, each of two microfarads, and is provided with four terminals. The theoretical diagram is shown in Fig. 1. It will be seen that with the help of the distributor high-tension current can be supplied to the set at three different potentials, and that each portion of the battery is shunted by a large capacity. It need hardly be pointed out that it is a very great advantage to be able to regulate the plate potentials of the various valves in the set instead of applying the same voltage to all. On the high-frequency side we require, as a rule, a voltage of between 60 and 80. The rectifier needs a much smaller plate voltage, and may be as low as 15 or 18, and will seldom exceed 50 or 60. Valves used as note-magnifiers usually do their best work with a high potential on their plates. It is a great mistake to imagine that a single condenser will suffice when several tappings are taken from the high-tension battery. If, for example, only the condenser marked C1 in Fig. 1 were fitted the portions of the battery lying between +2 and − and +3 and − would not have any capacity in shunt with them, and a single weak cell in either of these portions might lead to curious effects owing to the internal resistance of the battery.

The actual size of the box does not matter very greatly so long as it is large enough to contain the three condensers, which it is best to place at some distance from one another in order to simplify the construction and ease in making connections.

In this set were two note magnifying valves, the first of which was supplied by H.T. +2 and the second (a power valve) by H.T. +1. It was found that when the first note magnifier was



Our photograph shows the new aerial and masts at the new 2LO station situated in Oxford Street.

switched off signals were still quite strong in the telephones, and there were several other symptoms which appeared mysterious until the cause was ascertained. The arrangement shown in Fig. 2, in which the condensers are placed corner to corner with about half an inch between them has been found quite satisfactory. This means making the internal dimensions of the box roughly as follows: Length 9 ins., width 3 ins., depth 3 ins.

The four terminals are mounted by means of insulating panel bushes on one side of the box. In the other side and directly opposite each of them holes are made of a size which will just allow the flex used for the battery leads to pass through them. One end of each of these leads is bared for about 2 ins. It is then soldered both to the upper contact of its condenser and to the shank of the positive terminal to which it belongs. A knot is tied in the flex inside the box so that should the lead be inadvertently pulled or jerked no strain will be put upon the soldered connection. The four wander plugs must be marked in some way so as to make them easily distinguishable from one another. The writer's method of doing this was as follows. The negative plug was an ordinary plain black one. The other three were red. That corresponding to H.T. +1 was left in its original condition, but in the top of each of the other two a hollow was made with the point of a large drill. In the case of H.T. +2, this hollow was filled with green paint, white being used for H.T. +3.

R. W. H.

□ □ □

YOUR BROKEN SCREWDRIVER

WHEN working in the workshop the wireless experimenter may find himself with a broken screwdriver in his hand, which, on attempting to file it, proves to be dead hard, while no grindstone is handy, or at the best an oil-stone which will require a good deal of "elbow grease" applying before the screwdriver is again fit for use. The best way of putting the damaged screwdriver again into commission is to soften it first, after which it can very easily be filed. To do this heat the point in a gas-flame or fire till it is a cherry red, and allow it to cool off slowly. You can now file up the edge to the right size and shape. Before using it again, however, it is necessary to harden it. The point should therefore be again raised to a cherry-red heat, and quenched out by dipping it into cold water. The driver is not yet ready for use, as it is much too hard and brittle, and the first time it is used on a recalcitrant screw it will break. The next process then is to "let it down."

Tempering

Polish the point of the screwdriver with some emery cloth and heat the shank in a gas-flame about an inch and a half away from the point; this should be done carefully and the bright portion watched closely. After a few moments it will be seen to change colour, first going a faint yellow, changing to light brown, dark brown and purple. At this stage the heating should be discontinued for a moment, and if the shank is hot enough the heat will run into the point and the purple colour will change to a bright blue. The screwdriver should now be dipped into cold water; after this process it will be correctly tempered.

C. P. A.

At a recent Wireless Exhibition in Newcastle a "Constructors' Competition" was held, and our photograph shows some of the competition entries.

Tempering Steel Springs

IT is sometimes necessary to temper small steel springs that have had to be softened in order to drill or file them, and if they are of irregular shape the question of tempering them evenly may seem somewhat of a problem. This is easily done by letting them down in molten lead. The spring may be hardened in the usual way by quenching out in cold water from a bright red heat. Now melt some lead in an old iron ladle and dip in a small piece of polished steel. If, on withdrawing it, it is a bright blue colour the temperature of the lead is correct; if it has gone black it is too high, while if it is only dark brown or purple it is too low. If the lead is the right temperature, remove it from the flame or fire and drop the hardened spring in; leave it for a moment, then withdraw it from the lead. The spring should now be a bright blue colour, and will be correctly tempered.

C. P. A.

Jottings by the Way

Wrath

THOUGH you have not the good fortune to know General Blood Thunderby as intimately as I do, you are nevertheless sufficiently well acquainted with his character to enable you to realise that he is not the sort of man to have his freedom tampered with. When he first read the text of the proposed Wireless Bill, whilst sitting at breakfast at Simla Villa, I am told that a terrible scene ensued. As his eyes travelled down the column his face turned slowly from its normal ripe tomato colour first of all to that of raspberry jam and

. . . *The thing is monstrous*

finally approached the rich shade of black currant tart. Rising to his feet—his young nephew, who is spending a few days with him, is my informant—he roared: "The thing is monstrous," bringing his hand down with a resounding thump upon the paper to emphasise his point. It was unfortunate that at the moment the paper should have been covering a dish of poached eggs. The contents of one of these fell upon Percy, the General's Alsatian, who, temporarily blinded and wondering who had hit him, promptly bit the first leg that he saw. The fact that the limb thus attacked belonged to the General had no calming effect upon the warrior. He became almost incoherent, raving disjointedly of dogs, Governments, eggs, tyranny, iniquitous bills, people who put dishes under his papers, enslavers of the freeborn Englishman, and things of that kind. Even so I think that everything might have passed off well if he had avoided sesquipedalian words. As it was, in trying to get "unwarrantably anticonstitutional" off his chest all in one mouthful he partly dislocated his jaw, remaining open-mouthed and speechless. Thanks to the united efforts of Mrs. Blood Thunderby and the nephew, armed respectively with a boot-jack and a bed spanner, the jaw was eventually restored to its proper place, but as he had to go about for the best part of a week with his face in a sling the General was prevented for some time from expressing any further opinions upon the measure to be introduced into Parliament for the proper control of us terrible wireless folk.

Terrible Fellows

Really, when you come to think of it, we must be a pretty tough crowd if a measure of this kind is necessary to keep us in order. What I mean to say is that if a fellow goes and blows another chap's head off with a gun the police do not walk straight into his house and demand to see his gun licence. They are extremely tactful about the matter, not inconveniencing him in any way until they are pretty sure of their ground. Or again, suppose that you possess a couple of dogs for which you ought to pay fifteen shillings in licences in January, you cannot be cast into prison for months and months, fined the price of a motor car, and have the bow-wows confiscated just to top things off. But, apparently, if you do not hand over your ten bob for a wireless licence much worse things than these may befall you. In fact, failure to take out a receiving licence appears to be, in the eyes of those who drafted the Bill, a crime that is on a level with bigamy, issuing dud cheques, and mutiny on the high seas. Should this Bill ever become law, which Heaven forbid, I fear that Little Puddleton will be deprived of its "Wayfarer" for about six months every year. This is what happens to me. Mine is an experimental licence. (Swank.) On or about the 15th of June I receive from the Post Office a little slip requesting me to send the Postmaster a cheque for ten shillings. I always feel flattered by his willingness to accept my

. . . *I shudder to think of the future* . . .

cheque, and after leaving the slip lying about on the mantelpiece for a day or two I lose it. I think that some of the blue blood which flows in my veins must be of Spanish origin, for I am one of those who find to-morrow amongst the most beautiful of all words. I resolve that to-morrow I will send my cheque. And it goes on being to-morrow until I forget all about it. Then I get one of those nasty communications that puts my back up. You know the sort of thing I mean: "Pay up at once or you are for it." During the next two or three days I think out scathing covering letters to accompany my cheque, which is, of course, to be posted to-morrow. The months slip by, and one day, realising that I am a

pirate I borrow ten shillings from Poddleby and send it in. So far I have escaped the pains and penalties. The Postmaster and I have had our little tiffs, but it has never come to anything worse than that.

The Future

But I shudder to think what the future has in store. What will happen when June comes round with its seasonable snow storms? I shall receive my slip as heretofore. I shall place it on the mantelpiece. I shall say, "tomorrow I will send a cheque." And one day two or three weeks later, whilst I am essaying to tune in Timbuctoo or Pekin, I shall feel a heavy hand upon my shoulder. Turning round I shall find myself face to face with the majesty of the law as represented by P.C. Bottlesworth. He will ask for my licence. I will talk about the weather. He will produce the handcuffs. He will place them about my slender wrists; he will lead me to the local gaol, placing one hand upon my elbow whilst under the arm attached to the other he carries my wireless set. And the next morning I shall be dragged before the bench, who will fine me one hundred pounds. I will offer all that I possess in the shape of 2s. 3½d. and a bad half-crown, "found," as the *Little Puddleton Gazette* will have it, "upon the person of the accused." The bench will refuse to accept this, and I shall be cast into the dungeons. Yes, it is rather a terrible prospect.

The General Once More

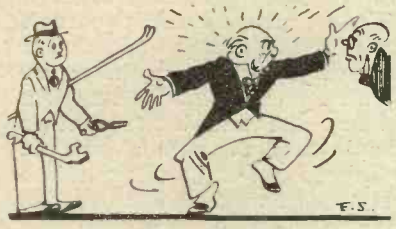
As I have said, the General was unable for some time to tell us what he really thought about the matter, but as I was approaching the hut the other night the words "monstrous . . . unspeakable . . . disgusting . . . un-English . . . unheard of . . . attack upon liberty . . . mediæval despotism . . ." wafted to my ears made me realise that the warrior's jaw was once more in full working order. As I heard nothing more after "mediæval despotism" I feared that he might have suffered another dislocation and ran back home at top speed for the selection of suitable tools for dealing with such a crisis. However, when I arrived with a crowbar, a pair of gas pliers, and a monkey wrench I was delighted to discover that all was well. "I am glad," I said as I stood in the doorway, "to find that my funds are unfeared . . . that is to say, to fear that my fiends are unfounded." They all stopped talking and looked at my array of weapons. Gubbsworthy and Snaggsby advanced quietly and relieved me of them, whilst Poddleby, having apparently

. . . *A rather terrible prospect* . . .

caught the infection, remarked "that 'Wayfarer's' way appeared to be mindering." When I had reassured them that all was well we settled down to business, and the General let himself go once more.

A Gift

Somebody once said that the most priceless of all gifts was that of self-expression. If the author of that beautiful thought could have heard our president express himself upon the Wireless Bill I believe that he would have received confirmation of his opinion. Possibly you have heard a master of foxhounds talking to one who has ridden over growing



. . . *The General simply opens his mouth* . . .

wheat. Possibly as a raw recruit during the Great War you may have come to learn what the sergeant-major's voice can do. Possibly again you may have been near a volcano when an eruption has been in progress. These things are pretty fierce, I admit, but compared with General Blood Thunderby's denunciation of the Wireless Bill they were as the cooings of a sucking dove. The General simply opens his mouth and lets himself go and you understand quite plainly whether he is or is not in favour of what he is talking about. On the occasion of which I am speaking we gathered that he was not in love with the Bill, its proposer, its seconder, its supporters, or those who would carry out its provisions should it become law.

Poor Bottlesworth

The fellow for whom I felt most sorry during the General's outburst was the unfortunate P.C. Bottlesworth, who has recently been elected a member of the club. As the president described at length exactly what he would do to anybody who tried to search *his* house for concealed wireless gear poor Bottlesworth aged visibly. A fervid appeal to the meeting to stand together as one man in the event of an intrusion and to deal, to say the least of it, faithfully with the intruder made Bottlesworth turn pale and his hair stand on end. But the worst was yet to come. At the end of his harangue the General suddenly spotted Bottlesworth.

Intimidation

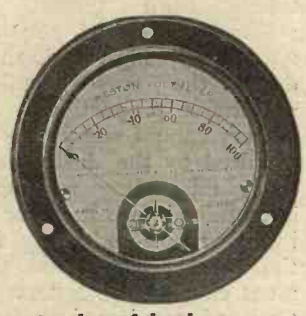
Pointing a menacing finger at him he said, "And I observe that among the members present is one who will be called upon to carry out the directions of this iniquitous Bill. Let me tell you, Bottlesworth, that if you come to Simla Villa to examine officially my wireless gear I will push variable condensers down your throat, I will make you drink the contents of my accumulator, I will hang you from my aerial, and bury your body as an earth plate." Bottlesworth, I understand, has written to headquarters submitting his immediate resignation from the Force should the Wireless Bill become law. If he should go, I do not envy his successor.

WIRELESS WAYFARER.

Broadcasting in Japan

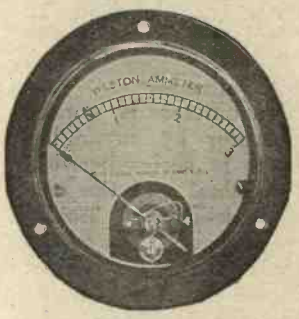
The much-heralded inauguration of broadcasting in Japan was arranged for March 1, and in preparation for it thousands of people bought receivers. At the last moment, however, the Communications Department refused authorisation.

Electrical Measuring Instruments



A neat and useful voltmeter reading up to 100 volts.

Some notes upon the principles and construction of measuring ammeters, describing their advantages and disadvantages.



A typical ammeter used by amateurs.

THE average wireless man uses, as a rule, only two classes of measuring instruments—the voltmeter and the ammeter. He may have two of the former, one arranged to read small E.M.F.'s such as that of the filament battery, and another capable of recording the voltage of the high-tension battery.

General Use

Again, he may possess two or possibly three current-measuring instruments in the ammeter, the milliammeter and the microammeter. All of these, whatever the work they do, work on the same principle, they are simply calibrated galvanometers. The voltmeter, which is a shunt instrument, contains a fairly high resistance, whilst the ammeter, which is always placed in series, has comparatively low resistance windings, and is frequently provided with a shunt which carries the greater part of the current, and allows only a small proportion of it to enter the working part of the instrument.

Moving Coil System

Good voltmeters and ammeters are made upon what is known as the *moving coil* system, whose working parts are shown in Figs. 1 and 2. Between the poles of a permanent magnet is fixed an iron cylinder, which concentrates the magnetic field. On each side of the magnet, and bridging the pole pieces, is a brass bracket which contains a jewelled bearing. Pivoted in these bearings, and arranged so that it can rotate in the small space between the core and the pole pieces, is a coil consisting of very fine wire wound round a light metal frame (Fig. 2) of copper or aluminium. The pointer is attached to the pivot, so that it moves with the coil, whilst the hair - springs upon either side are arranged to oppose the movement of the coil and to hold it when no current is passing in such a position that the pointer rests upon the zero mark of the scale. Current entering

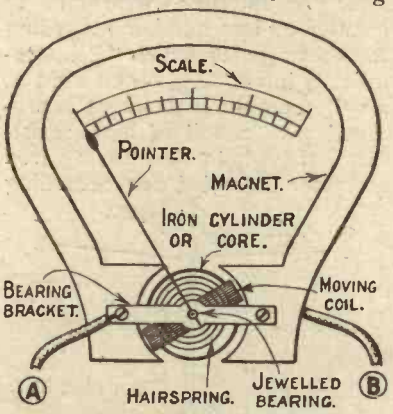


Fig. 1.—Principal working parts of a measuring instrument.

by the lead A in Fig. 1 is conveyed through the bracket and the hair-spring to the windings of the moving coil. It leaves then *via* the hair-spring on the far side and the lead B. When the coil is carrying current a magnetic field is set up round it, and it moves against the hair-springs in an endeavour to place its lines of magnetic force at right angles to those of the magnet. The heavier the current passing through the coil the greater will be the deflection, until a maximum point is reached. The direction of movement will depend upon that of the current. Thus if current entering at lead A moves the coil and its pointer clockwise, a reversal of the flow will bring about an anti - clockwise movement. When used simply as a galvanometer the moving coil instrument has usually a central zero position for the pointer, a movement of which to either side denotes the presence of current and indicates the direction in which it is flowing. Voltmeters and ammeters have generally the zero position at the left-hand end of the scale, one of the terminals being marked +. It will be seen that it is most important in the case of moving coil instruments with left-hand zero positions always to connect them so that current flows through them in the correct way.

An Ammeter

To turn the moving coil galvanometer into an ammeter all that is necessary is to provide it with a shunt to carry the greater portion of the current. The resistance of the windings and the shunt being constant, the same proportion of current will always be carried by the latter, and it is now quite a straightforward business to calibrate the scale so that it will show exactly the amount of current passed. By placing a large amount of fine wire upon the windings of the moving coil, the instrument can be made to give a full-scale deflection in response to a very small amount of current. If the shunt is made of high resistance, or is absent altogether, a very large proportion of the current, or the whole of it, will be carried by the windings. The instrument can then be calibrated as a microammeter or a milliammeter.

Heavy Currents

With a shunt of low resistance only a small part of the current is delivered to the windings, and the instrument can be made to read the ampereage of heavy currents.

A Voltmeter

The galvanometer is turned into a voltmeter by arranging the resistance in series between the input terminal and the corresponding hair-spring. As by Ohm's law the voltage across the terminals of the instrument is proportional to the current flowing and the resistance, the scale can now be calibrated to read the E.M.F. across two points of a circuit in which a voltmeter is placed in shunt. By varying the resistance the meter can be made to read either high or low voltages.

Refined Instruments

In all good moving-coil instruments the action of the pointer is very nearly dead beat. It does not flash past the proper reading and then swing to and fro for some time before coming to rest. This dead-beat action is the result of careful design, the principle being that when the metal former cuts across the magnetic field eddy currents are induced in it which oppose its motion and quickly bring it to rest (Fig. 2). The extreme lightness of the moving parts also assists in producing the dead-beat action. In really good instruments directly current is admitted the pointer swings smoothly to the correct reading and stays there. This is a very great advantage.

Advantages

The advantages of well-made moving coil instruments are these, a very great degree of accuracy, an evenly divided scale, and low current consumption. Their disadvantages are that the scale may often be comparatively short on account of the restricted movement of the coil; that they will not stand rough handling, and that their initial cost is rather high.

Moving Iron System

Cheaper instruments are made upon what is known as the *moving iron* system. In some types the current that flows between the terminals is utilised to create the magnetic field by being passed through a fixed coil of wire. Within this are two small pieces of iron, one fixed and one attached to the spindle of the pointer. These two pieces of iron exercise a mutual repulsion when a magnetic field is set up by the passage of current flowing through the coil. As the amount of this repulsion depends upon

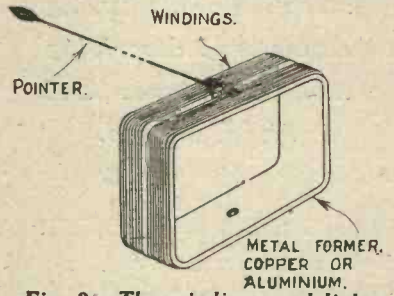


Fig. 2.—The windings and light metal former.

the flow of current, the scale over which the pointer moves can be calibrated to read in amperes or in volts. In the ammeter the whole of the current usually flows through the turns of wire forming the coil, which are made of finer or stouter wire and of greater or less number according to the range for which the instrument is intended. When used as a voltmeter the instrument is provided with a coil of high resistance, though in the moving iron ammeter intended for recording

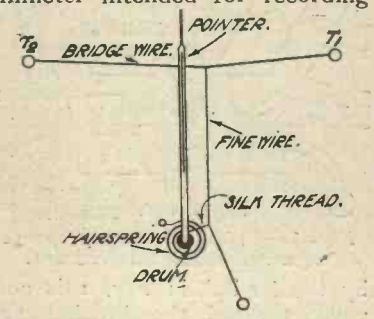


Fig. 3.—Showing principle of the hot wire ammeter.

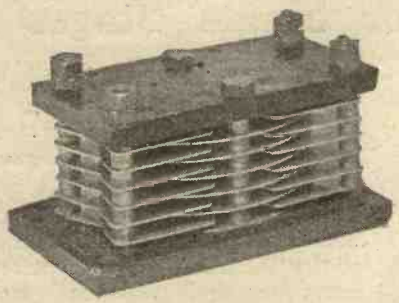
the ampereage of heavy currents it may consist of no more than a single turn of thick wire. The main advantage of the moving iron instrument is its low cost. Against these we must set a good many disadvantages. Moving iron instruments are not so accurate as those made on the moving coil system, and their scale divisions tend to close up on the lower readings, although in instruments of good design a practically uniform scale may be obtained. The cheaper instruments sold are not dead beat, but those of good quality may be made sufficiently so for all ordinary purposes. The moving iron voltmeter is not satisfactory for taking high-tension battery readings, since its resistance is not usually high enough to cut down the current taken to reasonable proportions. As the battery cannot supply the current required by the instrument entirely misleading readings may be obtained with it. For obtaining a rough-and-ready idea of the current flowing in the filament circuits the ordinary cheap type of moving iron ammeter will answer quite well, and a voltmeter of the same type may be used for testing accumulators. It is best, however, in the end to purchase really good instruments which can always be relied upon to record accurately.

Hot Wire Ammeter

Another type of instrument, working on an entirely different principle, is the *hot wire* ammeter, which may be used for measuring either direct or alternating currents. The principle of this instrument is shown diagrammatically in Fig. 3. Current enters at terminal T1, and after passing through the bridging wire leaves at T2. Its passage causes this wire to heat up and to expand and sag. When this happens the fine wire connected to the bridging wire slackens, lessening the tension of the silk thread between it and the drum. This enables the hair-spring to assert itself, and the pointer is moved by its torque. The greater the current the more will the bridging wire sag, and therefore the greater will be the movement of the pointer. When current ceases to flow the bridging wire tautens and the pointer is returned to the zero position by the tension exerted by the fine wire on the silken thread which turns the drum against the hair-spring.

R. W. H.

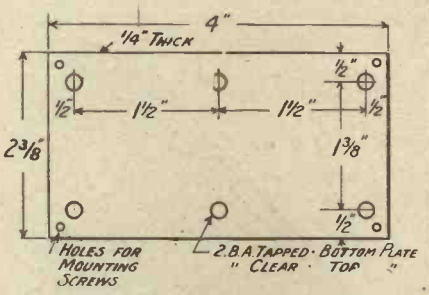
An Air-Spaced Fixed Condenser



The completed condenser, though rather bulky, is strong and efficient.

By C. P. ALLINSON.

The following article deals with the construction of a new type of fixed condenser which should appeal to those who are desirous of obtaining maximum efficiency.



Each end plate is cut to the dimensions shown and afterwards drilled as indicated.

MORE and more experimenters are turning their attention to the reception of short waves, and the ultimate aim for all instruments used for these high frequencies is that they should have the lowest possible losses. On this account there are many who would prefer to use fixed condensers with air dielectric. The drawing shows a simple method of making such a condenser from the fixed vanes from an ordinary variable condenser. These vanes can be obtained for a few pence a dozen.

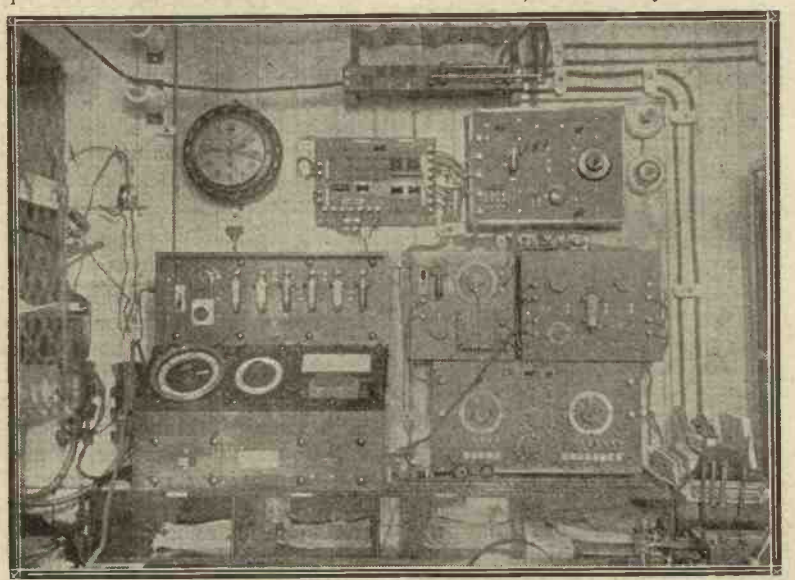
The Construction

Four short lengths of 2 B.A. screwed rod will also be required and some condenser spacing washers. Two pieces of ebonite 4 in. x 2⅜ in. x ¼ in. are also required. The construction of this condenser is clearly shown in the figure, and the dimensioned sketch of the end plates will be useful for marking out the ebonite end plates.

One of these is drilled 2 B.A. and the other end plate should have 2 B.A. holes tapped in it into which the lengths of screwed rod are fixed, locknuts being run down and tightened so as to make a firm job of it. A condenser vane is then slipped down over two of the rods on one side and ordinary 2 B.A. washers placed on the other two lengths so that the vane which is slipped on them will be half the thickness of the condenser spacing washers above the first. The condenser can then be built up in the usual way so that alternate vanes interleave each other, and finally the other end plate slipped on after having been levelled up with washers as found necessary, so that when the top nuts are tightened down the whole is quite firm without the two end plates being strained in any way. If the large spacing washers are used it will be found that 13 vanes will give an approximate capacity of .0001 μF. Larger or smaller condensers can be made by using more or less vanes as required. If smaller spacing washers are used, not only will the condenser take up less room, but the capacity for a given number of plates will be greater. A .0001 μF condenser may only require 7 or 9 vanes.

An Improvement

In order to reduce the amount of solid dielectric in the field, holes may be drilled in the end plates. Only the best quality ebonite, of course, should be used, and if there is any doubt as to surface leakage it should be rubbed down with glass paper.



A typical receiving station on board ship. Note the D.F. apparatus on the left.

A High-Frequency Transformer for Single Stages

By G. P. KENDALL, B.Sc., Staff Editor

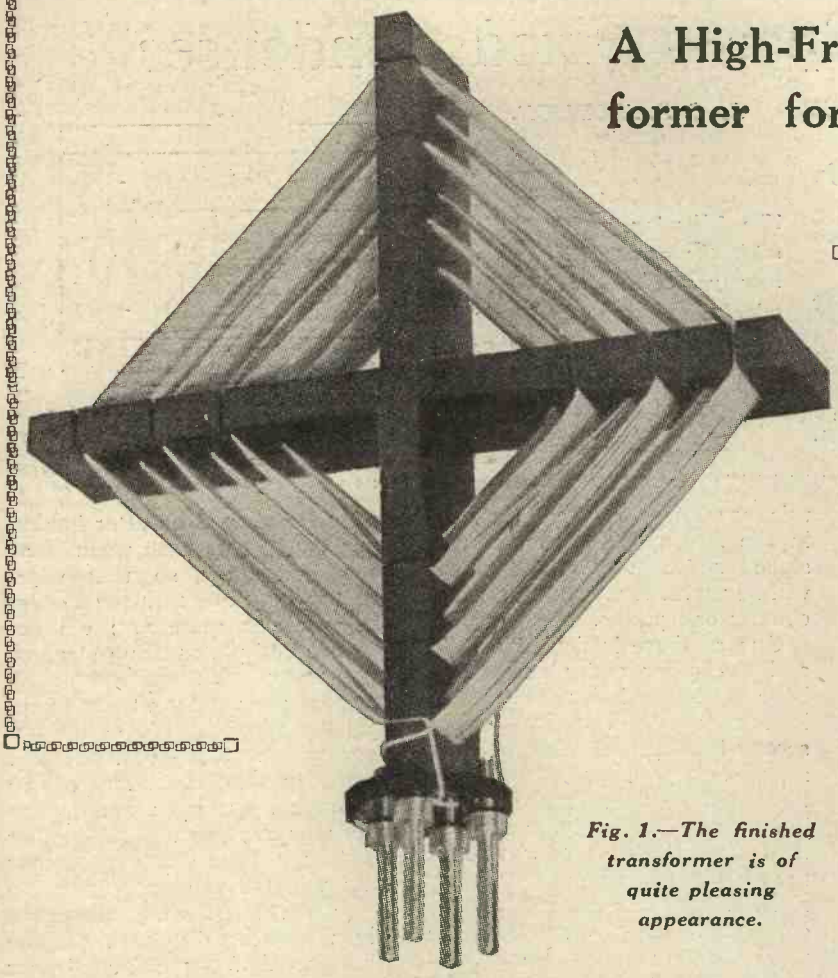


Fig. 1.—The finished transformer is of quite pleasing appearance.

THE design of a high-frequency transformer, like that of most wireless appliances, is something of a compromise, since one has really to make an attempt to reconcile some quite opposing factors. One has, for example, all the usual considerations to take into account governing the construction of a good tuning inductance, but at the same time one must make allowance for unusually stringent requirements regarding compactness, limitation of stray fields, and so on. The result is that in the great majority of cases a high-frequency transformer is a distinctly inefficient piece of apparatus when regarded as an inductance, simply because it is necessary that it should be quite small and compact and that its stray field should be reasonably small, to reduce interaction between successive stages. This latter point is one which is of considerable importance and has a great deal to do with the different behaviour of a set employing two or more high-frequency valves when different makes of plug-in transformer are tried.

A Curious Phenomenon

It may be interesting to note in passing that this question of

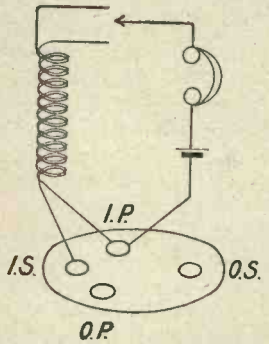


Fig. 2.—How to identify the ends of the windings.

the intensity of the magnetic field of a high-frequency transformer at any given distance from the instrument itself provides the explanation of the somewhat puzzling fact that a set of the "Transatlantic" type may seem to oscillate much more readily upon long wavelengths than upon the shorter ones, which is, of course, contrary to expectation. This does not always take place, but when it does it is probable that it is due to the larger number of turns upon the long wave transformer producing a stronger magnetic field (with consequent more intense reaction effects) between two successive stages. It is therefore quite natural that designers of high-frequency transformers intended for use in all sorts of sets must devote a good deal of attention to the problem of making the transformer as small as possible, and the natural result is that the types with which we are familiar mostly incorporate windings of quite high ohmic resistance and very considerable self-capacity.

High Efficiency Undesirable in Multi-stages

We cannot, therefore, expect them to behave in any way as efficient inductances, nor is it, indeed, desirable that they should do so when more than one stage of high-frequency amplification is to be used, if we are to keep a reasonable degree of stability in the receiver without the aid of special devices such as neutralising condensers.

An Interesting Field for Experiment

Where only one stage of high-frequency amplification is used we find a somewhat different situation, since here it will be possible to sacrifice compactness to a considerable extent, and it will be possible, further, to make the transformer much more efficient when regarded from the tuning inductance point of view, without making the set seriously unstable as a result of stray coupling effects.

An interesting departure from the conventional form of plug-in transformer is described in this article. Readers of former issues will see how it has been evolved from the low-loss coils previously described.

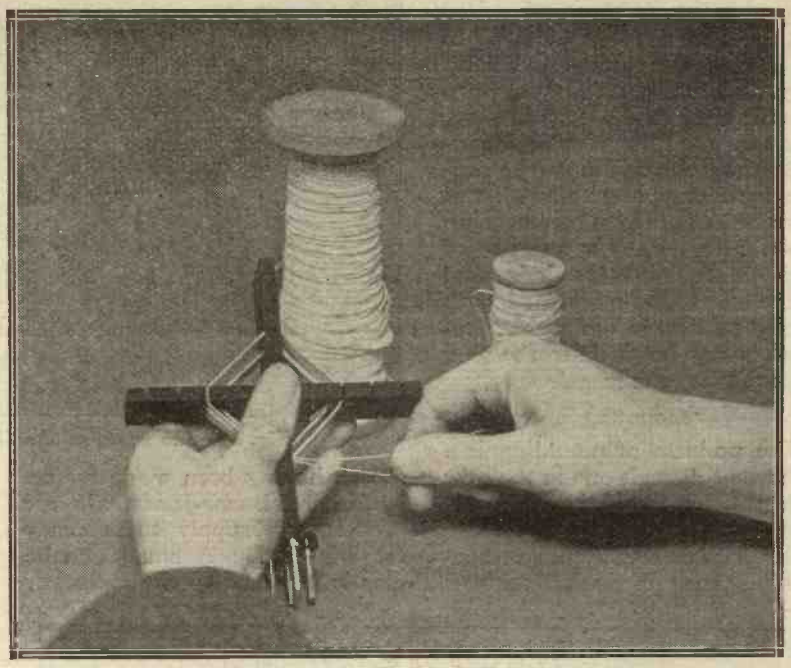


Fig. 3.—The winding is carried out with the aid of two bobbins of wire.

Design of Transformers for Single Stages

The design of highly efficient intervalve transformers for use in sets employing only one high-frequency valve offers a very interesting field for experiment, and the particular transformer which is described in these notes is intended merely to represent one of many possible arrangements possessing desirable features. The basis of this transformer is the multi-layer cross-coil, which I described in a recent issue, and the result is certainly a coupling whose high-frequency efficiency is decidedly good. The capacity of the winding is kept quite reasonably low, and the gauge of wire employed may be sufficiently large to achieve reasonably low damping. The reader is advised to refer to the original article on this method of coil-winding for the exact details of the former employed, and it will be found that a very simple cross-shaped ebonite support for the windings is employed, which will serve equally well for the foundation of a transformer arrangement, such as that which we are now considering. (The issue of *Wireless Weekly* containing the original description was that of February 11, Vol. 5, No. 17.)

Arrangement of Primary and Secondary

A variety of possible arrangements present themselves for the insertion of the windings, and the one which I have found most suitable for the circuit in which I have tested this transformer is that in which both primary and secondary are wound on together, two bobbins of wire being employed, so that the two wires can be fed in simultaneously. This method of winding involves the maintenance of good insulation between primary and secondary, since if the covering of the wire is not really dependable it is quite possible for shorts between primary and secondary to develop, with consequent injury to high-tension batteries and possibly valves. I therefore recommend that double-cotton-covered wire should be used, and that when the winding is complete it should be given a coat of moderately diluted shellac varnish, and then very thoroughly baked.

The Winding

The method of winding is extremely simple, being practically the same as that involved in the winding of an ordinary multi-layer coil upon one of these formers, the only difference being

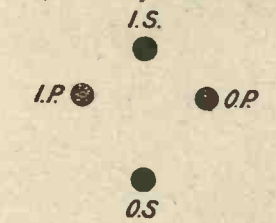


Fig. 4.—The standard connections of a high-frequency transformer.

that the winding is carried out, as it were, with a double wire which is fed from two bobbins.

Use Two Bobbins of Wire

If one obtains a suitable quantity of wire upon one bobbin, it is an easy matter to run off, say, a quarter of a pound of it on to a spare bobbin, and then mount these two upon the workbench so that they are free to revolve easily, a convenient method of achieving this end being to drive two long wire nails a little way into the bench at suitable positions, upon which the two bobbins can be slipped. The wire used may be No. 28 or 30 double cotton covered, and the number of turns upon primary and secondary will depend, to some extent, upon the requirements and personal preferences of the experimenter.

Turn Numbers

Those who like to cover the band between 300 and 500 metres by the use of a transformer possessing a moderate number of turns and a fair-sized tuning condenser, such as a .0003 or .0005 microfarad capacity, will find that 60 turns primary and secondary will meet their requirements.

Simultaneous Winding

This is conveniently achieved by placing 10 turns of each winding in each layer, thus filling all the available spaces. In carrying out the actual wiring, a turn of each winding is slipped into the slot, a little practice enabling one

to slip in the primary and secondary together, so that one carries out the winding with what is, to all intents and purposes, a twin wire. No pains need be taken to prevent these two wires crossing, since they will have to be identified at the conclusion of the process by a simple test which I will describe later. Upon commencing the winding, leave a free end of each wire about 6 ins. long, and at the conclusion a similar length should be left, in order that connection may be made to the plug mounting for the transformer.

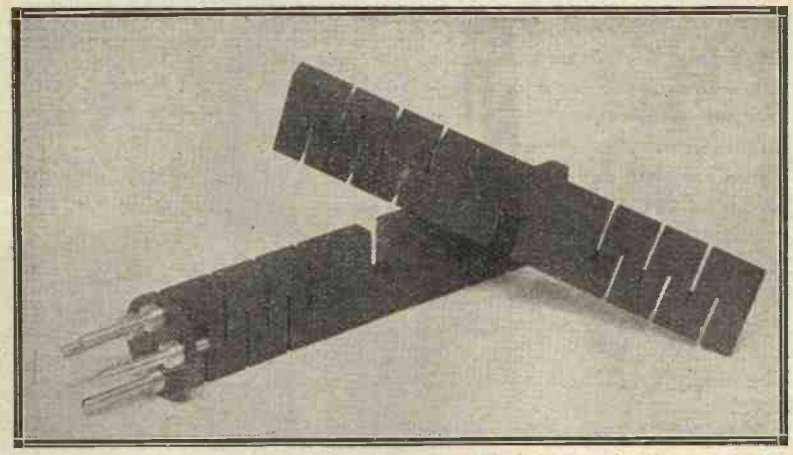
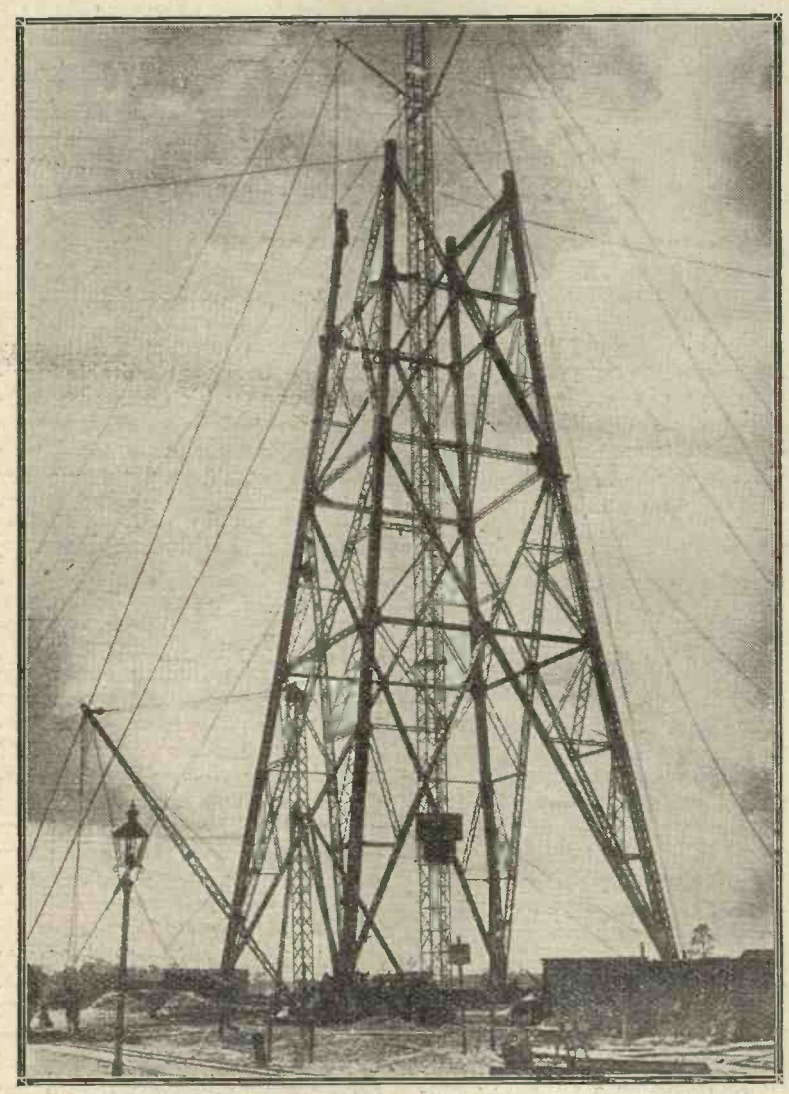


Fig. 5.—The parts of the former ready for assembly.

Mounting

The problem of mounting is a somewhat difficult one in the case of a transformer of this type, but the method illustrated is one which I have found entirely successful, the particular formers shown having been made for me by Messrs. Burne-Jones, who are prepared to supply them ready for winding. A small ebonite disc is attached to the extremity of one of the arms, and in this disc the necessary four pins are mounted, two of them serving to attach the disc itself to the end of the cross arm. I find this method quite robust enough for practical purposes, since one does not expect such a component to stand up to very rough usage, and its appearance as a finished transformer is quite pleasing.



An elaborate mast construction which is being carried out at one of the Berlin stations.

Connections

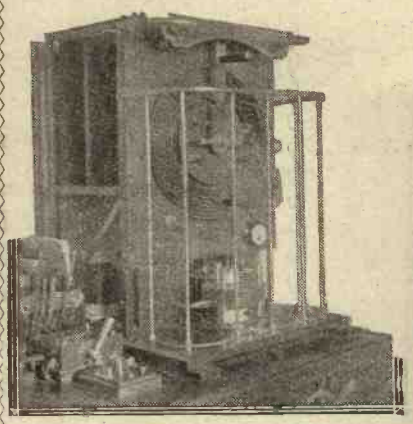
It is advisable to adopt the standard scheme of connections, and these are shown in one of the accompanying diagrams, which represents the four pins as seen when the transformer is held in the hand and one looks at them end on. When the winding has been completed the inner ends of the two are screwed down under the pins marked IS and IP, and one must then proceed to identify the equivalent outer ends in order that they may be connected beneath the pins marked OS and OP. This is very easily done by means of a pair of telephones and any convenient low-voltage battery, such as an ordinary dry cell, the connections being shown in another diagram. One tag of the 'phones may be connected to the battery, a lead being taken from the other pole of the battery to the IP pin of the transformer, and the other tag of the telephones is then touched upon the two outer ends of the winding until the one is found which gives a click. This is promptly connected under the OP terminal before one has time to confuse it with the other end, while the remaining one is tested in a similar manner to ascertain whether it is electrically con-

(*Concluded on page* 840)

Reception Conditions Week by Week

By W. K. ALFORD.

Review of reception for week ending March 8th.



Spark transmitting apparatus on the s.s. "Maloja."

IN a previous discussion under this heading I mentioned, a few weeks ago, the impossible conditions for long distance reception which will be brought about by the overcrowding of stations on the broadcast band of wavelengths.

There is every indication, at the moment, that the apparent lack of co-operation among the various broadcasting services in Europe is rapidly bringing about this condition.

It must be noticed by every listener that hardly a night passes without one or other of the British stations being "heterodyned" by some foreign station. One can hardly believe that this sort of thing is deliberate, but there is no admissible excuse for it at present, and it should suffice to stir our responsible authorities to action before it gets too late to check the epidemic which has brought about the state of chaos which pervades the broadcast service in the States.

Wavelength Allocations

Presumably, the broadcasting service is recognised by Government Departments in various countries as a public service, and requires to be worked under International Agreement just as the ordinary "telegraph" service, which, although it was apparently adequately protected under the Geneva agreement of some years ago, is beginning to need re-casting in the direction of wavelength allocation. The net effect of overcrowding of the broadcast wavelengths is to limit reception to the "local" station whose signals, being very strong, are more or less immune from "heterodyning" by the weaker carrier-wave of a more distant station.

The Need for Tolerance

Although nothing has been intimated publicly, the B.B.C. must certainly be looking forward to the time when great care must be exercised in any wavelength allocations, lest they burden themselves with a further opening for people to grumble at the service for matters outside their control.

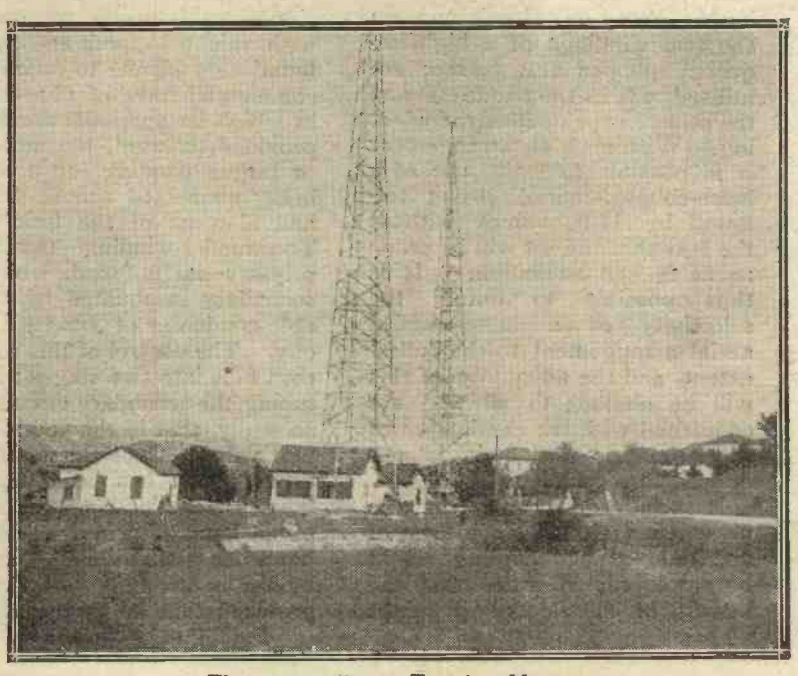
Truly may it be said, that no commercial undertaking, in the history of the world, is so dependent for its success on circumstances outside its control as a broadcasting company, and it would be well if some of the "heavy-handed" and perfectly "unsinkable" critics would consider this very carefully before they embark on their tirades.

The New 2LO

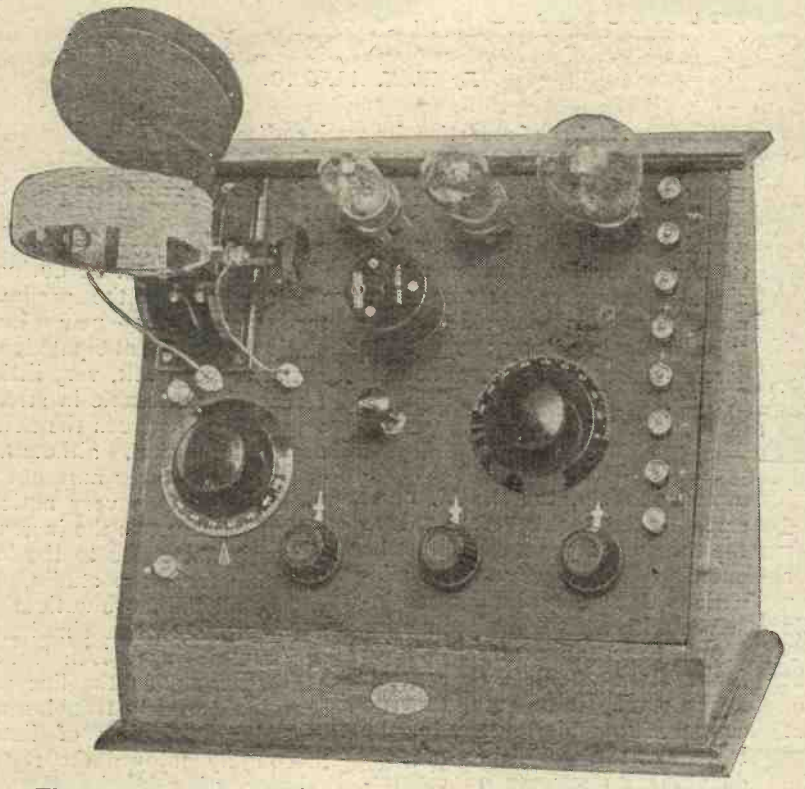
A point of interest during the week has been the preliminary testing of the new London station. As I anticipated in my remarks last week, very little difference is noticeable in strength, at 35 miles, between the new and the old station, although, of course, full power may not have been used. One very noticeable thing, however, is the increase in parasitic noise due to the longer land-line from the studio, which will be all the more noticeable, if not rectified, when simultaneous programmes are given from distant stations, as the line noises are already fairly troublesome.

A large number of listeners thoroughly enjoyed the re-transmission of 5XX by Pittsburg, KDKA, on Tuesday, March 3, about midnight and after. The whole thing was remarkably well done and reflects the greatest credit on the Westinghouse engineers.

(*Continued on page 827.*)



The new station at Tangier, Morocco.



The receiver, when completed, presents a business-like yet distinctly pleasing appearance.

Stability with

By JOHN

Neutrodyne receivers are popularity, and below is set in which the well- neutrodyning is employed frequency.

READERS of *Wireless Weekly* will need no introduction to the Cowper method of neutralising, and many will already be familiar with the modification suggested by Mr. Percy W. Harris wherein the two windings of a high-frequency plug-in transformer are utilised, one as the anode coil and the other as the neutrodyne winding. With such an arrangement it is possible to make use of a loose-coupled aerial circuit followed by H.F. valves without the fear that the set will be prone to fierce self-oscillation. It is thus possible to obtain the selectivity of a loose-coupled aerial arrangement to the fullest extent, and the advantage of this will be obvious to all who are concerned with the elimination of some station which it is not desired to receive.

It occurred recently to the present writer that some form of aperiodic aerial coupling might be employed, in order that the benefit of loose-coupling might still be obtained and at the same time simplifying the number of tuning controls necessary.

Tuning arrangements

The present receiver is designed, therefore, to conform with this principle, and will be found very simple to operate. A commercial form of plug-in coil, in which an aperiodic winding is provided, is used, the secondary or larger winding of this coil being connected across the grid and filament of the first valve. The smaller winding—that is, the primary—is unfuned, while the secondary is shunted by a variable condenser of .0005 μF capacity. The control of this receiver thus falls into two stages : firstly, tuning the secondary circuit, and, secondly, that in the anode of the first valve. Once the neutrodyne arrangement has been adjusted, it will remain constant for a given band of wavelengths, this band being that which is covered by the neutrodyne unit in use, provided that the high-frequency amplifying valve or its H.T. voltage, are not altered.

Panel Layout

Looking at the photograph of the finished receiver, we see that the aerial and earth terminals are on the left of the panel. These terminals are connected internally to two Clix sockets, which are situated just below the coil-holder. Connection is made from these Clix sockets by means of flexible leads to the terminals on the side of the special aperiodic plug-in coil utilised. This coil is plugged into the fixed socket of the coil-holder, while the moving socket contains the reaction coil. Coming now to the row of terminals on the right of the receiver, the top two are for the telephones, the second one being positive, the next three terminals are for high-tension positives in the order of 3, 2, 1,

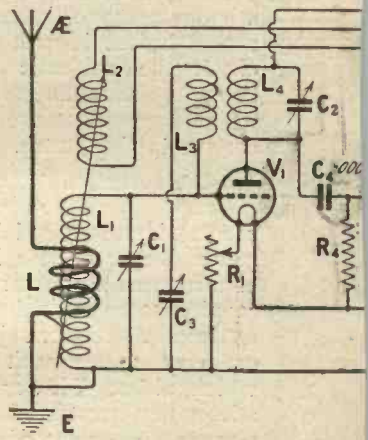


Fig. 1.—The theoretical circuit a separate

h Selectivity.

W. BARBER.

steadily achieving greater described a special 3-valve nown Cowper method of y means of a plug-in high- ransformer.

the next terminal is the high-tension negative, while the bottom pair of terminals are those to which the low-tension battery is connected. The three filament resistances are seen at the bottom of the panel, while the knob controlling the neutrodyne condenser will be seen below the plug-in neutrodyne unit. Another photograph given with this article shows the appearances of the set when the coils and valves of the set are removed, thus giving a clear idea of the layout.

The Circuit Diagram

Fig. 1 shows the circuit arrangement of the receiver, and it will be seen that the aerial is joined to the aperiodic winding L on the coil L1, the latter being tuned by the variable condenser C1. The coil L4 in the anode circuit of the first valve is one winding of the plug-in neutrodyne unit, the other being the neutrodyne winding L3, which is connected, one end to the grid of the first valve, and the other end to the fixed plate of the neutrodyne condenser C3, the moving vane of which is connected to the negative of the filament battery.

The second valve acts as a detector, reaction being provided for by the inclusion of the coil L2 in the anode circuit, while the last valve is a transformer-coupled note-magnifier. A small condenser should be provided across the primary of the inter-valve transformer in order to by-pass the high-frequency component of the current in that circuit.

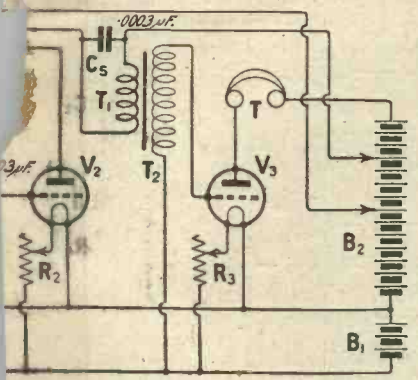
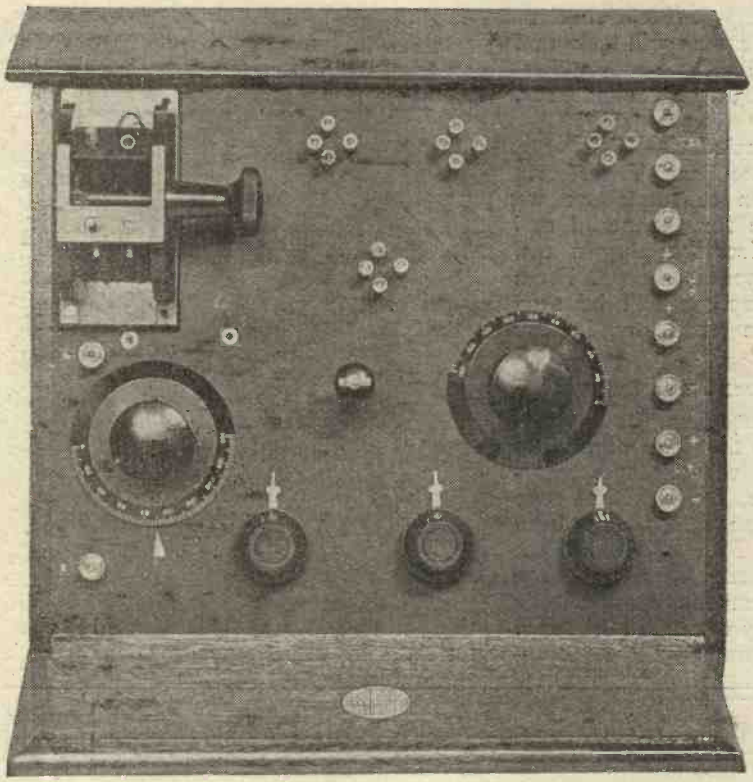


Diagram. Note that each valve has H.T. tapping.



In this photograph the coils and valves have been removed to allow an accurate conception of the layout.

List of Components Required

The following is a list of the parts used in this receiver, and for the benefit of those who wish exactly to duplicate it the names of manufacturers are given. It is understood, however, that this information is only intended to serve as a guide, and that other makes of components may be substituted for those named, provided they are of good quality.

One ebonite panel, 12 in. x 10 in. x ¼ in. (Peto Scott Red triangle.)

One cabinet of suitable size. In this case I have used a sloping front cabinet made by the Carrington Manufacturing Company.

One two-way coil-holder. (Burndept.)

One .0005 variable condenser. (Jackson Brothers.)

One .0003 variable condenser. (Jackson Brothers.)

One neutrodyne condenser. (Magnum.)

One neutrodyne unit. (Magnum.)

Three filament resistances. ("Royal," R. A. Rothermel, Ltd.)

Sixteen valve sockets, or, alternatively, four complete valve-holders. (Magnum.)

One low-frequency transformer. (Peto-Scott, Max-Amp.)

One .0003 μF plug-in condenser and clips. (McMichael.)

One 2-megohm grid-leak and clips. (Dubilier.)

One .0003 μF condenser. (Dubilier.)

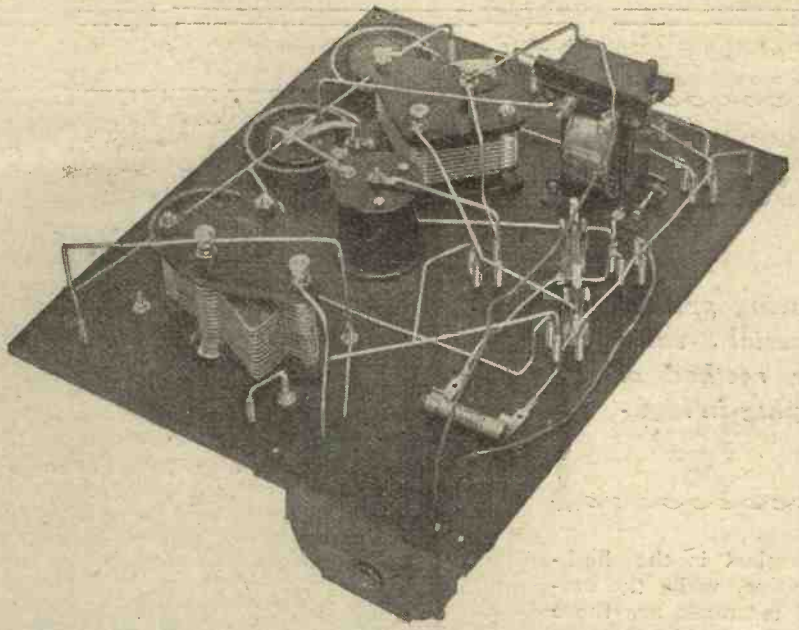
Ten terminals.

Radio Press Panel Transfers.

In addition to the above we shall require for the aerial and secondary circuit a plug-in coil of the semi-aperiodic type. From the photograph it will be seen that I have used an Igranic Unitune.

Considerations in Layout

The layout has been considered from the point of view of compactness without overcrowding the parts, and it will be seen that appearance has not been sacrificed. Fig. 2 gives all the necessary dimensions, and the constructor can thus mark out his panel directly from this drawing. In order to simplify the construction, a template should be used for marking out the positions for the valve sockets, if separate sockets are used, and one of the



The relative heights of many of the wires may be gathered from this photograph, which also shows clearly the mounting of the grid leak.

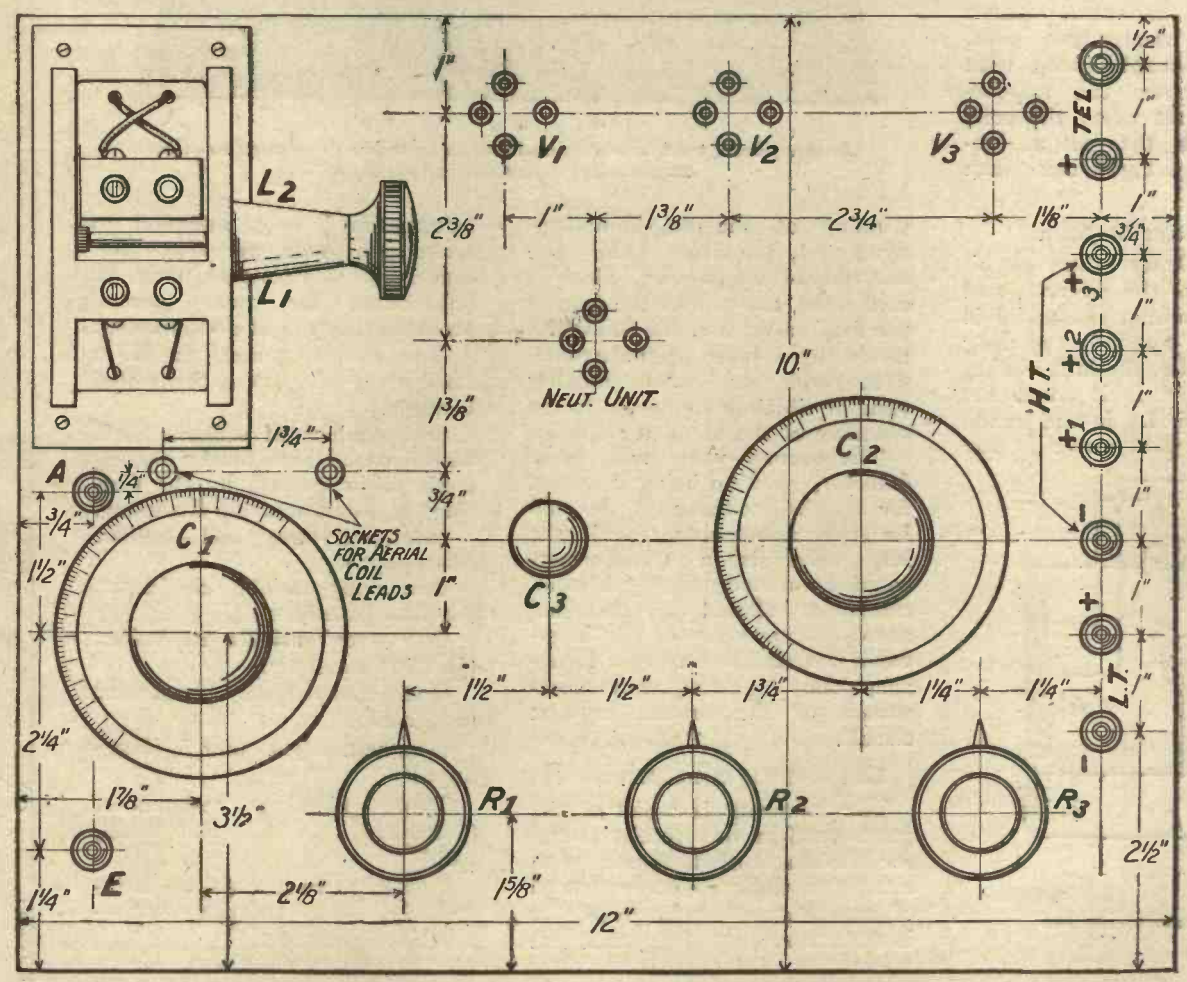
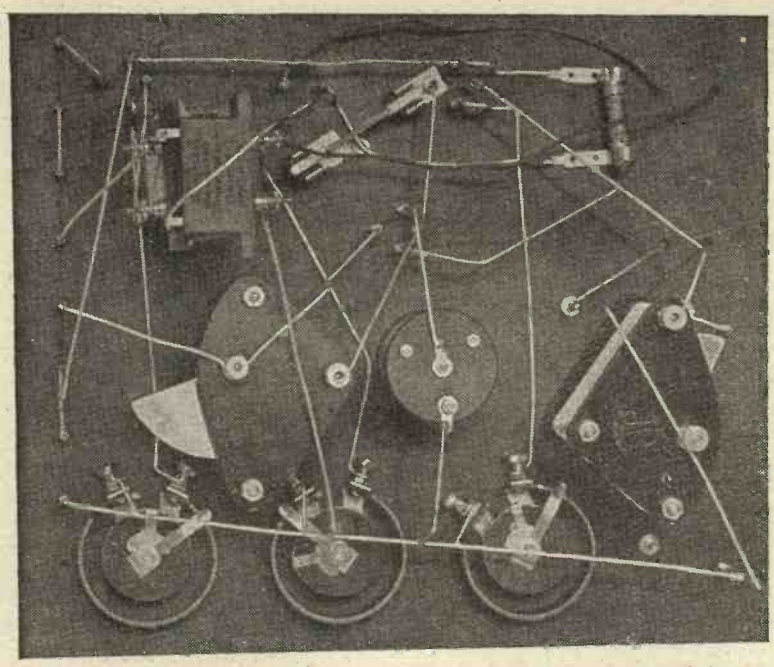


Fig. 2.—The drilling diagram. All necessary dimensions are given. If desired, a full-size blueprint may be obtained. Blueprint No. 104A should be quoted.



A helpful plan view of the wiring. If used in conjunction with the wiring diagram, all possibility of error is eliminated.

excellent commercial types, such as the Aermonic or the Morris, to mention only two, may be used. The template is placed on the panel in the desired position, given a light tap with a hammer, when it will be found that four marks have been made upon the panel in the correct position. It is then quite an easy matter to drill the necessary holes.

Tapping in the Terminals

It will be noticed from the back-of-panel photographs that the valve sockets and terminals are tapped into the panel, no nuts being used. This method of fixing these parts need not be adhered to if the constructor does not possess the necessary taps, in which case clearance holes should be drilled and the pieces secured by nuts on the underside of the panel.

The low-frequency transformer is secured to the panel by means

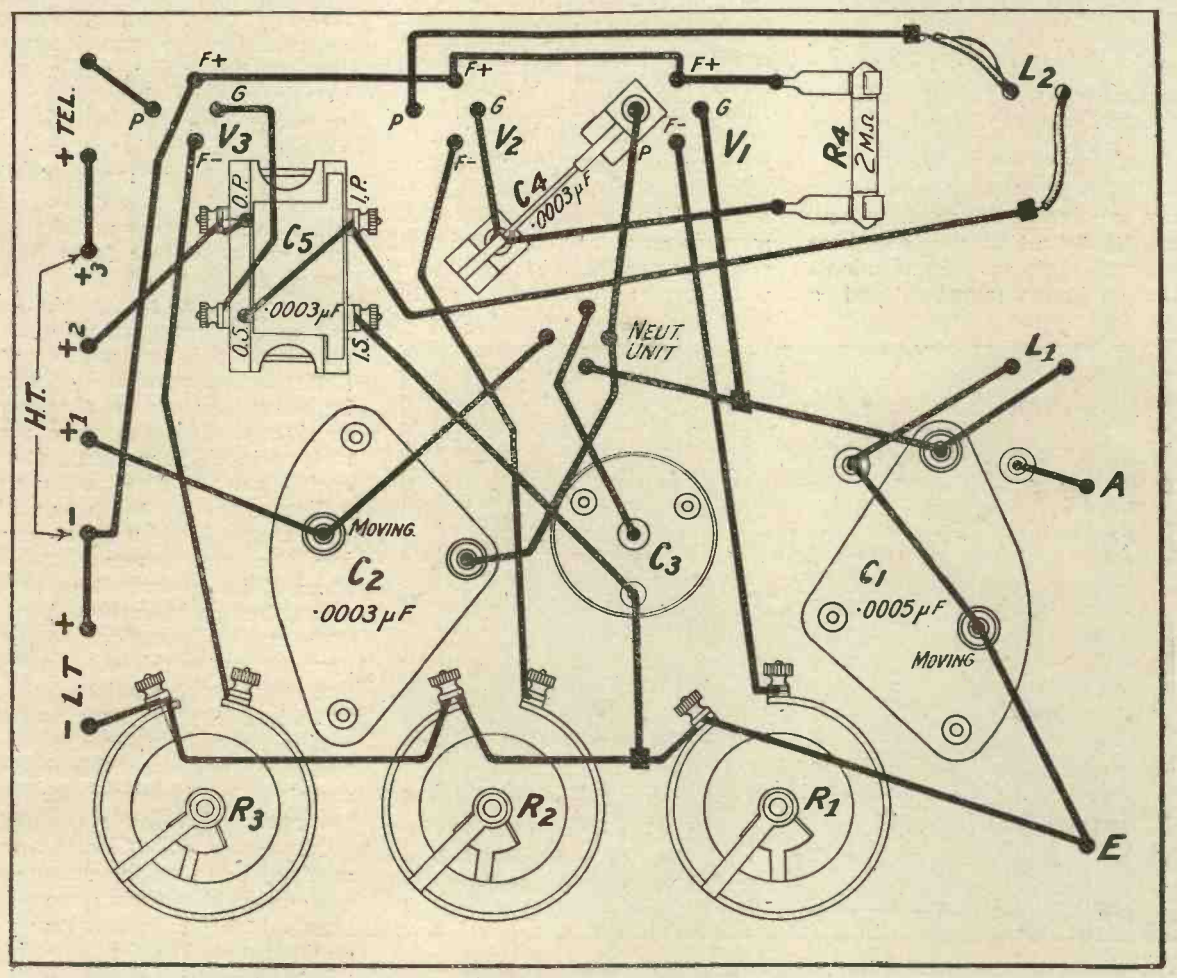


Fig. 3.—The wiring diagram, Blueprint No. 104B.

of " blind " holes, that is, holes which do not go right through the panel. The alternative method of drilling a clearance hole and countersinking it may be used, in which case bolts about ⅜ in. long will be required.

Mounting the Components

The components may then be mounted upon the panel, and this will present no difficulty. It may be noticed that the condenser dials are of a dissimilar nature to those supplied by the makers of the condensers named. This is actually the case, the dials used being known as the Collet dials, these being obtainable quite cheaply from most dealers.

Wiring the Receiver

When all the parts have been mounted in position, the wiring may be commenced. This is carried out with No. 16 tinned copper wire of round section, and the necessary connections will be quite easily followed from the wiring diagram. The back-of-panel photographs should also be consulted when wiring the receiver, in order that the different connections may be spaced to the best advantage.

Testing the Receiver

When complete the receiver may be joined up to an aerial and tested. As a first test, the three positive high-tension terminals may be joined together, and a single lead taken from them to a tapping on the high-tension battery. The semi-aperiodic coil is put into the fixed socket of the coil-holder, and flexible leads are taken to the Clix sockets upon the panel. A suitable reaction coil is plugged into the moving socket. Almost any good general purpose type of receiving valve may be used in this receiver, and the filament and high-tension voltages should be adjusted to comply with the maker's directions. In order to adjust the neutrodyne condenser, the reaction coil L2 should either be swung well away from the secondary coil, or replaced by a short-circuiting plug. The anode condenser is now moved over its scale, and it will then be noticed that the set will oscillate over a considerable portion of the dial. The stabilising condenser, which should, at the commencement, be in the minimum position, is then gradually turned, and it will be found that this adjustment will narrow the band over which the set will oscillate, as indicated on the anode condenser dial. Continue this adjustment very gradually until a point is reached when the receiver will not oscillate over any part of the anode condenser scale. The neutrodyne adjustment is now correct, and will remain constant for the band of wavelengths covered by the neutrodyne unit. The reaction coil may now be replaced in its socket, and tuning is then effected in the ordinary way by variation of the aerial and anode tuning condensers. The receiver will be found to be very easily operated, and will provide many hours of fascinating work, owing to the fact that one is able to obtain the maximum from a high-frequency amplifying valve when operating in these conditions.

Results Obtained

The receiver was completed a few moments before the London station closed down upon a certain evening, and during the few moments that remained excellent loud-speaking signals were obtained from that station at a distance of five miles, south-east, the signals being clear and undistorted, whilst the majority of the unpleasant mush which is frequently obtained with high-frequency amplifiers was absent. Immediately after 2LO had closed down the condenser settings were adjusted to the wavelength of the Madrid station, and this station was then brought in at excellent strength in the loud-speaker. Reception was, however, not by any means perfect, as, owing to the host of local oscillators, one was unable to obtain reception free from heterodyne whistles.

On a further test in the early evening, Birmingham was received on the loudspeaker at a strength not previously obtained by the writer on a three-valve receiver without neutrodyne control, no interference being experienced from the London station at a distance of five miles on a high 100-ft. aerial. During the evening the programme from 5IT formed the principal entertainment, but at intervals Aberdeen was received at good 'phone strength, although at times an annoying spark station right on top of 2BD's wavelength utterly spoiled reception, there being less than 5 metres difference in wavelength between the two stations.

Newcastle and Glasgow were received during a subsequent evening, while during the Children's Hour transmissions five stations were heard but not identified, as no call signs are given on these occasions.

Our photograph shows Madame Tetrazzini, who broadcast at the concert organised by the "Evening Standard," discussing the programme with Mr. A. R. Burrows, Director of Programmes.

Reception Conditions Week by Week.
(Concluded from page 821.)

Relative Difficulties

A great many people have spoken to me on the very much greater success which attended the experiment compared with the efforts of the B.B.C. to return the compliment and re-broadcast KDKA. In this respect, it is only fair to say that the difficulties in the two cases are not comparable at all. Firstly, 5XX is a 25 kw. station, and was ostensibly using every one of them. Secondly, the conditions of reception are fairly stable on the wavelength of 5XX, and most unstable and difficult on 68 metres, on which wavelength the transmission of KDKA is taken before it is passed on to the transmitter. Lastly, as most experimenters realise, high-frequency amplification is a vastly different proposition on 1,600 metres than on 68 metres, and it was possible for the American engineers to amplify the signals of 5XX to a very much greater degree, and with greater ease, than the B.B.C. could on the 68-metre transmission of KDKA.

The Value of Relaying

Nevertheless, these matters did not detract from the interest and value of the experiment in the least, and the outcome will undoubtedly strengthen the spirit of co-operation which will have such an important bearing on broadcast services in the future.

□ □ □

A Rough Test for Small Condensers

FEW experimenters are lucky enough to possess a means, such as the capacity bridge, of determining accurately the values of fixed condensers. So long as no components but those of thoroughly reliable make are purchased this does not matter very greatly, for condensers of well-known make seldom show a variation greater than 10 per cent of their stated value.

But it happens to all of us that we have occasionally to purchase a small fixed condenser of unknown make because we want one in a hurry and no other is available. Such condensers usually have a capacity which is anything but that claimed for them, and it is convenient to be able to test them roughly.

An Approximate Method

Here is a method which gives results sufficiently accurate for most purposes. To be able to use it, it is essential that the experimenter should possess a variable condenser of good make whose maximum capacity is known. It should *not* be of the square law type. Prepare a chart in the following way: On a piece of squared paper make a horizontal straight line, and mark it off into divisions representing, say, 0.0001 μF. Draw a straight line at right angles to this, making on it divisions corresponding to condenser scale degrees. Opposite the 180 deg. mark, and immediately above the division corresponding to the condenser's maximum, make a dot. Take its minimum as about 5 per cent. of the maximum, and make a second dot opposite the 0 deg. mark to represent this. Join the two dots by ruling a straight line between them. Your chart will now show you *roughly* the capacity for any dial setting.

Make up a simple crystal set, placing the condenser under test in parallel with the inductance in the circuit. With the wavemeter ascertain the wavelength to which the circuit is tuned. Now remove the fixed condenser, replacing it with the variable. Tune the circuit until it is in resonance with the wavemeter, and read off from your chart the amount of capacity needed to produce this result. You can then tell approximately what the capacity of the fixed condenser is.

R. W. H.

Lord Riddell, who recently broadcast from 2LO.

The instrument is quite self-contained and adds to the appearance of the instrument table.

An Improved Transmitters' Wavemeter

By PERCY W. HARRIS, M.I.R.E., Assistant Editor.

A FEW months ago (in *Wireless Weekly* for October 29, 1924) I described some experiments with transmitting wavemeter circuits and the construction of the instrument I finally decided upon. This has given me excellent service, and I am pleased to know that a number of readers have built this instrument with much satisfaction to themselves. As I have recently re-built the instrument in a considerably improved form, using practically the same parts, and as, moreover, the finished instrument matches the special form of receiver described in last week's issue, it occurred to me that a few notes upon it would not be out of place.

The Circuit

To save reference back to the previous article, I am reproducing in Fig. 1 the circuit used. It will be seen that the oscillatory currents set up in the circuit formed by the coil and variable condenser are rectified by means of a crystal detector and passed through a Weston galvanometer, a pair of telephones being included for the double purpose of providing a choke and enabling aural calibration to be given to the instrument when a suitable buzzer wavemeter is available. The calibration of such an instrument by a buzzer wavemeter cannot be particularly accurate, and I have found the best method of calibrating the instrument is to induce in it from a separate oscillator or heterodyne wavemeter already calibrated as a receiving wavemeter, currents which can be rectified by the crystal and give a visible indication. In such a case the telephones are used only as a choke, and it is not always convenient to have the cords hanging about the table. For this reason I substituted for the telephones on the original instrument an iron core choke which I had by me, and which had been used for experiments with choke amplification.

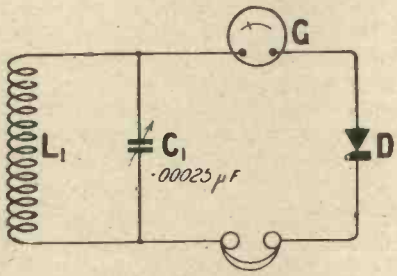
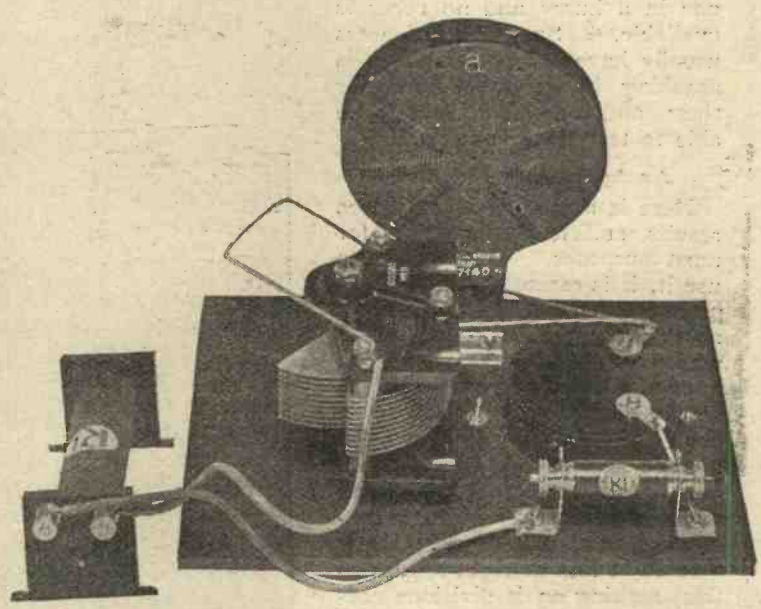


Fig. 1.—The circuit adopted.

No External Connections

By screwing this on the front of the box and connecting two short leads to the telephone terminals the wavemeter became much more compact. The original crystal detector used proved quite as satisfactory as most, but with the advent of a new R.I. permanent crystal detector, I lost no time in substituting this for the old form. Not only did one gain the advantage of stability of adjustment, but I immediately noticed the tuning became much



The panel removed from the cabinet and the choke coil standing alongside. This latter is screwed to the interior of the cabinet on reassembly.

It is a well known fact that the use of neat and compact apparatus encourages and facilitates accurate experimenting. This article describes an improved form of the wavemeter Mr. Harris has previously described.

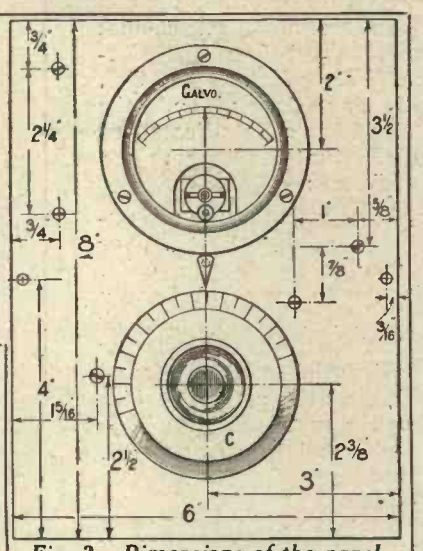


Fig. 2.—Dimensions of the panel and other details.

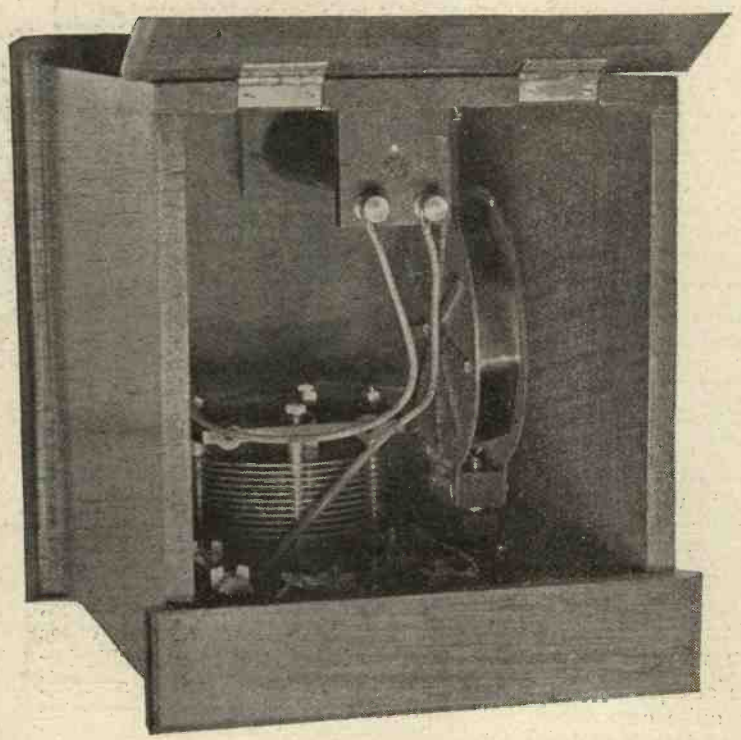
sharper, due to the particular form of rectifying minerals used.

Crystal Inside

Furthermore, there was no longer any necessity for the crystal detector to be outside the instrument so that both the choke and the crystal could be placed inside without any disadvantage. It immediately occurred to me to rebuild the apparatus on a vertical panel in such a way that the choke coil and crystal detector were all inside, and as there are no terminals for exterior connections, all that need appear on the front of the panel were the dial of the condenser and the scale of the galvanometer.

One Panel Only

For convenience of construction an endeavour was made to mount all the components on the one ebonite panel, but it was found that without making the box unduly large it was not convenient to place the choke upon the same panel. For this reason it was attached to the back of the box and two flexible leads from the front panel taken to it. A coil socket, facing inwards, is so placed that when the box stands on the table the coil is held in a vertical plane and thus will pick up currents from the transmitter with facility. In actual practice the wavemeter is kept two or three feet away from the transmitting apparatus, and is permanently in position on the right of the receiver, the cabinet of which matches in height and depth and general finish. Change of coils for different wavelength ranges is easily effected by lifting the lid and withdrawing the coil from the socket, substituting the desired coil in its place.



Looking down into the cabinet to show the position of the choke fixed to the back of the cabinet.

Calibration

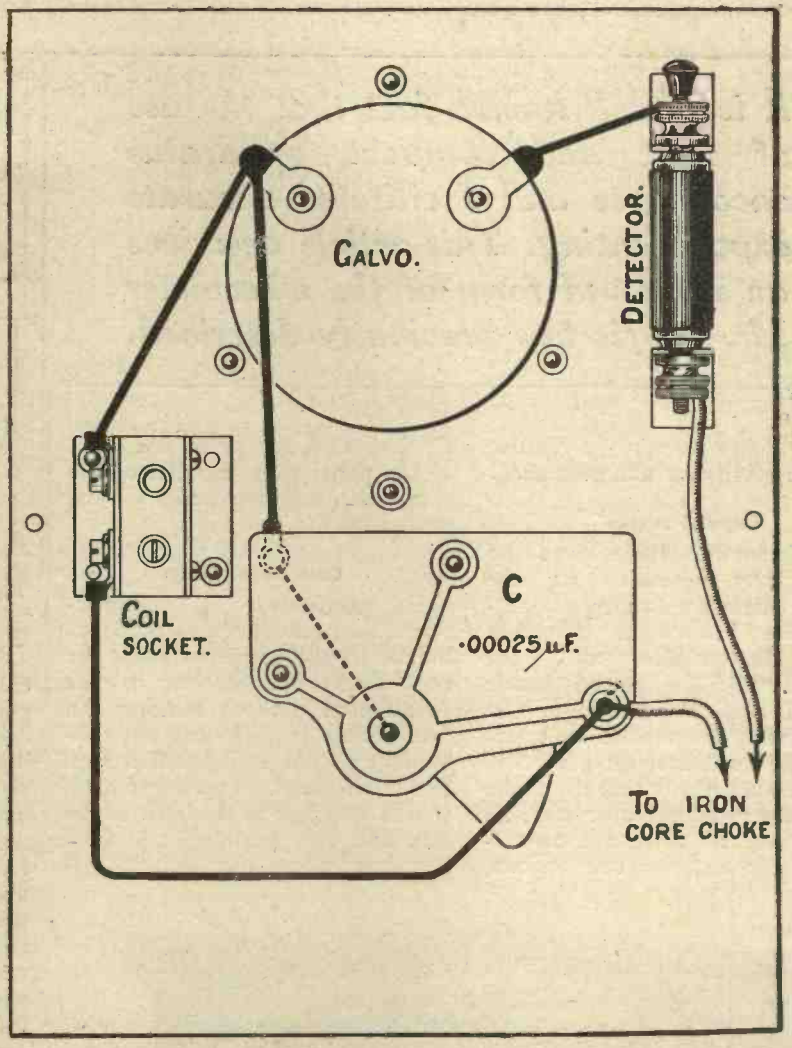
As mentioned above, the calibration is best effected by bringing the transmitting wavemeter near to a calibrated receiving heterodyne wavemeter. At about a foot away there will be a deflection of several degrees of the galvanometer needle. In this way cross calibration from the receiving heterodyne wavemeter (described in *Wireless Weekly*, Vol. 3, No. 7) is very easily effected.

Components

The new crystal detector and the choke are both of R.I. manufacture, the square law condenser of .00025 μF capacity is of

Sterling make, and the galvanometer is a Weston, while the coil socket is a Magnum. The cabinet can be obtained from the Carrington Manufacturing Co., through any dealer, and the ebonite panel is a Peto-Scott Red Triangle. Suitable coils to use are as follows :—

For the 90 metre range a Gambrell small a, Burndept B, or other similar short-wave coils. For the 150 to 200 metre band a Gambrell A, Burndept S2, or similar coils. Suitable coils for any wavelength band can be found by consulting the makers' tables showing the tuning range with a .00025 μF condenser in parallel, but without aerial or earth. In acting from these tables do not run too close to the makers' minima, as these are often "idealised" and for some reason or other are not always realisable in practice!



Wiring diagram to scale. Flexible leads go from the detector and the condenser fixed plates to the choke terminals.

High Tension from Flash Lamp Batteries

HIGH-TENSION batteries can often be an expensive item of the wireless installation, and a great saving may be made by making up one's own batteries from flash-lamp refills when the set in use is not of the multi-valve type. Not only is this method very cheap, batteries at 4s. a dozen being quite suitable, but as the cells become exhausted it is an easy matter to remedy the fault by replacing defective cells by others.

It is best to solder all joints, as this does away with noises through bad contact between the connections. The long strips, which are negative, may be bent over, tinned, and connected to the shorter positive strips. It is most convenient to make up these batteries in batches of twelve, giving a nominal voltage of 54. If possible, the batteries should be dipped in paraffin wax before connecting up, as this prevents all chance of leakage, and also helps to hold the batteries in one solid block.

Clips similar to the old type of tie clips are suitable for taking tappings.

A. S. C.

Methods of Wiring up Sets

THERE are in general use three different ways in which a set may be wired up, namely, with square-section wire, large-section round wire, and Systoflex wiring. The last method is perhaps the easiest in that, owing to the fact that the wire is insulated, shorting between two wires is prevented.

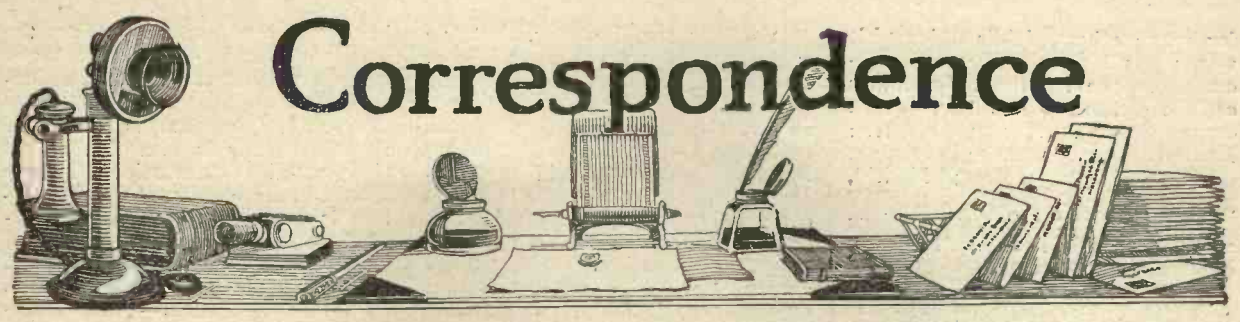
The use of square wire is now becoming quite common, and if this method is adopted the wire should be kept as straight as possible, and all bends should be right angles if good appearance is to be preserved. Good spacing should always be paid attention to.

Round Wire

In the case of round wire the job of wiring is much the same, though perhaps quicker, as the wire may be bent by hand. Spacing should still be attended to as before.

There is no doubt that whatever type of wiring is utilised all connections should be soldered, except in a few special cases where it is better to use soldering tags. Although wires screwed under terminals and nut may give just as good results as soldered joints at first, they may give trouble later as a result of the nuts working loose.

A. S. C.



Correspondence

"THE FOREIGN RADIO TIMES."

SIR,—I consider your *Foreign Radio Times* an absolute necessity, and am sure you will soon find a demand for increasing its scope.

Personally, I vote for the immediate inclusion of Madrid, a station which I enjoy frequently.

I don't want *any* stations cut out, but if quite necessary then cut out one of the German-speaking ones and include one of Spanish.

Wishing your enterprising paper the success it deserves.—Yours faithfully,

A. H. SAUNDERS.

Woodford Green.

SIR,—My purpose in writing to you is to compliment you on the list of foreign station transmissions published in *Wireless Weekly* of March 4. This is surely a new feature which will be of great interest to all listeners-in, and should therefore be worked out in all possible detail. I would therefore suggest that it would be well *worth while* to devote as many pages to this feature as would be necessary to enable you to give the full programmes for the week. No other paper published in England gives so many particulars of foreign programmes as yours. I study daily the programmes given in *The Times*, the *Daily Mail* and *The Radio Times*, but I find many variations in these papers as to wavelengths of the stations, and the programmes are given in such a confused way that one has to waste a lot of time before getting a clear idea of the foreign programmes and their times.

Your paper, which I had before me on March 7, was a *great help* to my listening-in to foreign stations. I am sure your note that Zurich was giving some English songs would enlighten many people who thought they were hearing an English station.

I listened-in to all the stations of your programme on March 4 except America, and I think it would be useful and interesting if in future you could also give particulars for Brussels, Münster, Breslau, Stockholm and Frankfurt. Most of these stations come in in full strength.

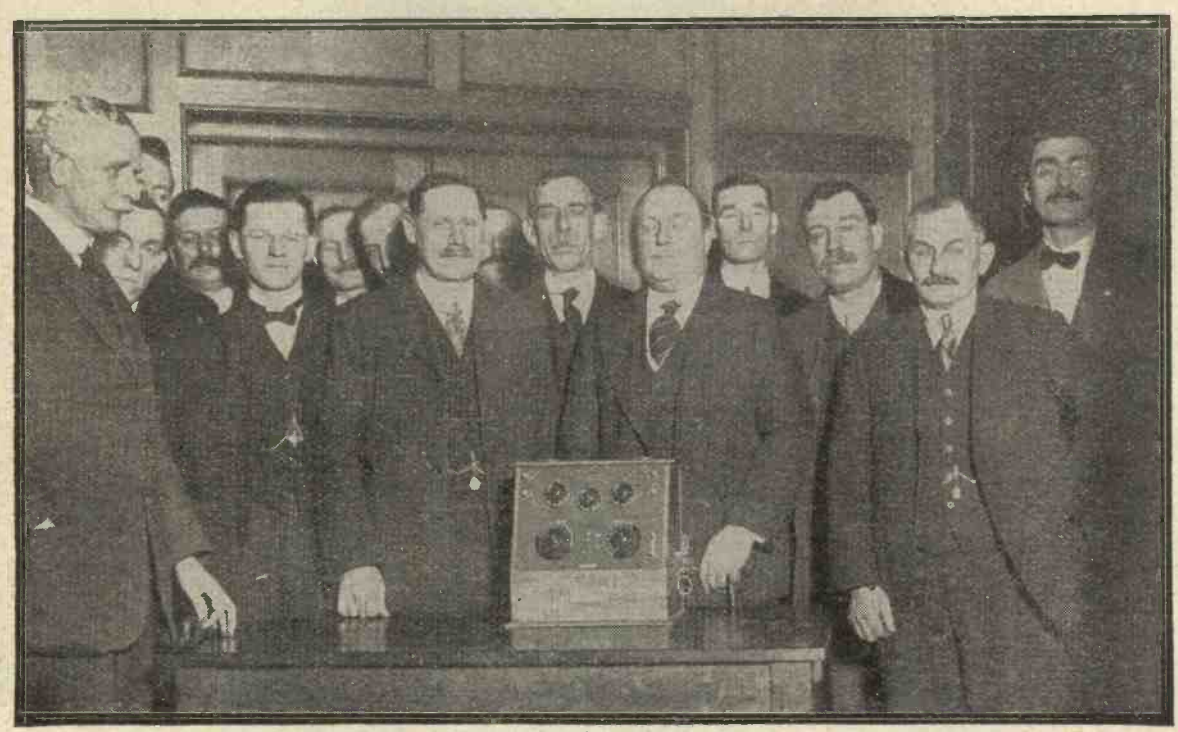
May I suggest that in printing the programmes the stations should be *arranged according to their wavelengths*, i.e., from Brussels to Paris Eiffel Tower, and perhaps Königswursthausen.

Please excuse me for asking so much, but as you invite suggestions I am taking the liberty of making this one, which I feel sure would be welcome to many listeners-in.—Yours faithfully,

P. TROWBERRY.

Bradford.

SIR,—As a regular reader of your paper, I should like to express my approbation of your new feature, *The Foreign Radio Times*, which, speaking for myself, and I am sure



***Sir Arthur Stanley** (with walking stick) accepting a wireless set for St. Thomas's Hospital from the drivers and firemen of the Nine Elms Loco. Depot.*

for many others, fulfils a long-felt want; but I should like to see included in the list the programmes of the following stations, which come through very well here: Radio-Belge, 265 metres; Hilversum (Holland), 1,060 metres; Madrid, 392 metres.

Also some of the German stations are very good, such as Munster, Breslau, etc.

A four-valve family receiver made by Mr. F. W. Wenham.

We find Radio-Paris is about our best foreign station, the German relays also coming in very well.

Our set is a home-made "All-Concert" three-valve and one-valve amplifier, as described by Mr. Harris in "12 Tested Wireless Sets," and we are very satisfied with it. Our "bag" includes some 30 odd Continental stations, and we can get all B.B.C. stations, main and relay, with the exception of Swansea.

We have also had U.S.A. several times, KDKA and WBZ coming through at excellent strength, and among others WGY and WOR.

Hoping you will continue this excellent feature, and wishing your paper every success.—Yours faithfully,

F. S. WALBURN.

Colwyn Bay.

SIR,—You ask for the opinions of readers with reference to the new feature, *The Foreign Radio Times*.

First of all let me say that I think that it is an excellent idea, and one that will be of great use to all readers. I have often wished that some such programmes could be obtained.

It strikes me, however, that the selection of stations is not the best. The four Paris stations everybody wants to know about, but I am not so sure about Vienna. Two serious omissions are Brussels (Radio-Belgique) and Madrid (Radio-Iberica). Both of these stations come in at good strength in this neighbourhood. Also with regard to the American programmes chosen, I should say that the ones wanted are KDKA, WBZ and WGY. Of the Continental stations Munster and Hilversum are also received in the North of England and might be included.

It will, of course, be far better when you can make arrangements to include the full week's programmes.

In conclusion, I should like to say that my set is a three-valve ("All-Concert") on an indoor aerial, and I can get all the Paris stations, Brussels, Hilversum, Madrid practically any night.—Yours faithfully,

J. H. S. JONES.

Chester.

SIR,—I am much interested in your *Foreign Radio Times* Supplement, and hope you will be able to extend it.

I read your three periodicals, *Wireless Weekly*, *Modern Wireless* and *The Wireless Constructor*, and am much interested in them. I might say that I have read each of them from the first number, and have nothing but praise for the excellent circuits, etc., depicted and described. With regard to the Continental programme, I am sorry that SBR (Brussels) is not mentioned, as this is one of the best Continental transmissions in the North of Ireland so far as reception is concerned. Also, with regard to the American stations, I would suggest the inclusion of WBZ and WGY, both of which "come in" very well here.—Yours faithfully,

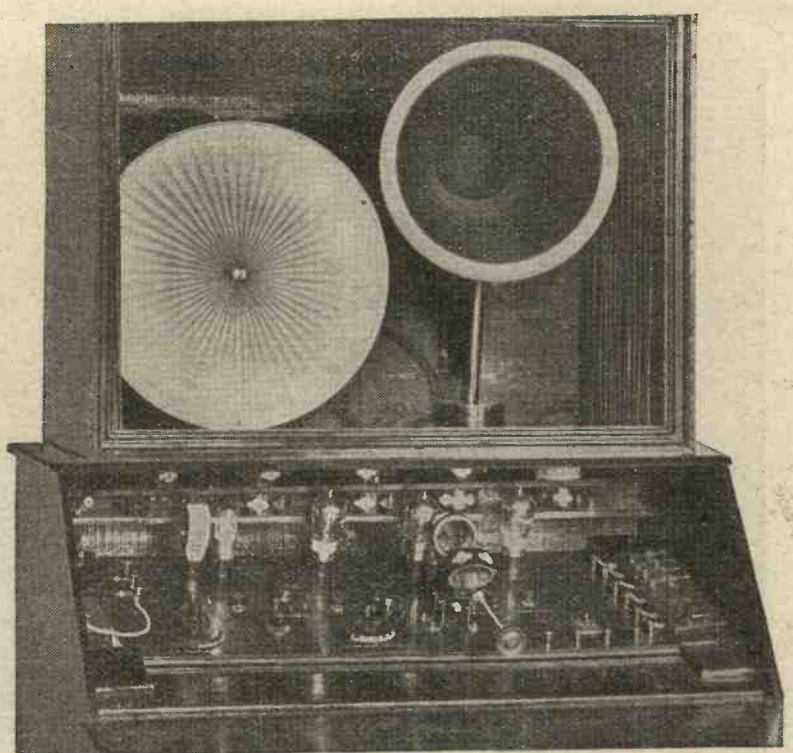
J. E. DAVIS.

Belfast.

SIR,—Referring to your new feature, *The Foreign Radio Times*, edited by Captain Plugge, I think you are to be congratulated on this exceedingly useful compendium of information.

The putting before listeners-in of the actual programmes of foreign stations is likely to give them far greater interest and enthusiasm for long-distance reception than the previously published bald information that news bulletins, concerts or talks were "on" at certain times. Indirectly the table given will probably call for improvements in the design and sales of really first-class apparatus for D.X. work and thus be a stimulant towards "better radio."

"The only improvement which one could suggest is that the usually employed call formula used by each station with phonetic equiva-



The loud speaker for use with Mr. Wenham's receiver is concealed behind the curtain seen in the former photograph.

lents (" Ici Radio Paris "—" Eesee Rahdeeoh Pahree, etc.") should be printed with the other station information.—Yours faithfully,

W. J. RICKETS, A.M.I.E.E.

Peckham, S.E.15.

SIR,—I suggest that *The Foreign Radio Times* should be a real supplement and easily detachable from the main body of *Wireless Weekly*.

The Sunday programme should be as complete as possible.—Yours faithfully,

E. G.

Wateringbury.

SIR,—Congratulations on your enterprise, *The Foreign Radio Times*. This new feature will make *Wireless Weekly* more valuable than before, and may I suggest that Radio Belge be printed if possible?

Trusting you will continue *The Foreign Radio Times*.—Yours faithfully,

H. R. HARDIE.

Twyford, Berks.

SIR,—I would like to congratulate you on the excellent supplement appearing in *Wireless Weekly*. A paper such as *The Foreign Radio Times* has been a heart-felt need for some time, and I am pleased to see that you have again been the first to realise the requirements of wireless amateurs in this country.

Wishing you all success with your untiring efforts.—Yours faithfully,

W. A. BAKER.

Brighton.

SIR,—I wish to congratulate you on again leading the way in the radio world by being first to publish complete foreign programmes. It seems to me to be a very great step and one which will be appreciated by numerous listeners-in who previously could not follow very accurately the announcement of programmes from foreign stations.

Wishing your new venture great success.—Yours faithfully,

M. D. ANDERSON.

Peckham, S.E.

SIR,—I am very interested to note your supplement in *Wireless Weekly*. I think it is a splendid addition to your already invaluable paper.

The wavelength and power of these Continental stations are specially useful, and I am now able to distinguish stations to which I have tuned in.

I am glad this supplement is a regular one, and wish it every success.—Yours faithfully,

H. STANLEY.

London, N.W.3.

INTERACTION BETWEEN AERIALS

SIR,—I was exceedingly interested in Mr. Harris's remarks in Random Technicalities regarding interaction between receivers and transmitters in the same room. I imagine this is the first notice the matter has received in any journal, and the problem is one that has interested me for some time.

Signal strength in a given receiver whose abilities are known does vary periodically, as also does the selectivity achievable. One is, perhaps, a little too prone to blame, say, 2LO for varying their power input when these changes take place.

Experiments very similar to Mr. Harris's have led me to the conclusion that interaction is to blame for a good many phenomena of this sort that are usually put down to some entirely different source. Very curious results can be experienced when a house is wired throughout with a system of loud-speakers, as is my own. One experiment I have tried is to tune the aerial lead in and then place several sets in the same room and in

another room. These sets have no physical connection with the aerial system, but so long as the aerial is tuned it will be found that reception will occur in each receiver, even when it is some distance from the tuned aerial or in another room. When two or more aerials of different types are in use the interaction is very strange. I have been able to reduce the wavelength of a receiver from 200 to 60 metres by making use of this interaction between various aerial systems. By this I mean enable a receiver which has a normal minimum wavelength range of 200 metres come down to 60 metres temporarily.

It is found also that if a valve receiver is in use in a house close to my own the variation of tuning in this receiver can affect the tuning of my own when I am tuned to a weak distant station. There is no other aerial really close to my own aerial.

While experimenting with transmission on very short waves, such as *one* and *two* metres, I have found interaction effects very marked. Another receiver left tuned by accident will have a great effect upon both the aerial current of the transmitter and the wavelength. I have found it necessary to totally enclose my transmitters in a shield and also work them in another room before I could avoid this interaction.

But several interesting lines of thought spring from an experience such as this. There appears here to be a type of absorption of energy or signal strength which contradicts the idea that additional receivers in any one district have no effect upon the strength of the reception in those previously existing. It also gives point to a theory of my own that certain types of fading are due to absorption by an interfering station which is not sufficiently close to the received station to be actually audible in the receiver. Again, it leads to a line of work in the problem of the elimination of static, since I have found myself by using a receiver in a room where there are other receivers tuned to various wavelengths it is possible to eliminate static in the receiver in use by varying the tuning of the receivers not in use.

This may seem very involved, but it is the result of actual experience. The reason I am not able to give more definite data is purely owing to the amount of other work I have on hand having prevented me from following up the line of experiment.
—Yours faithfully,

EDWARD C. DAVIES.

Highgate, N.6.

TWO WIRING HINTS

SIR,—Please find enclosed two hints for set wiring, which may be of use to you.

They have been employed in instrument works, and save a good deal of time.

To prevent mistakes when wiring a useful dodge is to draw a sketch of the panel with a piece of carbon paper, face upwards, underneath. The terminals and the over-all outline of the components are also drawn in position. If the wiring is now added it can be put in the actual positions that the connections will occupy.

Upon turning over these will be shown as viewed from the underside of the panel and so avoid the error of mistaking the ends of the panel.

A very convenient method of supporting a panel during wiring is to make four legs of brass rod. They can be made of screwed rod of a size that will slip through the fixing holes in the panel. A washer of about ¼-in. diameter should be soldered about 2 inches from one end of each, then a cloth washer to go between this and the panel. A nut should be used to fasten the legs to the panel so that it can be moved without the legs falling out. The length of the legs will depend upon the height of the projections on the panel.—Yours faithfully,

Charlton, S.E. F. C. BRYAN.

THE FOUR-VALVE FAMILY RECEIVER

SIR, — Having constructed the "Four-Valve Family Set," from Radio Press Envelope No. 2, by Percy W. Harris, M.I.R.E., I thought you would be interested to see some photographs (page 832), including the home-made cabinet. The panel and loud-speaker, etc., are all enclosed. Also the accumulator and batteries are out of sight, and the whole presents a neat piece of furniture, and all is tidy.

The construction of the cabinet was my first experience at woodwork and I found it most interesting and not so difficult as I anticipated. The finishing was more trying, as I tried french polishing for the first time; this calls for patience, but one is well rewarded by the results.

I have arranged a fixed frame aerial in the top part of the cabinet, so in case of lightning I can disconnect the outdoor aerial and switch over to the frame. S.P.S.T. Battery switches are provided, so that anyone not used to "tuning-in" can switch on without interfering with the filament resistances or wander plugs. A D.P.D.T. switch is also added for either loud-speaker, one of which is permanently installed in the cabinet and the other used in various parts of the house. I have fixed Oriental muslin in the top part of the cabinet, which hides the loud-speaker but allows the sound to pass through. Wishing you all success.—Yours faithfully,

F. W. WENHAM.

London, W.13.

AN IMPROVED TWO-VALVE RECEIVER

SIR,—I have recently completed the Improved Two-Valve Receiver by Stanley G. Rattee described in *Modern Wireless* of January last. I am getting excellent results, using constant aerial tuning, all B.B.C. stations, including Aberdeen and Birmingham, both of which are very difficult to tune in here. My place being subject to interference from local picture house, electric pumps, ice-cream mixers, dough mixers, etc., Bournemouth, notwithstanding, comes in at excellent strength on loud-speaker.—Yours faithfully,

Paignton. HAROLD SANDERS.

THE TRANSATLANTIC V.

SIR,—I am writing you concerning my excellent results which are obtained with Mr. Harris's "Transatlantic V," described in *Modern Wireless* of June, 1924.

The general appearance of my set is identical with the original, the panel being 22 in. by 11 in., and all measurements being as given.

The radio-frequency circuit is exactly copied from the article, but on the audio-frequency side I have used transformer (2 Ferranti H.D.) coupling, which causes no trouble and gives very pure amplification. I have used two Utility lever switches, by which means I can use 3, 4 or 5 valves. The L.F. valves are two Marconi R type.

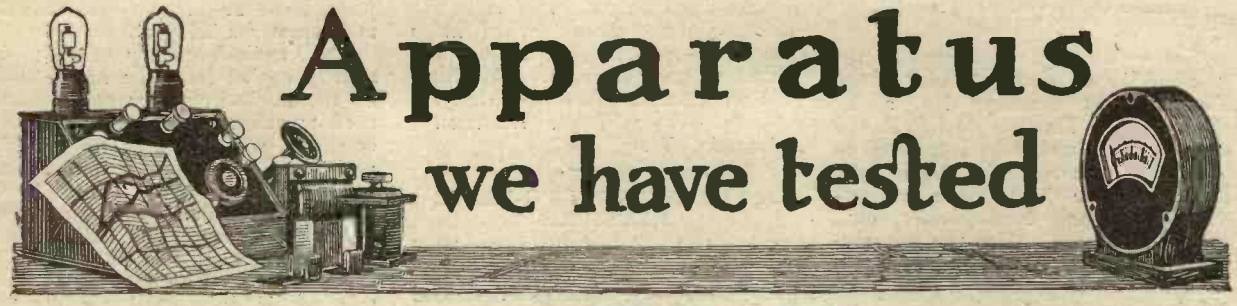
No fears need be entertained that this set is only good for distant stations, for Chelmsford is received on it most clearly and with a tremendous volume. All B.B.C. stations are received at excellent loud-speaker strength (Amplion Dragon standard), together with three relay stations (Leeds, Plymouth, Swansea), all of which can be received on the phones.

This set seems to have a special attraction for German stations—Cassel, Nuremberg, Hamburg, Munster, Breslau, Stuttgart, Koenigsberg, Frankfort, Leipzig, Munich and Berlin being all received well on the loud-speaker. Munster and Berlin often threaten to exceed Cardiff in volume!

Trusting that this will be of interest to you and to your readers.—Yours faithfully,

JOHN F. WEBBER.

Exeter.



Apparatus we have tested

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

Lissen Radio Chokes

Messrs. Lissen, Ltd., have submitted for test a sample of their radio-choke, of high inductance and small effective distributed capacity, for use in Reinartz reaction circuits of the modern type, and for other purposes for which such a choke is indicated. This is uniform in appearance with their low-frequency or audio-choke, being mounted in a moulded case 1¼ in. diameter by 3¼ in. high, on a flanged base drilled for fixing behind the panel or on a baseboard by two small screws. Small terminals on the upper surface of the same flange provide for electrical connections. The whole would occupy a space of about 3 in. by 1⅝ in. on the panel, of lozenge shape. We gather that this choke has a very large number of turns of fine wire, pile-wound, on an ironless core, giving small effective capacity but the necessary very large inductance; on practical trial, it was found to be adequate up to and beyond the wavelength of Eiffel, when used in a Reinartz type of receiver with only the 'phones as effective impedance in the plate circuit, with a hard R valve and limited H.T., giving smooth reaction and good oscillation control when using a fixed Reinartz reaction-coil of moderate size.

An earlier pattern of Lissen radio-choke of narrow disc type for direct mounting on the terminal of a reaction condenser has also been tested, and showed the same useful range as this later pattern; the earlier type has been referred to elsewhere. Either pattern is eminently suitable for use in a Reinartz receiver with fixed plug-in coils, to cover the whole available telephony range.

The finish and workmanship of these chokes was up to the usual good standard set by Messrs. Lissen, Ltd.

A Large-Range Filament Resistance

From Messrs. Gerrard Radio Stores come samples of their new pattern of micrometer-adjustment filament resistance, giving an unusually large range. An earlier pattern of this instrument was reviewed in these columns some time ago. The customary one-hole fixing is provided, with a range from ⅛ inch to about 5-16 inch for panels of varying thickness. Connections

are made to small soldering tags; a comfortable, large controlling knob is provided on the spindle, secured by a substantial grub-screw. The available range, on trial, was from about 1 to 150 or 200 ohms, with several turns of the knob. In the early samples submitted, the action was somewhat irregular for purely mechanical reasons; this will doubtlessly be remedied by the makers in later patterns when production is fully organised. The range of possible fine adjustment is very great in this device; the common difficulty of "packing" inherent in carbon-compression rheostats appears to have been largely overcome here. We shall be interested in any future development of this type of mechanism for overcoming the packing difficulty, as there are many possible applications of a large-range carbon variable resistance in experimental work, apart from the need for such an instrument in valve receivers when D.E. valves are adopted.

Cartridge Filament Resistance

We have received from Messrs. Enterprise Manufacturing Co., Ltd., several samples of their "Micrometer Filament Dimmer," in which the resistance element takes the form of a small cartridge, introduced into a cylindrical fitting of the usual one-hole-fixing type. The casing is about 2 inches long by a little under ¾-inch diameter, and is similar to that of a variable grid-leak with cartridge inset, already reviewed in these columns. The cartridge is also in the form of a rubber tube, ¾ inch long by 7-16 inch diameter, with brass end-plugs, and contains the carbonaceous resistance powder. Four different ranges are provided by the makers, nominally from 0 to 5, 10, 20 and 30 ohms respectively. Those tested were marked 0-5 ohms.

On practical trial the resistance-range was from about 0.4 to 100 ohms in each sample, but the adjustment was jerky above about 30 ohms. The range from .4 to about 30 ohms was covered swiftly, in one-half turn of the controlling knob. For turning on and off a bright-emitter type of valve, requiring an adjustable filament-resistance of only a few ohms for adequate control of not too critical nature, these cartridge resistances will evidently suffice for the range indicated by the makers. It is an obvious advantage to be able to replace the low-range cartridge by one of higher rating when changing over to D.E. valves from bright-emitters.

"L.E.S." Micro Filament Control

Samples of the latest pattern of their fine-adjustment filament-controlling resistance have been submitted by Messrs. London Electric Stores, Ltd. This is of the familiar cylindrical, one-hole fixing type, measuring 1⅝ inch long below the panel, by ⅞-inch diameter. The fixing device (the usual screwed collar and bush) will accommodate itself to panels ranging from ⅛ inch to ⅜ inch thickness—a commendable feature. A substantial knurled insulated knob is provided on the controlling spindle; connections are to be made to soldering tags on small terminal screws on the side of the barrel.

On test the different samples showed a steady adjustment from about 0.3 to some 200 or 300 ohms maximum, with smooth, silent variation, easily controlled, between these points. In actual reception, smooth control of a detector valve and of self-oscillation became possible; and D.E. types of valves could be operated safely from a large accumulator battery.

The various samples showed a uniformity of behaviour, and appeared to be soundly constructed and well finished. We can recommend this type of filament resistance, particularly for use in critical circuits requiring fine control.

Lissen Neutrodyne Condenser

A very neat type of "neutrodyning" condenser for use in various types of H.F. amplifying circuits in which the valve-capacities have been partly or wholly neutralised by some feed-back device involving a very small, adjustable condenser (in order to achieve stability when a lightly-damped first grid circuit, or where many stages of H.F. amplification are involved) has been submitted by Messrs. Lissen, Ltd. This small instrument is of the usual one-hole-fixing type, and, in fact, recalls a carbon-compression type of filament control, being contained in a small cylindrical case only 1½ inches long by 1-inch diameter. It is actuated by a long, knurled-top ebonite knob; the usual small soldering-tags on small screws in the side are provided for connections. The instrument is of the two-plate variety, having one fixed circular plate at the end of the container and a moving plate advanced towards the former by a micrometer-action controlled by the external knob. On measurement, the minimum capacity, eliminating the capacity of the leads, was about 0.9 $\mu\mu$F with the plate screwed out to the full distance of some $\frac{5}{8}$ inch; the maximum available, just before the plates touched, was around 7.7 $\mu\mu$F, giving a suitable range of adjustment and the necessary very low minimum for an effective neutrodyne condenser. Tried in the tuned-anode modification of the Hazeltine neutrodyne circuit advocated by the writer, it proved to give excellent control, and effective neutralisation of plate-grid capacities with a very lightly-loaded grid circuit and full negative grid-bias, using a neutralising coil in a two-coil holder of about the same size as the tuned anode coil itself, and fairly closely coupled to the latter.

The instrument is well finished, and operated extremely smoothly; we can, accordingly, recommend it for the purpose indicated, as well as for final fine-tuning in critical circuits, for which purpose the compactness of the instrument will give it a special appeal.

Micrometer Crystal Detector

We have received from Messrs. The General Electric Company a sample of their "Micrometer" crystal detector, fitted with a "Gecosite" crystal. This detector is of the horizontal glass enclosed type, fitting between spring supports on an ebonite base $2\frac{5}{8}$ in. by 1½ in. The latter has screw-holes for fixing on the panel, etc. Substantial plated terminals on the base provide for connections. The instrument was dismounted with much greater ease than usual, and was firm and secure when reassembled. The crystal is secured by a flanged knurled ring screwing on a cup base fixed to one end of the case, and is immediately accessible for replacement or re-adjustment in its holder. A special point is the micrometer adjustment of the whisker, which was found, on trial, to work with the most delightful delicacy and certainty, and to give a light contact with the excellent springy whisker provided. The adjustment was not easily disturbed by vibration. The whisker-holder is mounted in the ordinary type of ball universal joint, but rotation of an insulating knob at the end of the adjusting rod advances or withdraws the former by a fine micrometer screw action, a spiral spring taking up all back-lash.

This detector has evidently been the subject of very careful design. The workmanship and finish are excellent, and the insulation resistance of the base passed severe test. We might suggest that the area of crystal surface exposed by the holder is rather unduly limited, so that the sensitive spots would be rapidly exhausted in daily use for broadcast reception, and that the holder might, with advantage, be made to take a rather larger fragment of crystal. The "Gecosite" crystal supplied with the instrument proved excellently sensitive on trial.

Information Department

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R. J. (BERKHAMSTED) writes that he wishes to attach some ivorine scales to his panel without drilling, and asks for suggestions.

The most convenient adhesive for this purpose is celluloid cement such as is used for repairing accumulators, and it will be found to be quite satisfactory so long as the ebonite panel has not been treated with vaseline or oil after rubbing down. If this latter is the case, it may be necessary to mark the outline of the scale on the panel, and then carefully rub over this surface with emery to remove any traces of grease. This being done, the under surface of the ivorine scale should be rubbed over with emery paper and liberally smeared with celluloid varnish. Leave it exposed to the air for a few minutes until it becomes sticky, and then press the scale firmly upon the panel, and place a weight upon it until dry.

A. S. O. (TONBRIDGE) is having considerable difficulty as the result of the stretching of his aerial halyards, and asks for any suggestions. He uses manila rope for the purpose, and he finds that the aerial requires constant attention according to atmospheric conditions, and he has been advised to use finely stranded steel cable in preference, but has considerable doubts as the efficiency of this material from the electrical point of view.

Ordinary untreated rope is certainly most unsuitable for the purpose, and if rope is used at all it should be of the tarred variety. Good tarred hemp is fairly suitable, since after the initial stretching it becomes fairly constant, and is not much affected by weather conditions. It will only require tightening at quite long intervals.

With regard to the galvanised steel rope recommended, evidence is lacking as to any possible loss of efficiency, and we are inclined to doubt whether such loss is worth taking into account under ordinary receiving conditions. Experiments have certainly been carried out with a view to deciding this point, but the effect was so small that it could not be observed under ordinary receiving conditions. If it is decided to use the galvanised steel wire care should be taken to obtain a really good sample, since on some varieties we have seen, the galvanising was extremely thin and the wire would be likely to have only a short life when exposed to atmospheric

conditions. On the other hand, a good specimen will last an extremely long time, and we know of one set of halyards which were erected in 1919 and are still in perfectly sound condition.

C. F. A. (CAMBRIDGE) is constructing a super-heterodyne receiver from an American design and asks for details for the home construction of intermediate frequency semi-aperiodic transformers.

It is a somewhat difficult piece of work to turn out a good transformer of this type, much tedious winding of fine wire being involved, but the following data should provide a transformer of fair efficiency. Use one of the standard barrel type ebonite formers employed for long-wave transformers of the semi-aperiodic type, suitable dimensions being—length 3 inches, diameter 2 inches. Eight grooves should be cut in this former, an eighth of an inch wide, and half an inch deep, four grooves serving for the primary and four for the secondary, the windings, of course, being put on in alternate slots. In each groove wind 500 turns of No. 42 single silk-covered resistance wire, connecting the alternate slots in series in the usual manner. The transformers for successive stages should be roughly matched, and a certain amount of care should be taken in counting the turns. Three of these transformers can be used together with very little difficulty from instability, provided they are spaced somewhat apart, say, 6 inches, and a potentiometer should be provided for the control of the natural tendency to self-oscillation.

M.I.R. (BEDFORD) states that he is very much troubled at frequent intervals by what he believes to be showers of electrically charged rain. During these showers he hears a continuous pattering noise which gives rise to a continuous roar, which completely prevents reception, and occurs so frequently that it is becoming a serious problem to him.

The symptoms certainly agree with frequent showers of charged rain, but the fact that they occur so frequently that they average one per week strikes us as extremely unusual. We infer from our correspondent's letter that this has been going on for some months; we are, therefore, a little doubtful whether the cause should not be sought in some artificial source, such as some kind of electrical machinery in his neighbourhood, a defective switch in the house-lighting installation, or some other cause of this nature. To settle the point we suggest that our correspondent should try the effect of an indoor aerial of good size, noting whether the noise is very much reduced, or whether it is merely reduced in the same ratio as the signals from the station with whose strength he is familiar. Should they be almost completely eliminated, charged rain is, no doubt, the cause, but if they are only reduced in the same ratio as the signals, it is more likely that the alternative explanation is the correct one.

H.F. Transformer for Single Stages

(Concluded from page 820.)

nected through the winding to the IS pin, and assuming that a satisfactory click is obtained it is then screwed down under the OS pin.

It will probably be found when using one of these transformers, that the set oscillates much more easily than before, and it may be necessary to use either a potentiometer or reversed reaction to stop it from doing so.

"To Switch or not to switch!"

The complex problem of deciding whether or no a certain circuit or component should be switched, and the best method to adopt when the answer affirms the question, is the subject of an attractive book by Oswald J. Rankin entitled "Switches in Wireless Circuits."

This is one of the latest additions to the series of authoritative books on wireless, published by Radio Press, Ltd., and like its predecessors is written in an accurate, yet perfectly readable manner. Profusely illustrated with diagrams, shown both theoretically and pictorially, the contents give over 50 different switching arrangements covering practically every requirement.

All difficulties heretofore associated with the trouble of switching will vanish with the purchase of this book and the danger of valves burning out or possible battery damage will be completely eliminated.

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Wireless Weekly

Vol. 5. No. 23.

ROUND-THE-WORLD WIRELESS

By PHILIP R. COURSEY, B.Sc., F.Inst.P., A.M.I.E.E.

3 strong reasons why you should use Burndept Apparatus

A remarkable approach to the theoretically perfect.

Burndept Standard Condensers absorb less than 0.05 per cent. of the power applied to them! The spindle is self-aligning, the top bearing running in a flexible steel housing and the lower bearing consisting of a steel ball running between metal cones. This patented method of construction ensures absolutely free running and permits fine tuning adjustments to be made without "vernier" attachments. The upper bearing compensates for slight wear, the capacity of the condenser remaining unchanged. Burndept Condensers are absolutely noiseless, even when used in circuits oscillating on wave-lengths of 75 metres (a frequency of 4,000,000 per second). To obviate hand-capacity effects, steel snap-on dust covers are provided.

Burndept Standard Condensers, for panel mounting, with dial, knob, screws and drilling template:

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No. 417. Capacity .001 mfds., **35/-**

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EDITED BY JOHN SCOTT-TAGGART, F.Inst.P., A.M.IE.E

The Wireless League and the B.B.C.

THE great interest taken by the listening public in the quality of the programmes broadcast by the British stations is well indicated by the formation, at the initiative of *The Daily Express*, of what is to be called "The Listeners' League." The object of the league is to ensure that the views of the man-in-the-street are adequately represented and that he should have at least some measure of control over what is broadcast. As matters stand at present, the public, which pays the piper, must take what is given to it, and is in no way represented on the Board of Management. We have previously indicated in these columns how easily the British Broadcasting Company can be misled by relying upon the letters it receives as giving a true reflection of general public opinion; certainly the most vocal portion of the public is by no means the most representative.

Provided it is conducted in a proper manner, the Wireless League may, we believe, prove of value in the broadcasting movement. It must not be forgotten that, although the Radio Society of Great Britain has worked to further the interests of the wireless amateur and experimenter, it has, on the whole, failed to enlist the sympathy and the support of the general broadcast listener. The Wireless League may go far to remedy this state of affairs due to the absence of any adequate representation of the public's point of view in the arrangement of the programmes, and the general relations between the B.B.C., Postmaster-General, the industry and the public.

Here and there in the correspondence relating to the formation of the League we have noticed letters suggesting that better broadcasting programmes would be obtainable if the B.B.C. monopoly were broken and competition in broadcasting instituted. With this view we strongly disagree. However unconstitutional the arrangement may seem to be, however strange it may appear that a government department should collect revenue on behalf of a commercial company, and whatever reasonable defects may usually attach to monopolies, the present arrangement—with safeguards—seems to us to be by far the most generally satisfactory and workable. It is, however, imperative that the closest watch should be kept to see that the B.B.C. do not abuse the great powers given to them by the public. Unfair competition with private enterprise must be checked firmly, and the management of the company must bear in mind that their revenue, powers, and, possibly, even the life of the B.B.C. will depend upon the exercise of sympathy and tact. An excessive development of *amour propre*, perhaps natural at the moment, while temporarily satisfying is likely to lead the company into considerable difficulties in the future. The chances are that the autocratic powers of the B.B.C. will tend to wane as the public becomes more intimate with broadcasting, while political changes in the future may even revolutionise the present system. At such a future time the B.B.C. will be forced to exercise the discretion and outward show of sympathy which they now regard as a condescension on their part.

The troubles of the B.B.C. are by no means over, and they may need all the support possible from those who take the long view and favour a system which is satisfactory as long as it is conducted soberly and in harmony with public opinion.

Our only fear is that in the heyday of their success they may alienate this support and give extremists the opportunity for ill-considered attack. The tendency to minimise newspaper criticism is very marked, the B.B.C. forgetting that, however evanescent these attacks may be, their repetition has in the public mind an unpleasant effect, which no amount of propaganda through the microphone can remove.

Meanwhile, any league or society which will assist in preventing abuses will be doing useful work provided it is conducted vigorously and with good judgment.

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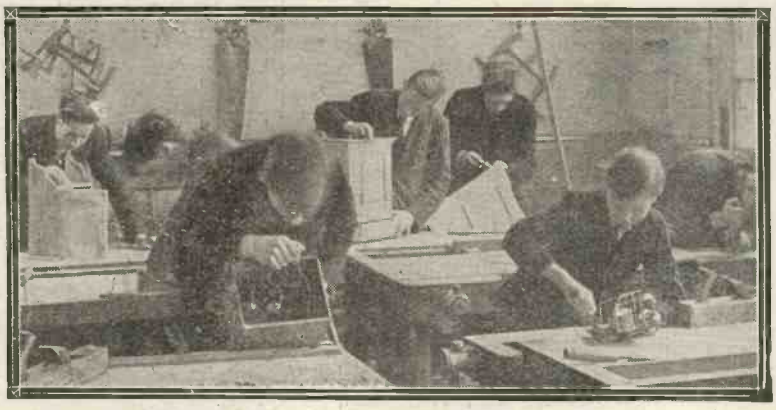


Boys at the Beaufoy Institute busily engaged in the workshop in constructing wireless components and receivers.

Wireless . . . and the Young Idea

A brief description of the Schools Wireless Exhibition.

IN many schools and institutes wireless as a hobby for boys, and as an aid to developing their interest, and to lead them to a broad appreciation of the realities of science and its methods, is given every encouragement. The recent exhibtion of wireless work by London schoolboys, held by the Schools Radio Society at the L.C.C. Beaufoy Institute, is of great value in this connection.

Eighteen Schools

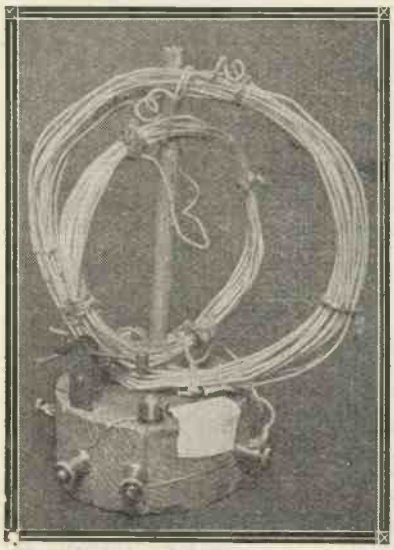
Exhibits were shown from eighteen elementary schools of examples of the constructional work done by the boys both at their homes and in the school workshops. Examination of the general science syllabuses of several schools showed that the scheme of work included instruction in simple wireless theory, while in some cases practical and constructional work formed a definite part of the curriculum.

Exhibits

Some interesting exhibits were those by the students of the Beaufoy Institute, the school three-valve set, constructed entirely by the students, and embodying a simple straight circuit consisting of a detector and two low-frequency valves, being a particularly well-made receiver.

"Polyversal" Cabinet

An exhibit of remarkable ingenuity was the "Polyversal Cabinet," designed and made by Mr. T. F. Barrett, a member of the staff at the institute. This complex piece of work is an arrangement to give by means of various forms of switching a multiplicity of circuits using a crystal and from one to seven valves. It is understood that the possible circuits include the ST100, other reflex circuits, T.A.T. circuits, Neutrodyne, and others, in addition to the usual straight circuits. A single-valve reflex receiver embodying the ST 74 circuit, and a four-valve set were among the other examples of the work done by the boys at the institute.



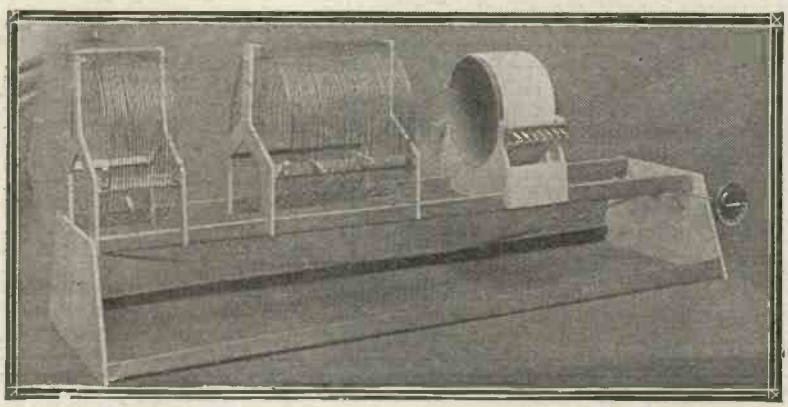
A typical specimen of the type of receiver made as a class exercise at the Dalston Road School. The design is that of the crystal set described by Mr. A. D. Cowper in "Modern Wireless" of December, 1923.

Components

The interest taken by the scholars in the working and construction of wireless sets is reflected in the many examples of component parts and accessories constructed by themselves. These included home-made frame aerials, numerous types of variometers, fixed condensers, different forms of coils, crystal detectors, etc., and pieces of apparatus to illustrate the principles of electricity involved.

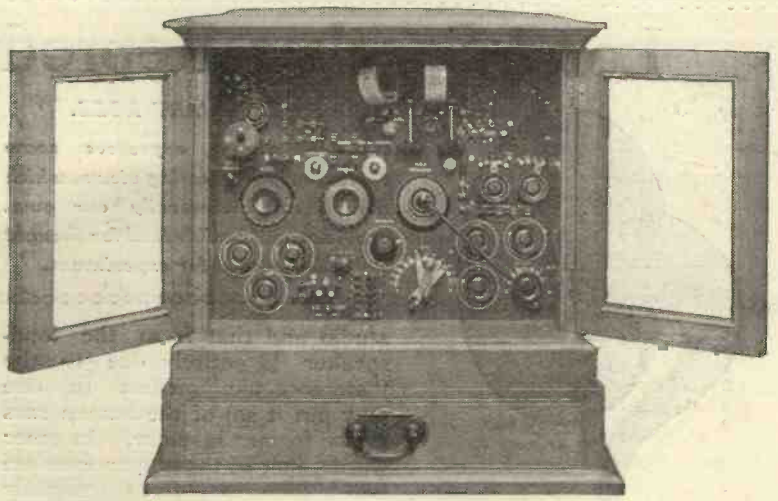
Crystal Sets

There was a large number of crystal sets of different types all



A low-loss tuning unit of skeleton construction exhibited on one of the stands.

The interest in wireless taken by the average schoolboy is very admirably expressed in the number and variety of home-constructed wireless receivers which were to be seen at the recent Exhibition held at the L.C.C. Beaufoy Institute.



The "Polyversal Cabinet" is a multi-purpose receiver of unique design.

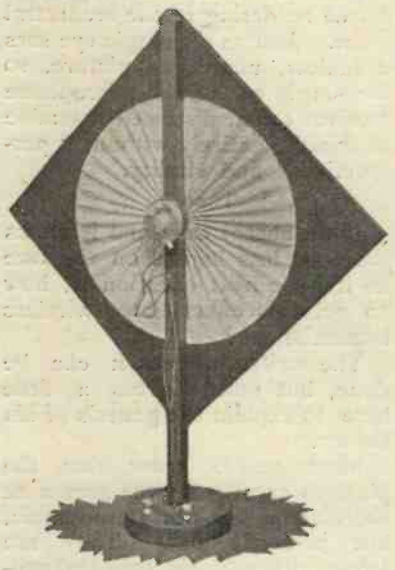
constructed by boys between the ages of twelve and fifteen. The majority of these used either a slider and coil or a variometer of the type shown in one of the accompanying photographs, and in most cases the crystal detectors were home-made. The standard of workmanship was on the average distinctly good.

A Four-Valve Set

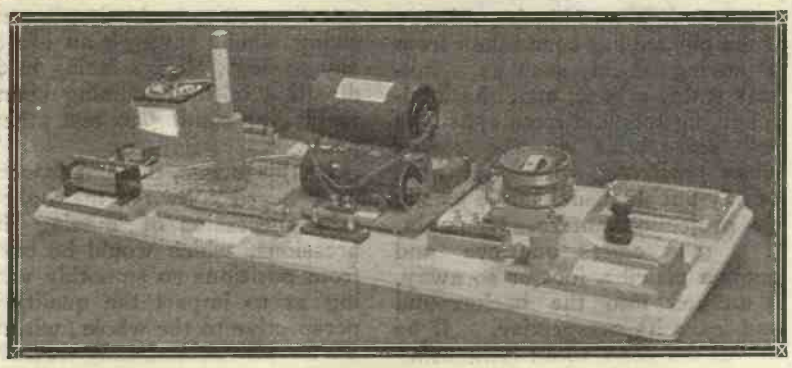
Some well-made sets were shown in the exhibit of the Mansford Road School, a tuning unit and a four-valve experimental set by a boy of fourteen being particularly good. The school wireless set made by the boys of the Michael Faraday L.C.C. School was another interesting exhibit. This was constructed in an "upright grand" gramophone type of cabinet, also the handicraft of the boys, and the circuit used in the set is that of the All-concert de Luxe so familiar to our readers.

Valve Characteristics

Another interesting part of the exhibition was that provided by the Wireless and High-frequency Section of the Regent Street Polytechnic. Apparatus for more advanced work was shown here, and a useful set of valve characteristics taken by the students themselves was a noticeable feature of the exhibit. A pleated diaphragm type of loud-speaker designed by the students was also of interest.



A pleated diaphragm loud-speaker designed by the students of Regent Street Polytechnic.



A selection of parts made by the boys of the Elizabeth Street School. The microphone amplifier in the centre is the work of a boy of 13.

Various demonstrations and exhibits of commercial apparatus gave added interest to the exhibition.

American Re-transmission of Chelmsford.

SOME misconception of the true position of American re-broadcasting of English stations has taken place owing to a number of amateurs picking up a harmonic of the Chelmsford station under the impression that they were receiving the American re-transmission of 5XX. The first actual re-transmission occurred on Tuesday morning, the 13th inst., when traces of music and the time signal from Big Ben got through. The music was from a special programme, and the re-transmission took place through the station WJZ.

On Saturday night, the 14th inst. (or rather Sunday morning, the 15th), a much more successful re-transmission took place, this time for two hours, the stations being WJZ and WGY. The re-transmission of the Savoy Bands and a special programme took place. Credit for this is due to the Radio Corporation of America, to Mr. Beverage of aerial fame, and to Dr. Goldsmith and Mr. Weinberger. Portions of the WGY programme were received in England, and reports of good reception have also been received from Barcelona and Vienna.

Loud-Speaker Reproduction

By C. STUART ROSE.

Our contributor expresses some particularly interesting views, which though not necessarily our own, provide considerable food for thought and material for experiment.

THE best of present-day wireless loud-speakers, in the opinion of the writer, reproduces imperfectly. Any criticism, however, reflects the more seriously on the shortcomings of the gramophone industry—for the principle in both forms of reproduction is the same, but whilst wireless is an infant, the gramophone has had 40 years in which to improve itself.

The simile of the " band playing in a tunnel " is still true of the gramophone and the loud-speaker to a very marked extent.

Shape of Trumpet

Until quite recently the theory was held that the shape of the trumpet was responsible for this " distortion "; but when gramophone reproducers were evolved which eliminated the trumpet altogether, there was no noticeable improvement. Now it might still be pointed out that, although the trumpet was not used for reproduction, it could not be dispensed with for *recording* in order to concentrate the sound properly.

Muffle

Even if this is granted, it does not dispose of the presence of this same disturbing muffle in the wireless loud-speaker, because the *input* end (the microphone) is not enclosed in a funnel at all!

We must go further than this, and many authorities are now of the opinion that the marked difference between music heard in the studio and that from the loud-speaker is entirely due to the " stereoscopic " effect (if one may put it so) of the human ears in the former instance. In other words, just as the human eyes see two pictures from slightly different angles, which combine to give the brain a perfect relief-view of the scene, with all values absolutely correct, so the ears hear two sets of sounds, also from different angles, which combine to give us a true rendering of the orchestral piece. Just as the single eye sees a hollow, unrelieved picture, so the single ear of the microphone receives a flat, distorted ensemble of sounds, entirely without " perspective " and vitality.

Theory

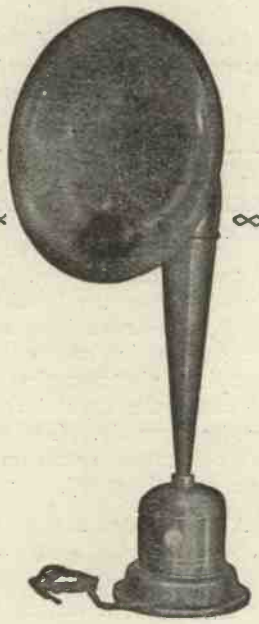
If we accept this (and it seems more or less logical on the face of it), the next question is, how to get this effect into wireless transmissions?

The writer believes it can be done, but must digress a little here to explain the genesis of his theory.

Most people know that the pictures thrown on the screen at the cinema are not stereoscopic, but perfectly flat. They are taken with a single lens, and projected through another single lens.

Analogy

But here is an amazing thing—if the picture has been taken from a moving object, such as a railway train, a boat, etc., the landscape, figures and trees *appear in full perspective on the screen when projected,* without the aid of any but the usual single lens in the projection-lantern. Or again, if a man closes one eye and holds a pencil a foot or so away, it merges into the background and loses its perspective. If he moves his head about (still using only one eye, however) the pencil regains its proper optical value,



and stands out in relief, as though the two eyes were being used.

Now, it is submitted that if a single lens on a moving platform can take a series of pictures that, when reproduced with the present available apparatus, appear solid and life-like, a single microphone (or ear) on a moving base can " accept " a series of sound-waves that, when reproduced in the ordinary way, will have all the bright and vivid characteristics of the original music, without any flatness at all.

Swinging Microphone

The analogy is reasonable, and there seems to be a sound argument for a trial of the theory in actual practice. This could probably be arranged by so suspending the microphone (or the recording diaphragm of the gramophone; the theory applies equally well to both) that it could swing slowly through an arc of, say 30 deg., always facing in the direction of the incoming sound, and never coming to rest at any point.

By this means, the sounds would be " heard " by the microphone in a succession of moving impressions, which would be taken from positions so smoothly varying as to impart the quality of perspective to the whole, without which all mechanically or electrically-reproduced music must be dull and lifeless.

An Auto-Coupled Crystal Set

By C. E. LOTCHO.

An interesting crystal receiver embodying an air-spaced low-loss inductance.

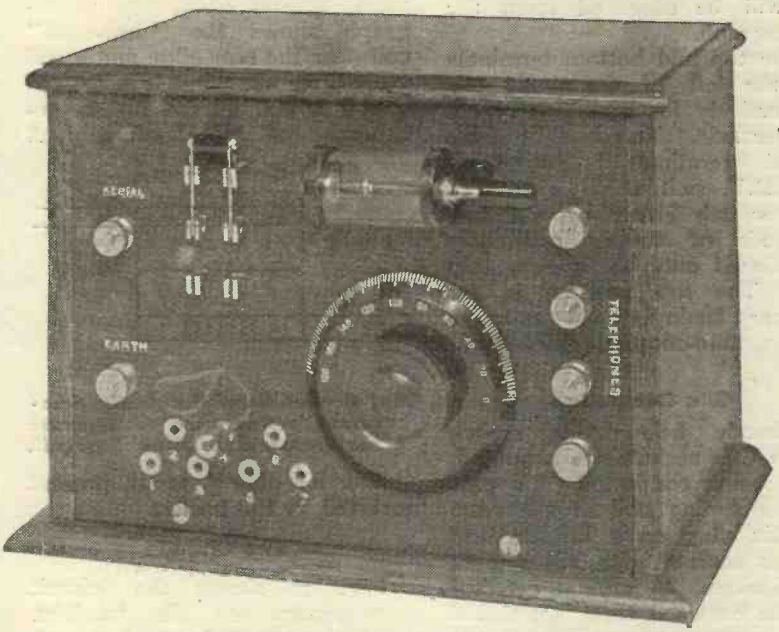


Fig. 2.—Appearance has not been sacrificed in the construction of this efficient crystal set.

CRYSTAL sets, when compared with valve sets, possess two important advantages which have served to keep them in constant demand by wireless listeners. One point is that their initial cost is cheap, and the upkeep nothing at all; the second point is far more important in the eyes of many—the unrivalled purity of reproduction obtainable.

Limitations

Unfortunately, however, the crystal receiver has several notable disadvantages, the chief of these being the limited receiving range and volume possible, and the inherent lack of selectivity due to the damping effect of the crystal. The crystal set shown in the photographs has been designed with a view to overcoming to a certain extent the latter defect, while in regard to the former, results are certainly decidedly good, being equal to those obtained from the best crystal receiver previously tried.

Two Methods of Tuning

Provision has been made for two different forms of tuning, one method being for use where increased selectivity is desired, and the other for ordinary conditions. From this, however, it should not be inferred that selective tuning is unsuitable for ordinary purposes. When the set is arranged for selective reception, a form of tuning known as "semi-aperiodic aerial tuning" or "auto-coupling" is brought into use.

The other method consists of the usual arrangement of a tuned coil connected directly to the detector circuit. An unusual feature has been introduced in the latter case by the provision of a means of obtaining very fine tuning over a considerable wavelength range.

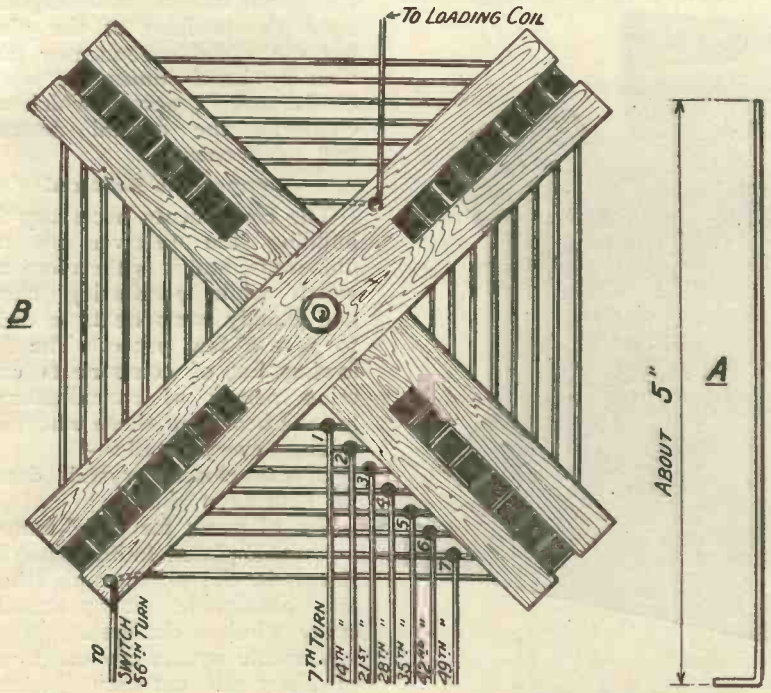


Fig. 1 illustrates how the tappings to the low-loss coil are made; at A is shown a specimen tapping wire.

The Tuning Coil

Many readers will observe that the tuning coil is of similar pattern to one which I described in the March 11 issue of *Wireless Weekly*, both turns and layers being spaced by air. Mr. G. P. Kendall recently tested for me a coil wound in this manner, and, the results being very good in view of the moderate space requirements, it was decided that the time expended in making such a coil for the receiver would be more than justified.

The Layout

Without sacrificing efficiency it has been possible to arrange the components upon the front of the panel in an orderly manner, as will be observed from the photograph.

The top and bottom terminals on the left of the panel are respectively for aerial and earth connections. To the right of the aerial terminal is a small D.P.D.T. switch. By means of this switch either of the two methods of tuning previously mentioned may be brought into use. The top position is for ordinary tuning, while the lower brings auto-coupling into operation.

Clix Connections

Directly below this switch seven Clix sockets are arranged, each being connected to a part of the tuning coil at the rear. A Clix plug on a flexible lead makes contact with any one of the sockets. A crystal detector of the enclosed type is situated in a convenient position at the top of the panel, while below is a knob controlling a variable condenser of .0005 μF maximum capacity. Four terminals on the right of the panel permit the use of either one or two pairs of 'phones. It is often advantageous, in the latter case, to place the two pairs in series, and this has been made possible by the internal wiring of the terminals.

Coming now to the components mounted on the wooden panel at the back, the photograph shows the "low-loss" coil near the rear edge and a coil mount, for use when it is desired to add a loading coil for the reception of Chelmsford. A

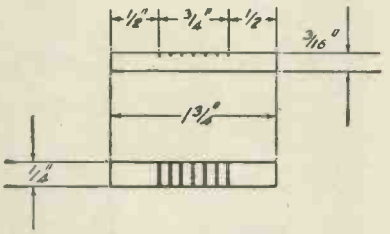


Fig. 4.—Details of the ebonite separating pieces used to separate the layers and the turns of the coil.

"shorting-plug" is at present inserted in the socket.

The Circuit

Fig. 7 shows the circuit arrangement of the receiver. With the switch in the top position, the crystal detector is joined directly to the aerial, while the lower side of the variable condenser C1 of .0005 μF is connected to earth through a fixed condenser of the same capacity. The resultant maximum capacity is .00025 μF (half the capacity of either when used alone), and this is more suitable for the present form of tuning.

Upon changing the switch to the lower position, the number

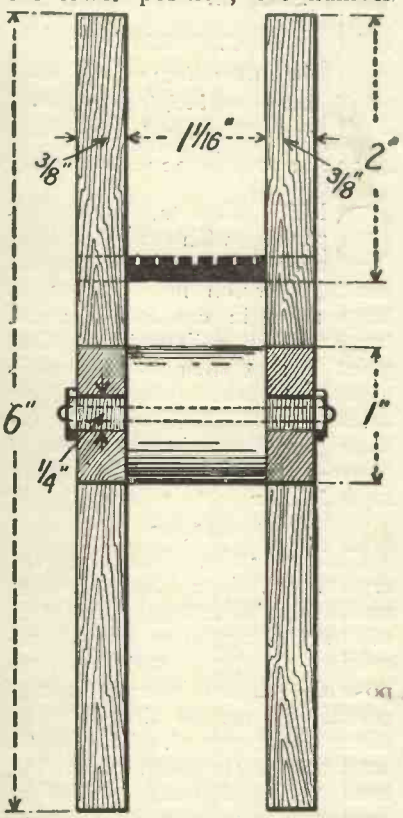


Fig. 5 shows the construction of the coil former.

of turns of the coil L1 included in the aerial circuit still depends upon the position of the plug, but the variable condenser (this time by itself) tunes the whole of the coil L, across which are connected the crystal detector and telephones.

Components Required

The components necessary for building the receiver are not numerous, and it is therefore not worth while purchasing cheap and shoddy components in order to save a few pence. The following list of components contains names of manufacturers for the benefit of those who wish to copy every detail :—

Glass-enclosed crystal detector (Burndept, Ltd.).

Set of parts for panel-mounting nickel-plated knife switch as shown in the photograph (these are obtainable at practically every wireless dealers).

Variable square-law condenser of .0005 μF capacity (Jackson Bros.).

Six W.O. type terminals.

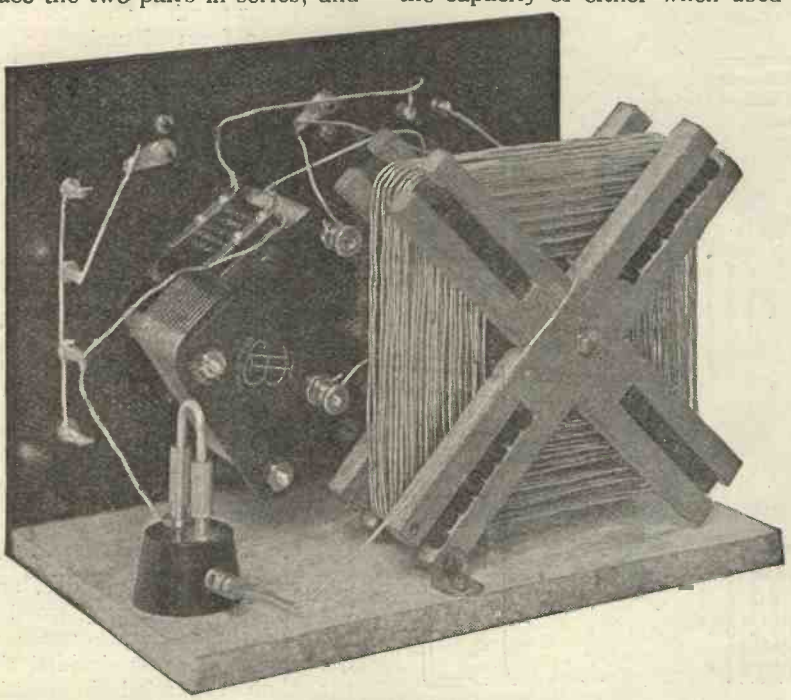


Fig. 3.—This back-of-panel photograph shows clearly how the low-loss coil is mounted.

Seven Clix sockets and one plug (Autoveyors, Ltd.).

Ebonite panel 8 in. x 6 in. x ¼ in. (This should be guaranteed free from leakage.)

Baseboard 8 in. long x 5 in. wide x ⅜ in. thick.

Cabinet of suitable size to take panel and baseboard.

Fixed condenser of .0005 μF (Dubilier).

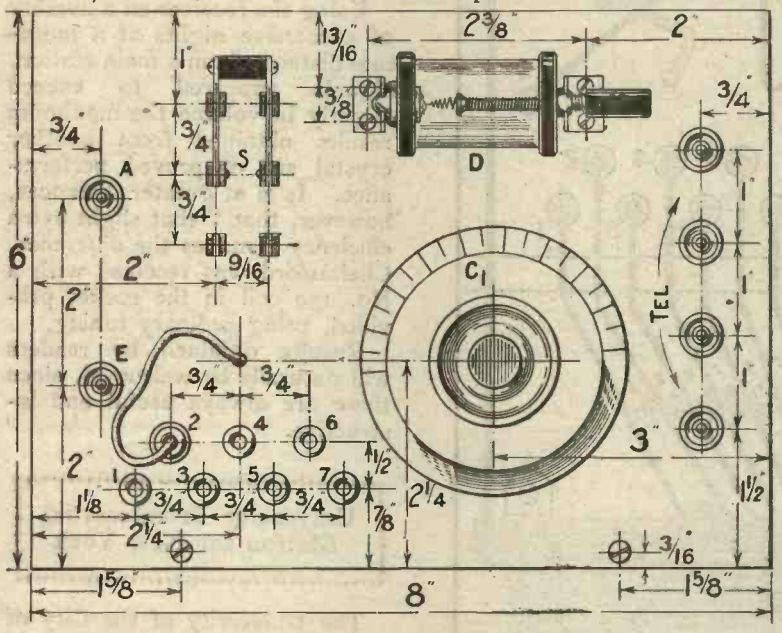


Fig. 6 shows the panel layout, with all dimensions necessary for marking out and drilling.

Coil socket for board-mounting (McMichael).

Shorting-plug for above.

For the construction of the coil we require :—

½ lb. of No. 18 tinned copper wire, or alternatively enamelled copper wire.

2 ft. of wood 1 in. wide and ⅜ in. thick.

A piece of ebonite 1¾ in. wide and 3/16 in. thick, and preferably 9 in. or 10 in. long.

Packet of Radio Press panel transfers.

Constructing the Coil

Bare tinned copper wire has been used for winding the coil shown, and I experienced no troubles whatever due to "shorting" between neighbouring wires or layers. Should the constructor of this set feel any doubt whatever as regards his ability to make a firm job of the coil, however (no great skill is required actually), I strongly advise that enamelled wire be used for the winding to ensure safety, for a poorly-made bare wire coil in which some of the turns touch may exhibit remarkable and puzzling symptoms.

Detailed instructions regarding the building of a coil of this type were given in the March 11 issue of *Wireless Weekly*, and if that issue is referred to no difficulty need be anticipated in this part of the constructional work. The present coil, however, is larger than that described previously, for it contains eight layers, each layer consisting of seven turns, a total of 56 turns resulting.

The two cross-pieces of the coil former are identical with those of the coil already described. It will be seen from Fig. 5 that the only way in which the present former differs is in the distance between the two crosses, which in this case is 1 1/16 in. Otherwise it is identical.

When the 56 turns have been wound on in the correct manner tappings are taken at seven points on the coil for connection to the Clix sockets on the panel. Fig. 1 (B) illustrates how the tappings are made and also at what points. The numbers one to seven correspond with the numbers of the Clix sockets, to which they must shortly be connected. At (A) in the same figure a specimen tapping wire is shown, the lower end being soldered to the coil.

Drilling the Panel

All the positions for the holes to be drilled in the panel are given in the drilling diagram, and no difficulty should be experienced here if all the components are at hand so that the correct sizes for the various holes may be quickly ascertained. The baseboard may be fitted to the panel at this stage, two wood screws as shown being suitable for the purpose.

Mounting the Components

When mounting the components in their places, reference should be made to the photographs and the drilling and wiring diagrams if necessary. A point which may require elucidation is the mode of fixing the coil on the baseboard. This is very simply carried out with the aid of two "Meccano" angle brackets and four "Meccano" bolts. If these are not procurable, two pieces of brass strip may be bent to suitable shapes and used in the same manner.

Wiring-up

The wiring diagram shows all the connections required, and care should be exercised to follow this correctly. The fixed condenser C2 is secured in position partly by means of the stiff wire used for making the connections (this being similar to that used in the winding of the coil). It is also allowed to rest on the variable condenser.

It will be seen from the wiring and drilling diagrams that a flexible lead passes through a hole in the panel, and is terminated outside by a Clix plug. With the wiring finished the receiver is ready for work.

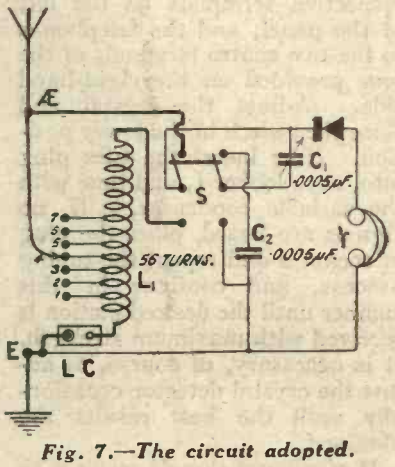


Fig. 7.—The circuit adopted.

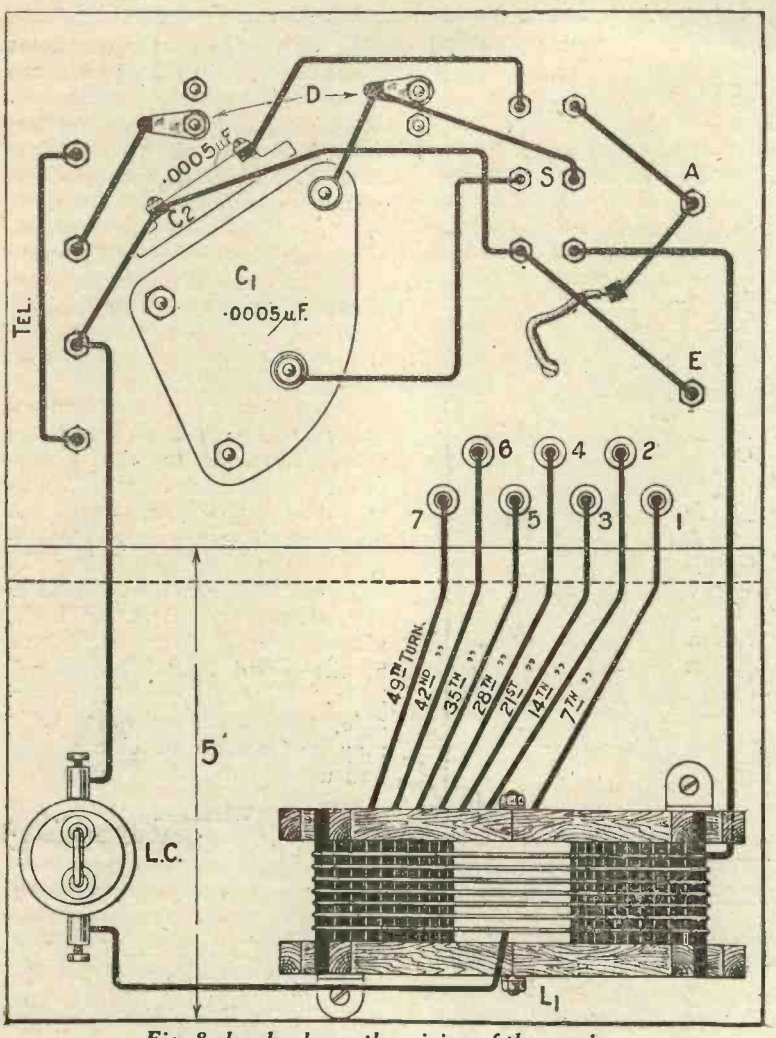


Fig. 8 clearly shows the wiring of the receiver.

Operating the Receiver

We will deal first with the selective form of tuning. Connect the aerial and earth to their respective terminals on the left of the panel, and the telephones to the two centre terminals of the four provided on the right-hand side. Adjust the crystal and place the switch in the lower position. Now insert the Clix plug into, say, socket 1, and tune with the variable condenser. If no signals are heard, place the plug in socket 2 and repeat the tuning process, and continue in this manner until the desired station is received with maximum strength. It is necessary, of course, to adjust the crystal detector occasionally until the best results are obtained.

If maximum signals result with the plug in socket 4 the set may be made more selective by plugging into socket 3, and still more so by going down farther. Since this also results in a decrease in signal strength, however, a compromise must be effected when interference is experienced. If your local station is a " relay " whose wavelength is not much over 300 metres, slightly better results might be obtained by making the coil one of seven layers instead of eight.

Ordinary tuning may be reverted to by changing the switch to the upper position, when tuning may be carried out in the manner described for semi-aperiodic aerial tuning. The remarks regarding selectivity and signal strength do not apply in this case, however. It will be found in some instances that the form of tuning first outlined is superior not only as regards selectivity but also in regard to signal strength. Much depends upon the aerial employed.

Using Two Pairs of 'Phones

It is often impracticable to use two pairs of 'phones in parallel, especially if their respective resistances are dissimilar. It is always safe, however, to place them in series, and this may be effected on the set by connecting one pair to the two upper 'phone terminals and the other pair to the remaining terminals.

Some Results

Using the receiver on a number of successive nights at a moderate distance from a main station, signals appeared to exceed slightly in volume the maximum results obtained from another crystal set of proved performance. It is at greater distances, however, that " that slight extra efficiency " makes the difference. Chelmsford was received with a No. 150 coil in the socket provided, using ordinary tuning.

Results obtained by readers will naturally be welcomed, since these are always useful and instructive.

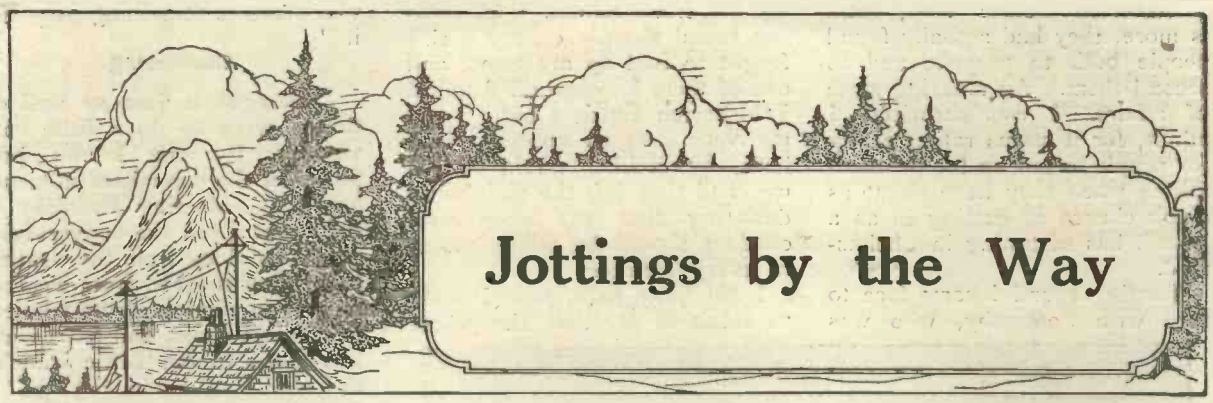
University Broadcasting Station for New York

The University of the City of New York has completed plans for the erection of a broadcasting station which will possess several unusual features. One of the aerial supports will be a mast from Sir Thomas Lipton's yacht, the *Shamrock IV*, which was the craft which competed with the *America* in 1920. The mast consists of two sections, one of steel 113 ft. high, and a topmast of wood 56 ft. high, equipped with a masthead light, which will be visible at night for many miles around.

When the station commences working, the University authorities expect to use it for the broadcasting of lectures, which are now being sent out from other New York stations. The entire equipment will be constructed in the Sage Laboratories of the Engineering School.

BASKET COIL ADAPTORS

With reference to the article on " Basket Coil Adaptors " in our March 4 issue, we note that a coil-holder of similar type may be purchased from Hall & Brenard, Ltd. (price 3s. 6d.).



Jottings by the Way

The Committee

HOW many clubs, I wonder, wireless or otherwise, have their activities hampered, their comfort destroyed, their finances wrecked, by the baleful activities of their committees? I have always felt rather strongly that the committee of the Little Puddleton club is not all that it should be, and I have not hesitated to say so at many meetings, or, rather, to begin saying so, and to go on until stifled by the chairman. Since the chairman is, of course, himself a member of the committee, one can never get in a really resounding smack such as one's soul longs for. And, after all,

. . . *Poddleby rotates* . . .

with fellows like Bumpleby Brown and Poddleby on the committee, what can you expect? What do they know of high finance? How can they possibly have acquired any knowledge of organisation and management? Can people so utterly bereft of *nous* be trusted to sift out candidates for election properly, choosing the sheep and rejecting the goats? I think not. It was largely for these reasons that I came to a sudden resolve this spring when it was announced that Bumpleby Brown was to retire in rotation that there would be a vacancy on the committee.

Rotation

I have never seen Bumpleby Brown rotate, though Poddleby performed this feat once before my eyes when, whilst walking down the High Street, he stepped upon a lemon sole which

. . . *Cross-word puzzles are so difficult* . . .

had slipped from the slab of Mr. Rabbitts, our local fishmonger.

A Noble Prospect

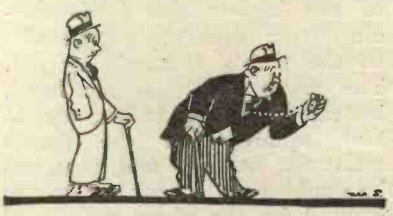
But to return to the committee. As I have said, the notice stated that Bumpleby Brown would retire in rotation, and I am anxiously waiting to see him do it. The resolve to which I came, after lying awake for a whole afternoon devoted to thinking the matter over, was that I would offer myself as a candidate for the vacant seat. One swallow, we know, does not make a summer, and the inclusion of *one* really efficient member can hardly be expected to reform our committee entirely all in a moment. But, as you know, I am one of the world's workers,

. . . *He doubled up* . . .

and I intended to leave no switch unturned in my efforts to make the committee quite worthy of the club.

Cross-word Puzzles

You will realise what a sacrifice I am making in offering myself for the post. Already my time is fully occupied, as you will readily understand when I tell you that directly my after-breakfast pipe is finished I sit down to work and do not rise until my wife summons me to lunch by prodding me in the ribs and suggesting that it is about time I woke up. Women are always prone to mistake deep thought for mere sleep. The afternoon is equally strenuous and the whole evening is one long spell of work. The cross-word puzzles in the evening



. . . *He glanced hurriedly at his watch* . . .

papers are so difficult nowadays, are they not?

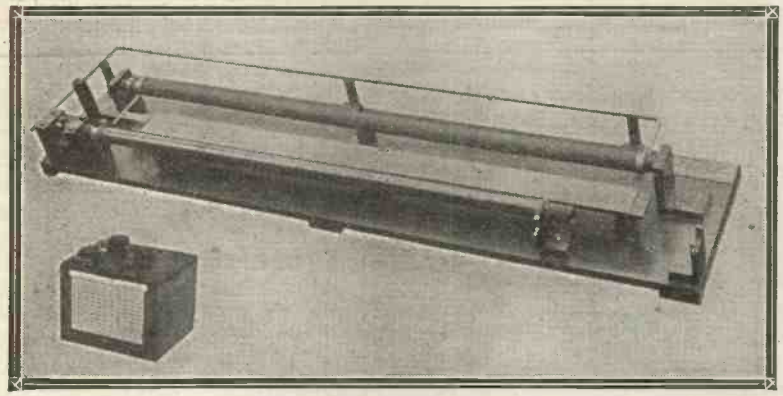
Preparations

I imagined, naturally, that when I allowed myself to be proposed and seconded, I would be given a walk-over, for it is not every day that a club has the chance of putting a fellow like myself upon its committee.

You will hardly believe it when I tell you that when I next sauntered down to the club and glanced at the notice board I found that there were *two* candidates besides myself for the vacant post. There beneath my own was Snaggsby's name as large as life, and immediately below his came that of Admiral

Whiskerton Cuttle. And, what is more, they had actually found people both to propose and to second them. An amazing state of affairs. I was surprised, I admit, for it seems rather a pity for people to put up for the committee when they have about as much chance of getting in as a 50-coil has of tuning in Chelmsford.

Turning round I came face to face with Snaggsby, who was



An early type of wavemeter, the Cymometer, invented by Prof. J. A. Fleming, M.A., D.Sc., F.R.S. A modern wavemeter may be seen in the foreground.

standing two or three yards from the board. I rushed forward with outstretched hand to greet him, but was unfortunate enough to catch my foot in one of the high-tension leads running from Poddleby's generator to the club's transmitting set. The result was that my hand, instead of landing in his, caught him squarely on the fourth waistcoat button, and that, as he doubled up, I bore him to the ground by the sheer weight of my unintentional charge. Any decent fellow would have seen that the whole thing was an accident, but Snaggsby went about saying that I was so disgusted at his putting up for the committee against me that I had rushed upon him and knocked him down without a word of warning.

I did my best to explain. When we picked ourselves up I held out my hand once more, but Snaggsby, saying that he wanted no more ju-jitsu, retired behind the generator and dared me to come on. It was an unlucky morning for me, for whilst I was standing in front of Snaggsby's entrenchment explaining with outstretched arms that I meant no harm, I heard a sudden hearty shout almost in my ear from behind. In turning round sharply on my heel I forgot to fold up my arms, and one of them knocked off Admiral Whiskerton Cuttle's hat. I did my very best to appease them both, but neither would believe me, and they left the club-house declaring that my disgraceful conduct should be made known to every member.

I am quite sure, now I come to think of it, that the whole thing was simply a plant. If you will listen for a moment, my dear Watson, I will tell you my theory. The committee were terrified when they saw my name down as candidate for the vacancy. "This," they said to themselves, "will never do. If a really efficient fellow like Wayfarer is elected, all our old peace will be gone and we shall have to do some work. Let us get two others to stand as candidates and let us urge them to do all they can to blacken Wayfarer's name. We will hide the fact that he spent an entire legacy in giving us a new terminal; we will belittle the services that he has rendered to the club; if we cannot make his name mud, we will make it something jolly like it."

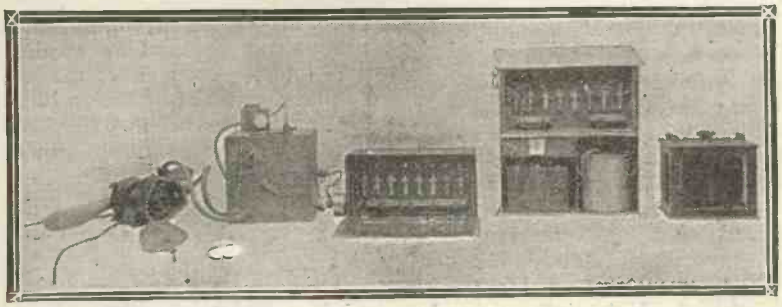
Canvassing

I thought it just as well as things were to do a little canvassing, for one knows how powerful the committee influence can be. Meeting Poddleby in the street I led the conversation gradually along from the weather to weather reports, from weather reports to wireless, from wireless to wireless clubs, and from wireless clubs to the Little Puddleton club. "I am relying," I said, "upon your support in the election." I could see that Poddleby did not dare to give himself away for fear that some of his fellow-members on the committee came to harm. Though, in answer to my remark, he glanced hurriedly at his watch and said that he must be getting home, I realised that he was heart and soul behind me.

An Honour to Us All

Therefore, dear reader, when next I write to you, I shall do so, not as one of the common herd of the Little Puddleton Wireless Club, but as a member of the committee. I am sure you will feel as I do, that my elevation is an honour to all of us. I shall be delighted to crack a bottle with you in honour of the occasion, if you will kindly forward it to me at the committee room of the club.

WIRELESS WAYFARER.



The original Marconi aircraft transmitter used on the Rolls Royce Handley-Page biplane which was preparing to fly the Atlantic from Newfoundland in 1919, when Captain Alcock forestalled the attempt.

STOP PRESS.
ELECTION NEWS

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Can we Signal to Australia in the Summer?

By PHILIP R. COURSEY, B.Sc., F.INST.P., A.M.I.E.E.

In this highly informative article Mr. Coursey reveals how all experimenters were misled on the first two-way communication with Australia and New Zealand.

"2OD." Mr. E. J. SIMMONDS, famous for his two-way working with the Antipodes.

WHICH way do our signals go to Australia and New Zealand? This is a query about which there has been some discussion, and it is the purpose of these notes to endeavour to throw some further light on the subject. Now, Australasia as a whole lies to the eastwards of the British Isles—*i.e.*, its longitude is east of Greenwich—and hence the shortest distance from this country to any point in either Australia or New Zealand is found along an easterly route. It is for this reason that prior to the hearing of New Zealand and Australian signals and the establishment of two-way communication with radio amateurs there, it was anticipated that such communication, if ever found possible, would be effected only when the Eastern Hemisphere was in darkness. This only occurs near sunset here, which corresponds to early morning in New Zealand.

It came, therefore, somewhat as a shock that the first interceptions of signals should be made in the early morning here when the Eastern Hemisphere is bathed in sunlight. For some reason or other the signals were thought to prefer, apparently, the westerly and longer route via America, which would be in darkness. This was attributed largely to the superior carrying properties of signals over the Pacific Ocean, westerly from the United States.

A Point Overlooked

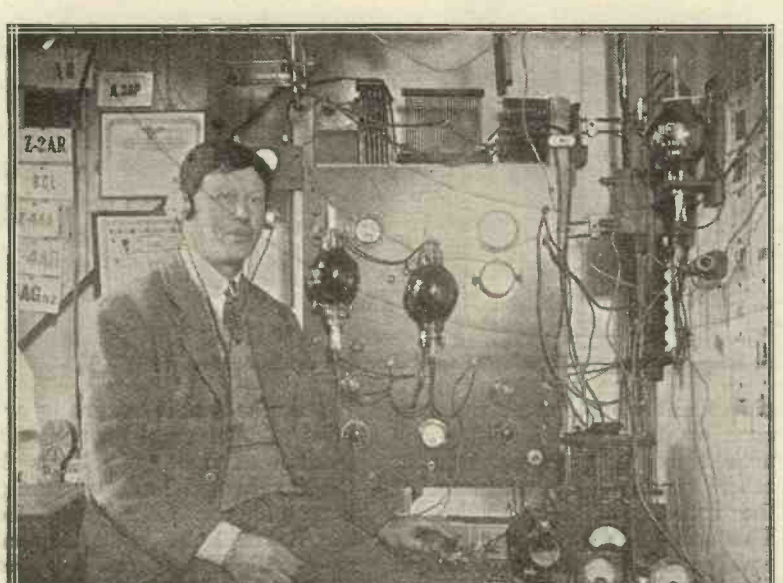
In connection with such surmises, however, the real direction of, say, New Zealand from London has apparently been overlooked—that is to say, the shortest great-circle direction. Reference to a great-circle map of the world plotted with London as centre, such as is reproduced in Fig. 1, shows that there is very little question of truly *easterly* or *westerly* routes as ordinarily understood, but that the true direction is north-east in the case of New Zealand, and about N.E. by E. for Eastern Australia to E.N.E. for Southern Australia. It should also not be forgotten that the earth's equator does not lie in the plane of the ecliptic, and consequently that the limits of light and darkness as separating day and night do not pass through the poles except at the equinoxes.

How the Globe Helps

Reference to a globe map of the world is a great help in considering these matters, and when this is done the surprise previously felt with regard to the time of first making contact with New Zealand radio amateurs is at once lost, bearing in mind that it was effected in the autumn.

Dawn and the Map

A sketch drawing of a globe arranged at the appropriate angle corresponding to winter in the British Isles and dawn in London is reproduced in Fig. 2. From this it will be at once evident that the "twilight band" passing through London, passes in approximately a north-east by northerly direction, passing over Norway, Northern Russia, and thence (by inspection of the actual globe) it is seen to cross Northern Siberia to China, and thus to Australasia. In other words, the twilight band separating night from day at the time of dawn in London during the winter months runs precisely *in the direction of the shortest distance to New Zealand.*



"2 NM." Mr. Gerald Marcuse, another amateur who has worked Australia and New Zealand.

Hence signals between these places can under these conditions and in winter travel almost, if not quite, in darkness, and yet follow practically the shortest route. What is more, they may actually be helped or guided by this " twilight band," the transition from night to day perhaps acting as a sort of guiding reflector for the waves.

The sketch in Fig. 2 is drawn at the position of the earth at mid-winter at approximately dawn in London, and is drawn from a position looking slightly downwards on to the earth from a point somewhat above the equatorial plane. The North Pole is thus marked on the drawing, just inside the upper limit of the map. This position enables the route taken by the twilight band to be more clearly seen, as more of the northern coastline of Europe is thereby made visible. Although, of course, this " twilight band " is comparatively narrow, and therefore will only cover a comparatively narrow part of New Zealand at one time, yet signalling to places near the band—places either just inside the dark zone or just into the light—will probably be much easier than at other times, since the bulk of the route will be in darkness. This spreading to places near the band would be quite sufficient to account for the ability to signal to Australia as well as to New Zealand, since in the foreshortened view of these places as " seen " from England along the route indicated, they occupy only a comparatively narrow angle measured from here.

The day-night transition line is obviously a great-circle on the earth, and hence at sunrise in London will be representable on the great-circle map of Fig. 1 by a straight line. Since at mid-winter the sun is vertically overhead at places $23\frac{1}{2}°$ south of the equator at noon, it follows that the northward limit of sunlight is the Arctic Circle $23\frac{1}{2}°$ from the North Pole. Consequently our twilight line on the great-circle map will pass through London and be a tangent to the

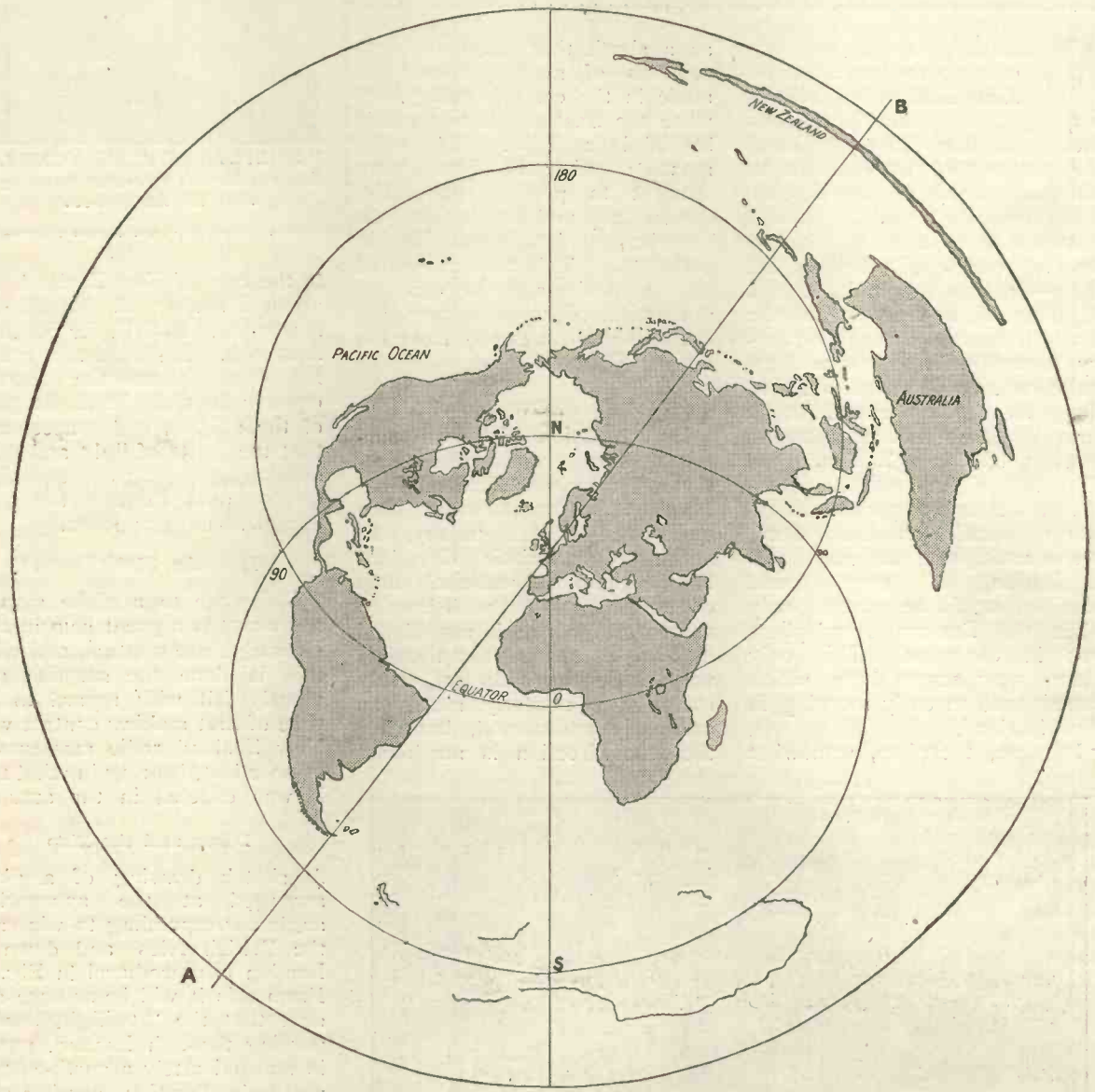


Fig. 1.—A great circle map of the world, plotted with London as its centre.

curve of latitude 66½° north. This line is marked A-B on the map, which is reproduced, and it will be seen to pass right across the southern island of New Zealand. Communication with these parts, and also with adjacent territory, should under these conditions be much aided.

Summer Displacement

As the year advances, and the sun travels northwards, the inclination of this line A-B representing the division of night and day to the meridian of Greenwich will become less and less. At the equinox it will coincide with the meridian, and at midsummer it will be inclined at a similar angle to the westward instead of to the east. Communication with Australasia should at these times (*i.e.*, dawn in London in summer) be much more difficult, even if not quite impossible at the same wavelengths as before. Whether it will be possible at other and shorter wavelengths remains to be seen. It is, however, perhaps important to note that even at midsummer in England we still have conditions very similar to those we have been discussing, and as represented by the line A-B in Fig. 1, but under these conditions they are found in the *evening in London*, which is early morning in New Zealand and Australia.

What to Expect

From this we may quite reasonably be led to expect that near *sunset* in summer we may experience very similar signalling conditions as were found in the early winter just before sunrise. Whether this will be so and whether two-way working can be maintained then remains to be seen. Static is, of course, another factor which must be reckoned with to some extent.

Naturally the possibility of signalling being helped in the manner indicated here will not be confined to the mathematical line as drawn on the map of Fig. 1, but the effect should obviously extend for some distance on either side of the line, since the signals will still be travelling quite close to the twilight band. Of course, local conditions, geographical or otherwise, along the route may modify the exact route followed by the signals, causing them to deviate somewhat to the east or west. This accounts for the duration of the period each morning during which signalling has been possible, while the shifting of this day-night line as the year progresses accounts for the gradual shift which has been experienced in the hour at which signalling has been possible.

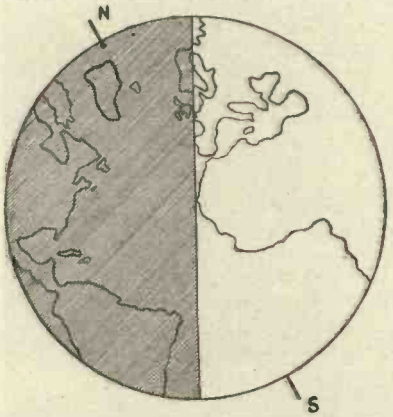


Fig. 2.—A sketch of the globe indicating night and day conditions with winter in the British Isles and dawn in London.

Even, however, if there is no such strengthening effect due to reflecting mirror-like action of the twilight band, it must be evident that from what has been pointed out above it is quite possible for the signals between England and Australia and New Zealand to traverse practically the whole route in darkness with only a short distance in light, and yet follow very closely the shortest route as shown on the map.

It is also interesting to note that on the basis of this theory signalling to Japan should be practicable under similar time conditions as signalling to New Zealand; but, again, whether this will ultimately prove possible must remain to be seen. It may well prove more difficult to signal the shorter distance to Japan (only some 5,500 miles) than it is to Australia, if there is any strengthening of the signals due to the proximity of New Zealand to the antipodes of London, but since Australia is very considerably removed from the antipodes and yet two-way signalling to radio amateurs there has been possible, it would seem that, so far as our knowledge goes at present with these wavelengths, this effect is not of very considerable importance.

Measurement Necessary

Even if local effects do actually modify the real route to some extent as compared with the above, it yet seems extremely probable that the actual route must much more approximate to the one described than to a truly westerly (although dark) one across America and the Pacific. Unfortunately we cannot follow the signals all the way, but some D.F. measurements, if they could be made, might be a very considerable help. Possibly, too, in due time, as more and more radio amateurs spring up in other countries of the world, we may gradually accumulate more information of this type by finding out what places it is possible to signal to at the same time, and in this way our knowledge of the routes of the signals and of the mechanism of radio transmission may be further increased.

OBITUARY

Mr. W. W. BRADFIELD, C.B.E.

All who are concerned in the world of shipping and in the wireless industry will hear with the deepest regret of the death of Mr. W. W. Bradfield, General Manager of the Marconi International Marine Communication Co., Ltd., which occurred in a London nursing home on 17th March. Mr. Bradfield was born in London on 18th March, 1879, and thus passed away a few hours before the 46th anniversary of his birth.

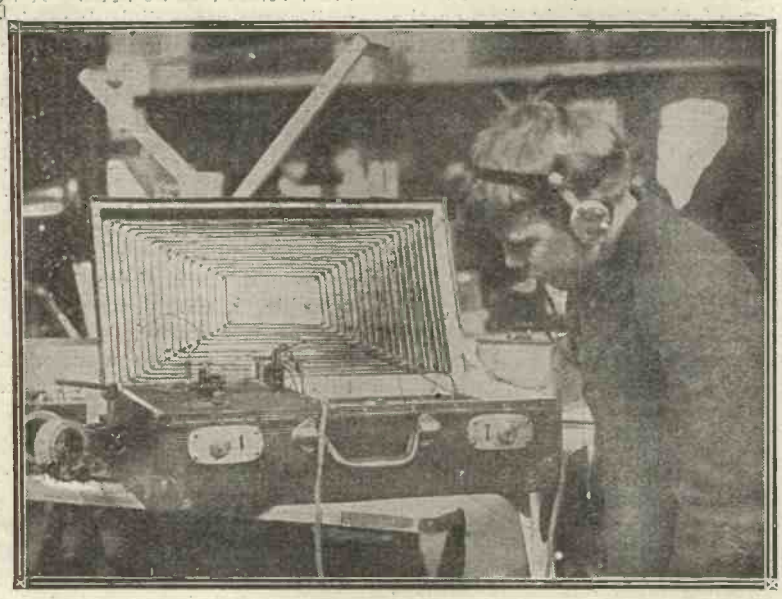
Mr. Bradfield had been in failing health for some time, but, with the devotion which he had always shown to the interests of the Company, he could not be persuaded to follow the advice of his doctor and take the rest which he so much needed. Consequently he broke down completely towards the end of last year and went to Switzerland for treatment. Unfortunately, it was too late to restore him to health, and he was brought back to London.

Mr. Bradfield belonged to the following institutions:—The Institution of Electrical Engineers (London); The Institute of Electric Engineers (New York); The Institute of Radio Engineers (New York); The Electro-Harmonic Society; The Old Students Association, Finsbury Technical College; and the following clubs:—The Junior Constitutional Club; The Royal Automobile Club; The Aldwych Club; The Chelmsford Rugby Football Club, and New York Athletic Club.

Reception Conditions Week by Week

By W. K. ALFORD.

Review of reception for week ending March 15th.



A two-valve portable receiver made by scholars of St. Paul's School, Dorking.

RECEPTION conditions, in general, have taken a mild turn for the better this week, and, were it not for the continuance of the very intense "X's," long-distance reception would have been as good as at any period this winter.

An interesting feature of the week was the testing of the new London station during the daytime, and up to the present my anticipation that very little change would be noticed has been upheld, although some effect may take place at greater distances.

Almost simultaneously with my remarks last week, on the potential chaos which is beginning to show itself in Western Europe, owing to the haphazard allocation of wavelengths, a representative conference has been arranged among the companies concerned, and it is to be hoped that this will bring about a friendly settlement of the matter.

Continental Stations

In this connection, the example set by the British stations in rigidly adhering to allotted wavelengths will show in striking contrast to the looseness of certain Continental stations. On Tuesday last (March 10) what was, perhaps, the greatest concert which has ever been broadcast, was given by Madame Tetrazzini, assisted by a number of very eminent artistes, and practically the whole of Europe listened, to say nothing of America, where, I am given to understand, the concert was relayed extensively throughout the Eastern States.

The "Radiofonica" station at Rome also gave an excellent relay, which was distinctly heard in this country.

Was ever the appreciation of the enterprise of a great British newspaper so widespread?

Manchester Station

While we are on the subject of simultaneous broadcasting, I should like to mention a point which is quite familiar to a number of people and yet is quite unnoticed by others.

It refers to the reception of Manchester and other stations which are distinctly difficult to receive well in the South. Now a lot of people are heard to say that, at times, they receive, say, Manchester easily, and at good strength. On going into the subject I found that the solution lay in the fact that the apparent strength of Manchester increased by nearly 100 per cent. when taking the London programme—the reason being fairly obvious. Most sets cannot separate London and Manchester properly at about 20 miles from London, and when Manchester is tuned in, when taking a London programme, the transmission of the latter is still filtering through, giving the impression of remarkable reception of the former station—the "time-lag" being so small that the two transmissions seem as one.

The number of people experiencing this apparent phenomena without realising its cause is quite remarkable, and it is worth remembering that the same thing may happen with other stations under the same conditions, before being thrilled by what appears, at first, to be a fine feat of reception.

Long Distance Reception

The experimenter interested in "DX" morse reception has had a rather trying period lately owing to the bad atmospheric conditions. American amateurs are still coming in in large numbers and it is quite impossible to "log" them all. One or two use telephony quite a lot and it is sometimes possible to hear what they say with the help of a little imagination, which is really remarkable considering the small powers used.

The "jamming" on the amateur wavelengths in the States must be appalling. One well-known transmitter told me, the other evening, that there were eight stations, all working at the same time, all within a mile and a half of him, and all in a wave-band of four metres!

Keenness

The keenness of the ordinary broadcast listener to learn the morse code is growing apace, and I know quite a number who sit down for half an hour every evening armed with a "buzzer key" and the Postmaster-General's Handbook, fully determined to elucidate the mysterious sounds which sometimes spoil his broadcast enjoyment.

A Hint for Long Wave Tuning . . .

A useful tip which may be applied when it is desired to receive the long wave telegraphy stations

IN the receiving sets of a year or two ago it was usual to have tuning condensers of quite large maximum capacity. The A.T.C. was usually of 0.001 μF, whilst the capacity of the secondary and anode tuning condensers was as a rule 0.0005 μF. Modern practice favours the employment of condensers with maximum capacities of about half those mentioned. Thus, in few up-to-date sets designed for general work will the maximum of the A.T.C. be found to exceed 0.0005 μF, and anode circuit tuning is generally done with condensers rated at 0.0003 μF.

Long Wave Reception

The low minimum capacity obtainable with a well-designed condenser of to-day makes it possible to cover a respectably wide band on the medium wavelengths with one set of inductances used in conjunction with condensers of these values. But for long wave work it is desirable to be able to bring in larger capacities at will.

Clip-in Condensers

A very handy method is as follows: Close to each variable condenser fit a pair of clips upon the upper surface of the panel, connecting one of them to the fixed and the other to the moving plate contact. Provide a set of clip-mounting fixed condensers with values equal to those of the variable components. When work is being done on the longer waves the capacity of the variable condensers can be supplemented as necessary by placing fixed condensers in the clips, in which position they will be in parallel with the fixed ones.

Mr. S. K. Lewer, of West Hampstead, who is only seventeen years of age, has a splendid record as a wireless enthusiast. Up to now he has logged several hundred American and Canadian Stations, and has picked up Mexico, North Greenland, Argentine, Australia, and New Zealand. During 1924 he made five thousand log entries.

An Example

Suppose for example that a 0.0005 μF aerial condenser will not tune the set quite up to the wavelength of a desired signal, a 0.0005 μF fixed condenser is placed in the clips, the knob of the variable being turned back to zero and then gradually advanced. In this way a variable capacity from the minimum limit of the variable condenser to 0.0005 μF is first obtained; then when the fixed condenser is placed in shunt the capacity in the circuit can be varied between the minimum of the variable component *plus* 0.0005 μF and 0.001 μF.

Stated Capacities

This method of paralleling is effective only if the variable condenser is up to its stated maximum capacity and the fixed one has a value not exceeding that claimed for it. If the variable condenser had an actual maximum of 0.0004 μF, and the fixed condenser was of 0.0006 μF, there would be a gap in the tuning which might make it impossible to tune in the signal desired. Fortunately variable condensers of good make can be relied upon; many of the best makers give actual guaranteed figures for their components. Fixed condensers, too, of reputable makes are accurate to within quite small limits.

R. W. H.

Historic Wireless Apparatus

IN connection with Messrs. Selfridge's birthday celebrations during this week there will be on exhibition in the wireless department of the stores a number of pieces of historic wireless apparatus, lent by Marconi's Wireless Telegraph Co., Ld., some of which have never been publicly exhibited before.

They include early examples of a wireless telegraph coherer receiver, aircraft wireless equipment, wavemeter, valves, and magnetic detector, which, for comparison, are ranged side by side with their most modern counterparts.

The New 2LO Station

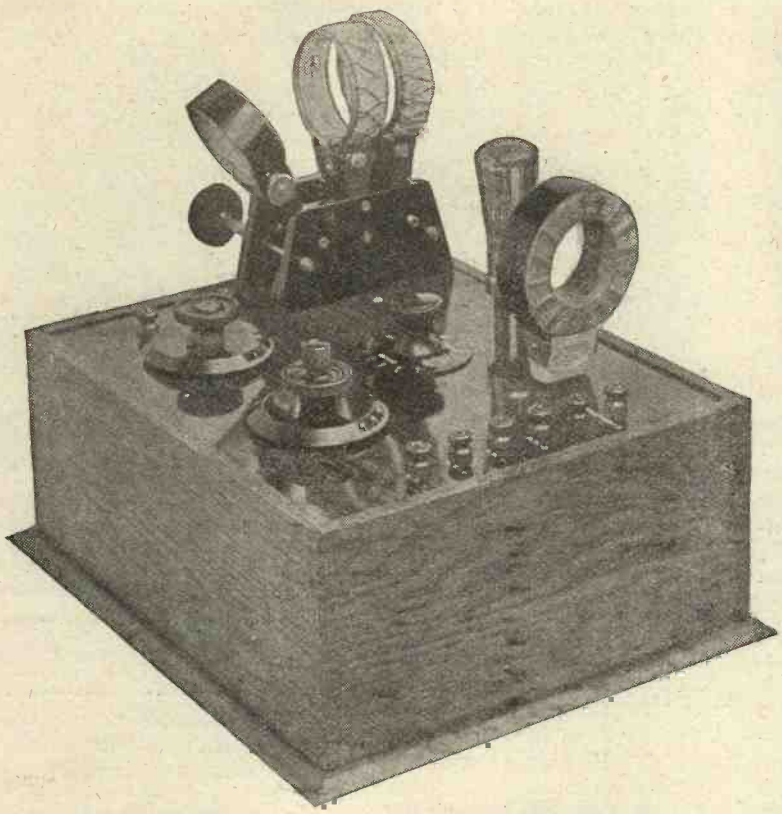
The London broadcasting station on the top floor of Marconi House has now closed down, and the new one in the West of London has undertaken the regular transmission of the daily programmes of the British Broadcasting Co. The old station, however, is being kept as a standby until the new station has proved itself thoroughly effective.

An Ordinary Meeting of the R.S.G.B. will be held to-night at 6 p.m. at the Institute of Electrical Engineers, when Mr. P. K. Turner will lecture upon "The Testing and Measuring of Wireless Components."

A Reinartz
Using Plu

By STANLEY G. RATTE

Full constructional details build a sensitive single va fine control of reaction. added attraction of being semi-aperiodic aerial



The aerial and grid coils are tightly coupled, as shown in the three-way coil-holder.

THOUGH, strange to say, the Reinartz circuit has never risen in this country to that condition of popularity so familiar with other good circuits, those readers who have experimented with it will doubtless agree that it is a very fascinating arrangement. The two main characteristics of its attractiveness are good selectivity and fine reaction control; the first is obtained by a semi-aperiodic aerial coupling, whilst the latter is given by a combination of electrostatic and electro-magnetic reaction coupling in the manner shown in the theoretical circuit diagram.

Adaptations

In last week's issue of *Wireless Weekly* there was published a special article by the inventor of this circuit, namely, Mr. John L. Reinartz, and upon referring to that article it will be seen that his Fig. 4 circuit for use with short-wave work still retains the main details of his original circuit. The experimenter who introduced the circuit to this country is Mr. Percy W. Harris, who has to his credit many adaptations of the original arrangement, including the use of plug-in coils.

Wavelength Range

In *Wireless Weekly* for August 15, 1923, I described the construction of a two-valve Reinartz receiver in which tuning was obtained by means of a tapped coil and variable condenser, whilst more or less rough adjustments for reaction were made by a similar means, being subsequently corrected by another variable condenser. The essential difference between the tuning arrangements of that receiver and the one under description is that whereas in the earlier set the wavelength range was limited to a relatively small waveband, in the present case all the telephony wavelengths, excluding the ultra-short waves, may be covered without difficulty, tuning and reaction control being given by the two variable condensers.

Coils

The compact appearance of the receiver may be gathered from the photograph of the set with the coils and valve in position, the two terminals on the left being for the aerial and earth connections, whilst those on the right are for the batteries and telephones. The two coils seen to the back of the three-way coil-holder are the aerial and grid-coils, and with the receiver in use are coupled together as tightly as circumstances will permit; the remaining coil of the three shown in the holder is the plate-coil, and is adjusted for the optimum

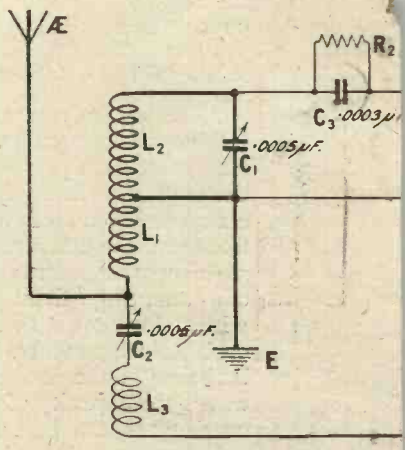
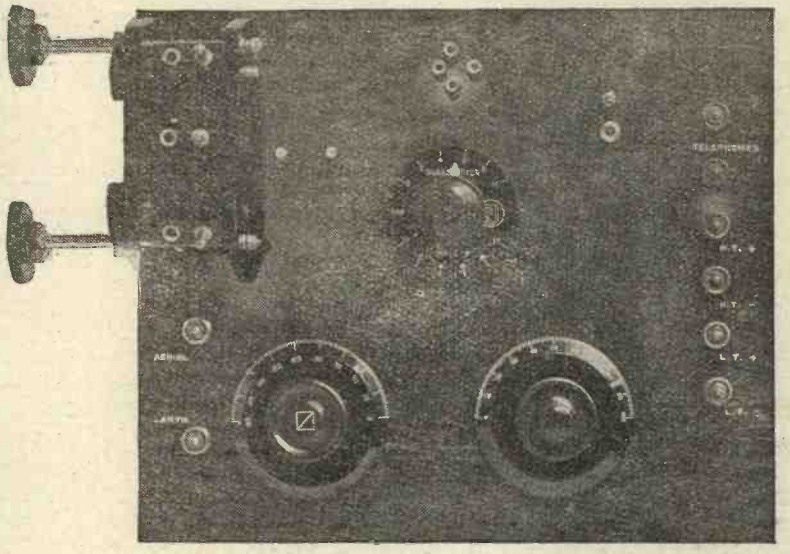


Fig. 1 —The theoretical

z Receiver
g-in Coils

E, M.I.R.E., Staff Editor.

are here given of how to ve receiver which gives a This little receiver has the xtremely selective, in that coupling is employed.



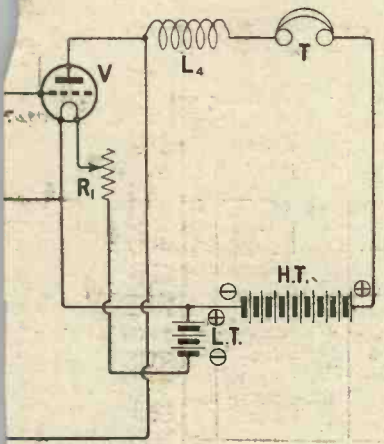
This full-face view of the panel shows the disposition of the components and terminals.

coupling, after which, as with the other coils, it is left alone. The coil seen to the right of the valve is a choke-coil of the plug-in variety, actually a No. 300, the purpose of which will be explained later.

The two condensers seen at the front of the set are for secondary or grid circuit tuning and reaction control, that fitted with the "vernier" plate being the reaction condenser.

The Circuit

The theoretical circuit arrangement incorporated in this receiver is shown in Fig. 1, wherein L1 constitutes the semi-aperiodic aerial coil conductively and inductively coupled to the secondary or grid-coil L2, this latter being tuned by the condenser C1. The coil L3 is the plate-coil consisting of another plug-in inductance, the condenser C2 giving the desired control of reaction.



circuit of the receiver.

Connected between the plate of the valve and the telephones there will be seen still another coil L4, which serves as a choke to ensure that the high-frequency currents take the path through the reaction or plate-coil and condenser rather than through the self-capacity of the telephones.

To make certain that this self-capacity of the telephones does not by-pass these high-frequency currents the radio choke L4 should always be used, and should itself for obvious reasons be a coil of low self-capacity. The remaining details of the circuit are much the same as in any other single-valve circuit, and call for little comment.

Components

The components for the construction of a receiver of this type should be of good quality if the best results are to be obtained, and in accordance with the usual procedure the actual parts embodied in the receiver illustrated are given below together with their origin. This information is given purely for the information of readers, however, and does not necessarily mean that other makes should not be used; on the contrary, any good make of component may be substituted so long as the values stated are respected. Should the reader have by him any good make of condenser other than either of those incorporated for instance, then it may be included without hesitation so long as its value is the same as that it is intended to substitute.

One ebonite panel measuring 12 in. x 10 in. x ¼ in. (That in the photograph is a Radion mahoganite panel 3/16 in. thick.)

One three-way coil-holder (Peto-Scott).

One 0.0005 μF square-law condenser (Peto-Scott).

One similar condenser with vernier (Radio Instruments, Ltd.).

One dual filament resistance (Radio Instruments, Ltd.).

One grid-leak and condenser of 2 megohms and 0.0003 μF respectively (McMichael).

One coil socket complete, or parts for panel mounting.

One valve-holder or parts for panel mounting.

Eight terminals. (Those in the photograph are a special type with an "oxi-copper" finish which matches the mahoganite

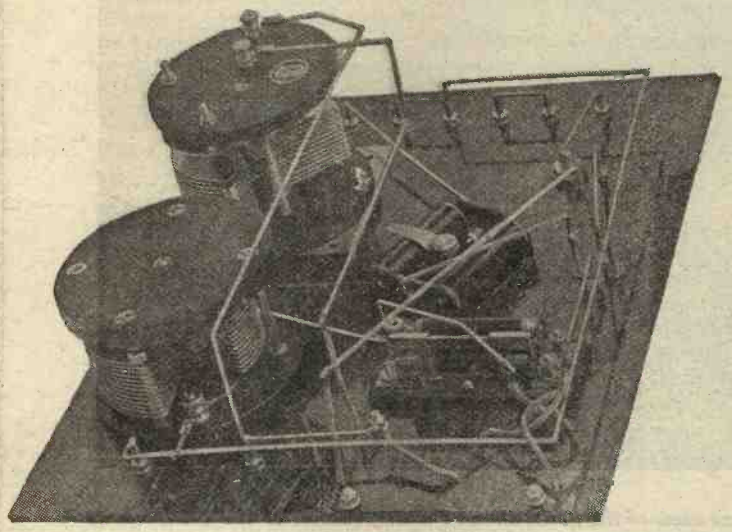
panel, supplied by Grafton Electric.)

Quantity of square tinned copper wire for connecting purposes.

Set of Radio Press panel transfers.

The Panel

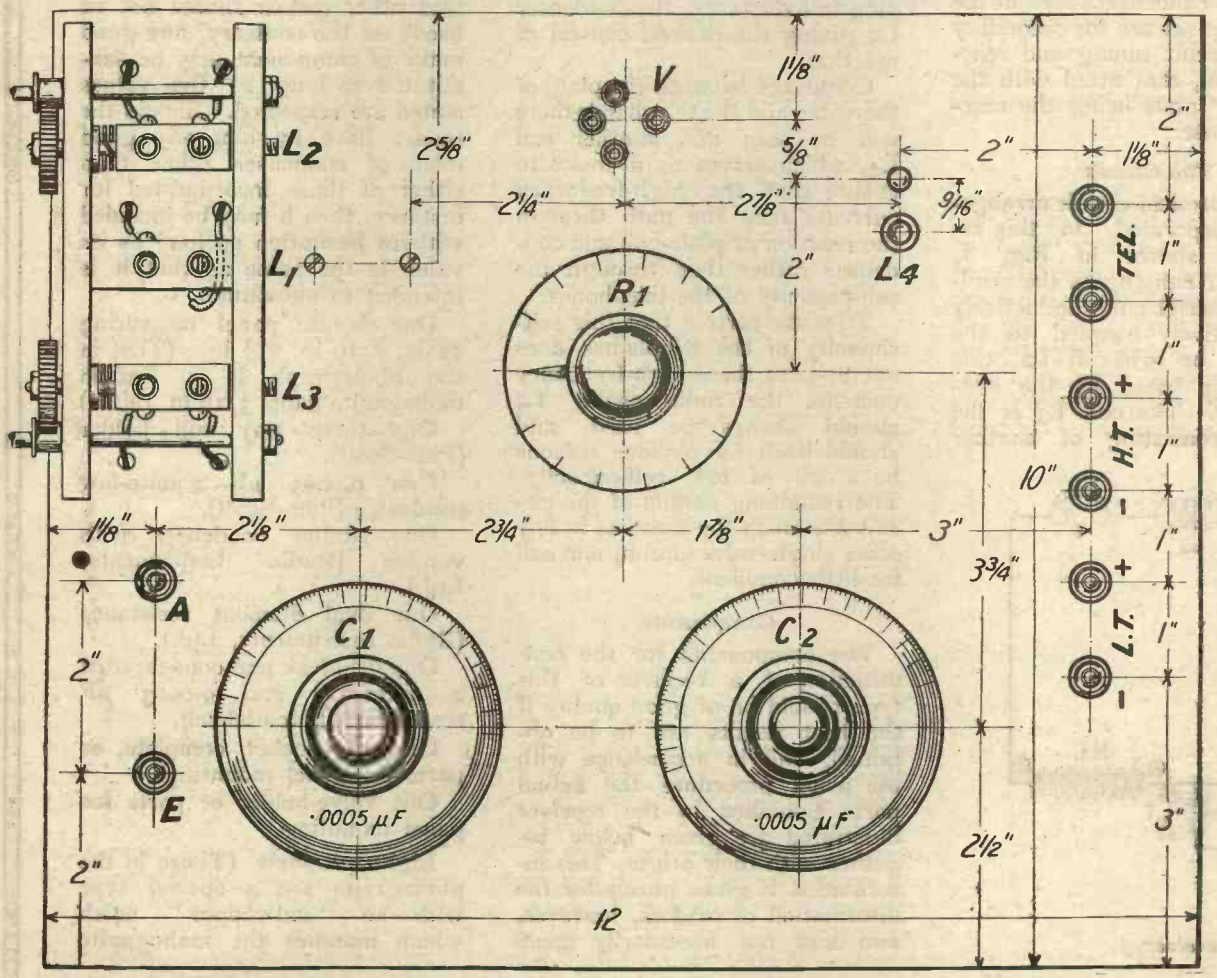
The panel should be drilled in accordance with the instructions given in the layout and dimensioned drawing, and before mounting the components the countersinking should be done where necessary. In connection with this panel, readers are advised to buy guaranteed ebonite, and since this material is now so easily obtainable there can be no reasonable excuse why a retailer should seek to persuade a purchaser of a panel to buy inferior quality ebonite.



The well-spaced wiring and easy access to the components may be seen from this photograph.

Wiring Up

The wiring up of this receiver is a perfectly straightforward piece of work, and since the components are all easily accessible little difficulty will be experienced by even the beginner in set construction. The actual wiring may be observed from the photographs showing the underside of the panel, whilst the wiring may be followed for practical purposes from that illustration showing the wiring as a working drawing.

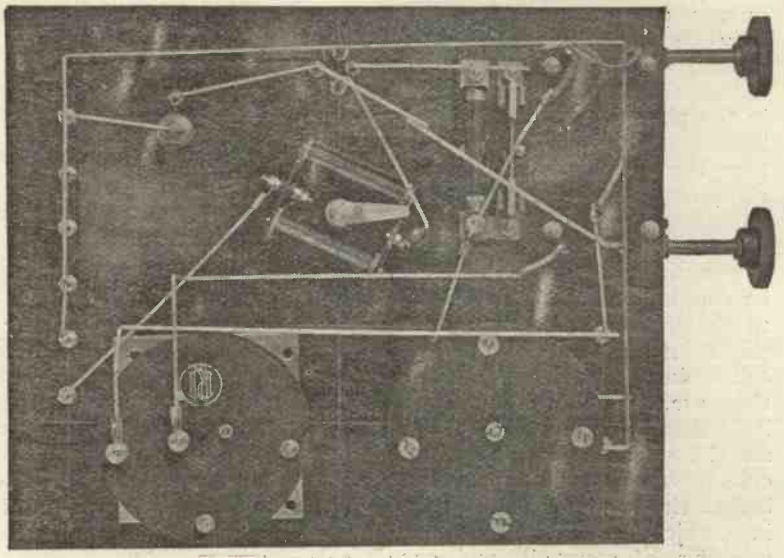


This drawing, which is exactly half-size, shows the purposes served by the terminals and also gives the necessary drilling dimensions.

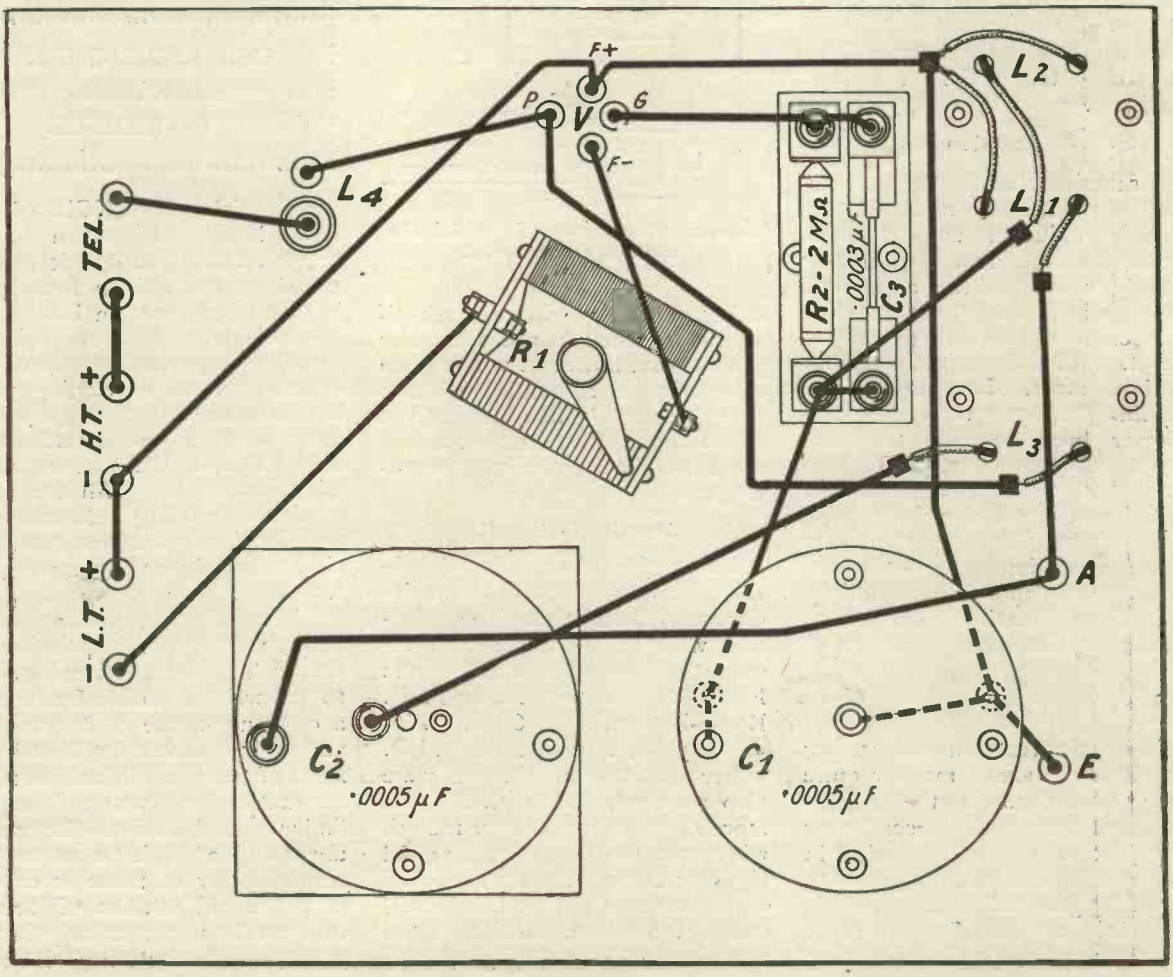
For simplicity in connecting up it is best to wire up first the L.T. negative leads and then the plate circuit before attempting the other connections, as by so doing the panel is kept clear for the more twisted leads. After the plate circuit has been connected up the wiring of the L.T. positive lead further simplifies the wiring which is to follow. The connecting up of the coils should be observed with extreme care in that if two of them are connected the wrong way round serious tuning defects will result when the operation of the set is attempted. To make sure of these connections a separate figure of how the joins should be made is reproduced.

Operating the Receiver

With the wiring completed the valve may be inserted in its socket and the batteries connected for testing purposes to the terminals, as indicated in the illustration of the panel layout. Assuming that the valve brilliancy answers in accordance with the control given by the filament resistance, insert a No. 250 or 300 plug-in coil in the choke-coil socket (L_4); connect aerial, earth and telephones. The best results with a receiver of this type will



By comparing this photograph of the underside of the panel the actual wiring of the original receiver may be followed.



A practical back-of-panel wiring diagram which may be compared with the photograph shown above.

be obtained when the aerial coil (L1) used is best suited to your own particular aerial, but for purposes of trial a No. 25 coil may be inserted in the aerial socket, with a No. 50 in the grid circuit (L2) and a No. 50 or 75 in the plate socket (L3). Before lighting the valve for reception turn the reaction coil (L3) at right angles to the aerial coil (L1), and set the reaction condenser (C2) at the zero value. The aerial coil (L1) should now be coupled as tightly as possible to the grid-coil (L2) by turning the adjusting knob of the grid-coil socket. Leaving the coils as they are, the valve should be lighted and tuning made upon the aerial condenser (C1). With the coils given, it will not be long before the local station is tuned in (subject to B.B.C. stations working, of course!), and once the loudest signals have been found turn the reaction condenser about halfway round its scale, and see if the set will oscillate; if it does turn the condenser back immediately until oscillation stops, though it is unlikely that the set *will* oscillate.

Reaction

Assuming that the set does not oscillate with the reaction condenser adjusted as described, move the reaction coil (L3) very slowly nearer to the aerial coil (L1), still keeping the reaction condenser at the halfway adjustment, until the set *just* oscillates and no more. Leaving the coil in this position, turn the condenser back towards the zero value until the set stops oscillating. With the coupling so found, reaction control can be carried out by means of the condenser alone, alteration of the secondary tuning condenser necessitating, sometimes, further adjustments of the reaction condenser.

Coupling

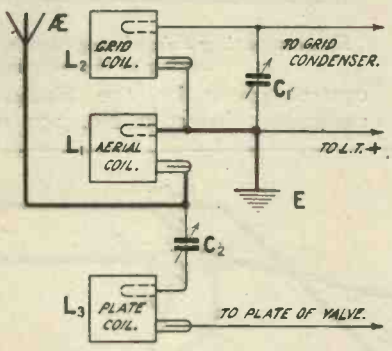
With the reaction coil setting found in the above manner quite large variations in the adjustments of the secondary condenser *may* necessitate an alteration in the reaction coil coupling, though it will be generally found possible to obtain a good reaction effect over the whole scale of tuning condenser.

Should it be desired to tune to the stations with wavelengths above the 400 metres line, then the No. 25 coil should be replaced by a No. 35, whilst a No. 75 and No. 50 should be used for the grid and reaction coils respectively.

For the reception of Chelmsford or Radio-Paris, the aerial coil should be a No. 100, with a No. 200 and No. 250 for grid and reaction coils respectively; in the same sequence coils No. 150, 300 and 250 may be used for the reception of the Eiffel Tower.

Selectivity

If more than average good selectivity is desired, then it may be understood, within reason, that the smaller the aerial coil (L1) the sharper and more difficult the tuning with the selectivity it is aimed to procure. For general use, however, where good selectivity is demanded without that "super" fine tuning, a No. 25 coil in the aerial socket is most useful upon the lower wavelengths.



Showing the manner in which the coils are connected.

Results Obtained

Using the receiver in South-East London first upon an indoor aerial and then in conjunction with an outdoor aerial, excellent results were obtained from Ecole Superieure, Radio-Paris, Radio-Iberica, 5IT, 6BM, 5WA, 5XX, 5NO, and of course 2LO. Other stations than these were also received, but with a little more difficulty in tuning, though when once tuned gave really good signals; among these were 2ZY and several Continental broadcasting stations, which upon referring to *The Foreign Radio Times* proved to be Berlin, Hamburg, Zurich, Radio Belge, and Breslau. An attempt at reception was also made upon the short wavelengths, using a Gambrell a/2 as L1, a Gambrell a as L2, and a Gambrell A as the plate or reaction coil, when a number of French, British, and American amateurs were received without difficulty.

The operation of the receiver throughout is very simple in spite of its selectivity, and particularly attractive is the smooth control of reaction. For the reader who wishes to build for himself a small receiver, which will give him the full range of a single valve, with the assurance that he will be able to eliminate possible interference, then the set described will satisfy his requirements. Further, the easy control of reaction will in some cases find a greater appeal than that given by the more usual method of varying the reaction coupling by means of a swinging coil.

INTERNATIONAL WIRELESS CONFERENCE

A CONFERENCE of the leading European broadcasting authorities, convened by the British Broadcasting Company, met in London on Wednesday, March 18, to examine ways and means of co-ordinating and developing wireless broadcasting through agreement between the broadcasting authorities of the various countries concerned. All the principal broadcasting authorities on the Continent were represented, either directly or by agents in London.

The whole field was explored, and it was agreed in principle to establish an international bureau to perform the double function of a clearance-house of information and an instrument for the adjustment of technical difficulties of an international character. The preliminary deliberations disclosed a unanimity of opinion as to the responsibility of those in charge of the administration of broadcast services, particularly in the direction of fostering international good will.

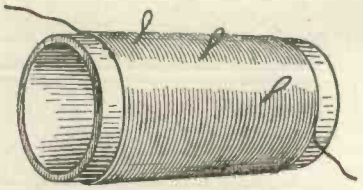


Fig. 1 shows the simplest method of taking tappings on a single-layer coil

Making Coil Tappings

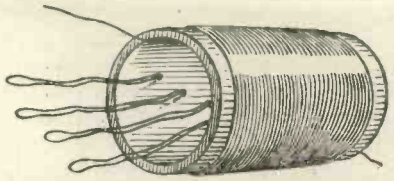


Fig. 3.—By this method the connecting wires are all inside the former.

IT may be required to make up special coils from time to time from which a certain number of tappings want to be taken. If the coil is a single-layer solenoid there are several ways of taking these tappings. What is probably the simplest of these is

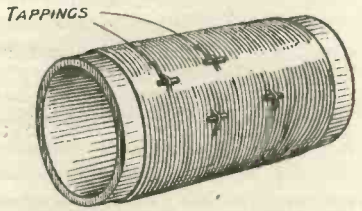


Fig. 2.—Raising the tapping turns with small pieces of ebonite.

shown in Fig. 1, and merely consists in twisting a loop in the wire while the coil is being wound at the point that a tapping is needed. These loops are bared after the coil is completed and the necessary leads soldered on. Another method is to wind the coil to the end, then, with some sharp-pointed instrument, lift a turn of the wire at the point where a tapping is wanted, and place a slip of wood or ebonite underneath it (Fig. 2).

Soldered Connections

Finally strip the insulation from the raised portion of the wire and solder the connection on. Yet another method is shown in Fig. 3. Here again a loop is made in the wire at the point that a tapping is to be taken, but instead of just twisting the wire a long loop is made and pulled through a hole that is made in the former on which the coil is being wound.

Loop Tappings

The loop is made of sufficient length to reach to the point to which it is to be connected, and thus eliminates the necessity of soldering a lead to it. Yet another method will be seen in Fig. 4. This consists in drawing a small loop of wire through a washer securing it with a small wooden or ebonite pin; then when the coil is completed the wire can be bared at the various points and the necessary leads soldered on. Care should be taken when soldering leads on to tapping-points on a coil that no

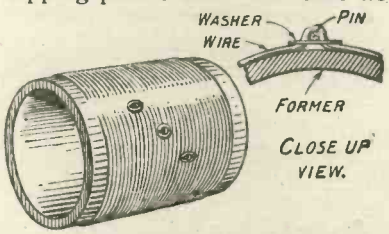


Fig. 4.—Another neat method for taking tappings.

flux is allowed to drop or splutter on the cotton insulation of the wire, or its insulating properties may be seriously impaired.

C. P. A.

Our photograph shows M. Paderewski, the famous pianist, who broadcast to all stations on March 15.

A Useful Store Box

By H. BRAMFORD

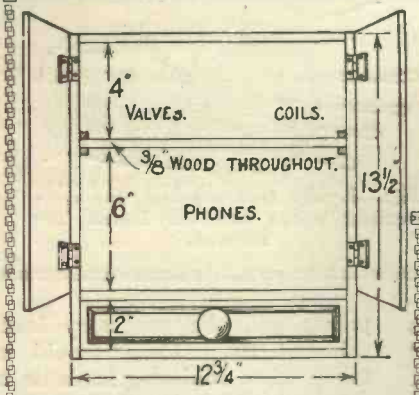


Fig. 1.—Details of the construction.

The expense of constructing such an item would be small in comparison with the cost of one damaged valve. Details of construction are shown in Fig. 1. The dimensions given are cutting sizes. Plain deal ⅜-in. thick will be very suitable for construction.

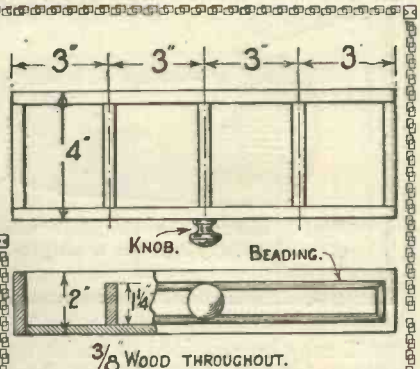


Fig. 3 shows the arrangement of the drawer.

IT is necessary to conveniently store certain wireless components in such a way as to ensure their safety, and at the same time to have them immediately accessible. Valves are expensive things to leave lying about, when the slightest jolt may injure their filaments; coils are easily damaged with knockabout use, and several other small accessories are also often required at hand. The idea is therefore to construct a special cabinet to contain such articles, the needed component always being at hand, thereby dispensing with the usual "where on earth did I put that crystal?" accompanied by endless searchings in junk boxes.

Details of the coil and valve shelf are shown in Fig. 2. Valve

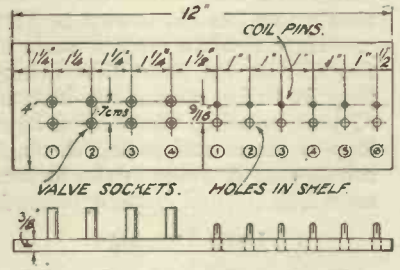


Fig. 2.—Dimensions of the shelf for valves and coils.

sockets are used to support the valves. Two sockets are required for each valve. These are spaced equi-distant to the plate and grid pins of the valve.

The coils are supported by means of a coil plug and a hole in the shelf. The centres of the panel hole and the plug are 9-16 in. apart. The valve division may be lined with green baize or thick felt. The shelf below the valve shelf is intended to receive two pairs of headphones. At the bottom of the cabinet is a pull-out drawer divided off as shown in Fig. 3 for the storage of clip-in condensers, plug-in transformers, crystals, cat-whiskers, shorting plugs, links, etc. A good finish may be given to the cabinet with walnut stain. The stain is made up by simply mixing walnut crystals with water to the depth of colour desired.

Madame Tetrazzini, at the dinner given in her honour by Burndept, Ltd. Our photograph shows, left to right, Countess Brambilla, Duke Fillippo Caffarelli, Madame Tetrazzini, Mr. Geoffrey Duveen, Mrs. W. W. Burnham and Mr. W. W. Burnham.

Easily-made Neutrodyne Condensers

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

Some notes of interest to those readers who wish to improvise suitable Neutrodyne condensers for experiments with the Hazeltine Neutrodyne circuit.

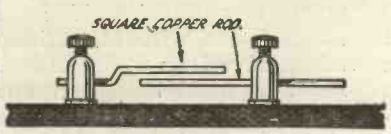


Fig. 1.—A simple application of square rod.

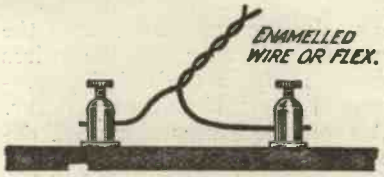


Fig. 4.—The twisted wire method.

THE merits of the Neutrodyne system of high-frequency amplification were recognised theoretically a long while ago, but for some curious reason this method of stabilising multi-stage sets was not until recently very widely used in this country. At the moment it is attracting the attention that it deserves, and Neutrodyne receiving sets are being made up by a large number of constructors.

Three H.F. Stages

With the Neutrodyne method three sharply tuned high-frequency stages can be used with comparative ease, and a set made on these lines is a revelation both for its signal strength and for its almost uncanny power of bringing in distant transmissions at times when other receivers can do nothing with them.

Neutrodyne Condensers

Those who construct Neutrodyne receivers according to the instructions given in *Wireless Weekly* will, of course, provide themselves with specially-made variable condensers of small maximum capacity, several excellent types of which are now available at very reasonable prices. But should the reader wish to experiment with the original American arrangement of the circuit he will find that it is possible to make up suitable condensers in a variety of simple ways, a few of which are described below.

The American Method

Fig. 1 shows one of the most convenient and simple of all methods. Two telephone or "push-in" terminals are mounted about 2 in. apart. In one of them is fixed a small piece of the square tinned rod used for wiring sets, which is bent as shown in the drawing. This is the "fixed plate." The "moving" plate consists of a straight piece of the same rod inserted into the second terminal. By varying the length of the protruding piece of straight rod the capacity can be adjusted very finely, and there is little difficulty in finding the point at which the desired Neutrodyne effect takes place. Should it be found that adjustments are not sufficiently fine the maximum

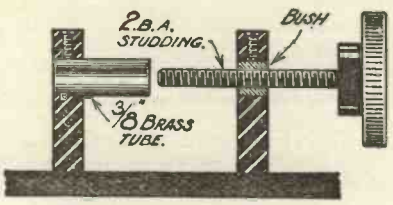


Fig. 2.—A more elaborate arrangement

capacity of the condenser may be reduced by increasing the bend in the fixed rod, which creates a greater air space between the two.

Another Suggestion

A more elaborate Neutrodyne condenser can be made up in the way shown in Fig. 2. Here the end pieces are ¼-inch ebonite fixed to a small baseboard by means

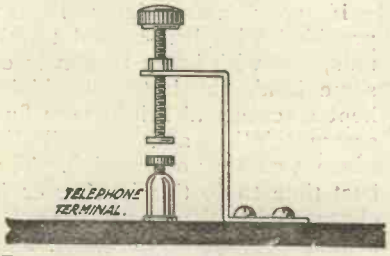


Fig. 3.—Another suggestion for a small capacity variable condenser

of screws. In one is mounted a short piece of ⅜-inch brass tubing, which is fixed in position by means of a setscrew. The other end piece is provided with a bush tapped 2 B.A., which is also fixed by a setscrew. Through this bush runs a length of 2 B.A. studding fitted with a standard condenser knob. The contacts are made by soldering leads to the tubing and to the bush. The advantage of a condenser of this type is that it enables minute adjustments to be made, whilst if a small white spot is made on the outer surface of the knob the number of turns required to produce the desired capacity may be counted and noted for future reference. In making up this kind of condenser great care must be taken to see that both the tube and the piece of studding are straight and correctly centred, for it must not be forgotten in some forms of Neutrodyne circuit a faulty condenser may lead to a disastrous short circuit.

Old Crystal Detectors

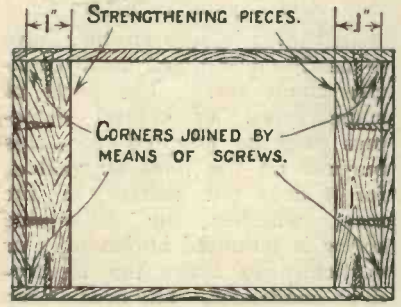
In Fig. 3 is seen another form of easily constructed small capacity condenser. The parts of some types of crystal detectors may be adapted for this purpose on the lines suggested, for it does not matter in the least whether the adjustable screw is mounted horizontally or vertically to make the Neutrodyne condenser. The crystal cup is removed, and in its place a telephone terminal is mounted, the setscrew being turned hard down so that there may be no shake in it. The cat's whisker having been removed, a small circular metal disc may be soldered to the end of the adjusting screw to form the moving plate of the condenser. Here again care must be taken not to cause a short circuit by making actual contact between the two plates of the condenser. A method which is occasionally employed is shown in Fig. 4. Here two pieces of enamelled wire are inserted into terminals, and their ends are simply twisted together until the right amount of capacity is obtained. This way of making an emergency Neutrodyne condenser has also the

advantage of simplicity to recommend it, but it must be used with considerable care, for should the enamel covering of the wires crack away in the twisting process a short circuit may occur. A short piece of flex may, if desired, be used instead of the wire. If you test this method with either enamelled wire or flex let me warn you against the "bright idea," such as that which occurred to a friend of mine. He had the inspiration that the simplest way of finding the correct adjustment would be to twist together pieces of wire that were obviously too long, and then to snip off a tiny piece at a time with the wire nippers until the proper point was found. If he had snipped one wire at a time all might have been well, but he forgot that when both were cut at the same time there would be a short circuit through the jaws of the nippers!

□

Cabinets for Wireless Sets

MANY people do not want to pay the price of new cabinets for their sets, and those experimenters who make up many different sets can ill afford a fresh commercially made cabinet for each one. Skeleton cabinets (namely, those without any bottom, just two sides and two ends) are quite sufficient. They give a finished appearance to any set, keep dust out, and protect the wiring and components at the back of the panel. Incidentally inspection of the interior of a set is possible without the necessity of removing several screws.



The constructional details of a home-made cabinet.

These cabinets are easily made in the following manner:—A piece of wood is required for the front, sides, and back, just wide enough, so that when the box is made it is a little deeper than all wires and component parts on the back of the panel. This wood may be of mahogany or oak, if desired, but plain white wood, when stained or varnish-stained, is quite good enough. The piece of wood is cut into four lengths, two as long as the longest way of the panel, and two the length of the other measurement of the panel, minus twice the thickness of the wood used. These are joined, as shown in the diagram, by means of two or three screws at each corner, care being taken to keep the corners at right angles.

If there is any tendency for the completed box not to be quite firm two pieces of wood for strengthening may be put in at the bottom of the box. These should be about 1 in. wide and fixed with four screws each, as shown. A further help in keeping the box square is to put two screws to each side of the panel when screwing down instead of one as is generally used.

A. S. C.

□

Hints on Accumulators

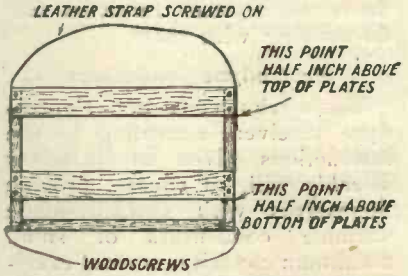
THERE are a few points about accumulators to which due attention is not always paid. Care should be taken to observe the correct charging rates, not to discharge below the safe maximum discharge rate, and never to leave an accumulator in a discharged condition or to use acid of incorrect specific gravity. Neglect of these main points may seriously impair the efficiency of the accumulator, but the little extra trouble taken in observing them will help to increase the useful life of a battery.

If your accumulator is not provided with lead-coated terminals, but with brass terminals of some kind, the latter should be kept smooth and bright with fine emery cloth, and periodically given a coating of vaseline. The best time to do this is after each charge, when the tops of the cells should be wiped quite clean and dry with a piece of rag.

Always have a carrying crate; if you have not one, the description here given for making one is very simple, and such a crate costs very little. Make it out of teak or ordinary wood soaked in paraffin wax. The wood should be ½ in. or ¾ in. thick, according to the weight and size of the accumulator. First cut a suitable piece for the base the same size as the bottom of the accumulator. Then two end pieces, the same width and coming about an inch above the top of the containing cases of the accumulator, are screwed on. Now cut four strips about 1½ in. to 2 in. wide, and screw in positions as shown in the diagram, two each side of crate.

The top piece should be about ½ in. above the top of the accumulator plates, and the bottom piece about the same height above the bottom of the plates. This allows inspection of the acid level and the amount of sediment without taking the accumulator out of its case. A piece of strap is screwed on for a carrying handle, as shown in the sketch.

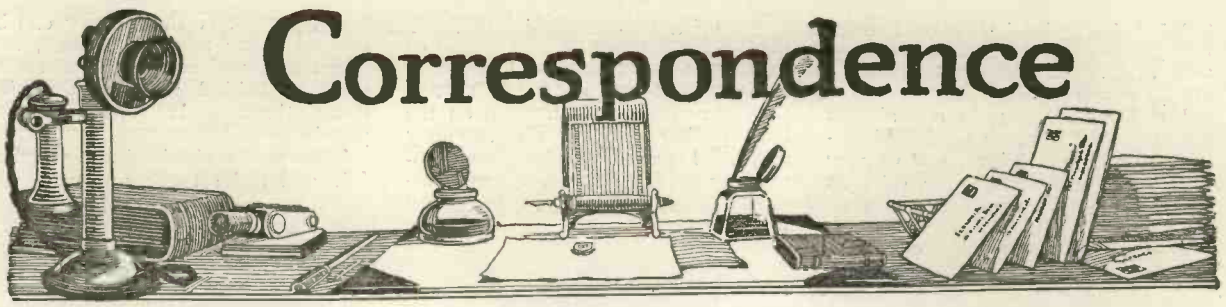
A. S. C.



A suggestion for building a carrying crate.

A FLOATING RELAY STATION

The broadcasting station at Copenhagen has acquired a floating relay station recently in the shape of the s.s. *Aalborghus*, which re-transmits on 445 metres the concerts which are broadcast from Copenhagen on 750 metres. Three days a week, on Tuesdays, Thursdays and Saturdays, when the ship is lying in the harbour of Aalborg, the Danish station can be picked up by listeners in the neighbouring countries on two wavelengths, those of the main station and its aquatic auxiliary.



"THE FOREIGN RADIO TIMES"

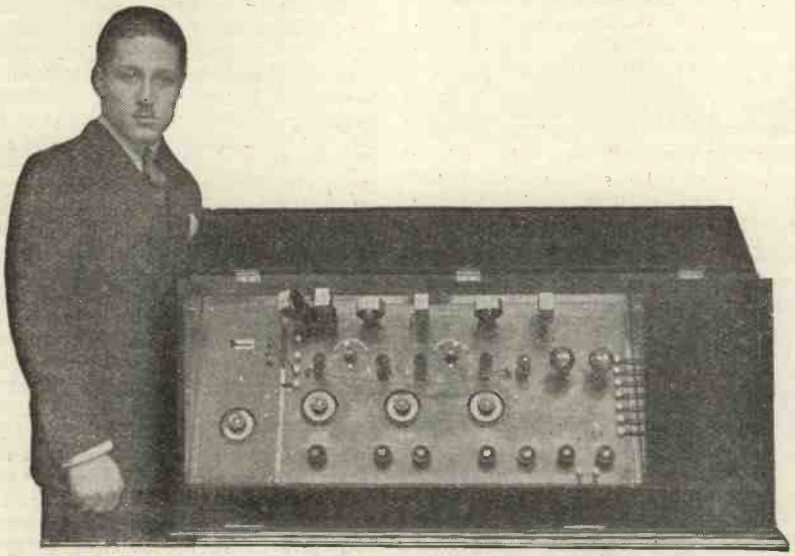
SIR,—Congratulations on your excellent and useful innovation to *Wireless Weekly*, the programme supplement, *The Foreign Radio Times*.

Please allow me to put in a plea for the programmes of Brussels, Hilversum and Madrid. The first two can be tuned in without the slightest interference from 2LO (about seven miles away) or Chelmsford respectively. Brussels is heard at really good loud-speaker strength on Mr. Harris's four-valve Family Set (Envelope No. 2).—Yours faithfully,

A. J. ROBERTS.

London, S.W.17.

SIR,—I have been a subscriber to *Wireless Weekly* for some time now, and I think your new supplement is of great use to amateurs.



Mr. J. Elliott with the seven-valve T.A.T. he has built. An A.B C. wavetrap which he sometimes uses may be seen on the left.

I notice you do not always publish the programmes of the broadcasting station at Brussels, and I should be glad if you could see your way to include these in future. I have often been able to tune in broadcasting stations on the Continent, and being unable to ascertain the station I have not had the pleasure of knowing whom to thank for an agreeable programme.

I am looking forward to your next issue.—Yours faithfully,

H. ALDOUS.

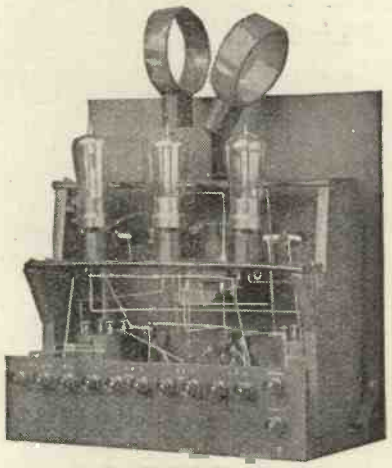
London, N.W.1.

SIR,—In response to the request for suggestions *re The Foreign Radio Times*, I am sending you a few herewith. I sincerely hope that this will become a permanent feature of your journal, and that you will find it possible to devote at least six pages to this interesting feature.

Personally, although I can receive American broadcasting almost any night, I see little object in including programmes of these stations, because the season for American reception is nearly over. I suggest, however, keeping in all the Paris Stations, and Brussels, Zurich, Rome, Hilversum.

As regards German stations, judging from receptions both here and 12 miles south of Guildford, I think the following stations the best for inclusion: Hamburg, Munster, Munich, Frankfurt, Stuttgart and, if space permits, also Berlin. These stations would, I think, fit fairly well into four pages for the five days, and if you could see your way to increase this to, say, five or six pages and the whole week, I am sure it would be much appreciated by your readers.

One point which, I think, should be rigidly adhered to, is that the same stations should be given each day as long as they are working, *e.g.*, one does not want to see Hamburg down for Wednesday, but omitted on Thursday. If new stations are added you should see there is room to include it every day.



Mr. Scarborough's three-valve receiver seen behind the panel.

If the power of Leipzig is increased to 5 kw., this should also be included.

I trust that these suggestions will be of some assistance to you, and wish your journals every success, but please do not start any more, or none of us will have money left in our pockets. —Yours faithfully,

H. C. L. GRENSIDE.

Liverpool.

P.S.—I view with much displeasure the increase of power at 2LO, as I usually reside in Highgate, N., and it was quite bad enough cutting out the old 2LO. As the London programme is accessible almost anywhere in the country via the relay stations, it seems rather unfair on London listeners to increase the power of this station.

H. C. L. G.

SIR,—I much appreciate the new supplement which you are now publishing in *Wireless Weekly*.

I have often been able to tune in stations on the Continent with a two-valve set, but as the call signs

are not given very frequently from foreign stations, I have not been able to discover the exact station I am in touch with.

I notice that you do not always give any programmes for broadcasting stations in Belgium, and wonder if there is any reason for this, as these are stations which are very easy to get.

I hope this supplement will be a regular feature, as it is of great value to listeners.—Yours faithfully,

(Miss) W. McLeod.

London, N.W.1.

Sir,—As yet I am not the fortunate possessor of a wireless set, but frequently listen-in at a friend's. I am very much struck by your *Foreign Radio Times*, which so enhances the pleasure of a foreign concert, and feel I must write and express my sincere appreciation of your new venture.

With every good wish for its future success.—Yours faithfully,

Blanche F. Williams.

Brighton.

Sir,—With reference to last week's correspondence in your issue *re* the publication of the Supplement, *The Foreign Radio Times*, and your request for further correspondence on the matter, I strongly endorse the opinion of others that I hope it will be a permanent feature and also the present publication enlarged in order to bring in more programmes. Hilversum deservedly should have a place in the supplement; they come through very clear and give good programmes, and they are evidently out to give further satisfaction, as they often ask listeners in this country to send them reports and criticisms on the station's reception. I would like to see Brussels, Madrid and Frankfort also included.—Yours faithfully,

T. V. Johns.

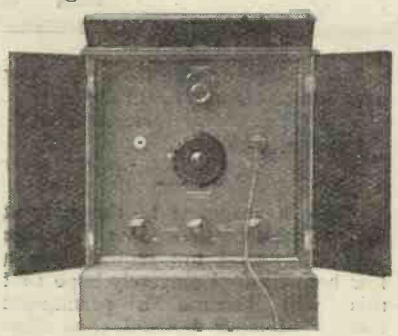
Lowestoft.

THE "ALL-BRITAIN" RECEIVER

Sir,—Having made the "All-Britain" set as described in last year's autumn double number of *Modern Wireless*, I thought that you would be interested to know the results which I have obtained with it.

As you will see by the photograph, I have made it as a portable set, being absolutely self-contained. The lid of the case—which is covered with leather-cloth—comes right off, as you will see, and plugs in the top of the case by means of a removable plug. A frame of five turns of flex is wound inside the lid and brings in any station within about 25 miles at excellent loud-speaker strength.

With regard to results I may say that I have never before imagined that a set could cut out London at a distance of four miles and receive Cardiff at moderate strength on the loud-speaker—I can do this any night. I have had American stations on several occasions, and Brussels, Radio Paris, Madrid and Hamburg, all come in at good strength.



The neat layout of Mr. Scarborough's receiver is shown by this layout.

Wishing you continued success, I remain—Yours faithfully,

Brian M. D. Westgate.

Crouch End, N.

THE SEVEN-VALVE T.A.T. RECEIVER

Sir,—Enclosed are photographs of the Seven-Valve T.A.T. Receiver by Mr. John Scott-Taggart, including the A.B.C. Wave-Trap by G. P. Kendall, which may be of interest to you and your readers.

I have constructed the cabinet to make it as fool-proof as possible while giving due regard to accessibility. You will see the whole cabinet can be shut up with the glass panel in front, switches being provided at the right-hand side of

The "All-Britain" receiver as built by Mr. Westgate.

the battery box outside the cabinet to connect the H.T., L.T. and G.B., while the loud-speaker terminals are connected to a plug in the lid. I leave the set tuned to the local station, which can be instantly put into operation with the three switches by anyone during my absence.

The two panels are built into a frame hinged at the bottom so that an inspection of the interior can be quickly made to replace fuses, etc. The aerial and earth leads are also enclosed behind the panels, which come through between the two panels.

The results obtained are wonderful, and the set gives every satisfaction.

Wishing Radio Press every success.—Yours faithfully,

J. Elliott.

London, N.W.11.

A READER'S RECEIVER

Sir,—Having made the Transatlantic V, the Puriflex, the Family Four, all by Mr. Percy W. Harris, I thought the enclosed would perhaps interest you.

It is a straight three-valve set exactly as given by you in the April issue of *The Wireless Constructor*, except it has separate H.T. for each valve, with plug and jacks for two or three valves. The lay-out is my own idea, and is really as good as it looks.

Since the photos were taken I have added C.A.T., which is a refinement.—Yours faithfully,

Jas. Scarborough.

Doncaster.

A SINGLE VALVE RECEIVER FOR KDKA

Sir,—Ever since KDKA started broadcasting on 68 metres last year I have been trying to find the ideal set for this work, *i.e.*, efficiency and simplicity and ease of control and volume. I buy all the wireless papers and have made up lots and lots of short-wave receivers, and though they all worked, none of them, in my opinion, came up to what I wanted, but I have found one at last, and that is the Single Valve Set described in February's *Modern Wireless* by Stanley G. Rattee. It answers all above requirements, and providing one uses extension handles (in my case they are 15 in. long), no trouble is experienced with capacity effects. I was so pleased with the results on one valve that I added a L.F., and so pleased with the results of two valves that I added a second L.F., which give excellent results on the loud-speaker. I don't mean you have to bury your head in the speaker to hear, but it can be heard in the next room easily. I personally have been complimented so much on these results that I consider that the right person to get the praise is Mr. Rattee, though I hope that at least "·06" of the results are due to my having taken great care in my aerial and earth installation and also care and trouble in the other points which are so vital to short-wave work. I should like to add that I have an ordinary four-valve set besides this

one, on which I get great results—America, etc., etc., and have managed to get it to go down as low as 60 metres, but there is no comparison between reception on my original set and this latest one.
—Yours faithfully,

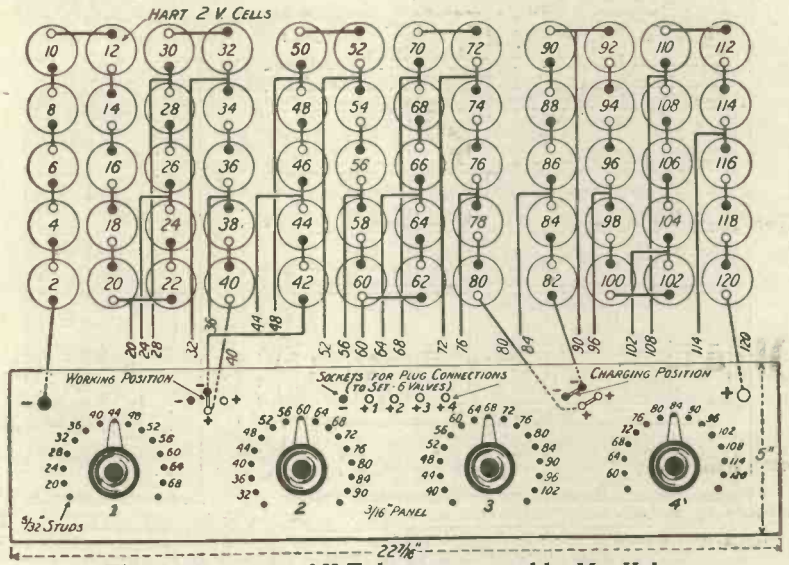
C. FISHER.

Bournemouth.

HIGH-TENSION ACCUMULATORS

SIR,—I have been much interested in the recent references in *Wireless Weekly* to the use of small capacity accumulators for high-tension units. I have for some time used a 120-volt accumulator, made up of 60 Hart cells of the circular type; these are arranged in three groups of 20 cells each, contained in a drawer and wired up to four selector switches, the studs being so spaced that it is not possible to short-circuit adjacent studs when moving the switch arms. I enclose sketches of both the drawer and the switch panel and wiring. You will notice that the three groups of 20 cells are wired up in such a way that by inserting the short-circuiting "U" plugs in the manner shown as "charging position," the battery may be charged as a 40-volt unit from one lamp passing .3 ampere.

When using the battery as a 120-volt unit the short-circuiting plugs are inserted as shown as "working position"; in this position the three units are in series.



The arrangement of H.T. battery as used by Mr. Haley.

Thanking you for the interest derived from your most excellent publications, *Modern Wireless* and *The Wireless Constructor*.—Yours faithfully,

J. N. HALEY.

Finchley.

A SINGLE-VALVE RECEIVER FOR KDKA

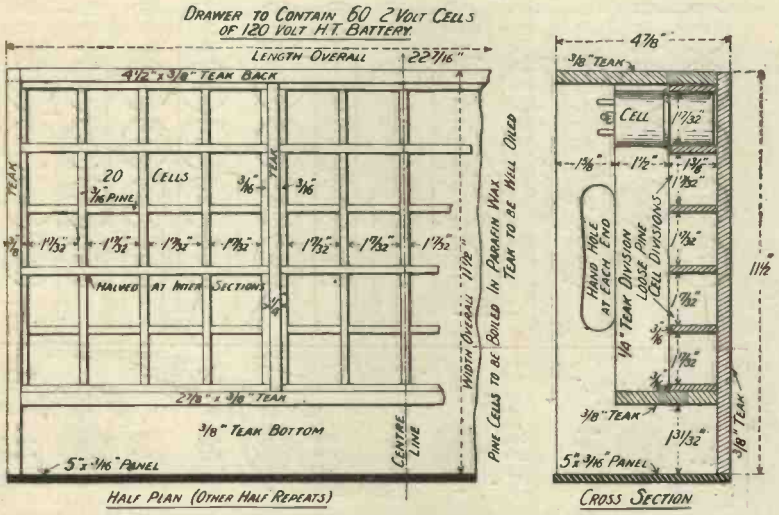
SIR,—Heartiest congratulations to Mr. Stanley G. Rattee on his wonderful little one-valve set described in the March issue of *Modern Wireless*. I recently constructed same *exactly* according to the plan, although I was unable to secure the first-class components indicated, and

had to be satisfied with what I could get over here.

After changing over the connections to the reaction coil, I found that the set oscillated well over the whole scale of the condenser and picked up with the greatest of ease quite a number of French and Belgian amateurs, morse and telephony. Last night at about 11.30 I heard an orchestra as loud and distinct as one usually receives a local station on a good crystal set. Every instrument could be heard with perfect clarity. I could not believe this to be America until the announcement came through strong and clear (and with an American accent), "This is Station KDKA, Pittsburgh, on 68 metres."

The results are wonderful and far beyond my expectations.—Yours faithfully. FRANK HAWKINS.

Brussels, Belgium.



The containing box used with Mr. Haley's H.T. battery.

AERIAL INTERACTION

SIR,—I have just read Mr. Harris's article, "Random Technicalities," in the March 4 issue about radiation variation, and note his invitation to readers to let him know of their experiences in the same way.

Some time ago I was conducting experiments with a small power transmitter of the Hartley circuit, and I noticed the radiation was not always the same for given input powers valve and wavelengths. This puzzled me for quite a long time, until one night I found the solution.

I generally do some short-wave reception at night on about 60-100 metres, and often check off the wavelength of the amateurs being received by means of a buzzer wavemeter, and the radiation drop only occurred when using a wavelength of 73 metres.

Finally, I came to the conclusion that the receiver or wavemeter had something to do with it. About that time I was trying to identify a station or harmonic of one which I read every night on 73 metres,

but he never gave any call sign, or at least I never heard any. I found that the radiation dropped 50 per cent. when the wavemeter, 3 ft. from the transmitter, was left tuned to 73 metres; on detuning the wavemeter up to about 300 metres the radiation went up to about 60 per cent. of normal. Then the receiver, which was switched on to 73 metres and on an indoor aerial directly under the outdoor, was cut out and the radiation again jumped up to full normal reading. This strange behaviour of the Hot Wire Ammeter was more noticeable when using pure c.w. rectification and smoothed A.C. than when using I.C.W. (T.V.T. unit).

Hoping these notes may interest you and your paper, which I wish every success.—Yours faithfully,

HAROLD HARDY,
British 2A.O.X.

Liverpool.

H.F. RESISTANCE MULTI-LAYER COILS

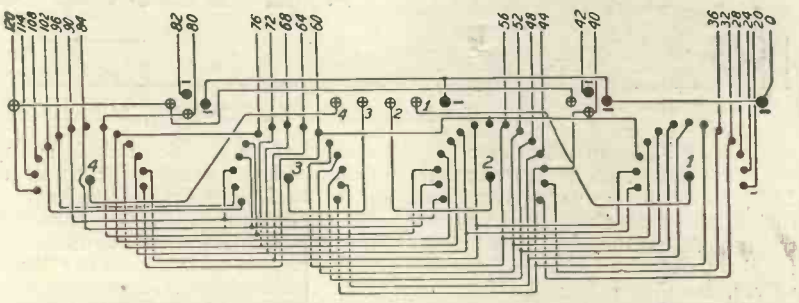
SIR,—I was most interested in reading the article in Vol. 5, No. 14 issue on H.F. resistance of coils. It is the first time I have seen actual figures published on this most important point. It will be most useful in designing coils in the future. On one point, however, I do not quite follow your contributor. He states that basket coils are in effect multi-layers. Surely they are more closely related to single-layer coils. In the "Radio Experimenter's Handbook," Part 2, by P. R. Coursey, it states that winding depth and length are to a first approximation interchangeable in calculating inductance, and it would seem to be also the case respecting skin effect, since both are due to magnetic lines of force. I have had no experience of basket coils, but have found the disc type coil wound in a groove in an ebonite X described by Mr. Percy W. Harris in your columns, even more efficient than single layers.

Wishing your excellent periodicals every success.—Yours faithfully,

A. R. MONCORN.

Sherborne.

[NOTE: Our contributor placed basket coils in the multi-layer category solely from the point of view of skin effect. Approximate calculations of inductance are certainly made by the method quoted by our correspondent, but this does not affect the fact that many authorities consider that all spiral coils are open to the same objection of serious skin effect losses as true multi-layer coils. In this connection we would refer our correspondent to the remarks of Mr. Kendall on p. 634 of the February 11 issue.]



Illustrating the connections employed in Mr. Haley's arrangement. The dead studs are not shown for reasons of simplicity.

Apparatus we have tested

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

Dual Filament Rheostat

From Messrs. Radio Instruments, Ltd., we have received a sample of their dual-purpose rheostat, for controlling filament temperature both for bright-emitter and dull-emitter valves, so that either can be used at will on the same receiver.

This is a highly finished and substantially built instrument, with a one-hole fixing device of unusually good design that will accommodate panels of varying thickness up to $\frac{3}{8}$ in. A neatly engraved metal scale is provided, which has a double graduation for the two ranges. The controlling knob is secured by a substantial set-screw on its spindle. Below the panel a metal frame carries two solenoid-type wire resistance-spirals, side by side, and a single metal spring contact-finger works over either of these according to the position of the controlling knob. On measurement the maximum of the thin wire resistance spiral was about 25 ohms, whilst that of the thick wire one for bright-emitters was about 4 ohms, and it carried the current for a standard type of R valve without noticeable heating-up. The action was smooth and silent in both ranges. A definite "off" position is provided, and substantial stops.

The space occupied by the whole instrument is about $2\frac{1}{2}$ in. square and a depth of 1 in. behind the panel. Small terminal screws on the frame are supplied for the connections, and are easily accessible for wiring up.

"Duwatcon" Variable Condenser

An interesting type of double-range variable condenser has been sent to us by Messrs. Dubilier Condenser Co., Ltd., designed to cover continuously a considerable range of frequencies with a single tuning inductance, by means of series-parallel switching of the tuning condenser. It is well known that the ordinary series-parallel switching arrangement often leaves a gap in the series of available wavelengths, which has to be bridged, in practice, by the insertion of another tuning coil. In this "Duwatcon" variable condenser the wavelength range is made continuous by providing an overlap in the available tuning capacities by means of two

variable condensers of different capacities with an actual overlap in the engagement of the two sets of moving plates with their respective fixed plates. The moving plates are mounted all on the same spindle, but are cut in the form of a segment of a circle in place of the usual semi-circle; the smaller set (of eight plates) begins to engage with its fixed plates before the larger set (of 20 plates) is completely entered between its own fixed plates. The small capacity is permanently connected in parallel with the inductance; the larger capacity is put in series with the aerial in one position of the series-parallel switch, and in the "parallel" position is out of use altogether. The effect of this is that, with ordinary aerial capacities, there is the necessary small overlap of total effective tuning capacity when changing over to give a continuous tuning range.

In general build, finish and workmanship this instrument recalls other condensers from the same makers which have been reviewed here recently, and has the same type of under-panel fitting with a small false panel carrying indicator and stops. Similar large terminals are provided, three in number; a substantial "pig-tail" connection is made with the moving plates. The space occupied is about 3½ in. diameter by 4 in. below the panel. The actual capacities of the two parts of the condenser, on measurement, came out at just over .0006 μF and just under .0002 μF, with minima of 33 and 18 $\mu\mu$F respectively. The insulation resistance was excellent, and, tested on an oscillating circuit, the losses were evidently of a low order.

Chaseway Variable Grid-Leak

Messrs. The Chase Electrical Manufacturing Co., Ltd., have submitted samples of their "Chaseway" variable grid-leak. This is of the one-hole-fixing variety, and is contained in an insulating case about 2⅜ in. by 1 in. by ½ in. The control is by a small knob on a spindle which moves in and out longitudinally through about 1⅛ in., quite freely. This moves a small block sliding within the case, in which are mounted two spring contact brushes of graphite, which make contact with the usual pencil lines or streaks of graphite made, in this instrument, on the inner narrow sides of the case. Small terminals fitted on the sides of the case provide connection to the thickened ends of the pencil lines. As the two graphite lines are in series, the available range can be quite large. On measurement, the resistance was variable from about 17 megohms in each of two samples to a minimum which ranged around 24,000 to 40,000 ohms, but not very precisely defined. The variation was very rapid in the neighbourhood of the minimum. In actual use in reception the grid-leaks were silent enough when once set, but left something to be desired in the matter of silent operation when adjustments were being made. They operated satisfactorily when set. The values of resistance appeared to be fairly reproducible, with sufficient accuracy for practical purposes. It is evident that with a wholly enclosed and protected pencil line and with graphite contact brushes backed by a spring, as here, a much more satisfactory variable leak will result than is usual with the ordinary type of pencil line leak.

A Double Universal Coil-Holder

A curious and versatile type of three-coil-holder has been submitted for test by Messrs. Rap Instrument Co. In this instrument, in addition to the usual central fixed coil-plug fitting (arranged on a rectangular base 3½ in. by 2¾ in.) there are two outer holders which have a double motion, pivoting on vertical pillars and rotating on axes at right-angles to these pillars. The result of this combination of motions, which are controlled by 4-in. handles fitted with the usual knobs, is that the reaction coupling

or primary and secondary coupling can be varied between wide limits or reduced effectively to zero. The coils can also be brought very close together if required. On trial, it was found that the long handles gave the necessary fine control over coupling when that was required. The bearings for the rotational movement about the horizontal arms are capable of adjustment by set screws, but the holder is scarcely suitable for the very large coils used in long-wave telegraphic work. For broadcast reception on the ordinary wavelength the instrument appeared rigid enough to carry the ordinary types of plug-in coils.

The workmanship and finish of the instrument were commendable and the insulation resistance, on test, proved to be very satisfactory. Connections are made by ordinary flex to the two outer coils to small screws on the coil-plugs; the centre holder is provided with terminals on the base.

Non-Resonant Loud-Speaker Trumpet

Messrs. Scientific Supply Stores have submitted for test a large pattern of their series of non-resonant loud-speaker trumpets, intended to be substituted for an existing metal or wooden horn, in order to get rid of the characteristic resonance or ring (the "gramophone" effect so much deprecated) which such a trumpet of hard, resilient material generally exhibits. We understand that these horns are made of various sizes and shapes, with nozzles to fit most of the existing loud-speakers on the market.

The material of the horn is a special composition which possesses the necessary mechanical strength without being hard; the surface, both inside and out, is made quite rough, so as to further diminish any resonant effects. The shape of the large pattern which was submitted to extensive tests was that of a long, straight cone, with flaring mouth; smaller patterns are made with a bend and of the conventional shapes. The finish is in a quiet, attractive dull bronze, which does not look out of place in a private dwelling-room.

The effect of replacing an ordinary small metallic trumpet by this large non-resonant one was remarkable; apart from the increased power, the resulting fidelity of reproduction was positively startling, the illusion of actual presence of the artists in the room, or perhaps behind a door-opening, being very near indeed. An impression of effortless power was given, there being an entire absence of the localised blare and shout of the ordinary small trumpet when on full power. Even an ordinarily indifferent small loud-speaker was vastly improved by this trumpet, and became endurable to listen to continuously—though of course the distortion introduced by too thick or resonant a diaphragm, or by some particular mechanism behind the latter, cannot be compensated for by a trumpet; nor can the reaction-distortion of an over-pressed receiving set nor the effect of poor, cheap L.F. transformers. With an efficient three-valve receiver, on a moderate suburban aerial, and with modern practically distortionless transformers and a power valve for the last stage, etc., *i.e.*, under fair conditions, and with a good L.S. base to which the large trumpet was applied, every word of the speech from the local station was clearly readable in every room of a large house, and there was no blare or noticeable distortion. The gramophone effect so much complained of was not there at all.

We can most strongly recommend this type of non-resonant trumpet for application to existing instruments, to replace the ringing smooth-bored type of trumpet usually fitted, and strongly advise at the same time that the larger patterns be chosen. We gather that the prices are very reasonable.

Information Department

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M. G. R. (LIVERPOOL) states that he possesses a pair of adjustable headphones, whose positive and negative tags are not marked, and he asks how he can identify them for himself.

A general method which is applicable to all adjustable types whose tags are not marked positive and negative is as follows :—First of all, when actually receiving signals, so adjust the 'phones that the diaphragms or reeds, as the case may be, just drop back upon the pole pieces, and produce weak and probably harsh signals. Now reverse the two tags and note whether the diaphragms or reeds spring clear again. If they do so the 'phones were correctly connected in the first instance, and the tag which was gripped under the telephone terminal which was wired internally to the high-tension positive should be marked positive, perhaps by binding with red cotton. If, on the other hand, there is no apparent change, the 'phones should be readjusted to the point at which the diaphragms just, and only just, fall back on to the pole pieces, and the connections again reversed to the old order. If the pole pieces now spring clear the connections should be altered to the second arrangement, which was the correct one.

The procedure given will serve for the majority of receivers, but some instruments may require different treatment. It is possible in these cases that when the diaphragms have just dropped on to the pole pieces, with the aid of the steady anode current, they will not spring clear upon the reversal of that current, and in this case the aim should be to adjust the 'phones so that the diaphragms just fail to drop on to the pole pieces, whereupon a reversal of the tags should be made. If the diaphragms now fall against the pole pieces the new arrangement is the correct one. If they do not do so adjust once more until they just fail to drop on to the pole pieces, and then once more reverse the tags. If they now start to give the characteristic rattle against the pole pieces, it shows that this new connection is the proper one, and the tags may be marked as previously mentioned.

A. L. J. (BRADFORD) is in considerable difficulty with the

quality given by his loud-speaker, which is of a certain well-known make and is the third specimen of this make which he has tried. He has returned the two previous specimens as being defective, but the third possesses exactly the same objectionable qualities, and he therefore asks our assistance. The reproduction which he obtains is very harsh and metallic, and no adjustment of the gap between the diaphragm and the pole pieces produces any improvement.

Since our correspondent has tried three specimens of a perfectly reliable make we think it safe to assume that the trouble must undoubtedly be in his receiving set; but he assures us that he has used the best of components throughout, the two low frequency transformers being of a well-known make. The objectionable quality which our correspondent describes may be due to continuous oscillation taking place in the low-frequency circuits at some inaudible frequency, and the usual experiment of reversing the IS and OS of one of the transformers should be the first test which is made. The description of the trouble, however, leads us to think that it is more likely to be due to the lack of the correct size of shunting condenser across the loud-speaker itself, since it is of one of the makes which functions very much better with the aid of this condenser. We suggest that one of .004 μF should be tried, increasing this to .005 and .006 if the desired improvement in quality does not take place. If it proves impossible to remove the whole of the metallic tone in this way without introducing the hollow muffled effects, characteristic of the use of too large a condenser, the effect of placing small condensers in parallel with the secondary winding of the second low-frequency transformer should be tried, the suggested value being .0001 μF for a preliminary test, increasing this value if necessary. In addition to this, a shunting resistance of about 100,000 ohms or a quarter of a megohm should be tried in the same position.

E. A. B. (Matlock) has built a "Transatlantic V" receiver (his first set) and reports that although he can get all stations at fair strength in the phones, when he switches over to the full five-valves only weak signals are heard from the loud speaker.

There may be an actual fault in the circuits of the low-frequency valves, but the symptoms given in detail in our correspondent's letter make this seem improbable. It is more likely that the trouble results from a characteristic of all sets in which resistance capacity coupling is used on the low-frequency side. In such sets switching in the low-frequency valves involves bringing a resistance of (usually) 80,000 ohms into the anode circuit of the detector valve, with a consequent drop in the effective anode voltage of perhaps 50 per cent. The result, of course, is to upset completely any critical adjustment of reaction, and throw the set a long way from its most sensitive state. Hence, it is quite possible that a station which was quite strong in the phones when the reaction was critically adjusted will scarcely be heard from the loud-speaker unless the set is readjusted after switching in the low-frequency valves. In the case of the "Transatlantic V," the set should be brought back to its most sensitive state after switching in the L.F. valves by turning the potentiometer towards the negative end, or by bringing up the reaction coil to the necessary amount and slightly re-tuning as may be required. Another possible cause is that the accumulator is too small, so that the additional load of the last two valves causes a voltage drop on the previous three.

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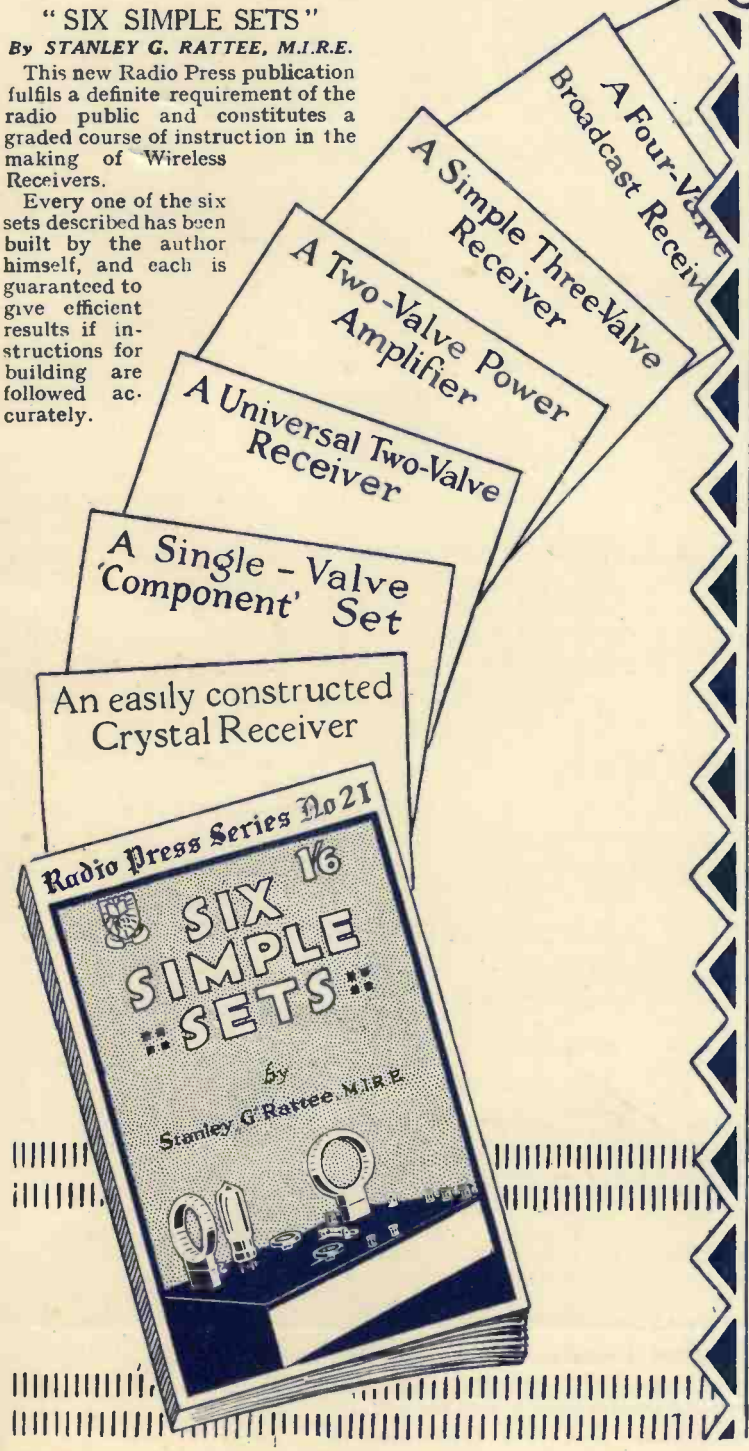

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