# HOW A PENTODE WILL "PEP UP" YOUR SET: FACTS AND FIGURES

Amateur Wireless and Radiovision

3d Every Wednesday

WESTECTOR CIRCUITS for EXPERIMENTERS

ROMANCE OF THE MORSE CODE

"THERMION" ON NEW-YEAR RADIO

FULL-SIZE A.C.-D.C. BLUEPRINT

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OR D.C. AT WILL 3-VALVER

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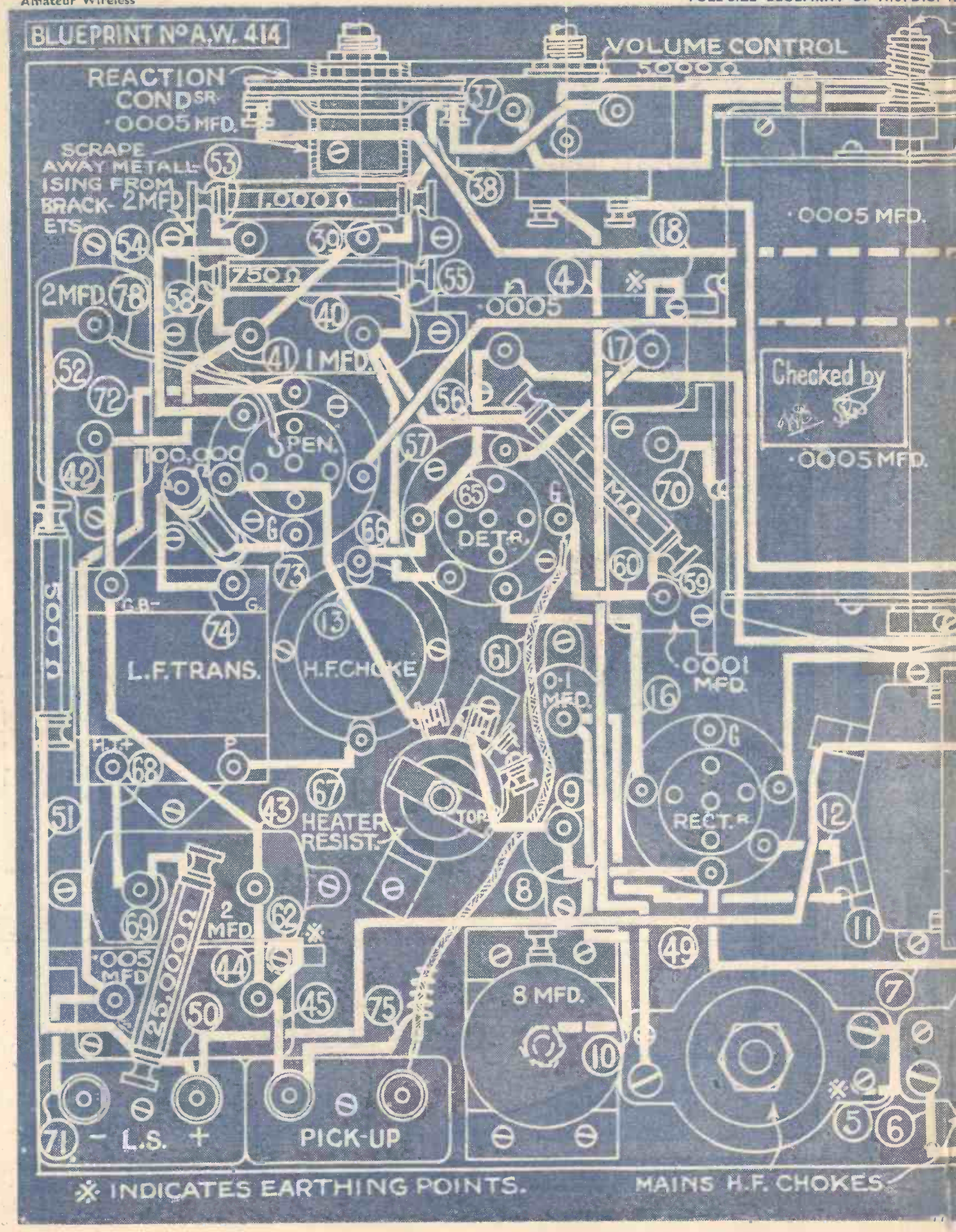
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Amateur Wireless & RADIOVISION

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# News from Broadcasting House

By Our Special Commissioner

### "Absent Friends"

NOW that the Christmas programmes are but a memory let me give full credit to a young man who did much to make "Absent Friends" such a success. It was L. Gilliam, who devised the whole show.

He lost three nights' sleep wondering whether Bermuda would miss her cue, or whether the men in the coal mine would fail to connect, or whether—but you know how many things *might* have gone wrong.

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### Well Done, Gerald Cock!

MODEST Gerald Cock, the chief of the Outside Broadcast department at the B.B.C., really did earn a bouquet for his admirable arrangements at Christmas. He was again at Sandringham in charge of His Majesty's Christmas relay.

This year the wires connecting the King's microphones in his study with the amplifiers in the adjacent room were hidden under the carpet, and only the walnut cases containing the microphones gave any clue that the world was listening.

*Admiral Sir Charles Carpendale*

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### The Play Festival

ACCORDING to Val Gielgud, Director of Drama at the B.B.C., the recent play festival has done a lot to stimulate interest among young and at present unknown authors.

This being so, I am reassured to find such names as E. M. Delafield and Lord Dunsany in the list of spring productions. Their plays are usually very good entertainment.

We are to hear, among other plays, an "actuality" broadcast based on the raising of gold from the ill-fated *Egypt*. *Trent's Last Case* is another play that sounds very good meat to me.

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### John Watt Thinks Again

HAVING failed to book W. H. Berry, my friend John Watt has thought again—and has postponed the Adelphi programme, which was to have introduced his new "Songs from the Shows" series.

Instead, he will put over a programme around Shaftesbury Theatre successes, with Anona Winn and Wynn Ajello taking star parts.

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### Another Light Show Coming

BRIAN MICHIE, that giant member of the B.B.C. who used to do so well in the Effects Department, has been studying the technique of vaudeville production under John Sharman—who is, of course, quite a "veteran" at the game.

Brian is about to launch out on his own, and if hopes are fulfilled, "Soft Lights and Sweet Music" should be as great a success as the "Café Collette."

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### Who Introduced the King?

DID you recognise the voice? I did. It was, of course, Admiral Sir Charles Carpendale. You heard the National Anthem played by the B.B.C. symphony orchestra.

A record was used, as personal attendance at the studio of the whole orchestra would have meant about a hundred and seventeen vacant chairs at Christmas dinners. Still, it was a very good record, made specially for His Majesty's broadcast.

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### For the Highlands

THAT famous mobile van of the B.B.C.—harbinger of new stations—leaves for the Highlands in the New Year, looking for the new Highlands Regional site.

*Wynn Ajello*

Meanwhile, the van has not been idle. I traced it in the suburbs of London the other day—out on "hush-hush" tests. Apparently the B.B.C. is toying with the idea of a broadcast commentary on wheels.

### Wanted—A Mobile Earth

ONE of the difficulties of broadcasting from a van is the lack of an earth. The mobile van is, of course, on pneumatic tyres, which very effectively insulates the transmitter from earth.

But, as one engineer pointed out, worse snags than this have been overcome in radio, so eventually the commentary-on-wheels idea may come off.

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### Sir Oliver Lodge

THIS famous scientist will be among the eminent speakers in the New Year's talks series from Broadcasting House. He will deal

*HERE you see those well-known radio stars, the Carlyle Cousins, taking part, with Dawnya and Petrov, the dancers, in the recent Exide dance held at Birmingham. As is usual at an Exide affair, the four hundred and fifty dancers had a marvellous time. It proved to be one of the best trade functions of this kind ever held in Birmingham. The famous dancers Dawnya and Petrov provided some of the thrills of the evening, and those Carlyle Cousins proved by their performance how well merited is their popularity over the radio.*

## *Did You Give Radio?*

*AT Christmas, we mean. Many people, perplexed with the perennial question of Christmas gifts, have "said it with radio" this year. As "The Father of Radio Transmission," it is fitting that His Excellency the Marchese Marconi should make to his lovely wife, the Marchesa Marconi, a Christmas present of a Marconiphone, model 291 radio-gramophone.*

*This instrument is one of the finest of its kind, being a seven-valve super-heterodyne with the addition of a gramophone turntable and pick-up. The model 291 is fitted with automatic record-changing apparatus, which will play eight records running without any attention.*

*It is well known that the Marchesa takes a very keen interest in the Marchese's radio research work, and it is therefore all the more delightful that her Christmas present this year was something so typical of the best in modern British radio—bearing, as it does, a trade-mark symbolising her husband's pioneer work in the field of radio communication.*

*The picture (left) shows a member of the Marconiphone staff at Hayes tying up the Marchesa's present with a huge ribbon bow before despatch. The other picture shows the Marchese Marconi and his wife listening to amplified alarm clock ticks at an exhibit at the Chicago Century of Progress Exposition.*

with the highly controversial subject of "Survival After Death."

We are also to hear from various authorities talks on ghosts, haunted houses, telepathy, and mediums. My hint a while back that the new talks would give you something to talk about is coming true with a vengeance.

### *Broadcasts "Ghosts"*

TALKING of spooky things, I must tell you that Ibsen's play, *Ghosts*, is down for broadcasting during the second week in January. Val Gielgud, the producer, has collected a very strong cast, including Milton Rosmer, Margaretta Scott, Norman Shelley and, please note, David Eccles—a new "find."

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### *The Test Matches*

NOW that the Australians have finally decided to send a team over next summer, the B.B.C. has arranged to cover the tests with eye-witness accounts from the grounds.

Running commentaries are *not* contemplated. Even "Plum" Warner could not make a maiden over sound very thrilling—hence the more compact accounts to be broadcast after each game.

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### *Going to America*

GERALD COCK is off to the United States in the spring—just for a holiday. I wonder whether he will run across his chief, Roger Eckersley, who is also going to the States about that time?

Gerald Cock proposes to sail all the way to San Francisco and back, just to enjoy the voyage, but he may find time to fly across the continent and look up Roger Eckersley in New York.

### *Too Formal!*

AT Broadcasting House they have in stock a nicely phrased little card which thanks correspondents for their interest. It is used as a reply to all appreciative fan mail.

I got one of these cards last week—and so did a famous composer who had wired appreciation of a concert of his own works. This bureaucracy again!

### *Broadcast Records*

I WONDER what the B.B.C. is thinking of the recent court judgment over gramophone records? It was held that the makers of the records have the copyright and that they are entitled to demand payment for public performances.

Will this mean fewer records from the B.B.C.? Come along, Christopher Stone, ease our horrid fears!

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### *Future of Empire Broadcasting*

FOLLOWING the very successful relay from Bombay recently, the B.B.C. is thinking of extending this aspect of Empire broadcasting. In the past Empire broadcasting has been all give and no take—programmes sent from Daventry to the Empire but nothing, either in payment or in kind, being brought to us.

### *Using "P.O." Circuits*

THIS one-sided arrangement will slowly change. We shall get more hook-ups with various parts of the Empire. At last the engineers have apparently seen the light.

Post Office radio-telephone links are now so good that I am constantly amazed more use has not been made of them by the B.B.C. There is now a beam link with practically every important point of the Empire.

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### *B.B.C.'s Party*

MANY members of the B.B.C. staff are eagerly awaiting the great New Year's party at Grosvenor House. There will be plenty of stars of the air to entertain them—if they are prepared to fork out the ten and sixpence for a ticket.

Doris and Elsie Walters, Leonard Henry, Ben Osborne and Nellie Perryer are among the well-known radio personalities who will take part in this B.B.C. whoopee night.

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### *Television Films*

SOME people are trying to make out that television systems making use of films are not really television at all. All this hair-splitting is rather tedious, I think.

After all, supposing the science does advance so as to enable the Derby to be televised. Who will be able to "look in" at an actuality broadcast?

Most of us will be quite prepared to see the thrill in the evening—by film or any other method that gives us a good picture.

# Radio Gossip of the Week

### *Pentodes for Economy*

DON'T fail to read "The Experimenters" this week. They are in great form—telling you exactly how much more economical are pentodes than ordinary power valves.

They point out that the bad name pentodes earned in their early days was entirely due to wrong usage.

In their inimitable way they show figures that prove how much better all round performance you can get from a modern pentode in a battery-operated set. An article for everyone to read!

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### *The Brussels Fire*

ON a recent Saturday night one of the Brussels broadcasting studios was badly damaged by fire. The musicians escaped unhurt but a number of instruments which could not be taken out in time were completely destroyed.

Was the fire caused by the playing of a specially "hot" number?

### *For the Natives*

FOR the benefit of listeners in the Belgian Congo, the Brussels programmes are being transmitted through the Ruysselede (Bruges) short wave station (29.04 metres). We shall soon hear of this kind of criticism:

Native "fan" to friend, after performance of famous soprano: *This fella Mary he sing, one topside note too very much for ears belong me.*

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### *Punishment Fits the Crime*

ACCORDING to a Polish daily, wireless receivers have been installed in prisons at Warsaw and Lodz.

Time: 1935; Scene: Any police court in London.

Magistrate (to prisoner): "As this is not your first appearance here you are sentenced to listen to six broadcasts of a vaudeville hour. Let this be a lesson to you.

Prisoner (emitting an ear-piercing yell): "Mercy, 'ave a 'eart, Guvnor!" (As he faints he is caught in the gaoler's arms.)

# "PEP" UP WITH A PENTODE!

*She Experimenters* are out to prove this week that pentodes mean "pep" and economy of battery working. They prove that the idea of pentodes being greedy in anode current is quite fallacious. Practical data is given to show why everyone with a battery set ought to use a pentode for the power-output stage. The comparative figures are most convincing.

*Stages in the assembly of a Mullard PM22 pentode valve. Note especially the three different grids, these being control grid, auxiliary grid and the suppressor grid. The last-named grid is of course internally connected in the pentode*

JUST as we were dozing after a really excellent Sunday lunch—you know that delightful half-hour when nothing seems to matter—*thump* went the front-door knocker. We laid low for a few seconds, but it was no use. An even louder rat-tat really roused us, so resignedly we opened wide our hospitable portals.

### Power Valve Wanted!

In walked a laddie from down the village who, so far as we know, is not a radio fan—chickens are more in his line. "Well, and what can we do for you?" we asked, hopeful yet fearful.

"I want to borrow a power valve—mine has just burnt out and I simply must get the missionary talk for that dreadful old aunt who's staying with us." Thus moaned Sam.

We made clucking noises to indicate sympathy and went off to dig out some sort of 2-volt power valve. To our amazement we could not find one. Nothing but pentodes. Then it dawned on us. We really have not had much to do with the battery power valve for quite a while. Pentodes have so long seemed to us the only battery power valves worth using.


*Cossor 220HPT pentode*

So we handed Sam a nice little pentode we knew worked very well. He did not fall over our necks as we had fondly hoped. Started murmuring some nonsense about pentodes being very hard on his poor old high-tension battery.

So *that* was the trouble. We would never have believed it possible for pentodes to receive such condemnation. But, on thinking over this incident, we came to the conclusion that many amateurs must *still* have the illusion that pentodes really are greedy in anode current.

In fact, further investigation, to our amazement, proved quite conclusively that this impression about pentodes is widespread. So we have been getting together some facts and figures to prove that pentodes are not the fast livers so many people think they are. On the contrary, we can say that pentodes are the most economical power valves anyone with batteries can possibly use.

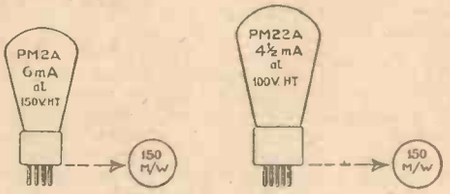
There are two ways of looking at this problem. Either you can compare anode currents for a given output, or you can consider a given output and see the difference between the anode currents of a power valve and a pentode.

Some people are most concerned, as our Sam was, with economising the battery current; they do not specially want terrific volume. On the other hand, many listeners *do* want as much volume as they can get, but they know very well that big volume usually means a large expenditure of anode current. In fact, many of our friends think only a mains set can give them really good volume.

Now we have been digging into the heart of the dislike for pentodes. Bad quality is often attributed to the pentodes—unfortunately this was not far wrong in the early days.

When the pentode first came out it was plugged straight into the valve holder previously occupied by an ordinary power valve. Very little attention was paid to the correct value of grid bias, consequently the valve was often overloaded through having too much bias.

Further, reproduction was often screechy because no form of tone correction had been applied. And the idea of a special matching transformer had not been accepted.

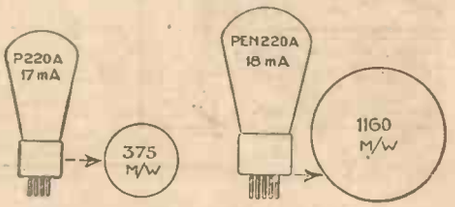



*Here you see a Mullard PM2A power valve and a PM22A pentode, giving the same output. Note that the pentode requires 1½ milliamperes less than the power valve and 50 volts less high tension*

With all these things against the correct working of the pentode, it is surprising that it worked at all. That it did work was a pity, perhaps, because it was then working so badly that many condemned it out of hand—and have never since troubled to give it a trial in the light of accumulated experience.

Given proper matching and simple tone correction there is no question about the quality of the pentode. It is just as good as, and often better than, any ordinary power valve. We are left to prove that the pentode, when properly worked, is actually more economical in battery current than the power valve.

Two very popular valves on the market are the Mullard PM202 triode power valve and




*Output of a Mazda P220A and the output of a Pen220A compared with the approximately same anode current. The output of the pentode is three times as great*

the Mullard small pentode, PM22A. If we are using a high-tension battery of 150 volts and bias these valves according to the maker's instructions, we get an output of 350 milliwatts from the power valve and 425 milliwatts from the small pentode.

That proves only *one* thing—that the output of the pentode for a given high-tension voltage is greater than a super-power valve. Now what about the anode current? Under the conditions mentioned the super-power valve takes 14 milliamperes, whereas the pentode takes only 9.5 milliamperes.

To boil down these figures to a concise basis of comparison, the super-power will take 2.1 watts from the high-tension battery against 1.42 watts for the pentode. The saving in anode current is obvious—*if you use the pentode.*

We have by no means exhausted the virtues of this pentode. To get the full output from the small pentode you require only 3.1 volts on the grid—only a small input, that is.

*Continued on the next page*

For the Experimenter

By P. WILSON, M.A.

# Westector Circuits

THE circuit diagram for the Westector as usually specified appears so unlike that of the leaky-grid valve detector that many people appear to imagine that it is essentially different. This is not so.

In fact, the Westector can perfectly well be plugged in between the grid and cathode sockets of a diode detector valve holder, provided due care is taken to connect it round the right way.

The normal way of connecting up a Westector is as shown at Fig. 1. This method of connection, however, rather obscures the fact that the resistance and the condenser are the usual grid leak and condenser which we use in ordinary valve circuits; it has the distinct advantage, however, that automatic volume control can be used with one set of vanes of the preceding tuning condenser earthed. It corresponds to the use of a diode valve upside down!

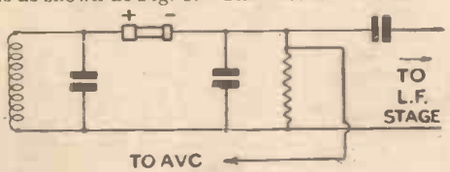


*Fig. 1*

Thus the analogous valve circuit is at Fig. 2.

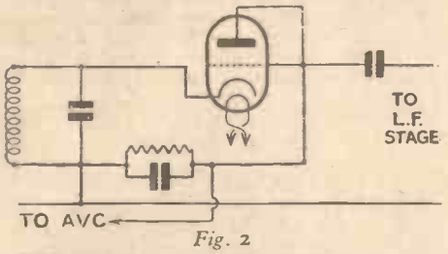


*Fig. 2*

The only difference between this and the ordinary diode circuit is that here it is the grid end of the tuning coil that is earthed and not the cathode end, as may easily be seen by re-drawing the circuit as in Fig. 3.

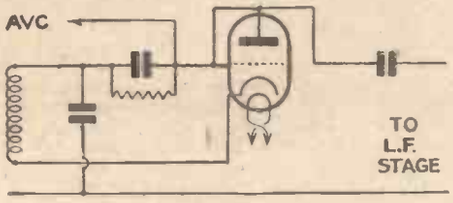


*Fig. 3*

A more usual diode circuit as is shown by Fig. 4 and the corresponding Westector circuit will be as in Fig. 5.

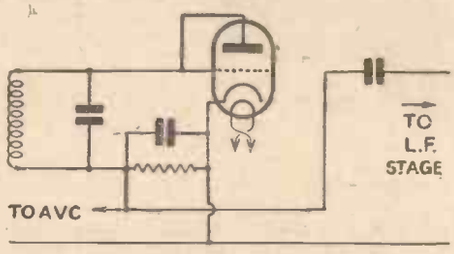


*Fig. 4*

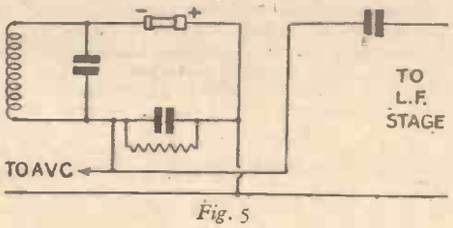


*Fig. 5*

With a super-heterodyne receiver, where there is no difficulty about not earthing the tuning condenser in the preceding intermediate-frequency stage, the circuit works very well. I have just tried it for the purpose of direct comparison with my own diode. In future I propose to use a Westector.

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"Pep Up" with a Pentode—*Continued from page 1147*

Against this the super-power valve needs 9.2 volts.

In practice this means that certain stations heard at good volume with the pentode might not be heard at all well with the super-power valve.

So far so good. If you are interested mainly in the question of battery economy, let us take a Mullard PM2A small power valve and compare it with a Mullard PM22A pentode. Take firstly the power valve. The maximum output possible is 150 milliwatts, and to get this you need 150 volts high tension, and that means 6 milliamperes anode current. This works out at about .9 watt from the high-tension battery.

### Advantage of the Pentode

Now, with the pentode valve, if you want to get 150 milliwatts it is not necessary to use a 150-volt high-tension battery. A 100-volt battery is ample. The anode current is then only 4.5 milliamperes, which means a drain of only .45 watt from the high-tension battery. Which is just half the wattage of the power valve.

You now see that by using a pentode valve you get exactly the same volume or power output for just half the running cost as compared with a small power valve. This is not counting the fact that as only a 100-volt battery is needed the initial and replacement costs are lower with the pentode.

Another important point we have not mentioned. As the anode current is much less with the pentode than with the power valve the battery will last considerably longer. So your running cost for a given power output will be quite 50 per cent. less for that reason alone.

If economy is not so very important, but you want the maximum volume consistent with practicable running costs, you might consider our next illuminating comparison.

We have found from experience that a man who wants more volume almost always go and buys a super-power valve—and ever afterwards grumbles about the awful anode current demands on his high-tension battery.

Well, take a look at these next figures. One of the largest power valves of the battery type that you can buy to-day is the Cossor 230XP. With 150 volts high tension this valve will take 22 milliamperes anode current. For all that you get only 450 milliwatts maximum undistorted power output.

Compare this with the Cossor 220PT, which is a battery pentode power valve. With the same high-tension voltage, that is 150 volts, and only 19 milliamperes high-tension anode current, the output is a little over 1,000 milliwatts—over twice the output, in fact.

With these two valves as examples, you can see that the pentode gives you a 3-milliampere current saving, an increased output of 550 milliwatts, and a lightening of the load on the accumulator by .1 ampere, because the filament of the pentode is only .2 ampere against .3 ampere for the power valve.

In the Mazda range we can make out an even more sensational comparison. The P220A, the largest battery power valve in the Mazda range, takes 17 milliamperes at 150 volts high tension, and gives 375 milliwatts output. This represents quite good volume, but compared with the Pen220A pentode in the same range it is really quite miserable.

Consider the output of the Pen220A. It is 1,160 milliwatts. The anode current is 18 milliamperes at 150 volts. So that if you are content just to double the output you can reduce the anode current by about 4 milliamperes. Once more you gain in two ways with the pentode. You get double the power and you reduce the drain on the battery.

### Power versus Pentode

By the man with a smaller set the P220 power valve in the Mazda range is often used. It takes 10 milliamperes at 150 volts. It gives an output of 180 milliwatts. But if you use the Pen220 with 150 volts high tension you can obtain an output of 400 milliwatts for an anode current of only 5 milliamperes, or 600 milliwatts for 9 milliamperes. Meaning that you get over three times the output for 1 milliampere less, or twice the output for half the anode current of the power valve. Could anything be more convincing?

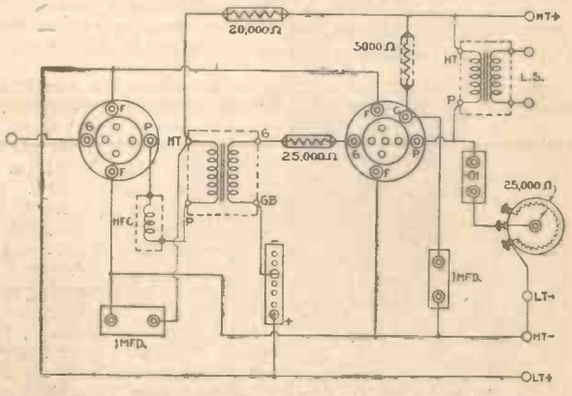
Well, it convinces us and we hope it does you. Even our Sam, by the way, is now quite convinced—so much so that we never hope to see *that* pentode again.

We might help those of you who are going in for pentodes by giving a few little hints and tips. Glance at our practical circuit of a typical pentode output stage. You will see that there are one or two components not usually found in an ordinary output stage.

The grid leak, for example, in series with the control grid should have a value of 25,000 ohms.

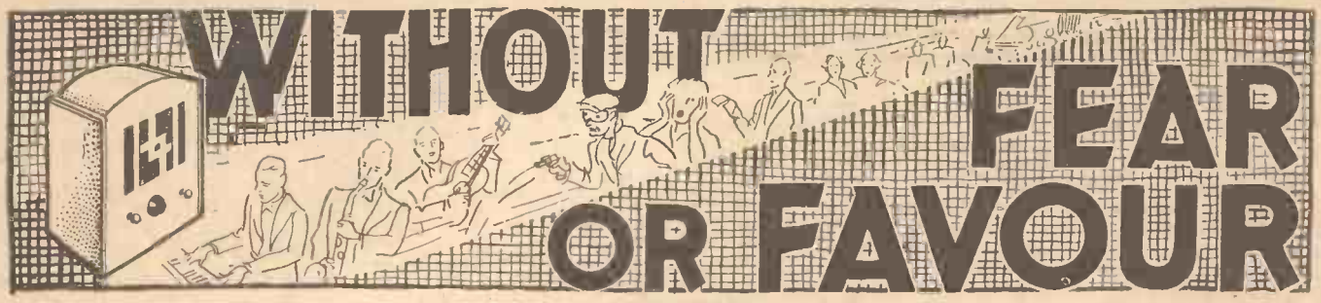
In series with the auxiliary grid, which, by the way, is the centre leg of a five-pin valve, marked c on the valve holder, connect a 5,000-ohm resistance. This is to keep the voltage on the auxiliary grid below that on the anode, otherwise the anode current will be rather high.

Virtually across the primary of the output transformer there is a .01-microfarad condenser in series with a 25,000-ohm variable resistance. This is for tone correction.



*Typical pentode circuit, with an output transformer for correct matching, a tone control and a grid-stopper*

Programme Criticisms by WHITAKER-WILSON




*Monday*

*SCRAPBOOK FOR* 1913 appealed to me as a type of show that might be considered really characteristic of broadcasting. The B.B.C. has given us many reminiscences, but none better than this.

If you or I had been asked to write an account of the outstanding events of 1913, I doubt whether we could have done it very well. We might have remembered a song here and there, but who of us remembered the saving of the passengers and crew of the *Volturno* disaster? The representation was quite thrilling.

*Beryl Orde*

The tour of the London halls of that year, with excellent imitations of George Formby, Vesta Tilley, and Marie Lloyd; a reminder of Caruso and Melba at Covent Garden; Pelissier's Follies; the Tango Craze—all these really brought back the year before the War with an amazing vividness.

Before leaving the subject of what I consider ideal in the broadcasting sense, I should like to congratulate Leslie Baily on his script (which contained some admirable English), and also the announcer, whose style of diction carried everything along at a pleasing speed.

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Good imitations are in the air—or on it—to-night. Most imitations I have heard have been libels on the originals; I have been alternately irritated and bored to tears by them. Indeed, I have often observed in these columns that if the originals were really like what the imitators make of them, they would never have got anywhere.

Beryl Orde played at least a dozen characters in an entertaining little show called *Jazz Justice*, in which Eddie Pola was the judge. I listened to her with growing admiration. She really *did* imitate. Grandma Buggins and Tallulah Bankhead were lifelike, but I must own to surprise that Miss Orde could change her voice so completely as to imitate to the life the Houston Sisters and Greta Garbo. Cicely Courtneidge has been done so often that I really think I could imitate her myself but I admired Miss Orde again as Gracie Fields.

My only criticism is a suggestion that she should not try to imitate the opposite sex, especially people whose voices are as deep as Claude Hulbert's. Otherwise, Miss Beryl Orde can, in my opinion, be set down as the best imitator radio has yet produced. I hear she is only twenty-one, and that this is her first broadcast.

*Tuesday*

*By Royal Appointment* appealed to me as a very suitable light entertainment. We hardly expected anything very deep in the way of plot, but there was enough to keep us going.

Mark Lubbock's music deserves a word of praise. "I Told You So" was a good song. I also liked "The Soldier on Parade." Another song stood out in the story, "A Girl Just Must Have Love." Its lyric went quite far enough into the matter, but I had a good laugh over the line about Adam and Eve raising Cain. A jolly show.

*Wednesday*

*On the House* is another example of the futility of attempting to write comic shows for radio comedians. The technique of these things is simple. A writer composes a sort of vaudeville and sets a scene for it.

*The Fire Station*, you will remember, was a specimen. It was a dead failure.

The show under consideration was set in a public-house where everyone seemed to be enjoying free drinks. If they had said anything clever while they were having them the idea might have been passable. As they did not, I personally failed to see the point. An hour wasted.

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The great Beethoven Mass made as good broadcasting as a work of that size and weight can be expected to make. It would not appeal to a majority. Probably nobody at Broadcasting House thought it would, but it is a great work to have attempted—indeed, to have rendered so well.

*Thursday*

Handel's *Messiah*, on the other hand, is always welcome. It is enormously popular. There was a surprisingly good rendering of part of it by the Nottingham Harmonic Society to-night.

My only criticism is to ask why we were not allowed to hear the Christmas portion instead of the Easter. You can't get away from it—the *Hallelujah Chorus* does remind us of Easter!

*Friday*

Du Garde Peach is one of the best radio-writers we have. His *Path of Glory* was revived in the play festival advisedly; it may lead to more plays of the kind.

It was an extravaganza, of course. Therefore one forgave the ridiculous position of a Colonel placing the General under arrest and assuming command himself. Apart from moments of that kind, the play bristled with smart satire.

*Mark Lubbock*

Mr. Peach almost proved that it is cheaper to lose a war than to win it. Some lines were delicious.

I liked that of His Excellency who observed that one never reads dispatches. "One mentions one's friends in them, but one doesn't *read* them."

Plays of this description, with every line designed to satirise, make admirable broadcasting. One doesn't roar with laughter; one just sits and chuckles. And chuckling is good for one.

*Saturday*

The fifth of the *In Town To-night* series was not too brilliant, though I liked the vivacious Mexican cabaret singer whose name the announcer fuddled so that I was none the wiser. I should have liked her better if she had sung instead of half-talking.

The Burmese lady doctor attracted me, and also the aged clown, but I thought the relay from Euston station waste of time. I prefer the "puffer" record.

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The variety show produced some good humour. First from Berns Ecks, whom I should like to hear again. His account of his life was decidedly funny and delivered entirely to the radio audience.

Sandy Rowan is always good. I enjoy his Scottish patter, but I had no idea he could sing so well. I thought "Roaming" charming. I hope he will be asked again soon and that he will sing more songs of that nature. Sentimental songs in dialect—particularly his—are always worth hearing.

The sort of songs of which we get too many are the sort Florence Oldham sang. These light half-ballad, half-cabaret numbers are rather boring.

Alexander and Mose were brilliant. Never more so, perhaps. There, again, they have set themselves a difficult task in keeping up such a standard.

Mose said he and his wife agreed as well as the two packets in a Seidlitz powder.

Those two were really good to-night.

## Average Listener says—

*"WHY so many intervals in the programmes? I am always switching into the middle of a three- or four-minute break.*

*"It is very annoying. Especially when I read that the B.B.C. has a permanent library of over 25,000 gramophone records. Why not play a few of them during all these intervals?*

*"Then I have a grumble about the interval signal. It is the mouldiest sound in broadcasting. When you can hear it at all it sounds just like a death-watch beetle at work. Or worse.*

*"The trouble is that half the time the signal is so faint I cannot hear it. What's the good of that?*

*"I believe the B.B.C.'s excuse is that they don't want their interval signal to irritate anyone. That's why it is toned down. Probably the real reason is that they don't want to advertise their wretched intervals too much."*

# LONDON 1933 — THAT

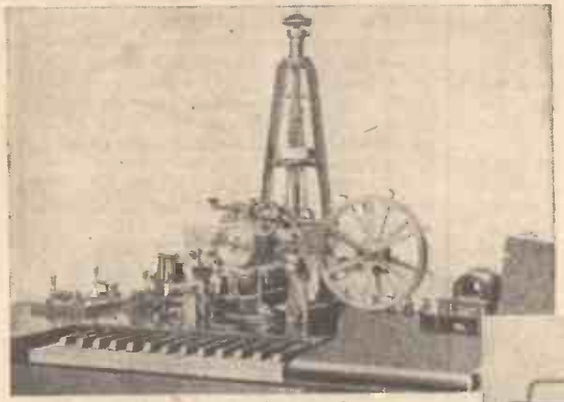
*Strip from a Wheatstone perforator*

By W. T. LOWE and E. PHILLIPS
(of the Central Telegraph Office, London)

(Illustrations by courtesy of Engineer-in-Chief, G.P.O.)

AT the beginning of this wonderful era of communications, many inventions for transmitting telegrams by electrical process were put into operation. In one instance, it was necessary to use thirty-five wires, one for each letter of the alphabet and each figure. Later, we shall read of operators sending their

*H.M. telegraph ship "Alert"*



messages apparently simultaneously over one wire.

The single-needle, double-needle, and double-plate have been used for a number of years on the British and other railway systems. Many policemen of but a few years' service could tell you quite a lot about the A B C telegraph, for at one time, it was the standard system of the Force. All of these, however, and more, have rendered service in the Post Office.

### Operation Based on Morse Code

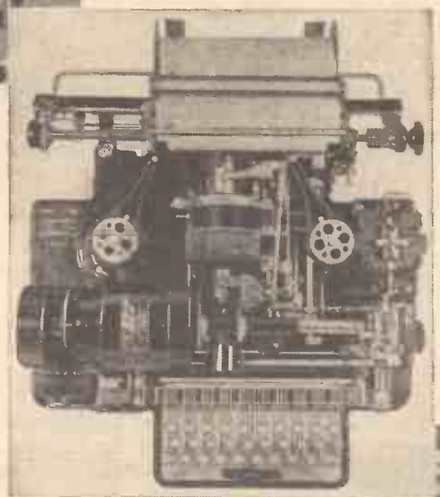
The operation of the single-needle and double-plate was based on the morse code. As is, perhaps, generally known, morse (key and sounder) was once recognised as the premier system. Unlike the small counterpart usually visible (and audible) in small offices, the huge volume of telegraph traffic passing through the larger stations made it necessary more widely to adopt the use of the apparatus. In addition to rheostats, galvanometers, resistance boxes, and switches, which surrounded long-distance circuits, batteries of typewriters, Wheatstone transmitters and receivers, stick or pneumatic perforators, Creed reperforators and printers, manual and automatic Baudots, Booth Willmott, Murray, and Western-Electric instruments added to the display. Wheatstone, the stick and pneumatic perforators, and the Creed reperforator and printer were associated. The morse code was utilised as a basis for their operations.

Before a message could be transmitted by Wheatstone, a slip had to be prepared. In the first place, this was done with the punching sticks; at a later date with pneumatic perforators; and, finally, with typewriter-keyboard apparatus known as "Kleinschmidts" or "Gells." The slip contained a number of messages or a long press message. It might, therefore, have been several yards in length. When completed, this slip was run through a Wheatstone transmitter. The delicate mechanism could be seen in motion through a small oblong glass window, as the tape wended its way underneath a broad cogwheel. At the distant station the signals came out in morse on a blue paper tape.

Time was when the receiving operator would tear off every few messages, the slip being handed to another telegraphist to write up from the dots and dashes.

Then the Creed reperforator appeared. The outline of its operation was that, instead of being received as definite morse characters, an exact replica of the perforated tape came out on the receiver. This was put through a Creed printer and the letters automatically printed in Roman characters on another piece of slip, which was gummed on to a telegraph form.

As the Baudôt instrument has been responsible for displacing morse to a large extent, it deserves



*(Top left) Hughes keyboard. (Above) Interior and keyboard of Telex Teleprinter. (Right) Creed reperforator and printer*

a short description. It is a French invention and bears the name of the inventor. Being a "multiplex" apparatus, a number of messages varying from two to six may be sent simultaneously on one wire.

The means for doing this is provided by the "distributor," which consists of rings of brass

*ABC telegraph*

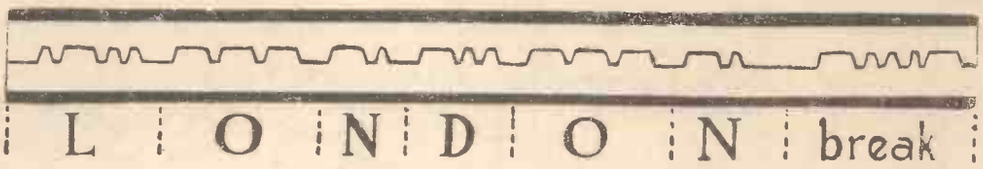
mounted on a brass case, inside which is machinery for turning an axle. Metal "brushes" are fixed on the outer end of the axle. These pass over the brass rings and so permit currents to pass in succession to the various receiving and sending mechanisms which are connected with the "distributor." The "set" may consist of "distributor" and one, two, or three associated receivers and senders. As the brushes revolve round the brass rings, a "click" is heard in the sender apparatus once each revolution.

### Line at Operator's Disposal

This indicates to the operator that the line is at his disposal at that moment. He accordingly makes the signal forming his letter and, in effect, the line is then passed by means of the distributor to the next sending apparatus, causing a "click" to be heard there. The brushes revolve usually at 120 revolutions per minute, so each operator has the use of the line twice per second. But, to all appearances, sending and receiving is proceeding simultaneously on the "set."

The Baudôt sending apparatus has five keys, like piano keys. By depressing one, or more, of these together, in specified combina-

# MORSE!




*Strip from an Undulator machine*

*Listeners who try to follow chattering morse signals will perhaps be interested to know that practically all the instruments mentioned in this article have been used or experimented with for transmitting messages by wireless*

tions, any letter or figure and many signs of punctuation may be telegraphed.

For instance, letter "A" is formed by depressing the first key; letter "E" by depressing the second key, "T" by depressing keys 1, 3 and 5; "G" by depressing keys 2 and 4; and so on.

The received currents are led to a special Baudôt receiver. This is a very ingenious apparatus, consisting of a brass case containing five electromagnets and an axle on which is mounted a type wheel and associated mechanism. By a series of electrical and mechanical movements, as the type wheel revolves, a paper tape is brought into contact with its rim at the moment when the letter or figure being signalled is in the printing position. The letter or figure is thus printed on the paper and the paper moved forward one space in readiness for the next letter.

*Double-needle telegraph instrument*

The message is, therefore, received in printed characters on the paper tape which is gummed to a telegraph form for delivery.

Though a complex apparatus, the Baudôt is a very steady form of telegraph. It has the advantages of stability and adaptability to traffic; for, if there is not sufficient work for two operators to send, one key can be closed down and one operator employed elsewhere. This apparatus is employed almost exclusively on wire communication between London and Continental cities.

An earlier form of printing telegraph is the Hughes. This is still in use in the Foreign Telegraph Department of the G.P.O. for working to offices where there is not a large amount of traffic. It was the first practical printing telegraph invented and was the work of the American Professor Hughes. The instrument has twenty-eight keys accommodating the twenty-six letters of the alphabet, and keys for changing from letters to figures or vice versa. By depressing a key current is sent along the line. At the receiving end, this current actuates mechanism which raises a paper tape against a revolving type wheel at the moment when the required letter is in the printing position.

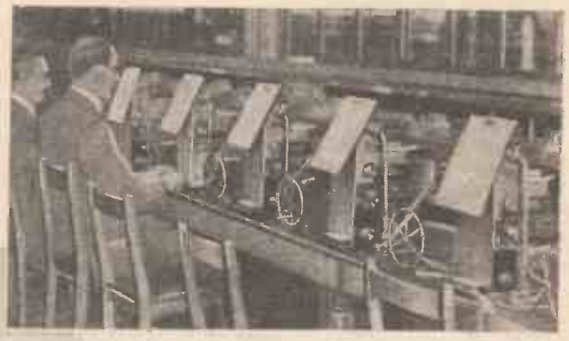
By depressing the various keys presenting the letters required, it is thus possible to telegraph messages, which are received in printed form at the other end. A motor turns the type wheel and its associated mechanism, and each apparatus is arranged to run at the same speed before commencing work. This apparatus has been very popular on the Continent and Professor Hughes received many

Honours from the rulers of various countries. Before the invention of the Baudôt, it was the principal means of telegraphing from London to the Continent and skilled operators could dispose of a great volume of traffic by its means.

The disadvantage is that it cannot be multiplexed, it can only be duplexed, allowing for one message in each direction at once, and has now been almost entirely superseded by the Baudot. It is interesting to note that the principles of the "Hughes" apparatus are utilised in most of the later forms of "printing telegraphs."

For wireless telegraphic communication between London and Continental cities, morse is in general use. Automatic transmission is usual, effected by means of perforated tape. Reception is by means of the Undulator, an apparatus which is more sensitive than the Wheatstone receiver. A stylus rests on the paper tape which is continually running and makes a line in violet ink. When no currents are being received, the line is steady, but when currents are being received, the needle moves sideways and traces dots and dashes above the centre line.

But on the inland telegraph system, the



(*Above*) *Pneumatic perforators.* (*Left*) *Baudôt keyboard*

Baudôt and everything else (with the exception of typewriters for copying purposes) has been displaced. Morse is as dead as mutton. The Teleprinter is now the premier instrument. To qualify, a Post Office operator must be able to send seventy messages per hour. Some operators have been known to send over a hundred.

The receiver must scan every message, check the number of words, and do a little rapid mental arithmetic since, for the purpose of minimising delay, he must calculate the time taken in transit. The exterior of the instrument is like a glorified typewriter. The interior is a little more complicated.

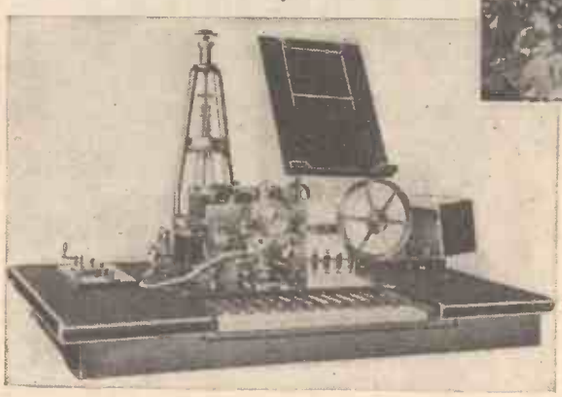
For £65 per annum, any telephone subscriber can now lease a telegraph instrument. This system is called the "Telex." It is thereby possible for a subscriber to type telegrams

*At the Central Telegraph Office*

direct from his or her office, or residence, to either the nearest head telegraph office, or direct to other subscribers. Every facility is given by the authorities for tuition and maintenance of plant, etc.

The messages are charged for like telephone calls.

The writers' knowledge of things telegraphic leads them to believe that the time is not far distant when this system will be extended to wireless.



*Hughes telegraph keyboard*

# On Your Wavelength

By Thermion

### A Happy New Year!

MY very best wishes to all readers for the happiest of New Years. May their aerials stand unshaken by the stormy winds, their sets perform prodigies of distance-spanning, their valves have service lives beyond the wildest dreams of those who made them, and their loud-speakers possess a tone that is the admiration of all who hear them!

It ought, by all the signs and portents, to be a magnificent wireless year, for the sunspots have run true to form. It was predicted that 1933 would be good, and so it was. Its successor should be better still, particularly for reception upon the medium waves. With luck, too, we should have little bother from atmospherics.

### Wireless in the Coming Year

EVERY New Year since "A.W." first appeared I have donned the prophetic mantle and tried to predict the big things in wireless that would come to pass during the ensuing twelve months. In past years it has not been too difficult to find numerous developments that were likely to be made and on the whole I've proved such a good prophet that I've been sorely tempted more than once to bring out an Old Thermion's Wireless Almanac.

But this year the task is by no means a light one. You see, both sets and the parts thereof have reached such a state of perfection that there seems to be very little room for anything that is really big in the way of innovations.

Next year will certainly not give us such a crop of thrills as 1933, which brought class-B and Q.P.P. amplification, self-adjusting volume control, and wondrous valves like the double-diode-triode, the double-diode-pentode, the heptode, the high-frequency pentode and the indirectly-heated mains rectifier.

### How Will Radio Progress?

ONE thing is sure. The good set bought or made now will not become obsolete for many a long day. Progress will be made mainly in refinements and in matters of detail. The super-het will be almost alone in the field at the next Exhibition. There will be small and simple patterns with only four (or perhaps three) valves, selling at about the price of the three-valve "straight" of to-day. These midget low-priced super-hets will in most cases not contain self-adjusting volume control or tone control.

Next will come the medium-priced super-het having four or five valves and incorporating both self-adjusting volume control and tone control. Lastly, I expect to see a good many "super" super-hets with nine or ten valves, designed for all-wave operation, and containing such refinements as the squelch circuit and twin matched loud-speakers.

### Valves and Components

THE most likely—certainly the most desirable—developments in valves are the indirectly-heated battery valve, the genuinely non-microphonic detector and the tandem valve, containing both the driver unit and the output electrodes. Owing to greatly increased sales, valve prices will probably be reduced during the year.

I expect to see progress made in ganged permeability tuners. If these can be brought to perfection it will be one of the biggest advances in wireless made for many a long day.

We may hear more of the electrostatic loud-speaker, and I would not be surprised to see an entirely new principle in loud-speakers making its appearance. Efforts will be made to get rid of second-channel interference once and for all in super-hets by the use of special circuits and I predict that we shall see the development of intermediate-frequency transformers tuned to much higher frequencies than the 126 or 110 kilocycles that are now the standards.

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### "Debunking" Wireless

WHEN I lunched with Percy Harris the other day he was chuckling over an article that he had just written for the *Wireless Magazine* with the purpose of showing up the nonsense that is talked about wireless and the bits and pieces that go to make up our receiving sets. Look out for it. It will open your eyes.

It's amazing, really, how ready we are to accept things as gospel if we hear them once or twice, or see them the proverbial three times in print. For instance, somebody once stated that the low-frequency transformer must always introduce distortion. The thuds made by transformers as they hurtled into dustbins were heard throughout the land and for months no self-respecting person would be seen with anything but resistance-capacity coupling on the low-frequency side.

Then it was found that resistance-capacity coupling had its own defects and that the transformer was pretty good after all. Wireless is full of things like that. Yes, P. W. H. must have enjoyed writing that article!

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### My Five-bob Battery

THE five-shilling 120-volt battery has now done ten days under test, at four hours a day, or forty hours in all. It is being run, if you remember, through a fixed resistance such that the load was 10 milliamperes to begin with when the battery was fresh.

Its original voltage was 122.6. It began to-day's run with a reading of 110.2 volts and ended it at 103.4 volts. So far it has made a better showing than I expected, for it is certainly a superior performer to some cheap batteries that I have tried; but those big drops between the beginning and the end of a four-hour run show that it is not up to the job of supplying a nominal 10 milliamperes, at any rate if you value quality.

You can see how "end-of-the-evening" distortion is introduced by such a fall in voltage as takes place during each four-hour period.

### Another Wonder Battery

ANOTHER reader insists that I don't know the real capabilities of the first-class standard-capacity high-tension battery. He mentions a make that I happen to know well, having put over a score of them through laboratory tests.

"Mine," he writes, "lasts fifteen months, running eight hours a day and supplying on the average 6 milliamperes."

Let us see what figures have to say. In fifteen months there are 456 days and at eight hours a day this comes to 3,648 service hours. Multiplying by .006 ampere—6 milliamperes—we have 21.9 ampere hours.

This refers, of course, to each cell, since all supply the same current. Now a primary cell works by "eating" zinc, and the highest efficiency obtainable in theory is 1.2 grammes of zinc per ampere-hour. In practice the figure is much higher. But if we multiply 21.9 by 1.2 we get 26.28 grammes of zinc as the smallest possible weight required for the job.

This is equivalent to nine-tenths of an ounce. Weigh an empty cell-can and see if it's possible! My correspondent has clearly over-estimated the service hours—a thing we're all liable to do unless a written record is kept.

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### Long Waves and Lucerne

THOUGH the B.B.C. has announced tentatively that Daventry 5XX will adopt its new wavelength on January 15, it seems likely that few, if any, changes will actually be made on the long waves. The fact that Holland, Sweden and Luxembourg did not sign

*Broadcasting has played a great part in the Christmas festivities this year. Here are two happy listeners offering a toast to the New Year radio—with their Marconiphone radio gramophone in the background*

the Lucerne agreement makes it impossible to operate that portion of the plan which affects wavelengths above 1,000 metres. France has already announced that the Eiffel Tower will continue in action, instead of closing down as it was due to do.

I expect that the long-wave transmissions will continue for some little time to be pretty well exactly as they are at present. So that's one tuning scale, at any rate, that won't need to be recalibrated for the present.

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### *Are Accumulators What They Were?*

LOOKING, the other day, over my stock of low-tension accumulators, which has to be rather a large one, I was amazed at the bad condition of the plates of some of those that were new only this time last year. Though they had been very well treated and neither over-loaded nor over-charged, several showed signs of disintegration of the positives and one or two were on their last legs.

Those of the mass-plate type were generally in the worst shape. This compares very badly with the record of my three heavy-duty cells which were bought six years ago. They have each had one new set of positive plates in that time, and though they have been in constant use they are all now in excellent order.

Is it possible that accumulators of certain types are now too cheap to be good? Certainly, I'd rather pay fifty per cent more if it means a service life three or four times as long. What do you think?

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### *Not Fair to Listeners*

ADVERTISING is advertising, but was it quite fair of one relay concern to issue posters suggesting that the only way to avoid the "chaos" which would occur after January 15 was to subscribe to a relay service?

If there were chaos—which there won't be—the receiving sets used by the relay people would be just as badly affected as those in private houses.

There is no set—and so far as we can see there is never likely to be one—that will cut out heterodyne whistles, unless, of course, a filter is used, which cuts out all the "top" along with the whistle. Don't be stampeded.

There's no cause for alarm. Your own set will work just as well after January 15 as it did before.

*That the B.B.C. does not intend to let the grass grow under its feet at Portland Place is proved by the constant refurbishing of the exterior of the building. This clever picture of workmen outside Broadcasting House was taken by Mr. E. J. Denney, of the Kodak works at Harrow*

## Listen to These Broadcasters - - - - - By Slade


### *France's National Station*

RADIO PARIS was taken over by the Posts and Telegraphs Department (generally known as PTT) of the French Government on December 17. The project was first mooted many months ago and the delay has been due to organisation difficulties owing to the numerous Cabinet changes that have taken place in France.

The station is to change its name to Emetteur National Français, or French National station, but I expect that most of us will continue to call it Radio Paris, having done so for all these years. The power is to be put up in the near future to 150 kilowatts. When this happens the station should have an immense range, for it is already well heard over a large part of Europe even in broad daylight.

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### *Wavelength Accuracy*

THE importance of maintaining the accuracy of the frequency, or wavelength, of a wireless transmitting station is now a matter of common knowledge. The ordinary listener to broadcast programmes realises the difficulties that arise when stations depart from their allotted wavelengths, and the greatest care and attention must be continuously devoted to the accuracy of measuring instruments.

The standard of frequency to which all such instruments in this country are ultimately referred is at the National Physical Laboratory, Teddington.

In essence, the instrument is a tuning fork of the same general form as that used by musicians as a standard of pitch, and the researches which have enabled the extraordinary degree of accuracy of modern radio communication to be reached consist of experiments on methods of mounting the fork and of securing exact balance of its two prongs; an investigation of the effects of slight changes of temperature and atmospheric pressure and the means of avoiding them; a study of the electrical circuit used to maintain the fork in continuous vibration, and the magnetic coupling of this circuit to the fork; and, finally, the means of determining to the highest accuracy the frequency of the fork. The complete standard equipment includes a chronograph specially designed by the late Dr. Dye for this purpose.

Mere inspection of the chart of this instrument enables the frequency of the fork to be read with an accuracy of one part in ten million in terms of time as measured by the standard clock of the laboratory. This would represent a deviation of not more than about three seconds a year if the fork was running continuously for that period.

### *Sea Water—and All That*

CURIOUS that the august National Physical Laboratory should be worrying about the nature of the sea water in the English Channel, isn't it? Yet sea water has electrical properties worth investigation by no less an authority than the well-known Dr. R. L. Smith-Rose.

We know that sea water can give us a shock—who has not shuddered on tip-toeing shiveringly into the briny, into a sea that looks so inviting from the pier, yet later takes on an ominously wicked appearance of dreadful coldness?

Well, it is nothing to do with this sort of shock that the worthy Doctor has been investigating the samples of water taken from the English Channel. Something much more serious.

What he has been trying to find out—and has, indeed, found out—is the electrical resistivity of sea water. Which, believe me, is no laughing matter.

### *Wireless Waves Know Best!*

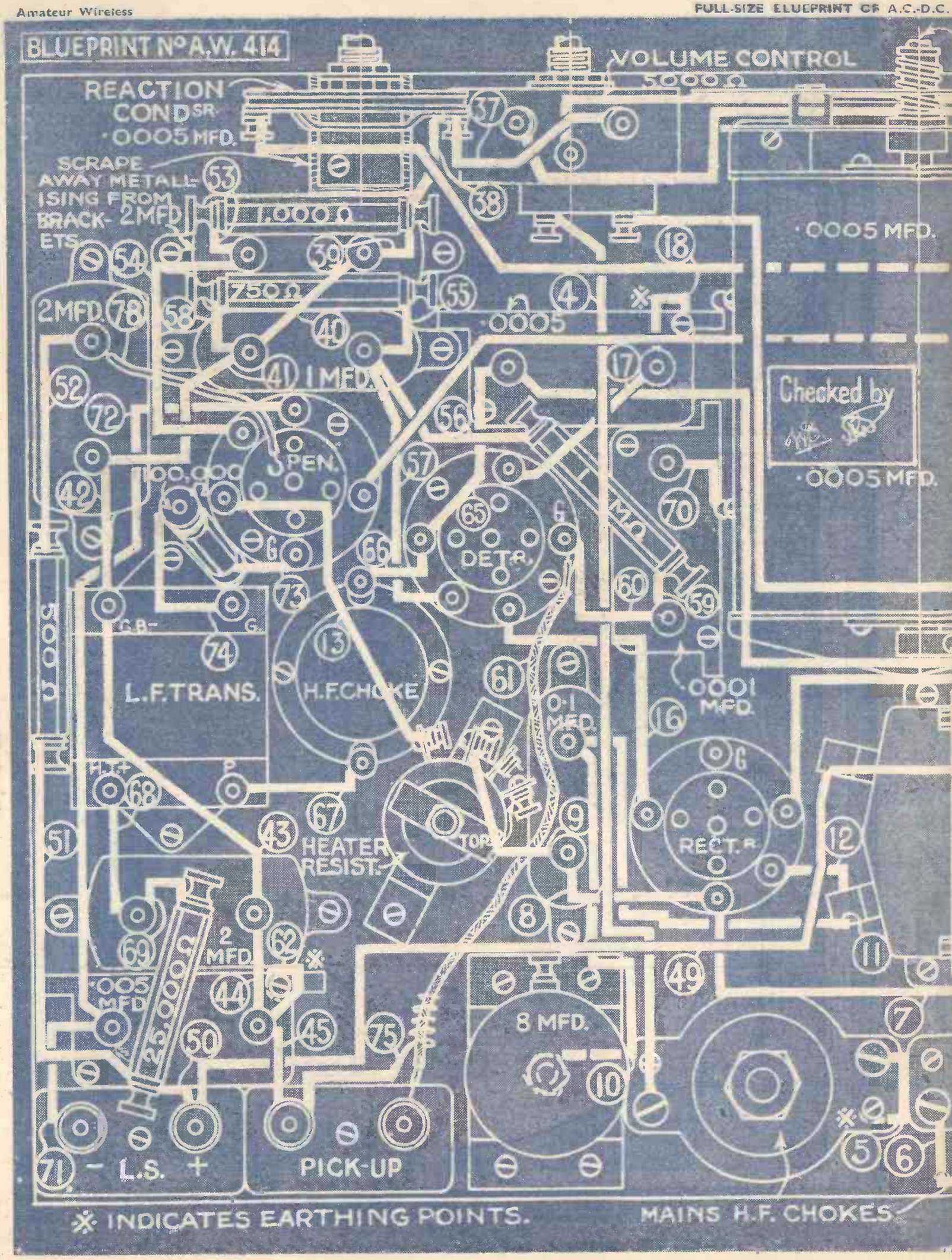
FOR consider the effect of the sea on wireless transmission. Have we not known, ever since Marconi sent those first significant dots across the Atlantic, that wireless waves prefer to travel over sea waves, rather than become all too quickly absorbed over dry land?

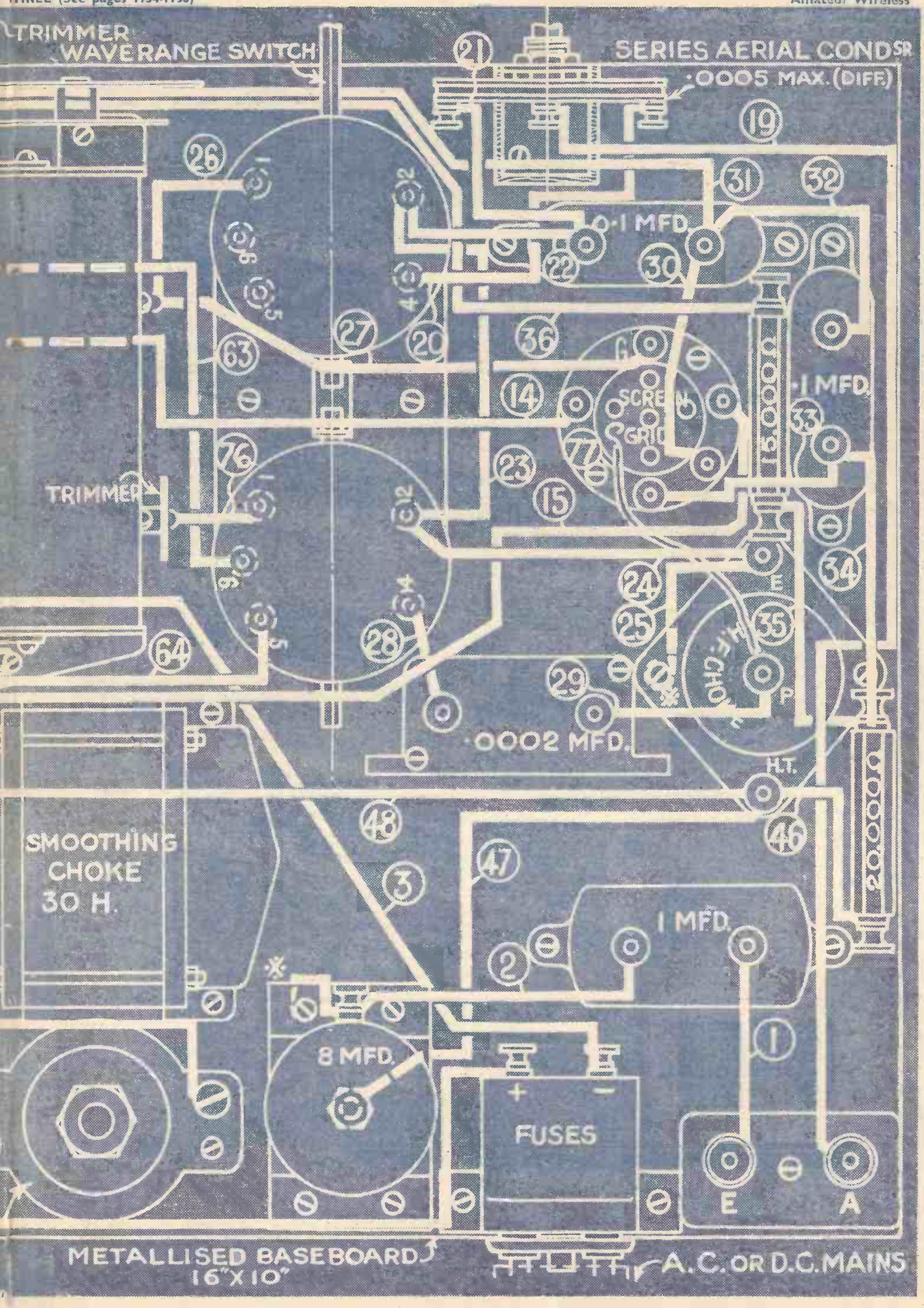
The reason is simple. The water has a much lower resistance to the wireless waves than dry land. Hence the determination to see just what is the resistivity of sea water.

Various frequencies up to 10,000 cycles per second were used in these experiments, on all wavelengths above 30 metres. The result has been the establishment of sea-water's electrical resistivity at about 20 ohms per cubic centimetre.

Just how significant is this result will be clear when I tell you that the corresponding figure for *moist* garden soil is five hundred times as great. No wonder wireless waves prefer a sea voyage!

I gather that as the result of these experiments useful data has been gathered to help in the design of ships' beacons for radio communication at sea. Which is a fitting conclusion to the experiments, since they end, as they began, with the English Channel—or, at least, with samples of it.


BLUEPRINT Nº A.W. 414
VOLUME CONTROL
5000 Ω
REACTION COND.SR. ·0005 MFD.
SCRAPE AWAY METALLISING FROM BRACKETS
2MFD
1000 Ω
·0005 MFD.
750 Ω
2MFD.
·0005
1 MFD.
Checked by
·0005 MFD.
PEN.
100,000
DET.R.
MAN.
G.B-
L.F.TRANS.
H.F.CHOKE
·0001 MFD.
0·1 MFD.
HEATER RESIST.
REC.T.R
2 MFD.
·005 MFD
25,000 Ω
8 MFD.
- L.S. +
PICK-UP
INDICATES EARTHING POINTS.
MAINS H.F. CHOKES


TRIMMER
WAVE RANGE SWITCH
SERIES AERIAL CONDSR
·0005 MAX. (DIFF.)
·1 MFD.
·1 MFD.
TRIMMER
SCREEN GRID
·0002 MFD.
H.T.
SMOOTHING CHOKE 30 H.
1 MFD.
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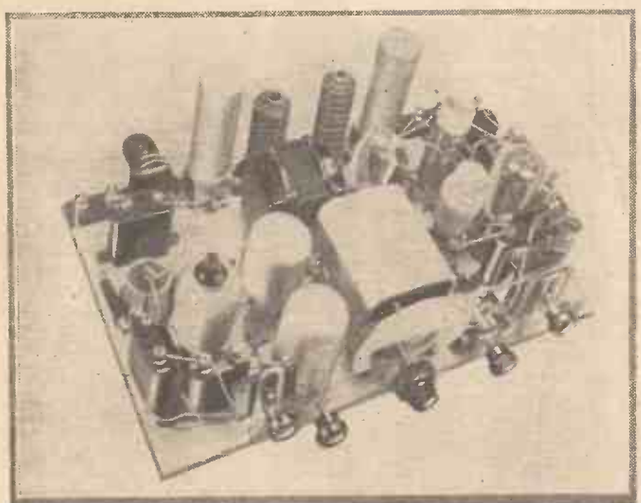
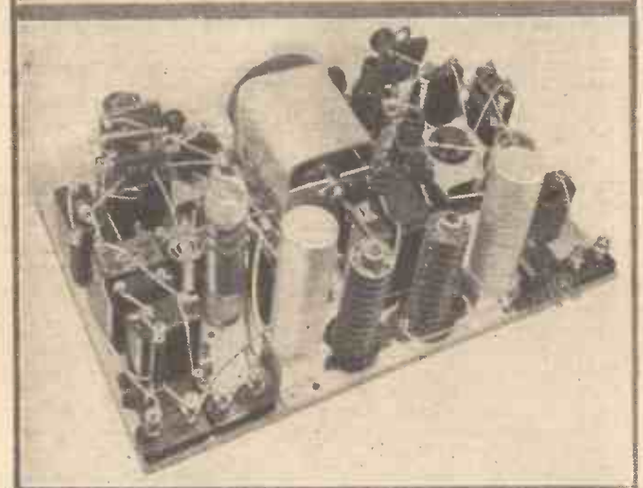
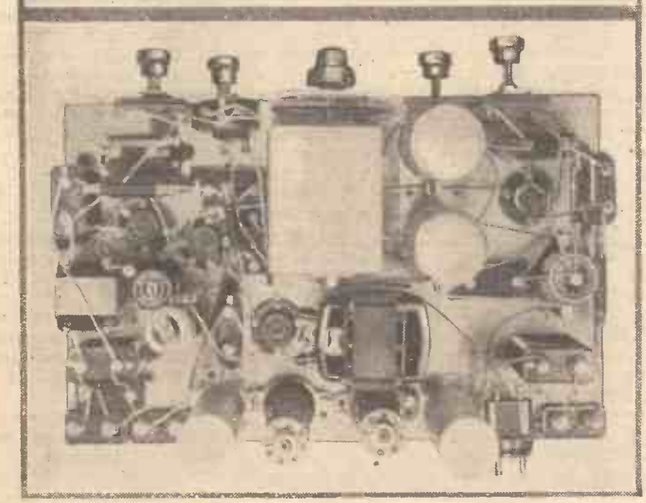
E
A
METALLISED BASEBOARD 16"X10"
A.C. OR D.C. MAINS

# Plug-in to A.C. or D.C. At Will wit

## Whatever Your Mains (As Long as They are Over 200 Volts) You







By the AMATEUR WIRELESS Technical

AS we announced on page 1,131 of the December 23 issue of AMATEUR WIRELESS, we have designed a mains set that will work equally well on A.C. or D.C. supplies —without any alteration to the "works" when going over from one supply to the other.

Such a set, which we might call a *universal* mains set, has a special value to readers who, at present on a D.C. supply, never know when they may be changed over to the A.C. type of mains under the grid system.

Readers in this category tend to forego the undoubted reception advantages and great convenience of maintenance associated with a mains set because they do not want to have to scrap apparatus in the event of a change over.

Now, with the modern universal mains set, such as we are about to describe, there is no longer any need for the D.C. mains listener to use a battery set—or to wait for the long-delayed change over to A.C. He can go right ahead with a design that we can guarantee to give just as good service without any alteration at all, on A.C. as on D.C.

### Convenience of the Set

A universal mains set is a great convenience, anyway. Often enough you might like to take your set to a relation or friend, but are deterred from doing so because his mains are not the same as yours. All that is changed with a universal set.

The first point to note about this set is that *there is no mains transformer*. When we are dealing with D.C. we have to remember that the current is uni-directional, and that it cannot pass through a transformer as can so easily be done by A.C.

As a matter of fact, with the right valves and circuit resistances, a transformer is by no means essential in an A.C. set. One of the chief reasons for using a transformer is to change the voltage of the supply so that it is suitable for the valves we are using—for the three receiving valves and for the mains rectifier valve.

If we choose suitable valves and insert resistances to cut down the voltage, we can do without a transformer quite easily. A rectifier can be inserted in series with one of the mains leads for the A.C., and this will allow D.C. to pass through without any trouble, although the rectifier is then inoperative.

The guiding principle in designing a universal mains set is to work rather along the lines of a D.C. set, with the valve heaters wired in series with each other and with a suitable dropping resistance; and to insert a half-wave rectifier in one lead so that when the supply is A.C. it is rectified. The heater of the rectifier is also wired in the series arrangement, but here again there is no difficulty if the right type of valve is chosen.

You will see from the theoretical circuit diagram of the A.C./D.C. Three that we have a more or less straight-three sequence, with a variable-mu screen-grid valve in the first stage, a detector, and a double-grid type of power valve in the output. Such a combination of valves has been tried and found excellent for average conditions, provided that the tuning circuits are made sufficiently selective. We have fully attended to this important point. As you will appreciate, there are two tuning circuits in the set, one for the aerial tuning and the other for the inter-valve coupling.

For a start, we should explain that iron-core coils have been used. These certainly provide us with the highest possible selectivity per stage, as many readers will have proved for themselves in many of our preceding sets.

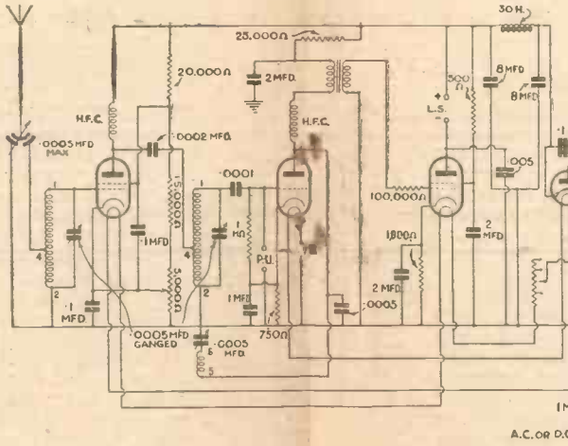
### Cutting Down Losses

The use of an iron core, we might explain for the benefit of new readers, cuts down the high-frequency losses of a tuning coil and enables a higher degree of selectivity to be obtained than is possible with the compact type of air-core coils.

Going further into the circuit for the benefit of technical readers, you will note that the high-frequency coupling is of the parallel-feed or tuned-grid type, with a high-frequency choke in the anode circuit and a tuned circuit across the grid and cathode of the detector.

A .0002-microfarad coupling condenser is used to keep up the selectivity. A higher value would give a little more volume, perhaps, but only at the expense of the invaluable selectivity. This coupling circuit, in combination with the variable-mu screen-grid valve, gives us a very selective high-frequency stage. Volume can be varied on the screen grid, in addition to a form of volume control in the aerial circuit.

We have used a *differential* .0003-microfarad condenser in the aerial circuit, between the aerial lead and the tuning coil, in order to give a fine variation of selectivity without upsetting the tuning adjustment. Although the aerial coupling is varied on one half of the differential,




*Circuit used for the A.C./D.C. three-valver fully describe these pages. A full-size blueprint appears on the inside*

# h This Universal Three!

## can Listen at Once by Plugging-in This Set

### Staff

and thus the selectivity, the other half makes up for any differences in aerial load on the coil. In this way you can vary selectivity without having to re-adjust tuning.

The gramophone pick-up arrangement is worth a word. When the set is on the radio setting there is no bias imposed by the cathode resistance in the detector circuit. This is because the grid leak goes to cathode. When the pick-up is brought into circuit one end of the pick-up is at earth potential, the other end going to the control grid of the valve. The result is that the bias resistance becomes operative and negatively biases the valve for the required low-frequency amplification.

Carrying on with our circuit analysis, note that there is a grid stopper in the output grid circuit, the value being 100,000 ohms. This cuts out, or rather drops across itself, any residual high-frequency current that may have strayed through, and thus enhances the stability of operation.

#### Reducing the Mains Voltage

Now for the mains supply. We use a tapped resistance to drop down the mains voltage from whatever it is to the required 16-volt potential of the heaters of the Tungsram valves. This resistance is designed for all mains supplies from 200 to 250, either A.C. or D.C. It has three tappings so that you can adjust it to suit your own particular supply.

The mains rectifying valve for the A.C. function of the set is wired in the positive lead, and in this same lead there is a smoothing choke. The smoothing of the supply is completed with two 8-microfarad electrolytic condensers. When the set is on A.C., one of these acts as the usual reservoir condenser and the other as the output smoothing condenser, but on D.C. the reservoir condenser is simply so much extra smoothing on the mains side.

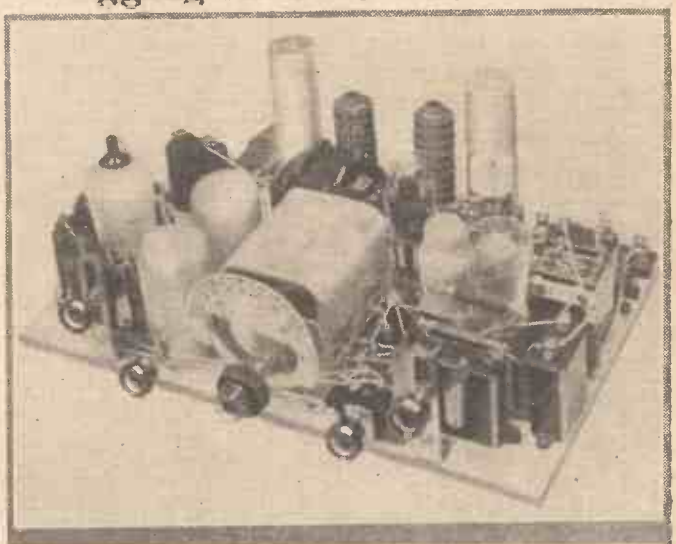
The filament circuits of the valves—that is the three receiving valves and the rectifier—are specially wired up in series so that the detector heater comes at earth potential. This is an important point in the design, as it materially cuts down the tendency for hum at the detector stage.

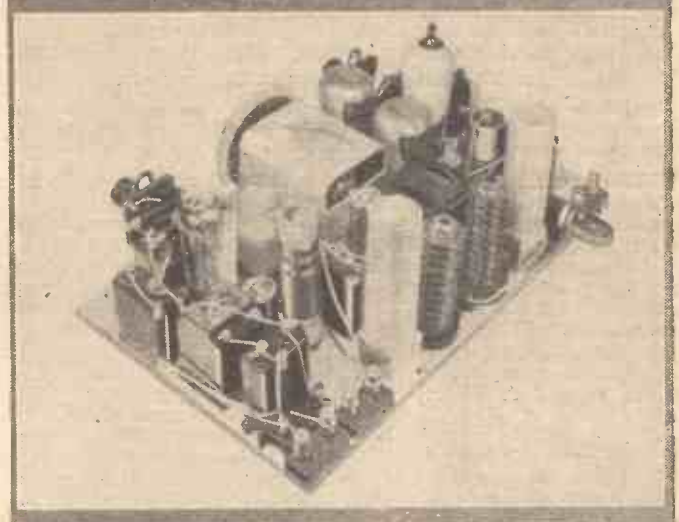
You should also make a special note of the 1-microfarad condenser between the negative main lead and earth. This is an essential component.

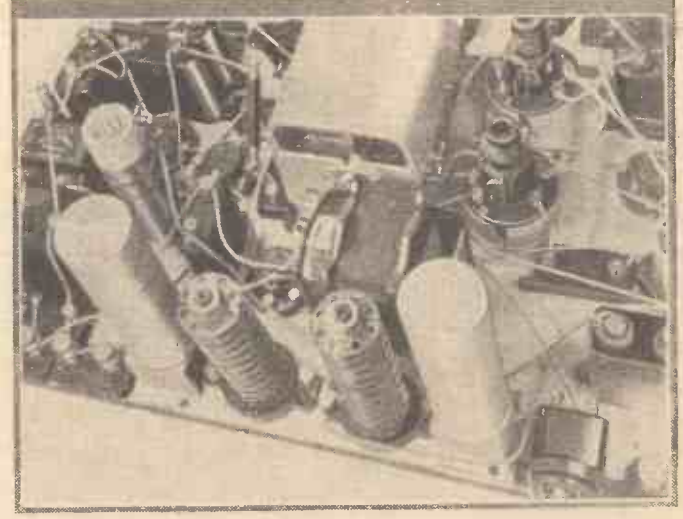
Another star feature of the design is the use of two special mains chokes of the high-frequency type in the two leads from the supply. These again prevent the introduction of mains interference and are one of the several factors that make the set so quiet in operation.

So we come to the simple construction of the set. You cannot do better than follow our full-size blueprint, printed on the inside cover of this issue. A separate blueprint can be obtained for 1s., post paid. This provides the constructor with all the essential details of the component


*ed in cover*







## COMPONENTS NEEDED FOR THE A.C./D.C. THREE

**BASEBOARD**
1—Peto-Scott Metaplex 16 in. by 10 in.

**CHOKES, HIGH-FREQUENCY**
1—Telsen standard screened, type W341 (or Graham-Farish, Wearite).
1—R.I., type Quad Astatic (or Lissen, Graham-Farish).
2—Goltone mains, type PHF (or Wearite).

**CHOKE, LOW-FREQUENCY**
1—Heayberd, type 751 (or Wearite, Bulgin).

**COILS**
2—Lissen iron-core screened aerial, type LN5321.

**CONDENSERS, FIXED**
1—Lissen .0001-microfarad (or Dubilier, Graham-Farish).
1—Lissen .0002-microfarad (or Dubilier, Graham-Farish).
1—Lissen .0005-microfarad (or Dubilier, Graham-Farish).
1—Lissen .005-microfarad (or Dubilier, Graham-Farish).
3—Dubilier .1-microfarad, type BB (or Lissen, Graham-Farish).
2—Dubilier 1-microfarad, type BB (or Lissen, Graham-Farish).
3—Dubilier 2-microfarad, type BB (or Lissen, Graham-Farish).
2—Dubilier 8-microfarad, type reversible electrolytic.

**CONDENSERS, VARIABLE**
1—British Radiophone two-gang .0005-microfarad, type 458A (or J.B., Utility).
1—Graham-Farish .0003-microfarad differential (or Telsen, Polar).
1—Graham-Farish .0003-microfarad (or Telsen, Polar).

**HOLDERS, VALVE**
4—Graham-Farish five-pin (or Lissen, Telsen).

**PLUGS & TERMINALS, ETC.**
1—Bulgin combined mains plug and fuse holder, type F15.
3—Lissen terminal blocks (or Telsen).

**RESISTANCES, FIXED**
1—Graham-Farish 500-ohm (or Lissen, Telsen).
1—Graham-Farish 750-ohm (or Lissen, Telsen).
1—Graham-Farish 1,000-ohm (or Lissen, Telsen).
1—Graham-Farish 15,000-ohm (or Lissen, Telsen).
1—Graham-Farish 20,000-ohm (or Lissen, Telsen).
1—Graham-Farish 25,000-ohm (or Lissen, Telsen).
1—Graham-Farish 100,000-ohm (or Lissen, Telsen).
1—Graham-Farish 1-megohm (or Lissen, Telsen).
1—Bulgin mains, type MR25.

**RESISTANCES, VARIABLE**
1—Bulgin 5,000-ohm with switch, type VS36 (or Claude Lyons, British Radiophone).

**SUNDRIES**
2—British Radiogram 4 in. metal-mounting brackets.
2—British Radiogram single electrolytic condenser mounting brackets.
1—Peto-Scott Metaplex strip 5 in. by 2 in.
Connecting wire and sleeving.

**TRANSFORMER, LOW-FREQUENCY**
1—Varley, type Nicore II (or Lissen, Telsen)

### ACCESSORIES

**CABINET**
1—Peto-Scott, type ACDC.

**LOUD-SPEAKER**
1—Amplion, type MC22.

**VALVES**
1—Tungsram SG2018.
1—Tungsram R2018.
1—Tungsram PP2018.
1—Tungsram V2018.

layout, as well as giving a point-to-point guide to the wiring. Each lead is numbered in sequence and you have only to follow this sequence to be quite sure of having made all the connections correctly.

As you will see from the illustrations, the components are laid out on the baseboard without the use of a panel. The variable controls are fitted to brackets on the front of the baseboard. At the centre of the controls is the tuning—a double-gang condenser being used to simplify the operation. On the left is the aerial selectivity control and the wave-change switch knob. On the right is the reaction control and the screen-grid volume control.

Please note that we are using a new type of Dubilier condenser for the smoothing, a type that is reversible in action and therefore especially of use in this universal mains set, where we are dealing perhaps at one moment with D.C. and the next with A.C. Dubilier have not yet listed these condensers and they are a brand-new development. If your dealer has any difficulty in supplying, write to Dubilier's about it and tell them you want them for this set.

When the set has been assembled and wired up according to our blueprint, you can fit it into the specified console cabinet. A permanent-magnet moving-coil loud-speaker takes the top part of the cabinet in the original model, with an integral matching transformer. We suggest you follow this idea yourself. You then have a very fine self-contained set giving excellent quality.

As a safety measure we have used the well-know Bulgin combined fuse and mains plug at the back of the baseboard. This effectively shields anyone from such minor shocks as any mains set is liable to give. May we remind you that this universal mains set has been designed in such a way that *there is absolutely no danger in its construction or use.* The valves used are of the low-voltage type and the set as a whole is no more dangerous to use than any D.C. set of similar type.

In operation the set will be found very easy. You have plenty of controls to play with, but not too many to cause confusion. The aerial selectivity control should be played off against the screen-grid volume control, reducing the aerial coupling and increasing the screen-grid magnification when you want to separate two tricky stations.

# The Problem of Too Much Volume

By E. H. Robinson

UNLESS something is done about this volume business there is going to be trouble. The majority of the inhabitants of this country now live in urban or suburban districts in rows of houses constructed with no provision at all for reasonable sound isolation.

Very soon there will be over six million licenced wireless receivers in operation and, in the nature of things, a very large proportion of receivers are worked in densely populated districts.

### Broadcast Appeals

Throughout the summer, which this year has given us an unusually long period of balmy evenings just asking for wide-open windows, the B.B.C. has broadcast appeals that receivers should not be used in a way to annoy neighbours.

With the increasing power available from output valves in modern sets annoyance can often be caused even when windows are tightly closed. Party walls are never really sound-proof, and an ordinary commercial receiver with an output valve delivering 2.5 watts up against such a party wall is more than likely to cause a declaration of "war to the death" from neighbours.

The increase of output power, which is now associated with battery-operated as well as mains-operated receivers, is due to no lust for mere noise. It is an unfortunate fact that as things are we cannot have natural reproduction without quite considerable power.

Below about 1 watt of undistorted output bass does not exist in anything like true proportion. Between 1.5 and 2 watts the sound of an orchestra begins to be quite realistic and there is an increase in this realism as the power is raised up to something like 5 watts.

An output power of 2.5 watts or over can be heard all over quite a large house and such volume is obviously quite unsuited for use in a semi-detached villa, but the power is there in most sets and it is a characteristic of average human nature to use that which is available.

Something might be done to re-introduce headphones. Before they were swamped by the loud-speaker, certain firms were turning out headphone sets of the reed type which did give remarkably faithful reproduction and it does not seem beyond the bounds of possibility that a little money spent on research would result in telephone earpieces with a very fine response curve.

*Talking of volume, here is a photograph of the largest orchestra ever broadcast. It is composed of 404 pieces and broadcast recently from Radio City, New York*

### Headphones Welcome

Such instruments would be welcome in those very many houses where only one or two want to listen whilst others wish to be doing things which are impossible when a loud-speaker is working at full blast.

Whilst we are waiting for the development of the loud-speaker and for the marketing of sets provided with alternative headphone plugs and for the research work which is still necessary on the headphone itself, users of wireless in populated areas can do quite a lot to prevent themselves from being regarded as public enemies by keeping their loud-speakers as far as possible from party walls and experimenting with the volume control to find a point at which reasonably good quality can be obtained without undue noise.

The Golden Rule is still the only all-satisfying guide to conduct.

# Programme Items for Your Entertainment

*Making good use of the Christmas gift—a Pye portable*

*Wednesday, December 27*

NATIONAL: Variety programme.

London Regional: Orchestral concert.

Midland Regional: *Death at the Opera*, a play by J. C. Cannell, in which a murder is staged to look like an accident; producer, Martyn Webster. Talk by Princess Nathalie Troubetskoy.

West Regional: Pantomime—*The Babes in the Wood.*

North Regional: Dance music, relayed from Harrogate.

Scottish Regional: Choral and orchestral concert, relayed from St. Andrew's Hall, Glasgow. Renfrew Male Voice Choir; conductor, Charles Rennie.

Belfast: Orchestral concert.

## Wavelength Changed Already!

INNSBRÜCK (Austria) is apparently the first station to alter its wavelength according to the Lucerne Plan, and is anticipating the "all-change" date. It is now testing on 578 metres (579 kilocycles) in order to ascertain whether any interference is caused to the morse transmissions of shipping in the Mediterranean. The wavelength is a very favourable one in view of the mountainous district it has to serve, and if all goes well the power of the station will be raised to 2 kilowatts.

Finally, at a meeting of one of the Committees of the League of Nations at Paris recently, where the question of broadcast propaganda was considered, with a special reference to certain countries guilty of offending their neighbours in this manner, the opinion was expressed that the only means by which the evil could be fought was in the nature of jamming—meeting force by force, so to speak. J. C.

*Thursday, December 28*

National: Orchestral concert of notable numbers produced during the year.

London Regional: Variety programme, relayed from the Argyle Theatre, Birkenhead.

Midland Regional: Midland composers (No. 21), Francis Edward Bache; vocal and instrumental concert. "Five Million Books a Year," talk by Percy Marshall.

West Regional: "Cofio Miri'r Fyddin," by old soldiers from the village of Aberysgethin.

North Regional: Variety relay from the Argyle Theatre. Jack Martin with his Hotel Majestic Orchestra.

Scottish Regional: Band concert.

Belfast: *The Miniature*, a fantasy by Anne McQuillan. *Rolling the Planet*, a comedy by George Shiels.

*Friday, December 29*

National: *The Streets of London*, a play of low and high life in the middle eighties; the B.B.C. Theatre Orchestra will play.

London Regional: *The Magic Flute* (Mozart), Act 1, relayed from Sadler's Wells.

Midland Regional: Midland composers (No. 21), Vaughan Williams; vocal and instrumental concert.

West Regional: *The Magic Flute*, from Sadler's Wells.

North Regional: Horwich R.M.I. Band; conductor, W. Wood.

Scottish Regional: *Babes in the Wood*, relayed from the Theatre Royal, Glasgow.

Belfast: "Lullaby," an orchestral concert; Anne Montgomery will sing a group of "Old and New."

*Saturday, December 30*

National: Music-hall programme.

London Regional: Programme of modern chamber music.

Midland Regional: Midland theatre pantomime music.

West Regional: *On the Scot*, or *Double-crossing the Border*, a seasonable serial story.

North Regional: "December, 1833," a feature programme; contrasts and similarities in local conditions at the end of this year and a century ago. Recital of Bach music by Percy Richardson.

Scottish Regional: *On the Scot.*

Belfast: A programme by the first prize winners in the North of Ireland Bands' Association Championship contest. "Retrospect," a programme reviewing some of the most important items of the past year.

*Sunday, December 31*

National: Service from Canterbury Cathedral. New Year's Eve feature programme.

Scottish Regional: Song recital by Catherine Stewart (contralto), includes songs by Beethoven, Arnold Bax, and Roger Quilter.

*Monday, January 1*

National: Concert of British music relayed from the Queen's Hall; Solomon is the solo pianist.

London Regional: *Meet the Prince*, a musical comedy adapted by John Watt, who will be assisted by Harry S. Pepper in production. "Education for Life," an address to be given by Dr. George Dyson, relayed from University College, London.

West Regional: Talk on countryside customs by Jenkin James. *Y Flwyddn Newydd*, folk-songs, poetry, and penillion sung with harp accompaniment.

Scottish Regional: Some of the best artists in the country in a gay, crowded New Year party. Midnight till 1 a.m., dance music by Jack Chapman and his band, from the Albert Palais de Danse, Glasgow.

*Tuesday, January 2*

National: *Meet the Prince.*

West Regional: Frederick Harvey (baritone), the chorus of the Cardiff Musical Society, and the Western Studio Orchestra in a programme for Devon lovers.

Scottish Regional: Scottish Orchestra concert, relayed from St. Andrew's Hall, Glasgow; conductor, John Barbirolli; soloist, Ria Ginster.

**Sets That Set a Standard.—3**

## The 1931 Ether Searcher

WHEN we come to examine the progress of the Ether Searcher through the years since its first inception in 1927, we find that by the year 1931 a great change had come over set designing. No longer were sets designed around individual preferences in such matters as circuits and layouts.

Sets were designed as the result of a consensus of technical opinion, not the work of any one man, but the crystallisation of the general technical trends of the year.

So, in the 1931 Ether Searcher, published in the January 17, 1931 issue of AMATEUR WIRELESS, we find a set that J. Sieger was very proud of. He might well have been, for it epitomised many outstanding technical developments.

Band-pass tuning was a very important feature of that Ether Searcher. Selectivity had become the paramount requirement of reception. It could be met only by a well-designed sequence of tuning circuits.

In a three-valver, a band-pass aerial-tuning arrangement would account for two of these tuning circuits, and the intervalve coupling for a third, thus making a thoroughly sound filter for separating the wanted station from the unwanted stations on each side of it.

### New Fashion in Layout

Screened coils and screen three-gang condensers were featured in the 1931 Ether Searcher, which set a new fashion in layout—a metallised baseboard and a small vertical control panel taking the place of the all-metal chassis type of construction.

Again the tuning was by one knob, and controls were remarkably simple for such a high-grade performer. This set was a true Ether Searcher, *for it set a standard that was not beaten in its year.*

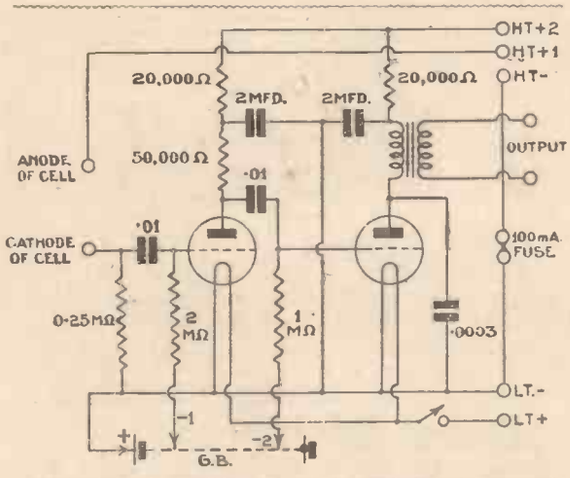
*Another year is with us. What sort of an Ether Searcher are we going to give you for 1934? Ah, that's a secret! But we will not keep you waiting long now. Be patient. It is coming soon!*


# The Photoelectric Cell

## An Outline of its Action and Application

THE conversion of light changes into sound, as exemplified in talking films or television, carries with it one of the most fascinating of electrical phenomena. Such an electrical phenomenon as the transference of light energy into electrical energy has attracted the investigations of scientists for many years and is, at the present time, receiving even closer attention, owing to new openings which are becoming apparent as to the commercial possibilities of such a device.

Two methods are at present known for attaining this result. The one utilises the property of the element selenium for changing resistance with different amounts of light falling on it. The other method makes use of a phenomenon very similar to that which takes place in an ordinary wireless valve, namely the emission of electrons which can be attracted by a positive electrode or anode; an electron current is thus formed in the same way as that produced in a ordinary wireless valve. This device is known as the photoelectric cell and, in its fundamental principles, it is really extremely simple.




*Circuit of simple amplifier for experimental photoelectric work*

When we say "light," the majority of us think of sunlight, electric light, coloured light, etc. In the broad sense of the word, however, light can be made to include something much wider than this. It is well known that the colours of the rainbow are composed of what we know as "white light" split up into its various components which give various reactions to the retina of the eyes, causing the impression of different colours. It is also well known that it is possible to re-combine these various colours once again to form white light. The range of visible colours which form white light is termed the visible spectrum.

Light is, therefore, really composed of ether vibrations at varying frequencies, the faster vibrations giving the effect of blue light and the slower vibrations the effect of red light. These vibrations, however, continue on both sides of the visible spectrum. If the ether vibrates faster, that is, at a higher frequency than to give the effect of blue light, the vibrations are no longer visible and are called the "ultra-violet rays." If the ether can be made to vibrate at a still higher frequency we have what are called X-rays.

It has been well known for some time that the impact of these ether waves of varying frequencies on certain substances gives rise to a very interesting phenomenon. In certain substances, notably metals, the trains of waves of extremely high frequency which are directed upon them have the effect of liberating a supply of electrons from the surface of the substance. This is known as the photoelectric effect. It has been found by careful investigation that this effect varies very considerably with the substance or metal upon which the waves fall and also upon the frequency of the waves. Thus, waves of extremely high frequency, which correspond to what we call X-rays, are able to liberate a supply of electrons from all known substances, but as we diminish the frequency of the waves the tendency to liberate electrons diminishes. At the other end of the frequency scale there are no substances capable of liberating electrons.

Research has found that each metal or substance possesses a certain definite limit of electron emission for a certain wave-frequency, no emission being provided at lower frequencies than this limit. At the same time, however, there is apparently no upper limit to the frequency of ether waves to which the substance is sensitive.

If we want to make our photoelectric cell operate with waves of frequency corresponding to visible light, we must choose a substance which will give off electrons with waves of this frequency impinging upon it, and there are only a few elements which will do this. It is quite easy to find the element which will give off electrons for these rays, which are known as ultra-violet rays or "actinic rays," but as we go through the spectrum and approach red light it becomes more and more difficult to find the substance which will be sensitive.

### Easy to Understand

Assuming, therefore, that we have found a suitable element which will give off electrons by directing a beam of white light upon it, the remaining action will be quite easy to understand to all who have used wireless valves. It is well known that a valve consists of two fundamental parts—the negative electrode or "cathode" which can be made to give off electrons by heating it, and the positive electrode or "anode" which acts as a collector of these electrons.

Exactly the same principle applies in the photoelectric cell except that, in this case, the cathode gives off its electrons, not by virtue of heat applied to it, but by the impulse of light waves falling upon it.

The photoelectric cell, in its simplest form, consists of a glass bulb which may be evacuated, or may contain inert gas, and in this bulb are contained the electron-emitting cathode and the electron-collecting anode. The anode is connected externally to the positive of a high-tension battery, the circuit being completed to the cathode as for an ordinary wireless valve.

It will now be apparent that, when a cell is in the dark, no electrons are emitted

*Continued on page 1162*

# Broadcasting Stations

Wavelengths are brought up to date week by week. For the purpose of better comparison, the power indicated is that of the carrier wave.

| Metres | Kilocycles | Station and Call Sign | Country | Power (Kw.) |
|---|---|---|---|---|
| 16.86 | 17.790 | Daventry (GSG) ... | Great Britain | 20.0 |
| 19.54 | 15,350 | Lisbon (CTIAA) | Portugal | 2.0 |
| 19.56 | 15,330 | Schenectady (W2XAD) | United States | 20.0 |
| 19.68 | 15,234 | Paris (Colonial) ... | France | 15.0 |
| 19.73 | 15,200 | Zeesen (DJB) | Germany | 8.0 |
| 25.2 | 11,905 | Paris (Colonial) ... | France | 15.0 |
| 25.28 | 11,865 | Daventry (GSE) ... | Great Britain | 20.0 |
| 25.4 | 11,810 | Rome (2RO) | Italy | 15.0 |
| 25.51 | 11,760 | Zeesen (DJD) | Germany | 8.0 |
| 25.53 | 11,750 | Daventry (GSD) ... | Great Britain | 20.0 |
| 25.57 | 11,730 | Huizen (PHI) | Holland | 40.0 |
| 25.63 | 11,705 | Paris (Colonial) ... | France | 15.0 |
| 29.04 | 10,331 | Ruysselede (ORK) | Belgium | 10.0 |
| 30.0 | 10,000 | Madrid (EAQ) | Spain | 20.0 |
| 31.3 | 9,585 | Daventry (GSC) ... | Great Britain | 20.0 |
| 31.38 | 9,560 | Zeesen (DJA) | Germany | 8.0 |
| 31.55 | 9,510 | Daventry (GSB) | Great Britain | 20.0 |
| 31.6 | 9,490 | Poznan (SRI) | Poland | 1.0 |
| 37.33 | 8,036 | Rabat (CNR) | Morocco | 6.0 |
| 38.47 | 7,799 | Radio Nations (HBP) | Switzerland | 20.0 |
| 42.92 | 6,990 | Oslo (LCL) | Norway | 0.5 |
| 43.86 | 6,840 | Budapest | Hungary | 2.0 |
| 45.38 | 6,610 | Moscow | U.S.S.R. | 10.0 |
| 46.69 | 6,425 | Boundbrook (W3XL) | United States | 1.0 |
| 48.86 | 6,140 | Pittsburgh (W8XK) | United States | 40.0 |
| 48.94 | 6,130 | Mexico (XETE) | Mexico | 2.0 |
| 49.02 | 6,120 | Wayne (W2XE) ... | United States | 1.0 |
| 49.18 | 6,110 | Chicago (W9XF) ... | United States | 5.0 |
| 49.18 | 6,110 | Boundbrook N.J. (W3XAL) | United States | 18.0 |
| 49.4 | 6,073 | Skamlebaek (OXY) | Denmark | .5 |
| 49.47 | 6,065 | Nairobi (VQ7LO) | Kenya Colony | .5 |
| 49.55 | 6,055 | Vienna (UOR2) | Austria | .5 |
| 49.59 | 6,050 | Daventry (GSA) ... | Great Britain | 20.0 |
| 49.83 | 6,020 | Zeesen (DJC) | Germany | 10.0 |
| 50.0 | 6,000 | Moscow (RNE) | U.S.S.R. | 20.0 |
| 50.26 | 5,969 | Vatican (HVJ) | Italy | 10.0 |
| 202 | 1,484 | Tarragona (EAJ33) | Spain | .25 |
| 203 | 1,478 | Bilbao EAJ28 | Spain | .25 |
| 204.7 | 1,465.4 | Liege (Exp.) | Belgium | .35 |
| 209.8 | 1,429 | Miskolcz | Hungary | 1.25 |
| 209.8 | 1,429 | Magyarovar | Hungary | 1.2 |
| 209.8 | 1,429 | Pecs | Hungary | 1.2 |
| 211.3 | 1,420 | Newcastle | Great Britain | 1.0 |
| 214.3 | 1,400 | Aberdeen | Great Britain | 1.0 |
| 215 | 1,395 | Liege (Reg) | Belgium | 0.35 |
| 215.6 | 1,391 | Chatelineau (EL) | Belgium | .2 |
| 217.1 | 1,382 | Konigsberg | Germany | .5 |
| 217.1 | 1,382 | Dublin | Irish Free State | 1.2 |
| 218.5 | 1,373 | Salzburg | Austria | 1.5 |
| 218.5 | 1,373 | Plymouth | Great Britain | .2 |
| 220 | 1,365 | Beziers | France | 1.0 |
| 220 | 1,365 | Turin (2) | Italy | 1.0 |
| 222.1 | 1,351 | Binche | Belgium | .2 |
| 223.5 | 1,342 | Antwerp | Belgium | .4 |
| 224.4 | 1,337 | Cork (6CK) | Irish Free State | 1.2 |
| 225.9 | 1,327.3 | Fecamp | France | 10.0 |
| 227.4 | 1,319 | Bremen | Germany | 1.5 |
| 227.4 | 1,319 | Flensburg | Germany | .5 |
| 227.4 | 1,319 | Hanover | Germany | 1.5 |
| 230.6 | 1,301 | Malmo | Sweden | 1.25 |
| 231.6 | 1,295 | Kiel | Germany | .25 |
| 232.8 | 1,289 | Wallonia (Binche) | Belgium | .3 |
| 235 | 1,283 | Lodz | Poland | 2.2 |
| 236 | 1,270.8 | Bordeaux (S.O.) | France | 3.0 |
| 237.2 | 1,265 | Nimes | France | 1.0 |
| 238.9 | 1,256 | Nurnberg | Germany | 2.0 |
| 240.6 | 1,247 | Stavanger | Norway | .5 |
| 242.3 | 1,238 | Belfast | North Ireland | 1.0 |
| 242.7 | 1,236 | Liege | Belgium | .3 |
| 244.1 | 1,229 | Basle | Switzerland | .5 |
| 245.9 | 1,220 | Salonica | Greece | 1.5 |
| 245.9 | 1,220 | Linz | Austria | 1.5 |
| 247.7 | 1,211 | Trieste | Italy | 10.0 |
| 249.8 | 1,201.8 | Juan-les-Pins | France | 1.0 |
| 251.5 | 1,193 | Barcelona (EAJ15) | Spain | 1.0 |
| 253 | 1,185 | Gleiwitz | Germany | 5.0 |
| 255.1 | 1,176 | Toulouse (PTT) | France | .7 |
| 257.3 | 1,166 | Horby | Sweden | 10.0 |
| 259.3 | 1,157 | Treves (Trier) | Germany | 2.3 |
| 259.3 | 1,157 | Frankfurt-A-M | Germany | 17.0 |
| 259.3 | 1,157 | Cassel | Germany | 0.5 |
| 259.3 | 1,157 | Freiburg L/B | Germany | 5.0 |
| 261.6 | 1,147 | London National | Great Britain | 50.0 |
| 261.6 | 1,147 | West National | Great Britain | 50.0 |
| 263.8 | 1,137 | Moravska-Ostrava | Czechoslovakia | 11.0 |
| 265.7 | 1,129 | Lille (PTT) | France | 1.3 |
| 267.4 | 1,122 | Nyiregyhaza | Hungary | 6.3 |
| 267.6 | 1,121 | Valencia | Spain | 3.0 |
| 269.8 | 1,112 | Bari | Italy | 20.0 |
| 271.5 | 1,105 | Rennes (PTT) | France | 1.3 |
| 274 | 1,095 | Turin (Torino) | Italy | 7.0 |
| 276.5 | 1,085 | Heilsberg | Germany | 75.0 |
| 277.8 | 1,080 | Bratislava | Czechoslovakia | 14.0 |
| 281.2 | 1,067 | Copenhagen | Denmark | .75 |
| 283.6 | 1,058 | Innsbruck | Austria | .5 |
| 283.6 | 1,058 | Berlin (E) | Germany | .5 |
| 283.6 | 1,058 | Magdeburg | Germany | .5 |
| 283.6 | 1,058 | Stettin | Germany | .5 |
| 285.1 | 1,052 | Radio Lyons | France | 1.0 |
| 286 | 1,049 | Montpeiller | France | .9 |
| 288.5 | 1,040 | Bournemouth | Great Britain | 1.0 |
| 288.5 | 1,040 | Scottish National | Great Britain | 50.0 |
| 291 | 1,031 | Viipuri | Finland | 13.2 |
| 293 | 1,022 | Kosice | Czechoslovakia | 2.5 |
| 293.7 | 1,021.5 | Limoges (PTT) | France | .7 |
| 296.1 | 1,013 | Hilversum | Holland | 20.0 |
| 298.8 | 1,004 | Tallinn | Estonia | 11.0 |
| 301.5 | 995 | North National | Great Britain | 50.0 |
| 304 | 986 | Bordeaux (PTT) | France | 13.0 |
| 308 | 974 | Vitus-Paris | France | 1.0 |
| 309.9 | 968 | West Regional | Great Britain | 50.0 |
| 312.5 | 960 | Genoa | Italy | 10.0 |
| 312.8 | 959 | Cracow | Poland | 2.0 |
| 315.8 | 950 | Marseilles | France | 1.6 |
| 318.8 | 941 | Sofia (Rodno Radio) | Bulgaria | .5 |
| 318.8 | 941 | Dresden | Germany | .25 |
| 319.4 | 938.8 | Naples | Italy | 1.3 |
| 321.9 | 932 | Goteborg | Sweden | 10.0 |
| 325 | 923 | Breslau | Germany | 60.0 |
| 328.2 | 914 | Poste Parisien | France | 60.0 |
| 332.2 | 903 | Milan (Siziano) | Italy | 50.0 |
| 334.4 | 897 | Poznan | Poland | 2.0 |
| 338.2 | 887 | Brussels (No. 2) | Belgium | 15.0 |
| 342.1 | 877 | Brunn (Brno) | Czechoslovakia | 32.0 |
| 345.2 | 869 | Strasbourg (PTT) | France | 38.0 |
| 348.4 | 861 | Barcelona (EAJ1) | Spain | 8.0 |
| 348.8 | 859.2 | Leningrad RV70 | U.S.S.R. | 100.0 |
| 352.1 | 852 | Graz | Austria | 7.0 |
| 355.9 | 843 | London Regional | Great Britain | 50.0 |
| 358 | 838 | Tiraspol | U.S.S.R. | 10.0 |
| 360.5 | 832 | Berlin | Germany | 100.0 |
| 363.6 | 825 | Algiers (PTT) | North Africa | 13.0 |
| 364.1 | 824 | Bergen | Norway | 1.0 |
| 366.5 | 818 | Fredriksstad | Norway | 0.7 |
| 368.1 | 815 | Bolzano | Italy | 1.0 |
| 368.1 | 815 | Helsinki | Finland | 13.2 |
| 368.1 | 815 | Seville (EAJ5) | Spain | 1.5 |
| 370.1 | 810 | Radio LL Paris | France | 0.8 |
| 372.2 | 806 | Hamburg | Germany | 1.5 |
| 376.4 | 797 | Scottish Regional | Great Britain | 50.0 |
| 380.7 | 788 | Lwow | Poland | 16.0 |
| 385.1 | 779 | Radio Toulouse | France | 8.0 |
| 385.1 | 779 | Stalino | U.S.S.R. | 10.0 |
| 389.6 | 770 | Leipzig | Germany | 150.0 |
| 394.2 | 761 | Bucharest | Roumania | 12.0 |
| 398.9 | 752 | Midland Regional | Great Britain | 25.0 |
| 403 | 743 | Sottens | Switzerland | 25.0 |
| 408.7 | 734 | Katowice | Poland | 12.0 |
| 413 | 725 | Athlone | Irish Free State | 80.0 |
| 416.4 | 720.5 | Rabat | Morocco | 6.0 |
| 419 | 716 | Munich | Germany | 100.0 |
| 424.3 | 707 | Madrid (EAJ7) | Spain | 3.0 |
| 424.3 | 707 | Moscow (ROZ) | U.S.S.R. | 100.0 |
| 431 | 696 | Belgrade | Yugoslavia | 2.8 |
| 436 | 689 | Stockholm | Sweden | 55.0 |
| 441.2 | 680 | Rome (Roma) | Italy | 60.0 |
| 447.1 | 671 | Paris (PTT) | France | 7.0 |
| 447.1 | 671 | Danzig | Danzig | .5 |
| 451.8 | 664.1 | Madona | Latvia | 15.0 |
| 451.8 | 664 | Agen | France | .6 |
| 452.8 | 663 | Milan (Vigentino) | Italy | 4.0 |
| 453.2 | 662 | Odessa (RDH) | U.S.S.R. | 15.0 |
| 453.2 | 662 | Klagenfurt | Austria | .5 |
| 456.6 | 657 | San Sebastian | Spain | 5.0 |
| 459.4 | 653 | Beromunster | Switzerland | 60.0 |
| 465.8 | 644 | Lyons (PTT) | France | 15.0 |
| 472.4 | 635 | Langenberg | Germany | 60.0 |
| 476.9 | 629 | Lisbon (tests) | Portugal | 20.0 |
| 480 | 625 | North Regional | Great Britain | 50.0 |
| 488.6 | 614 | Prague | Czechoslovakia | 120.0 |
| 495.8 | 605 | Trondheim | Norway | 1.0 |
| 501.7 | 598 | Florence | Italy | 20.0 |
| 501.7 | 598 | Gorki | U.S.S.R. | 10.0 |
| 508.5 | 590 | Astrakhan | U.S.S.R. | 20.0 |
| 509.3 | 589 | Brussels (No. 1) | Belgium | 15.0 |
| 518.1 | 579 | Vienna | Austria | 100.0 |
| 525.3 | 571 | Riga | Latvia | 15.0 |
| 532.9 | 563 | Muhlacker | Germany | 100.0 |
| 539.8 | 555.7 | Palermo | Italy | 3.5 |
| 542 | 554 | Sundsvall | Sweden | 10.0 |
| 550.5 | 545 | Budapest (1) | Hungary | 120.0 |
| 555.5 | 540 | Wilno | Poland | 22.0 |
| 559.7 | 536 | Tampere | Finland | 1.0 |
| 559.7 | 536 | Kaiserslautern | Germany | 1.5 |
| 559.7 | 536 | Augsburg | Germany | .25 |
| 572.4 | 524 | Grenoble (PTT) | France | 3.0 |
| 577 | 519.8 | Ljubljana | Yugoslavia | 7.5 |
| 578 | 519 | Innsbruck | Austria | .5 |
| 582.6 | 515 | Tartu | Estonia | .5 |
| 690 | 434.7 | Oulu | Finland | 1.2 |
| 746.2 | 402 | Moscow (RMO) | U.S.S.R. | 20.0 |
| 747.2 | 401.5 | Ostersund | Norway | 0.6 |
| 760 | 395 | Geneva | Switzerland | 1.25 |
| 833 | 360.1 | Heston Airport | Great Britain | 5.05 |
| 844.8 | 355 | Budapest (2) | Hungary | 3.0 |
| 1,000 | 300 | Moscow (ROZ) | U.S.S.R. | 100.0 |
| 1,079 | 278 | Tiflis | U.S.S.R. | 35.0 |
| 1,083 | 277 | Oslo | Norway | 60.0 |
| 1,105 | 271.5 | Minsk (RMG) | U.S.S.R. | 35.0 |
| 1,115 | 269 | Moscow (Popoff) | U.S.S.R. | 40.0 |
| 1,140.8 | 263 | Monte Ceneri | Switzerland | 15.0 |
| 1,153.8 | 260 | Kalundborg | Denmark | 30.0 |
| 1,190.5 | 252 | Luxembourg | Gd. Duchy of Lux. | 200.0 |
| 1,200 | 250 | Istanbul | Turkey | 5.0 |
| 1,200 | 250 | Reykjavik | Iceland | 21.0 |
| 1,255 | 239 | Vienna (Exp.) | Austria | 3.0 |
| 1,276.3 | 235 | Tunis | Tunisia | .75 |
| 1,304 | 230.1 | Leningrad | U.S.S.R. | 100.0 |
| 1,360 | 220.6 | Motala | Sweden | 30.0 |
| 1,411.8 | 212.5 | Warsaw | Poland | 120.0 |
| 1,445.8 | 207.5 | Eiffel Tower | France | 13.0 |
| 1,481 | 202.6 | Moscow (RTC) | U.S.S.R. | 500.0 |
| 1,554.4 | 193 | Daventry National | Great Britain | 30.0 |
| 1,634.9 | 183.5 | Zeesen | Germany | 60.0 |
| 1,724.1 | 174 | Radio Paris | France | 75.0 |
| 1,796 | 167 | Lahti | Finland | 54.0 |
| 1,875 | 160 | Kootwijk | Holland | 50.0 |
| 1,875 | 160 | Moscow (RCZ) | U.S.S.R. | 100.0 |
| 1,875 | 160 | Brasov (tests) | Roumania | 20.0 |
| 1,935 | 155 | Kaunas | Lithuania | 7.0 |

# Early-morning Broadcasts

## By JAY COOTE

ANYONE who at any time has visited the Continent will have noticed how much earlier the foreigner rises than we do on our side of the Channel. If you land in Paris, Brussels, Berlin or Vienna at 5 a.m. you will find the streets already busy with people going to work, shops with the shutters off, and cafés being swept out preparatory to receiving their breakfast visitors.

This early rising is also reflected in the broadcast programmes from most European stations.. Turn to your receiver—if such is your desire!—at 5 a.m. even at this period of the year, and you may tune in a number of transmissions. It is true that most of them may consist of "physical jerks," but here and there you will pick up a light concert.

### Even on Sundays!

Even on Sundays a number of studios are on the air at what we should consider over here an unearthly hour for a day of rest. Berlin (Zeesen) opens up at 5.15 a.m. and at 5.35 a.m. all the German stations broadcast a concert from one of the transatlantic liners in the ports of Hamburg or Bremen, usually preceded by a particularly noisy carillon of bells from the latter's Cathedral.

Curiously enough, in the matter of early-morning gymnastics, the foreign studios have not made up their mind whether the husband or the wife should get up first. Although Germany grants no concession to either, the Danes awake the women at 7 a.m., leaving the men to sleep another fifteen minutes; the Finns are more gallant, namely, 6.45 a.m. for the male members of the household and 7.15 a.m. for the weaker—and possibly better-looking—elements; Prague greets the new-born day at 5.45 a.m. with a mixture of "jerks" and music, and at 6.30 a.m. takes its listeners over to Carlsbad for a concert by the Kursaal orchestra.

So far, Vienna has not troubled its listeners until 7 a.m., but Graz, with a more active population, sends its call out at 5.55 a.m., tells its listeners what weather they may expect, and cheers them up with a lively pot-pourri of songs and musical comedy melodies.

The times I have mentioned all refer to Sundays; on weekdays you may take it that most of these stations show activity from fifteen to thirty minutes earlier. By the time the hands of your watch point to 7.30 a.m. you may take it that with the exception of Great Britain, Belgium, Yugoslavia, Roumania and Spain, all other European states are represented in the ether and are well away with the day's radio programmes.

### International News

Even during the winter the listener who cares to play with his receiver in the early hours of the morning may find much to interest him. If he can understand a language or two he can pick up items of international news long before the daily paper reaches his breakfast table.

◆ ◆ ◆

In the matter of late broadcasts, with our return to Winter Time we are not so fortunate, as most of the Continentals close down at the latest by 11 p.m. G.M.T. Now and then you may find a stray studio working until mid-night; Langenberg, Frankfurt and Mühlacker are offering a few night transmissions every week. Reykjavik may be heard on some days until 1 a.m. G.M.T., and when the French stations relay outside broadcasts, if they include political or other speeches, they may go far beyond their usual time schedule. Spain can no longer be classed as a night bird; of late the programmes have been greatly curtailed.

Conducted by J. H. Reyner, B.Sc., A.M.I.E.E.

# We Test for You

## J.B. DILECON CONDENSER

THERE has been a considerable improvement in solid-dielectric condensers of recent years. So much so that they can be considered satisfactory for many purposes where low loss and accuracy of calibration are not essential.

The J.B. Dilecon condenser is a very robust little job which occupies the space of 2 in. by 2 in. with the plates fully open. The

*J.B. Dilecon variable condenser*

overall depth behind the panel is barely ¾ in. There is no pigtail, but a special form of split washer grips the end of the spindle and makes an adequate contact.

**Test Results.**—The maximum capacity of the condenser, which was rated at .0005 microfarad, was found to be 645 picofarads (.000645 microfarad). This generous maximum did not affect the minimum which was surprisingly low, being only 9 picofarads, which is a better figure than many air condensers can claim.

The movement was smooth and easy, and the condenser can be considered an excellent example of this type of component.

*Makers: Jackson Bros. Price: 2s. 6d. (with knob).*

## RADIOFORMER STATIC FILTER

THIS is one of the matched-impedance types of lead-in now becoming popular. At the aerial end of the lead-in is fitted a small step-down transformer enclosed in a small metal case and designed to clip on to the aerial wire itself. A lead is taken from the low-potential side of this transformer by means of a screened down-lead to the set, where it is connected to another transformer which steps up the voltage again to the original potential.

Owing to the transforming action, the effect of capacity between the lead-in and the earth shield is greatly reduced and it is not necessary to use a large and bulky lead-in, the cable supplied being little more than ¼-in. in diameter.

*Complete Radioformer static filter equipment*

A step-up transformer at the set end is provided with two aerial taps so that it may be suitably matched to various types of set by a simple process of trial and error.

**Test Results.**—The installation was connected up in accordance with the instructions and was found to work very satisfactorily. It gave no audible reduction in the signal strength. Artificial interference was generated locally to such an extent that reception on an ordinary down-lead was practically impossible.

By using the Radioformer, the pick-up was reduced to a mere background which did not cause serious interference. Readers who are troubled with man-made static should consider this device.

*Makers: Radioformer, Ltd. (Sifam). Price: 17s. 6d.*

**Test Methods Explained**

## Fixed Condensers

*THE usual method of checking the capacity of the condenser is to use a capacity bridge. In this arrangement the condenser under test is compared with a standard variable condenser which is varied until it is equal in capacity to the condenser under test. A pair of telephones is connected across certain parts of the bridge and a source of audio-frequency voltage is applied so that under ordinary conditions an appreciable current flows through the telephones, giving an audible note.*

*When the capacity of the variable condenser in the bridge is equal to the capacity of the condenser under test this current is balanced out, giving a silent point in the headphones, and the bridge is said to be balanced.*

Potted Biographies—15

# Elsie and Doris Waters

THESE two are actually sisters, and Londoners by birth. That hardly needs pointing out, for nobody could get the Cockney dialect to such a nicety unless they were London born. You would not know it, though, from hearing their ordinary speech.

I had lunch with them a day or two ago at their home near Regent's Park and learned that they have four brothers, only one of whom lives at home.

Both girls studied piano and elocution at the Guildhall School of Music. Elsie also studied the violin. I tried to make her play to me, but she did not seem any too keen. As a matter of fact, I hear that she is really a good player.

I want them to give a violin and piano recital in a vaudeville one night before turning themselves into Gert and Daisy. Elsie, by the way, is Gert, and Doris is Daisy.

Elsie writes a good many of the songs they sing, those dealing with wives of various comedians being amongst the number. Both girls are thoroughly musical.

Doris told me they began their professional career just ten years ago, performing at concerts, "at homes," and so on.

When first asked to broadcast they refused, but in 1927 repented of their decision and decided to come to the microphone and see what sort of show they could make.

*Elsie and Doris Waters*

Doris interested me by an account of how Gert and Daisy came to life. They had been making a record and had an odd side to fill. They improvised a Cockney scene on the spur of the moment and were told they had scored a hit. Since then they have taken Gert and Daisy about with them everywhere, and have succeeded in creating two of the best microphone characters.

They write practically everything they do and, as is usual with mirth-makers, are very anxious to find new material. You will never catch them serving up old stuff—nor playing to the studio audience. W.-W.

# Postcard Radio Literature

*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, E.C.4. "Observer" will see that you get all the literature you desire. Please write your name and address in block letters.*

### "Hello 'Mike"

THIS booklet, published by Regentone, Ltd., is the best of its kind that I have read. It is unique. Half of it is devoted to short biographies and cartoons of some of the most popular radio stars, including Christopher Stone, G. F. Allison and Henry Hall. A very amusing and informative section. The other section contains information and illustrations of the Regentone receivers, A.C., D.C., table and console models, mains units and a quick-reference directory of all the Regentone dealers in England, Scotland and Wales, in order of counties. A very interesting and useful booklet. Take this opportunity of obtaining a copy, you'll like it! **119**

### Loud-speaker Pioneers

"Pioneer manufacturers of moving-coil loud-speakers, 1925—1934." So say Baker's Selhurst Radio, and using those years of experience they have produced some very fine models—from the standard permanent magnet for the normal set to the super job for a power amplifier. A.C. and D.C. mains energised, 6-volt energised and permenant magnet, these models are all included in a catalogue, with useful hints on operation. By the way, for those few fans who make their own moving-coil loud-speakers, Baker's Selhurst supply ready-wound coils and diaphram assemblies at reasonable prices. **120**

### Cossor—Kings of the Air

Cossor's new catalogue on valves is an extremely interesting publication. Each valve is allocated a page in the booklet and has all its characteristics tabulated, its use described and a curve showing the correct operating data. There are several two-page articles on the correct use of certain valves, a feature of great value to experimenters. **121**

### The Photo-electric Cell

*Continued from page 1158*

from the cathode and no current will flow in the anode circuit. If now we direct a beam of light on the cathode, it will start emitting electrons and a minute current will commence to flow in the anode circuit. This current is extremely small, being, even with a most powerful light source, only about one thousandth of that we find in a receiving valve. It must therefore be very considerably amplified before it becomes of any practical use.

Ingenious methods have been devised by mean of which the steady anode current formed in this way can be chopped up into a series of rapid impulses; these, in turn, applied to the grid of an ordinary three-electrode valve can then be amplified in the same way as a wireless signal is amplified between the detector and the loud-speaker.

Various fascinating possibilities at once open up when we consider that, by reasonable amplification, we can convert the minutest beam of light into an alternating current of considerable power, or use our equipment for detecting rapidly changing shades of light, as, indeed, is done in some factories to-day. F. E. H.

Sets of the Season Tested

# Blue Spot Class-B Four

A THOROUGHLY good set is the general opinion of all who have heard this Blue Spot receiver—attractive in appearance, both externally and internally—and sufficiently powerful to bring in all the stations anyone will normally want.

There are numerous points which, added together, account for the high overall sensitivity and selectivity of this receiver. Most four-valve sets have three tuned circuits—a band-pass input to give sharp tuning and a tuned high-frequency stage to couple the screen-grid to the detector valve.

In this set the procedure is reversed. The high-frequency valve is coupled to the aerial through a single sharply-tuned circuit, the band-pass stage being between the high-frequency valve and the detector circuit. The idea of this is to make ganging simple so that the adjustments hold over both the long and medium wavebands and so give high average selectivity.

**Brief Specification**

*Makers :* British Blue Spot Company, Ltd.

*Model :* Class-B Four pedestal.

*Price :* £12 19s. 6d.

*Valve Combination :* Variable-mu screen-grid high-frequency stage, steep-slope triode detector, a small power-valve driver, and class-B output.

*Remarks :* A very efficient battery set cleanly constructed.

*Type :* Class-B chassis-built pedestal receiver, battery operated.

It is always more difficult to gang an aerial band-pass coil as the damping caused by different aerial lengths varies very considerably. In this respect it can be claimed that the circuit is distinctly original.

The first valve is a variable-mu screen-grid, followed by an HL2 as a leaky-grid detector. This is transformer-coupled to a P215 driver valve, which feeds the class-B output valve.

When a 120-volt high-tension battery is used the undistorted output is in the region of 1,600 milliwatts. We must congratulate the makers of this set on the excellent quality obtained, for remember, it is battery operated, although this is sometimes hard to believe.

Being loud-speaker manufacturers may account for the quality, as the Blue Spot permanent-magnet reproducer has been very carefully matched to the class-B valve.

The controls are arranged in an attractive manner with two knobs and a switch at the front. The volume control is on the left-hand side of the cabinet and varies the grid voltage applied to the variable-mu valve. Looking from the front, the right-hand knob is for tuning—and simple it is. The dial is calibrated in station names and wavelengths as well, in case any of the stations should change their positions.

*The Blue Spot Class-B Four is housed in an attractive pedestal cabinet*

On the left-hand side is the reaction control, which can also be used as an auxiliary control of volume. The switch knob is diamond shaped so that it is easy to manipulate. It operates in the usual way. The first position cuts off all batteries and the accumulator, the second is for medium waves, the third for long waves, and finally you switch in the gramophone pick-up.

The tuning ranges between 200 and 580 metres on the medium waveband and 760 to 2,000 on the long waves.

Provision has been made for a gramophone pick-up and an external loud-speaker. There is a special feature about this. By reversing the plug the internal loud-speaker can be cut out in favour of an external one. There is plenty of space inside the cabinet for high-tension and grid-bias batteries as well as for an accumulator.

With the recommended 120-volt high-tension battery the average anode current is about 11 milliamperes, but when tuned to the local station with the variable-mu valve almost off the current is even less.

### Good Selectivity Test

We selected for our tests an average position about 35 miles north of London, with an aerial of 50 ft. total length. Such stations as Poste Parisien, Breslau and Milan could be picked up at good strength without mutual interference. This will give some idea of the selectivity. Another good achievement was the reception of Bucharest free from Leipzig, while Czigani music was heard from Budapest at four o'clock during the afternoon.

Talking about daylight range, during half an hour's test before breakfast Huizen, Berlin, Eiffel Tower, Motala and Kalundborg were picked up at good strength. During a short evening test it was too big a job to take down every station that was heard, so we will tell you of a few special ones.

Geneva on 750 metres is a station we have not heard for a long while (few sets will tune down to this wavelength) and from here we heard a programme being relayed from Berne. We tuned in twenty-six stations below the National programme on 261 metres, nearly all there were. Hilversum was listened to for quite a long time, while Strasbourg and Hamburg could be received free of interference from London Regional. Radio Normandie could be picked up at 18 degrees on the dial, which means that Aberdeen and Newcastle listeners will be able to hear their local stations without difficulty.

An idea that we liked was the aerial compensator at the rear of the chassis. This is a pre-set type of condenser that can be adjusted if you are close to the local station and you require additional selectivity.

Altogether, the set has been well thought out and then well made. Most listeners will be attracted by the fine lines of the cabinet, clearly seen from the photo.

This set can be recommended to anyone who has not a mains supply available and we conclude as we started—it is a thoroughly good set.

## INFORMATION BUREAU

**Will every querist please observe the following revised rules?**

Please write concisely, giving essential particulars.

A fee of **one shilling** postal order (not stamps), a stamped, addressed envelope and the coupon on the last page must accompany all queries. Not more than two questions should be sent at any time.

Slight modifications of a straightforward nature only can be made to blueprints. For more serious alterations the minimum charge is 2/6.

Blueprints supplied by us will be charged for in addition, but of course, readers may send their own blueprints for alteration.

Modifications to proprietary receivers and designs published by contemporary journals cannot be undertaken. Readers' sets and components cannot be tested by us. Queries cannot be answered by telephone or personally. Readers ordering blueprints and requiring technical information in addition should address a separate letter to the Query Department.

**We do not answer queries in cases where the fee is omitted.**

Queries should be addressed to the Query Department, "Amateur Wireless," 58/61, Fetter Lane, London, E.C.4.

## The Physical Society's Exhibition

THE twenty-fourth annual exhibition of scientific instruments and apparatus, arranged by the Physical Society, will be held on January 9, 10, and 11, 1934, at the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, S.W.7. The sessions will be from 3 p.m. to 6 p.m. (4 p.m. to 6 p.m. on January 10), and from 7 p.m. to 10 p.m. daily.

The leading manufacturers of scientific instruments will be exhibiting their latest products in the Trade Section. The Research and Experimental Section will contain contributions from most of the important research laboratories in Great Britain, and there will be a special sub-section devoted to experiments of educational interest.

On January 11 Sir J. Ambrose Fleming, D.Sc., F.Inst.P., F.R.S., will lecture on "The History and Development of the Thermionic Valve," at 8 p.m.

Members of institutions and scientific societies may obtain tickets from their secretaries; tickets may also be obtained direct from the Exhibition Secretary, The Physical Society, 1 Lowther Gardens, Exhibition Road, London, S.W.7.

## Ready for the Lucerne Changes

TO meet with the requirements of the Lucerne Plan changes, Philips have issued new station-identification charts for their sets. These charts will replace those originally supplied with receivers types 630A, 630C (last year's models), 634A, 634C, and 636A.

Two charts will be packed with each set until January 15; after this date the present chart will be omitted.

For present owners of Philips sets arrangements have been made with dealers to supply charts free of charge, if application is made on the special form, stating the type and serial number of the receiver and the number of the present chart. It is essential that these details are supplied as there are many different charts.

If you have any difficulty in obtaining a chart, write to Philips Lamps, Ltd., of 145 Charing Cross Road, London, W.C.2, marking the top left-hand corner of the envelope "Charts."

## Notes and Jottings

REVERSIBLE electrolytic condensers are now available from Dubilier. This eliminates the trouble of injured condensers through reversed connections, as in the case when the mains plug of a D.C. set is inserted in the socket the wrong way round. Two 8-microfarad condensers of this type are used in the A.C./D.C. Three described in this issue. As these condensers are new lines they may not be stocked by your dealer, but he will have no difficulty in obtaining them from the makers. They are supplied in the standard container type 0281 and are priced at 7s. 6d.

◆ ◆ ◆

Next week's issue of AMATEUR WIRELESS will contain a special article, written by one of the leading authorities in the field, on "Electrolytic Condensers: Why to Use Them and How." This feature will tell you all you need to know about this useful component.

◆ ◆ ◆

Many listeners are writing to ask us how the Lucerne Plan wavelength changes will affect their reception on and after January 15. Well, we have good news for them. The issue of AMATEUR WIRELESS dated January 13 will give full details of the alterations and how the changes will affect your dial readings.

## FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order, NOT STAMPS. Quote the Blueprint number shown below; not the number of this issue.

### CRYSTAL SET (6d.)

| | |
|---|---|
| 1931 Crystal Set | AW308 |

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

| | |
|---|---|
| B.B.C. One-valver | AW387 |
| Portable Short-wave One | AW354 |

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

| | |
|---|---|
| Clarion-voice 2 (SG Det, Pen) | AW371 |
| Home Station A.C. 2 (D, Pen) | AW374 |
| B.B.C. National Two (D, Trans) | AW377 |
| Melody Ranger Two (D, Trans) | AW388 |
| Full-volume 2 (SG Det, Pen) | AW392 |
| "A.W." Iron-core Two (D, Trans) | AW395 |
| "A.W." Iron-core Two with Q.P.P. | AW396 |
| Consolectric Two (D, Pen) | AW403 |
| Screen-grid Two (SG Det, Trans) | WM289 |
| A Two for 7 Metres (D, Trans) | WM295 |
| New-style Radiogram (D, Trans) | WM299 |
| A.C. Quality Gem (D, Trans) | WM312 |

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

| | |
|---|---|
| James Push-push Three (SG, D, Q.P.P.) (1/6) | AW378 |
| Everybody's Home Radiogram (SG, D, Trans) | AW381 |
| Home-lover's New All-electric 3 for A.C. mains (SG, D, Trans) | AW383 |
| Our Up-to-the-minute Three (SG, Westector, LF, Trans) | AW384 |
| Class-B Three (D, Trans, Class B) | AW386 |
| S.S.3 (A.C.) (SG, SG Det, Pen) | AW390 |
| "Up-to-the-minute Three" with Class B, 1/6 | AW384B |
| New Britain's Favourite Three (D, LF, Class B) | AW394 |
| A.C. Triodyne (SG, D, Pen) | AW399 |
| Home-built Coil Three (SG, D, Trans) | AW404 |
| Fan and Family Three (D, 2LF) | AW410 |
| £5. 5s. S.G.3 (SG, D, Trans) | AW412 |
| 1933 Economy S.G. Three (SG, D, Trans) | WM306 |
| Harris Ethergram (SG, D, Pen) | WM308 |
| A.C. Calibrator (SG, D, Pen) | WM309 |
| Narrow-pass Three (SG, SG Det, Pen) | WM314 |
| £6 6s. Radiogram (D, RC, Trans) | WM318 |
| Simple-tune Three (SG, SG Det, Pen) | WM327 |
| Tyers Iron-core Three (SG, SG Det, Pen) | WM330 |
| I.C.B. Three (D, LF, Class B) | WM333 |
| Economy Pentode Three (S.G, D, Pen) | WM337 |
| Three-range Three (SG, D, Pen) | WM336 |
| Simplicity A.C. Radiogram (SG, D, Pen) | WM338 |
| Duo-tune Three (SG, D, Pen) | WM341 |
| A.C. Transportable (SG, D, Pen) 1/6 | WM347 |
| All-wave Three (D, 2 LF) | WM348 |

### FOUR-VALVE SETS (1s. 6d. each)

| | |
|---|---|
| Melody Ranger (SG, D, RC, Trans) with copy of "A.W." 4d. postage | AW375 |
| "A.C. Melody Ranger" (SG, D, RC, Trans) | AW380 |
| Signpost Four (SG, D, LF, Class B) | AW398 |
| "A.W." Ideal Four (2SG, D, Pen) | AW402 |
| Table Quad (SG, D, RC, Trans) | WM303 |
| "Words and Music" Radiogram (2SG, D, Trans) | WM307 |
| Home Short-waver (SG, D, RC, Trans) | WM311 |
| "Words and Music" Radiogram de Luxe (2SG, D, Q.P.P.) | WM307A |
| Empire Short-waver (SG, D, RC Trans) | WM313 |
| Merrymaker Super (A.C. Super-het) | WM345 |
| 1934 AC Quadradyne (2SG, D, Pen) | WM349 |

### FIVE-VALVE SETS (1s. 6d. each)

| | |
|---|---|
| James Short-wave Super (Super-het) | AW328 |
| Simple Super (Super-het) | AW340 |
| The Etherdyne (Super-het) | AW406 |
| 1934 Century Super (5v. Super-het) | AW413 |
| Class-B Quadradyne (2SG, D, Class-B) | WM344 |

### SIX-VALVE SETS (1s. 6d. each)

| | |
|---|---|
| New Century Super (Super-het) with copy of "A.W." 4d., post free | AW363 |
| New A.C. Century Super (A.C. Super-het) | AW365 |
| James Super-straight Six (2SG, D, LF, Push-pull | WM339 |

### SEVEN-VALVE SETS (1s. 6d. each)

| | |
|---|---|
| Super Senior (Super-het) | WM256 |
| Seventy-seven Super (A.C. Super-het) | WM305 |
| Q.P.P. Super 60 (Super-het) | WM319 |

### PORTABLES (1s. 6d. each)

| | |
|---|---|
| General-purpose Portable (SG, D, RC, Trans) | AW351 |
| Midget Class-B Portable (SG, D, LF, Class B) | AW389 |
| Holiday Portable (SG, D, LF, Class B) | AW393 |

### AMPLIFIERS (1s. each)

| | |
|---|---|
| Universal Push-pull Amplifier | AW309 |
| "A.W." Record Player (LF, Push-pull) | AW319 |
| Battery-operated Amplifier | AW362 |
| A.W.'s Push-push Amplifier | AW376 |
| Class-B Gramophone Amplifier | AW391 |
| Universal A.C. Amplifier (3-valve) | AW411 |
| Five Q.P.P. Output Circuits | WM315 |

### MISCELLANEOUS (1s. each)

| | |
|---|---|
| "A.W." Trickle Charger | AW352 |
| Add-on Band-pass Unit | AW359 |
| Short-wave Adaptor for New Century Super | AW367 |
| Plug-in Short-wave Adaptor | AW382 |
| Three Class-B Units | AW400 |
| "A.W." Television Receiver | AW401 |

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of most 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." Address letters:

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



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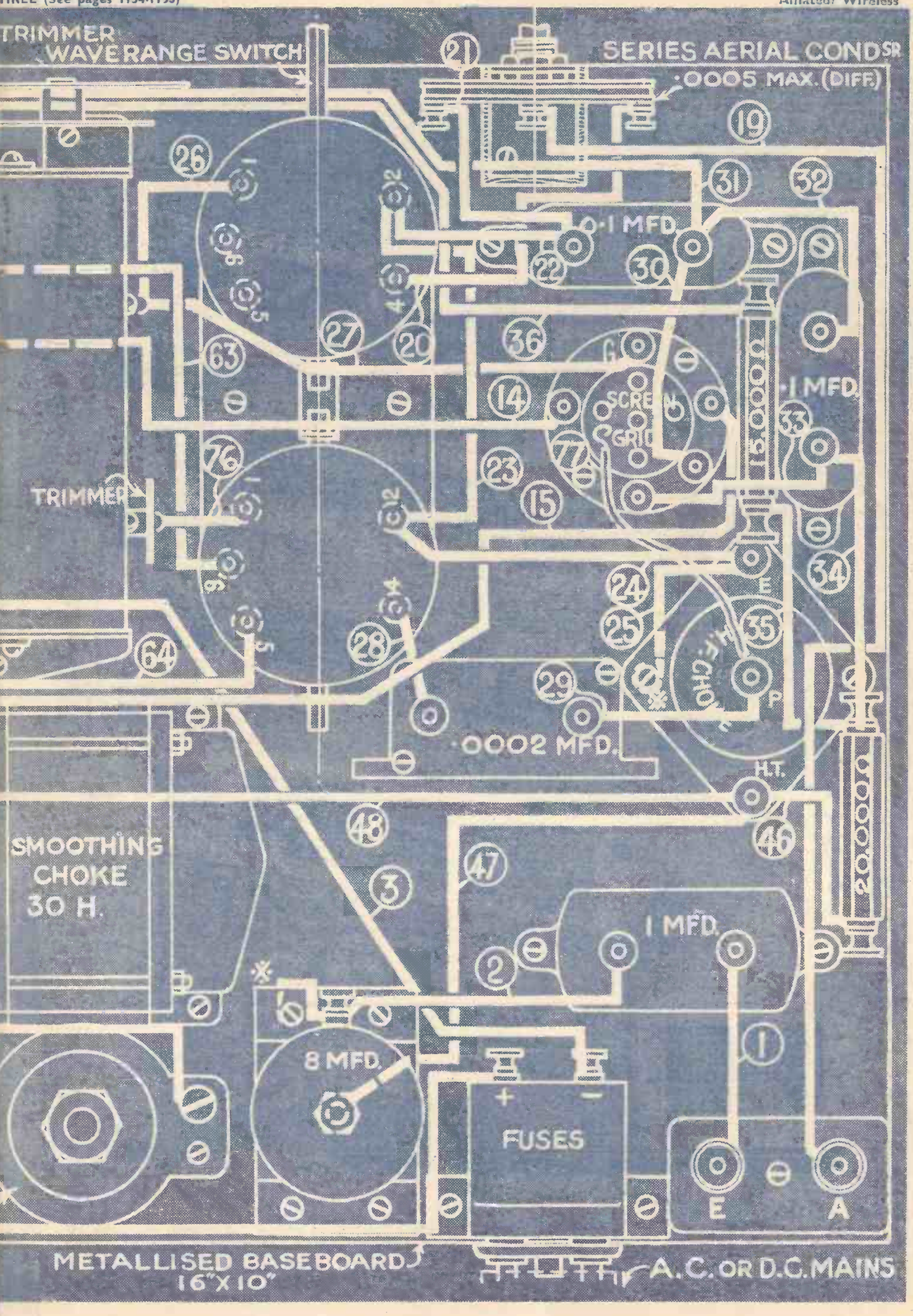
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·1 MFD.
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