"EVERYBODY'S ALL-IN TWO"

"ETHER SEARCHER" PRACTICAL HINTS & TIPS


# Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XVIII. No. 452 Saturday, February 7, 1931



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

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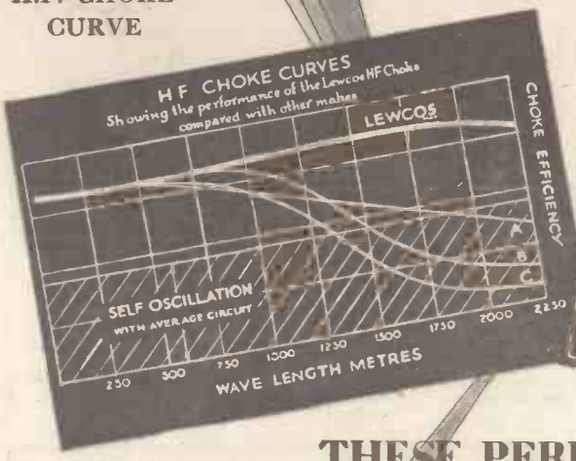


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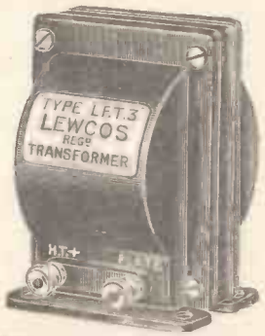


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No. 452. Vol. XVIII. FEBRUARY 7, 1931

# Amateur Wireless and Radiovision

EDITOR: BERNARD E. JONES.
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THE LEADING RADIO WEEKLY FOR THE CONSTRUCTOR, LISTENER & EXPERIMENTER.
RESEARCH CONSULTANT: W. JAMES.
ASSISTANT EDITOR: H. CORBISHLEY.

## NEWS · & · GOSSIP · OF THE · WEEK

### A NEW TRANSPORTABLE

YOU will see on the front cover this week a picture of an entirely self-contained set in use. "Ah," you may say. "That's the sort of set *I* want—one with no batteries to carry about, and which can be used in any room." Well, here it is, described in this issue. It is called, "Everybody's All-in Two."

### NORTHERN REGIONAL HITCH?

ANXIOUS listeners in the North are asking whether some hitch has occurred in the B.B.C.'s plans for opening the Northern Regional broadcasting centre in March. We are officially informed that everything is going according to plan and before this month is out preliminary tests after midnight on a wavelength of 479 metres can be expected. Following this it is proposed to transmit late dance periods through this Northern Regional channel, as was done for the Brookmans Park tests. The B.B.C. engineers do not anticipate a long preliminary canter for the Northern Regional.

### HOW SLAITHWAITE IS PLANNED

INTEREST centres largely on Slaithwaite at the moment. No outside visitors have yet been invited by the B.B.C to see the station, but nevertheless a general idea of the station layout can be gauged from information which has been received. The arrangement is not unlike that of Brookmans Park. At the entrance are the control rooms and offices. Then comes the main transmitter hall with the twin transmitters, one on each side. At the back is the generator room, and in a building at the end are the Diesel engines.

### THE WAVELENGTH CHANGES

A GOOD deal of confusion has arisen over the wavelength changes that will be involved when the Northern Regional starts. Fears that Brookmans Park listeners will not be able to receive the Midland Regional clear of the Northern Regional have been expressed by some readers. When the Northern Regional takes over the Midland Regional's present wavelength of 479 metres, the Midland Regional will take Glasgow's 398-metre wavelength. There will still be quite a good separation between the Midland Regional and the London Regional stations. Of course, Glasgow will have Manchester's present wavelength of 376 metres, a change that should not worry London or Midland listeners, owing to the low power of the Glasgow station.

PRINCIPAL CONTENTS



### MEET BABS FARREN

ALL listeners will make Babs Farren's acquaintance by radio through the London National on March 2 or through the London Regional on March 3. Philip Ridgeway has found in Babs Farren a girl with a personality voice; this popular producer of vaudeville has long been looking for a girl whose voice would appeal to listeners for its charm and freedom from accent. Picked from more than one hundred girl applicants, Babs Farren is the daughter of Fred Farren, the old actor who taught Jack Buchanan to dance.

### DISCUSSING MÜHLACKER

BY the time this is read, the International Broadcasting Union will have met at Semmaring, near Vienna, to discuss, among other things, the interference between high power stations such as Mühlacker. Admiral Carpendale and Noel Ashbridge will represent the B.B.C. and they will meet their opposite numbers of the other European Broadcasting Organisations. The hope that something will be done about Mühlacker at this conference is based on the fact that the B.B.C. and the German broadcasting people have been co-operating ever since Mühlacker started its transmissions. It

## JACKS ON THE FIELD!

**Jack Payne and Jack Hylton have entered into a new kind of friendly rivalry—football. Two teams selected from the members of each dance band met at Fulham last week. Here is the first goal being scored by Jack Payne's team**

**NEXT WEEK: A TWO-VALVE SET FOR £1! Full details and Full-size Working Drawings**

# NEWS & GOSSIP OF THE WEEK —*Continued*

appears that the Germans are quite amenable to suggestions from the B.B.C.

### FILMING IN A THEATRE

AN AMATEUR WIRELESS representative was present last week at the filming of *Nippy* in the Prince Edward Theatre in London. First National Pathé took a long-duration "shot" while the play was in progress, and the audience was probably unaware of what was going on.

These film folk are a great deal ahead of the B.B.C. in these matters. They use a special microphone at the footlights which is *directly connected* to a three-valve amplifier. In this way they get over the trouble of induction in the "mike" wires. B.B.C. "O.B." engineers are clever, but the film people have more experience behind them, and it makes itself obvious on difficult "shots" such as film-making in a theatre.

### AN ORGAN NOTE

AT the moment the B.B.C. is wondering whether or not to install an organ in the giant studio of Broadcasting House. There is a fear that the great notes of an organ might reverberate through the central control tower in spite of all the sound-proof precautions that have been taken. So when the various studios are approaching completion engineers are to experiment by blowing through a deep-noted pipe in the main studio. This is the studio where one thousand people can be accommodated.

### SIX ORCHESTRAS

ALTHOUGH the full complement of 115 players appear before the Queen's Hall audience every Wednesday, no less than five other combinations are heard on different B.B.C. broadcasts. The Sunday Symphony Orchestra is 80 strong, and for the Bach cantatas there are only 35. Then there is the Mozart orchestra of 40 and the Light Symphony Orchestra of 75. Still another combination of 40 forms what might be termed the theatre orchestra. These combinations are so arranged that the best talent in the country is available for every kind of orchestral broadcasting.

### THE COST OF BROADCASTING

HOW much does it actually cost to broadcast? We are all fond of talking about "free" programmes provided by advertisers, but it must not be forgotten that the programmes are not free to the advertiser. Generally he has to pay a considerable amount. An American broadcasting concern in Texas, covering six stations, charges $555.80 for a half-hour broadcast. That works out at over £200 an hour. It makes one wonder what the B.B.C.'s time is worth.

### JACK PAYNE'S REQUESTS

A LISTENER has suggested that when Jack Payne announces that a dance tune just played is by request, he is in effect "plugging" the tune by giving more prominence to it than to other tunes. The truth is that Jack Payne receives hundreds of requests in the course of a week's mail for particular tunes to be played again. Another listener has asked why he has given up his "cheerio" at the end of the afternoon's broadcasting. Jack Payne has stopped this cheery way of ending his programme because he, in common with other broadcasting artistes, has a horror of becoming stereotyped.

### SUNDAY PROGRAMME TIMES

THE discussion as to the proper times for Sunday programme items is still going on. A woman reader writes to a national daily: "May I plead with the B.B.C. that whatever change they may see fit to make in their Sunday programmes, they will not alter the evening service at eight o'clock? I am one of hundreds of mothers temporarily deprived of the privilege and pleasure of attending church . . . Mornings are much too busy; at 6.30 the day's work is hardly done, but 8 o'clock, when all is peaceful and quiet, is an ideal time."



### "MACHINE" MUSIC

LISTENERS have heard, now and then, the sounds of machines as they form themselves in the minds of composers. All the sounds of factory life in the great Robot play *R.U.R.* were made by musical instruments. Schonberg, on the other hand, used massive chains in his *Gurrelieder*, because no ordinary musical instrument could emphasise his intention. On February 25, listeners to the B.B.C. Symphony Concert are to hear another version of the machine theme in the form of a symphonic episode entitled, "The Factory," an overture which depicts the activity of a steel factory in full swing.

### WANTED, A HARPSICHORD

THE B.B.C. is looking for a harpsichord. Not any old harpsichord, but one fit to take its place where it is needed, in the B.B.C. Symphony Orchestra. If possible the B.B.C. will buy British, but it may have to go abroad to get the right instrument.

### THE PRINCE AND RADIO

NOW that the Prince of Wales has passed Bermuda, the range of the normal ship's radio plant will be insufficient to keep him in direct touch with England; but the Marconi short-wave wireless transmitter and receiver which was specially installed for the Prince's use on the liner *Oropesa*, on which he is travelling, will enable him still to maintain constant touch with this country through the short-wave coast station at Portishead, near Bristol.

Although many ships now carry short-wave sets for long distances, no ship fitted with short-wavers for communication with England has yet made the voyage along the South American coast, which will be followed by the Prince of Wales. At no time during the voyage should the Prince of Wales find any difficulty in maintaining direct communication with England.

While the short-wave set on the *Oropesa* is carrying out communication with Great Britain the normal wireless equipment will be used for navigation and the exchange of messages with local ship and shore wireless stations on the run through the Caribbean Sea, the Panama Canal, and down the South American coast.

## AERIALS ON KITES!

**For direction-finding experiments the Radio Research officials at Slough are using these kite aerials, which ascend to about 500 ft. Small transmitters are used with a range of half a mile or so**

# BEHIND THE SCENES AT SAVOY HILL


THERE is a room on the second floor in Savoy Hill where are held all the important meetings regarding programmes, finance, and so on. It is called the "Programme Conference Room."

Every Friday, at half-past eleven, the various directors of departments meet together to discuss the programme to be broadcast six weeks ahead.

The chairman is the Director of Programmes, and with him sit his Assistant Director and an official who minutes the proceedings. Ranged round the long table are the Productions Director, responsible for vaudeville, drama, etc., the Education Director, the Outside Broadcast Director, the Talks Director—the only lady present—the Music director, various provincial station directors, and last, but certainly not least, the official responsible for the compilation of the rough layout for the projected programmes.

The meeting commences with a reading of these projected arrangements, and from time to time suggestions are made, items deleted or substituted, and alterations agreed upon until the final draft is approved.

Then follow some minutes of special interest, the chairman asking each in turn if there is anything he wishes to say. The Talks Director, for example, has a suggestion for a series of special educational plays to schools; the Productions Director wants authority to "put on" another Bernard Shaw play; the Talks Director has found an African explorer, just returned to England, who has a lot of interesting things to say, but wants a large fee, and so on.

"Anything for outside broadcast department?" says the Chairman.

The O.B. Director opens his file. He is a great humorist.

"Well, I've had a letter from the Little Mudlington Boy Scouts' Association, and they want to know if we will relay the Mayor of Mudlington's speech at their annual sports next month."

There is a general laugh.

"And what would be the cost of such a transmission?" gravely asks the Education Director.

"Well," says the O.B. chief, "you see, Little Mudlington is a rather out-of-the-way place. Telephone facilities are scarce and electric power scarcer. I should say about sixty pounds for ten minutes!"

There follows a brief period of silence and then the Chairman: "I feel that this meeting does not consider such an expense warranted, in view of the rather doubtful programme value of such a transmission."

The meeting agrees. Little Mudlington is disappointed.

### A True Story

Here is a story about an actual incident at a programme board.

You all know that there has been a great deal of controversy about what is known as "song plugging" by the evening dance bands; in other words, the continual repetition of a popular number until the listening public is almost driven to distraction.

Well, one day at programme board there had been a pretty lengthy discussion about this "song plugging" evil, when it was noticed that it was almost time to adjourn.

The Music Director, therefore, interrupted the proceedings to ask an urgent question about the advisability of continuing the Bach cantatas on Sundays.

Nobody seemed to have an opinion on the subject until the Outside Broadcast Director, feeling that something ought to be said, asked if, in view of the fact that there were some fifty-two Sundays in the year, there were enough Bach cantatas to go round.

The music director, with biting scorn in his voice replied, "My dear chap, if we gave a cantata every night of the week, we should still have enough to go round!"

The O.B. Director wasn't going to be snubbed. "You couldn't do that," he said quietly.

"Oh, indeed, and why," snapped the Music Director.

"Because it would be song plugging," returned the O.B. official. And the meeting, needless to say, broke up in disorder.

# OUR LISTENING POST

by JAY COOTE

DURING the past week I have added several stations to my log; this was due, no doubt to the fact that the atmospheric conditions on several nights were peculiarly favourable for listening to long distance calls. Reykjavik is on the air; it may not be operating officially but it now tests almost nightly and its power (16 kilowatts) is such that its voice is well heard even on the southern coast of England. Try for it towards 7 or 7.30 p.m. G.M.T. Sunday is an excellent day for such a search. If successful you will pick up a broadcast of a sacred service apparently relayed from a church in the Iceland capital; on other nights it will be a small orchestra or a recital of gramophone records. You cannot mistake the call, it is: "*Utvarysstaed Islands*," the last word being pronounced *Iss*-lands.

So far as my experience goes, the transmission is dead on 1,200 metres. As luck would have it when searching for Reykjavik, on three occasions I captured Istanbul at about the same time. You will find this station on your condenser dials within two or three degrees of the Iceland transmitter, corresponding with a wavelength of 1,228 metres. If you hear tinkly music from string instruments accompanying the oriental wailing usually picked up from Algiers, you may log the Turk straight away. I find from my log that the station closes down towards 8.30 p.m. G.M.T.

During the same period, Nice-Juan-les-Pins has been coming through at good strength. You may not always manage to disentangle this station from its neighbours as this portion of the waveband is very congested but on some evenings it seems to break away from them and on these occasions you may hear a relay from the Palais de la Mediterrané at Juan-les-Pins. It may be an orchestral or vocal concert or a dance band.

Have you noticed the harmonic of Warsaw which is so persistent, now and again, on a wavelength just below London Regional? At first, I was inclined to believe that one of the Poles had taken up a new position in the "European Concert," but careful checking proved that it was the Warsaw programme.

The advent of new high-power stations is making itself felt more and more. As an example, the tests now being carried out by *Radio Belgique* on 15 kilowatts prove without doubt that we may expect some trouble with Milan. Brussels is much nearer Great Britain than the Italian transmitter and of higher power, with the result that it is difficult to prevent the latter's broadcast from being swamped. On the other hand the exchange of wavelengths carried out by Gleiwitz and Leipzig must be appreciated by listeners to the London National programme on 261 metres.

### Battery Connections

THE pictorial diagram given last week shows how the battery connections should be plaited together in three separate groups. You must, of course, attach the wander plugs and accumulator spade tags to the ends of the flex before they are plaited together, for once they are plaited you will not know which wire is which. Keep each set of wires separate, the H.T. wires, low-tension and grid bias being plaited in separate groups. An inch or so of electrician's adhesive tape at the end of each plait will keep the leads in position.

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### A Tuning-coil Trouble

There is a point to watch in connection with the three tuning coils. Some of these coils are provided with soldering tags (which it is unnecessary to use if the standard point-to-point system is adopted), and these soldering tags may foul the bases of the coil screens.

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### Using Other Coils

F. B. (Windsor) wishes to know whether he can substitute the original Ether Searcher coils in the 1931 model without upsetting the general working of the latest set.

We cannot advise the use of the earlier coils in the latest model of the "Ether Searcher."—ED.

**THE "1931 ETHER SEARCHER"**

**Amazing success has greeted the "1931 Ether Searcher"—the new "A.W." set which was described in Nos. 449, 450, and 451. Full-size wiring plans and constructional charts, together with helpful pictorial plans and an automatic tuning scale, have been given in these three issues, and thousands of amateurs have started to build the "Searcher." We have received a huge number of letters of appreciation from readers who are getting the fifty-station reception we claim, and here is a collection of helpful information which will interest and appeal to the rapidly growing army of "Ether Searcher" builders. This set will break all records.**

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### Watch This Valve-holder Point

Some valves have rather long pins and it may so happen that the pins are of sufficient length to make contact with the foil beneath the holders when the valves are pushed right home. This will short-circuit the high-tension. To prevent this cut away a small circle of the foil beneath each valve holder or fit discs of cardboard or bakelite between the valve-holders and the foil. These discs are provided in the kits of parts for the "Ether Searcher" supplied by Messrs. Ready Radio.

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### Fitting an Output Filter

J. M. (Middlesex) intends to use his "1931 Ether Searcher" with a mains H.T. supply unit and wants to know whether any alteration will be required to the wiring of the receiver.

An output circuit should be fitted between the speaker terminals on the receiver and the speaker. Either a choke filter output or a transformer output can be fitted, whichever is most convenient or most favoured. Otherwise no alteration is necessary apart from using the eliminator exactly as described by the makers of the particular mains unit. The voltages applied to the various H.T. terminals on the receiver should, of course, be as near as possible to the values we specify.—ED.

# HINTS & TIPS "ETHER"

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### Using Mains Valves

A.C. valves can be used with the "Ether Searcher" and an outfit such as the Six-Sixty mains conversion unit is quite suitable. With this, special valve holder adaptors are provided and these are fitted with terminals enabling the heater current to be supplied without alteration of the existing filament wiring of the set. It is important to keep these holders wired the correct way round, as is explained in the instructional matter accompanying the unit. We have tested one of these Six-Sixty units in conjunction with an "Ether Searcher," and find that there is negligible hum and that the results are entirely satisfactory.

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### The Triple-gang Condenser

The triple-gang condenser is provided with a protective casing which is fairly close to the fixed vanes. There is a small gap between the fixed vanes and the casing but there is just a possibility that when the condenser is being mounted on its supports the casing may be bent so that it touches the plates. You should watch this point.

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### That Screen-grid Connection

There is a real advantage in having a special insulated socket for the connection to the screen-grid valve. You can, of course, merely twist the end of the flex lead from the .0003 fixed condenser around the anode of the screen-grid valve, but there is always the danger that the wire may be pulled off and that the loose end will touch the screen surrounding the valve.

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### Adding a Pick-up

It is a simple matter to add a pick-up to the "Searcher." The diagram on the next page shows how it is done. It is advisable to provide a pair of terminals on a small strip at the back of the baseboard, and if desired, a switch may be provided in one lead so that the pick-up can be cut out of circuit when not required. It will be seen that one side of the pick-up input leads is taken to the grid of the detector valve while the other is taken to the grid bias negative 1 lead, which also supplies the grid bias for the screen-grid valve. Pick-up stages generally work better with a small negative bias, for this prevents the detector

**A WONDERFUL SET**

**Sir,—Perfectly wonderful set. Selectivity all you claim. Muhlacker absolutely clear of London in 1 degree movement of dial.**

**I find the short-wave readings fairly accurate, but am 10 degrees below your figures on the long waves.**

**Yours faithfully,**

**F. B. (Portsmouth).**

**WORKING FROM THE MAINS.—Here are a number of mains units which can be used to work the "Ether Searcher" from the lighting supply. On the left is the chassis of a popular Junit model, which gives 25 milliamps and which can be obtained, if desired, with an accumulator trickle charger. Next is one of the many Ekco units which we have tested with the "Searcher." The unit shown is for A.C. mains and has two variable controls. The Six-Sixty unit shown next is used with special mains valves, and takes the place of all batteries—G.B., L.T., and H.T. The A.C.**

valve from being overloaded when it is acting as the first low-frequency amplifier. This bias is automatically provided by the G.B.—1 tapping.

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### Using the Mains

You will find the "Ether Searcher" economical in use, for with the standard valves specified the H.T. consumption is only between 8 and 10 milliamperes. This is well within the ability of a good medium- or double-capacity H.T. battery, but there are advantages in using an eliminator if the mains supply is available. We have tried several commercial eliminators in conjunction with the "Searcher." There is a wide range of Regentone units either for A.C. or

# FOR "SEARCHER" BUILDERS

D.C. mains and "Ether Searcher" users who must study economy will be interested in the new Regentone portable models. Both A.C. and D.C. types are available and both have trickle chargers for the accumulator. The new A.C. portable model is the W5A, and the D.C. model is the combined Model 2. A.C. mains users will be interested in the Atlas model AC188, which provides an output of 25 milliamperes, so that quite a large power valve may be used in the last stage of the set. This eliminator also charges at ½-ampere, so that there is no fear of the accumulator running down. There are several types of Ekco eliminator suitable for those who have either A.C. or D.C. mains and the portable model Ekco unit may even be used. This gives 120 volts at an output which is suitable for the "Searcher." We have tried the standard Junit H.T. eliminator with the "Searcher," and found that there was more than sufficient anode current available, the maximum output being approximately 150 volts at 25 milliamperes, that is with the type 150/4AC. This eliminator is available with a filament transformer so that A.C. valves may be used in the set. If you want to make up your own eliminator then you might care to have a set of Heayberd's home-constructor eliminator parts. Several kits of parts and complete units are available for various voltage and current outputs.

There are several models of Tannoy eliminators, made by Messrs. Tannoy Products, which are eminently suited for use with the "Ether Searcher." We have tried the type C.P.2 unit. This worked very well indeed and was entirely satisfactory, provided that too large a power valve was not employed, so that the total consumption was kept under 10 milliamperes. The larger model, type W8, was then tried. This gives an output of 200 volts at 40 milliamperes and has ten tappings of 20 volts each.

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### A Wiring Tip

Do take care of the several negative connections to the screen. The earth terminal, for instance, is connected to the screen by a short length of wire which is tucked under the terminal strip and twisted round one of the screws holding the strip to the baseboard, thus making electrical connection with the screen.

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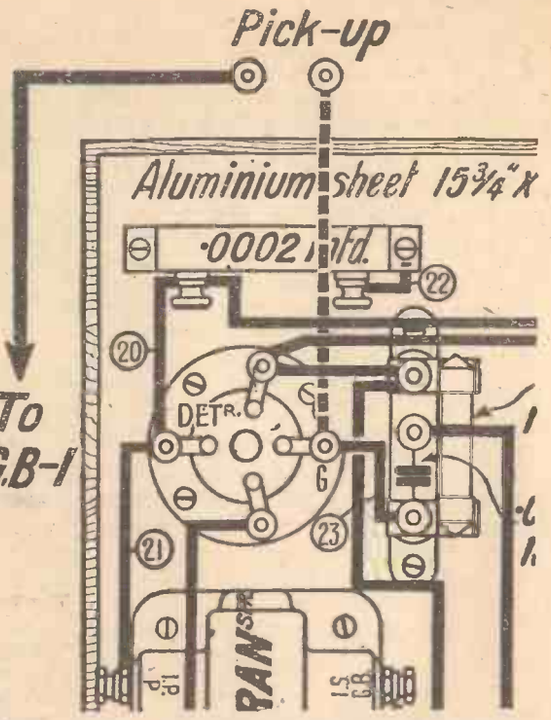
### Build with Best Parts

It is most strongly recommended that the original components given, or the alternatives, should be used and that the layout as shown by the free full-size diagram




This is a reproduction of a portion of the wiring plan, showing how easy it is to add a pick-up

should be very closely adhered to. The "1931 Ether Searcher" has meant months of design and you will gain nothing by trying to alter the layout.

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### Using a Two-gang Condenser

H. C. (London) has the original "Ether Searcher" and wishes to know whether it would be possible to use the two-gang condenser already in his possession with another separate condenser for the "1931 Ether Searcher."

The twin gang condenser can be used for the first two coils in the receiver and the separate condenser should be used for the third coil, which has a reaction winding. The twin condensers will thus be used for tuning the band-pass and grid coils for the first valve.—ED.

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### A Home-made Mains Unit

If you want to work the "Ether Searcher" on D.C. mains, then why not make up the "A.W." H.T. Unit and Charger, which was described in last week's issue. This is capable of giving fine results, as we have found on test in the "A.W." laboratory. The "A.W." H.T. unit will also charge your accumulator.

model of a new Regentone unit is shown next. This works very well with the set, and has a special fixed tapping for the screen-grid point. A D.C. model of this unit is available. Both incorporate accumulator chargers. The Clarke's Atlas model AC188, shown next, has a fine voltage output—more than enough for the "Searcher." It trickle-charges at ½ amp, and gives 150 volts at 25 milliamps. On the right is an A.C. mains unit, made from a Heayberd home-coostructor kit. Kits and complete units are available for all types of mains supply.

# RECORDS of the MONTH'S BROADCAST MUSIC

LISTEN TO THE BEST ITEMS AGAIN!

***The inability of the listener to obtain an encore or the repetition of broadcast music is one of the greatest shortcomings of listening via radio. How often have you desired to recapture some particular item? The gramophone record makes this possible, and the following notes are intended to link up current wireless programmes with the record. In every case the most suitable presentation of a particular item will be recommended and the name, make and number of the record given.***

### A Very Pleasing Suite

COLERIDGE-TAYLOR'S "Petite Suite de Concert" is well worth a place in even the most modest library. . Many will remember the "Caprice de Nanette" movement, a most pleasant, joyful piece of music. There is an excellent rendering on Decca K504 which can be cordially recommended. The suite is played by the Hastings Municipal Orchestra, and finely played, too. However, play it with a half-tone needle ; the volume is a trifle on the heavy side for a rather "delicate" piece.

### A Dramatic Picture in Music

A fascinating, eerie composition is Saint-Saëns' "Danse Macabre." It has, unfortunately, suffered at the hands of innumerable cinema musicians by the rending of a dozen bars or so from their context. Thus many of the public have a brief acquaintance with it—as the accompaniment to some scene of horror. But get the record H.M.V. D1121 and listen to the Philadelphia Symphony Orchestra playing it. You will have heard, fearfully maybe, a masterpiece magnificently performed and recorded.

### Strauss Again

Viewed from the beneficial point, does any composer's music do one more good than either Johann's or Richard's? So let us give thanks that programmes include many of these pleasures. (But why will quartets and sextets play overtures?) However, we did have the "Gipsy Baron" overture early in January—Johann Strauss in different guise from the composer of the "Blue Danube." There is some fine, impressive (but always tuneful) stuff in this piece.

I have had the greatest difficulty to recommend a recorded version and so give the three I have tried again and again, "without prejudice," as one may say. Columbia L2352 (Bruno Walter and Symphony Orchestra), H.M.V. D1289 (Berlin State Orchestra), and Po'ydor 19902 (Berlin Philharmonic Orchestra). All are wonderful, but I believe I prefer the Polydor. . . On second thoughts, though—no; hear them all for yourselves.

### The Rosenkavalier Waltz

After its performance by the Victor Olof Sextet on Jan. 5, one need only *remind* gramophone owners to get this piece in one form or another; almost everybody knows it. The Berlin State Opera Orchestra play the full score on C1819, and there is a pleasing abridged version on Piccadilly 5063 by the Athanaeum Octet.

### And Two More Baritone Songs

Is there a jollier song than "Ho! Jolly Jenkin" or a more beautiful than "Linden Lea"? The latter was sung from London on Jan. 22 and 24. Two famous composers—Sullivan and Vaughan Williams; a famous singer in great form—George Baker; and both on a 3s. record, H.M.V. B2396. I do not know better value in the H.M.V. or any other catalogue. Every gramophone owner should have this record and hang the expense!

### A Children's Suite (John Ansell)

A pleasant miniature, this. It was played by the Mc.Gowran Quartet on Jan. 10. There could well be more of this clean, crisp piece. I commend the performance of the Decca Light Symphony Orchestra conducted by the composer; this record is excellent value. The title reminds one of, and compels one to mention, Elgar's "Wand of Youth" Suite No. 2, played a few weeks ago from London Regional. As a suite it is unsatisfying, but here and there are one or two worth-while movements. H.M.V. D1649 is the best selection: I do not think general taste will enjoy anything much in Suite No. 1.

### Pique Dame (Suppé)

Lovers of "Poet and Peasant" and "Light Cavalry" will like the above overture. There are two alternatives : a Polydor recording (full version) by Paul Godwin's Orchestra and one (abridged) on H.M.V. C1594 by the Coldstream Guards. I prefer an orchestral rendering for such a piece, but Suppé "goes" well on a military band and the Guards' performance is a fine one.

### A Tragic Ballad—"Edward"

One does not often hear Loewe's setting of this song of horror, perhaps because it is such an enormous task to do it justice. Edward Glorenshaw sang it from Manchester on Jan. 7. But it is a piece of shattering power if the due dramatic force is behind it. For those who seek a thrill, hear Norman Allin sing it on Columbia 9874; he excels himself.

### More Popular Schubert

Last month I mentioned the delights of "Lilac Time" and recommended a recorded version. During January the Victor Olof Sextet played the entr'acte from "Rosamund"—a characteristic and charming companion to the ballet music played in the first mentioned excerpts. Hear H.M.V. D1568 on which the San Francisco Symphony Orchestra play it with real understanding. (On the other side is Mendelssohn's Wedding March, which makes the expenditure of 6s. 6d. well worth while. *Anybody* could be married to this record!)

### A Very Amusing Ditty

"At Santa Barbara" was sung on Jan. 19 from Midland Regional by Bertram Newstead. This, I think, is Kennedy Russell's best song and you will enjoy immensely Peter Dawson's rendering on H.M.V. B2661. A song one will not readily tire of.

### A Regret—and an S.O.S.

We have recently had selections of Easthope Martin's songs and *The Beggar's Opera* by orchestras or smaller combinations. And yet we are without any electrically recorded version of the latter or any arrangement of the former at all. Surely these would prove best-sellers.

### Continental Light Music

Still they are heard, these very good tunes from our neighbours. The German talkies are responsible for some compositions which make the American equivalents the poorest of stuff. I hope everybody bought the "Bin Kein Hauptmann" record I recommended last month. No home is complete without it! Here are some more which have come over the Channel during January—on cheap records, but *such* value. No. 1 : "I'm ever so Glad!" and "Give Me a Piece of Chocolate," both happily on one record—Columbia DC2020. The first is a foxtrot, the second a tango, and there are no vocal choruses. This record will soften the heart of the fiercest opponent of modern dance music. No. 2 : "Wonder Bar." Not entirely Continental now, but the "Elizabeth" song still goes strong. Try Decca FF1732 by the Rhythm Maniacs.

**LISTS OF RECORDS FOR INTERESTED READERS**
**Editor's Special Announcement**

**This is the second of a series of monthly articles in which the reader is told or reminded of gramophone records of notable broadcast items of the preceding weeks. We know from our correspondence that very many thousands of our readers are interested in the gramophone and realise that the record, after all, is nothing more nowadays than a "bottled broadcast" awaiting release at the individual's own convenience.**

**It occurs to us that readers keenly interested in records might care to be supplied regularly with lists of new releases and we have therefore made arrangements to pass on to the companies concerned any requests for such lists as may reach us. All that the reader need do is to send us a postcard mentioning the names of the gramophone company or companies in whose records he is particularly interested. He will, in due course, regularly receive the lists.**

# RADIO . . . RADIO . . . RADIO . . . RADIO

**IMMEDIATE DELIVERY**

**ALL ORDERS CARRIAGE PAID**

# 1931 ETHER SEARCHER

READ WHAT THIS SATISFIED USER OF A PILOT RADIO KIT SAYS

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*Messrs. Peto-Scott Company, Limited,*
*77 City Road, London, E.C.1.*

*Dear Sirs,*

*Many thanks for the extremely prompt delivery of the kit of parts for the 1931 Ether Searcher which I have now assembled. I am very pleased with its performance, especially as regards selectivity, the degree of which is very high, stations being cut out without any overlapping, even on the strong National and Regional Transmissions. On the first evening I logged 40 stations on the long and short waves and there are dozens more to come. The set took me only three hours to put together, thanks to the drilled and slotted panel and the set of Betta Links. You are welcome to use this letter if it can be of use to you.*

*Yours faithfully,*
*Signed, W. W.*

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*N.B. Full list of officially approved parts is published in our announcement in "A.W." for January 17th, 24th & 31st.*

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A.W. 7/2/31

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# On Your Wavelength!

## NOW'S YOUR CHANCE

IF you want to hear medium-wave stations from America, now is the time to do a little burning of the small-hours oil. Not for something like five years have the Yanks been coming in as they are now. Reception is reported from all over the country and signal strength is often so good that one H.F. stage easily does the trick. Some of the best received stations at the moment are WIOD on 230 metres, WPG on 270.6 metres, WTAM on 280 metres, WTIC on 282 metres, WBZ on 302 metres, KDKA on 305 metres, WABC on 348 metres, WBAP on 374 metres, WGY on 378 metres, WJZ on 395 metres, WGN on 417 metres, WLW on 428 metres, and WEAF on 454 metres. If you make a table of these, putting in the approximate likely condenser settings before you start, success is probable so long as atmospherics are not about. By far the most powerful at the moment are WIOD, WPG, WGY, and WJZ, though KDKA, WBZ, WTIC, and WEAF are all pretty good.

## BRINGING THEM IN

YOU can easily work out the expected condenser settings within small limits from the known readings for European stations. It is far better to go for definite stations than merely to conduct a general search over the broadcast band. To hear American stations it is generally essential to have all tuned circuits closely in resonance, and if you make just a general search it is quite likely that you will miss some because, for some reason or other, you do not obtain perfect resonance. There is no need to sit up very late, for on favourable nights—and recently we have had a good run of these—reception is often possible directly after midnight. Sometimes you can hear the Americans even before then. I had WPG on one occasion at 11.30 p.m., the group of relays which occupies this wavelength under the European scheme having closed down by that time.

## DON'T BE MISLED

TAKE my tip, though, when you are trying for America; always enter the field hoping for the best, but fearing the worst. Do not, I mean, be thrilled the moment that you pick up the sound of speech or the strains of music and leap to the conclusion that you are hearing something from the far side of the Atlantic. The Spanish and German stations have a habit of working late and, unfortunately, they don't give their call-signs as a rule at very frequent intervals. You may, therefore, if you are not on the look out, listen to one of these stations for a long time, gloating on your marvellous reception at a range of over 3,000 miles and being brought down to earth with a bump when you hear the call-sign given or identify the language as something quite different from American-English. Some nights ago Heilsberg carried on until all hours, and Barcelona seems to make a habit of this sort of thing. I must confess, though, to having been thoroughly spoofed myself one early morning. The transmission had every sign of coming from a great distance, accompanied as it was by the characteristic form of rather quick fading. However, it turned out in the end to be Lille conducting a late concert transmission.

## BUY ONE AND STOP HIM!

BUY a hydrometer and stop the fellow at the charging station from damaging your batteries if you are an accumulator user. A hydrometer suitable for the purpose does not cost much; and, my hat, doesn't it tell a story! There are, of course, many good charging stations which really look after batteries. Unhappily, though, the number of those which are not good is far greater. Accumulator charging is a very profitable business, and has been taken up as a side line by all sorts of people who know nothing whatever about the treatment of batteries or if they have knowledge, do not bother to put it into practice. You would be surprised if you knew how few charging stations make regular use of the hydrometer when dealing with customers' batteries. And, believe me, there is absolutely nothing else that can give a proper indication of the state of an accumulator. Here is an example. I took a battery round the other day, remarking that at the last charge it had given only about half the service hours that it should. The next day the owner of the station said: "You know, that battery of yours was not run down; it showed 2 volts per cell when you brought it in." "Did you test with a hydrometer?" I inquired. No, he hadn't done that. He was perfectly satisfied with the voltmeter test, though actually it shows nothing.

## HOW IT IS DONE

HERE is actually the kind of thing that happens at many charging stations. The battery is simply connected up to the charging board and left until the boy who superintends operations thinks it about time that it came off. He disconnects, puts a voltmeter across the terminals, finds the reading about 2 volts per cell and hands the battery over for delivery to the customer. You pay the full price for a charge and you receive in many cases something less than half a charge. As very few customers have—or, at any rate, use—hydrometers, this kind of thing can be done wholesale, and it makes a profitable business still more profitable. Lately I have been sampling friends' accumulators immediately after their return from having a refill. The specific gravity of the fully charged cell varies slightly with different makes and types, but generally it should be between 1,250 and 1,280. Tests have shown many fully (!) charged batteries with the gravity a trifle under 1,200, and, so far, not one which measured between 1,250 and 1,280. One of the most startling finds was an expensive and almost new high-tension accumulator whose cells mostly showed a gravity of over 1,300. This was a clear case of wrongly mixed electrolyte in the first instance, and if the state of affairs had not been discovered by the hydrometer the life of the battery would be short.

There is absolutely no question that a big percentage of accumulators is "done] in" by carelessness on the part of charging stations over the gravity of the solution with which they are filled in the first instance, for if it contains too little or too much acid injury to the plates is sure to occur more or less rapidly. You can buy a good hydrometer for a few shillings, and its possession and use is an excellent way of insuring pounds' worth of batteries.

## NOISES OFF

IN not a few European countries it has been a penal offence to cause interference with broadcast reception by radiation from electrical machinery, flashing signs, and so on. In this land of ours no steps have so far been taken, and probably none will be until matters have got into such a state that it is exceedingly difficult to find a remedy. The use of electricity is increasing by leaps and bounds, and there will be a tremendous extension during the next few years as the grid scheme comes near completion. At present neither the B.B.C. nor the Post Office has any powers; nor can you obtain redress if you take the matter into the law courts. Your next-door neighbour can put in an electric sausage machine and neglect the brushes until the contraption produces a miniature firework display whenever it is in operation. He can then, if he likes, run it all night, causing interference with everyone in the vicinity, and no man may say him nay. The remedy in most cases is perfectly simple and quite inexpensive, but unless the offender is willing to adopt it of his own free will, nothing can be done.

## SOURCES OF TROUBLE

AT the present time there are countless sources of interference, and probably most of us who live in places where there are lighting mains have had some experience of how great a nuisance can be caused. Flashing signs are amongst the very worst offenders and the distance at which they can cause interference is surprising. Tracking them down is interesting and not usually very difficult. The general symptoms of flashing-sign interference are that the set produces "tocks" singly or in groups at regular intervals. In a case that came my way the other day the loud-speaker remarked: "Tock-tock-tock," then, after an interval of one second, "Tock," and after a further two seconds repeated the cycle. Enacting the part of sleuth-hounds, the friend who was suffering and myself set out upon the trail. There were not many flashing signs in the neighbourhood, and at first it seemed as if none of them was behaving in a way that quite filled the bill.

# On Your Wavelength! (continued)

Then in the window of a little shop in a side street we came across a sign that was going: "Flash-flash-flash . . . flash . . . flash-flash-flash," and so on. As the grouping and the timing exactly agreed, there couldn't be any doubt.

We went in and had a friendly chat with the proprietor. We told him that we were experiencing distressing interference, and he was hardly sympathetic, since just the same thing had happened to him. Matters were, in fact, so bad, he told us, that he had had to give up using his wireless set. We could hear for ourselves if we liked. Obligingly he switched on, and the loud-speaker bellowed: "Crash-crash-crash . . . crash . . . crash-crash-crash." We showed him that the crashes exactly coincided with the flashes and convinced him that he was producing the interference from which he himself suffered. This had the desired effect, and the matter has now been set right.

## AN A.C. HUM TROUBLE

A.C. hum is a most troublesome feature at times. I had a set the other day which I knew to be satisfactory as far as general design was concerned, and for that matter as far as the construction was concerned, because I had already tested it out and obtained excellent results from it. I wanted to make use of it for a special purpose, and I therefore got it down from the shelf on which it was reposing and put it to a more or less perfunctory test in order to make sure that everything was still in order.

I found to my surprise that things were most decidedly not in order. There was quite an unpleasant hum which was quite audible on reception. I assumed that one of the earth wires must have become displaced and consequently spent some time earthing various different points of the set. After having found a number of false alarms—one of which was that earthing the H.T.+ cured the hum to a large extent—I eventually traced the trouble down to a badly soldered connection in one of the grid leads.

## THE REAL FAULT

THE receiver had a jack in the grid circuit, whereby the insertion of a plug to which the pick-up was connected, automatically disconnected the radio circuit and inserted the pick-up across the grid and filament ready for gramophone playing. Such a jack, of course, involves a lead from the grid to one of the contacts and it happened that this lead was not properly soldered; thus, although the joint appeared tight on the face of it, it was not really so, and the high resistance developed was sufficient to give the effect of a broken grid, although at the same time signals were coming through both on radio and gramophone.

## AN OLD SNAG

THIS is the first case I have met where I have had the symptoms of a broken grid lead simultaneously with the reception of signals in an apparently satisfactory manner. Now I come to think of it, some of the old time circuits used to give us much the same sort of trouble, but in this case the break in the grid circuit usually appeared on the earth side. This, of course, is quite an old form of trouble where the filament return is broken or has a high resistance, and I had checked over this point carefully, and satisfied myself that there was no break at this juncture.

However, I did eventually trace the trouble down, and the re-soldering of the contact to the jack cured the fault.

## WIRELESS PATENTS

I WONDER if there is any industry in which the question of patents has presented a bigger problem than in wireless? From the very beginning of broadcasting, the air has been thick with mutterings of royalties for this, that, and the other type of valve or circuit, and battles royal are continually being fought in the courts to decide the ownership of the spoils. I suppose it is inevitable that these things should be. Certainly the inventor, like any other worker, is worthy of his hire. But it is all rather confusing, and difficult for the ordinary layman to know how and where he stands.

## PUSH-PULL AMPLIFICATION

ONE of the most important of the various patents still in force is that covering push-pull amplification. This was granted on January 7, 1915, to Western Electric Co., Ltd., and so would, in the ordinary way, be due to expire on January 7, 1931, after enjoying the full normal "life" of sixteen years. I see, however, that the High Court has just granted the present owners an extension of four more years, on the ground that the intervention of the War hindered the full development of the patent and prevented the inventor from reaping his just reward. So for this further period every user of a push-pull stage of amplification must continue to pay tribute as heretofore.

## IN THE HIGH COURT

IN the ordinary way it is not an easy matter to extend the life of a patent. Part of the bargain made by the State with the patentee is that the benefit of his invention must pass freely to the public at the end of the full term of sixteen years, unless the inventor can prove in the High Court that he has reasonable grounds for asking for a prolongation. If he does so, it is open to anyone interested to oppose the application. In the present instance, several well-known manufacturers, including the Columbia Graphophone Co., Ltd., and the Mullard Radio Valve Co., Ltd., joined forces to argue that the patent should lapse. But the Court held that the full commercial exploitation of the push-pull amplifier had been held up by the War, and allowed the extra four years by way of compensation. The decision is one of considerable interest, because in the long run, of course, it is the public who pays.

**NEXT WEEK:**

**A**

**UNIQUE 2-VALVE SET**

It will cost about £1 to build.

It will receive Regional and National Programmes.

It will have a simple home-made coil.

It will be described in detail and full-size wiring and lay-out drawings will be given in next week's issue.

## WHAT'S IN A NAME?

IT is, perhaps, excusable to mix matters a bit as between wavelength and frequency in ordinary "shop" talk. But one naturally expects more accuracy in the written word. For instance, the other day I found myself very much at sea trying to follow the thread of an argument concerning the effect of tuning on reaction, all because the writer would insist upon referring to "higher" and "lower" wavelengths. Now there are high frequencies and low, and there are long waves and short, but it is by no means clear when one wavelength can be said to be "higher" than another. A frequency of 1,000 kilocycles is naturally higher than one of 300 kilocycles. In the same numerical sense a wavelength of 1,000 metres should be "higher" than one of 300 metres. But in this particular instance it was quite clear from his context that the author used "higher" when he really meant "shorter" wavelengths. A small point, perhaps, but rather misleading at times.

## A STRANGE BUSINESS

THE other night I went round for a smoke with friend number one, who possesses nothing bigger than a two-valver, consisting of a detector and an output stage. He went across and twiddled his controls, saying: "I want you to hear my star station." Presently music was coming in with a volume amply sufficient to fill the very big room in which we were. "What's that?" I asked. "Budapest," he replied. "I always get him like that." "That" was considerably louder than I usually receive Budapest with four valves and I found on examination that the reaction control wasn't pushed right up to the limit; the set was, in fact, bringing in the station quite comfortably and with excellent quality. Inquiries showed that friend number two couldn't do anything of the kind, though his set is a really efficient one. A strange business, isn't it? Three houses all quite close together and one of them can get Budapest better on two valves than the others can on four. To make quite sure, I borrowed the said two-valver and tried it out in my own house, where I found that Budapest was what you might describe as a decent headphone signal.

THERMION.

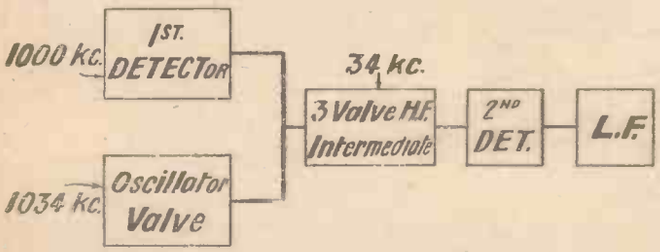
# BACK TO THE SUPER-HET!

## TENDENCES IN SET-DESIGN FOR 1931 ARE DISCUSSED IN THIS ILLUMINATING ARTICLE BY ALAN HUNTER

ALL the signs and portents indicate the early return of the super-heterodyne set. Phoenix-like, this system seems about to rise again, to even greater heights of popularity than it experienced several years ago. What is the super-het; why did it die; and why has it come to life again?

Let me answer these questions, for they are being asked by many readers interested in the future development of broadcast reception. Firstly, what is the super-het? It is a system of reception originally invented to provide stable and appreciable high-frequency amplification; invented in the days when real high-frequency amplification on broadcast wavelengths below 1,000 metres was problematical, if not impossible.

Valves were so inefficient that any attempt to make them amplify at high frequency was almost futile, due to feed-back oscillation and negligible amplification factors. These valves could be made to give a moderate amount of high-frequency gain if the coupling were tuned to a long wavelength, say 2,000 metres. A three-stage amplifier with long-wave or aperiodic couplers, would, even with the mediocre valves of those days, give a fair signal step up before detection—but only on the long wavelengths.




Showing how an incoming signal of 1,000 kilocycles (300 metres) is combined with a local oscillation of 1,034 kilocycles to produce a modulated beat frequency of 34 kilocycles (8,000 metres). This is passed through the long-wave amplifier to the second detector and then amplified in the usual way

### How the Super-het Works

So the super-het came along. With this system the long-wave amplifier was tuned to maximum efficiency at one particular long wavelength. The incoming signals, of all wavelengths, including those between 200 and 600 metres, were first received on a detector valve, passed through the long-wave amplifier to a second detector and finally amplified by the usual low-frequency methods

Coupled to the first detector was an oscillating valve, quite the most important part of the whole system. For the oscillations of this valve combined with the incoming oscillations, producing a frequency equal to the difference between the incoming frequency and the oscillator frequency. In other words a beat frequency was produced.

Suppose the incoming signal frequency was 1,000 kilocycles and the local oscillator was 1,034 kilocycles. The new frequency appearing in the anode circuit of the first detector would then be 34 kilocycles, or the difference between 1,000 and 1,034 kilocycles. The Technical Editor will go into the need for the first detector in an article next week. Here it is only necessary to say that the process outlined above converted a modulated signal of 300 metres into a modulated signal of over 8,000 metres (34 kilocycles).

The value of such a change is obvious; the long-wave signal could be amplified, whereas the short-wave signal could not. As the long-wave amplifier gave its greatest amplification at one fixed tuning point in the long-wave band, it was obviously necessary to make the local oscillator beat with the incoming oscillations to produce this predetermined fixed intermediate frequency. All that meant was an adjustment of the oscillator. As the incoming wavelength changed, so was the wavelength of the oscillator. The result was equal amplification of all incoming signals, irrespective of wavelengths.

### The Old Type

So much for the answer to the question as to what is the super-het. Now why did it decline in favour? The main reason was the improvement in the properties of high-frequency valves and in the circuits for them. We had the neutralised circuit for the three-electrode high-frequency amplifying valve; more recently the screen-grid valve has come along to give us stable and appreciable high-frequency amplification on wavelengths between 200 and 600 metres. To-day we can provide as much high-frequency amplification of medium-wavelength signals as is needed to load the detector valve to the fullest possible extent.

Another factor that helped to kill the super-het was the high running cost. Seven valves was about the minimum in a super-het having, say, first detector and oscillator, two intermediate high-frequency stages, second detector and two stages of low-frequency amplification. The filament current of such a set was about .5 amperes and there were no super high-tension batteries to cope with the considerable anode current. Nor had mains power been developed.

### Is It Coming Back?

Now we come to the question as to why the super-het is returning. Firstly, I think, because we now need above all else selectivity. It is curious how the selective properties of the super-het have been neglected. We have been building sets with as many as four tuned circuits and we have had to suffer from all the inequalities of amplification over a wide tuning range, forgetting that the super-het gives us all the selectivity needed—with the variation of only one tuning circuit.

Sets have been developed in this country with two high-frequency-amplifying valves and sometimes three, involving three or four tuned circuits, all of them continuously variable from 200 to 600 metres and from 1,000 to 2,000 metres. Few, if any, of these sets can claim to give equal amplification over the whole tuning range explored by the ganged condensers. And the ganging of the several tuned circuits is by no means always true. We have arrived at a development in the straight set where complexity is just as great as in the old super-het. If five valves have to be used in a good straight set to-day there can be no objection to the super-het as regards the number of valves needed. And since the really big sets of to-day are of necessity mains-driven the objection to upkeep costs is also ruled out.

Even if we have to contemplate battery operation the valves of to-day are very much more economical to run than in the days when the super-het was widely used. Both filament and anode current have been enormously decreased.

It is significant that two of America's leading electrical organisations have adopted the super-het principle in this year's models. British manufacturers can also employ this principle since the recent clearing up of the patent situation.

## THE HOW AND WHY OF RADIO

# XXII—FIRST STEPS IN MAINS WORKING

***If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this series of articles, specially prepared for the beginner, no previous knowledge of wireless is assumed. It is intended to deal with every aspect of the subject and the whole series will endow the beginner with sufficient knowledge to enable him to derive the greatest possible interest from the fascinating hobby of wireless***

UP to now, in this series, I have not given much attention to the power supply of the receiver, having been involved in the details of tuning, detection, amplification and kindred matters; but no elementary survey of radio can be complete without some consideration of the power

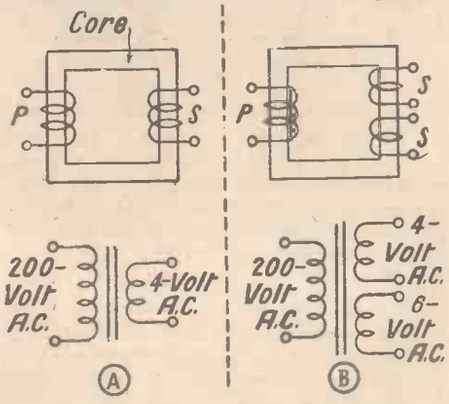



**Fig. 1. Simple transformer connections**

supply. No longer can we complacently fit a 120-volt battery and forget the power supply until a new one is needed; for just as rapidly as this country is being electrified, so are our radio sets.

This week, let us briefly run over the sequence of events in an A.C.-supply unit. It is true that D.C. mains are still quite common, but these supplies are being rapidly changed over to A.C. In any case the use of D.C. for radio is greatly restricted.

The A.C. mains lighting our bulbs, heating our fires and boiling our electric kettles can completely replace the batteries of the radio. Hence the term all-electric set, in which all the power, for high tension, low tension and grid bias is derived from the electricity supply. But before this unending supply can be so usefully put to work, several changes must be made. A.C. stands for alternating current; but what we need in the set is direct current, and very regular direct current at that. One exception is the A.C. valve, whose filament is so constructed that at a low voltage it works by the heating effect of the A.C.

We have four-volt A.C. valves working from a 200-volt A.C. supply. How is this voltage cut down? By taking advantage of the extremely useful fact that A.C. can be stepped up or down in voltage by means of a transformer. We cannot go into transformer theory here, but we should remember that only A.C. can be transformed.

The transformer comprises a primary winding well insulated from a secondary winding, with a centre core of soft iron. Application of A.C. to the primary causes an A.C. voltage to be developed across the secondary. This is because the current is changing its direction, usually as rapidly as 50 times per second.

If the secondary has the same number of turns as the primary we find that a 200-volt input gives a 200-volt output. Suppose the turns on the secondary are less than on the primary; then we get a lower voltage from the secondary than we apply to the primary. And if the secondary turns exceed the primary turns? Then we get a higher voltage from the secondary than we apply to the primary.

This, I suppose, looks like something for nothing; but the energy, as expressed in watts, is almost the same at the output as at the input. A simple equation tells us that watts equals volts times amperes. We might have a 12-watt primary consumption. The supply might be 200 volts. So from the simple equation above, we see that amperes equals watts divided by volts, so

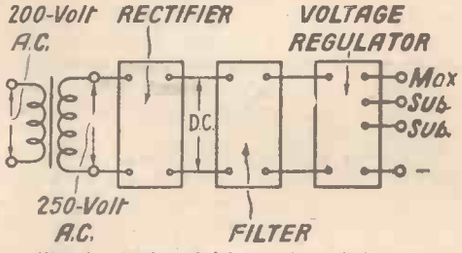



**Fig. 2. Mains divisions of an A.C. unit**

at the input voltage suggested the current would be .06 ampere.

The transformer might be so constructed that the output voltage is 4 volts. This winding might be feeding three A.C. valves, taking one ampere each. Then from the equation watts equals volts times amperes we know that the total energy is 4 times 3, or 12 watts.

Transformers, then, are very efficient. Some are as much as 94 per cent. efficient. With transformers we can change the voltage to a higher or lower value. So in Fig. 1 at A is shown a transformer used to supply 4 volts to the A.C. valves of an all-electric set. Note that at B Fig. 1 two secondaries are fitted to the transformer. Provided that the primary winding is suitably designed and the core is big enough there is no reason why as many as six secondaries should not be wound over a common primary. In the average all-electric set we have at least three secondaries on the transformer.

The transformer shown at B could supply a three-valver consisting of high-frequency and detector valves with four-volt A.C. filaments and a power valve with a 6-volt filament. Remember that all we are changing is the voltage. The current remains alternating and is only suitable for heating A.C. filaments. If we want to use the 200-volt input for supplying the anode current of the valves, we must not only change the voltage to a suitably lower or higher value, but we must also make the alternating current direct. Fig. 2 shows the general sequence, common to all power units for A.C. supplies.

We start with a transformer, which steps up the 200 volts to 250 volts, because, as we happen to want a 200-volt output we must allow 50 volts drop across the different parts of the apparatus. Still A.C., this 250 volts is supplied to a rectifier, emerging as a series of one-way pulses of current.

The current from the rectifier is no longer alternating, but is by no means continuous, due to the inherent inability of the rectifier. The next stage is the filter, which smoothes out the creases, so to speak, delivering not merely a direct current (that is a one-way current as opposed to A.C.) but also a continuous and even current.

By this time the initial A.C. of 250 volts, having been through the rectifier and filter, has dropped to 200 volts. The last stage between the power unit and the set is the voltage regulator. Not all the valves will want the full 200 volts. The high-frequency and detector valves may need 60, 80, 120 or 150 volts. So resistances are introduced, their values being readily worked out from Ohm's Law.

Fig. 3 may help the beginner to visualise

(*Continued at foot of next page*)

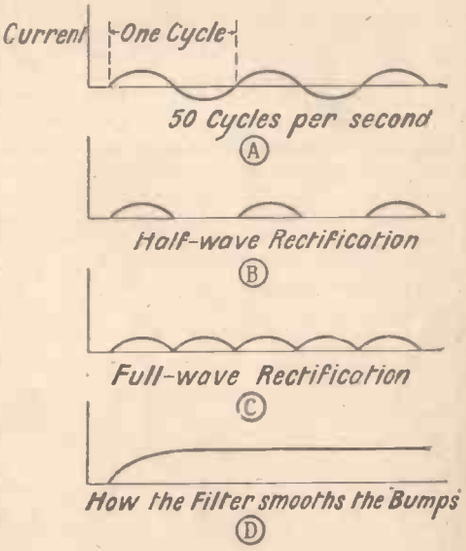
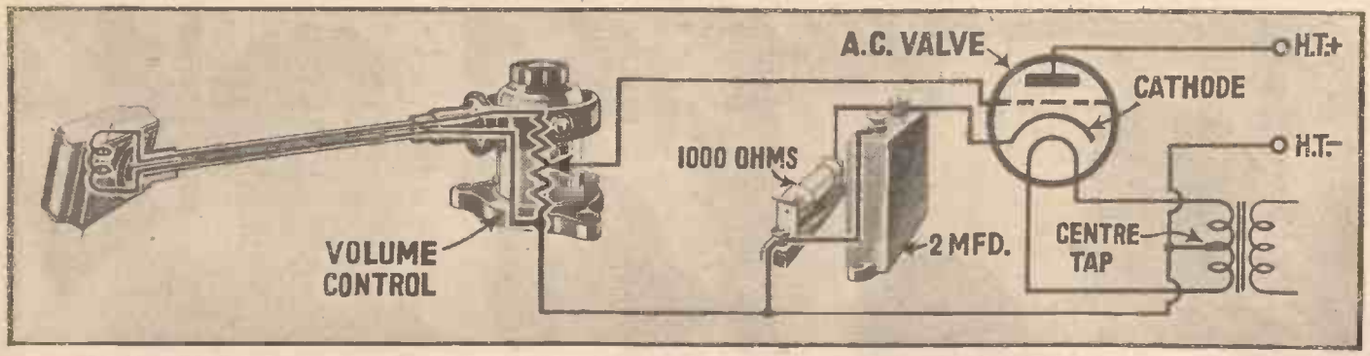



**Fig. 3. How the A.C. is converted into D.C.**

# BETTER QUALITY FROM THE GRAMOPHONE AMPLIFIER

*Some Useful Hints on Biasing*




**This pictorial diagram shows how "automatic" grid bias can be applied to the first A.C. valve in a gramophone amplifier. Note the volume control between this valve and the pick-up**

ONE of the chief causes of distortion in gramophone amplifiers is overloading. When considering overloading we are apt to think only of the power valve. The preceding valves can also be overloaded; and any distortion in the early stages will be magnified considerably before the power valve is reached.

The best test for distortion due to overloading is to insert a milliameter in the anode circuits of the valves. The writer has noted distinct distortion from an amplifier in which the needle of a milliameter, connected in the power-valve circuit, remained perfectly steady, even during loud passages. By inserting the meter in the anode circuit of the input valve the distortion was traced, for the needle deviated considerably during the reproduction.

The cause of this distortion was inadequate bias on the grid, which had been connected through the pick-up directly to the centre tap of the filament transformer. In a two-valve amplifier for gramophone-record reproduction, it is necessary to apply negative grid bias to the first valve. This need is sometimes overlooked, especially when A.C. valves are used.

The pictorial diagram shows how what is known as automatic grid bias can be applied to the input valve. It will be seen that the cathode is connected to the centre tapping of the 4-volt filament transformer through a fixed resistance shunted by a fixed condenser. This connection makes the grid negative, with respect to the cathode, by an amount depending upon the voltage drop across the fixed resistance.

This voltage drop can easily be worked out from Ohm's Law. Alternatively, if the amount of voltage drop or grid bias is known, the required value of resistance to give this voltage can be found. Suppose we want to apply 3 volts grid bias to the input valve, an A.C. type. The current flowing through the resistance will, of course, be the anode current, which can readily be measured or found from the valve curves.

For an input valve the anode current might be 3 milliamperes. And we want that current flow to cause a 3-volt drop. From Ohm's Law we know that $R = \frac{E \times 1{,}000}{I}$, when R is the resistance in ohms, E is the voltage drop, and I is the current in milliamperes. So $R = \frac{3 \times 1{,}000}{3}$, or 1,000 ohms.

Generally speaking, a 1,000-ohm resistance between the cathode and the centre tap of the filament transformer provides just the right amount of negative bias for the first valve of a two-valve A.C. amplifier. The resistance should always be shunted by a 1- or 2-microfarad fixed condenser.

### An Example

The valve shown by the diagram is suitably biased to take the full voltage of the pick-up. Even so, a volume control is essential, otherwise distortion will be produced through overloading the power valve. Suppose the pick-up develops 1 volt, which is applied to the grid of the input valve. This valve might have an amplification factor of 20, and the transformer a step-up ratio of 3 to 1. The peak voltage developed on the grid of the power valve following the transformer would, therefore, be $1 \times 20 \times 3$, or 60 volts.

Only a super-power valve with 200 volts on the anode could handle this input without overloading. And a power valve capable of converting this large input into correspondingly large current variations would probably overload the loud-speaker! A volume control is essential between the pick-up and the input valve, unless the pick-up is very insensitive.

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### "FIRST STEPS IN MAINS WORKING"

*(Continued from preceding page)*

what happens in the A.C. power unit. At A is shown the form of the A.C. input, waxing and waning in opposite directions 50 times per second, that is, assuming a 50-cycle supply. B shows how a half-wave rectifier (not often used these days) cuts off the alternate half cycles, leaving a somewhat irregular series of current impulses. At C is shown how a full-wave rectifier, so to speak, turns over the alternate half cycles so that a much more regular series of uni-directional current pulses is produced.

Obviously it is easier to produce the smooth, continuous current shown at D from the C condition than from the B condition. Hence the wide use of full-wave rectifiers, which cut down the cost of smoothing apparatus by providing an output that is already tolerably even.

Next week, I will explain how valve and metal rectifiers work, and later I will deal with filters and voltage regulators.

HOTSPOT.



## MAN-MADE STATIC

SOME power-transmission lines already carry current at a pressure of 220,000 volts, and steps are being taken to increase this to 380,000 volts. At such pressures the chief problem is to prevent corona discharge and "arcing" across the insulators. Apart from the actual loss of power, leakage of this kind sets up ether disturbances which may interfere seriously with wireless reception. Accordingly the insulators used for power transmissions are now being tested up to 2,000,000 volts. The actual tests are carried out in a darkened room, so that the faintest corona glow is at once detected. When a "flash-over" does take place, it is a most impressive sight, whilst the noise is like the bursting of a high explosive.

B. A. R.

# BROADCAST ARTISTES IN PICTURE

*WALTER GLYNNE.—This famous tenor, heard on January 18, hails from Swansea, and went direct from college to the D'Oyley Carte Co.*

*JEANNE GAUTIER.—Early in the month this brilliant young French violinist gave a recital of music by the Spanish composer, Joaquin Nin.*

*Dr. ADRIAN BOULT.—Now Musical Director of the B.B.C. Conducted the Royal Philharmonic Society from 1918.*

*ELENA GERHARDT.—A special recital was given recently by this celebrated German singer of Lieder, at Savoy Hill. She was famous in this country long before the War for this type of song.*

*SEPTIMUS HUNT.—One of the members of the most successful of concert parties, "The Roosters."*

*NIGEL DALLAWAY.—A brilliant pianist and all-round musician, Mr. Dallaway is now connected with the Midland Regional Station.*

*SYDNEY CROOK is at the moment a member of the Victor Olaf Sextet.*

*MABEL FRANCE, as "Aunt Maria," has quickly established herself "on the ether."*

*GWENDA EATON, a young artiste heard from the Midland Regional Station on January 22.*

*NEALL LYALL, a well-known baritone. His songs are always well chosen.*

*RAYMOND AMY, a beautiful singer with fine diction.*

*JOHN COLLINSON has broadcast every type of song and from nearly all B.B.C. stations.*

*ARTHUR MACKNESS, an original member of "The Roosters." Their recent concert was relayed from Kingsway Hall.*

*A Weekly Programme Criticism*—By SYDNEY A. MOSELEY.

# Without Fear or Favour


## DANCE MUSIC PRESENTATION

### THE CLAQUE

ALAS, the Fleet Street Choir gave its rendition (another good word) at 7 o'clock and I missed it! I hope they will arrange for a later broadcast, when most of us are about.

◆ ◆ ◆

A thrilling, well-delivered, and intimate talk was given by Air-Commodore L. E. O. Charlton, who took one back to a war which, in many ways, was more in keeping with fiction than the Great War. But I did hope that the Commodore would have ended on a more cheerful note.

◆ ◆ ◆

I liked "Going South," "reminiscences of plantation songs" given under a rather thin setting. The point about Mr. Dereck McCulloch's presentation is that he chose the right songs, and the right cast, too. The Four Harmony Kings, Mary O'Farrell, Tarrant Bailey, Jnr., and John Payne made the production very enjoyable, and I listened-in for a second time. I do not quite understand, however, where Betty Bolton came in.

◆ ◆ ◆

Cliff Lester and others agree with me and disagree with "Harold" in the stand taken up with regard to Jack Payne and his presentation of some of the dance music. One reader says either it is dance music or it is not. Another wages very strong against Jack Payne's latest sacrilege by playing "Liebestraume" in "hot time."

As for "Harold's" view on this subject, I shall not print his latest epistle. I doubt whether it would pass the censor!

◆ ◆ ◆

Did my ears deceive me, or have the engineers tried a new stunt with regard to the claque. It seemed to be rather in the background the other evening. Until we clear the gang out of the studio altogether, this might be a happy compromise, short of fading the noise out entirely. I have received many letters backing me up in my complaint about the claque.

◆ ◆ ◆

Incidentally, there has been lately a tendency for prolonged applause which has not been checked by the announcers.

◆ ◆ ◆

Strong criticism has been expressed against the description read out by an announcer, in the concert relayed from No. 10 studio describing some fantastic music. I should think that the announcer was reading from his notes, although I am not sure!

◆ ◆ ◆

Joan and Nancy Allen-Brown were quite bright in their songs and duets with ukulele accompaniment.

Tommy Handley's return was signalised by his putting over some really smart stuff. He certainly goes up "one" as a result.

I think, however, that Gillie Potter, as successful as he was, should not be in the same programme as Tommy Handley, since their turns are rather much of a muchness.

◆ ◆ ◆

Madame Karsavina took an opportunity of paying a well-deserved tribute to Pavlova. I was rather anxious to hear how she came over, and although, on the whole, it was successful, her broken English was sometimes rather difficult to follow.

◆ ◆ ◆

Gustav Ferrari (tenor) is an undoubted artiste, but whether Wigan or Whitechapel appreciated him is rather doubtful. In a concert-hall he would be a great success, but I wonder whether this type of turn appeals to the wider multitude.

◆ ◆ ◆

The Symphony Concert relayed from Birmingham, with Leslie Heward conducting the City of Birmingham Orchestra, was a very fine affair. When are we going to *see* Mr. Heward as well as hear him in London again?

An Impression of Jack Padbury

## BLAME THE SET

### FILM CRITICISM

◆ ◆ ◆

"Mackintosh," the short story by Somerset Maugham, adapted for broadcasting by Jean Bartlett, was well produced by Val Gielgud, the productions director. I liked the prologue and epilogue, which were well spoken. This type of play always gets over well. Furthermore, Mr. Gielgud knows how to choose his cast.

◆ ◆ ◆

I do not altogether care for Leila Megane, but I suspend judgment because sometimes one must blame the set, and lately my sets (I have five of them, from a crystal to a seven-valver) all seem to have an evening off.

◆ ◆ ◆

I am told by members of my family, who follow the programmes as closely as I do, that Harold Nicholson's talks for secondary schools started well with Viscount Cecil. Mr. Nicholson, as I have said before, has good material, but, somehow, many of us think he is affected. Nevertheless, I hand on this bouquet second-hand.

◆ ◆ ◆

The fact that I was asked to give talks on the films has made it difficult for me to criticise the work of the present critic, and, frankly, I have often purposely avoided listening to him. But when I do, I always feel moved to state that he sounds to me immature and inexperienced. Doubtless an excellent beginner on a newspaper, but surely not quite the man to represent the B.B.C. on this important work.

◆ ◆ ◆

One can easily follow Claude Hulbert and Enid Trevor, and that is saying a lot. I like the turn, but Claude should get some better material.

◆ ◆ ◆

Again I touch wood, because it may have been my set, but in the duets between Doris Vane and Dale Smith, Dale Smith's voice predominated, and since he was singing the second line it sounded all wrong. The old-fashioned song idea is still good, and if only he would remember that he is singing in a duet, all would be well.

# A SET FOR AL

# EVERYBODY'S

## AN ENTIRELY SELF-CONTAINED TWO-VAL TO ROOM. IT INCORPORATES A CONE SP OR MAINS ELIMINATOR. SIMPLE TO OPER

THE average set needs an aerial, although with modern sets, such as the "Ether Searcher," it is surprising what can be done with only a few feet of indoor wire.

Nevertheless, there are very many listeners who have no use for a receiver with exceptional range or with moving-coil amount of volume. What they want is a set which will give them good reproduction of the local stations and 5XX, and which, although it may need a very short indoor aerial, nevertheless can be carried from room to room and moved without having to bother about batteries.

### Self-contained

In order to meet this demand, the AMATEUR WIRELESS Technical Staff has produced this new set, which is appropriately called the "Everybody's All-in Two."

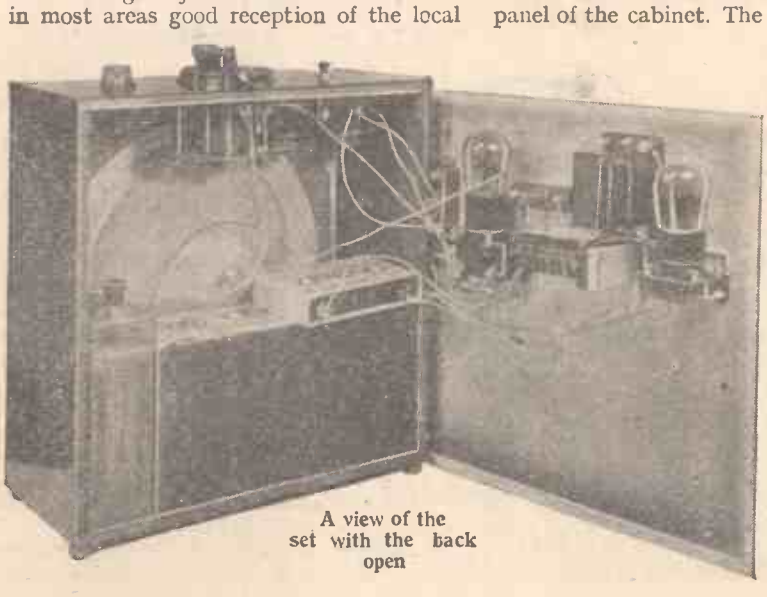
First, see what it is capable of doing. It consists of a detector and a power valve. Provision is made for an aerial and earth, but nothing very efficient is called for and in most areas good reception of the local stations is obtained with only a short indoor wire and with a connection to any convenient water pipe or direct earth point.

If a mains eliminator is used, then in very many cases the earth automatically provided by the mains wires is sufficient. Apart from the aerial and earth connections, though, everything is contained in the cabinet of the set.

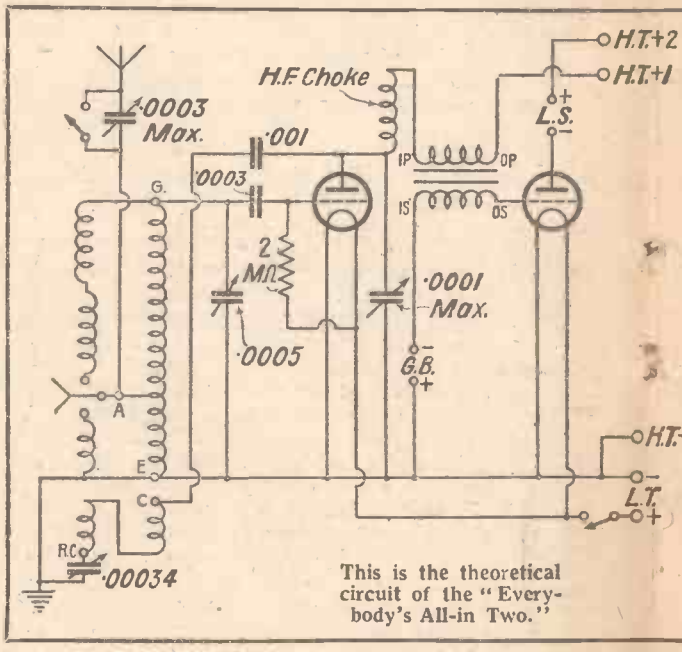
There is a cone speaker forming the front of the cabinet. Batteries or portable-set mains eliminators fit below the speaker cone. The tuning controls are on top of the cabinet and the tuning and reaction condensers and coil are immediately below. The other components of the set are fitted on the back panel of the cabinet. The construction of this set, you will agree, is a little different from the conventional idea of baseboard with panel at right angles, but nevertheless there is nothing at all difficult about the construction of this all-in two-valver, which is simpler than the average portable for outdoor use and which is also very cheap to make up.

### Dual Range

A special type of tuning coil has been used. This is of the dual-range variety, so that the set can, in most districts, pick up 5XX and Radio Paris as well as the

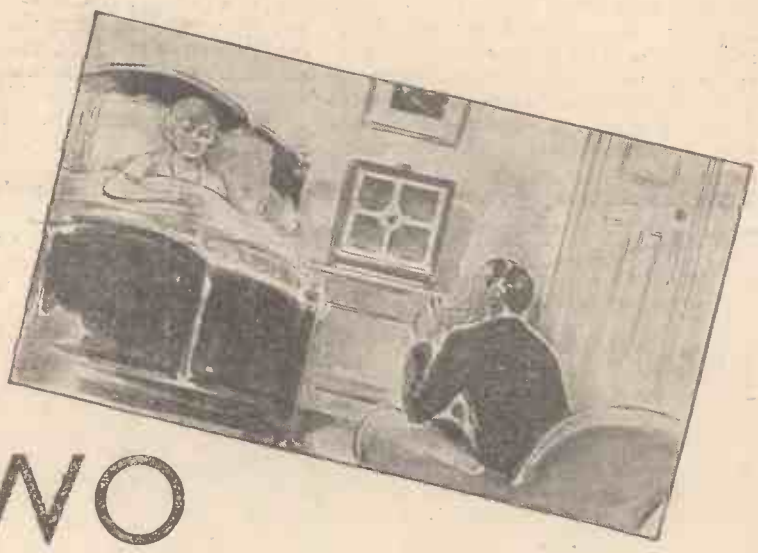


A view of the set with the back open




This is the theoretical circuit of the "Everybody's All-in Two."

# L OCCASIONS



# ALL-IN TWO

## LVER WHICH CAN BE TAKEN FROM ROOM EAKER AND HAS SPACE FOR BATTERIES RATE, WITH ONLY ONE TUNING CONTROL

medium-wave stations. Furthermore, it is a coil of a rather selective type, and it is so connected that the most is made of its inherent selectivity. Added to this fact the set will generally be used with a small aerial, and small aerials are always naturally selective, so you need have no fear that this all-in tuner will not be able to separate stations as you would wish.

### One-knob Control

Tuning is very simple, because there is really only one control. This main tuning control is fitted with a slow-motion dial on top of the cabinet. On one side of it is a reaction condenser, while on the other side of it is the wave-change switch. On top of the cabinet also is fitted the low-tension on-off switch.

### Cheap to Build

We have said that this set is cheap to build. This you can see for yourself on examination of the list of components required. The cost is very low, even considering the fact that the set incorporates its own speaker and is fitted in a very attractive and well made cabinet.

In order to make the construction as simple as possible for every amateur who wants to make up this set, we are giving in this issue enlarged wiring plans and a layout diagram. These will be found on pages 234 and 235. You will find that these show just where to mount the parts and how to connect them up. It is very important to keep the spacing of the parts just as shown. The original set represents a great deal of experimenting to get the best results and you will certainly not obtain any better results by trying to vary the layout for yourself. With any type of self-contained receiver it is always important to adhere to the layout.

### The Components

In the list of components alternatives are given in some cases, and if you make use of these instead of any of the first-mentioned parts, then you should endeavour to keep the layout and wiring as nearly as possible in conformity with that of the original. After all, the layout is actually quite simple.

The cabinet, which forms the basis of the

### *COMPONENTS FOR THE "ALL-IN TWO"*

Cabinet (Camco Triumph).

Talisman dual-range aerial coil (Wearite).

.0005-mfd. variable condenser (Lotus, J.B., Polar, Lissen, Formo, Ormond, Burton, Utility).

.00034-mfd. reaction condenser (Lotus, Readi-Rad.)

.001-mfd. fixed condenser (Dubilier, Readi-Rad, Lissen, Telsen, Watmel, T.C.C., Graham-Farish).

.0003-mfd. max. pre-set condenser (Sovereign, Polar, Lewcos, Formo).

.0001-mfd. max. pre-set condenser (Sovereign, Polar, Formo, Lewcos).

Low-frequency transformer (Ferranti type A.F.8, Telsen, Lissen, Burton, R.I., Voltron, Varley, Lewcos).

.0003-mfd. fixed condenser with grid-leak clips (Dubilier, Lissen, T.C.C., Readi-Rad, Telsen, Graham-Farish, Watmel).

2-megohm grid-leak (Lissen, Telsen, Graham-Farish, Ferranti, Dubilier, Sovereign).

High-frequency choke (Lewcos, Telsen, Lissen, Varley, Readi-Rad, Bulgin, Sovereign, Voltron, Burton, Tunewell, R.I.).

Two valve holders (Junit, W.B., Parex, H. & B.).

On-off switch (Bulgin, Readi-Rad, Wearite, Junit, Burton, Benjamin, Lotus, Lissen).

Loud-speaker unit (Ormond, Blue Spot, Hegra, Tunewell, Triotron, K.D., Sheffield Magnet).

Loud-speaker cone with frame (Kone-Dope).

Vernier dial (Brownie, Lissen, Ormond, Formo, Astra).

Two terminals, marked: A., E. (Belling-Lee, Clix, Burton, Eelex).

Five wander plugs, marked: H.T +2, H.T.+1, H.T.—, G.B.+, G.B.— (Belling-Lee, Clix, Eelex, Burton).

Two spade terminals, marked: L.T.+, L.T.— (Belling-Lee, Clix, Eelex).

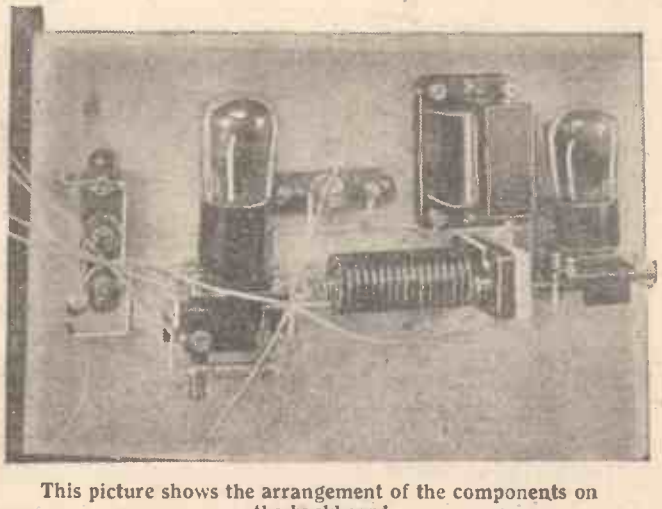
Rubber-covered flex for battery leads (Lewcoflex).

Glazite for wiring.

2-volt accumulator (C.A.V., 2AN7).

High-tension battery, 100 volts (Fuller).

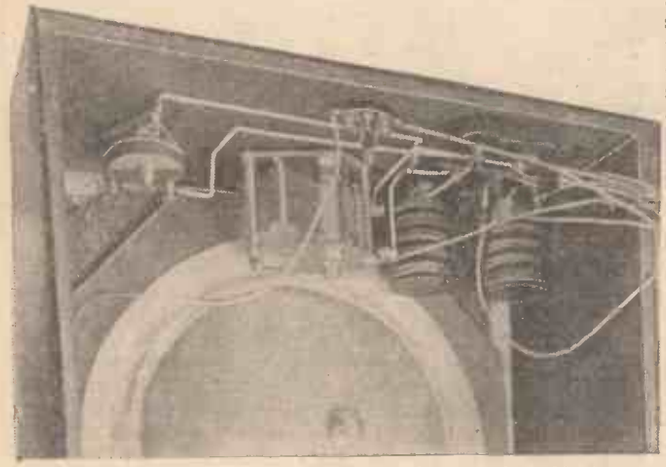
Grid-bias battery, 9 volts (Fuller).



This picture shows the arrangement of the components on the backboard

# "EVERYBODY'S ALL-IN TWO" *(Continued from preceding page)*

whole set, of course, can be purchased ready-made, as indicated by the components list, or it can be made up of five- or seven-ply wood, if you have the necessary skill with the few wood-working tools required. The main part of the cabinet is simply a rectangular box-like formation with a speaker fancy fret form of front and a plain piece of stout plywood forming the back of the box. This also is the mounting board for seven of the receiver components.



**This photograph shows the components beneath the cabinet top**

## Assembly

Let us deal with the fixing of the components first of all.

All the parts on this board are fixed by means of small 6 B.A. bolts. There are two pre-set condensers, two valve holders, the grid condenser and leak, the high-frequency choke, and the low-frequency transformer. On the right-hand side, looking at the board from the back, are aerial and earth terminals.

## Points to Note

There is no difficulty about mounting any of these parts, but it should be remembered that the high-frequency choke is mounted on its side on a small platform of seven-ply wood. This piece of plywood, in turn, is screwed at right angles to the board and is held in place with wood screws.

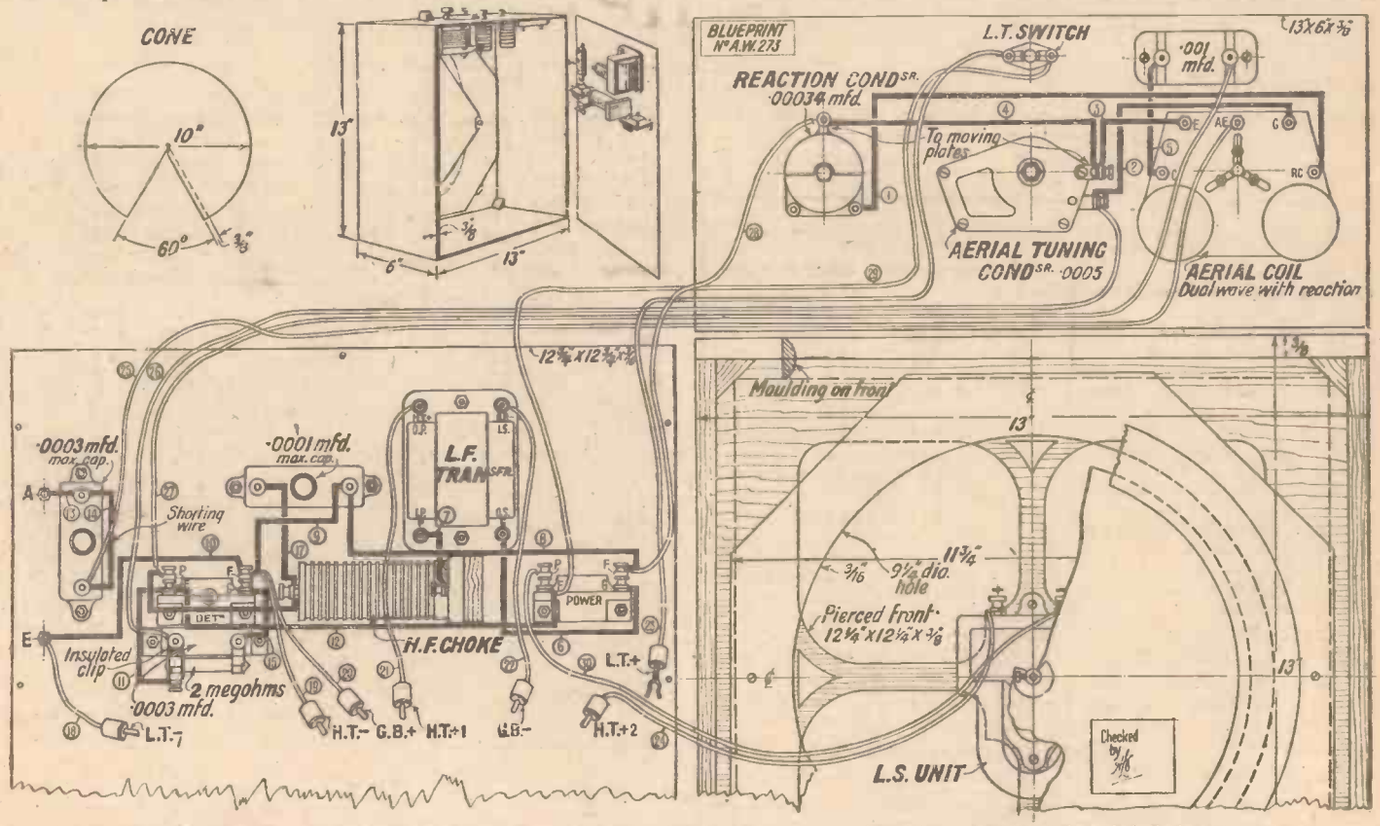
There is no need to have any insulation for the aerial and earth terminals, provided they are placed away as shown and the terminals are simply clamped directly to the board. It is important to keep the spacing of these parts as shown, because otherwise there is a possibility that they may foul the condensers or the coil or the underside of the top of the cabinet. This is a point which also should be watched when choosing alternatives. Some low-frequency transformers, for example, are higher than the Ferranti type A.F.8 component specified and may touch the reaction or tuning condensers when the back of the panel is screwed into position.

The coil, tuning condenser, reaction condenser, and on-off switch can now be placed in their positions beneath the top of the cabinet. All these parts have one-hole fixing and you should take care to tighten down the one-hole fixing nuts so that none of the parts tends to turn. The tuning condenser has a slow-motion dial, which needs a separate fixing bolt.

## The Loud-speaker

The tuning coil is held down only by the one-hole fixing nut. Now for the speaker. It is best to purchase the complete cone assembly specified, for this is mounted on a thin plywood rim. The speaker unit is screwed to the back of the speaker fret, with the control knob projecting through the front so that it may be conveniently operated from the speaker side of the receiver.

The cone is then put over the speaker unit drive rod, and it should be seen that the cone slides freely over the rod before the wooden rim of the cone mounting is screwed to the back of the frame. If there is any side strain on the rod caused by incorrect mounting of the cone diaphragm, then the speaker will not work. Don't forget, too, that before the cone is put in position, two lengths of rubber-covered flex should be brought out from the speaker unit and before these are twisted together a red wander plug, marked H.T. positive 2, should be attached to the end of the flex lead connected to the terminal marked




**Here are complete details of "Everybody's All-in Two," the back being shown opened and turned to the left. A full-size blueprint is available, price 1/-**

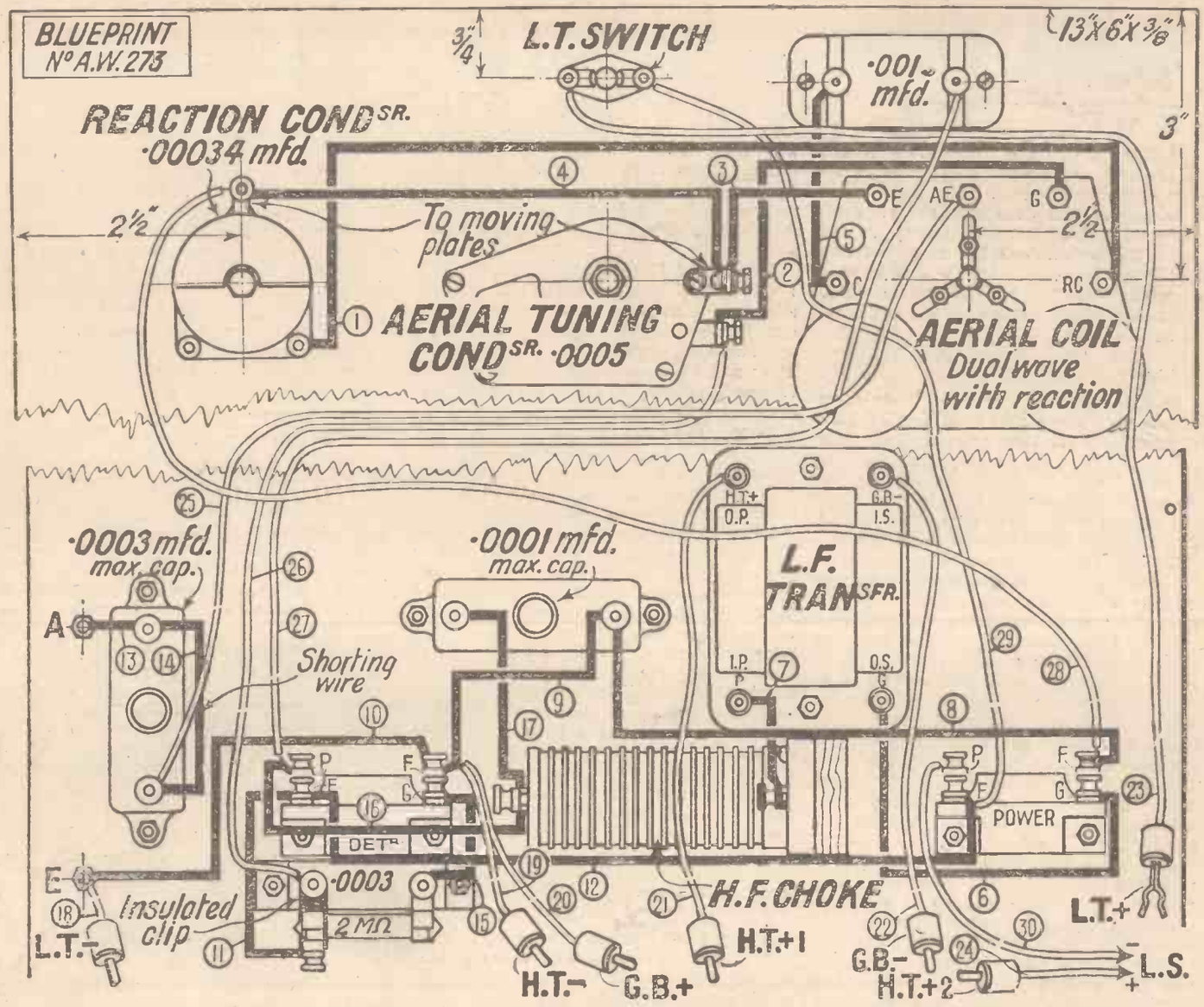
# "EVERYBODY'S ALL-IN TWO"

"positive" on the speaker unit. For neatness the leads may then be twisted.

### Wiring

Wiring is quite simple, particularly as you have the large charts to act as a guide. Part of the wiring is carried out with stiff insulated wire and, for convenience, it is best to make soldered connections. Flex leads, though, are used for the battery connections and for the connections between the components on the top of the cabinet and those on the backboard.

It now remains only to choose suitable valves and batteries and to connect up the batteries to the set. In next week's issue full details will be given of the best valves and batteries to use in order to make the most of the range and power of the "Everybody's All-in Two." Operating hints will also be given.




An enlarged drawing of the wiring showing the connections between the components mounted in the case and those on the backboard

## FRAME-AERIAL RECEPTION

IN theory a frame aerial should give no reception from a station situated at right-angles to the plane of the windings. When the aerial is aligned for zero reception, signal voltage is induced in both vertical limbs, and since the voltages are in opposition, they should balance out. One end of the frame windings is, however, connected to the grid, which has practically no capacity to earth, whilst the other end is connected to the filament, and therefore to the filament battery, which has a very considerable capacity to earth. This upsets the proper balance and allows a certain amount of current to flow down the filament side of the aerial, which of course prevents the undesired signals from being completely cut out.

B. A. R.

**NEXT WEEK:**

**A TWO-VALVER FOR £1**

The new 16-kilowatt transmitter erected by the Marconi Company at Reykjavik (Iceland) is now testing nightly on 1,200 metres. Short programmes of orchestral music or gramophone records are broadcast and a sacred service is relayed from the capital city every Sunday evening.

On January 31, at 2.30 p.m. G.M.T., Lyons PTT broadcast a special transmission of considerable interest. It consisted of a visit to the summit of Mont Brevent, one of the highest spots in the French Alps opposite Mont Blanc. The commentary was relayed to OTT Strasbourg.

SETS OF DISTINCTION

# The BURTON EMPIRE S.G. THREE.

*Makers: C. F. & H. Burton. Price: £8.12.6 without valves*

IN this country the three-valver is still the most widely-used set, holding its own against every other type. And since considerably less than half the set-users enjoy the blessing of electricity in the home, it is not difficult to understand why the battery-operated three is still in such demand. What is a little mysterious is the lack of these sets among the manufactured products.

### A Lively Set

In the course of a season I have come across very few really good factory-built three-valvers for battery operation. The latest to arrive in the laboratory is the Burton Empire S.G. Three. I like the design of this set and I must record my enthusiasm for its performance, which an evening's test proved to be exceptional.

The price of this set is £8 12s. 6d. but as this does not include the valves, we must include £1 for a screen-grid high-frequency valve, 8s. 6d. for a detector, and 10s. 6d. for a small power valve, bringing the price up to £10 11s. 6d. Even so, this is below the average for a three-valver complete with valves. The valves used to test the set were as follows: Cossor 215SG, Mullard PM1HF and Cossor 215P. The anode-current consumption with this combination of the valves was found to be 12 milliamperes. A double-capacity high-tension battery is therefore needed for economical working.

As soon as the set was connected up I realised how lively it was in action. The tuning and general operation was not critical. In the course of an hour I obtained an excellent log of stations. Starting at the bottom end of the scale on the medium wavelength range I got the National at 25, naturally very strongly reproduced, on a linen-diaphragm loud-speaker. Then came Bratislava at 30, unusually strong for this type of set.

Followed an interval of heterodynes until Bordeau was reached at 43. Göteborg at 50, Grenoble at 52, and Strasbourg at 55 were all very strongly heard before reaching the London Regional at 62. Above this, Toulouse at 68 was clear and Frankfurt at 70, Katowice at 73 and Berlin at 75 were above the average strength. Those two giant voices of the ether, Stockholm and Rome were very strong at 79 and 80 respectively. Just before the Midland Regional at 86, I got Lyons at 84 and above Milan at 89, Brussels at 91, Vienna at 92 and Munich at 93.

On the long-wave range I found the set was more sensitive from 50 degrees upwards. Thus Eiffel Tower 67, Daventry 75, and Radio Paris 89 were very strong. whereas Kalundborg at 37 and Oslo at 25 were not so strong, although quite enjoyable.

In view of this exceptional sensitivity I was specially interested to see whether selectivity had been sacrificed to achieve signal strength. The London National, maximum at 25 had completely disappeared at 15 and 30, a spread of only 15 degrees. London Regional, maximum at 62 had gone again at 55 and 68, a spread of only 13 degrees. These readings must be considered in conjunction with the fact that my test aerial is only 50 feet long. I consider this set achieves a very happy mean between sensitivity and selectivity.

In obtaining the log of stations mentioned above I had a good opportunity to appreciate the easy handling of this set. The main control is the thumb-operated tuning dial fitted along the curved portion of the cabinet near the top. In a separate metal panel at the bottom of the cabinet are arranged the auxiliary controls, consisting of a fine tuner on the left and a reaction control on the right. Between these is the master switch, putting the set out of action in its central position, and providing long- and medium-wave tuning to the left and right respectively.

### Easy Operation

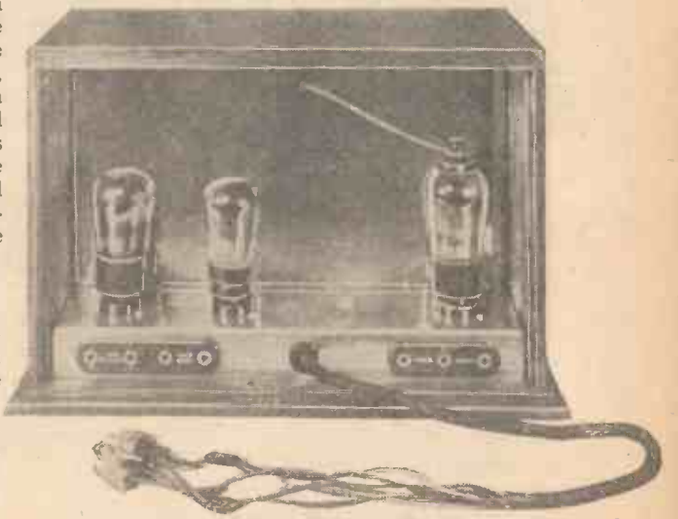
Reaction and fine tuning controls are both smooth in action and have a lot to do with the efficiency of the set. The fine tuner especially is an aid in increasing the strength of distant stations. Rough tuning can be done on the thumb-operated dial, at the top of the set. I found it possible to log many stations without reference to the fine tuning control, which needed attention only as a final boost and not as an essential control in the search for stations.

### Quality

Quality of reproduction, with a set of this type, largely depends upon the choice of valves, especially the power valve, adequate high-tension current and voltage, and the provision of a good loud-speaker. I can say that following my tests this set is worth a good quality reproducer, such as a linen-diaphragm or an inductor dynamic. With a P2 type of valve and the maximum high-tension voltage recommended by the makers I was able to use this set as a very satisfactory gramo amplifier.

In summarising my opinions of the Burton Empire S.G. Three, I should say that it is a very satisfactory broadcast receiver for battery operation, bringing in foreign stations clear of the locals, and separating the locals easily, with a simplicity of operation only appreciated by actual handling.

SET TESTER.



A rear view of the Burton S.G. Three: note the accessibility and compact arrangement

## A TELEVISION DEVELOPMENT

IT is curious how history repeats itself—even in the field of invention. Some thirty years ago Duddell found that an ordinary arc lamp could be used to reproduce speech-frequencies. Since then it has in fact been used as both a loud-speaker and as a microphone. Quite recently it has been shown that an arc lamp will also respond, under suitable conditions, to the higher frequencies used in television. This discovery is an important step towards the production of television pictures of real entertainment value. Up to the present the size of the picture and the clearness of definition have both been limited by the comparatively weak illumination provided by the ordinary neon lamp.

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***The Ready Radio Kit of the "A.W." 1931 Ether Searcher was submitted to lengthy tests by Mr. J. Sieger, the "A.W." designer, and officially approved by "Amateur Wireless."***

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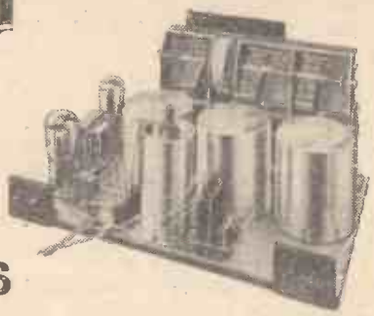

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Consisting of :—

| | £ | s. | d. |
|---|---|---|---|
| Complete Kit of Parts with 3 Mullard Valves and Cabinet to specification : ... ... ... | 8 | 14 | 6 |
| 1 Fuller 120-volt H.T. Battery | | 15 | 10 |
| 1 Fuller 2-volt 30 amp. L.T. accumulator (type SW X7) ... | | 11 | 0 |
| 1 Farrand Inductor-type Loud-speaker Unit ... ... ... | 3 | 10 | 0 |
| 1 Fuller 9-volt Grid Bias Battery | | 1 | 6 |
| | £13 | 12 | 10 |

Or 12 equal monthly instalments of 26/-

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Consisting of :—

| | £ | s. | d. |
|---|---|---|---|
| Complete Kit of Parts with 3 Mullard Valves, Cabinet to specification ... ... ... | 8 | 14 | 6 |
| 1 Atlas Mains Unit with Trickle Charger (A.C.188) ... ... | 6 | 0 | 0 |
| 1 Fuller 2-volt 30 amp. L.T. accumulator (type SW X7) ... | | 11 | 0 |
| 1 Fuller 9-volt Grid Bias Battery | | 1 | 6 |
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*Please send*..... *at £*.....

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.....

*Town*..... *Nearest Railway Station*.....


### "Over Fifty Stations"

SIR,—I must write and congratulate you on your "1931 Ether Searcher." Having tried many of your sets in the past, I naturally tried the "Searcher."

It is easily the best set I have handled and is marvellous in its selectivity. I live roughly nine miles from Brookmans Park, and can cut out the National or Regional transmitters in two degrees. In fact, I can tune in the new Stuttgart station without any serious interference from the London Regional.

Apart from such perfect selectivity, the tuning is mere child's play, station after station coming in as the one-control knob is turned. I have logged over fifty stations already, although I have only had the set working two evenings.

Wishing AMATEUR WIRELESS every success. B. A. BARTON (Nazeing, Essex.)

### Super-het Popularity

SIR,—I have always been an admirer of the super-het receiver and invested in one of these sets in the early days of their popularity. For some two or three years this type of receiver seems to have taken a back seat, but I now notice that they are again coming into vogue. Can you explain why this type of receiver was dropped or can you tell me why they are again coming into their own?

D. A. (Manchester).

The super-heterodyne receiver was first made popular owing to its being capable of giving very good amplification with stability on the short and medium waves. It also gave good selectivity, which was a great asset, but such sets proved to be rather costly in initial cost and upkeep. With the advent of neutralised H.F. circuits and, later, screen-grid valves, it was possible to obtain the necessary amplification and stability with less valves and, therefore, less cost. Selectivity is now a necessity owing to the advancement of the Regional Scheme, and the use of screen-grid valves for intermediate frequency amplifying in super-heterodyne receivers, to get great range and also stability and selectivity, seems to us to be the natural course of advancement. —ED.

### The "Short-wave Super-het Adaptor"

SIR,—At long last I am able to receive short-wave transmissions with a minimum of effort and a maximum of pleasure. I have built and unbuilt more short-wave sets than I can enumerate, but with none of them have I been completely satisfied.

I am using your adaptor in front of a receiver of my own construction, containing three stages of screen-grid H.F., a detector, and two stages of L.F. amplification, and I quite expected that when the adaptor was coupled up to the receiver there would be some degree of instability and hand capacity, but neither exists to the smallest degree. Unless a signal is very weak, I find it unnecessary to use more than the first stage of L.F. amplification, one stage usually being quite sufficient to ensure full loud-speaker reproduction.

I have added two refinements to the adaptor, one being a milliammeter wired into the negative lead and the other a very small variable condenser in parallel with the A.T.C. The object of the first addition is to have visible control over the oscillation of the detector in the adaptor, as, by watching the needle and keeping it steady while searching for carrier waves, one can be certain of not overdoing oscillations so as to cause the reception to go dead.

The total consumption of both valves in the adaptor is 6 milliamperes, but as the reaction condenser is brought into use until the detector valve is just on the point of oscillation, the consumption falls to 5 milliamperes. A further increase in reaction reduces the consumption, but if taken below 4½ milliamperes the adaptor "goes dead," which is as it should be. The other refinement secures ease in fine tuning, but is not really necessary unless the A.T.C. is geared on the high side.

R. C. D. (London, W.3).

*(Continued in third col. of page 240)*

# For the Newcomer to Wireless: Using a Speaker in another room

YOU know that I have rigged up a "local station" receiver for my family? Well, I want to be able to arrange things so that they can use the loud-speaker in any one of four rooms, the set, of course, remaining where it is. Can you give me a simple scheme for carrying this out?

You don't want, I suppose, to be able to switch the set on or off from all of these rooms?

No, that isn't at all necessary. People will have to go into the room in which the set is, anyhow, in order to fetch the loud-speaker, for I don't propose to provide more than one.

In that case it becomes quite a straightforward matter; but, first of all, one question about your set.

Fire away.

Have you a filter circuit in the output or is there an output transformer?

As a matter of fact, there is neither. Please tell me why you ask?

If the loud-speaker is connected directly into the plate circuit the whole of the high-tension direct current passed by the output valve must go through its windings, mustn't it?

Yes, of course.

And therefore any leads connected to the output terminals of the set must also carry the whole of this current.

Why, of course.

What is your plate voltage for the last valve?

A hundred and fifty, supplied by a super-capacity dry battery.

One of these leads goes to H.T.+, whilst H.T.— is earthed. Suppose, now, that you get a short-circuit owing to defective insulation, pretty serious results may follow.

But surely even a "super" H.T. battery won't deliver much current?

Won't it, just! One of these batteries in good condition may pass as much as 15 amperes for a few seconds, and fifteen times 150 works out at 2¼ kilowatts—quite enough to do pretty serious damage.

I see, now, why you recommend an output transformer where extension leads are used.

Use either that or a filter circuit, and you are perfectly safe, since the extension leads carry only a small A.C. load, and that only when the set is switched on.

What wiring system do you recommend?

Having arranged your output circuit in one of the ways which we discussed, run a pair of wires from the loud-speaker terminals of the set to each of the rooms in question and fit in each a small wall-plug socket. Connect to the loud-speaker a plug to fit the sockets and the job is done. If I were you, I wouldn't use ordinary twin flex.

Why?

Owing to the fact that the insulated wires are twisted round each other, the capacity between them is quite considerable, and in long leads made of this material it may run to a figure big enough to cause a certain suppression of the higher notes.

What, then, do you recommend?

Good quality bell wire does very well, the two leads being arranged to run not too close together.

# IN MY WIRELESS DEN

## WEEKLY TIPS— CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

### Power Detection and Cost

THOSE who use dry batteries for high tension must be careful not to proceed too far with power detection.

There are two chief reasons, the first being that the fairly heavy current passed by the valve may make the total load upon the battery excessive, and the second reason has to do with the effect of the heavy current upon the coupling transformer.

If, for example, you fit a valve of, say, 10,000 ohms in the detector position and apply a voltage of 120, the current is likely to be of the order of 8 milliamperes. With 75 volts the current will be about 4 milliamperes. Now the performance of a transformer may be perfectly satisfactory when the current passing through the primary winding is 4 milliamperes, but is likely to be poor when the current is twice as great.

Actual burn out is not to be feared, but the inductive value may be reduced by the action of the current to so low a figure that the performance is poor. The nature of the whole amplification-frequency curve may, as a matter of fact, be changed by the excessive anode current.

### A Mains Aerial

The fact that good results are sometimes to be obtained by using the mains as an aerial will, no doubt, be the reason for experiments in this direction being carried out by amateurs.

A fixed condenser, having good insulation for the purpose, is connected between the aerial coil of the set to one side of the mains. When the set is of the mains type, the connection is made between the coil and the input from the mains to the set.

Results are usually much better with the power plug connected in a certain direction, to be found by trial, and the size of the condenser best suited to the circuit should also be decided upon after tests.

Usually the condenser should be one of small capacity, such as .0003 microfarad, or even less. And it must be well insulated. Some small condensers of this capacity might easily break down, for it must be remembered that one side is connected to the mains and the other side to earth through the coil.

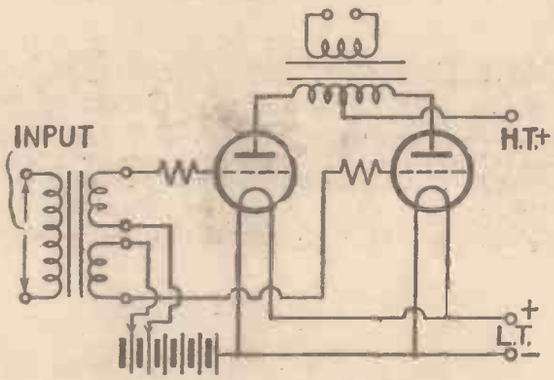
The arrangement of the aerial wire in the set is of some importance. When there are high-frequency stages, not completely shielded, couplings may exist between the aerial wire and the circuits and so cause instability and poor magnification.

### Push-pull and Bias

The practice is growing of arranging that the two valves of a push-pull amplifier shall have separate grid-bias values. The adjustment of the grid bias is becoming of more importance with modern valves, as they have relatively high slopes.

Unless the valves are carefully chosen, the best results will certainly not be obtained with a single bias for the push-pull stage. The bias adjustment should be made to provide equal anode currents through the two valves.

With small valves of the steep-slope type, the effect of slight changes in bias is usually most marked. The result is that poor results will be obtained if the precaution of setting the two values is not taken.




**It is usually advisable to have separate grid bias for each valve of a push-pull combination, and this circuit shows how a split-secondary transformer enables separate bias values to be applied**

The diagram shows a tapped input transformer and how it is connected. First, one valve should be adjusted, using a meter in its anode circuit, and then the other. When this has been effected, the circuit will work normally, provided the valves are not too different in regard to their amplification factors and anode impedances.

### A Handy Meter

One of the most valuable instruments that you can have is a milliammeter having a range of, say, 0—5. Connect meter in the anode circuit of the detector and note how the current changes during tuning.

To begin with, the current may be 3 milliamperes. When a strong signal is brought in the current will decrease, falling, perhaps, to 2 milliamperes. This is a rough indication of signal strength.

With some sets you can tune much more accurately if the meter is used in this way. In sets having band-pass circuits, in particular, the tuning is much simplified and better quality of reproduction should result from accurate tuning.

In ganged sets the meter is very valuable. You can match up the separate circuits easily, the reading of the meter decreasing, showing a stronger signal, of course, as the circuits are brought into tune. Slight differences in the tuning of the separate circuits as connected individually may not produce an audible increase in strength, but when the meter is used the changes are noticeable and the total improvement is a considerable one.

### What Size Reaction?

One sees all kinds of values of reaction condensers used in sets. Sometimes it is .0001 microfarad, or again it is .0005.

Why this great difference in values? There is no real reason, I suppose. The particular detector valve used and the coil to which the reaction is applied are both factors.

By reducing the number of turns in the reaction coil itself, the capacity of the condenser must be increased in order to provide adequate feedback. Personally, I often use the greater value of reaction condenser, as usually the best results are obtained when there is a fair capacity in the anode circuit of a detector.

## "READERS' IDEAS AND QUESTIONS"

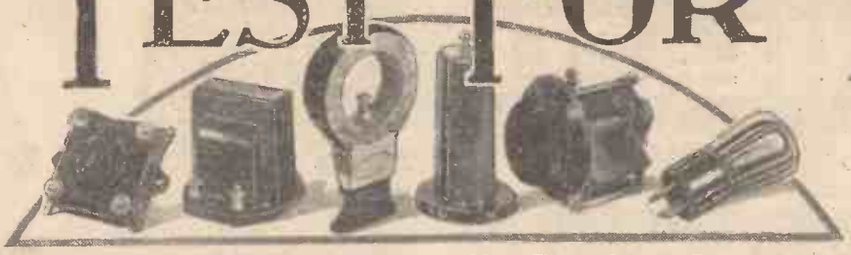
(*Continued from page 238*)

### Transatlantic Telephony

SIR,—A number of evenings recently I have listened on the ultra-short waves and have heard a station working which I have been unable to understand. Speech is heard, but it seems to be mixed up so that it is totally impossible to decipher what is being said. No matter how I try I cannot bring out the speech clearly from the mush which accompanies it. Can you explain what this trouble is and how I can receive the station clearly? I might say I get Rome and several other short-wave stations quite clearly. J. D. (London).

The signals you have been receiving are those of the Transatlantic Telephone Service. These signals are distorted so as to prevent eavesdropping by ordinary amateurs and they cannot be received clearly without special apparatus at the receiving end additional to the ordinary receiving apparatus.—ED.

# WE TEST FOR YOU



*A weekly review of new components and tests of apparatus.*

*Conducted by our Technical Editor: J. H. REYNER, B.Sc., A.M.I.E.E.*

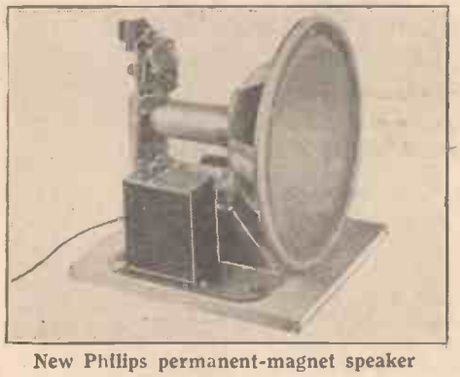
### A New Philips Speaker

FOR some time past Philips receivers have been supplied with permanent moving-coil speakers. This speaker has now been placed on the market as a separate unit. It is of unusual construction in certain of its features.

A relatively small diameter coil is used —2.5 centimetres in diameter, and the coil instead of being very short has an axial length of 1.5 centimetres. This is probably done in order to keep a fairly large proportion of the coil in the powerful magnetic field even on loud passages and thereby to avoid the distortion otherwise obtained when the coil moves out of the gap.

Another useful feature is the use of a soft material for the cone instead of a hard paper. This prevents the shrill resonances which are usually experienced in the upper registers, and renders the speaker very useful for use with pentode valves, which tend to accentuate the high notes owing to the rising impedance of the speaker.

When used with a triode the falling away at the high frequencies was noticeable for the same reason—i.e., the absence of the diaphragm resonances—but the quality was, nevertheless, well balanced. A tone filter is fitted, by which still more of the upper frequencies may be cut off if required in order to avoid heterodyne interference,



New Philips permanent-magnet speaker

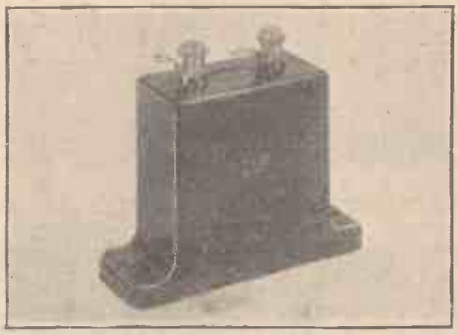
or for use as a scratch filter. We found this very pleasant in action, and not unduly harsh.

The sensitivity was a little below the average, even for a permanent magnet speaker, but where the instrument is supplied with average volume it is capable of giving very pleasing quality.

### Franklin Condensers

WE have received this week some Franklin condensers for examination. These condensers are of the usual construction, the condenser element being housed in a neat brown moulded case. Either screw terminals or soldering tags are available for making connection, and the size of the component is normal.

Two types are made, one tested at 500 volts D.C. and the other at 1,500 volts D.C., the rated working voltage being a little less than half the test voltage in each case. We received one of the 500-volt type, and placed it on test for an hour at 350 volts A.C., which is double the rated working voltage. The insulation after the run was quite satisfactory. A feature which will commend



Franklin fixed condenser

itself to many readers is the price, which ranges from 1s. 6d. for a .1-microfarad condenser up to 5s. for a 4-microfarad.

### Polar Tuning Chart

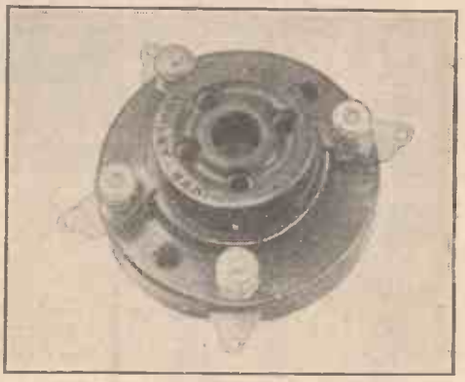
I HAVE just been using one of the Polar tuning charts supplied by Messrs. Wingrove & Rogers. This consists of a strong piece of cardboard measuring 10 ½ in. by 9 ¼-in., on which are drawn out large and small squares marked vertically in wavelengths, and horizontally in condenser degrees. On the left-hand side, the wavelength is marked from 200 to 550 metres, and on the right-hand side 1,500 to 1,750 metres.

All that the user has to do, is to tune in certain known stations, such as the local and the Daventry stations, and mark these on the graph corresponding to his condenser readings and the wavelength of the station. Then join these points up by a smooth curve. The chart is now ready for use. If a station is tuned in at 60 degrees on your dial, you follow the vertical line through 60 up to the curve, when the horizontal line at this point will give the wavelength of this station. Similarly, if it is desired to tune in the station on 400 metres, follow the horizontal line through 400 metres until it meets the curve and then follow this down vertically until it gives the condenser reading. As the charts only cost 2 ½d. each, one can easily recalibrate after any modification has been made, or if the chart gets dirty.



### Ashley Valve Holder

MESSRS. ASHLEY RADIO, LTD., have recently put on the market a new type of valve holder, selling at the

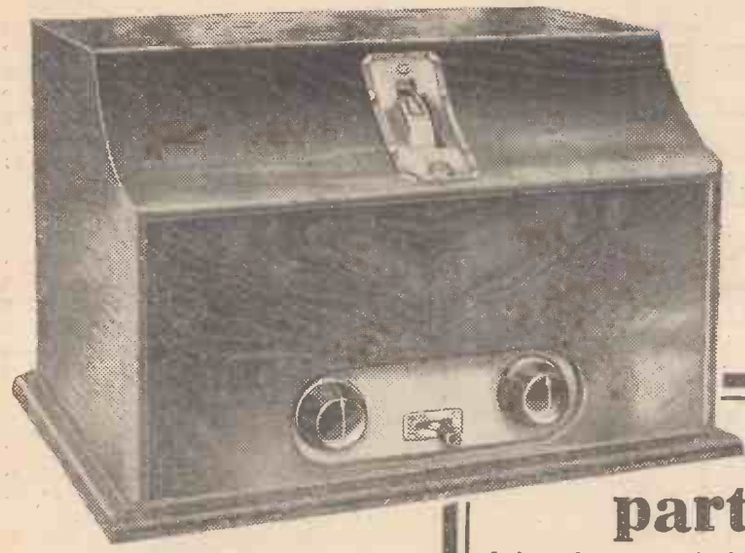


A good valve holder, the Ashley

moderate price of 1s. The holder consists of two bakelite mouldings, one being attached to the other by phosphor-bronze strips, which also form part of the sockets and terminate in soldering tags. Four terminals, clearly marked with the appropriate lettering, are also provided.

Accidental contact with the wrong socket is impossible, owing to the fact that these are sunk well below the surface of the moulding. A circular groove passing through each socket aids in guiding the valve into position, since the pins may be placed in this groove, and the valve rotated until it drops into position. The springing, though stiff, tends to insulate the valve from external vibration, whilst the contact between socket and pins is adequate without being unduly harsh.

This holder may be recommended.



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An instrument of highest efficiency, carefully wound to give correct ratios.
Type B/3, Ratio 3-1, 10/6 each
Type B/5, „ 5-1, 10/6 each

**THE BURTON DIFFERENTIAL CONDENSER.** Price 5/- each

# Built with the same parts as you can buy

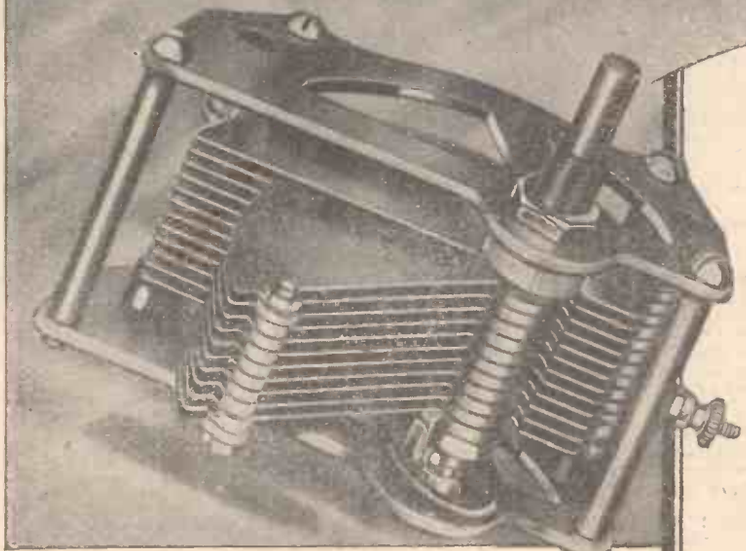
Independent tests of the BURTON SCREEN-GRID THREE referred to in the editorial columns of this journal prove it to be a most efficient and desirable set in every way. If you do not buy a BURTON RECEIVER, build one with BURTON COMPONENTS. *Obtainable from all leading Radio Dealers* **C. F. & H. BURTON, Progress Works, WALSALL**

# BURTON COMPONENTS

## THE BASIS OF BEST RECEPTION

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

# LOTUS CONDENSERS



**Once again Lotus Condensers are chosen!**

In the "Everybody's All-In Two" circuit, a Lotus .0005 Variable Logarithmic Condenser and a Lotus .00034 Reaction Condenser are specified; emphasising once more the efficiency and dependability of these components.

*Obtainable from any Wireless Dealer at the following prices:*

.0005 Variable Logarithmic Condenser (as illustrated) ... **5/9**
(In other capacities from 5/-)

.00034 Reaction Condenser **5/6**
(In other capacities from 4/9)

Ask also for Lotus Differential Condensers from **5/3**. And the Lotus Drum Dial for Ganged Condensers :—

with one .0005 Condenser **15/3**
with two .0005 Condensers **22/-**
with three .0005 Condensers **28/9**

**GARNETT WHITELEY & CO., LTD.**
Lotus Works, Mill Lane, Liverpool.

# RADIOGRAMS

THE Oxford and Cambridge Boat Race will, as usual, be described in a running commentary broadcast on March 21. An eye-witness account of the 'Varsity sports will also be broadcast by Mr. H. M. Abrahams in the National programme on March 7.

Impressions of Dan Leno, Harry Tate, George Formby, Fred Emney, George Lashwood, and Gracie Fields will be heard in a broadcast of *Dick Whittington and his Cat* from the Birmingham studios on February 20.

Syncopated songs will be sung in German by Greta Keller during the vaudeville programme on the National on February 9. Gillie Potter will invent further satire, and Ernest Thesiger and Harold Scott will take part in the broadcast, which also includes a musical scena entitled *The Fountain*.

Formed in 1878 in the tiny village of Hasland, near Chesterfield, the Hasland Silver Band has been conducted for more than thirty years by Mr. H. J. Moseley. This band will broadcast on February 16.

A special programme of Coleridge Taylor's music has been arranged by the Midland Studio Orchestra for February 18.

A programme entitled "The Music of Spain" will be given by the Midland Studio Orchestra on February 17.

A new series of excerpts from operas starts on February 10 with a relay from the Covent Garden Opera Company's performance of *Rigoletto* at Liverpool. This is for listeners to the National. On February 14 part of *Il Trovatore* will be relayed on the Regional.

*The Pursuit of Pleasure*, which is Mr. Lance Sieveking's programme for February 12 and 14, will give listeners the atmosphere of night life during the past two centuries.

Vaudeville for Regional listeners on February 11 and National listeners on February 13 will be provided by Leslie Weston, Wilfred Shine, Florence Marks, and Alexander and Mose.

"Dance and be Merry" is the title of a programme for dances of various countries and peoples to be broadcast by the D'Alton Instrumental Quartet on February 19.

Wolves are roaming in large droves on the Siberian Steppes, attacking villages in their search for food. As it is impossible to mount adequate guards, microphones are being hung in trees on the outskirts of the village. A speaker is mounted at the village guard-post and the microphones pick up sounds of the approach of packs of wolves and warn the villagers.

A German company proposes to establish an international radio advertising station which will broadcast announcements in several languages. The promoters hope to use the new 100-kilowatt transmitter which is to be erected in Luxemburg. One can imagine the station being forced to transmit something more interesting than advertising announcements if it is to be successful!

The Scottish Orchestra, owing to financial straits, is in danger of being disbanded. Listeners have many happy memories of relays of concerts by this organisation, which is the premier orchestra of Scotland. It is suggested, accordingly, that the B.B.C. should do something really worth while in support of the public efforts which are being made to prevent the passing of the orchestra.

A 7-kilowatt short-waver is being erected in Morocco for communicating with France.

The Radio Corporation of America has brought radio music into some of the departments where many women are employed and the work is monotonous. The results are quietened nerves, more concentration, and a greater efficiency. A bank of speakers and a large power amplifier have been installed.

# POWER VALVE COMPARISONS

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

WHEN considering the question of the choice of the right valve to use in the output stage, the first point to be realised clearly is that it is the alternating power with which we are concerned. The valve draws a certain current from the high-tension battery, and there is thus a continual absorption of energy taking place. When we apply a signal to the valve, however, the anode current varies and it is only this alternating component of the power which is capable of producing any audible response from the loud-speaker. The A.C. power is usually only about 20 per cent. of the total power in the circuit, so that the anode current taken by a valve is no guide to its power output.

### Estimating Power Output

A reasonably exact determination of the power output likely to be obtained from a valve under given conditions is best obtained graphically. One can obtain a reasonably close estimate of the power output to be obtained by quite simple calculation. After all, what is the power output from the valve. Simply the alternating anode current multiplied by the alternating anode voltage.

It is more convenient to use the expression in a slightly modified form. The anode current is, of course, the anode voltage divided by the resistance. (Throughout these calculations the terms anode current and anode voltage refer to the alternating voltages and currents, and not to steady values). Thus, we can write down the following expression:

$$\text{Power} = \frac{(\text{Anode voltage})^2}{\text{Resistance}}$$

But anode voltage = mEg, where Eg is the grid voltage, and the resistance is the sum of the internal and external resistances. Hence

$$\text{Power} = \frac{m^2 Eg^2}{R + r}$$

This gives us the total power in the circuit; we are only interested in that proportion of the power which is developed in the external circuit, i.e., in the loud-speaker. This is obtained by multiplying the expression by the ratio of the external resistance to the total resistance. It is sometimes more convenient, however, to assume a definite relationship between R and r. For example, it is often stated that for best results the speaker impedance should be quite twice the internal valve resistance, and this is true in a large number of cases. Therefore, let us assume that the loud-speaker impedance is n times the valve resistance. We can then substitute this in the previous expression and determine exactly the proportion of power obtained in the loud-speaker itself.

Before doing this, however, it is desirable to make one more modification. The value of the voltage quoted is the R.M.S. or effective value, but it is more useful to determine the power in terms of the maximum or peak voltage which is practically equivalent to the grid-bias voltage on the valve. The 2 introduced in the denominator of the expression below allows for this factor. Hence we can write:

$$\text{Power output} = \frac{m^2 E^2 g}{2r} \cdot \frac{n}{(n+1)^2} \text{ watts,}$$

where r = valve resistance
m = amplification factor
Eg = grid bias
n = ratio of speaker impedance to valve resistance

Now this is a fundamental simple expression for the power output and it may be applied with a reasonable accuracy to any valve we choose. The results will be satisfactory provided that our knowledge of the amplification factor, internal resistance, etc., is sufficiently representative of working conditions. Let us take, for example, a P240 valve, for which m = 4 and r = 2,500. The grid bias at 150 volts is 24, and we are left with the necessity for assuming some suitable value for the external impedance. Now, as a general rule, a valve with a medium or fairly high amplification factor, we may assume the best speaker impedance to be twice the valve resistance, so that n = 2. With valves having a low impedance, and correspondingly low amplification factor (more particularly where large voltages are used on the anode), this value should be increased somewhat and the figure of 3 is safer. In the present instance we will take n = 2; when substituting the above expression we get an output of 400 milliwatts.

### Simple Comparisons

The calculation, therefore, is one of considerable simplicity and it is useful to be able to check up roughly the power output of different valves in order to make some comparison between their performance. For example, two valves have recently been introduced by one of the manufacturers, one of which is rated as a power valve, and the other as a super-power valve. The power valve has a better mutual conductance. Why should it be inferior to the super-power valve? Let us examine the case. The figures are:

| | m | r | Grid Bias | Mutual Conductance |
|---|---|---|---|---|
| Power valve | 15 | 3900 | 4½ to 6 | 3.85 |
| Super-power valve | 7.5 | 2100 | 10½ | 3.5 |

For purposes of comparison we will assume that the internal impedance is twice the valve impedance, so that n = 2. Evaluating the expression for power output, we find that the results are as follows. With the first valve the grid bias is rated at 4½ to 6. Let us assume that the maximum grid swing is the mean of these two, i.e., 5¼ volts. On this assumption, power output is

$$\frac{15^2 \times 5.25^2}{2 \times 3900} \times 0.22 = 175 \text{ milliwatts.}$$

In the case of the super-power valve the expression is

$$\frac{7.5^2 \times 10.5^2}{2 \times 2100} \times 0.22 = 315 \text{ milliwatts.}$$

(Continued on page 248)

Abstract of a Lecture delivered to the G.E.C Telephone Society.

## POWER VALVE COMPARISONS

(*Continued from page 246*)

It will be observed that the numerators are the same in both cases. The power valve has twice the amplification factor, but half the grid swing of the super-power valve, so that the two effects cancel out, and we actually obtain the same anode swing. In the case of the super-power valve, however, the lower m value has been accompanied by a reduction in the internal resistance, and this enables us to obtain nearly double the power output.

These examples will serve to illustrate how the capabilities of a valve for handling power can be estimated quickly. As I have previously pointed out, a graphical method is the only really reliable one.

### Valves in Parallel

Sometimes when we want to obtain more power output from a set we connect two valves in parallel in the output stage. This will give us a certain increase in power output because we are obviously getting twice the variation of anode current that we were before. If these circuit conditions are left the same, however, we shall not avail ourselves of twice the amount of power externally. Let us assume that originally the speaker was correctly matched to the valve, so that n = 2. If we now place another valve in parallel, and leave the transformer ratio the same, n becomes 4, and this means that the final factors in the expression for power output, instead of being .22 falls to .16. Consequently, instead of getting twice the power output we only get 1.45 the previous output. In order to make the best possible use of the two valves in parallel, the output transformer ratio must be altered to readjust n to the new conditions.

It will thus be clear that in order to obtain the best result from a valve, the impedance of the speaker must be correctly matched. Since one uses a variety of different types of valve in the last stage this means a variety of different loud-speaker impedances, which would be quite impracticable if we had to alter the loud-speaker itself. Certain loud-speakers are provided with tappings, enabling the best winding impedance to be chosen, but the more usual method is to employ an output transformer which has several ratios. By a choice of the correct ratio the effective impedance of the anode circuit may be adjusted to correspond approximately with the optimum low value previously discussed.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Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4.

# Postcard Radio Literature

### A Portable Super-het.

A FINE portable set employing a super-het. circuit is the "Metropolis" five-valver. This sells at the extraordinarily low figure of 24 guineas, including all royalties, and as it employs two screen-grid stages and a pentode, it has exceptional range and amplification. I recommend everyone in search of a good portable to write through my catalogue service for full details of the "Metropolis." **173**

### The Stenode Radiostat

Interest centres largely on the Stenode at the moment. If you are keen to try this set and have not the necessary facilities to make one up yourself, then why not get in touch, through my free catalogue service, with Electric Reproducers, Ltd., who make standard models of the Stenode Radiostat for batteries or mains operation. The sets work off a small frame aerial and have single dial tuning. **174**

### Colvern Coils

Colvern coils are used in the "1931 Ether Searcher," and it is true to say that they were chosen because they have so many features which recommend them. If you want to improve the performance of your old set by fitting new coils then write to me for the new Colvern booklet giving particulars of the whole range of coils. **175**

### New Mullard Valves

If you are a keen valve user you will doubtless have lists of valve details which you like to keep up to date. If so then obtain from the Mullard Wireless Service Co., Ltd., the latest leaflets which have just been issued to replace some old ones in the Mullard loose-leaf catalogue. **176**

### Exide H.T. Batteries

Exide are now making dry H.T. batteries which are appropriately named Drydex. The experience that Exide have in accumulator construction should help them in the production of these new batteries They are obtainable in standard double and triple capacities, while portable set H.T. batteries and grid-bias batteries are also available. Get particulars of all of them by dropping a post card for the new Dubilier leaflet.

OBSERVER. **177**

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# BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

| Metres | Kilo-cycles | Station and Call Sign | Power (Kw.) |
|---|---|---|---|
| **GREAT BRITAIN** | | | |
| 25.53 | 11,751 | Chelmsford (GSSW) | 15.0 |
| 200 | 1,500 | Leeds | 0.16 |
| 242 | 1,238 | Belfast | 1.2 |
| 261.3 | 1,148 | London Nat. | 68.0 |
| 288.5 | 1,040 | Newcastle | 1.2 |
| 288.5 | 1,040 | Swansea | 0.16 |
| 288.5 | 1,040 | Stoke-on-Trent | 0.16 |
| 288.5 | 1,040 | Sheffield | 0.16 |
| 288.5 | 1,040 | Plymouth | 0.16 |
| 288.5 | 1,040 | Liverpool | 0.16 |
| 288.5 | 1,040 | Hull | 0.16 |
| 288.5 | 1,040 | Edinburgh | 0.4 |
| 288.5 | 1,040 | Dundee | 0.16 |
| 288.5 | 1,040 | Bournemouth | 1.2 |
| 288.5 | 1,040 | Bradford | 0.16 |
| 301 | 995 | Aberdeen | 1.2 |
| 309.9 | 968 | Cardiff | 1.2 |
| 356.3 | 842 | London Reg. | 45.0 |
| 376.4 | 797 | Manchester | 1.2 |
| 398.9 | 752 | Glasgow | 1.2 |
| 479.2 | 626 | Midland Reg. | 38.0 |
| 1,554.4 | 193 | Daventry (Nat.) | 35.0 |
| **AUSTRIA** | | | |
| 218.5 | 1,372 | Salzburg | 0.6 |
| 246 | 1,220 | Linz | 0.6 |
| 284.7 | 1,053.6 | Innsbruck | 0.6 |
| 351.7 | 853 | Graz | 9.5 |
| 453 | 666 | Klagenfurt | 0.6 |
| 517 | 581 | Vienna | 20.0 |
| **BELGIUM** | | | |
| 206 | 1,456 | Verviers | 0.3 |
| 206 | 1,456 | Antwerp | 0.4 |
| 216 | 1,391 | Chatelineau | 0.25 |
| 243 | 1,235 | Courtrai | 0.1 |
| 244.7 | 1,226 | Ghent | 0.25 |
| 249.6 | 1,202 | Schaerbeck | 0.5 |
| 338.2 | 887 | Velthem (Louvain) | 12.0 |
| 509 | 590 | Brussels (No. 1) | 20.0 |
| **BULGARIA** | | | |
| 319 | 941 | Sofia (Rodno Radio) | 1.0 |
| **CZECHO-SLOVAKIA** | | | |
| 263 | 1,139 | Moravska-Ostrava | 11.0 |
| 279 | 1,076 | Bratislava | 14.0 |
| 293.6 | 1,022 | Kosice | 2.5 |
| 342 | 878 | Brunn (Brno) | 3.0 |
| 487 | 617 | Prague (Praha) | 5.5 |
| **DENMARK** | | | |
| 281 | 1,067 | Copenhagen | 1.0 |
| 1,153 | 260 | Kalundborg | 10.0 |
| **ESTONIA** | | | |
| 401 | 748 | Reval (Tallinn) | 0.7 |
| 463 | 648 | Tartu | 0.5 |
| **FINLAND** | | | |
| 221 | 1,355 | Helsinki | 15.0 |
| 291 | 1,031 | Viipuri | 15.0 |
| 1,796 | 167 | Lahti | 54.0 |
| **FRANCE** | | | |
| 172.5 | 1,730 | St. Quentin | 0.3 |
| 222.9 | 1,346 | Fécamp | 1.0 |
| 235.1 | 1,275 | Nimes | 1.0 |
| 237.2 | 1,263 | Bordeaux-Sud-Ouest | 2.0 |
| 240.6 | 1,247 | Béziers | 0.6 |
| 249 | 1,205 | Juan-les-Pins | 0.5 |
| 256 | 1,171 | Toulouse (PTT) | 1.0 |
| 265 | 1,130 | Lille (PTT) | 15.0 |
| 272 | 1,103 | Rennes | 1.2 |
| 285.7 | 1,053.6 | Radio Lyons | 0.5 |
| 286 | 1,049 | Montpellier | 2.0 |
| 294.6 | 1,018 | Limoges (PTT) | 0.5 |
| 304 | 988 | Bordeaux (PTT) | 35.0 |
| 315 | 952 | Natan-Vitus (Paris) | 0.5 |
| 317.3 | 945.4 | Marseilles (PTT) | 1.5 |
| 328.2 | 914 | Grenoble (PTT) | 3.0 |
| 329.5 | 910.3 | Poste Parisien | 1.2 |
| 345.2 | 869 | Strasbourg (PTT) | 12.0 |
| 370 | 810.5 | Radio LL (Paris) | 0.5 |
| 385 | 779 | Radio Toulouse | 15.0 |
| 447 | 671 | Paris (PTT) | 2.0 |
| 466 | 644 | Lyons (PTT) | 2.3 |
| 1,445.7 | 207.5 | Riffel Tower | 15.0 |
| 1,725 | 174 | Radio Paris | 17.0 |
| **GERMANY** | | | |
| 31.38 | 9,560 | Zeesen | 15.0 |
| 216.3 | 1,387 | Königsberg | 1.7 |
| 219 | 1,369.7 | Flensburg | 0.6 |
| 227 | 1,319 | Cologne | 1.7 |
| 227 | 1,319 | Münster | 0.6 |
| 227 | 1,319 | Aachen | 0.3 |
| 232.2 | 1,292 | Kiel | 0.31 |
| 239 | 1,256 | Nürnberg | 2.3 |
| 246.4 | 1,217.2 | Cassel | 0.3 |
| 253.4 | 1,184 | Gleiwitz | 5.6 |
| 259.3 | 1,157 | Leipzig | 2.3 |
| 269.8 | 1,113 | Bremen | 0.3 |
| 276.5 | 1,085 | Heilsberg | 75.0 |
| 283.6 | 1,058 | Magdeburg | 0.6 |
| 283.6 | 1,058 | Berlin (E) | 0.6 |
| 283.6 | 1,058 | Stettin | 0.6 |
| 318.8 | 941 | Dresden | 0.3 |
| 325 | 923 | Breslau | 1.7 |
| 360 | 833 | Mühlacker | 75.0 |
| 372 | 806 | Hamburg | 1.7 |
| 390 | 770 | Frankfurt | 1.7 |
| 418 | 716 | Berlin | 1.7 |
| 452.1 | 662 | Danzig | 0.2 |
| 473 | 635 | Langenberg | 17.0 |
| 533 | 563 | Munich | 1.7 |
| 559.7 | 536 | Kaiserslautern | 1.0 |
| 559.7 | 536 | Augsburg | 0.3 |
| 566 | 530 | Hanover | 0.3 |
| 570 | 527 | Freiburg | 0.35 |
| 1,635 | 183.5 | Zeesen | 35.0 |
| 1,635 | 183.5 | Norddeich | 10.0 |
| **HOLLAND** | | | |
| 31.28 | 9,599 | Eindhoven (PCJ) | 30.0 |
| 299 | 1,004 | Huizen | 8.5 |
| 299 | 1,004 | Radio Idzerda (The Hague) | 0.6 |
| 1,071 | 280 | Scheveningen-Haven | 5.0 |
| 1,875 | 160 | Hilversum | 8.5 |
| **HUNGARY** | | | |
| 550 | 545 | Budapest | 23.0 |
| **ICELAND** | | | |
| 1,200 | 250 | Reykjavik | 16.0 |
| **IRISH FREE STATE** | | | |
| 224.5 | 1,337 | Cork (1FS) | 1.5 |
| 413 | 725 | Dublin (2RN) | 1.5 |
| **ITALY** | | | |
| 25.4 and 80 | | Rome (3RO) | 9.0 |
| 206.1 | 1,013 | Turin (Torino) | 8.5 |
| 313.2 | 958 | Genoa (Genova) | 1.5 |
| 332 | 905 | Naples (Napoli) | 1.7 |
| 441 | 680 | Rome (Roma) | 75.0 |
| 453 | 662 | Bolzano (IBZ) | 0.2 |
| 501 | 599 | Milan (Milano) | 8.5 |
| **LATVIA** | | | |
| 525 | 572 | Riga | 12.0 |
| **LITHUANIA** | | | |
| 1,935 | 155 | Kaunas | 7.0 |
| **NORTH AFRICA** | | | |
| 363.4 | 825.3 | (Algiers (PTT) | 13.0 |
| 416 | 721 | Radio Maroc (Rabat) | 10.0 |
| 1,250 | 240 | Tunis Kasbah | 0.6 |
| **NORWAY** | | | |
| 235.5 | 1,275 | Kristianssand | 0.5 |
| 241 | 1,244.5 | Stavanger | 0.5 |
| 364 | 824 | Bergen | 1.0 |
| 367.1 | 817.1 | Frederiksstad | 0.7 |
| 453.2 | 662 | Porsgrund | 1.5 |
| 494.2 | 607 | Nidaros | 1.2 |
| 584.7 | 513.2 | Hamar | 0.8 |
| 1,077 | 278.5 | Oslo | 75.0 |
| **POLAND** | | | |
| 234 | 1,283 | Lodz | 2.2 |
| 244 | 1,229 | Cracow | 1.5 |
| 312.8 | 959 | Wilno | 0.5 |
| 338.1 | 887.1 | Poznan | 1.9 |
| 381 | 788 | Lvov | 2.2 |
| 409.8 | 732 | Katowice | 16.0 |
| 1,411 | 212.5 | Warsaw | 14.0 |
| **PORTUGAL** | | | |
| 240 | 1,250 | Oporto (Teatro Apollo) | 0.25 |
| 320 | 937.6 | Lisbon (CTIAA) | 0.25 |
| **ROMANIA** | | | |
| 394 | 761 | Bucharest | 16.0 |
| **RUSSIA** | | | |
| 427 | 702 | Kharkov | 4.0 |
| 720 | 416.6 | Moscow (PTT) | 20.0 |
| 800 | 375 | Kiev | 20.0 |
| 824 | 364 | Sverdlovsk | 25.0 |
| 870 | 344.8 | Tiflis | 15.0 |
| 937.5 | 320 | Kharkov (RV20) | 25.0 |
| 1,000 | 300 | Leningrad | 20.0 |
| 1,103 | 272 | Moscow Popoff | 40.0 |
| 1,200 | 250 | Kharkov (RV4) | 25.0 |
| 1,304 | 230 | Moscow (Trades' Unions) | 165.0 |
| 1,380 | 217.5 | Bakou | 10.0 |
| 1,481 | 202.5 | Moscow (Kom) | 20.0 |
| **SPAIN** | | | |
| 251 | 1,193 | Barcelona (EAJ15) | 1.0 |
| 268.7 | 1,116 | Barcelona (EAJ13) | 10.0 |
| 349 | 860 | Barcelona (EAJ1) | 8.0 |
| 368 | 815 | Seville (EAJ5) | 1.5 |
| 425.7 | 704.7 | Madrid (EAJ7) | 2.0 |
| 453 | 662.2 | San Sebastian (EAJ8) | 0.5 |
| **SWEDEN** | | | |
| 230.6 | 1,301 | Malmo | 0.75 |
| 257 | 1,166 | Hörby | 15.0 |
| 302 | 990 | Falun | 0.65 |
| 322 | 932 | Göteborg | 15.0 |
| 436 | 689 | Stockholm | 75.0 |
| 542 | 554 | Sundsvall | 15.0 |
| 770 | 389 | Ostersund | 0.75 |
| 1,242 | 241.5 | Boden | 0.75 |
| 1,348 | 222.5 | Motala | 40.0 |
| **SWITZERLAND** | | | |
| 244 | 1,229 | Basle | 0.5 |
| 403 | 743 | Berne | 1.1 |
| 459 | 653 | Zurich | 0.75 |
| 678.7 | 454.6 | Lausanne | 0.6 |
| 760 | 395 | Geneva | 1.5 |
| **TURKEY** | | | |
| 1,223 | 244.3 | Istanbul | 5.0 |
| 1,542 | 194.5 | Ankara | 7.0 |
| **YUGOSLAVIA** | | | |
| 306 | 980.4 | Zagreb (Agram) | 0.7 |
| 430.5 | 696.8 | Belgrade | 3.0 |
| 574.7 | 522 | Ljubljana | 2.8 |

## A RADIO DANGER

THERMIONIC valves are usually finished off in an induction "furnace," which is simply the space inside a coil carrying a high-frequency current. As soon as the valve is placed in position, the metal electrodes are raised to a white heat by the inductive action of the H.F. current, acting across the intervening space. Even at some distance away, the inductive action of radio-frequency energy can be quite pronounced, and more than one case is on record of destructive fires being caused in this way. The United States Government have, in fact, recently prohibited the erection of short-wave wireless transmitters near to any aircraft-fuelling depot, on the ground that there is serious risk of explosion when petrol is stored in the vicinity.

M. B.

## *When Submitting Queries . . . . . .*

Please write concisely, giving essential particulars. A **Fee of One Shilling** (postal order), a stamped addressed envelope, and the coupon on the last page must accompany all letters. The following points should be noted.

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One Control One .. .. .. .. .. AW267
Hartley Single-valver .. .. .. .. WM198

### TWO-VALVE SETS (1s. each)

Talisman Two (D, Trans) .. .. .. AW194
No-battery A.C. Mains Two (D, Trans) .. AW230
No-battery Gramo-radio 2 (D, Trans) .. .. AW238
1930 Talisman 2 (D, Trans) .. .. .. AW239
Searcher Two (D, Trans) .. .. .. AW245
Arrow Two (D, Trans) .. .. .. .. AW249
Forty-five-shilling Two (D, Trans) .. .. AW250
Searcher Short-wave 2 (D, Trans) .. .. AW259
Challenge Two (D, Trans) .. .. .. AW261
Loftin-White Two (A.C. Mains) .. .. AW263
Everybody's All-in 2 (D, Trans) .. .. .. AW273
Brookman's Two (D, Trans) .. .. .. WM168
Gleaner Two (D, Trans) .. .. .. WM201
Music Monitor (D, Trans) .. .. .. WM208
Merlin Two (A.C. Set) .. .. .. .. WM213
Five-Point Two (D, Trans) .. .. .. WM220
Brookman's A.C. Two (D, Trans) .. .. WM225

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Beginner's Regional Three (D, 2LF) .. .. AW233
Britain's Favourite Three 1930 (D, 2 Trans) .. AW243
The "A.W." Exhibition 3 .. .. .. AW247
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1931 Ether Searcher (SG, D, Trans) .. .. AW271
Brookman's Three (SG, D, Trans) .. .. WM161
Brookman's Push-Pull Three (SG, D, Trans) 1/6 WM170
Inceptordyne (SG, D, Pentode) .. .. WM179
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Falcon Three (A.C. Set) .. .. .. .. WM217
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Lodestone Four (HF, D, RC, Trans) .. .. WM193
Searcher's Four (SG, D, RC, Trans) .. .. WM194
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Regional Band-pass Four (SG, D, RC, Trans) WM211
Five-Point Four (SG, D, RC, Trans) .. .. WM216
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Supertone Four (SG, D, Push-pull) .. .. WM227

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Regional A.C. Five (3SG, D, Trans) .. .. WM224

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Falcon A.C. Unit .. .. .. .. .. WM219
Hyperdyne Short-wave Adaptor .. .. .. WM228

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of any of these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine."

**Amateur Wireless Blueprints Dept.,** 58-61 Fetter Lane, London, E.C.4.





### OUR BLUEPRINT SERVICE

**Constructors of receivers described in this Journal should make full use of our Blueprint Service and avoid all risk of failure.**

## CHEAPER MAINS WORKING

MOST amateurs realise that with practically every set greater economy is obtained by working with the mains than by the use of batteries or H.T. accumulators. Lucky is the man with either A.C. or D.C. mains, for the initial outlay for his eliminator is practically the last expense he has to incur for H.T. power; the mains current consumption is negligible. Now comes news of a reduction in the prices of many Regentone mains units and also of the introduction of a number of new low-priced units. Among the newcomers is a new type of portable set unit incorporating a trickle charger; this sells at £4 15s. This is somewhat similar to the existing type W5, which sells at £5 17s. 6d., but the new model has no variable tapping. A D.C. unit of a similar type, also with a trickle charger, is now available at £2 12s. 6d. A good eliminator which gives 18 milliamperes at 120 volts is the type W1D, the price of which is only £3 7s. 6d. Further particulars can be obtained from the Regent Radio Co., of 21 Bartlett's Buildings, Holborn, E.C.4.

**New Franklin Premises.** — Recent expansion of business has necessitated larger and more central premises for Messrs. Franklin Electric, Ltd., and these have now been acquired at 109 Kingsway, W.C.2 (Telephone, Holborn 1080).

**"Ether Searcher" Prices.**—It should be noted that in the Peto-Scott announcement on page 182 of "A.W." No. 451, regarding prices for kits of parts for the "Ether Searcher," the price of Kit A is £5 14s. 6d. (C.O.D.) or on hire-purchase terms, 10s. 6d. deposit with eleven monthly payments of 10s. 6d., and not 10s. 11d., as stated.

**C.A.V. Accumulators.**—"Ether Searcher" owners should note that the 2AG11 accumulator recommended for the set in the C.A.V. announcement on page 163 of No. 450 is actually of 60 amp.-hour capacity, and not 48 amp.-hour, as stated.



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