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Vol. XVIII. No. 450 Saturday, January 24, 1931

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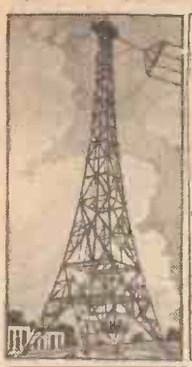

# Amateur Wireless and Radiovision

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## NEWS · & · GOSSIP · OF THE · WEEK

### THIS WEEK

WHAT do you think of the "1931 Ether Searcher"? Frankly, the Technical Staff is amazingly enthusiastic about it, and already many congratulatory messages have been received from readers and from prominent members of the wireless trade. There is no doubt about the fact that the new "Searcher" is a winner. It cannot fail to get good results, and with the aid of the full-size plans given last week you cannot fail to make a simple job of the construction. This week we are giving a large pictorial layout, which is a further aid to construction.

### FOR CONSTRUCTORS

THE giving of this large pictorial plan with every copy of this week's issue marks a new idea in presentation. Often when you have been making up a set you have longed for the assistance of an expert friend who, standing at your side, can point out possible pitfalls in construction. In this pictorial layout you have the "expert friend." You will find it following page 146 of this issue and it is a simple matter to remove it entire.

### AT NUMBER TEN

THERE was a good concert the other night at Number Ten Studio, when John Barbicolli and Cyril Scott were present. So much use is now made of this huge room that one wonders how the B.B.C. managed to do its big orchestral broadcasts before the wharf was thought of. It was interesting to see that Cyril Scott—who ought to know something of tone values and intensities—put his hands to his ears while the *Coq d'Or* music was very loud, whereas most of the audience seemed to like the huge volume of sound. If a broadcast is too loud for the human ear, isn't it too loud for the microphone?

### FOR DICKENS LOVERS

THE B.B.C. seems to be going in for Dickens rather a lot now; we recently had the "Dickens Fantasy," and now comes news that Sir Arthur Quiller-Couch's speech at the Dickens Fellowship Dinner on February 7 will be relayed in the National programme. He is a fine speaker, and this is an item well worth noting.

### PRINCIPAL CONTENTS



### NOT IN THE EAST!

**Radio for Arabia. The King of Hedjaz and Nejd, in Arabia, is buying fifteen transmitters to link up his joint kingdoms, and here, at the Marconi Schools at Chelmsford, are four of his subjects making a study of the beam feeder wires**

### A BROADCASTER IN MECCA!

THE KING OF HEDJAZ AND NEJD has just bought fifteen broadcasting stations! These will provide Arabia with a complete system of communication. Within the next eighteen months every important centre in the joint kingdoms will be linked up by radio. In addition to the fixed stations which will be erected in the towns, four Marconi sets fitted in lorries are to be supplied as general mobile telegraph stations, and to enable the King to keep in constant touch with his two capitals, Mecca and Riyadh, during his many journeys into the desert.

### FORBIDDEN!

IN Mecca a six-kilowatter is being rigged up, and a modern receiver will be installed within the sacred precincts; and as persons who are not of the Mahommedan faith are forbidden to enter the Holy City, a Mahommedan engineer has been specially trained and has installed the transmitting and receiving equipment in Mecca.

### VAUDEVILLE

IS there a dearth of vaudeville? The programmes seem to belie any such suggestion. The next vaudeville programme for National listeners comes on January 23, when Tommy Handley makes his reappearance before the microphone. Gillie Potter will "continue to tell the truth," this time about the U.S.A. Mabel Constanduros and Michael Hogan are also in the programme, with Jack Payne and his B.B.C. Dance Orchestra, who will give comedy numbers; Joan and Nancy Allen-Brown; Edgar Fairchild and Robert Lindholm; and the Bayan Singers, who

DON'T MISS THE SPECIAL ANNOUNCEMENT ON PAGE 148

# NEWS & GOSSIP OF THE WEEK—*Continued*

will sing Russian folk-songs. Vaudeville enthusiasts agree that we cannot have too much Handley, Potter, and Payne.

### THOSE RADIO PLAYS

THE U.I.R., at Geneva, says that more than 600 radio plays have been broadcast by the various organisations which are members of the Union during the past year. Of the 1,500 plays broadcast between March, 1929, and September, 1930, about one-third were written specially for the microphone, and a number have been translated for broadcasting in countries other than those in which they were originally produced. Anyway, the B.B.C. has been doing its full share in radio-play production, as most listeners know.

### OUTSTANDING FIXTURES

FOOTBALL fans should note the following dates. On January 31 The Arsenal versus Birmingham, second half, will be broadcast. On February 7 a Rugby International, Wales versus Scotland, will be broadcast from 2.50 to 4.30. On February 14, England versus Ireland will be heard from 2.50 to 4.30, from Twickenham. On March 14 the F.A. semi-final will be broadcast, and on April 25 the F.A. Final including community singing.

### ARE TALKS ENTERTAINMENT?

THIS is a question that the B.B.C. is reluctant to answer, especially as several of the group listening leaders who attended the recent talks conference voted in favour of talks at 8 p.m. in the evening. Feeling at Savoy Hill is against any further encroachment by educational specialists upon the recognised entertainment periods of broadcasting. Fears that the London alternative-programme transmitters are to be used to alternate education with entertainment should be allayed by the B.B.C.'s emphatic denial that 8 p.m. talks are to become general.

### "BOTTLED BROADCASTS"

B.B.C. engineers are at present experimenting with a metal tape recording machine invented by Dr. Stille. It is thought that the recorder may prove useful during B.B.C. rehearsals and for replaying in the evening outstanding events that have occurred during the day. We understand that the system has certain inherent technical limitations, but that B.B.C. engineers are quite hopeful of putting it to the uses suggested. At present the frequency range is somewhat restricted and background noise is a little pronounced.

### FEWER OSCILLATORS

IN analysing its technical correspondence for the year, the B.B.C. notes a marked decline in complaints referring to interference caused by neighbouring oscillations. It is suggested that the increased power of the London transmitters has helped to bring about this improvement, since there is no need now to push the reaction control to the limit. Considerable correspondence is still received about electrical interference. Service lifts, refrigerators, and trams are among the sources of electrical interference to wireless sets. It is thought that, apart from such measures as individual listeners may be able to undertake to overcome this form of interference, public opinion is enforcing an improvement. For example, listeners are inquiring before taking a flat whether there is any interference, and if so they are rejecting the accommodation!

### CUTTING THE CACKLE

THE well-known Los Angeles broadcasting station KFI has decided to limit advertising announcements to seventy-five words. "Brevity is not the only requirement," states Carl Haverlin, sales manager of KFI, "for announcements have to be truthful and must be backed by solid commercial responsibility." This station hopes that others will follow its example, to meet the growing public dissatisfaction with the excessive broadcast advertising now practised.


**A light-controlled boat. By means of photo-cells and L.F. amplifiers this boat has actually been controlled, and the gun fired, at a distance of several thousand yards**

### ANOTHER EXPEDITION

THE British Arctic Air Route Expedition, which has gone into the Arctic regions of Greenland, surveying air routes, has taken two short-wave sets. These are in direct communication with this country. They will be in continual use throughout the whole of the Expedition, which will last approximately twelve months. It is interesting to note that these sets are ordinary commercial three-valvers having a "straight" circuit as used by many amateur short-wave listeners.

## FOR "ETHER SEARCHER" BUILDERS

**Last week we gave free full-size wiring plans and constructional charts of the "1931 Ether Searcher," and a new style of presentation was adopted, the prints not being loose, but bound in the issue. This week another gift is being made which will appeal to all amateurs interested in this new set. This is a large-scale pictorial lay-out of the receiver, giving many valuable constructional hints and pointers. With the full-size prints and with this pictorial diagram you simply can't go wrong in making up the set. Turn to this week's pictorial lay-out, and also see the further information given on pages 150-152 about the "Ether Searcher."**

### THE NEXT REGIONAL

NO attempt is to be made, says the B.B.C., to rush work on the new Scottish Regional station. Work on the station at Falkirk will probably be postponed until Moorside has been thoroughly tested. The intention is that the two stations should be very similar, both in design and administration. An emergency studio will be located at Falkirk in case of breakdowns, but most of the programmes will be relayed from various centres by land-line.

### SOME FIGURES!

WE have every reason to be proud of our own radio industry, but the facts and figures are naturally not so big as those of some other countries, America, for instance. Over 3,000,000 sets are produced in the States each year, it is estimated. Steel, in strips and bars, is the metal most widely used by the American industry, some 110,000 tons being consumed, more than 1,600 of it in the form of screws, nuts and washers. Copper is next in importance, the consumption being estimated at 12,000 tons. Four thousand tons of aluminium, 1,800 tons of pure tin, 1,500 tons of nickel and its alloys, and 1,200 tons of zinc also enter into the manufacture of sets, speakers and valves.

### MORE LISTENERS

IN conversation, an official of the Post Office gave 3,587,304, subject to confirmation, as the total number of radio licences up to December 31, 1930. This includes 194,640 free licences issued to blind persons. It seems that we have not yet reached saturation point by a long way.

### FOREIGN O.B.'S

IF one can judge by outside broadcasts put out by some foreign stations, it seems that O.B.'s emanating from the B.B.C. savour just a little too much of preparation. Recently in a broadcast of bells and a choir from a Viennese church through Vienna, it was noticeable that a background of extraneous traffic noises enabled the broadcast to sound vivid and true. Why not a little B.B.C. background, sometimes?

Having a good set is one thing, but getting the best results from it is quite a different matter. There are probably many listeners who fail to get proper reproduction

and a large number of foreign stations simply because they do not fully understand the working of the controls. Here are some helpful suggestions by KENNETH ULLYETT

# MAKING THE MOST OF THE TUNING CONTROLS

"YES, I can get thirty stations on the speaker," says one listener.

"I find that I can only get fifteen, even when conditions are good," says another.

"It seems to me that this foreign-station business is a fisherman's yarn," says a third, plaintively. "When I turn the dials I hear plenty of squeaks, but the only *stations* I can get are 5XX and the National and Regional."

Between the first two listeners there is a difference only in kind, for one obviously has a better set than the other; but between the first two listeners and the unlucky man who has never heard Paris or Berlin on his speaker, there is a world of difference. Assuming that he has a set of only reasonable ability, his inability to pick up foreign stations shows that he cannot make the most of his tuning controls.

So far as controls are concerned, there are really only three types of set. There is the set with a reaction knob and only one tuning knob controlling one circuit—a plain two-valver or detector-and-2 L.F. set, for example. There is the set with one H.F. stage having, in all, a control for the H.F. valve, a control for the detector and, of course, a reaction knob. Then there is the ganged-tuning set which has a reaction knob and only one tuning control, but this knob simultaneously tunes two, or perhaps three, circuits.

Take the first of these sets, the outfit with only one tuning control. If this works satisfactorily on the local stations and brings in a choice of two and 5XX, then obviously it should be able to bring in Radio Paris and perhaps Königswusterhausen or one of the Russian stations on the long waves and at least three or four foreigners on the medium waveband.

Here is a bias battery inserted in the grid circuit of the high-frequency valve. This improves the H.F. control

### Sharpening the Tuning

If you find that on the medium waveband the National and Regional stations spread all round the dial so that there is no space left for foreign stations, then adopt one of the many ways to selectivity—a pre-set condenser in the aerial lead, perhaps, or a bandpass tuner or a wavetrap.

If there is no trace of interference and if you can hear plenty of squeaks when the set is oscillating and the tuning knob is


Connections for the incorporation of a tapped potentiometer in the grid circuit of the detector

turned, then it is only a question of resolving these carriers into stations. Make sure that the reaction control is smooth and that the set does not plop as it comes in and out of oscillation. Useful hints here are the alteration of the high-tension value (if a separate H.T. tapping is provided for the detector, then this is the only one that needs adjustment) and a change in the grid-leak value. Probably you have a 2-megohm leak and this may not be the most suitable. Try a 4-or 5-megohm leak, and see if the reaction plopping stops.

Or you might alter the wiring slightly and fit a semi-set potentiometer—one of those little wire-wound components which connect across the low-tension supply and

An aerial pre-set condenser mounted on the panel, as in the new "Ether Searcher" is a very handy control, especially in sets with ganged tuning

which have two alternative terminals to which the lower end of the grid leak (not connected to the grid) may be connected. In an ordinary set the leak is taken to the positive low-tension wire and the grid has a large part of the full low-tension positive bias on it. With the potentiometer arrangement you have a choice of bias, and one of these values may make for smooth reaction.

Perhaps the reaction circuit is not so good as it might be. There is no need for a condenser larger than .0003 mfd. A larger condenser may make control difficult. You might find it worth while fitting a differential condenser in place of an existing plain condenser and altering the wiring slightly to allow of the earth connection to the third plate in the differential condenser.

When you have succeeded in getting the reaction control smooth and the tuning reasonably sharp, then if you tune slowly you should have no difficulty in picking up the foreign stations.

Slowly turn the reaction knob until the set is just on the point of oscillating before that faint rustling noise begins. Then turn the main tuning knob *very slowly indeed*, a degree at a time, making further adjustment of the reaction knob if necessary to get the set on the point of oscillation. With many sets you will find that the reaction needs adjustment as the tuning knob is

(*Continued at foot of next page*)

# THE B.B.C. ON ITS REGIONAL PLANS

## How it is proposed to allocate the ten exclusive wavelengths

IMPORTANT news relating to the future development of the Regional Scheme is contained in a pamphlet just issued by the B.B.C. In pursuing this scheme to its logical end, the B.B.C. would have to provide dual transmitting centres: (1) in the south-east of England, near London, (2) in the neighbourhood of Birmingham for the Midlands, (3) in the north of England near Manchester, (4) somewhere between Glasgow and Edinburgh for Scotland, and (5) in south Wales or on the coast of Somerset. No better choice of locations could be found for giving the majority of listeners in the British Isles a service of alternative programmes.


**This map, reproduced by courtesy of the B.B.C., is shaded to represent the percentage of licences to population. The heaviest shading represents 15 per cent.**

These five centres, involving ten separate transmitters, do not entirely cater for the whole of the British Isles. Northern Ireland, the north-east coast, the northern half of Scotland, parts of the south coast and Cornwall and by no means least important, north Wales, are still not covered, unless one considers the Daventry 5XX transmitter as having sufficient service range for all these remote areas.

Northern Ireland must have programmes of local interest broadcast from Belfast. This means that the five centres already mentioned are one wavelength short, since there are only ten exclusive wavelengths altogether. It has been a matter for conjecture during the past year as to how the B.B.C. would get over this difficulty. Its plans are now revealed. Two of the stations, one at the proposed Scottish regional centre and one at the west of England regional centre, are to share a common wavelength. They will therefore have to radiate the same programme. It is proposed that this common programme shall be a National or universal programme. The remaining transmitter at each centre will broadcast programmes of regional interest.

In deciding that the Scottish and west of England regions should use the shared wavelength, the B.B.C. took into account the considerable distance between the two proposed sites. It is well known that if an endeavour is made to work two broadcasting stations on the same wavelength their service area will be reduced, and will be considerably less than that of either working on that wavelength alone. It is thought that listeners who cannot receive this dual wavelength transmission will be able to take the same programme from the long-wave Daventry station.

This scheme would seem to meet the demand in Wales for a programme of Welsh interest, since one of the twin transmitters, namely that with an exclusive wavelength, would be free to transmit programmes of a Welsh character. Now it happens that the most densely populated district in Wales is in the south, around Cardiff and Swansea. If the site were chosen to give a good service to the mountainous part of central Wales it would be unsatisfactory for south Wales. Moreover, this station will have to serve both south Wales and the south-west region of England.

At this stage it appears as though the programme compilers will have to face the difficulty of providing a Welsh programme that will satisfy the Welsh listeners and yet be of interest to the west of England listeners who find it impossible to receive the other regional station sharing the common wavelength with Scotland.

Once again the answer will be that Daventry 5XX, transmitting the National programme, can be tuned in by those west of England listeners who do not like the regional Welsh programme and who cannot receive the National outlet of western Regional due to its restricted service range. Everything points to the need for an increase in power of the long-wave Daventry station. As a matter of fact, such an increase has already been visualised by B.B.C. engineers.

"It is hoped that it may be possible in the future to raise the power" states the B.B.C. "The possibility is dependent on whether interference to the other essential services can be avoided." A. S. H.

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## "MAKING THE MOST OF THE TUNING CONTROLS"

(*Continued from preceding page*)

turned over the whole scale, and the actual setting for the point of oscillation is different at the beginning of the tuning scale from that at the end.

If your set has a high-frequency valve and a separate tuning control for it, then endeavour to keep the high-frequency valve and aerial-circuit controls in step. Very probably you will find that the readings of these two controls are a little out, and the amount of difference may vary according to what part of the scale you are considering.

To obtain some idea of the difference which may exist between the reading of one dial and that of the other, slack off the aerial preset condenser and tune in one of the local stations. You will find that, having reduced the value of the preset condenser, the tuning is very sharp and you will be able to obtain an accurate idea of the correct dial readings. Probably the high-frequency condenser will be a little more "in" than the aerial condenser.

Bearing in mind this difference in setting, you can then attempt to keep the circuits in tune, and, moving both dials very slowly, you should have no difficulty in logging several foreign stations.

### Ganged Tuning

There is a point to be observed with sets which have ganged tuning. It is, of course, very important to have circuits correctly ganged, and with modern coils and condensers, as used in the "1931 Ether Searcher," this presents no difficulty, although with older sets a large amount of preliminary adjustment is necessary to get the circuits actually in tune.

A difficulty is, that the ganging may alter as the condensers turn over the tuning scale, and while ganging may be correct on the medium waves it may be quite wrong on the long waves, and *vice versa*. A useful tip is to see what can be done to correct ganging by means of the aerial preset condenser. You see, whereas the detector valve has a constant load (the high-frequency valve connected to it) the high-frequency valve has a varying load (the aerial circuit connected to it), and it is this variation which upsets the ganging. If you have the preset condenser in a handy position you will often be able to make good use of it as the ganged condenser control is varied.

Often it is an advantage to have a little negative bias on the grid of the screen-grid high-frequency valve, particularly when the circuits are ganged. There is no need to provide a separate battery for this bias. The grid bias battery on the low-frequency side can be used quite well, as is done in the new "Ether Searcher." This point is mentioned because often an old set can be made to give good results by "hotting up" the performance of its high-frequency valve and adding negative bias.

# STORIES OF CELEBRITIES AT THE MICROPHONE

H. G. Wells at the B.B.C. microphone

*Some famous people are indifferent about facing the microphone but the majority appear terrified at the prospect. Below, "Savoy Hiller" gives some first-hand impressions of celebrities before the microphone*

"THIS is the National programme from London." . . . The voice of the announcer tells us once again that the B.B.C. has succeeded in arranging to broadcast yet another celebrity.

Needless to say, there is always a vast amount of work entailed in making these arrangements; the Programme Department at Savoy Hill has a special section which looks after this kind of broadcasting.

### How Celebrities are Located

This section consults regularly the visitors' books of the big hotels. Copies of the passenger lists, wirelessed from in-coming liners, are sent in by the shipping companies, and a kind of private detective organisation is employed to nose out important people who may be staying in London.

Now, very few of these celebrities manage to escape the vigilance of the responsible official at Savoy Hill, and possibly the hardest part of the whole thing is the process of persuasion. Naturally, some of these people are easy to persuade and some are even anxious; but strange to say, the majority seem terrified at the prospect. I have seen men and women who, in the ordinary way are accustomed to public life, film stars, intrepid airmen and so on, who seem to become petrified at the mere mention of the microphone.

### At a Moment's Notice

Major Kingsford-Smith, who flew the Atlantic, was an exception. When he broadcast in August of last year, he was perfectly composed and he made his speech for all the world as if he were addressing half a dozen people in a village hall. The same evening that Major Kingsford-Smith spoke—he had just broken the record for an Australia to England flight—Capt. Barnard the famous English pilot was due to arrive at Croydon with the Duchess of Bedford, having broken the record for an India to England flight.

The B.B.C. wasted no time; a fast car was dispatched to Croydon and arrived just as the plane arrived on the landing ground. The Duchess of Bedford was approached, but after her long flight she was too tired to think of anything but bed, and so Capt. Barnard, flying clothes and all, was bundled into the waiting car, rushed back to London, and within two hours was telling at least three million people some of his experiences. And how well he did it—tired as he was.

### A Timid Broadcaster

Gloria Swanson, on the other hand, was one of those people who really *was* afraid of the microphone. On the night of her broadcast her courage nearly failed her at the last moment. As one of the leading American actresses, the B.B.C. had planned a small reception for her in the drawing-room at Savoy Hill, and she was to be presented with a bouquet.

However, as soon as she saw what a fuss was being made of her, she fled into the ordinary artistes' waiting room and refused to be consoled until the Announcer on duty promised her faithfully that the reception would come *after* her broadcast, and not before. She had even brought a little bottle of throat mixture with her, which she insisted upon taking before she started, in case her voice should fail her at the last moment.

Of course, as soon as she *got* started everything was perfectly all right, which is rather like any other ordeal which requires nerve; and as a matter of fact her singing voice "came through" as clearly as many of our opera singers, in spite of the fact that she confessed afterwards to a far greater nervousness than she had ever experienced before a talkie camera.

The Hon. Mrs. Chetwynd, one of our finest lady racing motor drivers, broke the twelve hours light car endurance record at Brooklands Track on September 30, 1929, and, of course, off went our B.B.C. friend to persuade her to come to Savoy Hill. To his surprise she assented readily, and within half an hour she had composed a witty, interesting speech which described all her experiences during her twelve hours ordeal. When she arrived at the studio, however, and was given the signal to start—needless to say, most of these speeches are read from manuscript—the whole broadcast almost became a ghastly failure. Having been keeping up a speed of something like eighty-two miles an hour all day, she commenced to make her speech at about the same pace, with the result that for the first few seconds hardly one word was intelligible. (By the way, it is necessary always to speak slightly slower than normally when before a microphone.) However, after frantic imitation semaphore signalling by the Announcer, she realised her mistake and put the "brake on" with subsequent excellent results.

Phil Scott, the heavyweight boxer broadcast from the London station just before he left London to fight Jack Sharkey. Phil is, by nature, a rather meek and mild man, and he became very much like a small child being instructed in a new game, when he arrived in the studio. The official who conducted his broadcast, still tells the story of how he got the thrill of his life, ordering this gigantic specimen of the human race about, as if he were a mere nothing, and Phil took it all in good part, and sat down

Considerable difficulty was experienced in persuading Miss Gloria Swanson, the film star, to face the microphone

(*Continued at foot of next page*)

# RADIO-MADE MUSIC

## A NOVEL APPLICATION OF THE VALVE

A MUSICAL instrument in which the sound is created by radio valves was heard "on the air" for the first time in the United States on Tuesday, January 6, played by Maurice Martenot, the inventor.

In this instrument vibrations are produced in valves and passed through a diffuser to a loud-speaker, subject to intermediate modulation by the performer.

### A Wire Keyboard

Outwardly, the instrument resembles a spinet, or a small square piano of the last century. There is a five-octave keyboard similar to that of the piano, and inside the body of the instrument are the valves for generating the vibrations. The loud-speaker is separate from the keyboard.

A sensitised wire extends across the keyboard, and is held between the player's thumb and second finger to produce the desired pitch. The keyboard serves as a guide, so that the intonation is always exact. In this respect Martenot's apparatus differs most from that of Theremin, who first exhibited "music from the ether." His method was to control the pitch by moving the hands at a distance from the instrument, which gave only approximate regulation.

**Here are shown the essentials of the novel radio musical instrument in laboratory form**

At the left-hand corner of the instrument is a small shelf with a set of buttons, which control the timbre of the sound given by the instrument. It is possible at will to obtain the same quality as that of the violin or 'cello, flute, oboe, English horn, hunting horn, and trumpets. From the same shelf extends a lever governing the volume, which has an exceptionally wide range, while the quality of the tone remains clear and pure.

Martenot was trained in music as a child and achieved distinction as a pianist and 'cellist. Later, he studied counterpoint and harmony, but it was as a wireless operator during the war that he noticed the vibrations produced by oscillating tubes, and thought of turning them to account in a musical instrument. He developed the apparatus in his leisure hours, and probably would have been still working on it, but for the appearance of Theremin, an independent worker along similar lines.

### New Resources

Ernest Newman, the music critic, believes the instrument to be superior to Theremin's in that the player may play more rapidly, may produce a succession of perfectly defined semitones ranging through several octaves, and may indulge in trills, mordants and various other graces. It has been adopted in several Paris music schools, including the Ecole Normale, headed by Alfred Cortot.

The inventor contends that his object in developing the instrument has been not to imitate the sound of known instruments, but to provide composers with new resources for expression. Leopold Stokowski has predicted an orchestra of the future composed entirely of these electrical instruments.

H.

## "CELEBRITIES AT THE MICROPHONE"

(*Continued from preceding page*)

when he was told to or stood further away, as the case demanded. After the broadcast was over, his first words were: "Well, that's that, and I hope the wife got tuned in all right!"

Tom Webster, the famous cartoonist, had his speech typed out on very flimsy paper, with the result that at the preliminary rehearsal, every time he turned over a page the paper rustled—a sound which is magnified 100 per cent. over the microphone. When this was pointed out to him he promptly drew one of his famous cartoons using "the rustling of papers" as the theme, and suggesting, in his very humorous way, that the public could not pay their annual licences unless they could be certain of getting their money's worth in hearing a real good "rustle"!

One of the best speakers of all the celebrities who have broadcast from time to time, was Capt. McNeil, the Commander of the famous liner, the *Mauretania*.

Capt. McNeil had only just "come over," after attempting to break the *Bremen's* transatlantic record with a ship "old enough to be her mother." At the conclusion of his speech, relayed from an hotel in Southampton docks, and by means of a portable wireless set, installed on the bridge of the liner as she lay at her moorings 500 yards from the shore, Capt. McNeil was able to order his ship to say "Good-night" to the listeners, by giving three blasts on her siren.

An interesting letter was received by the B.B.C. on the following morning. It appeared that a listener who had a farm twelve miles from Southampton, heard this "Good-night" through his loud-speaker, and immediately afterwards walked out into his garden for what he called a "final breath of fresh air" and to his utter astonishment he heard the same "Good-night" as the siren's blasts were echoed inland. This showed that a sound relayed by landline and subsequently broadcast, travels at a greater speed than it does direct to the ear.

Some time ago the B.B.C. celebrated the jubilee of the London Telephone Service by organising a special broadcast, which included a relay of the sounds from a London telephone exchange, and this relay was preceded by a speech from the Controller of the London Telephone Service, and a description of the daily duties of the "Hallo!" girls, by an operator herself. It goes without saying that this lady's diction left nothing to be desired, accustomed as she was to speaking into a mouthpiece for eight hours every day of her life.

Mr. R. C. Sherriff, the author of *Journey's End*, was, on the other hand, reticent when asked to broadcast, and the B.B.C. had to put a special man on duty to keep Mr. Sherriff going, otherwise, he would have said nothing more than "How do you do" and "good-bye."

Bobbie Howes, the well-known London comedian, when asked to broadcast, found that the time allotted him was approximate to the raising of the curtain at the London Hippodrome where he was then playing as principal comedian. He found it necessary therefore, to go to the theatre first, put on his make-up and change into his stage costume for the first act, before coming to Savoy Hill, in order to be ready to go on the stage immediately after his broadcast. Imagine, therefore, the consternation of the hall-keeper at the B.B.C. when, on opening the door of a sumptuous limousine which pulled up at Savoy Hill, out stepped a comic little man, wearing a loud blazer and a schoolboy's cap several sizes too small for him.

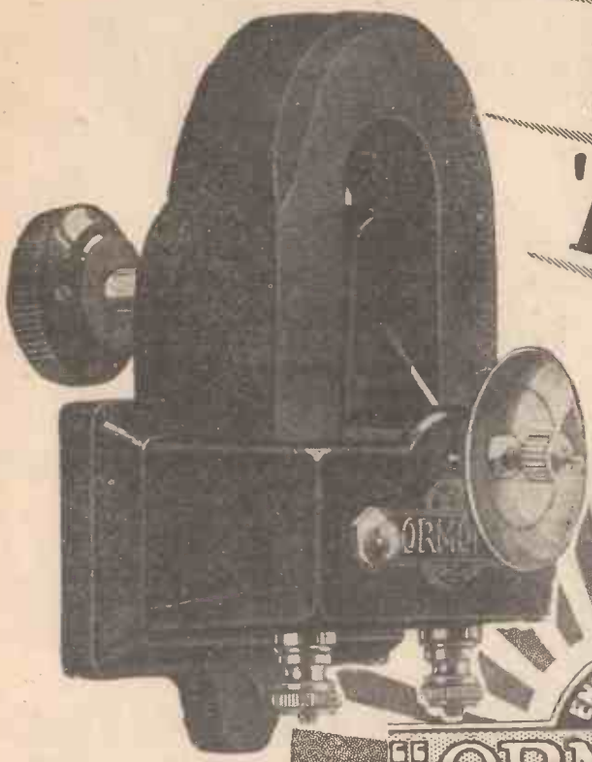
Most of our public men are quite composed when they are broadcasting, and, indeed, the Prime Minister is no exception to the rule, but it is an established fact that in the opinion of experts at the B.B.C., one of the finest microphone speakers is no other than His Royal Highness, the Prince of Wales.

### DID YOU KNOW THAT

**— the Canadian unemployment authorities at Ottawa are now broadcasting daily information regarding unemployed workers?**

**— it is recommended that a .003-microfarad condenser should be placed across the phone terminals of crystal sets and one-valvers. And in short-wavers, too, if you use phones.**

# The Unit chosen for the 1931 'ETHER-SEARCHER'



ENGINEERING "ORMOND" COMPANY LTD.

THE ORMOND

# ADJUSTABLE 4-POLE LOUD SPEAKER UNIT

*Get the utmost from your "Ether Searcher" by using the specified Loud-speaker Unit, as described in this issue.*

## *Punch—Power—Purity*

PROVED superior in every test impressed upon it, the Ormond 4-pole adjustable loud-speaker unit is a triumph of radio efficiency—especially the efficiency of Ormond Radio.

Only the finest materials and the best British workmanship are put into this Ormond Component. The result is a perfection of working hitherto unknown in a Loud-Speaker Unit of such low price.

Your dealer will supply you to-day with the Ormond 4-pole Adjustable Loud-Speaker Unit — none other offers such supreme advantages.

***Cat. No. R/450. In attractive Walnut finish.***

# 12/6

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**Ormond House, Rosebery Avenue, London, E.C.1**

*Telephone: Clerkenwell 5334-5-6 and 9344-5-6. Telegrams: "Ormondengi Smith."*

# GREATEST RADIO SENSATION

## NEW 3-VALVE SET OBTAINS OVER 50 STATIONS ON LOUD-SPEAKER WITH DAVENTRY 5GB WORKING

This is the new Northampton Plating Co. Super Selective 3-Valve Loud Speaker set, which is now offered to the public. After months of careful research a circuit has been designed superior in selectivity to a screen-grid set, and yet remarkably simple. It can be used, not only for cutting out the local station, but for other disturbances, such as Morse. It is the simplest, cheapest, and most selective in the world. No soldering required or coil changing. Experts have declared it absolutely unique. Over fifty stations have been obtained on loud-speaker with aerial 20 feet high using cheap valves, including Cardiff, Paris, Madrid, Manchester, Stuttgart, Toulouse, Hamburg, Glasgow, Frankfurt, Rome, Langenberg, Berlin, Brussels, Hilversum, Kalundborg, Konigswusterhausen, Radio Paris. These were obtained 3 miles from Daventry while 5GB was working. Thousands of novices with no knowledge of wireless have built the old Northampton Plating Co. Super 2 and 3 in all parts of the world, and have been astounded by the results even with cheap components but the new Super Selective 3 makes other sets old fashioned and marks the greatest improvement in valve sets for years. Orders have poured in from all parts of the world, including America, Turkey, Gold Coast, and Nigeria. In order to give everyone the opportunity of testing out the new circuit, two 6d. Blueprints, one for new Super Selective 2 and one for Super Selective 3 Valve, will be supplied for 3d. each.

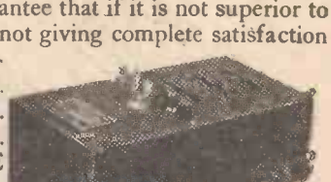
### NEW SUPER 4-VALVE PORTABLE SEPARATES TWO BROOKMANS PARK STATIONS UNDER THE AERIALS

**This is the latest model circuit by the Northampton Plating Co. offered to the public for the first time. It has been specially designed to satisfy the requirements of the new regional stations. Owing to its wonderful selectivity, it requires no wavetrap and obtains under favourable conditions a large number of Continental stations at loud-speaker strength, including Toulouse, Hilversum, Eiffel Tower, Konigswusterhausen, and Radio Paris. At less than half the price of a high-class portable set, it is acknowledged under severe technical tests to be far superior. In order to show what marvellous results can be obtained the set was placed between two aerials at the entrance to Brookmans Park, and the two programmes were easily separated. The set was also taken on a 1,000-mile motor tour over England and Wales. On the south coast and east coast many stations were easily obtained on loud-speaker at good strength. Even in Wales, where reception is difficult, excellent results were also obtained. In order that everyone may be able to construct this unique portable set, a full-size shilling Blueprint, with details and instructions, can be obtained from Northampton Plating Co. for 6d. Letters must be fully stamped. NAME AND ADDRESS IN BLOCK LETTERS.**

**TRADE SERVICE AGENTS WANTED.**

**MAKE YOUR SET ALL-ELECTRIC BY FITTING THE NORTHAMPTON PLATING CO. SUPER A.C. H.T. ELIMINATOR WITH TRICKLE CHARGER**

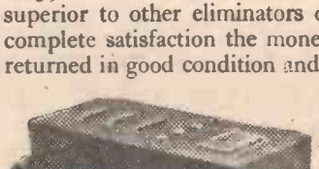
SPECIAL OFFER: 7 days' approval to test. This unit value £7 will be sent to any address on payment of £4 5 0 cash, or C.O.D., with the guarantee that if it is not superior to other units on the market and not giving complete satisfaction the money will be instantly refunded if returned undamaged. It is most silent in operation. Trade inquiries invited. STATE MAINS VOLTAGE AND CYCLES and VOLTAGE OF ACCUMULATOR.



Easy payments arranged.

**NORTHAMPTON PLATING CO. SUPER A.C. ELIMINATOR**

SPECIAL OFFER 7 days' approval to test. This A.C. eliminator, value £4, will be sent to any address on payment of 59s. cash or C.O.D., with the guarantee that if it is not superior to other eliminators on the market, and not giving complete satisfaction the money will be refunded instantly if returned in good condition and undamaged. It is guaranteed to be most silent in operation, giving over 20 milliamperes and suitable for 2-, 3-, and 4-valve sets. Test it for yourself. Trade inquiries invited. State mains voltage and cycles. Easy payments arranged.



### READ THESE TESTIMONIALS

It may, perhaps, interest you to know that I had my three-valve set converted to your circuit some months ago, and I have logged over sixty stations on the loud-speaker.

When I tell you that I only have an indoor aerial and the gas bracket for an earth you will understand this is a remarkable achievement, particularly as I am situated practically on the top of the tram wires and electric railway a couple of hundred yards away. I am certainly troubled with noises as the trams come up the street, but this, I presume, is only to be expected.— C. R. A., Birkenhead. 5.1.31.

Thanking you for goods of such excellent value received so quickly and well packed. I have made your 2-valve set and am quite astonished at the result.

Working at 42 volts for the highest in most cases I have received well over 39 stations. Each of these with the greatest quality. I am using a poor little indoor aerial slung too near the wall and ceiling. Wishing you greatest success.— N. M., Herne Hill.— 1.1.31.

**I have examined the above testimonials, and am satisfied that these are genuine communications.— Advertisement Manager, Daily Newspaper.**

### SPECIAL WIRELESS AND CYCLE BARGAINS

| Usual Price. | | Sale Price. |
|---|---|---|
| 10/- | Latest Type Cabinet, 12 by 8 | 4/11 |
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| 4/6 | .0005 Variable Condenser ... | 2/11 |
| 2/- | .002 Condenser ... ... | 10d. |
| 1/6 | .003 ,, ... ... | 10d. |
| 1/- | Grid Leak, 2 meg. ... ... | 10d |
| 1/- | Anti-Mic. Valve Holder ... | 9d. |
| 2/3 | Rheostat ... ... ... | 9d. |
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| 12/6 | Cone Unit ... ... ... | 6/11 |
| 12/6 | Cone Speaker Cabinets ... | 7/11 |
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| 3/- | 15 in. Cone Speaker Frets ... | 1/11 |
| 7/6 | Old Cossor Type Coils ... | 3/11 |
| 15/- | Old Cossor Type Cabinets, 21 by 7 ... ... ... | 7/11 |
| | Ebonite for same ... ... | 3/11 |

| Usual Price. | | Sale Price |
|---|---|---|
| 12/6 | Mullard Type Cabinet, 18 by 7... ... ... ... | 6/11 |
| 7/6 | Aluminium Panel, 18 by 7 ... | 3/11 |
| 17/6 | Dual Coil for M.W.3 ... ... | 12/6 |
| | Triotron Dull Emitter Valve | 4/11 |
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| | Triotron Super Power Valve | 6/6 |
| 15/- | Titan Coil ... ... ... | 9/11 |
| 9/- | 60-volt H.T. Battery ... | 3/11 |
| 12/6 | 100-volt H.T. Battery ... | 6/11 |
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|---|---|---|
| 5/6 | 2-volt Accumulator ... ... | 3/6 |
| 2/- | Accumulator Carr. ... ... | 11d. |
| 4/6 | Neutralising Condenser ... | 2/11 |
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| 2/- | Loud-speaker Cord ... ... | 11d. |
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| 21/- | D.C. Eliminator, 15 milliamps | 17/6 |
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New Cycles, Guaranteed. 59/11; with 3-speed. 79/11; with Dunlop Tyres, 10/- extra.

Parts supplied for all sets at Reduced Prices. Send now to avoid disappointment. Cash with order or C.O.D. Special terms to those making sets. All goods guaranteed and exchanged if not satisfactory. Inquire for anything you want. Trade supplied. Send for our wonderful Bargain Price List, A.W.

*Trade Service Agents Wanted.*

*Owing to the enormous number of inquiries and orders, write clearly Name and Address in Block letters to the firm that made Radio popular. Letters must be fully stamped.*

**NORTHAMPTON PLATING CO.** (Radio and Cycle Manufacturers), **NORTHAMPTON**

# On Your Wavelength!

## DO YOU REALISE?

I OFTEN wonder if listeners, on the one hand, and the wireless industry, on the other, have yet realised what the state of affairs is going to be like by the time that the B.B.C. has completed its Regional Scheme with nine transmitters on the medium waveband, each sending out a programme with an output power of 50 kilowatts or more. If, however, you have failed to do so, you can very easily obtain an idea of what will happen to the possessor of a receiving set of ordinary selectivity, and I am willing to wager that if you follow out my suggestion you will be rather amazed. Take a full list of stations in order of their wavelengths and provide yourself with a nice black or blue pencil. First of all, underline the B.B.C.'s present nine wavelengths which must be those that will be used by the Regional transmitters. These are 479 metres (Midland Regional), 398.9 metres (Glasgow), 376.4 metres (Manchester), 356.3 metres (London Regional), 309.9 metres (Cardiff), 301 metres (Aberdeen), 288.5 metres (relays), 261.3 metres (London National), and 242 metres (Belfast).

## BLOTTING THEM OUT

ASSUMING that you possess a set of high average selectivity, you should be able to receive stations whose frequencies are three channels above or below those of the Regional transmitters. Experience has shown that stations 9 and 18 kilocycles away would be interfered with, if not completely blotted out. Go through the list again, crossing out all the stations which are 9 and 18 kilocycles above and below those that you have already marked. The frequency of the Midland Regional is 626 kilocycles; so out go Prague, Moscow, Langenberg, and Lyons Doua. The next frequency is 752 kilocycles, and here we must strike out Berne, Kattowitz, Bucharest, and Frankfurt. The interference area of the Manchester wavelength, whose frequency is 797 kilocycles, just meets that of the wavelength above and overlaps with that from the London Regional. We can therefore put our pencils straight through everything that lies between Barcelona on 349 metres and Kattowitz on 408 metres. The Cardiff, Aberdeen, and relay wavelengths similarly overlap as regards their interference areas, and here we cross out all stations from Bremen on 316 metres to Bratislava on 279 metres. The London National has a wipe-out area extending from Lille PTT to Hörby and the Belfast channel washes out a common wavelength which doesn't matter—Cracow, Radio Beziers, and Nürnberg.

## WHAT WILL BE LEFT?

WHEN you have finished your blacking-out, just run through the list again and see what is left for you; and there is not very much. Budapest, Vienna, Rome, Stockholm, Madrid Union Radio, Strasbourg, Breslau, Gothenburg, Königsberg, and Leipzig practically complete the list of stations that will be available to the owner of a really good set with what we now regard as a high order of selectivity. Actually, the interference areas may be considerably wider, owing to the very deep modulation employed by B.B.C. transmitters. Unless the public, as a whole, wakes up and shows the B.B.C., with no uncertain voice, that we do *not* want the broadcast band blotted out, we shall find ourselves so deeply committed to the scheme that it will be too late to turn back.

## UNWORKABLE

I AM going so far as to say that if the Regional Scheme is put through in its present form, it will be found to be completely unworkable. Stenode owners will not need to worry, but the Stenode must necessarily be rather more expensive than a two-valve set to install and maintain, and one had an idea that the B.B.C. had the interests of the small man mainly in view in launching its scheme. Actually, the two- or three-valve set will find itself in most cases so utterly swamped that it can receive no programmes but those from its nearest home station, and it is highly probable that there will be interference from other sources with these. It will, for example, require a set of no ordinary selectivity to give reproduction without interference from the 301-metre transmitter when those on 288.5 and 309.9 metres are in operation, and a similar problem will arise for the three transmissions on 356.3, 376.4, and 398.9 metres.

## WHO BENEFITS?

WHO exactly benefits by deeply modulated super-power transmissions such as the Regional Scheme is going to give us? Most certainly not those within a twenty-mile radius of the transmitting stations if they are anxious to have good quality. At short range the combination of deep modulation and high power means inevitably distortion, where reasonable volume is required, unless special receiving gear and high plate voltages are used. Apparently there are few, if any, benefits to those living more than about fifty miles from the station; for experience has already shown very bad fading and slight distortion beyond such a range from both of the Brookmans Park transmitters, particularly that using the shorter wave. The only possible area in which any benefit is obtained is a ring lying between twenty and fifty miles from a transmitter. In the densely populated inner ring, and in the area outside the fifty-mile range, reception is quite definitely bad.

## THE VICIOUS CIRCLE

AND we have another most important point to consider. When the B.B.C. launched its Regional Scheme, other countries had in self-defence to evolve similar plans if they were not to be shouted down. The Mühlacker transmitter has already shown us interference between high-power stations using deep modulation at ranges of over four hundred miles, and what exactly is going to happen to the broadcast band if the present cut-throat policy is pursued and each nation continues to erect more and more powerful stations? We have also to reckon with Russia, who stands outside the agreements reached at wireless conferences. The sum of nine million pounds has been set aside by the Russian Government for the construction of super-power wireless stations. The most important is to be at Leningrad. This will have a power of 500 kilowatts. There are to be eleven other stations rated at 100 kilowatts and a further thirty-eight with a 10-kilowatt rating. All of these are to be completed within two or three years.

## POWER AND MODULATION

MYSELF, I do not think it necessary for any station to have a power higher than 10 kilowatts, in view of the growing efficiency and the decreasing cost of valve sets. I am quite certain, too, that deep modulation is utterly wrong. Its only advantage is, that it adds somewhat to the range of a transmitting station. Its disadvantages are that it very greatly widens the interference band of a station and that it enormously increases the difficulty of obtaining reproduction of good quality. Now, I think, is the time for the nations of Europe to get together and to evolve an agreement even more binding, than that upon which the Prague Plan is based. And if they cannot do it amongst themselves, let them hand the problem to the League of Nations, agreeing to submit to the ordinances of a technical committee appointed by that body. Broadcasting in Europe cannot be satisfactory unless and until we have a central authority with real power, on the lines of the Federal Board which controls broadcasting in the United States.

## LOOK FOR YOURSELF

IF you want to see what is going on at the present time, you have only to look at the Brussels Laboratory report for any previous month and to bear in mind that every station whose doings are recorded (with the exception of the Russians), belongs to a nation which subscribed to the Prague Plan and whose Government gave a definite undertaking to carry it out in the spirit and the letter. In the chart showing the wavelengths of stations for the month, every station should score a perfectly straight line and there should be no interlopers between allotted channels nine kilocycles apart. But what exactly do you see on the medium band? The number of stations whose records do make anything like a straight line is far too small. During the month of November, for example, Strasbourg deviated by as much as 6½ kilocycles from his proper channel, and the average deviation for all stations was a very respectable part of a kilocycle.

# On Your Wavelength! (continued)

## MORE CONFUSION

THEN look at the interlopers. To give a few examples, you find Bolzano pushing in on a wavelength where he has no business to be, the Norwegian relays occupying two wavelengths instead of one, various French stations using practically any wavelength they like, Genoa elbowing his way in and messing up many other stations, Falun trying all kinds of wavelengths, and the Swedish relays doing pretty well what they like. One of the jests in November was the transmission of the Radio Conference, whose wavelength record is like the temperature chart of an influenza patient. This transmission interfered on various occasions with at least three others. And it does not appear to have used the same wavelength on any two consecutive days. Don't you think that it really is time that the broadcasting authorities of Europe met together with the intention of really doing something, and jolly well saw that something was done?

## WHAT AMERICA THINKS

DR. ROBINSON, the Stenode man, had lunch with me the other day just after his return from his visit to the United States. He was enthusiastic over the welcome that he received and the amazing interest shown in his invention by manufacturers, wireless clubs, and listeners in general. The position in America is a little different from what it is in this country. Over there the public has long been used to sets incorporating from five to seven valves, and it does not appear to be in the least afraid of fine tuning. Here the average number of valves in use is far less, and the listener is probably not quite so used to delicate controls. Mr. Robinson believes that the crystal-gate Stenode, with its knife-edge selectivity, may come into very wide use in the United States, though in this country the simpler gate-less model will probably make a bigger appeal.

## A MISUNDERSTANDING

I HEAR, by the way, a good many people express an opinion that the gate-less Stenode is not protected by patents! This idea is, I think, quite wrong. It seems to have arisen in this way. In the gate-less model a super-heterodyne is employed, which has been done before. Similarly, a corrector circuit is used which brings up the top and tones down excessive bass; high-pass and low-pass filters have been used for various purposes for years. The essence of the Stenode idea is something that never has been done before. All previous attempts at selectivity have endeavoured to preserve the balance between bass and treble in the high or intermediate frequency circuits by the use of flat-top tuning or of band-pass filters. In the Stenode the preponderance of bass sounds, owing to persistence effects, is deliberately encouraged as far as the output of, at any rate, the second detector. If you connect a pair of telephones or a loud-speaker into its plate circuit the results are indescribable. Then correction is applied for the express purpose of redressing the balance between high and low frequencies. Every other system has postulated the necessity for receiving a channel of a certain minimum width in order to include sidebands.

## THE SIDEBANDS

DR. ROBINSON (who, by the way, does not deny the existence of sidebands, as many think, but maintains that they are not necessary for reception) cuts the sidebands for a set purpose and then does what has frequently been shown to be impossible, by using a corrector circuit to reduce the preponderating bass notes to their proper proportions. When this has been done the treble notes, which have been there all the time, though they were drowned, make their appearance once more, and the result is a close approach to perfection in reproduction.

## WEATHER CONDITIONS

A READER enquires whether wide-spread fog, such as we have been subjected to recently, is likely to have any unfavourable influence upon wireless reception. I must say that I haven't noticed any ill-effects in practice, nor do I think there is any sound theoretical reason why there should be. So far as atmospheric conditions are concerned, ionisation is one source of loss to the waves en route, whilst ground absorption is another. As sunlight is the principal cause of ionisation, especially the ultra-violet rays, the presence of fog should be beneficial rather than otherwise. Also, I believe that any free electrons originally present tend to be "immobilised" by the fog particles. On the other hand, the surface of the earth is more conductive when moist than when dry, so that here perhaps the fog increases absorption losses, especially where trees and foliage are plentiful. On the whole, I should say one effect cancels out the other, leaving matters in *status quo*.

## A MATTER OF INSULATION

OF course, the after-effects of fog may be appreciable. For instance, a layer of "fog slime" deposited on the aerial insulators is quite likely to open up a high-resistance path to earth, and so lead to loss of signal strength, particularly in the case of a crystal set where every microvolt of aerial pick-up is valuable. As a matter of fact, snow and sleet are the worst offenders in breaking down insulation, particularly in transmitting aerials where the potentials are so much higher than in reception. On one occasion, a fall of snow, lodging on the wires of the Sainte Assise transmitting aerial, brought the whole structure crashing down under the added weight, calculated at nearly 400 tons. Nowadays, however, such a contingency is prevented by sending a large heating-current through the wires so as to melt off any deposit of snow or sleet before it becomes dangerous. On the whole, fog is probably the least injurious of the various weather vicissitudes to which wireless is subject.

## COIL DEVELOPMENTS

IT is really rather interesting to note how the trend of development has gone back just recently to where it was some years ago. In the old days when we were just beginning to know something about neutralised circuits, we appreciated the value of controlling the stray coupling between the stages, and our Technical Editor introduced the well-known screened coils, which were used by many amateurs. The most useful feature was their simplicity; all you had to do was remove the cover, when you could insert any other coil you liked inside and replace the cover again.

## THE EFFECT OF THE S.G. VALVE

THEN came the introduction of the screen-grid valve, and with it, the again almost universal development of the dual-range coils. Both these effects militated against the old simple circuit, and we had a period of fearsome and wonderful coil combinations (I shall probably get rapped over the knuckles for saying this). For a time this was sufficient. The coils were not efficient and their very damping held the circuits down.

## ON SIMPLER LINES

THE next phase came when both coils and valves improved considerably, and in order to obtain the stability required, the circuits had to be built up in completely screened boxes, and we had chassis-built receivers in which everything was bottled up to the last degree. These receivers were very difficult to construct, and never became really popular. The latest developments follow on the heels of yet another valve improvement, which enables us to use simpler coils and still to obtain results superior to those of the old neutralised days. With this development comes the reversion to the old form of screen coil, having a removable cover. The variable condensers are either provided with partition screens or are completely screened in themselves, and to avoid any stray capacity coupling, the valves are now screened. Thus, although there is a little more complication, due to the necessity for screening more of the components, we are coming back to the simplicity of the older forms of set.

## FOR CONSTRUCTORS

I HAVE again been privileged to see an advance copy of the February issue of *Wireless Magazine*; it is certainly the best value in radio monthlies.

There is a special 16-page constructors' supplement called "The Trusty Twelve," in which reader-tested sets and mains units are dealt with. I see that a special offer of full-size blueprints for half-price is made. Here is a splendid opportunity to make good use of some of your old components.

In this issue—besides the supplement—there are over fifty features and I counted nearly 200 illustrations altogether. There is plenty to read even if you are not a keen constructor.

THERMION.

# FITTING POWER-GRID DETECTION TO YOUR SET

*The theoretical and practical aspects of power-grid detection, with notes on its application to average sets, are simply explained in this article by ALAN HUNTER*

TAKE a .0001-microfarad fixed condenser and a .25-megohm grid leak, connect them to a medium-impedance valve, give that valve its maximum anode voltage, and there you have the ingredients of power-grid detection. Unfortunately, wireless cannot be treated

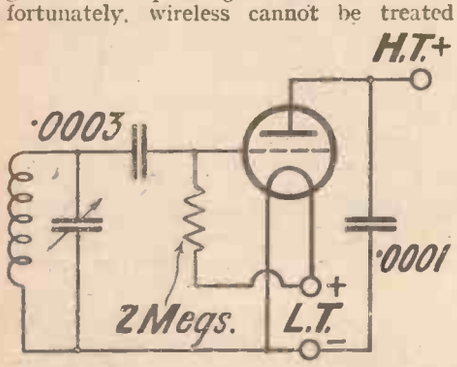



**Fig. 1. Normal arrangement and values for leaky-grid-condenser detection**

in this cookery-book fashion. Power-grid detection is now all the rage, but I fear it is being widely mis-applied.

Let us look into this scheme of detection, to see how it can be fitted to the average set. Most readers' sets employ a leaky-grid detector, with a .0003-microfarad grid condenser and a 2-megohm grid leak, connected as shown by Fig. 1. No alterations in these connections is needed for power-grid detection, merely a modification of values (see Fig. 2).

### Condenser and Leak Values

It has been found that the best results with a power-grid detector are provided with a .0001 fixed condenser and a .25-megohm or .15-megohm grid leak. The valve used with these values must be capable of handling big signal inputs without overloading.

That brings us to the real reason for power-grid detection. Its job is to provide distortionless detection when the input voltage is of the order of several volts. The pity is that a theory is rapidly gaining ground whereby it is assumed that because power-grid detection is capable of handling big signal inputs it will also give improved results with small inputs. That is far from true. The linear action of a power-grid detector is obtained only with a big signal input. With small inputs this form of detection introduces what is known as amplitude distortion.

Power-grid detection has, in fact, been developed for multi-valve sets, where great amplification is developed before detection, and where only one stage of low-frequency amplification is employed. If the power-grid detector is provided with sufficient input to work without distortion, the amount of low-frequency amplification needed to load the power valve is quite moderate.

Working backwards, let us take as an example the normal small power valve needing, say, 15 volts to load it fully. If we assume a transformer with a ratio of 3 to 1 and a medium-impedance valve having an amplification factor of, say, 10, the signal voltage required on the grid of the detector for full loading of the power valve will be 15 divided by 30. This means only .5 volt, much too small for the power-grid detector to do its work properly. In fact, with such a small input the power-grid detector would cause distortion. And if the input were increased, the output power valve would clearly be overloaded and again distortion would be introduced. Regarded in this way, power-grid detection does not seem of much use in small sets.

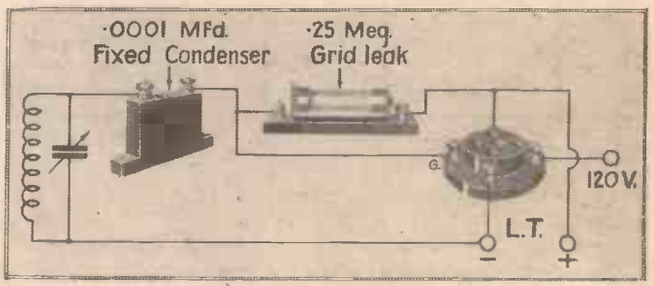



**Fig. 2. For power-grid detection low values of grid leak and condenser must be used**

But the tendency is to provide more and more amplification before detection, in order to achieve selective tuning and reliable reception of distant stations. In the future we shall have to arrange our detectors so that voltages of considerable amplitude can be handled without distortion. Here the power-grid detector is going to be invaluable.

The more technical readers may be interested to know why power-grid detection requires a fairly big input to work properly. We must consider grid detection from the beginning. The first thing to understand is that in the form of detection shown by Fig. 1 two distinct actions take place. The actual detection occurs between the grid and filament, which acts as a 2-electrode valve. At the same time the valve acts as a low-frequency amplifier, due to the effect on the anode current of the low-frequency grid voltages.

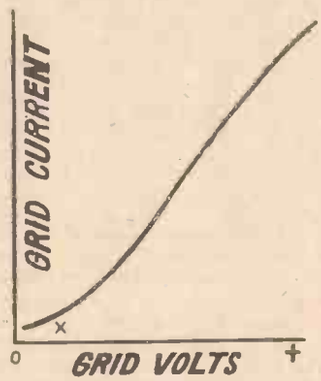



**Fig. 3. Note how the grid current increases as the grid voltage is increased**

### Detection

Detection is the process whereby one half of the modulated carrier wave is suppressed, so that the remaining half can affect the low-frequency amplifier of the set. Before the signal arrives on the grid of the detector, that grid is biased slightly positively, so that a small steady grid current flows through the grid leak to the filament.

If we plot grid volts against grid current we find that an increase in grid volts causes an increase in grid current, slight at first and then considerable (see Fig. 3). The operating point of this curve affected by the incoming signal will depend upon the value of the grid leak and the positive bias applied to the end of it. In practice the leak is taken to the positive side of the filament and working conditions adjusted by varying the value of the leak.

In the usual wireless set, detection takes place at the bend in the curve. With a normal grid leak and condenser arrangement the incoming signal would oscillate about the point marked X. It will be recalled that an incoming signal consists of positive and negative half cycles. Detection suppresses the negative half cycles. As will be seen, positive half cycles applied under the condition at X will increase the grid current, whereas negative half cycles will have practically no effect on the grid current. The desired suppression therefore occurs, and the varying grid voltage

# "FITTING POWER-GRID DETECTION TO YOUR SET" *(Continued)*

affects the grid-anode circuit of the valve.

So long as the positive half cycles of the signal applied to the grid are of sufficient amplitude to work on the straight portion of the curve, no distortion is introduced. But with a weak signal, or a strong signal so deeply modulated that the peaks swing back as far as the point ×, detection occurs on the curve; part of the positive half cycle is then suppressed and distortion follows.

From this point of view, the obvious safeguard is to increase the input voltage so

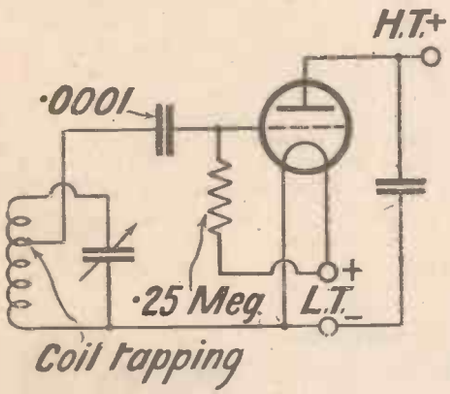



**Fig. 4. The tapped coil shown here overcomes the loss incurred by grid-leak damping**

that its peaks always occur on the straight portion of the curve. In other words, a large signal input should keep the rectifier distortionless. But in practice we find that if a really large input signal is applied to the grid of a normal leaky-grid detector, very noticeable distortion occurs. Since the grid-volts grid-current curve clearly proves that this input, far from introducing distortion, is calculated to prevent it, we must look elsewhere for the source of distortion. We find it in the anode circuit; in that part of the detector acting as an amplifier.

### Detecting and Amplifying

I have said that a detector valve is also a low-frequency-amplifying valve. For when the incoming signal has been detected by the suppression of the negative half cycle, due to the curvature in the grid-volts grid-current graph, the varying low-frequency signal on the grid affects the anode current. In a normal set the detector would probably have an actual anode voltage of 70 volts. Under the grid-bias conditions for detection, the usual detector valve, with such a low anode voltage, would not *amplify* without distortion anything approaching a three-volts input, in spite of the fact that this input could be quite easily *detected* without distortion.

To overcome the distortion due to the amplifying action of the valve we have to alter the working characteristics so that the valve can amplify without distortion as large a signal as can be detected without distortion. This cannot be done by altering the grid bias (as we should do in a straight low-frequency valve) so we must increase the anode voltage. If the volts actually applied to the anode are increased to 120, with a medium-impedance valve the distortion would be eliminated.

### Amplitude and Frequency Distortion

So far we have referred only to distortion due to the effect of the signal amplitude, having shown that the best way to prevent this distortion is to increase the input voltage and also the anode voltage. Our troubles are not yet over. With large signal inputs, the standard values of the grid leak and condenser introduce appreciable distortion. This is known as frequency distortion, present to some degree in nearly all leaky-grid detectors. It is due to the grid condenser, which tends to shunt the higher audible frequencies. This effect can be overcome by decreasing the value of either the grid leak or condenser, or both. In practice a value of .0001-microfarad condenser and .25 megohm leak prevent high-note loss in a power-grid detector, without seriously lowering the efficiency of detection.

Some loss of efficiency does occur, because as the leak value is lowered, more grid current flows and the damping across the tuning circuit is increased, causing a reduction in the voltage developed. This loss can be overcome by taking the grid condenser to a tapping on the coil, as shown by Fig. 4.

### A Summary

The reader with a three-valver, consisting of, say, one high-frequency stage, a detector, and a power valve, has little to gain and possibly something to lose by employing power-grid detection. If the set is mainly for local reception, and more than sufficient signal strength is available to operate the loud-speaker, a modification of the grid leak and condenser values may well improve quality. The 2-megohm leak could be changed to 1 megohm, or the .0003-microfarad condenser to .0002 microfarad. Sometimes both these changes will do the trick. The slight loss of sensitivity is more than compensated by improved quality. Such a modification does not constitute a change to power-grid detection, but does help to overcome frequency distortion.

As will now be realised, the indiscriminate use of power-grid detection is likely to lead to trouble. For example, the increased anode voltage for power-grid detection means an increase in anode current. With an L210 type of valve the anode current at 120 volts may be as much as 5 milliamperes. Not many low-frequency transformers have sufficiently good primaries to pass this current without some saturation and consequent loss of inductance, amplification, and quality. One enterprising firm has just marketed a special low-frequency choke for power-grid detection preceding transformer coupling

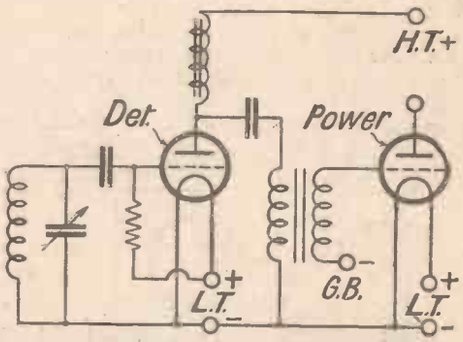



**Fig. 5. In this circuit the anode current is diverted from the transformer primary to a special choke**

Very little voltage is lost across the choke, which, as shown by Fig. 5, prevents the large anode current of the detector valve from passing through the primary.

To summarise—power-grid detection does provide distortionless rectification. But to ensure this condition a large input is needed, as well as a high value of anode voltage, applied to a suitable valve connected to the right values of grid leak and condenser.

To follow this form of detector, an amplifier with a low stage gain and a big power valve are advised. If we have a 3-volt input to a power-grid detector, an amplification for the detector valve of 10, and a transformer with a ratio of 2 to 1, the peak voltage applied to the power valve after the transformer would be 3×10×2, or 60 volts. This could be handled without distortion only by a super-power valve. Judging by several recent designs, this last point has not been sufficiently well emphasised.

## DID YOU KNOW

**—that when working a set having ordinary band-pass tuning, too pronounced a double-hump effect may be the result of too much reaction or too tight coupling between the band-pass coils. You should also make sure, if a ganged condenser is not provided, that both circuits are in tune.**

**—that some L.F. transformers having special alloy cores give distorted reproduction if the anode current is much above 4 milliamperes. This point should be watched because with some detector valves used with 100 volts H.T., the anode current is likely to reach the saturation point.**

**—that when building your new set you will probably find it easier to make use of the new separate coil and valve screens rather than to provide a metal box to cover the whole receiver, as in short-wave set practice.**

## AT THE QUEEN'S HALL

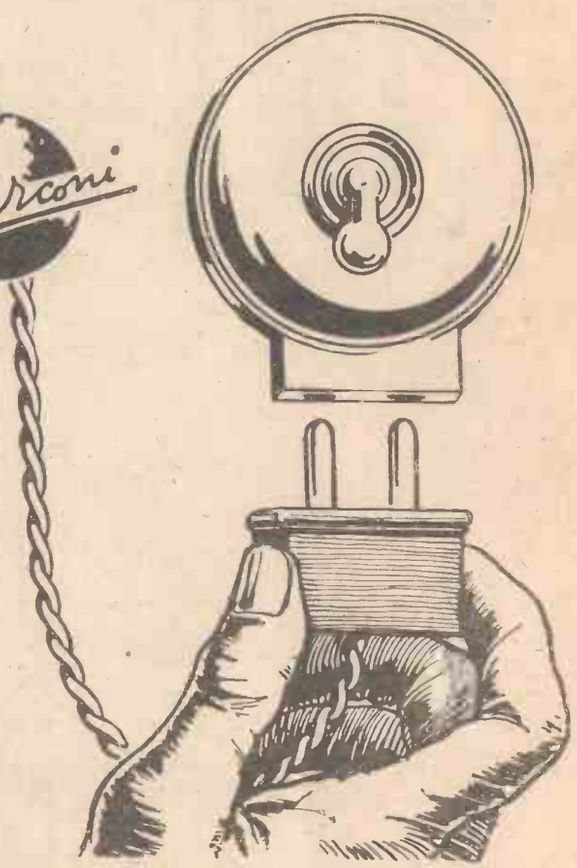
THE B.B.C. concerts began for this year with an ill-assorted programme. There was a Handel Concerto Grosso, a Liszt Concerto, some Debussy "Images" and Schubert's 7th Symphony. Ernest Ansermet is a very fine conductor, and his rendering of the symphony especially was a remarkable performance. The symphony itself starts well, but gets out of control during the last two movements. I should say that its two defects were a much too light *scherzo*, at a time when comic relief was unnecessary, and an anti-climax in the last movement that finished the piece off long before its real end. Towards the end of the last movement I felt like applying for an injunction. L. R. J.

# The Finest of all A.C. Mains valves


For all-electric radio of the highest efficiency, for unfailing reception and a perfect background of silence—the improved series of Marconi indirectly heated A.C. Mains valves stands supreme. High conductivity, rigid construction, mesh anode to prevent over-heating and grid emission, exceptional vacuum, and, above all, a long useful life—every feature, in fact, which is desirable in modern receivers is included in this range. There are types for the improvement of every set.

## EXCEPTIONAL CHARACTERISTICS

| | | Amp. Fact. | Imp. | Mut. Cond. | Price. |
|---|---|---|---|---|---|
| MS4 | Screen grid .. .. | 550 | 500,000 | 1.1 | 25/- |
| MH4 | General purpose .. | 35 | 16,000 | 2.19 | 15/- |
| MHL4 | Detector & L.F. amplifier | 20 | 8,000 | 2.5 | 15/- |
| ML4 | Power .. .. .. | 9 | 3,000 | 3 | 17/6 |




## Public Testimony

**D.E.R. VALVE No: R.11307.**

"I purchased the above valve several years ago, I think about six years, and unfortunately yesterday I dropped it on the floor, breaking the filament but not the glass bulb, thus ending a life of an old reliable friend. Its last position was the detector stage of my short wave receiver, and in this position it worked splendidly. I am certainly going to purchase another Marconi valve. . . . I am writing this letter as a mark of appreciation to your valves, and I thought you might be interested in this report, seeing that the valve has been in continuous use for six years or more. . . . A truly wonderful valve I can only describe it as."—G. W., Stockport.

## Expert Testimony

Marconi engineers, who have at their disposal unequalled resources of research and manufacture, have long realised that if really practical benefit is to be derived from high theoretical efficiency in a valve, it is imperative to unite every useful feature in a perfectly balanced design—no single factor must be emphasised to the detriment of practical performance. All Marconi Valves are practical interpretations of theoretical ideals; they contain just those features which, being properly united, will ensure the best all-round results and highest effective efficiency. The soundness of this principle is conclusively established by the fact that Marconi valves are used by the B.B.C., Imperial Airways, Trinity House Beacon Stations and Lightships, Empire Wireless Communications, Large Passenger Liners, etc.—a unique tribute to their unequalled performance and dependability.

# MARCONI VALVES

**USE THE VALVES THE EXPERTS USE**

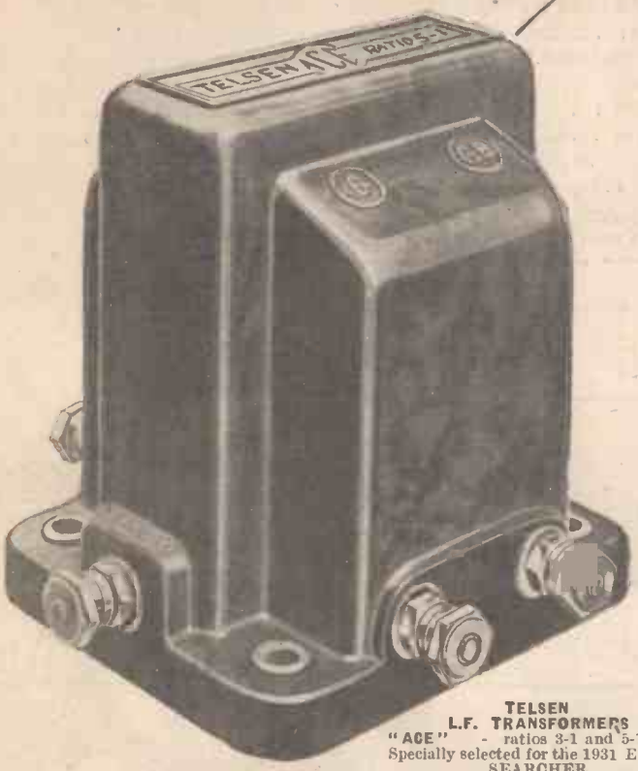
# SPARKLING CLARITY of Reproduction

## ONE OF THE MANY OUTSTANDING FEATURES OF THE 1931 ETHER SEARCHER

**A set of phenomenal performance . . . a set of exceptional merit, designed by Mr. J. Sieger of "Amateur Wireless," who has chosen for this circuit only those components which by their design and construction, are able to produce the pinnacle of performance that is achieved by this remarkable set.**

**This performance is due in no small measure to the expert choice of TELSEN Components. Telsen Components are scientifically designed and built by experts, and, when incorporated in any circuit insure exceptional tone—vivid reproduction and amazing volume.**

**In your new set incorporate TELSEN . . . and get perfection. In your old set, change to TELSEN and get improvement beyond measure.**




**TELSEN L.F. TRANSFORMERS**
"ACE" - ratios 3-1 and 5-1 8/6
Specially selected for the 1931 ETHER SEARCHER
"RADIOGRAND" ratios 3-1 & 5-1, 12/6
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# TELSEN COMPONENTS


**TELSEN GRID LEAKS**
Absolutely silent and non-microphonic, practically unbreakable, cannot be burnt out and are unaffected by atmospheric changes. Not being wire wound, there are no capacity effects.
Made in capacities of ½, ¼, 1, 2, 3, 4, and 5 megohms.
Price 1/- each.


**TELSEN FIXED (MICA) CONDENSERS**
Shrouded in Genuine Bakelite, made in capacities up to .002 mfd. Pro. Pat. No. 20287/30. .0003 supplied complete with patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts Price 1/- each.

**TELSEN FIXED MICA CONDENSER**
Price 1/- each.


**TELSEN FOUR-PIN VALVE HOLDERS.**
Specially selected for the 1931 Ether Searcher.
Price 1/- each.


**TELSEN VALVE HOLDERS**
Pro. Pat. No. 20286/30. An entirely new design in Valve Holders, embodying patent metal spring contacts, which are designed to provide the most efficient contact with the valve legs, whether split or NON-split. Low capacity, self-locating, supplied with patent soldering tags and hexagon terminal nuts.

**TELSEN 5-PIN VALVE HOLDER**
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**TELSEN H.F. CHOKE**
Specially selected for the 1931 Ether Searcher.
Designed to cover the whole wave-band range from 18 to 4,000 metres. Extremely low self-capacity, shrouded in genuine Bakelite. Inductance 150,000 microhenries. Resistance 400 ohms. Price 2/6 each

Advt. of Telsen Electric Co., Ltd., Birmingham.

# 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 Novel Linen Speaker

THE modified form of linen diaphragm speaker designed by the "A.W." Technical Staff has obtained a well-deserved popularity. It was found that the well-known double-diaphragm speaker owed a great deal of its efficiency to the stretching action exercised by the small diaphragm on the larger one. This led to the omission of the small diaphragm altogether, its place being taken by a Bowden wire which was pulled taut, and thus stretched the main diaphragm to the required extent.

We have received for test this week a new version of this form of speaker mounted in a cast aluminium chassis instead of the more usual wooden framework. The cone is 22 in. diameter, and is stretched taut in the manner just described, a Triotron unit being used for driving the cone. The general results were good, although probably the speaker had suffered in transit, because it did not seem to come up to the standard of the original models which we built ourselves.

The instrument, however, is neat and very light (being cast in aluminium) and will handle some 2 watts of power without overloading. The quality is pleasant, the bass being well in evidence. The speaker is made by William Williams, Alexandra Foundry, Cardiff, from whom any further particulars can be obtained.

A novel linen speaker

### New Tungsram Power Valve

THE development of speakers to handle several watts output has produced much more interesting output valves than formerly. We have recently tried out a Tungsram P430, which appears to be quite a useful valve. It has an internal resistance of 2,000 ohms with an amplification factor of 5. It will handle a grid swing of 30 to 32 volts with 250 volts on the anode, and is claimed to give an undistorted output in the neighbourhood of 1,500 milliwatts.

For a valve taking .3 amp only, these figures are particularly good. The valve is rated as an A.C. type for use in the last stage of A.C. sets, and for working off the usual 4-volt winding. In view of the low filament consumption, however, we see no reason why these valves should not be used in ordinary sets with 4-volt accumulators, when the results should be extraordinarily good.

### "Bildurone" Cabinets

CABINETS are always a matter of some difficulty to the amateur constructor. In many cases he wants to house his set and keep the dust away from it without going to the trouble of an expensive cabinet. In order to meet this demand Messrs. Eastick & Co., Bunhill Row, E.C., makers of the well-known Eelex components, have produced a series of "Bildurone" cabinets.

One of the "Bildurone" range of cabinets for the home-constructor

These are made out of seven-ply wood, and are cut to shape, so that they can be assembled with the minimum of difficulty. Brass angle-pieces are provided for the corners, and all that is necessary is to build up the back and sides on the base-board by using a few brads, and with the assistance of the corner pieces provided.

The hinged lid is then fixed in position, the front of the cabinet being occupied by the panel of the set.

**DO YOU KNOW**

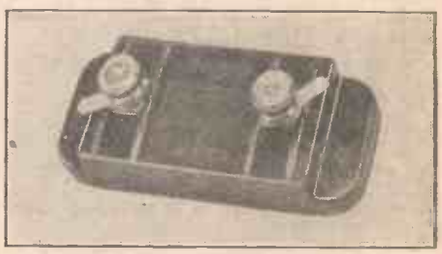
**—that cardboard is not the best material for the formers of tuning coils? It is much better to use ebonite, bakelite, or paxolin formers specially made for the job. Low efficiency and poor tuning can often be traced to the use of a coil former of incorrect material, or the use of wire with poor insulation.**

The whole operation is one which can be carried out in a short space of time, and if desired a coat of stain and varnish may be added afterwards. There is no doubt that these cabinets will appeal to the constructor.

### Bullphone Fixed Condensers

THIS week we have tested a Bullphone fixed condenser. This is of conventional form in mottled red and black moulding, the underside of which is a recess containing the condenser itself. The condenser is held in with a black sealing compound as usual, whilst two terminals are provided on the top, situated in channels which will hold grid-leak clips if necessary without permitting them to turn round.

The particular sample was rated to have a capacity of .0001, and we found on test that it was rather lower than this, only .000078.



A Bullphone fixed condenser

### Polar Ganged Condenser

THE disadvantages of the two circuits involved in each band-pass filter can be eliminated by the use of ganged condensers, the construction of which is simplified and less expensive if a common rotating spindle is used.

Such a condenser has been sent to us for test by Messrs. Wingrove & Rogers, of Liverpool. This Polar product possesses all those points of refinement belonging to the normal Polar "Ideal" condensers. The double spindle is carried on ball-bearings and the well-known Polar slow-motion device incorporated. To simplify the screening of both circuits, an aluminium plate is mounted in between the two sets of vanes.

The maximum and minimum capacities of both condensers were tested, and found to be practically the same, the difference being a matter of 2 micro-microfarads in the case of the maximum, and 6 micro-microfarads in the case of the minimum capacity. This slight difference we attributed to the presence of the screen, but in any case it is not of serious importance.

# THE SET of the SEASON

## A Special Note by The Editor

I HAVE never known a more general recognition of the merits of a set than has been accorded to the "1931 Ether Searcher." It is indeed the set of the season.

We have put the set forward with absolute confidence; we know what the set will do. We know that this three-valver is

**THE "REAL GOODS"**

It is well designed, compact, interesting in many ways, and cheap; it gives quality reproduction; it has plenty of volume and, finally, and most important of all, it is amazingly selective.

Last week we gave a general introduction to the set and presented readers with absolutely full-size drawings of the layout and wiring. This week we give all practical details of construction, reproduce the layout and wiring drawings at about half-scale for the benefit of readers who may not have seen last week's issue, and, in addition, give our readers a pictorial guide, which shows every component and contains a number of practical hints which the home constructor will be glad to bear in mind.

Next week we shall take the set to its

**FINAL STAGE**

and devote attention to the method of operating and to the results which the reader may expect and which we guarantee provided components are right and constructed correctly in accordance with published details.

Two special features next week I wish particularly to draw your attention to. Number one is an

**AUTOMATIC TUNING SCALE**

With it at hand you will be able to tune in any station within the capabilities of the set in a second or so. The scale may want in some cases slight modification by the individual reader, but very slight indeed, and this modification will consist of nothing more than tuning in very sharply a particular station and moving upwards or downwards a scale of wavelengths at the side of the dial scale—a matter of the greatest simplicity, as we shall show in a large illustration in next week's issue.

With this tuning scale and the "1931 Ether Searcher," any one of fifty stations—that is our claim, but actually the number of stations is very much larger—can be tuned in with satisfaction. This tuning scale should be hung up within easy reach of every "1931 Ether Searcher" our readers make.

Special feature No. 2 is a large scale design showing all external connections of the "1931 Ether Searcher," so that even the beginner who has built his very first set will have no difficulty whatever in completing the job.

**THE PICTORIAL DIAGRAM**

will show at a glance the connection to every external lead at the back of the set.

We know that readers who are building the "1931 Ether Searcher"—and they are a very considerable number—will find next week's issue most helpful in every way, and I wish them all the best of luck. They will have, on completing the set, something that will give them very real satisfaction.

Our next week's issue will contain many fine features in addition to those I have mentioned. It looks like being one of the most interesting we have published for some time.

***Order Next Week's "A.W." Now!***

## OUR LISTENING POST

By JAY COOTE

LATELY I have been devoting some time nightly to the Italian stations, as I find that on most evenings from either Rome or Milan a good programme is always available. Now the operatic season is in full swing, we may regularly rely on the relay of some well-known masterpiece from the Teatro Reale (Rome) or from the Scala Theatre (Milan), with, at odd dates, performances from Naples, Genoa, and Turin. The published programmes do not often give the name of the work to be broadcast, and consequently it is well worth while to ascertain what these studios are doing nightly towards 8 p.m. G.M.T.

On Mondays, by the way, from Milan you will pick up announcements in Italian, French, and English; they are given in connection with the call *"Radio Marelli-Milano."* The *Marelli* portion appears to be the name of some club or association responsible for the broadcast. They are first-class concerts to which I must draw your attention.

Radio Paris, as you perhaps know, is on the air every morning at about 7.15 a.m. with physical "jerks." As the station has to be opened for this daily feature, advantage is taken to broadcast gramophone records at 7.45 a.m. Later a news bulletin is given, and if you switch on to the station again towards 10.45 a.m. you will be able to assist at a rehearsal or *répétition générale* of the programme to be broadcast on the same evening or on the following day. You will find these rehearsals amusing if you understand French, for now and again the musical director, carried away by his enthusiasm—or otherwise!—may give vent to pungent criticisms concerning the performance of the artistes. He appears to forget that the "mike" is alive and conscientiously broadcasting his remarks to the four winds!

Just below Nurnberg you will now hear a Frenchman whose voice has been silent for some months; it is Bordeaux-Sud-Ouest (France), which has resumed its daily transmissions on 237.2 metres. I should have said "a French woman," for it is a lady announcer who does the work in the studio; she also rings a bell twice between items.

During the last week Moscow Trades' Unions, on 1,304 metres, has been making my speaker actually tremble with its terrific signals. A day or so ago I logged the opening call and was not surprised to learn that the station was transmitting with a power of 165 kilowatts *in the aerial.* On International nights it gives its address as Radio Central, Palace of Labour, Solianka, Moscow. And now I also learn that Leningrad intends to erect a 500-kilowatter to be used for the same pernicious brand of propaganda. Something to think about!

Kaunas (Kovno) also intends to increase its power, but its aim is a peaceable one. Arrangements are being made to exchange programmes with Koenigsberg, Riga, and Reval (Tallinn). On favourable nights on the south coast of England I can hear the Kovno entertainments fairly well.

## WHERE TO SEE THE "ETHER SEARCHER"

READERS will be interested to know that special arrangements have been made for the "1931 Ether Searcher" to be seen at principal centres all over the country.

In London the set may be seen in special displays in the Charing Cross Road windows of Messrs. Mullard Radio Service, and in the Somerset Street windows of Messrs. Selfridge & Co., Ltd. In addition, the set may be examined in the Radio Department of Selfridge's, and members of the "A.W." Technical Staff are giving special demonstrations of the set at the AMATEUR WIRELESS Stand in the Radio Exhibition being held this week on the fourth floor of the Selfridge building.

"Ether Searchers" may also be seen in the windows of Messrs. Lewis, in Liverpool, Manchester, Birmingham, and at Lewis' Royal Polytechnic, Ltd., Glasgow.

Very many of the manufacturers who are advertising in "A.W." components for the "Ether Searcher" have also arranged demonstrations of the set at their premises.

## BALLAST RESISTANCES

THE baretter or ballast resistance is used with valve battery-charging units to smooth out any voltage fluctuation in the supply mains. It usually consists of a fine iron wire mounted inside a glass bulb containing hydrogen, the whole being placed in series with the filament of the rectifying valve. The resistance of the iron wire increases with temperature, so that any sudden change in the mains voltage, tending to increase the current flow, is automatically checked. This stabilises the amperage fed to the filament of the rectifier.

M. B.

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


***A POPULAR TURN***

***THE SATURDAY INTERVALS***

***FAT STOCK PRICES***

***BROADCASTING HOUSE***

WITH the best will in the world, I do not seem to be able to catch up with my correspondence; although I am always delighted to hear from readers, since it helps me in understanding their point of view.

Two letters, however, I ought to mention. One from a keen advocate of Esperanto, who thinks the B.B.C. ought to do a little more to help "this universal language." For the moment, however, Esperanto is one more language rather than universal.

◆ ◆ ◆

THE other letter comes from the inevitable "regular reader," headed S.E. London, patting Jack Payne on the back. "Jack Payne and/or his Boys can sing as well as any other dance band."

My correspondent, however, agrees that they play and sing the same as every other band does. This is exactly what I complain about. The argument is that Jack has a different kind of audience from that of the ordinary dance band, since he has to broadcast a programme to please the dancer and the non-dancer.

◆ ◆ ◆

Violet Essex and Tucker, who is her husband, are certainly very popular and, unless I heard wrongly, one of the only turns who got away with an encore.

Violet certainly can sing, but what has happened to Tucker's violin? And as regards encores, *they must be strictly forbidden.*

◆ ◆ ◆

I thought I would have a full week-end listening. On Saturday, however, when I had settled down after lunch I found there was the usual full stop at two o'clock. Why? Hardly seems reasonable, does it?

◆ ◆ ◆

On Sunday I listened to Walter Widdop singing the aria "Sound an Alarm" from *Judas Maccabeus* (Handel). Walter certainly gets the top notes, and really there is nothing to sound the alarm about, as is sometimes the case when a tenor becomes ambitious! How few really good tenors there are!

◆ ◆ ◆

Is the Wireless Military Band becoming more military—or brassy? Either my ears deceive me or Mr. O'Donnell changes the composition and balance of his band sometimes. The beautiful "Maid of Arles" suite sounded at first too staccato and precise. But later the brass was less in evidence. Oh, reader, how I hate brass!

◆ ◆ ◆

I also listened and enjoyed the violin recital by Eda Kersey at half-past three. But—this complaint is yours and mine of old—why need we have waited till this hour for English transmissions? One day I must look up my old notes to see when we first tackled this problem. We certainly must persevere, and if necessary bring the big guns to help us.

◆ ◆ ◆

At the same time, I must add that I like the programme arrangement whereby when one nears the end of the London Regional programme it is possible to turn back, as I did, to the National programme for a little more light music. I heard Olga Haley whose singing always charms me. Her selection of songs, too, is assuredly not hackneyed. I never want to hear two more delightful songs than "Lullaby" (Cyril Scott) and "So We'll Go No More A-Roving" (Maud Valerie White). Or sung better either!

◆ ◆ ◆

I do not think that, as a rule, singers with colds should perform, and the preliminary excuse always strikes me as lame. Mr. Herbert Thorpe, however, put up a valiant fight against an obvious handicap, and came out well.

◆ ◆ ◆

Mr. W. W. Cash, secretary of the Church Missionary Society, in the World's Evangelical Alliance Service started in fine fettle in his address; but, alas, it developed into a lengthy and over-emphasised harangue! The general service, however, was good.

◆ ◆ ◆

Marjorie Bowen's "A Family Group" was, as I expected, amusing as a skit on what some of us were in Victorian times. I wonder, however, if the younger people enjoyed it as much as the older people.

◆ ◆ ◆

I somehow don't care much for Melville Gideon's familiarity in broadcasting. He gives the impression of vanity, which is fatal to popularity.

◆ ◆ ◆

Feeling depressed the other night, I switched on in order to hear the fat stock prices. It bucked me up immeasurably. Lots of listeners don't seem to realise that this is one of the funniest items of the day. And we unfarmerlike listeners may still laugh, even if the prices go up *or* down.

◆ ◆ ◆

Welcome once more to *A Sister to Assist 'er*, one of the few funny masterpieces that never seem to grow stale. I always felt, when Fred Emmery died, that the loss of the master impersonator would make it impossible to enjoy the play again. But Vernon Watson is a worthy successor.

◆ ◆ ◆

They invited me to see Broadcasting House in the making. And in a mood of weakness I went. The chief civil engineer delighted in making me climb up ladders from floor to floor! Eventually I banged my head on a piece of scaffolding, and it is by merest providence that your own critic is alive to tell the tale. I hear that, judging from the new building, we are in for more studio claques—multiplied a hundred-fold.

◆ ◆ ◆

The metronome, or clock system, of marking the intervals is not the success one had hoped it would be. One of my friends describes it as "Chinese torture". Another friend counted 200 signals during an interval. Surely this is unnecessary. Instead of being second ticks, why not a tick per three or four seconds?


**Lissenden's impression of Elizabeth Pollock**

# MORE ABOUT The "1931 ET

## THE SET GUARANTEED

DESIGNED BY J. SIEGER

RECEIVES FIFTY STATIONS ON THE SPEAKER

FIRST details were given last week of the construction of the "1931 Ether Searcher." In this week's issue we introduce a new idea in presentation. The set is shown in a large pictorial layout, with various pointers of construction. If the reader builds the set, using both the full-size wiring diagram, given last week, and the pictorial diagram, he will find that as he constructs and wires it he will have a constant check on his work.

There is a point to note about the fixing of the foil covering the baseboard. Most firms supply the foil ready cut to size, 15¾ in. by 9¾ in. This is laid on the baseboard, with a space of ¼ in. round the edges. If the foil obtained is in the standard size of 16 in. by 10 in., then it is advisable to cut it to the smaller size. It is held in position only by means of the components placed on it.

### Simplified Wiring

When fixing the foil, take great care to see it does not bulge up over the panel end of the baseboard, as this might cause a short-circuit with one of the components on the panel. If a bulge is unavoidable, then two or three thin nails will prevent any chance of a short circuit.

The simplified system of wiring should appeal to all constructors. First cut the insulated sleeving to the lengths shown on the free full-sized wiring diagram. The tinned copper wire should then be cut approximately 1 in. longer than the sleeving and a loop made at one end. This loop is placed over the terminal of the component being wired and screwed down. The sleeving can now be slipped over the wire and the end looped and fixed to the other terminal.

It will be noticed that some of the wires shown in the diagram are numbered more than once; this shows that other wires are of exactly the same length.

The full-size constructional plan given last week is a great help in making the connections. To use the plan correctly, unpin the two double pages on which it is printed and place one above the other so that the wiring coincides. It will be noticed that the wires are numbered twice here to avoid confusion and, in addition, two sets of arrow heads are shown, which should coincide. It should be noted that only one .0003 condenser is mentioned in the list of components; two are used, but one is incorporated in the centre coil.

When the wiring of the baseboard components has been completed, the condenser is fixed into position. There are only three

Another type of cabinet incorporating a loud-speaker

### *COMPONENTS REQUIRED*

**Ebonite panel, 8 in. by 6 in. (Becol, Trelleborg).**
**3-gang .0005-mfd. variable condenser with drum dial (J.B. "Chassimount," Lotus, Polar).**
**.0003-mfd. variable series aerial condenser (Readi-Rad, Brookmans type; Lotus).**
**.0001-mfd. variable reaction condenser (Readi-Rad, Brookmans type; Bulgin, Lissen, Lotus, Burton).**
**Set of three matched coils with ganging switch (two Colvern type TGSC, and one type TGSR).**
**Low-frequency transformer (Telsen, 5-1 Ace, Lissen, Varley, Ferranti, R.I., Burton).**
**On-off filament switch (Bulgin, junior; Junit, Lissen, H. & B., Benjamin, Readi-Rad).**
**.01-mfd. fixed condenser (T.C.C. flat type, Lissen, Dubilier, Watmel**
**.0002-mfd. fixed condenser (T.C.C., SP type; Lissen, Dubilier, Watmel,**
**Three valve holders (Telsen, Junit, Lotus, Benjamin, W.B., Clix).**
**.0002-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Watmel**
**.0003-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Watmel**

A comparison of this plan view sho and wiring diagra

# THER SEARCHER"

## TO MEET PRESENT-DAY CONDITIONS.

wires to be connected to the fixed plates of the condensers; these are Nos. 32, 33, and 34. The moving plates are connected in common to the spindle and frame and are earthed, via the fixing brackets, to the metal foil on the baseboard.

### Baseboard Connections

Before putting on the battery flexes, just a word on the correct way to fix the wires under the components for the negative connections. There are six of these wires, and the first to put on is No. 6. This connects the filaments of the detector and power valves to earth. Fix one end of the wire to the valve-holder terminal and loosen the fixing screws. Remove the screw nearest the edge of the baseboard. Now loop the end of the wire and place it between the valve holder and metal foil, then replace the screw so that it passes through the centre of the looped wire. The same procedure is carried out for the other five wires, Nos. 11, 15, 22, 29, and 30. The last is, perhaps, a little difficult, as the wire has to be passed between the coil base and the lid of the coil screen.

### Battery Leads

Now put on the various flexible leads. The first to put on is the screen-grid anode connection. This consists of a piece of rubber-covered wire, about 6 in. long, bared at both ends. One end is made into a loop and placed under the terminal of the fixed condenser. The other end goes to the anode of the screen-grid valve. In order to prevent H.T. "shorts" between the bare end of this wire and the metal valve screen, a Belling-Lee insulated screen-grid connector can be used.

Now for the battery connections. Number 31, the L.T.+ flex, is already fixed (that is if you have wired according to numerical order) and No. 36, the H.T + 3, lead should be put on. These leads should be cut so that about 18 in. of wire protrudes from the edge of the baseboard. Numbers 37, 38, and 39, L.T.—, H.T.—, and G.B.+ respectively, are fixed under a washer and screwed to the foil-covered baseboard.

When all wires are in place, connect wander plugs and spade tags to the ends and twist the various groups of leads together; H.T., L.T., and grid-bias leads in separate plaits. These can be easily twisted by hand and kept tight by means of small pieces of insulating tape tied at each end.

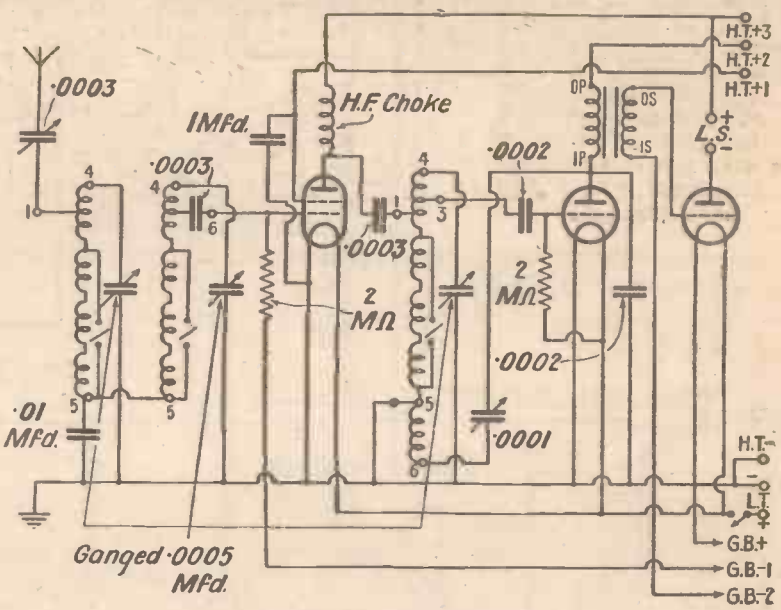
In all, the "1931 Ether Searcher" should not take more than about four hours to make.

It remains only for the set to be connected up and a preliminary test given. The detailed operating notes will be given next week.

### Valves

Place into their respective valve holders the three valves. The valves may be chosen from the following: Screen-grid—Cossor 220SG, Marconi S215, Osram S215,

(*Continued on the next page*)




The circuit of the "Ether Searcher"

uld be made with the layout
m overleaf

### COMPONENTS (Continued)

1-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Filta).
Two 2-megohm grid leaks (Lissen, Dubilier, Watmel, Ferranti).
Grid-leak clips (Bulgin, Wearite, Ferranti).
Three coil screens (H. & B., Readi-Rad, Colvern).
S.G. valve screen (H. & B.).
High-frequency choke (Telsen, Varley, Readi-Rad, Lissen, Bulgin, Sovereign, Tunewell, Lewcos, Burton).
Aluminium foil sheet, 15¾ in. by 9¾ in. (Readi-Rad, H. & B., Parex).
Two terminal blocks (Junit).
Four terminals, marked L.S.+, L.S.—, A, E (Belling-Lee, junior; Clix, Eelex, Burton).
Seven wander plugs, marked H.T.+3, H.T.+2, H.T.+1, H.T.—, G.B.+, G.B.—1, G.B.—2 (Belling-Lee, Eelex, Clix).
Two spade terminals, marked L.T.+, L.T.— (Belling-Lee, Eelex, Clix).
Insulated sleeving (Lewcos, H. & B.).
Cabinet (Clarion, Camco, H. & B., Readi-Rad).
2-volt accumulator (C.A.V. 2AG11).
120-volt high-tension battery (Fuller, "Sparta").
16-volt grid-bias battery (Fuller, "Sparta").

A rear view of the Carrington cabinet showing how the speaker and set are housed

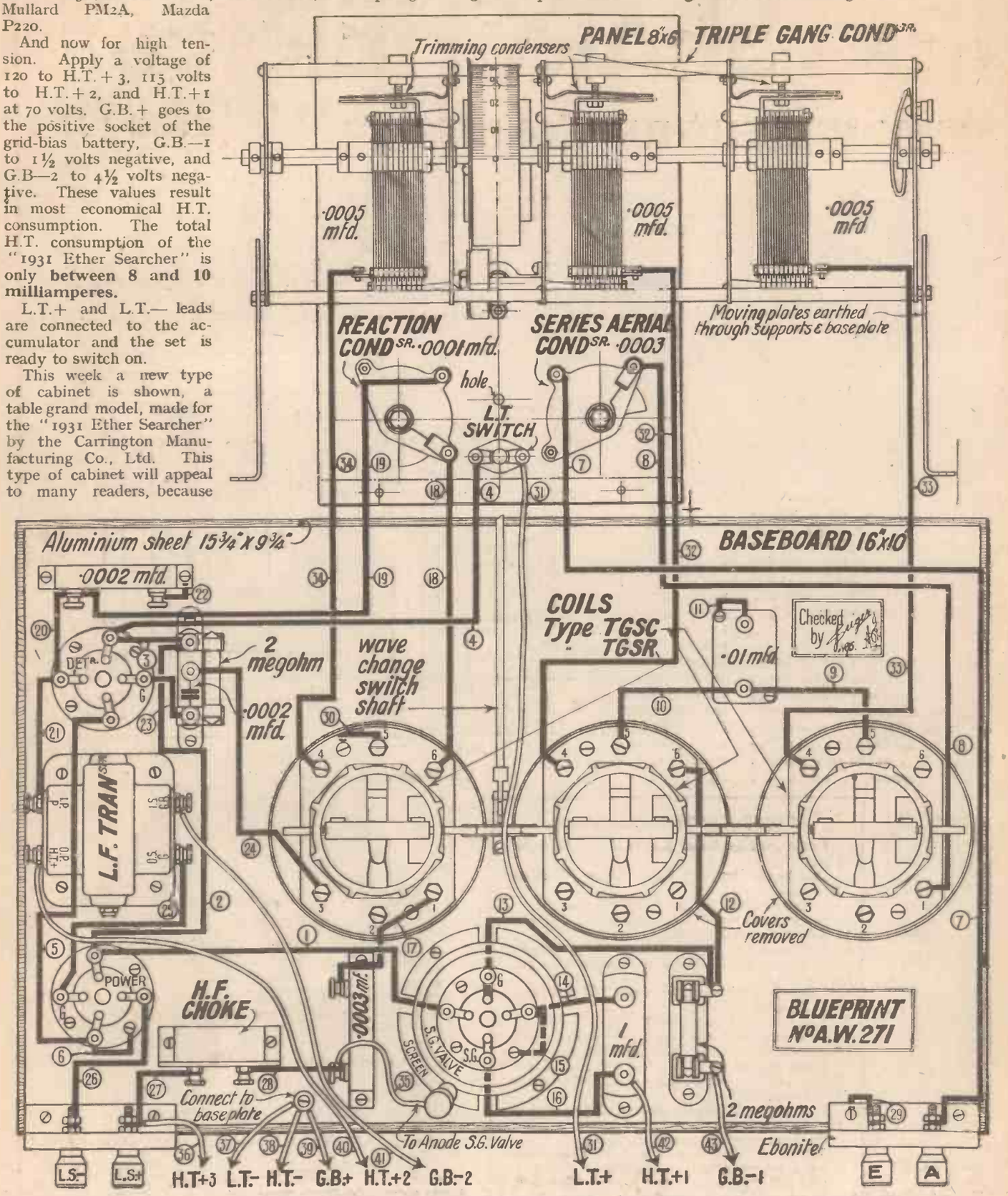
Mullard PM12, Mazda 215SG. Detector—Mullard PM2DX, Cossor 210 Det, Marconi L210, Mazda L210, Osram L210. Power—Cossor 215P, Marconi LP2, Osram LP2, Mullard PM2A, Mazda P220.

And now for high tension. Apply a voltage of 120 to H.T.+3, 115 volts to H.T.+2, and H.T.+1 at 70 volts. G.B.+ goes to the positive socket of the grid-bias battery, G.B.—1 to 1½ volts negative, and G.B—2 to 4½ volts negative. These values result in most economical H.T. consumption. The total H.T. consumption of the "1931 Ether Searcher" is **only between 8 and 10 milliamperes.**

L.T.+ and L.T.— leads are connected to the accumulator and the set is ready to switch on.

This week a new type of cabinet is shown, a table grand model, made for the "1931 Ether Searcher" by the Carrington Manufacturing Co., Ltd. This type of cabinet will appeal to many readers, because the batteries and speaker can be housed in it. The speaker we have used in this cabinet consists of an Ormond unit with a diaphragm of greased parchment. It is 8 in. in diameter and is supplied by Kone Dope.

Next week will be given detailed operating notes and station logs.




**Here is a reduced reproduction of the layout and wiring diagram of the "1931 Ether Searcher." Full-size prints of this amazingly selective three-valver were included in last week's issue. For readers who did not obtain that, a full-size blueprint is now available which can be obtained from these offices, price 1/-**

## THE HOW AND WHY OF RADIO

# XX—CIRCUITS SIMPLY EXPLAINED

## THE LOW-FREQUENCY STAGE

***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***

BECAUSE the high-frequencies of a wireless signal are always by-passed at the detector stage, all amplification following the detector has to do with low frequencies. Circuits for low-frequency amplification are quite simple to understand, especially if dissected in the way shown by this week's diagrams.

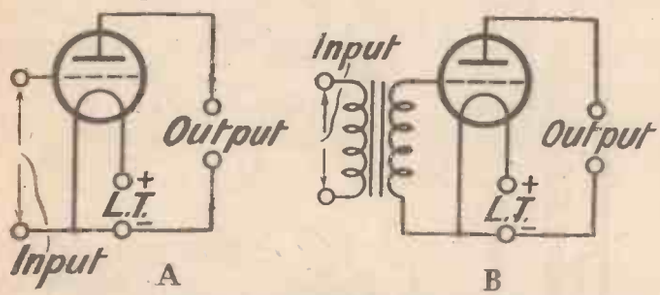



Fig. 1 (A). A skeleton valve amplifying circuit. (B) Transformer coupling arrangement for L.F. valve

Obviously, we cannot connect the output of the detector directly to the input of the amplifying valve. If we did that the anode voltage of the detector would be applied to the grid of the amplifying valve —and that would upset the whole apple-cart.

At Fig. 1B is shown how the low-frequency valve can be coupled to any desired input. The intermediary is a low-frequency transformer, consisting of a primary winding insulated from a secondary winding, both windings being wound over a centre core of iron. The primary goes to the input and the secondary forms the grid circuit of the low-frequency amplifying valve. One end of the winding goes to the grid itself and the other end to low-tension negative.

In this way the amplifying valve is separated from the battery potential applied to the preceding valve. Only low-frequency signals are able to flow from primary to secondary. If this secondary has more turns of wire than the primary, a step-up in the transferred signal voltage is obtained.

Thus from the point marked input at Fig. 1B to the point marked output, the total amplification depends upon the turns ratio of the transformer and upon the amplification factor of the valve. A simple example: amplification factor of 20 and turns ratio of three gives a theoretical overall amplification of 60.

Last week I explained that for high-frequency amplification it is easy to consider a high-frequency amplifying valve as intercepting two separate tuned circuits. In low-frequency amplification it is easier to consider the low-frequency coupling as intercepting two valves. So at Fig. 2 we see the valves connected on each side of a transformer coupling.

Note that the primary forms the anode circuit of the detector valve, from the anode, through the primary, to high-tension positive. Note also that the secondary forms, as at Fig. 1B, the grid circuit of the low-frequency amplifying valve. This grid circuit goes from the grid, through the secondary winding and through a grid-bias battery to negative low tension. The grid-bias battery applies a negative voltage to the grid; negative, that is to say, with respect to the negative end of the filament. Low-frequency valves have to be so biased to handle without distortion the large signal voltages developed by preceding valves.

(Continued on page 164)

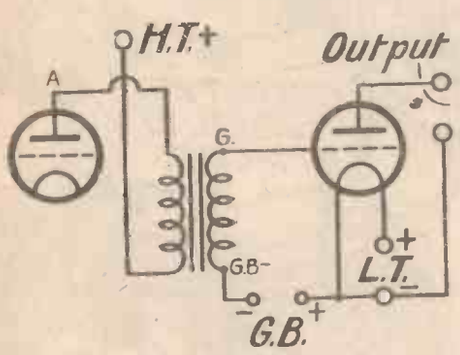



Fig. 2. Two valves coupled by transformer

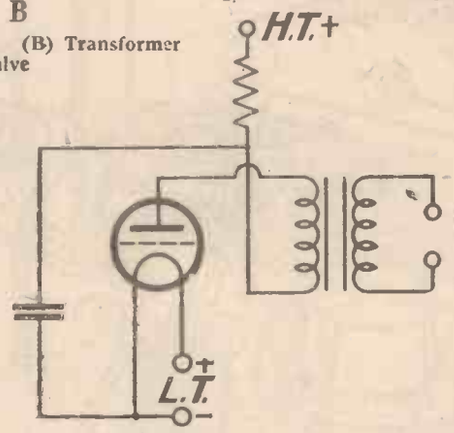



Fig. 4. How a de-coupling arrangement is incorporated

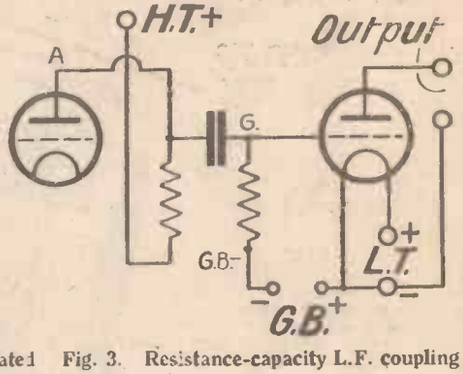



Fig. 3. Resistance-capacity L.F. coupling

Starting at Fig. 1, a skeleton valve amplifying circuit is shown at A. The signal is applied to the input of the valve and an amplified version appears at the output. The input is the grid circuit of the valve, the path between the grid and low-tension negative. The output is the anode circuit of the valve, from the anode to low-tension negative, through the high-tension supply, which is not shown.

A signal applied to the input of the valve at Fig. 1A would be amplified by an amount depending upon the amplification factor of the valve. The overall amplification from input to output could not be more than the rated amplification of the valve. Due to various losses it would always be something less.

As the valve in question is supposed to be a low-frequency amplifier it must be preceded by a detector valve. The question then is how to couple this amplifying valve to the preceding detector valve.

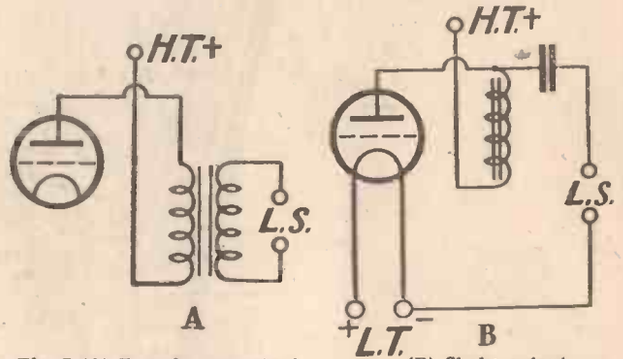
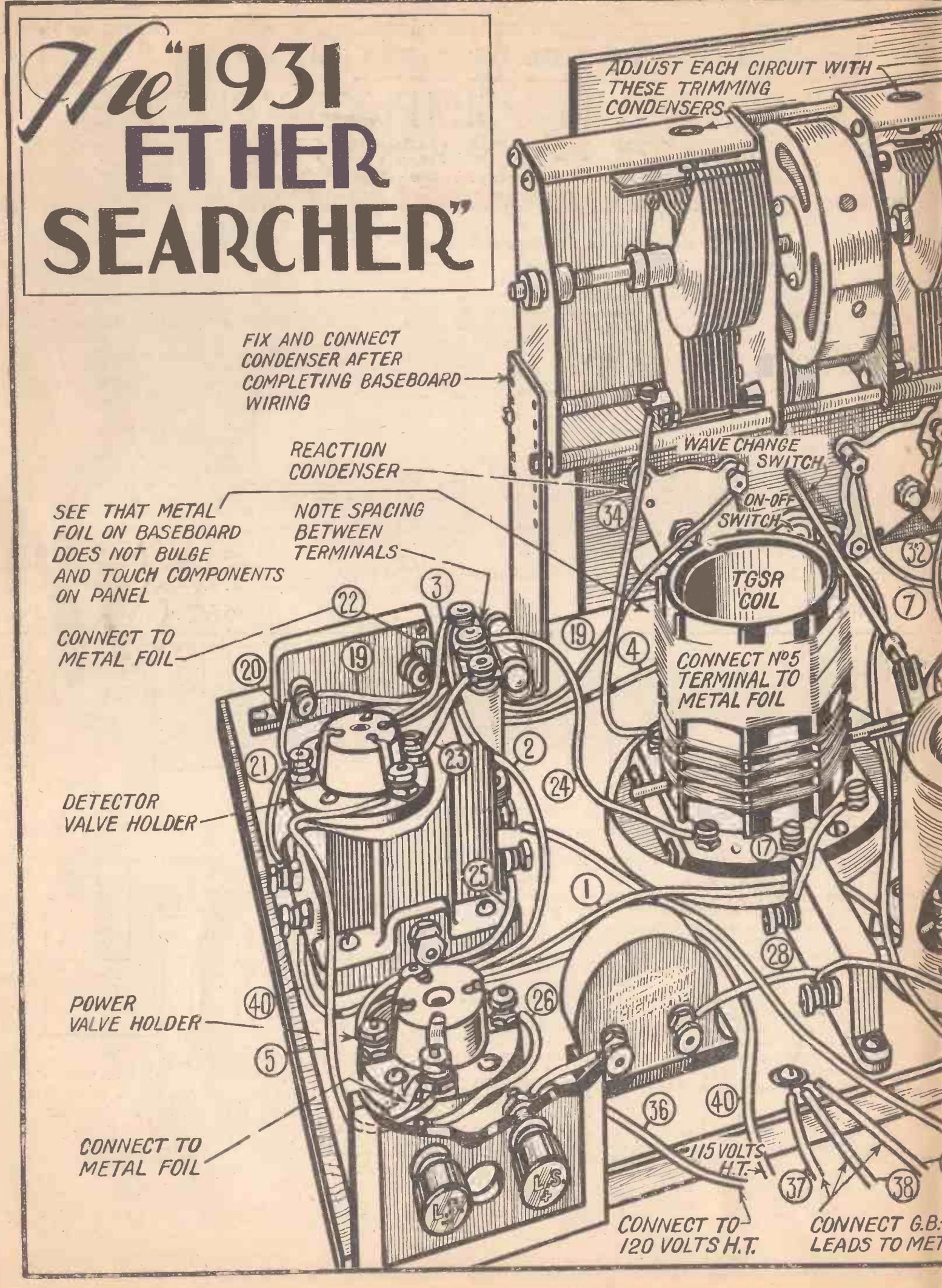


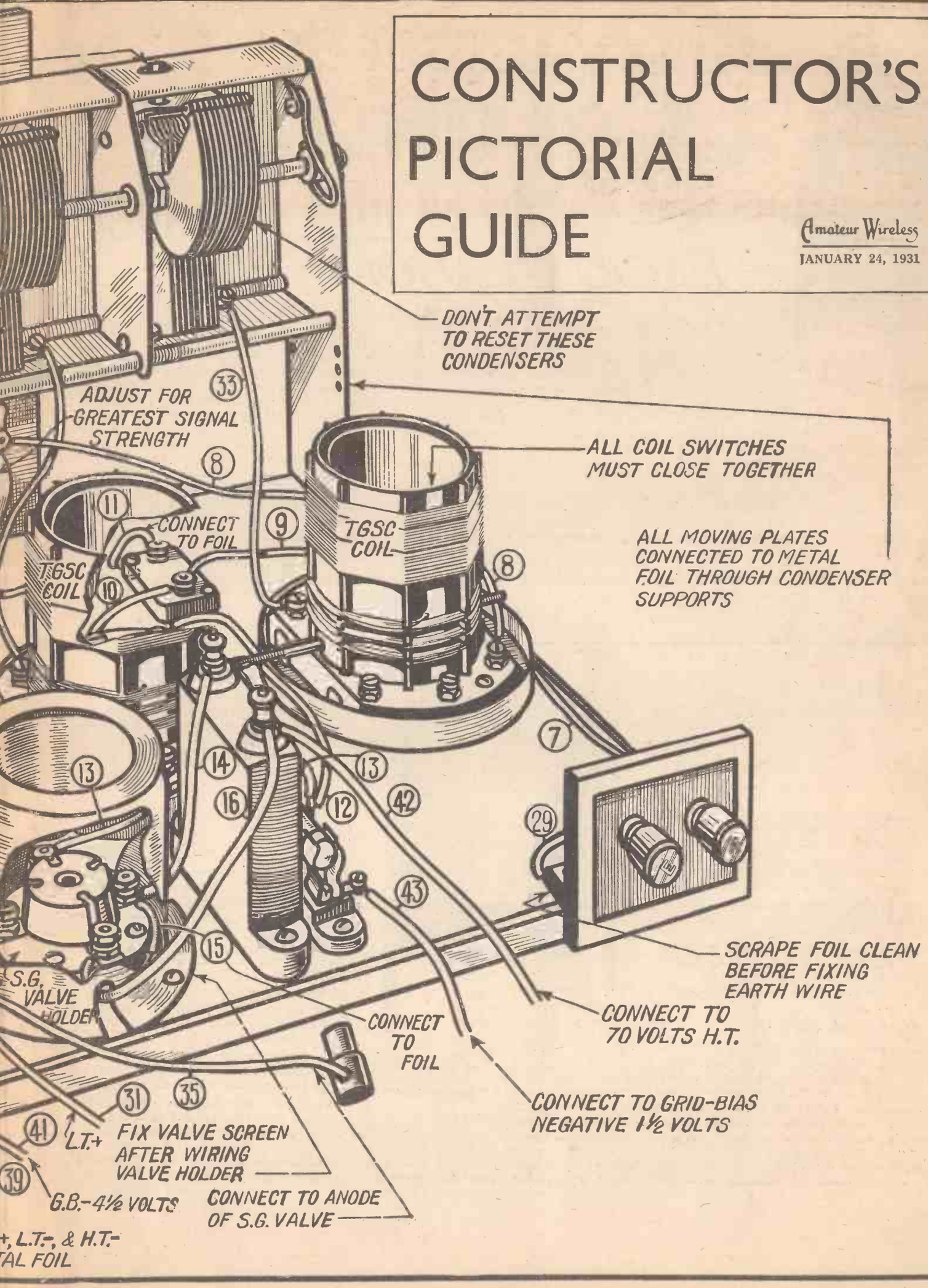

Fig. 5 (A) Transformer output (B) Choke output

# The "1931 ETHER SEARCHER"



# CONSTRUCTOR'S PICTORIAL GUIDE

Amateur Wireless
JANUARY 24, 1931



SETS OF DISTINCTION

# The COLUMBIA MODEL 310 RADIO GRAMOPHONE

*Makers: Columbia Graphophone Co., Ltd.,*
*Price: Oak, 40 gns. Mahogany, 43 gns.*

RADIO-GRAMOPHONES, by which are meant instruments capable of reproducing broadcasting programmes and gramophone records, are now available for the man in the street. Prices within the last year have come down with a run. As an example of value for money I find the Columbia model 310 hard to beat. The makers recently asked me to call at their public show-rooms at Clerkenwell Road, E.C.1, where the new 40-guinea Columbia radio-gramophone could be seen and heard. I went, saw, and was conquered by the delightful tone and simple layout of this new machine. Two different cabinets are available, a robust oak model for 40 guineas and a more ornate mahogany model for 43 guineas.

### The Circuit

It is a point of interest that this Columbia radio-gramophone is just half the price of the original Columbia radio-gramophone. But in spite of the popular price of model 310, I could see no evidence of undesirable economy, either in material or workmanship.

The basic circuit is on the lines of the popular Columbia model 307 table-cabinet set. It is a three-valver with a screened-grid high-frequency amplifying valve, tuned-anode coupled to the detector valve, which is transformer coupled to a super-power output valve. All three valves are required for the reception of radio programmes. For reproducing gramophone records the grid circuit of the detector valve is intercepted by a gramophone pick-up, so that the detector valve becomes the first stage of a two-valve gramophone amplifier.

### A Moving-coil Speaker

The eight-watt power valve drives a self-contained moving-coil loud-speaker. This is not one of the permanent-magnet types, but derives its exciting current from the U8 rectifying valve employed to deliver high-tension current to the anodes of the receiving valves.

Further evidence of the advance design of this radio-gramophone is the inclusion of an induction electric motor to drive the gramophone turntable, which is fitted with a fool-proof automatic stop. The standard Columbia gramophone pick-up is used.

It did not take me long to realise that this Columbia radio-gramophone is not merely a three-valve set with a few accessories for playing gramophone records. There are many signs that the makers are fully alive to the many possibilities for refinement. For example, on the gramophone motor board is a power switch, which over the normal range is adjusted to give full loading of the power valve without blasting, for all loud-cut records. To maintain the full output on softly-cut records, and for still greater power with loud-cut records required for dancing, an extra power range can be brought into use.

The Columbia 310 in a mahogany cabinet

The general layout of the controls for radio is similar to the Model 307 table-cabinet set. Two thumb-operated dials occupy the centre position on the escutcheon plate mounted above the opening of the loud-speaker. These dials are illuminated. The right-hand dial is marked in wavelengths, between 225 and 540 metres, in steps of 25 metres, and between 1,000 and 1,900 metres, in steps of 100 metres. The left-hand dial is not calibrated in wavelengths, since it is intended that this control be adjusted independently. As the two dials are fitted side by side the two tuning circuits associated with the tuning condensers controlled by these dials can be simultaneously varied.

Below the main tuning controls are two small knobs. The left-hand knob is called an intensifier and can be used to increase or decrease the strength of incoming signals. If the incoming signal is too weak to be brought up to good strength at the maximum setting of the intensifier, the reaction knob on the right can be used as an additional booster.

A very useful fitting is to be found at the top left-hand side of the cabinet, where a knob provides a variable aerial coupling for increasing the selectivity. I found this device highly satisfactory in cutting out the local stations.

### A Good Bag of Stations

During an evening's test of the set embodied in this radio-gramophone, I was able to get as many as 20 stations with the greatest ease in operation. This easy handling was also notable when changing the gramophone record needle, when switching over from radio to gramophone and when adjusting the speed of the motor.

My audition convinced me that the very best possible quality was being obtained from the super-power output valve. I must confess I was surprised at the considerable volume obtained during gramophone reproduction. The average family would certainly not need a greater output, even for dancing.

This machine is suitable for A.C. or D.C. mains operation and the mains can be used as an aerial if desired.

To get the best results from the radio side of Columbia model 310 an external aerial of moderate efficiency is needed, although for the reception of the local station there is a sufficient reserve of power to enable the mains aerial to be used.

SET TESTER.

# GUARANTEED ACCURATELY MATCHED BY READY RADIO

The 1931 Ether Searcher incorporates 3 tuned circuits with 3 tuning condensers all operated by the same knob. This method of tuning can only be successful if each circuit is identical. Both coils and condensers must be accurately matched. With accurately matched circuits as many as 50 stations have been received.

*Mr. J. Sieger—designer of the 1931 Ether Searcher—personally tested the Ready Radio Matched Kit at the "Amateur Wireless" Laboratories.*

The 1931 Ether Searcher is capable of giving such excellent results that Ready Radio have set up a special department at their Works where all 1931 Ether Searcher Kits are accurately matched and guaranteed before dispatch.

The importance of using accurately matched Kits cannot be too greatly stressed. Therefore order from Ready Radio and be sure of getting guaranteed accurately matched components.

**Ready Radio**

**159, BOROUGH HIGH STREET, LONDON BRIDGE, S.E.1**

**FULL LIST OF PRICES ON PAGE 155**

# IN MY WIRELESS DEN

## WEEKLY TIPS— CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

### Some Faulty Parts

IN spite of the necessity for good insulation in the parts used in both high- and low-frequency circuits, we seldom have trouble.

I have lately had a case, however, of poor insulation of the windings of an intervalve transformer. The set was noisy and I soon found that the transformer was at fault. The two windings were not very well insulated, with the result that a leakage was occurring and producing the noises heard.

Now a leak from the secondary winding to the core or to the primary may, quite apart from the production of noises, affect the quality. With a ½-megohm grid leak connected across the secondary coil, for example, the volume may be reduced and the quality be affected.

If there is a rise in the output of the transformer at the higher frequencies, this will be reduced. Some transformers are very sensitive to leaks across the secondary terminals. It is the best practice to reckon on a definite load across the secondary and, if necessary, to provide this in the form of a high resistance. In ordinary wireless practice this is not done, however.

### Tracing those "Strays"

A neat way of showing the presence of high-frequency oscillations in a low-frequency power stage was demonstrated by the Mullard people at the recent exhibition of the Physical Society.

A power stage having two valves was used, the anode currents being indicated by meters. The input transformer had connected to it a 4-volt battery and a key, and when the circuit was closed the voltage was suddenly applied to the input of the amplifier.

Near the power valves was a loop of copper having in series with it a flash-lamp bulb and a small condenser. When the key was pressed the bulb glowed and the anode-feed current increased, showing the presence of H.F. currents. The circuit with the bulb had a frequency of about 100 megacycles.

High-frequency oscillations will cause much trouble quite apart from spoiling the quality of the reproduction. The valves may soon be destroyed and the output transformer or filter circuit may be broken down. To avoid this trouble, a resistance of about 100 ohms may be connected in the anode circuit of each valve, quite close to the anode, or 5,000 ohms in the grid leads.

### Grid Leaks for L.F.

It is becoming a common practice to connect in the grid lead of the first low-frequency valve a grid leak of about 1 megohm.

When this valve happens to be a pentode, it is possible that this value of 100,000 ohms is on the high side. A pentode is very different from ordinary power valves in its grid circuit characteristics and a lower value might well be used.

By the way I have noticed that pentodes have a way of blue-glowing during use. The ones I am referring to are the indirectly-heated types, run from the mains.

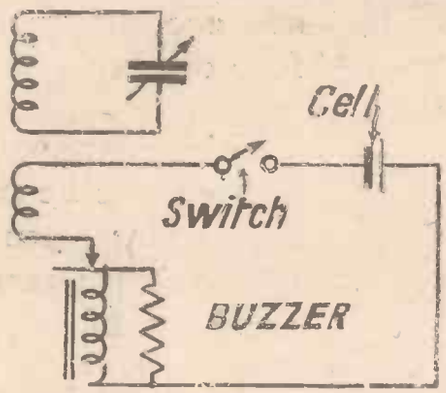
These valves are pumped very hard, that is, they are evacuated very well and the blue glow appears about the inner surface of the anode.

I notice that a momentary strong signal increases the glow, but does no harm.

### A Handy Wavemeter

A buzzer-excited tuned circuit is useful for testing. You can easily make up an outfit which will tune fairly sharply and be no trouble at all.

The connections are given in the diagram




**This is the circuit of the handy wavemeter referred to in the accompanying paragraph**

above. We have first the tuned circuit proper, comprising the coil and adjustable condenser. This circuit may have any type of plain coil and the condenser may be of .0005 microfarads.

Coupled to the coil is the buzzer circuit. A good high-note buzzer should be used; one can often be picked up cheaply. Then there is the battery and switch.

The strength of the oscillations and the sharpness of tuning depend upon the tightness of the coupling of the circuits, and the coil connected to the buzzer ought not to have too many turns or be too close to the main tuning coil.

You can easily find by experiment how many turns are needed. If the main tuning coil is a single-layer one, then the buzzer coil can be wound against one end of the winding. A rough calibration is easily obtained by listening to known stations and noting the setting of the tuning condenser at the point of tune.

### For Best Results

The necessity for care in making circuit adjustments if the best range and selectivity are to be obtained is well known. With a screen-grid stage, for example, the maximum amplification is obtained when the aerial circuit is practically oscillating at the same time as the anode circuit.

It therefore follows that the screen and anode voltages of the valve ought to be carefully adjusted. The more the magnification to be obtained before oscillation commences, the greater will be the total amplification, obviously.

Thus it follows that good shielding and the use of proper by-pass circuits is essential. Grid bias is not always necessary, but a .9-volt dry cell may often be used with advantage. A bias of —1.5 is often rather too much for battery valves, but —.9 is about right, and besides improving the selectivity, reduces the anode current.

### Some "Dud" Frame Aerials

I am afraid that some amateurs consider that any old thing will do for a frame aerial. They take a framework of wood, wrap on a few turns for the medium wavelengths and some more for the long waves.

This will not do, of course. The frame aerial is the collector and you cannot magnify what it does not collect. It pays to wind a good frame and in this connection the possible effect of the long-wave part upon the medium wave must not be overlooked.

When the long-wave part is shorted out by means of a switch, as it usually is, its natural wavelength may just happen to lie somewhere within the medium-wave range. At this point the medium-wave tuning will be poor and signals weak. If reaction is applied directly to the frame you will discover that it cannot be made to oscillate at about this point.

When the long-wave winding is placed in parallel with the medium-wave the results may be much below those obtained with the long-wave part removed. Here, again, then, great care must be taken.

If possible, tests should be made against separate frames, for then serious defects will the more readily be discovered. It is surprising what fine wire can be used for the long-wave winding, but mechanical considerations limit the degree of fineness to which you may go.

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### American Reception

SIR,—In a recent issue of AMATEUR WIRELESS, the note by "Thermion" on the mystery of the American medium-wave stations aroused my curiosity and prompted me to try for them.

Using a standard S.G. "three" of well-known make, I counted no fewer than thirty-five American stations on the medium band at strengths varying from weak 'phone to fair L.S. The only alteration to the set is the addition of a tuned aerial circuit. This seems to be absolutely necessary to get the best out of the set, the long-wave side being useless without it.

On the ultra short-wave band during the same period, 1 a.m. to 3 a.m., reception was hopeless, and with the exception of a station at Winnipeg on about 35 metres, nothing else of note was received.

All the stations were checked by means of the name of the station being called.

H. F. (Manchester).

### More Americans

SIR,—In "Thermion's" notes in AMATEUR WIRELESS recently he says he has had "not a whisper" of the medium-wave Yanks. He will, no doubt, be interested to hear that on returning from a New Year's Eve dance I switched on at 2 a.m. and received an American station on about 395 metres. At 2.15 the announcer gave out the name of the station, which I did not catch; he mentioned New York and the N.B.C. Then started a sponsored programme with the notes "Doh, soh, me, doh, doh, me, soh, doh," consisting of cross-talk and songs by two comediennes —one calling the other Molly.

The station faded slowly and at its best was a medium speaker signal, with little atmospherics.

My set is an electrified version of the "1930 Ether Searcher."

F. T. D. (Swansea).

### Power-grid Detection

SIR,—I have considered building the "Challenge Four" receiver, but before doing so I thought of using power-grid detection in place of that illustrated. One reads so much of this new form of detection that I wonder it was not incorporated by the designer. Can you explain whether this form of detection would be an advantage or not? F. R. (London).

Before deciding upon power-grid detection, it is necessary to consider both the input and output energies which will be available in the receiver. The input signal must be of sufficient amplitude to operate the power-grid detector valve satisfactorily and the output signal from the anode of this valve must not be so powerful that it will overload the grid of the power valve. In the case of a receiver which is designed for local station and distant station reception, the amplitudes of signal energy dealt with vary so much that it is not wise to attempt power-grid detection. On one transmission you might not be getting sufficient energy to operate the detector properly, and this would give rise to detector distortion, whilst on a powerful or nearby transmission you might be getting so much signal energy you would overload the power valve grid and get L.F. distortion. Power-grid detection is to be recommended in sets where a definite amplitude of signal energy is being received and where large outputs, for operating moving-coil speakers in large halls, are to be dealt with. —ED.

### The "All-wave High-mag. 3"

SIR,—Using the "All-wave High-mag. 3" set, with a few minor alterations, I was able to receive the London Regional programme about 100 miles north of St. Vincent and later I again received London when 60 miles north of Fernando-Noronha, off the Brazil coast. The distances are 2,300 and 3,700 miles respectively. The distance and places can be verified by the ship's position.

I have used many screen-grid sets, but with not as good results.

New York in B.A. comes in fairly well.

A. B. (*M. Y., Gascony*).

### Logging the Stations

SIR,—With reference to the letter from "E. G. S.," it is puzzling why he should be dissatisfied with the "graph" method of station identification. Having always used this method, I still uphold it.

There are, however, several little details which must be carefully done. Firstly, the three or four "known" stations must be very carefully noted and the dial readings taken with utmost precision. In preparing the graph, a very fine point is essential, either pencil or pen. The scale of the graph should be sufficiently large to permit halves and quarters of dial degrees to be noted with ease. I use paper ruled in millimetres and centimetres, using the bottom line, 1 millimetre to 1 metre wavelength, and the left-hand side of the sheet, 4 millimetres to 1 degree dial reading. A very fine graph can be plotted, and the position of every station noted, with room for more. Most people do not take enough care over the job, and then are surprised that the stations do not "tune" in where they expect to find them. I have found at times that two or three of the stations do not come in where they ought to, but it is quite reasonable to suspect those stations of being "off" their allotted wavelength, especially if all the others are correct on the graph. P. M. (Moseley).

## THE CENTRE OF ATTRACTION!


**This is the sort of intense interest the new "Ether Searcher" is arousing. Our photographer was passing one of the branches of Messrs. Peto-Scott when he saw, and "snapped" this crowd of enthusiasts interested in a special window display of the "Searcher"**

# MOVING-COIL SPEAKER MAGNETS

*Details of some interesting field strength measurements made at the Elstree Laboratories*

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

THE moving-coil loud-speaker is so much part and parcel of our radio life of to-day that we are rather apt to take it for granted. There are, however, a number of interesting points in connection with it which will bear closer investigation.

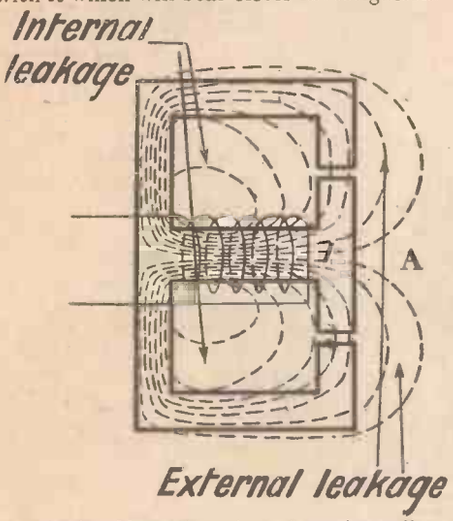


**Fig. 1. Magnetic system of moving-coil speaker showing disposition of the flux**

Consider for example, the magnet system, which is usually of the form shown in Fig. 1. I refer, of course, to electro magnets, in which the magnetism is produced by passing current round a coil of wire, in distinction to the permanent-magnet type, which is gradually coming to a practical state.

During some measurements which I had to make recently I became interested in the relative value of the field strength in the gap, and the leakage outside the gap. Probably the very idea of leakage is new to some readers, and perhaps I may dwell on this point for a moment or two.

The essentials of the moving-coil speaker are a speech coil (with diaphragm attached) situated in a powerful magnetic field. Strictly speaking, it should remain in that powerful field the whole time, so that the extreme displacement on the diaphragm on a loud passage should never move the coil outside the gap. In practice, of course, this is not so, but the point does not concern the present article. In order to produce this strong magnetic field, we shape our magnet in the manner shown in Fig. 1, and pass a current round the coil in the centre. This produces a strong magnetic field, as indicated by the dotted lines.

### The Magnetic Path

Since iron is a much better conductor than air, the majority of the field prefers to travel through the iron, and it has an almost complete path therein except for the air-gap. Having as it were, gathered a certain momentum by travelling through the iron, it jumps across this gap with comparative ease, although the current required to force the magnetic field across the gap has to be increased considerably. In practice somewhere about one-third of the current passed round the pot is used to set up a magnetic field in the iron, and the remaining two-thirds is used up in forcing that field across the air-gap.

### Leakage

This is the simple and ideal condition. In practice, as is nearly always the case, there are very sad departures from the ideal state of affairs. Our understanding of what happens will be made easier if we assume that the magnetic field flows through the magnetic circuit in much the same way as a current flows through an electrical circuit. That is to say, that we should consider the field starting at the point A, travelling along the core, up the back and along the outer shell, and then back across the gap to the point A. Just as electric currents will leak if ever they are given an opportunity, so the magnetic field seeks any alternative path in order to get back to the point A in the quickest possible time.

Now, air is not a magnetic insulator. It is simply a much poorer conductor of magnetic field than iron or steel. Therefore, some of the magnetic field jumps across from the centre piece to the outside as shown by the lines which deviate from the main structure. Across the whole of the inside of the magnetic system we have this internal leakage taking place, and it is quite serious in extent. In a reasonably designed loud-speaker it reaches probably 15 to 20 per cent. of the total magnetic field.

Nor is this the only source of leakage. We have magnetic fields being forced across the air-gap. As long as the field gets from the outer shell back to the centre pole-piece, it does not matter very much which way it goes, and quite a large proportion of the field does not return through the gap at all, but by devious routes outside the loud-speaker. This external leakage is again indicated in Fig. 1. As in the previous instance, this may be quite serious, although the extent is not as large as the internal leakage in the general course of events. In a well-designed speaker this is in the neighbourhood of 10 per cent., so that our total leakage is 25 to 30 per cent. of the total flux.

### Magnet Design

In passing, one may remark that many claims for the field strength of moving-coil loud-speakers do not take this leakage into account. Methods are used for finding the field strength which do not discriminate between the useful flux in the gap and the leakage flux, and therefore one sees suggestions that a speaker will produce 15,000 or 18,000 lines per square centimetre in the gap. Nearly all these results require to have about 30 per cent. knocked off them to allow for leakage, for it takes quite a good loud-speaker to reach even 10,000 lines actually in the gap, and there are many loud-speakers which have little more than half this field-strength.

Another important factor in connection with this leakage is the correct design of the magnetic system. If the centre core, for example, is already carrying a fairly large magnetic field, there will be a certain tendency to crowd out any further magnetic field. Thus, if we increase the magnetising current passing round the pot winding, we shall produce more magnetic field, but

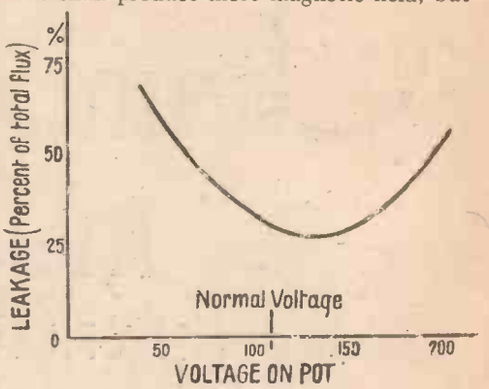


**Fig. 2. Curve showing field strengths at different voltages**

it does not follow that all of this will flow through the iron core and ultimately across the gap. In fact, the probability is that the increase in current will merely add to the leakage. This is very easily demonstrated by a practical test.

### Voltage and Field Strength

I made a number of tests on a speaker magnet, rated to work at 100 to 120 volts. A special method of test was used which enabled me to measure, firstly, the total flux, and then the flux actually in the gap, the difference between the two, of course, being the leakage. I then measured the field strength at various voltages ranging from 50 up to 200, the results being plotted in Fig. 2. It will be seen that when the magnet is running at its correct voltage, or a little over, the leakage is a minimum. This is because the magnet has been correctly designed, the proportions of the iron circuit being nicely adjusted. If the voltage is either under or over the rated value to any appreciable extent, the leakage rises rapidly.

This is understandable when one is over-running a speaker, for the reason just given that any further magnetic field strength is crowded out of the core; thus increasing the magnetising current abnormally does increase the field strength, but not to the extent one would imagine because of the large increase in leakage.

The reason for the increase in leakage when the magnet is under-run is not so easy to understand. It arises from the fact that the iron does not reach its maximum permeability at once, so that with low field strengths it does not make so much difference to the magnetic flux whether it flows through the iron or through the air. Under these circumstances it prefers to take the shortest path, and the leakage is again higher.

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# RADIOGRAMS

A RUNNING commentary on the fight for the flyweight championship of Great Britain, between Bert Kirby and Jackie Brown, relayed from Belle Vue Stadium, Manchester, will be heard by National listeners on February 2.

Harold Scott and Lance Sieveking are collaborating in a programme entitled "The Pursuit of Pleasure," which is to be produced in February. This will be a bird's-eye view of three centuries of entertainments.

*Stop Press*, which had a first edition before the microphone last summer, is to be revived by John Watt on January 27 (Regional), and January 29 (National).

A good deal will be heard presently about the Census, which is to be taken on April 26 next. On February 17 the Registrar-General, Mr. S. P. Vivian, will broadcast an introductory talk in the National programme entitled "Numbering the People."

A scene in a B.B.C. studio as reproduced in a stage play will be one of the excerpts relayed from *Little Tommy Tucker*, at Daly's Theatre, on January 31.

One of the famous Saturday night popular concerts will be relayed from the Central Hall, Birmingham, on February 7, when a cheery programme will be given by prominent artistes.

The City of Birmingham Orchestra, conducted by Leslie Heward, will give a concert for Midland listeners on February 6. The main feature of the programme will be Tchaikovsky's "Symphony No. 6 in B minor."

*Apollo in Mourne*, a play in one act by Richard Rowley, the Ulster writer, will be broadcast from Belfast on February 12.

The National Orchestra of Wales will take part in a performance of *The Veil*, by Frederic G. Cowen at the Bethesda Baptist Chapel, Swansea, on February 3. This concert will be relayed to Cardiff until 9 p.m.

The "Summer Mummers" will make another of their appearances before the microphone on January 30.

A programme of music by British composers will be given by the Midland Studio Orchestra on February 4.

Helen Guest and Bernard Johnson are the soloists in an organ and piano recital to be relayed to Midland listeners from the Albert Hall, Nottingham, on February 1.

Another Hallé concert is to be broadcast on January 29. This time it is a symphony concert, and the programme will comprise Mozart's "Haffner Symphony" and Dvorak's "Fourth Symphony," together with the "Beethoven Concerto" for violin and orchestra.

Stravinsky is playing the solo part in his "Pianoforte Concerto" at the B.B.C. Symphony Concert at the Queen's Hall on January 28—a National broadcast.

*Sacrifice* is the title of a one-act comedy by Elizabeth Illingworth to be broadcast from the Birmingham studio on February 3.

A Welsh play entitled *P'un?* ("Which?"), by Idwal Jones, will be broadcast from Cardiff on February 7, under the author's direction.

For the first time a touch of sensationalism is to be introduced by Mabel Constanduros and Michael Hogan into the usually unsophisticated atmosphere of the Buggins' household. In their broadcast on January 23 they will deal with "Murder at the Bugginses."

Five hundred members of London Girls' Clubs will take part in the St. Cecilia singing festival at the Queen's Hall on January 31. Harvey Grace will conduct. This is a London Regional broadcast.

The *Lord Talbot*, a vessel specially fitted for deep-sea fishing, will be the first Scottish fishing craft to carry a wireless operator.

# THE 1931 ETHER SEARCHER

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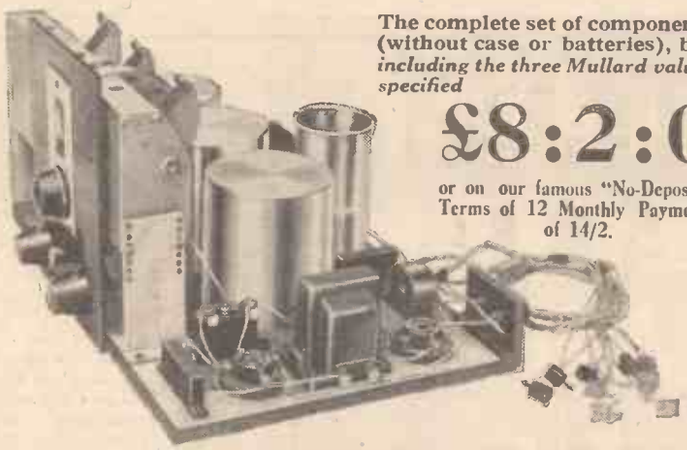
Another important point is battery economy. The three valves consume only .45 amp. filament current and 10 milli-amperes high tension. The excellent performance of the receiver is thus achieved without draining your battery.



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# The Brookmans Park Transmitters

## Mr. Noel Ashbridge, the B.B.C.'s Chief Engineer, replies to "Thermion's" Comments

SIR,—I have read with interest an article on the constancy of the carrier-wave frequency of the Brookmans Park transmitters, which appears in your issue of January 10. While I agree with the writer that the question of interference between two high-power stations working on adjacent channels is likely to present a serious problem in the future, I do not agree that the transmitters at Brookmans Park have a frequency shift sufficient to have any effect on interference such as that at present experienced from the new German transmitter at Mühlacker, near Stuttgart. It may be of interest to record that from time to time the following measurements have been taken on both transmitters at Brookmans Park:

(1) The change of carrier frequency under modulation. This test has been made by the Centre de Control of the Union Internationale de Radiodiffusion at Brussels several times, lasting for half an hour or so on each occasion, and it has not been possible to record any appreciable change due to modulation.

(2) The change of frequency of the carrier during one cycle of the modulation frequency. It is not possible in this letter to go into the methods by which this test is carried out, but it is sufficient to say that no appreciable change was measurable. This result was confirmed by an independent German observer, who happened to be interested in this particular measurement, and was present during the test.

(3) The change of frequency of the carrier resulting from changes of temperature of the apparatus. This, of course, is a very slow effect, having no relation to modulation, and is most noticeable when the transmitter is first started up and when the apparatus has not attained a steady temperature. It may amount to as much as 200 cycles over the whole day's run, but very little change takes place when once the transmitter has reached steady conditions. It will be obvious that this particular change cannot be the cause of interference with Mühlacker, since the frequency is never allowed to have a greater error than 200 cycles. A drift of this type is common to all transmitters in the absence of temperature control to the drive.

It must be realised, however, that a receiver employing an extremely selective circuit is unlikely to maintain extreme accuracy of its resonant frequency unless some control of temperature exists. It has always been intended that eventually the Regional transmitters should be fitted with a temperature-controlled drive, and, in fact, space was provided in the building for this purpose. It was not, however, installed in the first instance in order that experiments might be undertaken to determine the best type of drive for this purpose. The object of fitting such a device is, of course, to obviate slow changes during the warming-up periods and to render frequent checks unnecessary.

N. ASHBRIDGE, *Chief Engineer.*

---

The new 20-kilowatt Wilno (Poland) transmitter will be officially inaugurated in the course of next month; it will work on 312 metres.

The electro-technical section of the University of Bucharest (Romania) has installed a 300-watt telephony transmitter for experimental purposes. Broadcasts are made on 21 metres and on 50 metres every Saturday evening.

Bulgaria's first radio station operated by the Bigarski Radio Ljubitelj has started its transmissions on 319 metres; the power radiated is roughly 1 kilowatt in the aerial.

Once a year a raid is made upon the Glasgow studio by the students of the city. This auspicious event coincides with the annual Charities Day organised by these lively youths and maidens.

Work on the Vatican (Rome) broadcasting station is rapidly nearing completion and it is expected that its official inauguration will take place on February 6 in celebration of the tenth anniversary of Pope Pius XI. Although no official statement has been made, Italian papers report that there is a strong likelihood that his Holiness the Pope may be induced to broadcast a personal message on that occasion.

## "CIRCUITS SIMPLY EXPLAINED"

(*Continued from page* i)

We do not always use a transformer to couple a low-frequency amplifying valve to a preceding valve. Sometimes a resistance-capacity coupling is fitted, as shown by Fig. 3. Note the circuit similarity between Figs. 2 and 3. For example, the anode resistance forms the anode circuit of the first valve, just like the primary of the transformer. And the grid of the second valve is biased negatively through the grid leak instead of through the secondary winding. Because there is no transformer isolation, the positive voltage applied to the anode of the first valve is kept away from the grid of the second valve by means of a fixed condenser.

It must be said that transformer coupling, as shown at Fig. 2, is the most popular, but certain modifications are needed in modern practice. Fig. 4 shows the slight complication of de-coupling introduced into a transformer circuit. This de-coupling arrangement is for stability and general improvement in quality.

The circuit has become standardised, so its connections ought to be known by the beginner. The de-coupling is introduced into the primary of the transformer. Instead of the anode current going straight through the primary to the anode supply it has also to flow through a resistance, connected in series with the primary and the high-tension supply. This resistance usually has a value between 10,000 and 20,000 ohms. At the point where primary and resistance are joined a fixed condenser is connected, the remaining condenser terminal going to negative low tension.

### Output Circuits

No account of low-frequency amplification is complete to-day without reference to loud-speaker outputs. Between the last low-frequency valve, which is called the power valve, and the loud-speaker we now connect some form of output coupling. Fig. 5 shows the two most popular outputs. At A is transformer coupling. The anode circuit of the power valve consists of the primary winding and the secondary winding is connected to the loud-speaker leads.

The use of this transformer is two-fold. Firstly, it separates the anode current from the loud-speaker winding, which might be damaged through an excessive flow of current. Secondly, it enabled big differences in loud-speaker and valve impedances to be reconciled in the interests of quality.

At Fig. 5B is shown another output arrangement, whereby a choke and a fixed condenser replace the transformer. The high-tension supply is applied to the anode through the choke winding, but is prevented from flowing through the loud-speaker by the fixed condenser. This fixed condenser offers no appreciable barrier to the flow of low-frequency signals operating the loud-speaker mechanism. It is important to note that this form of output cannot match up widely differing impedances of power valve and loud-speaker, since the choke impedance is common to both.

HOTSPOT.

The new League of Nations short-wave transmitter shortly to be brought into operation in the neighbourhood of Geneva (Switzerland) will work on 15 metres during the day and on 35 metres at night; a further wavelength (18 metres) will be kept as a reserve channel.

---

The new 15 kilowatt Viipuri (Finland) station will be formally taken over by the Finnish broadcasting system early next month; it will relay the Helsinki programmes.

---

Berlin's new Broadcasting House will be used for the first time on January 22, when a special concert is to be broadcast in celebration of the event.

**"Amateur Wireless and Radiovision."** Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."

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# Postcard Radio Literature

**GET THESE CATALOGUES *FREE***

*Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard, giving the index numbers of the catalogues required (shown at the end of each paragraph), to "Postcard Radio Literature," "Amateur Wireless," 58–61 Fetter Lane, London, E.C.4. "Observer" will see that you get all the literature you desire.*

### New Mullard Speaker

THE latest addition to the range of Mullard speakers is the model "M"—a cabinet type instrument of very attractive design which has just made its appearance. It is fitted with a four-pole balanced armature movement and as it embodies several interesting technical features I advise you to write to the makers for the descriptive leaflet available. **162**

### Home-made Cabinets

A novel method of home assembly for cabinets has been developed in the Bildur-one cabinets, which are obtainable from J. J. Eastick & Sons. If you are dissatisfied with the appearance of your present cabinet, then why not write for a leaflet giving particulars of these simple-to-build cabinets? **163**

### Up-to-date

A very up-to-date illustrated catalogue of newest sets, eliminators and speakers has just come to hand from John Moores and Co., of Salford. This is the 1931 edition and copies can be obtained free through my catalogue service. **164**

### Reliability Guide

J. H. Taylor & Co. have sent me the Reliability Wireless Guide, No. 296X, which is a price list of all leading components and kits of sets. You should get a copy of this before buying any apparatus for that new set. **165**

### A New Price List

From the Scientific Supply Stores comes a new folder describing and illustrating many novelties in the way of exponential folded and re-entrant horns Particulars are also given of the latest Scientific product—a five-valve radio-gramophone. **166**

**DID YOU KNOW IT?**

**— With a crystal set the amount of selectivity is governed by the strength required, for as you sharpen up the tuning you generally decrease the volume, but with a valve set a slightly closer reaction coupling has the dual effect of sharpening the tuning and increasing the strength.**

## A NOVEL RADIO SHOW

ONE of the present attractions at Selfridges, Oxford Street, London, W.1, is a demonstration of radio science, which occupies nearly 2,000 square feet on the fourth floor. Some instructive apparatus is being shown, and the assembly of Mullard Orgola kit sets will be demonstrated. Many of the manufacturers of components employed in the Orgola receivers are making displays and giving demonstrations showing manufacturing processes, method of testing, and so forth. The new "Ether Searcher" is being demonstrated on the Mullard Stand as well as at the "A.W." Stand at this exhibition, as mentioned elsewhere in this issue.

## "ETHER SEARCHER" KITS AVAILABLE

PETO-SCOTT, LTD., ask us to point out that although they specialise in distributing "Pilot" kits for set constructors, and separate components on an "Easy Way" system of hire-purchase they also have a large stock of home-constructor sets and parts for immediate cash or C.O.D. deal. An illustrated catalogue can be obtained from 77 City Road, E.C.1. A large number of kits of parts for home construction of the new "Ether Searcher" are already available for immediate dispatch and thus there will be no delay or difficulty in giving prompt delivery either for cash, C.O.D. or on the "Easy Way" system.

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| Challenge Two (D, Trans) | AW261 |
| Loftin White Two (A.C. Mains) | AW263 |
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| Music Monitor (D, Trans) | WM208 |
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| Britain's Favourite Three 1930 (D, 2 Trans) | AW243 |
| The "A.W." Exhibition 3 | AW247 |
| Push-Pull "Two" (D, Push-Pull) | AW270 |
| **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 |
| Brookman's A.C. Three (SG, D, Trans) 1/6 | WM184 |
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| Searcher's Four (SG, D, RC, Trans) | WM194 |
| Invitation Four (SG, D, RC, Trans) | WM200 |
| Regional Band-pass Four (SG, D, RC, Trans) | WM211 |
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| 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."

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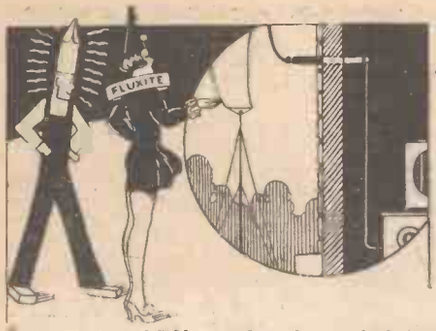


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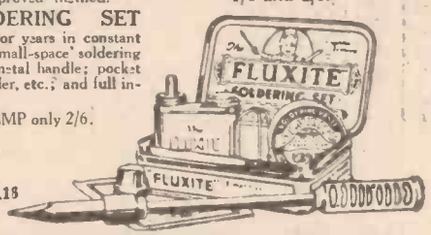


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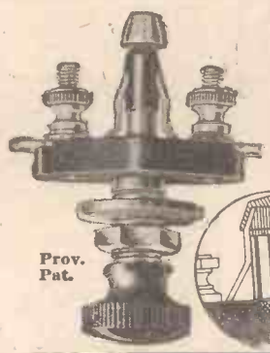


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| 332 | 905 | Naples (Napoli) | 1.7 |
| 441 | 680 | Rome (Roma) | 75.0 |
| 453 | 662 | Bolzano (IBZ) | 0.2 |
| 501 | 599 | Milan (Milano) | 8.5 |
| **LATVIA** | | | |
| 525 | 572 | Riga | 12.0 |
| **LITHUANIA** | | | |
| 1,935 | 155 | Kaunas | 7.0 |
| **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 |
| 240.6 | 1,247 | Stavanger | 0.5 |
| 364 | 824 | Bergen | 1.0 |
| 367.1 | 817.1 | Frederiksstad | 0.7 |
| 453.2 | 662 | Porsgrund | 1.5 |
| 493 | 608 | Nidaros | 1.2 |
| 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 | 663.2 | San Sebastian (EAJ3) | 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 |
| 1,235.6 | 242.75 | 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** | | | |
| 1,223.2 | 244.8 | Istanbul | 5.0 |
| 1,961 | 153 | Ankara | 7.0 |
| **YUGOSLAVIA** | | | |
| 306.8 | 978 | Zagreb (Agram) | 0.7 |
| 430.5 | 696.8 | Belgrade | 3.0 |
| 574.7 | 522 | Ljubljana | 2.8 |

## "STANDING" ACCUMULATORS

MOST types of accumulators deteriorate if left standing idle for any prolonged period. This can of course be prevented by giving the cell a "refresher" charge from time to time. If, however, the accumulator is to be definitely out of commission for some considerable time, the best plan is to dry it off. To do this the battery is first discharged at the normal rate until each cell shows 1.8 volts. The acid is then poured off and the cells refilled with pure water. After standing for 36 hours, the water is siphoned off. The accumulator can then be left idle for any length of time without suffering damage.

B A. R.

## *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.

The designing of apparatus or receivers cannot be undertaken.

Modifications of a straightforward nature can be made to blueprints, but we reserve to ourselves the right to determine the extent of an alteration to come within the scope of a query.

Queries *cannot* be answered personally or by telephone.

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**36**

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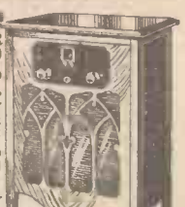
*(Reg. Design)*



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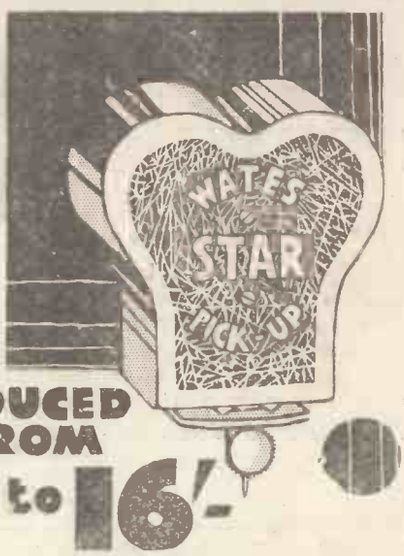


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