

THIS BIG ISSUE OPENS THE NEW SEASON

NEW SETS, NEW VALVES, AND NEW COMPONENTS

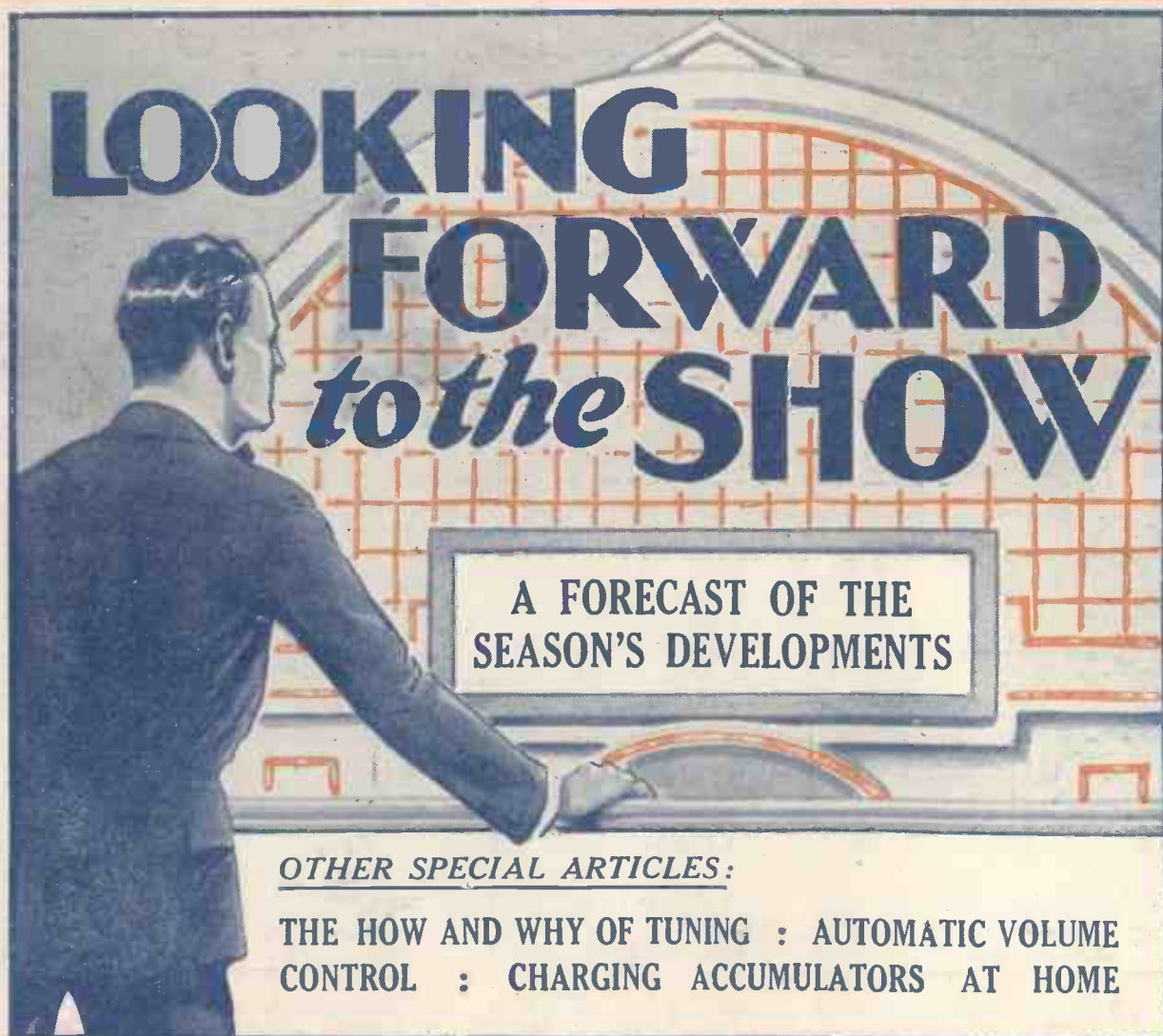
Amateur Wireless

Every
Thursday 3^d

and
Radiovision

Vol. XIX. No. 483

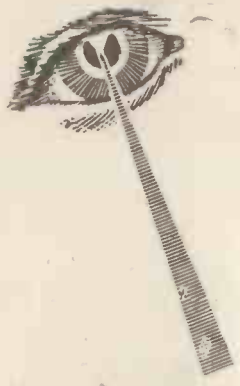
Saturday, September 12, 1931



**LOOKING
FORWARD
to the SHOW**

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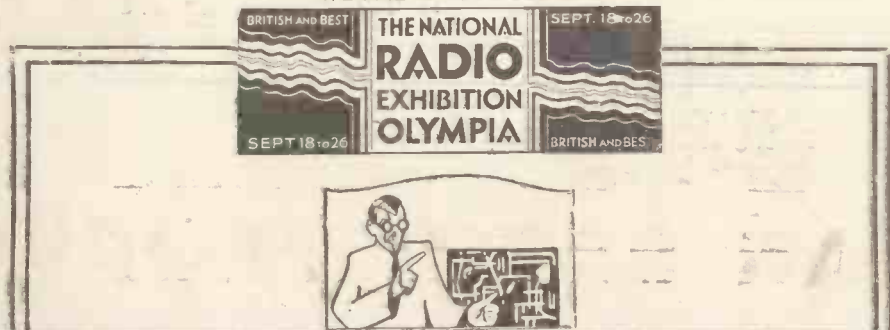
LEWCOS

(Regd.)

ANNOUNCEMENTS

WE CORDIALLY
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OF "AMATEUR WIRELESS"
AT OUR STAND, NO. 27, IN
THE NATIONAL HALL AT THE
RADIO EXHIBITION AT OLYMPIA

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B.T.H.



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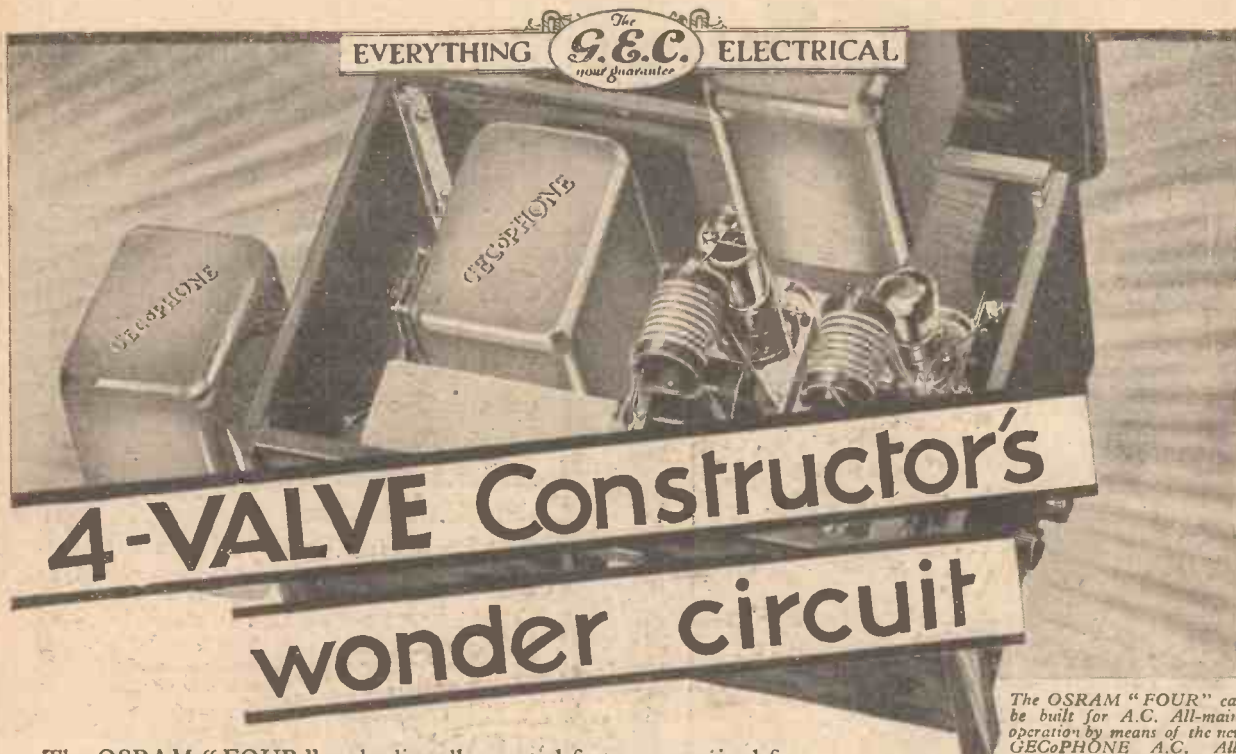
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PRICE 20/-

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STAND NO. 21
NATIONAL RADIO
EXHIBITION, OLYMPIA

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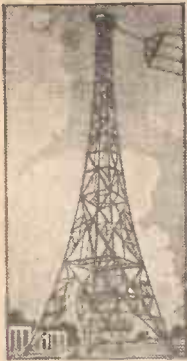
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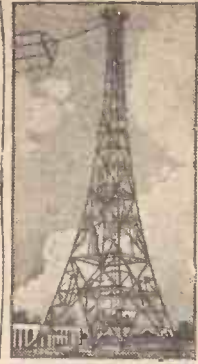
Advt. of The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2

Arks



Amateur Wireless

and
Radiovision



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BRITAIN'S LEADING RADIO WEEKLY
FOR CONSTRUCTOR, LISTENER & EXPERIMENTER.

RESEARCH CONSULTANT:
W. JAMES.

ASSISTANT EDITOR:
H. CORBISHLEY.

NEWS · & · GOSSIP · OF THE · WEEK

THE SHOW

EVERY amateur within reach of Olympia should make an attempt to visit the National Radio Exhibition on some day during the run from September 18 to 26. For those who are going, and also for those who cannot, and who have to picture the Radio Show events at their own fireside, AMATEUR WIRELESS is the best guide. A brief résumé of the contents of next week's special bumper Show Number is given in the panel in the centre of this page.

ADVANCE DETAILS

IN this issue you will find advance details of the new components, valves and complete sets. Nowadays, with the rapid changes in prices and design, it is essential to keep abreast of the times, and the easiest way of doing this is by reading "A.W." During the past few weeks "A.W." representatives have been collecting details of new apparatus to be produced for the 1932 season, and where advance parts have been available tests have been conducted. There are many good things for the winter's listening, as is proved by the advance information given this week.

OUR SPECIAL SHOW NUMBER!

Next week's issue of AMATEUR WIRELESS will be of the greatest value to every reader visiting the National Radio Exhibition, and also to the thousands who for various reasons are unable to be present but want to read about all the new interesting sets and components. Next week's issue will contain a Complete Guide with Plans, a large Pictorial diagram giving an accurate idea of the location of the various exhibits, and a Stand-to-Stand Review of the Exhibition. No matter whether you will be at Olympia in the spirit or in the flesh you must have "A.W." in front of you. It tells you about everything that is new in wireless.

SPECIAL BUMPER NUMBER. USUAL PRICE—3d.
ORDER YOUR COPY NOW.

B.B.C.'S HIGH STANDARD

SOME indication of the high standard of the performers in the B.B.C.'s symphony orchestra is given by the announcement that F. Vivian Dunn has recently been released from the orchestra to take up the position of Director of Music

to the Royal Marines Depot at Portsmouth. Mr. Dunn has been under contract as *seventeenth* first violinist for the B.B.C.'s orchestra.

THIS SEVEN-METRE PLAN

DURING the last two weeks numerous rumours have been going around about B.B.C. proposals to broadcast on the extremely short wavelength of seven metres. We are able to give the real facts. It is perfectly true that the B.B.C. has placed an order with Marconi's for the delivery, within the next two or three months, of a small transmitter, tuning from six to eight metres, and with a power that varies according to the wavelength used between one and two kilowatts.

NO INTERFERENCE

THE great attraction of the ultra-short wavelengths around seven metres is that there is no reflected ray. Therefore, no interference is caused outside the range of the transmitter, which is limited to about ten miles.

FUTURE POSSIBILITIES

WHEN the seven-metre transmitter is delivered to the B.B.C., it will be erected at some high point near London, so that experiments may be made. B.B.C. engineers hope to obtain data about the field strength distribution of seven-metre transmissions. Should these prove of service value, there is more than a dim possibility that the B.B.C. will consider the use of the ultra-short waves for serving local areas, such as Newcastle, for example.

RECEIVER NEEDS

BEFORE the ultra-short-wave B.B.C. transmissions could be picked up, the normal broadcast set would, of course, need modifying. A B.B.C. engineer has suggested that an adaptor, consisting of an oscillator and detector valve, tuned with an ultra-short wave coil, might be added to a broadcast set in order to obtain a super-het. circuit capable of giving satisfactory reception on seven metres. Whatever happens about the B.B.C.'s short-wave experiments, listeners can rest assured that a short-wave B.B.C. station of the future could at the most be only supplementary to the present service.



Wireless amplifiers featured in the stage show at a chain of London cinemas recently. Anton and his orchestra, and the cinema organ, synchronised with a gramophone record of vocal parts of operatic selections played. So that the conductor could hear the amplified records above the orchestra, he wore 'phones connected to a small amplifier

A GREATLY ENLARGED ISSUE NEXT WEEK CONTAINING A COMPLETE GUIDE TO THE SHOW

NEWS & GOSSIP OF THE WEEK —Continued

CHIEF ENGINEER IS ANXIOUS

IT is no secret that Mr. Noel Ashbridge, Chief Engineer of the B.B.C., is greatly concerned about the congestion likely to occur in the European ether this winter. His view is that either wavelengths will have to be sacrificed or the quality will have to suffer by reducing the high-note response of sets, so that the heterodyne whistle interference caused between high-power stations working too closely to one another will not be reproduced. The B.B.C.'s aim is to awaken European broadcasters to the need for immediate action.

ANOTHER "ESCAPE"

UNTIL recently only one private soldier had come forward to tell the story of his escape from enemy hands in the successful series which began some months ago. He was Private Pearce, now a miner. Now Henry Beaumont, who was a private in the Royal West Kents, is to come to the microphone on September 12. His story is a fascinating one, for he was one of the thirteen lucky men to escape through Nurse Cavell's organisation in Belgium—and he was "Number 83" on the ill-fated nurse's books.

MUSICAL COMEDY—WITH NO CHORUS!

THE *Cousin from Nowhere*, one of the first musical comedies to dispense with a chorus, is to be broadcast in the National programme on September 16. This play had a successful run at the Princes Theatre in 1923 and the book has been adapted for the microphone by Gordon McConnel. Regional listeners will hear this on Septem-

ber 17. Artistes taking part include Florence McHugh, Vivienne Chatterton, Wynne Ajello, John Rorke, Bobbie Comber, and John Armstrong.

TATSFIELD NEWS

WE hear that engineers at the B.B.C.'s Tatsfield listening post are now busy preparing for the autumn relays from America. Two vertical aerials are being erected. The distance between these aerials is variable, so that whatever wavelength is being received the aerials are placed just that distance apart. This is said to overcome a good deal of fading. At Tatsfield they are now taking delivery of three broadcast sets just completed by the B.B.C.'s research department at Clapham.

MOVING TO "B.H."

THE advance guard, so to speak, of Savoy Hill officials will take up their quarters in Broadcasting House on September 29. We understand that the outside departments of the B.B.C., such as those now in Southampton Street, will be among the first to be installed in the new headquarters at Portland Place.

B.B.C. AT OLYMPIA

IN connection with the B.B.C.'s exhibit at the Radio Exhibition at Olympia, we have already mentioned how broadcasting stations will be co-related on a map, with population figures for the service areas covered. We are interested to see that on the map showing this distribution the site of West Regional is definitely marked as Washford Cross. Does this mean that the long-drawn-out negotiations for the purchase of the site have at last been completed? Incidentally, we see that West Regional will serve nearly four million.

“CROSS TALK”

OF course, there is always a lot of

cross talk in connection with B.B.C. activities. Some of the talk is *very* cross! But on the night of August 26 listeners to North Regional were worried with cross talk between North Regional and North National stations. This went on for three days, but on the third day the trouble was tracked down to the tuning fork gear installed to synchronise North Regional with Newcastle. Apparently, high-frequency current got through this gear and so mixed up the programmes. Altogether, that synchronising has been ill-fated!

A GREAT NIGHT

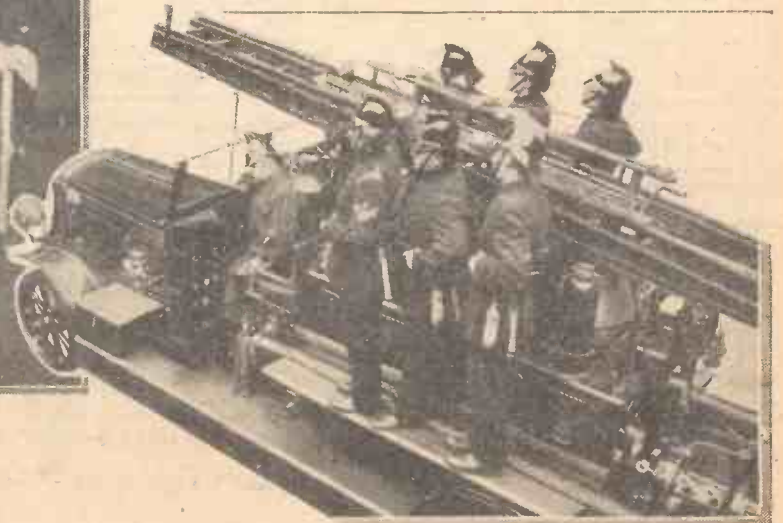
MOST listeners will look forward with keen interest to October 21, when the first of the B series of B.B.C. symphony concerts will be broadcast from Queen's Hall, London. This will be notable for the fact that Richard Strauss, acclaimed by many as the greatest living composer, will personally conduct the orchestra.

GHOST STORIES

QUITE a number of ghost stories are attached to Savoy Hill. It is news to us that a well-known actress of a few years ago committed suicide in a room below the floor now occupied by the Press Department. In those days the sacred precincts of Savoy Hill were given over to luxury flats. The recent mysterious opening of doors at Savoy Hill is attributed by some to the unquiet spirit of the former suicide occupant. We are asked to state that, when the B.B.C. goes to Broadcasting House, it will leave its ghosts behind!

KING'S ENGLISH

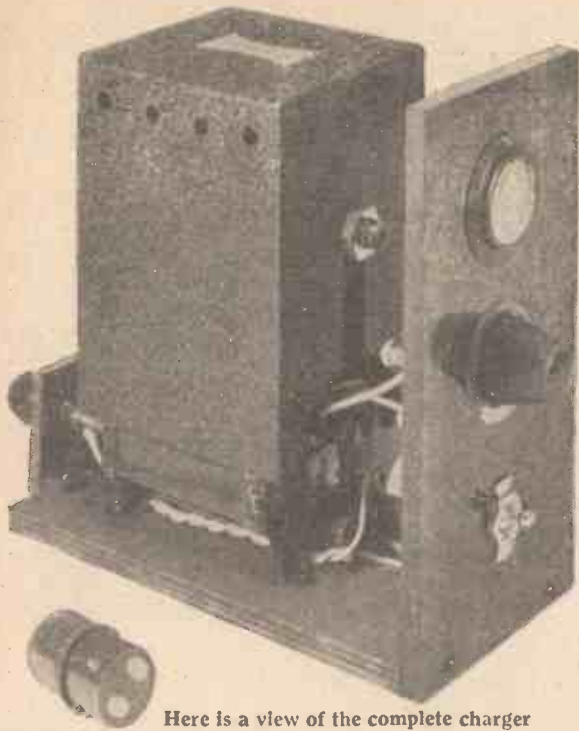
MR. A. LLOYD JAMES' talks to schools on King's English, starting on September 4 and broadcast every Thursday from 2.30 to 2.50 p.m., is sure to provoke criticism. We say this after noting the table of English vowels and diphthongs standardised for every lesson. It is obvious that standard English is in this series taken as southern English. How this will appeal to northern children remains to be seen. The idea of pronouncing "book" to rhyme with "shook" will certainly shake the northern child, as will "bun" rhyming with "done."



Fire engines in the Rochdale (Lancs) area can now communicate with fire stations while travelling at 40 miles an hour. (Above) is the transmitter at the station and (right) is one of the engines, the wireless receiver of which can be seen at the left of the driver's cab. The wavelength is 147.1 metres.

CHARGE YOUR ACCUMULATOR AT HOME

Details of a simple device that will enable listeners who have A.C. mains to do their own battery charging



Here is a view of the complete charger

If you have A.C. mains, then in the long run probably the most satisfactory way to work your set is with mains-heated valves.

Little difficulties arise because not every set is suited for mains valves without alteration in some other parts of the circuit, in order to keep the outfit stable (because mains valves are generally more efficient than their battery equipment) and also because while a set user has battery valves with plenty of life in them and a perfectly good accumulator, he does not want to scrap these.

Still, there is the bugbear of battery charging to be overcome and for the man with electric-light mains there is a very strong temptation to make up some little gadget by means of which the accumulator can be charged from the light or power mains, so saving those tiring journeys to the charging station.

Now that price reductions have been made in metal rectifiers, there is no great expense involved in a charger for two-, four- or six-volt batteries and to charge them at a nominal rate of 1-ampere or so. The production of a special combined power transformer and rectifier unit by Heyberd has further simplified the construction and lowered the cost.

It is not necessary to search about finding

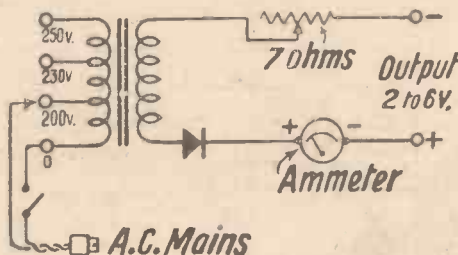
special transformers to match up with any type of metal rectifier unit that may be chosen for the particular charging requirements. In this present unit a complete rectifier and transformer is incorporated. This has three terminal tapings on the mains input side for 200, 230, and 250 volts. The most suitable tapping for your voltage should be chosen.

In the present unit a type of combined rectifier has been used which has separate terminals for an additional rheostat which can be added to control the charging rate and in the unit illustrated by the accompanying photographs this additional resistance—a 7-ohm job—is mounted on the panel. The output terminals are mounted at the back of

It is, of course, not strictly necessary to adhere to the layout and drilling centres given here. Some form of protective cover

COMPONENTS REQUIRED

- Baseboard, 6½ in. by 3½ in. (Camco, Peto-Scott, Read-Rad).
- Panel, 7 in. by 3½ in. (Becol, Peto-Scott, Read-Rad).
- Transformer rectifier unit (Heyberd, type A 0-2).
- 0.3 ampere (Bulgin).
- 7-ohm rheostat (Lissen, Ormond, Wearite).
- O.M.B. switch (Bulgin type S.80, Claude Lyc n.).
- Terminal mount (Sovereign, Junit).
- Two terminals, marked L.T.—, L.T. + (Bellinglee, Eelex, Burton).
- Connecting wire (Lewcos).
- Sleeving (Lewcos).
- Mains flex (Lewcoflex).
- Mains adaptor (Coltons).



The circuit of the charger

the unit and these are connected up to the accumulator output terminals and to the ammeter, on the panel.

All the parts needed for the construction of this simple unit are given in the accompanying panel. There is very little constructional work to be carried out, the unit being made up in the conventional baseboard and right-angle panel fashion.

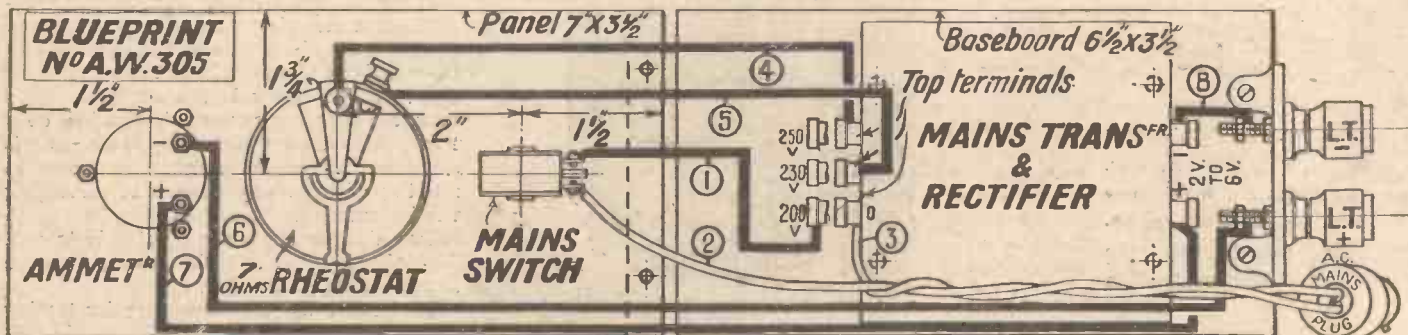
for the unit is advisable in order to keep the hands off the mains input side. The low-tension side, is, of course, quite safe to handle.

For convenience in connection there are two terminals on the small strip at the back and these are clearly marked positive and negative. It is very important to get the connections the right way round, for a reverse charge would damage the plates of the accumulator.

The mains supply connects up to the unit by means of a length of flex terminating in a plug or socket for connection with the mains point.

The wiring can most easily be done with tinned copper wire enclosed in insulating sleeving. Note the two short lengths of flex which connect up to the mains input side and which can easily be changed from one terminal to another, so that the most suitable tapping for the voltage can be

(Continued at foot of next page)



This layout and wiring diagram is practically half scale. A full-size blueprint is available, price 1/-

HOW THE UNFINISHED SYMPHONY CAME TO BE WRITTEN

THE famous *Unfinished Symphony*, by Franz Schubert, was begun in 1822. A great deal has been written—especially in annotated programmes of concerts where the work has been rendered—in which the writers have wasted much space in conjecturing why Schubert left it unfinished. Some have gone so far as to suggest that Schubert considered it complete as it was and that, in the two movements that have come down to us, he said all that he wanted to say.

That is obviously wrong on the face of it, because eight bars of the third movement were actually sketched out. As for the general public, I think it is true to say that it has often been concluded that Schubert died before he could finish his *Symphony in B minor*. Nothing is farther from the truth. Schubert wrote those two movements in 1822 and did not die till 1828.

The whole matter is capable of a very simple explanation. *Schubert forgot all about it*. It rather strains the imagination to believe that any composer who has reached the great height of symphony writing could actually forget that he had written one or, rather, part of one. This, however, is a fact in Schubert's case. You must remember that he wrote symphonies

and quartets more easily than most of us write our letters.

What happened was this. There was an excellent musical society at Gratz, the conductor of which visited Schubert and asked him to write a symphony for performance at one of their concerts. Schubert was the most obliging composer in the world and expressed himself delighted to write the work.

It so happened that he and his great friend, von Schober, had decided to take a short holiday in the Styrian mountains. They packed their cases and departed from Vienna almost immediately. On arrival at their destination Schober asked Schubert if he had brought any work with him to do during their stay. Schubert mentioned the request for the symphony and intimated that he would probably sketch it out before they returned. After a few days roaming about, Schubert felt his customary strong desire to write. Unfortunately, Schober suggested that they should write an opera together, he himself supplying the libretto. This was indeed unfortunate, as Schober was no hand at writing librettos and Schubert was certainly not successful as an opera-writer. However, they began to work. Towards the end of their stay Schubert suddenly remembered the people at Gratz. He there-

fore rushed down the two movements, as we know them, and took them back with him to Vienna. He then put them on his desk and put the score of the opera on top of them and thought no more about the symphony until the conductor called and reminded him of his promise. Schubert apologised profusely and handed over the two movements, saying that the other two would follow shortly. He then returned to the opera, which was still incomplete. Had the conductor called a third time the B minor symphony might have had a delightful *scherzo* and possibly a brilliant *finale* in B major; but he evidently did not like to worry Schubert again. The symphony, one imagines, is now immortal; yet Schubert himself never heard a bar of it nor, indeed, of the great C major which followed it. Perhaps if he had penned it to its final cadence it would still have been unfinished, for nothing in art is ever really definitely concluded. WHITAKER-WILSON.

A SHORT-WAVE ORCHESTRA

SHORT-WAVE listeners have commented on the high standard of musical reproduction of the PCJ band which can be heard most times when PCJ is "on the air." This to a great extent is due to the unusual arrangement of the instrumentalists before the microphone. The trombone player sits away by himself in a far corner. The trumpeter is a little nearer, but like the pianist he is still a good way away from the microphone. The saxophonists, violinists and drummer are close to the "mike."



"CHARGE YOUR ACCUMULATOR AT HOME"

(Continued from preceding page)



A back - of - panel view of the charger. Note how few components are required, and the simple construction



chosen. It is best to use insulated wire in a unit of this description as it removes all possibility of short circuits, which might damage the rectifier unit.

It should be noted that on a six-volt accumulator a charging rate of approximately 1/2-ampere is obtained and the ammeter on the panel can therefore be of the 0-1-ampere type. On a two-volt accumulator, however, the charging current rises to just over 1 ampere and a 0-3-ampere type ammeter is advisable in order to give an accurate reading without any danger of damaging the instrument.

The charger is extremely simple to use. Just plug it into the mains, connect up the accumulator, and switch on.

Preferably use a hydrometer for testing the specific gravity of the acid and in this way obtaining a good idea of the state of charge.

BROADCASTING HOUSE NEARLY READY

An "A.W." Special Representative paid a visit to Broadcasting House last week and saw the B.B.C. engineers at work on the first microphone and acoustic experi-

ments which are being made in the empty building. He shows how near to completion is the huge new B.B.C. headquarters, and tells of the first microphone tests.

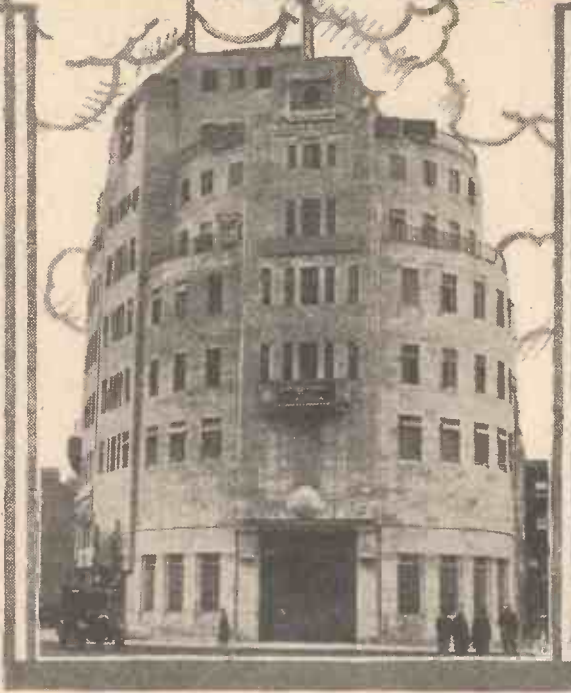
AMID a shower of falling plaster I entered the Langham Street entrance of Broadcasting House! In the main vestibule the workmen were making alterations to the ornate plaster work above the lifts and main staircase.

"I don't mind it when it's dry," said my guide, "it's when it's wet that it sticks!"

He spoke feelingly. There is plaster everywhere in Broadcasting House, and as the decoration scheme progresses there will be more and more plaster!

I took a second glance at the panel above the main staircase in the entrance hall. Here workmen appeared to be putting finishing touches to the B.B.C.'s gold-lettered greeting to visitors. It was the Shakespearian quotation which begins, I think: "The man who hath not music in his soul. . . ."

"I don't like those *Biblical* quotations," said my companion, and he was not very much pacified when it was explained that the workmen were actually taking down the Shakespearian paragraph and were putting up in its place a Latin quotation!



lines that link up Broadcasting House with B.B.C. transmitters.

This is the same kind of gear as at the Manchester Broadcasting House and when it is working it should banish once and for all the landline amplifier troubles.

We went along a little farther and saw the big radio play studio at the very top of Broadcasting House. This has not yet reached the plaster stage and the scaffolding is still in place, but it is obvious that this will be a bigger studio than any at present in Savoy Hill and will be a rival to the big Concert Hall studio in the basement.

As we left we called in to see what progress had been made in the Concert Hall and found that the floor was being boarded in and it is looking much more nearly finished than it was two or three weeks ago when all the bare brickwork was visible.

Nearly all the offices in Broadcasting House are quite finished and even the phone wires are being connected. The general impression I obtained was that Broadcasting House is nearly ready. How long will it be before the first part of the change-over from Savoy Hill takes place?

CONNECTING THE "CANS"

IN sets having metal screens and, perhaps, parts with metal covers, the point arises as to whether it is the better plan to connect them separately to the nearest earthing point or to join them together and to earth.

Experience shows that it pays to take a little care in this matter. You cannot be too careful in the earthing of the various screens. Sometimes it is found if a wire is taken to all screens and then to earth that the set is not stable.

The results may be perfectly satisfactory, however, if a separate wire is taken from each shield to the negative.

Naturally, it is first necessary to make sure that the cases of coils are not connected inside by the makers to the grid-bias side of the windings, for if grid bias is used an external earth may have the effect of short-circuiting the bias battery.

Sometimes the metal cover is insulated from the coil and sometimes the cover is connected. The makers usually state whether the cover is free or not and in any case it is an easy matter to determine whether the cover is joined to one of the coils.

As there is no power yet switched on to the building we struggled up the stone staircases which run parallel with the lift shafts and found our way to the Children's Hour studio where the B.B.C. engineers are carrying out their tests.

This is the studio in which the first note of music in Broadcasting House has been struck, for on the day before I paid my visit a section of the B.B.C.'s 114-member orchestra went up to the studio and played over a few pieces so that the engineers could get a first-hand idea of the reverberation factor.

This studio is a double-decker and we peered at the engineers below through a glass window on the top deck. Then we went down and saw the actual gear.

The Main Control

Three walls of this studio are sound-absorbent and the fourth is glass covered. This, I was told, is just an experiment to see what sort of reflection could be obtained from the glass wall and it would appear that the control is not good enough to justify the expense in many other studios.

There were, in this room, a number of standard A-type B.B.C. amplifiers microphones on stands and elaborate variable baffles; all of which are part and parcel of the reverberation factor testing gear.

We left the engineers busy working out their cosines and tangents and struggled up again to a long, glass-roofed room at the top of the building where there are some fifteen to twenty huge grey-painted metal panels carrying amplifying gear and switches and looking for all the world like part of the London trunk exchange.

This is the main control room for all the studios in the building and for the land-



Putting the finishing touches to the sound-insulating and ventilating layers in the corridors of Broadcasting House

AUTOMATIC VOLUME CONTROL— IS IT WORTH WHILE?

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

AMERICAN receivers have incorporated automatic volume control for some two years past, yet to my knowledge no receiver designed in this country either as a manufactured proposition or as a published design has included such a unit. Indeed, I have myself deliberately refrained from introducing a set incorporating this principle because I felt certain that the public would regard it as a fancy stunt.

One cannot help wondering whether this idea is really correct. If you have used a set with this automatic volume control the reversion to an ordinary set produces quite a shock. The reception of a distant station on an automatically controlled set remains practically constant. The inevitable fading is almost eliminated, for when the station fades the amplification of the receiver automatically increases so that the signal strength is maintained at the same level. Owing to the higher amplification there is probably a little more background noise, but one is hardly aware of this, only a critical ear realising the slight rise and fall of the mush the whole time.

Of course, if a really bad fade takes place so that the signal strength falls practically to nothing, it is impossible to increase the amplification in the receiver to compensate for this, but with the improvements made in transmission of recent years the fade-out is not experienced to anything like the same extent, and it is only occasionally that the arrangements break down.

Did you by any chance listen to the Prince of Wales's speech from Buenos Aires? If you did you were probably struck by the remarkable uniformity of the speech level. Despite the very large distance over which this transmission was taking place the customary somewhat rapid fade usually experienced on short-wave long-distance transmissions was noticeably absent. At the same time if you were a critical listener you observed that the interference from atmospherics, etc., rose and fell periodically throughout the transmission.

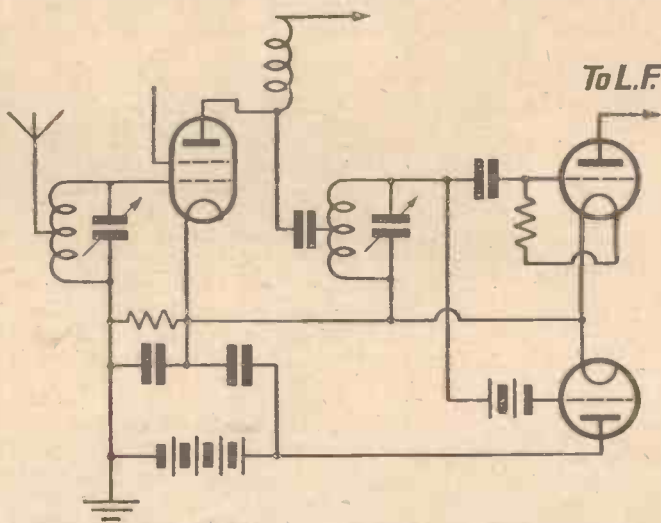
The reason was that an automatic volume control was used on this transmission. It has been standard on the short-wave beam telephony transmissions ever since their inception, and works extraordinarily satisfactorily. Yet few people are even aware of the possibility of its operation, let alone the simplicity with which it may be carried out.

Long-distance Listening and Volume Control

In America long-distance listening is undoubtedly much more indulged in than over here. It is quite a recognised thing to tune in to a station a thousand miles away in order to hear some regular feature, and in such circumstances, it is easy to understand that automatic fading controls are practically a necessity. Moreover, the American is accustomed to the use of

"multi-tube" sets, so that one extra valve makes very little difference. He would willingly pay the small extra price for the convenience gained in normal reception.

The suggestion that only one extra valve is required may come as a surprise to many readers, yet this is all that is necessary. Automatic volume control operates on the principle which we utilise for ordinary detection—that the variation in signal strength causes a variation in the anode current of the detector. All that is necessary is to connect up the second detector in parallel with the normal detector of the set, as indicated diagrammatically below.



A circuit incorporating automatic volume control

How Automatic Control Works

When a signal arrives at the detector stage it affects both valves equally. The normal detector, of course, converts the signals into low-frequency currents and passes these on to the L.F. stage in the ordinary way. The volume-control valve also receives the signal and in consequence its anode current takes up some particular value depending on the strength of the applied signal. If the signal is great, the anode current will be large. If it is small the anode current will be small also. This, of course, is for an anode-bend rectifier, which is the type usually employed for this class of work.

Thus the anode current is a direct measure of the signal strength. Indeed this is a well-known fact and is utilised in many cases to measure signal strength. In this instance, however, we make this anode current work for us in some convenient way. If we pass this anode current through a resistance we develop a voltage across it. If the signal strength is large, this voltage is large also and vice versa, and all that we have to do is to arrange to apply this voltage to control the amplification in the H.F. side of the receiver.

One simple way of doing this is to vary the grid bias on the H.F. valve, the grid bias to this valve being determined by the voltage from the volume-control valve. If the signal being received increases in strength, then the voltage developed in the volume control valve increases, so that the bias automatically increases. This reduces the efficiency of the H.F. valve and checks the amplification, preventing the signal from rising to the level it would otherwise do.

If, a moment later, the signal strength falls, due to a fade, then the bias on the H.F. valve is automatically decreased, the amplification of the valve becomes greater

and the signal strength is automatically restored. This amplification of the whole receiver must, of course, be sufficient to give satisfactory loud-speaker signals on quite a weak station, so that the amplifier is only working full out at the bottom of the fade, and on normal signals it is working in a relatively inefficient manner. This is really only logical. We should not dream of running a motor engine on full throttle all the time. Why should we drive our receiver full out?

There are one or two obvious points to be considered. The first is that

biasing the modern screen-grid valve introduces cross modulation. The variable-mu tube in America was introduced to overcome this difficulty, but there are other ways of doing it, the band-pass tuner doing much to relieve the trouble. There are also other ways of controlling the volume.

It has been suggested that if one uses an automatic volume control, then the light and shade in the music of an orchestral piece is lost. This is not so, because the volume control valve is designed to be affected by the mean value of the current only. The telephony transmission arrives on a carrier wave of a certain value, and the low-frequency modulation causes the instantaneous value of the carrier wave to rise and fall as required. The mean value of the carrier wave remains the same, irrespective of the strength of the modulation, always provided that no over-modulation is taking place. Consequently the volume-control valve is only affected by the mean value of the carrier, which is not in any way changed by the modulation. If the strength of the incoming carrier wave varies, the volume-control valve comes into operation and adjusts the signal strength, but the proportion of modulation remains unaffected.

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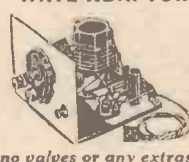
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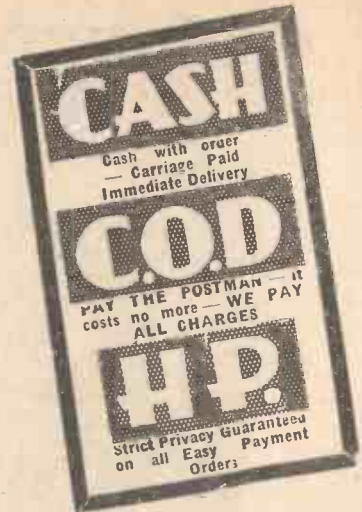
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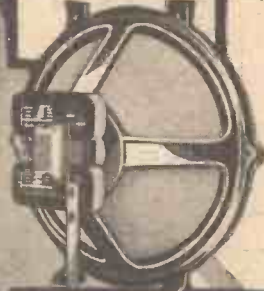
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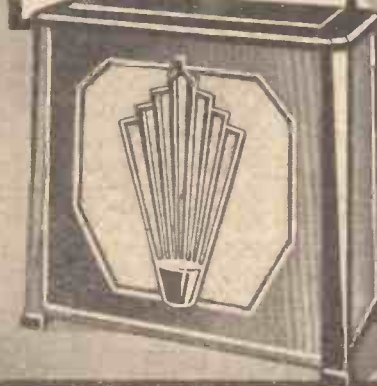
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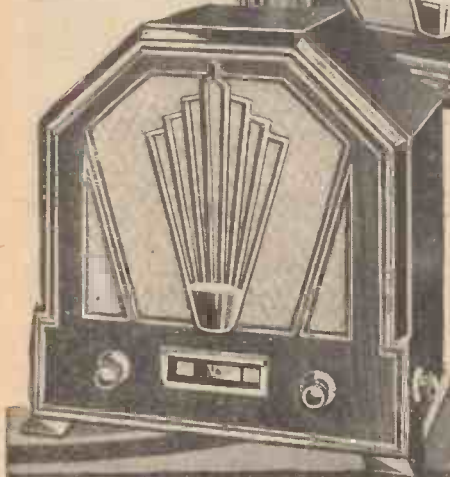
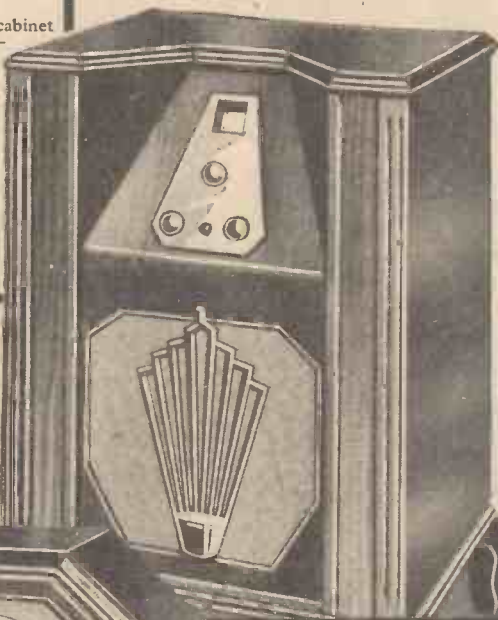
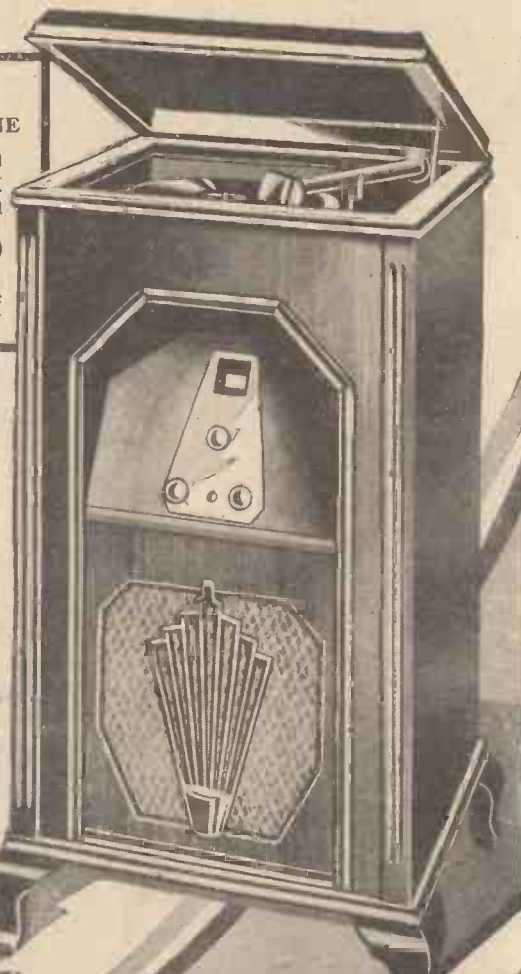
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Oh Low Wavelength!

OUR SHORT-WAVER

DO you ever turn to G5SW on 25.53 metres when you are at the knobs of your short-wave set? You will hear him pretty well unless you happen to live too close to him; for this may mean that you are in the skip area. I am rather over forty miles myself, and I find that his strength varies a great deal, according to the time of day or night. I wonder if you happened to pick him up one evening some time ago when he was apparently fiddling about with his modulation. Never I think, have I heard such extraordinary noises coming from any transmitter that reckoned to be broadcasting. I could not think what had gone wrong until, after things had become a little better, one of the engineers remarked into the microphone that listeners must have been finding reception pretty woolly.

SHORT HOURS

NOW that the Chelmsford short-waver is relaying bits of the Midland National programmes his services are very much appreciated by Britons living in far-off parts of the world. Unfortunately, though, his working hours are all too short. He closes down altogether on Saturdays and Sundays—just the time when hard-working folk in distant lands have leisure for listening—and on weekdays he transmits only from 12.30 to 1.30 p.m. and from 7 p.m. until midnight. What is most urgently wanted from a National British short-wave station is a non-stop twenty-four-hour broadcast. We have to remember that in our huge Empire it can be practically any time of the day or night at one place or another when it is, say, midday here.

MORE WAVELENGTHS WANTED

IT is quite certain, too, that the single wavelength of 25.53 metres is not suitable for broadcasting at all times. If you ever pick up transatlantic short-wave telephony you have probably noticed that a large variety of wavelengths is used, changes being made according to times and conditions. This is done in order to ensure an absolutely uninterrupted service, for the best wavelength for transmitting and receiving over great distances varies considerably during the twenty-four hours. This matter has been studied pretty thoroughly, and all the data obtained must be available for the B.B.C. authorities to study. Another point is that when atmospheres are so bad that listening is practically impossible on, say, 25 metres they may be almost entirely absent on about 16 metres.

If the B.B.C. was wise it would hasten to stake claims on two or three useful alternative wavelengths. If it delays doing so it may find that all the best ones have been picked up by someone else by the time that it wakes up to the fact that we need them for Imperial broadcasting. G5SW is

only a 16-kilowatt station, though its power should be ample for a world service, if only the optimum wavelength were used at all times. Actual running costs with so modest a plant cannot be very great, and the twenty-four-hour service should certainly be started without delay. This does not mean providing extra programmes. As you know, complete programmes are now occasionally "canned" at Savoy Hill on metal ribbon and afterwards reproduced by a pick-up device. The normal 6 p.m. to midnight programme could be given every day as a direct relay, then canned versions of the same could follow from midnight to 6 a.m., from 6 a.m. until midday, and from midday until 6 p.m. Were this done there would be no part of this great Empire of ours in which broadcast from the homeland could not be heard at convenient hours.

MAPS MAY DECEIVE

HAVE you ever thought of the appalling problems involved in drawing upon a flat sheet of paper a picture of countries and seas which are actually situated not on the flat at all, but on the surface of a sphere—or an oblate spheroid, if you insist upon strict accuracy? Turn to "maps" in a good encyclopaedia and you will be astonished to find how intricate the problem is. If the map covers only a small area the errors that must be introduced are not very great, but when you try to take in all Europe—or, worse still, the whole Eastern hemisphere—all sorts of queer things happen.

The wireless man hearing a distant station wants to know just how far away it is. He planks his ruler on the map, measures the distance, and then compares this with the scale of miles. The result that he obtains is as often as not incorrect, and it may be a very long way out indeed. Why, exactly, should this be? Well, the reason is that if you take any two points on the surface of a sphere the shortest route from one to the other must form part of a Great Circle. You have probably often come across that expression and wondered what it meant. A Great Circle is one whose diameter passes through the centre of the sphere. It represents, if you like, a disc of infinite thinness of exactly the same diameter as the sphere. This on a flat map is often represented by a curved line. The straight edge of the ruler, then, does not show the Great Circle distance between two points. You can obtain the real distance either by stretching a thread over the surface of a globe or by using a special map (in which the countries and seas look weirdly distorted) which shows the true distances along the edge of the globe from one particular point to another part of the world.

A NEW VALVE

SO far as I know, there is only one advance in valves this year which is at all of a startling nature. This is the twin-grid

valve. "Well, what of that?" you ask. We have had twin-grid valves for years. First of all, there was the original four-electrode valve with the second grid designed to reduce space-charge effects, and then came the screen-grid which has worked such wonders for H.F. Though it has two grids, just as they have, the 1931 twin-grid valve is quite different from either of these. Really, it is two valves in one. It has been designed especially for use in super-heterodyne sets where the first valve has, for economy's sake, often to play the double parts of oscillator and first detector. The screen-grid valve has been used in this way, one grid being employed for oscillator purposes and the other for rectification. It works pretty well, but it has just those little faults which do occur when you call upon something to do a job that isn't quite its own. This has been eliminated in the twin-grid valve, which functions happily and effectively as combined detector-oscillator. Since super-hets. are becoming rapidly more popular, there should be a big future for a valve of this kind.

THE FUTURE

MYSELF, I do not see that we can have anything very startling in valves for some years to come, unless somebody happens to light on the discovery of a revolutionary principle which will give us a cold emitter, or something of that kind. What, of course, we do want is a valve in which the amplification factor is largely dependent on the impedance. But that cannot come along unless and until some entirely new principle is invented. Another thing urgently required—again it is at present an impossibility—is a valve of low impedance which does not require an enormous amount of H.T. current. In the present state of our knowledge this seems pretty well as impossible as perpetual motion or the squaring of the circle. Doubtless, it will come in time, but it may be a very long time.

B.B.C. RESEARCH

VERY little is heard of the work of the Research Department of the B.B.C. Like all research men, probably the B.B.C. engineers prefer doing good by stealth. Occasionally we hear of their experiments, as in the very daring try-out in the north, when the attempt was made to synchronise the wavelengths of North Regional and Newcastle on 479 metres.

Probably owing to the outcry against the programme policy surrounding this experiment, its technical importance has been somewhat pushed into the background. Nevertheless, the idea of working a low-power relay on the same wavelength as a very high-power station, such as the 70-kilowatt Moorside Edge plant, must have been watched with more than passing interest by many European broadcasting authorities and others baffled by the growing congestion in the ether.

On Your Wavelength! (continued)

Due to the programme troubles in the north, the ordinary listener cannot have gained much of an impression regarding the possibility of synchronised working. Actually, the B.B.C. engineers were more than satisfied that the experiment was technically a success. The area of "mush" fell just where the B.B.C. engineers said it would, namely in that part of the country where a four-to-one ratio of signal strength was not obtained.

SHORT-WAVE RELAYS

B.B.C. research work outside the lime-light has been going on down at Tatsfield, where some progress has undoubtedly been made regarding types of aerials designed to overcome the fading inseparably connected with the reception of short-wave transmissions from America and other distant parts of the world.

At the moment I hear that a very interesting aerial experiment is in progress at Tatsfield. Two short vertical aerials had been put up and so arranged that their distance apart can be varied. When a 34-metre station is being received, for example, the two vertical masts are placed exactly 34 metres apart. This arrangement is claimed to give an appreciable reduction in fading. If this is true, one of the biggest drawbacks of short-wave reception over long distances will have been overcome. In any case, listeners will be able to judge for themselves when the B.B.C. starts its relays from America in the autumn.

Another centre of research that few listeners know anything about is situated at Clapham, in south-west London. Here much quiet, good work goes on in the detailed improvement of transmitting gear. This brings me to the latest B.B.C. experiment, namely the proposed transmissions on 7 metres.

A 7-METRE SERVICE?

SEVERAL of my friends have asked me whether, in the event of the B.B.C.

MIND YOUR SLEEVE

When operating your portable set take care not to let the sleeves of your coat brush over the terminals of the accumulator or over the H.T. battery



sockets. Wires may be displaced and some acid may get on to the sleeve. It is a good plan to keep the arms well away from the controls, as shown here, and to fit a cover to the battery compartment.

short-wave experiments proving successful, there is any likelihood of a drastic change in transmission technique taking place in the immediate future. Personally, I fail to see how any change could occur within the next two years. I imagine that when the 7-metre transmitter is erected in London within the next few months, at least a year's study of the field strength created by its transmissions will be undertaken by B.B.C. engineers. The data they collect should certainly be of great value for the future.

WHAT IS IT FOR?

IT rather looks as though this 7-metre stunt has been brought about by the B.B.C.'s growing anxiety regarding ether congestion. If their research engineers can definitely establish the fact that a 7-metre transmitter would cover, say, a ten-mile radius, B.B.C. programme compilers would have a solution to the present problem of providing listeners with programmes of local interest in addition to a programme of national interest. I think we should all watch this latest B.B.C. experiment very closely, for in years to come it may have far-reaching effects upon the design of our receivers.

Although I have not done much reception below 10 metres, I am sure the tuning operation to bring in even a near-by 7-metre transmission must be tricky. Slow-motion dials and long-extension handles working very low capacity tuning condensers would be essential. I am not at all sure that the present detector valve would be any use for the reception of a 7-metre signal. I do hope the B.B.C. will allow keen amateurs to participate in these experiments. Thousands would surely jump at the chance of joining in this very original work.

AN OSCILLATOR EXPERIMENT

EXPERIMENTING recently with a low-frequency oscillator, I was very puzzled by the discrepancy between the results I obtained and those which I should have done in theory. According to my working out, the frequency at which the circuit was oscillating should have been 150 cycles, whereas it was obvious that the frequency was distinctly higher than this. I made some measurements and found that it was practically 300 cycles, or twice as much as I was expecting to get from theoretical considerations.

A small iron-cored choke was being used for the inductance in the circuit, and this was being tuned with one of the .01 variable condensers which are now obtainable. Incidentally, the choke had been specially constructed after rather a lot of thought, so that it had a very low self capacity and gave me quite a good frequency range. Everything, indeed, was working very satisfactorily, except for the fact that the lowest frequency which I could reach with the condenser in its maximum position was just about twice what I wanted it to be.

I checked over my constants again. I measured the maximum capacity of the condenser and found that it was reasonably in accordance with my theoretical figure of

.01; I checked up the inductance of the coil, and found that it was also of the order I had expected. In desperation I set the circuit up again and puzzled for a long time before I hit on the real explanation.

THE REASON FOR THE DISCREPANCY

WHAT led me up to the solution of the difficulty was the curious behaviour of the circuit when I changed the valve. I was using a high-impedance valve taking very little anode current, and I found that if I changed this and inserted a low-resistance valve of the L class, the frequency became very much lower. When I started to think this out I realised that it was the reverse of what I should expect. The lower impedance valve would take more anode current, and would therefore cause more saturation in the iron, and a reduction in the inductance. This would cause the frequency to rise instead of become lower as I actually found was the case.

The inductance of an iron-cored choke does not only depend upon the D.C. current flowing through the winding, but also on the alternating current. If a strong alternating current is used the inductance increases considerably. The amount of the increase depends upon the design of the choke, and in this particular instance the increase was of a very marked character, owing to the fact that a rather small iron circuit was being employed. When I was using the low-impedance valve the oscillating current was much stronger, and this increased the inductance of the core to such an extent that the frequency was considerably reduced. When I measured the oscillating current under the original conditions, I found that it was only a fraction of a milliamp, and the inductance under these conditions was much smaller than I had anticipated. In point of fact, the inductance with my original measurements taken at 1 milliamp A.C. was four times as great as under the working condition of about 0.2 of a milliamp, and this accounted for the discrepancy. THERMION.

FIT A FUSE

For safety's sake it is a good plan to fit a twin fuse in the mains input leads



to any mains driven apparatus. One fuse alone does not provide full protection.

LOW COST and BETTER PERFORMANCE COMPONENTS at OLYMPIA

A review of the new parts available for home constructors and all set users

OLYMPIA this year will be a striking tribute to manufacturing skill. It is little short of amazing how the leading firms in the industry have developed new plant by means of which mass production parts can be turned out which really are of high quality and this has the natural result of meaning lower all-round costs.

Price reductions in certain directions

carbon resistance in place of a wire-wound job, because of the difference in price.

The reliability of a good wire-wound resistance is of a far higher order than that of any variable contact resistance can ever be.

Valve holders, apart from the price reductions, have not changed much, but all that I have examined so far have good contact

of the "Century Super," that by Show time they will appear as old friends.

In the same way, bandpassing has forced condenser manufacturers to scrap their older types and specialise in two and three-gang jobs, fitted with trimmers. Every important condenser manufacturer has a dual or triple condenser suitable for modern bandpass circuits.

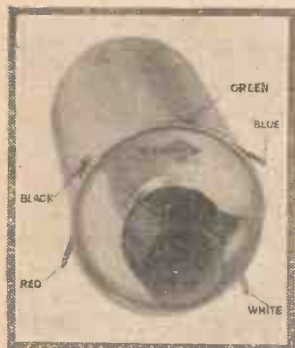
Improved Construction

Constructional features I note in advance designs are improvements in "pressed" condensers, bringing them up to the standard of solidity set by the earlier and more expensive diecast condensers, more easily adjusted trimming devices and, generally, a reversion back from drum control (which means having the condensers parallel with the panel) to ordinary right-angle mounting, even with triple gang condensers.

Everybody is reducing size of parts. This is obvious in condensers (particularly the new differential reaction condensers) and in low-frequency transformers. Last year's Exhibition heralded the introduction of special core transformers. This year the metal experts have gone one further.

A transformer of well-known make I have just been handling is no larger than a hen's egg, and only about twice as heavy! With some of these special transformers one has to connect them in a different way from the conventional and resistance feed is advisable with some. But as the necessary resistance can be obtained for 1s. or 1s. 6d. from most manufacturers, this is not much of a disadvantage.

Another good thing is that in previous



For set builders—a Wearite super-het coil, a Blue Spot disturbance eliminator for mains-driven sets and a Telsen coil incorporating a variable selectivity device



border on the sensational. I see now that small fixed condensers for grid circuits, for example, are to be sold by certain firms for 6d.—the price charged by some firms in previous years for the grid-leak clips alone!

This just shows you how clever mass production has reduced the selling price and it cannot be too strongly emphasised that because the manufacturing methods are better, the quality of components is on the general upward trend of improvement.

All Prices are Reduced

Fixed condensers, grid leaks, and resistances—parts which in the past one generally paid a high price for because cheap parts often were not made up according to their rated values—are now accurate and lasting.

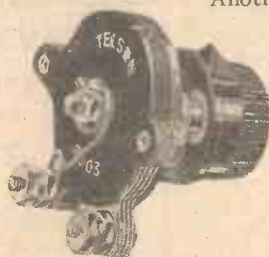
This development means that whereas previously one has had to pay perhaps as much as £1 for the condensers, valve holders, and resistances, in a set, a very few shillings now suffice for the purchase of these parts.

Spaghetti-type resistances were produced several months back and cannot come under the heading of new things for Olympia, but as more and more firms are manufacturing these, and as they are sold in many cases for a few pence, it is apparent that their early shortcomings have been overcome and that the trade now puts full confidence in them. Many component firms are marketing spaghetties, and low-priced wire wound resistances are also more easily obtainable.

This will make for better results, because previously one has been tempted to use a

and terminal arrangements, and some are exceptionally good. The old atrocities which could accommodate neither the banana type nor split pin valve leg have, been definitely put off the market. For 6d. can now buy a good valve holder.

Ordinary tuning coils have not changed



(Left to right) Celestion R.P.M. 12 permanent-magnet speaker, Telsen solid dielectric reaction condenser and Atlas A.C. mains unit with Westinghouse rectifier

much, and all the big developments have gone towards bandpass and super-het. coils. One or two firms are producing ordinary aerial coils and H.F. transformers with variable coupling and, in the case of aerial coils, with incorporated series condensers.

The popularity of bandpassing in ordinary three and four-valvers, though, has lead coil makers to produce coils which gang easily. Super-het. coils and I.F. transformers are so well-known to AMATEUR WIRELESS readers through the introduction

years one has fought shy of using output transformers or chokes, because of the guinea or 25s. which these components cost. Now the average price of these parts has been cut by 50 per cent. and pentode users will be among those who should be pleased that a good tapped choke for a pentode output unit can be obtained for under 10s.

There is nothing very striking in switches. Progress has been made throughout the year and inferior types scrapped. Some of

NEW COMPONENTS—LOWER COST AND BETTER PERFORMANCE

the new coils need three-point switches for wavechange switching and it has been rather a hard job for manufacturers to bring out a sure-contact three-point switch to sell for not much more than 1s. 6d.

Battery Developments

In battery and power supply changes have been made and, again, a noticeable



Two parts for set builders—(left) Telsen output transformer, provided with an earthing terminal for the core and (right) a section of the new J.B. enclosed ganged condenser

factor is the reduction in price. Most battery manufacturers have considerably cut their prices and not at the expense of the quality of materials contained in the cells. It is confidently understood that the reason for this reduction has been the still increasing need for high-tension batteries which shows that there is still a large proportion of sets in the country which are not mains driven.

There is a certain increase in the popularity of jelly acid and other non-spill types of accumulators, but owners of sets which are not transportable still show a preference for glass cells.

Present accumulators are really very satisfactory. It is seldom one hears of a fault in the plates. It is difficult to see how accumulator manufacturers can improve their products technically, although in many makes this year mechanical robustness has been aimed at, and most glass cell accumulators have internal ribs preventing plate movement and more solid terminal con-

nections than they have had heretofore. Metal rectification is more popular and, as is shown in a separate article, very many mains driven complete sets have metal rectifiers. Price reductions have been made here chiefly and mains supply units are noticeably cheaper—partly on account of the lower cost of the metal rectifier and because of the mass-produced smoothing

condensers and dropping resistances.

Last year a number of mains units were just an assembly of power components in a metal box. This year, the chassis con-



Two fine speakers and a battery—the Ormond moving-coil chassis, the Blue Spot model 22 speaker, and one of the Oldham Lively-O 10-volt H.T. units

struction idea has been copied from the set manufacturers. This is important. It makes for easy construction (and therefore

lower cost) and for simple testing if a fault develops.

Nearly every maker of a mains unit incorporates a model giving a trickle charging supply and provision is made in certain cases for automatic grid bias. One important thing I notice in the general range of H.T. units. The output is being increased and the makers are more generous in milli-amperes than they were.

1932 looks like being a permanent-magnet moving-coil year for amateurs who are discerning in their choice of a speaker. Manufacturers are using new alloys for the magnets and some of the new models which you will see at Olympia have magnets no larger than a clenched fist. Yet sensitivity is amazing and there is a comprehensive guarantee of permanency of magnetism.

There are one or two new cone speakers, the chief merit of which is increased sensitivity and the ability to handle, without overloading, the full output from a valve of the P2 class.

Firms who make permanent-magnet moving coils are in some cases supplying energised models, but generally speaking one would say that battery and mains fed

coil speakers are not so popular as they were last year. The permanent-magnet moving coil is comparatively so cheap.

12 KILOCYCLES TO COME?

WE believe the Mühlacker experiment is part of a series of tests to see whether the proposed 12-kilocycle separation between adjacent high-power stations is workable. Prominent broadcasting authorities in Europe are preparing the ground for a revision of the present Prague Plan, which, as readers know, works on a 9-kilocycle separation between stations, irrespective of their power. Before long we expect there will be a meeting at Berne to consider alterations to the present plan.

A short time ago the Marchese Marconi was to have broadcast a talk on "The Beginnings of Wireless." This, unfortunately, had to be postponed and listeners will now have an opportunity of hearing the Senatore discourse on this subject when he comes to the "mike" on September 19.

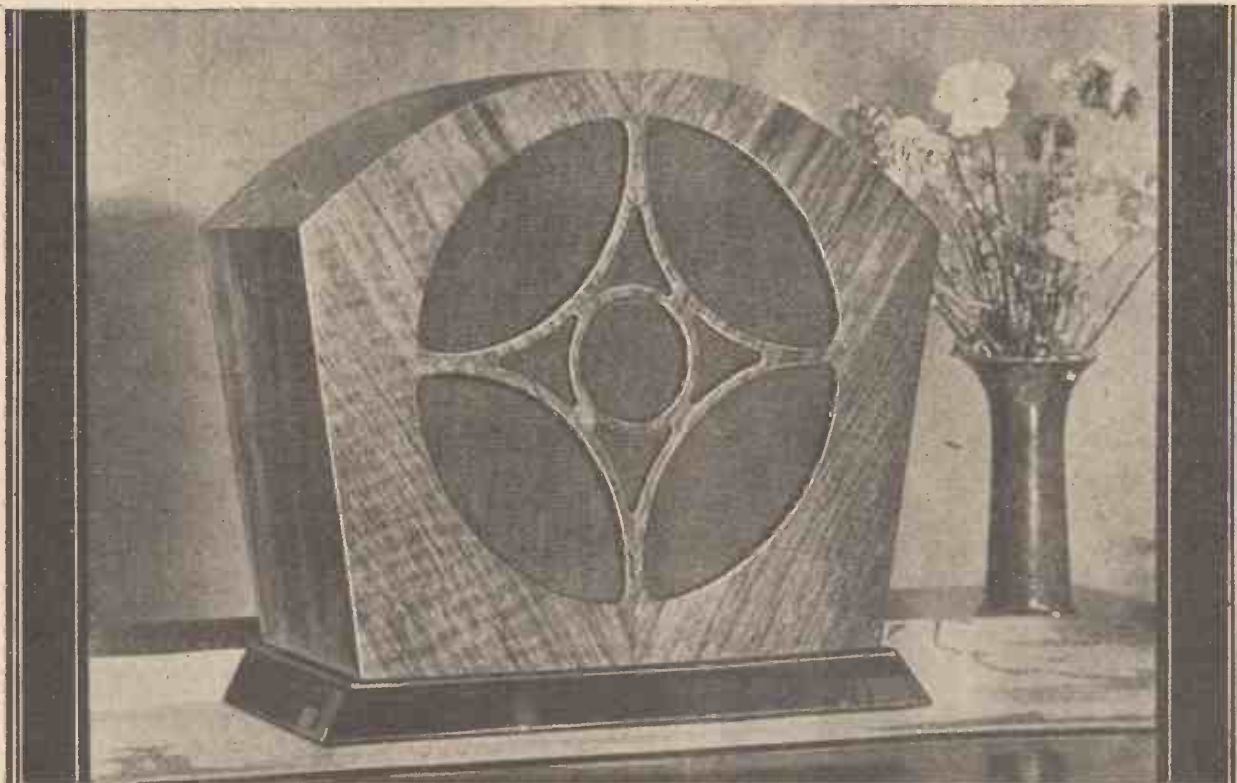
THINGS HEARD ON 900 METRES

A fog report.
A warning about a cloud bank due south.
Request for airplane's bearing.
Gale warning.
That another airplane was approaching.
Advice to land in Paris.
That the wind had changed.
News that the flier had passed another airplane a few minutes previously.
A report that London was fogbound.
"I hope to land in five minutes."
"I am delayed and will be fifteen minutes late."
A statement that there was not a ship in sight.
Something that was not intended for broadcast.
An Englishman's poor French accent.
A Frenchman's good English accent.
The song of a happy flier.

The number of stations in Europe originally incorporated in the Prague Plan was 200; it has now increased to 261, the total energy of European transmitters in 1929 being computed at 600 kilowatts. Taking into consideration the stations under construction, the power has now increased fivefold. Statistics show that whereas in that year there only existed one 50-kilowatt transmitter, by 1932 there will be brought into operation twenty-seven super stations of higher energy and the average per station will work out at 11 kilowatts, as against 3 kilowatts provided by the original plan allotting individual wavelengths. Such figures show the absolute necessity for a complete revision of channels and a reduction in the number of the smaller stations if chaos is to be averted.

The Abbey Players are to present a prose version of Sophocles' *King Oedipus*, by W. B. Yeats, in the Belfast studio on September 14.

NEXT WEEK: A COMPLETE GUIDE TO THE EXHIBITION



The Speaker is all important

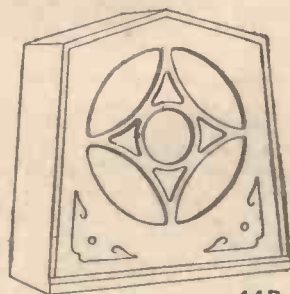
WHAT'S the use of having a receiver that brings in all Europe if you fail to get perfect reproduction? After all it is what you hear that matters; and it is your loud speaker that enables you to hear.

Whether your set be new or old, whether it be a "local station only" or reaches out all over Europe, be certain, for your enjoyment's sake, that your **speaker** is supreme.

All **BLUE SPOT** Speakers are **supreme**. **BLUE SPOT** Speakers give to speaking voices reality and sincerity, to singing a rich and resonant timbre, to music mellow, melodious charm. **BLUE SPOT** Speakers never add or subtract—they are perfect mirrors of the original.

Your dealer will be glad to let you hear a **BLUE SPOT** Speaker. You will find that, with all his experience to make him critical, he can find nothing but praise for it.

The model illustrated above is **Blue Spot 70R**.
The cabinet is in fine quality walnut. Price **70/-**



44R

ANOTHER MODEL

The cabinet is in solid oak. The design distinctive — The workmanship excellent. Price **52/6**

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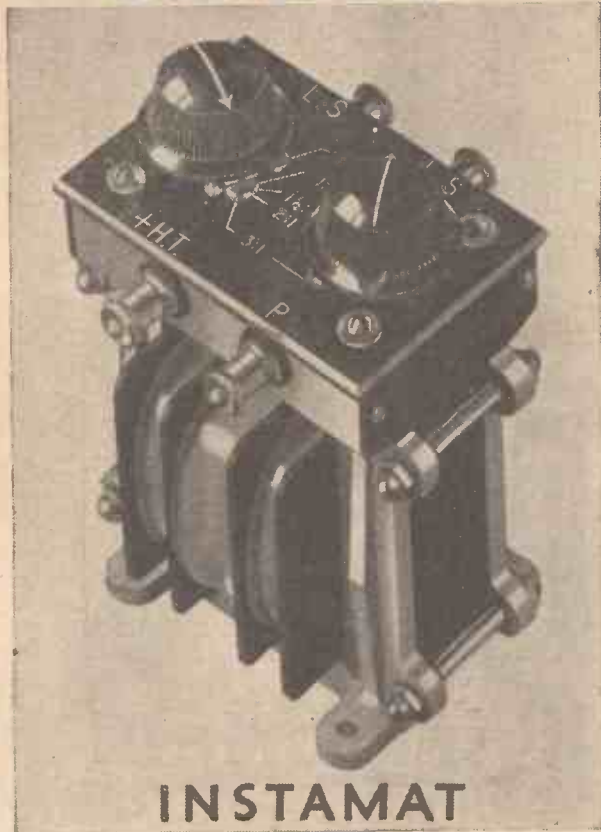


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QUALITY DEPENDS

on your OUTPUT STAGE



INSTAMAT

Your output stage must be right. You can have the best set and the best speaker that money can buy, but, unless they are accurately matched, quality must suffer.

Any radio expert will tell you that an output circuit is essential in a receiver capable of giving good quality and volume. It not only isolates the loud-speaker from the set, thereby protecting the windings and guarding the user against shock, but also prevents the voltage to the output valve being reduced. But the output transformer must be correctly designed. It must have very low D.C. resistance and yet be able to carry a heavy current without core saturation and—it must be of the correct ratio.

The most positive means of obtaining the correct ratio is to try a number of different ones, switching rapidly from one to another until the actual reproduction from the loud-speaker proves definitely that you are obtaining the perfect ratio.

That is just what the INSTAMAT enables you to do. It is an output transformer of the most perfect design, fitted with an ingenious switching arrangement with which you can vary the ratio whilst you are actually listening. No need to switch off the set or disconnect wires—just turn the switch knobs and hear the tone change. It is the only output transformer capable of giving you perfect quality by the turn of a switch.



INSTANT MATCHING SWITCHING ON THE INSTAMAT

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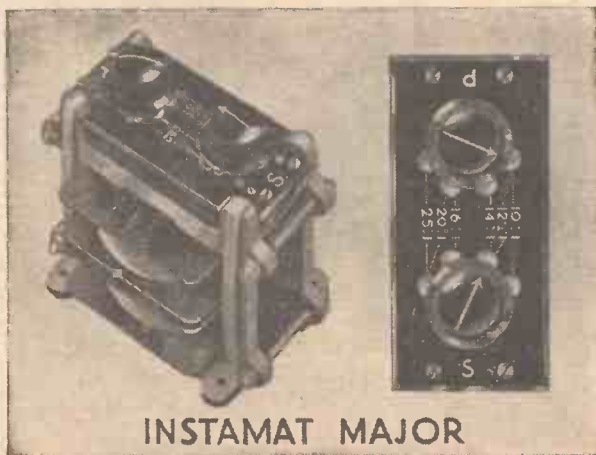
MAJOR

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FOR LOW RESISTANCE MOVING-COIL SPEAKERS Six ratios—10 to 1 up to 25 to 1. Heavy gauge windings and particularly large core. Current carrying capacity up to 150 milliamperes, without core saturation. Primary D.C. Resistance only 40 ohms: secondary 2 ohms. Weight 4 lbs.

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SETS OF DISTINCTION

MULLARD 1932--- THREE-VALVER



Makers:
Mullard Wireless Service Co., Ltd.

Price: £7 2s. 6d.

LET me hasten to tell my readers about the new Mullard kit, for it is a remarkable three-valver when assembled. I believe I am the first to build this new model. Well, I shall not be the last by thousands! When the kit arrived in the laboratory I found it neatly packed in a carton.

After going through the packages and checking them up with the very clear instruction sheet and plan, I estimated that the job could be done under two hours. By hurrying a little at the end of the assembly I was able to confirm this estimate, by completing the construction in 1 hour 50 minutes.

I can offer no prize for beating this time, but I feel sure that, since I did not hurry through the first part, while making these notes, the really "slick" amateur might get through the very simple assembly work in 1 hour 40 minutes. Still, the main thing is to follow the instructions implicitly. Then nothing can go wrong.

Easy Construction

There is no point in going through all the steps in the construction, since the reader will do all that if he buys the kit. I ought to mention that there are eighteen steps, from step No. 1, which is preparing the metal work, to step No. 18, which is assembling the cabinet. Accompanying almost every step is a clear photograph to help the builder. Certainly, these illustrations were a help to me.

Long before the set was assembled, I was impressed with the look of the two tuning coils. In each, the medium-wave winding is mounted at right angles to the long-wave winding, which is underneath. The coil formers are generously proportioned and wound with quite thick wire.

The screening between the coils is thorough and at the same time simple to assemble. The two-gang tuning condenser going with the two tuning coils is provided with trimmers and a really attractive dial marked from 0 to 100 degrees. The switching device on the coils is a high spot in the design. The action of the coil switch, which is operated from the front panel, is a model of precision and smoothness.

I should like readers to see the completed kit at the Exhibition. All will be delighted with the layout. Some idea of it can be gained from the picture herewith.

The circuit is a popular three-valve sequence, comprising a screen-grid high-frequency stage, a leaky-grid detector, and a

transformer-coupled pentode output stage. This circuit has obviously been kept as simple as possible, but there is no skimping of essentials. The aerial is connected to the first tuning circuit through a quite simple gadget, actually trimmer No. 1 on the gang condenser.

The screen-grid valve, a Mullard PM12, is coupled to the detector valve through a high-frequency choke and a .004-microfarad fixed condenser, which is connected to the tap on the grid tuning coil. This coil is tuned by the second half of the gang condenser and this is also provided with a trimmer. The values of the grid leak and grid

leak in the secondary winding of the transformer. This serves a useful purpose in dropping any high-frequency that may tend to get through. As its value is on the high side, it will tend to drop not only the high frequencies of transmission, but also the upper frequencies in the audible register. This is not a fault, for the pentode would otherwise tend to accentuate the high notes.

To summarise the circuit of this Mullard kit, I should say it represents the simplest interpretation of the high-frequency, detector, and low-frequency valve sequence consistent with efficiency. The simplicity is a

valuable point in a kit set, which is likely to be assembled by the novice as well as the seasoned amateur.

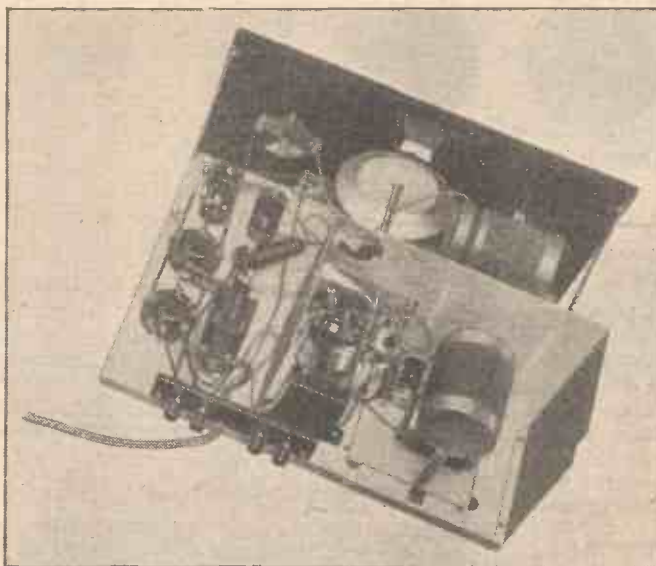
As the set took shape during my assembly of it, I could not help admiring the good finish of the cabinet and the symmetrical layout. The panel controls are worth describing. Foremost is the striking escutcheon plate carrying the tuning condenser knob and revealing the plainly readable tuning scale.

In operation, the trimmers work admirably, providing not merely accurate ganging over both wavebands, but also a wide variation in selectivity to suit all requirements. Tuning is truly a one-knob job.

The large knob on the left controls the filament rheostat in the screen-grid-valve circuit. The control of volume thus obtained is completely satisfactory, the strongest signals being reduced to inaudibility if required.

The knob on the right is for controlling reaction. This control must be treated with respect, otherwise violent oscillation may be produced. As a matter of fact, the volume of many stations is so great that reaction is not essential. There are still two more controls, one on the left for wave-changing, and the other on the right for the on-off switch. This switch, like the wave-change switch, has a fine mechanical action.

(Continued in third column of next page)



The assembled chassis of the Mullard kit set: Note how the cabinet is built up round it

condenser are 3 megohms and .0003 microfarad respectively.

Reaction is applied to the anode circuit of the detector, the reaction coil being coupled to the grid tuning coil. The amount of reaction is controlled by a .0003-microfarad variable condenser in series with the reaction coil.

There is no high-frequency choke in between the detector anode and the primary of the low-frequency transformer. It is evidently considered that the impedance of the primary is sufficient to divert the high-frequency current through the reaction. Certainly, my tests show that reaction is obtained over both wave-bands.

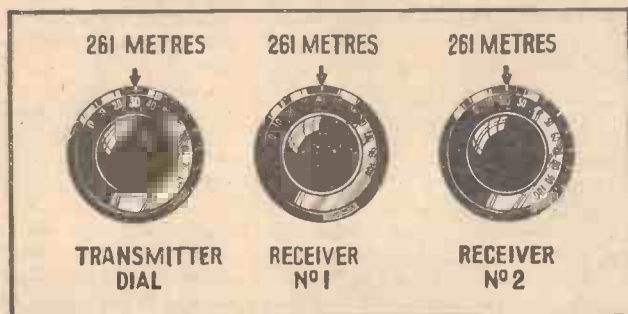
I note that there is a .25-megohm grid

THE HOW AND WHY OF TUNING-I

FIRST IDEAS ON TUNING

This is the first of a short series of articles on tuning, specially written for newcomers to Wireless. Here the first ideas about tuning are presented. In the articles that follow "Hotspot" will deal with all the difficulties about tuning that the beginner is likely to meet

EVERY listener who operates a wireless set must know something about tuning, for this is the process that enables one station to be selected in favour of all the others. So shall we think first of tuning as a selecting process? Assuming we know nothing of the action of tuning circuits, what can we be sure of? This at least; that when the tuning dial is set at say 50 degrees, we hear, say, London Regional; and that when the dial is turned to, say, 30 degrees, we hear another station, say, London National. Suppose these are the readings of your set; the natural question is whether these readings are constant for all sets using that sort of dial and tuned to those particular stations.



How the tuning dials of a transmitter and two receivers may differ for the same wavelength

In other words, if Smith buys a set with a 100-degree dial and Brown buys another make of set also with a 100-degree dial, will both buyers log London at the same degree point on the dial? The chances are that this will not happen. Here is the first puzzle of the radio novice; for if the London station transmits on 356 metres, why does its logging point vary according to the set?

Capacity and Inductance

The answer is simple. Tuning is made up of two things; one is capacity, and the other is inductance. We shall have to study these two ingredients in detail, but just now let us see how the knowledge that tuning is made up of them helps to solve the puzzle just created.

When a transmitter decides to send out its programmes on a certain wavelength, its tuning circuit has to be adjusted to that wavelength by choosing suitable values of inductance and capacity. If we call the inductance L henries and the capacity C farads, the expression LC gives us the oscillation constant of the tuning circuit. With a given LC value, we can find the corresponding wavelength by the equation
$$\text{Wavelength} = 62.8 \sqrt{LC}$$

From this we can now see that the wavelength of a tuning circuit can be made up of various proportions of inductance and

capacity. If we want to use only a small amount of inductance, the capacity will have to be greater than if we want to use a large amount of inductance. This is obvious if we remember that wavelength depends on the LC or oscillation constant of the tuning circuit.

The transmitter will choose a combination of inductance and capacity to produce the wavelength assigned to it. But in the light of our knowledge of LC we can now see that to make the receiver respond to this wavelength does not necessarily mean that the same amount of inductance and the same amount of capacity must be used at the receiver as at the transmitter.

So the puzzle of why Smith's set may be adjusted to a different dial setting from Brown's is solved. For if one set does differ from another it simply means that the proportion of inductance to capacity differs slightly in one set from the other. The set that employs the greater capacity to tune to the wavelength in question records the bigger dial reading, because the dial of the set controls

the variable condenser and that is the component providing the capacity of the tuning circuit. The reason one set has to use more capacity to tune to a given station than another set is that the first set has less inductance in its tuning circuit than the second set.

The Correct Combination

As a matter of passing importance, we should note that for any given wavelength there is an optimum combination of inductance and capacity for the tuning circuit. But as we are contending with dozens of wavelengths, for the dozens of stations picked up on the average modern set, it is obvious that this optimum combination will not always be obtained, especially if we remember that only the capacity of the tuner is varied and not the inductance, which remains fixed.

The transmitter is concerned with only one wavelength, and that is his own. Therefore he chooses the optimum combination of inductance and capacity for his tuning circuits. This combination may be quite different from the receiver. But the oscillation constant or LC value will be the same.

We have, in this preliminary article, talked glibly of inductance and capacity, without troubling how these two ingredients

of tuning are obtained. The mechanics of tuning will be discussed in the next article, when some first principles of inductance and capacity will be explained.

HOTSPOT.

"MULLARD 1932 THREE-VALVER"

(Continued from preceding page)

My tests of the completed kit were done at Streatham Hill, some twenty miles from Brookmans Park. The aerial was 60 ft. long. London National was maximum at 27 degrees, but was eliminated at 25 and 31 degrees. This powerful local station was therefore cut out in six degrees, which is very good for a three-valver. The result is all the more remarkable in view of the fact that selectivity of this order does not, in this set, cut down the volume of the more distant stations. London Regional, maximum at 53, had a spread of only five degrees.

On the long waves, Daventry was tuned in at 74, and had a total spread of only ten degrees. Because of this, I got Radio Paris and Eiffel Tower clear of interference.

I must mention that with the instruction sheet is provided a long list of approximate dial readings. Most of the well-known foreigners are included. My log points were within two degrees of all the stations listed, so I can congratulate the makers of the coils on the accuracy of the windings.

Here are a few of the many stations tuned in during my tests. Brussels No. 1 at 86; North Regional, 80; Rome, 72; Stockholm, 71; Toulouse, 59; Strasbourg, 47; Brussels No. 2, 44; and Hilversum, 37. These merely indicate the distribution of wavelengths round the dial, for altogether, after an hour at the dial, I logged thirty-one stations on the medium band; this log was in no small measure due to the very selective tuning, which enabled many stations usually blotted out on three-valvers to be heard clear of interference.

The pentode output valve, a Mullard PM22, takes quite a lot of anode current, but the amplification is well worth it and quality is pleasing, as I proved by connecting up to the Mullard kit a moving-coil loud speaker having a suitable self-contained output transformer.

There is much more I could say of this new Mullard Kit Set, but I have already exceeded my space, so all I can do is to advise readers interested in kit sets to apply for further details. A great set!

SET TESTER.

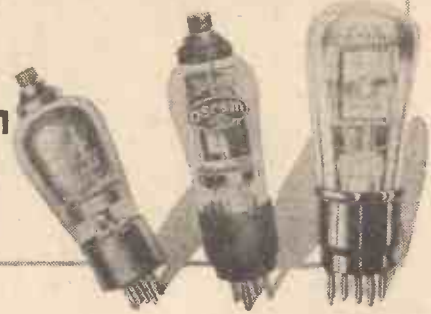
The latest agitation among a section of Scottish listeners is that there is only one remedy to meet the needs of broadcasting north of the Border, namely, an independent Scottish broadcasting company.

THE NEW VALVES

-AND-

YOUR SET

By ALAN HUNTER



SO many new valves have been produced by the valve makers during the last few weeks that the amateur may well be excused for some bewilderment. In this article I am referring briefly to the outstanding valves in each of the leading makes. Those interested in any particular valve should write to the makers for further details.

Cossor and Mazda Valves

I am interested in several of the new Cossor types. Altogether, there are nearly seventy valves in the new Cossor range! The 2-volt screen-grid Cossor valve, type 220SG, has the very low inter-electrode capacity of .001-micro-microfarad. I believe the Cossor makers were the first to tackle the lowering of the self-capacity of screen-grid valves. The result of this reduction should mean greater sensitivity, if due attention is paid to the rest of the design.

Another interesting Cossor valve is the 210Det, which can be obtained with a metallised bulb.

The Cossor 230XP is a power valve with a mutual conductance of 3. This valve gives a large output with considerable sensitivity. For average output requirements, I draw attention to Cossor 220P/A, which, with its mutual conductance of 4, provides appreciable low-frequency amplification.

In the Mazda range, the 2-volt pentode, known as the Mazda Pen 220, is likely to attract the amateur's attention. This valve, with 120 volts on the anode, and the same voltage on the screen, passes only

5 milliamperes, with a grid bias of -4.5 volts. The undistorted power output is 250 milliwatts. This is a fine valve for portable sets, because it gives just enough output for portable requirements and certainly does not run down the high-tension battery very rapidly.

Another interesting Mazda valve is the HL2, which should make a good detector, even with power-grid values. The amplification factor is 32 and the impedance is 21,000 ohms. The mutual conductance is, therefore, 1.5. A very sensitive detector, I should say.

Then we have the Mazda L2, which is specially designed as a power grid detector. This valve will handle a large signal input without distortion. The amplification factor is 19, which is remarkable because the impedance is only 10,000 ohms, indicating a mutual conductance of almost 2. As the Mazda L2, with 120 volts on the anode, passes 3 milliamperes, one would need to choose the low-frequency coupling following the detector with care. Probably with cheap transformers the resistance-feed method would be advisable.

The Marconi and Osram Ranges

There are so many valves of distinction in the Marconi and Osram ranges that I can but refer to a few I have already tried or heard working. The Marconi VMS4 is the first "variable-mu" valve to be introduced in this country. The Americans have been using these valves for a year past, and I am glad to know that our valve makers have

appreciated the advantages of the variable-mu construction.

When I explain that the negative grid bias applicable to the Marconi VMS4 is from 1½ volts to 40 volts, some idea of its function is at once gained.

The purpose of this valve, which has an indirectly heated 4-volt 1-ampere filament, is to provide a non-distorting variation in volume by making the sensitivity of the valve vary according to the input voltage applied to it. If a large input is applied, and the grid is suitably biased, the sensitivity of the valve is reduced without altering the characteristics in any other way. With this valve, a potentiometer control of the screen current provides a really satisfactory volume control for A.C. sets.

Another new Marconi valve is the MS4B, a 4-volt A.C. type, with an amplification factor of 1,120. As the impedance is only 350,000 ohms, much of this tremendous amplification is actually obtained. As readers probably know, high magnification factors with high impedances do not result in appreciable increase in sensitivity, because the impedance of the tuned circuit connected in the anode circuit of the valve is so much lower that only a very small part of the amplification is tapped off. The new MS4B is, therefore, welcome, because it achieves its high amplification factor with a relatively low impedance.

D.C. Valves

A range of Marconi valves (also produced in the Osram range, of course) that is sure to attract a great deal of attention is the D.C. mains group, consisting of screen-grid, detector, low-frequency and pentode types having 16-volt filaments which pass only .25-ampere current.

A pentode has been chosen for the power valve in this D.C.-mains range because, with the limited maximum voltage of 200 or, at the most, 250, you can get more A.C. watts output from a pentode than from an ordinary three-electrode power valve. Another reason for using the pentode in the D.C. mains output is that it needs only 10 volts grid bias instead of the 30 volts for a three-electrode power valve of corresponding power output. As volts gained for grid bias in a D.C. mains set are volts lost for the anodes of the valves, the low grid-bias voltage, required for this Marconi pentode is an obvious advantage.

(Continued at foot of next page)



A single-valve short-wave transmitter which will be on the stand (No. 246) of the Radio Society of Great Britain at the forthcoming Exhibition

For the Newcomer to Wireless : THE SHORT WAVES

I AM thinking of making up a short-wave set and I am wondering what type you would recommend.

One thing about the short waves is that when conditions are good their transmissions come in so powerfully that the simplest apparatus suffices.

By "simplest" you mean?

Nothing more than a two-valve set, consisting of a detector followed by a transformer-coupled note-magnifier.

What will such a set do?

If conditions are good it will give you telephone reception of literally scores of broadcasting stations from all parts of the world and loud-speaker reception of quite a number of them. I have often, for example, had PLF in Java, W2XAL and W2XAD, PCJ, and Doerberitz (AFK) at good loud-speaker strength with such a combination.

Then is that the ideal short-wave set?

From the point of view of economy it certainly is, but if you are prepared to spend just a little more you can make it far better. Even the finest short-wave set, though, need never be an ambitious affair.

What improvement are you going to suggest?

The use of a screen-grid valve as high-efficiency amplifier in front of the detector.

But I thought that it was almost impossible to obtain any appreciable

high-frequency amplification on the very short waves.

People used to believe this, but nowadays practical results show that appreciable amplification can be obtained by means of the screen-grid valve used in a suitable circuit. And the S.G. valve has another very big advantage.

What's that?

Just this. If you use a detector coupled straight to the aerial you are almost certain to be bothered by hand-capacity effects when you get below about 25 metres. No matter what you may use in the matter of screening or filter circuits and so on, you will find that these effects occur.

What exactly do you mean?

Well, as your hands approach the tuning condensers, for example, you may find that the tuning varies. Often, too, if you pinch the telephone leads between the forefinger and thumb of one hand you will find either that the set howls or that the station that you were hearing disappears. Again, moving your head whilst you are wearing the telephones may vary the tuning quite a lot. There are few things more annoying than a set whose tuning alters if you move to light a cigarette, or which howls at you if you touch a metal ash-tray on the table.

What does the screen-grid valve do?

In most cases it eliminates all this kind of thing and in every case we may

safely say that its presence brings about a very great improvement by reducing hand-capacity effects very considerably.

Does it really amplify?

It doesn't, of course, give quite the magnification that you will find on the broadcast or long wavebands, but it certainly does amplify on the ultra-short waves.

To what extent?

Well, you will find that if there is a station from which without it you can obtain reception only by being on the very verge of oscillation, speech and music are well heard when the screen-grid valve is in use with the reaction coupling considerably slackened.

And just what does that mean?

It means that you get far better quality in your long-distance reception and that you haven't got to do the minutely fine tuning that is often necessary in short-wave sets with no kind of high-frequency amplification.

Would you rather have a screen-grid stage than a second note-magnifier?

Certainly I would, for if hand capacity effects are bad with a single note-mag. stage, they are far worse if you use two without an S.G. valve.

What then is the ideal short-wave set?

A four-valver with a screen-grid high-frequency amplifier, a grid-leak-and-condenser detector, and two note-magnifying stages so arranged that you can use one or both at will.

"THE NEW VALVES AND YOUR SET"

(Continued from preceding page)

Another big point in favour of the new Marconi (and also Osram) D.C. mains valves is that as the filament current is only .25-ampere, the total power consumption on a 200-volt supply of a group of these valves connected in series is only 50 watts, instead of the 200 watts required with 1-ampere filaments. The characteristics of the Marconi and Osram D.C. valves correspond exactly with the A.C. valves. This will prove a great convenience in changing from D.C. mains to A.C. mains.

As might be expected, the Mullard range is notable for many improvements in existing types and for the introduction of several new valves. A fairly new Mullard valve that readers may not yet have tried is the PM1HL, an excellent detector, with an impedance of 18,500 ohms. The well-known Mullard PM2DX, which was, I think, the first special detector introduced, has been improved so much that its filament-current consumption is now only .1-ampere instead of .2-ampere.

The Mullard PM2A is a power valve of special use in portables and small sets. The amplification factor is 12.5. I recently tried another newcomer to the Mullard range, namely the PM202. This is a really good super-power valve in the 2-volt class. Its impedance is 2,000 ohms and its amplification factor is 7, indicating a mutual conductance of 3.5. The filament-current con-

sumption is quite moderate, being .2 ampere, and with a double-capacity high-tension battery this valve can be economically run.

Among Mullard A.C. mains valves, I must mention the Mullard 904V, which has the tremendous amplification factor of 85! This should prove an excellent valve in sets where the first valve is the detector, and consequently where the input to the detector is fairly small. Another Mullard A.C. valve is the Pen4V, an indirectly heated pentode. This will give a power output comparable with the Mullard 054V, the indirectly-heated three-electrode power valve, only with a much smaller signal input.

Osram Developments

As is well known, valves in the Osram range are also available in the Marconi range, so readers already have an indication of Osram developments. I should mention the Osram PT4, which is a 4-volt 1-ampere directly-heated pentode, providing an undistorted power output of 6 watts.

The filament is directly heated. This is an advantage in A.C. sets where all the other valves are indirectly heated, for the pentode then draws anode current as soon as the set is switched on and so prevents a high voltage accumulating on the high-tension output condenser.

For super-het. enthusiasts, the Osram DG2 will prove of special value. This is a double-grid valve, with a 2-volt .2-ampere

filament. The anode voltage is 25 and so is the screen voltage. The amplification factor is 4.5 and the impedance is 3,750 ohms, so the good slope of 1.2 is indicated.

Two new mains rectifiers are included in the Osram range. The Osram U12 provides a maximum current of 120 milliamperes with 350 volts on each of its anodes. The Osram U14 also provides 120 milliamperes, but with 500 volts on each of the anodes. Both these rectifiers have 4-volt directly heated filaments taking 2.5 amperes.

Very few additions have been made to the Eta range, but this is natural, as Eta valves have only recently been introduced into this country. As most readers know, there are Eta valves for 2-volt accumulators and a series for A.C. mains operation. I am told that a complete range of Eta valves is about to be introduced for American sets sold in this country. There will be six different American types.

The Eta BW604 is a new 2-volt small power valve, taking .2-ampere filament current. This will have an amplification factor of 6 and an impedance of 4,000 ohms. Then there is a new Eta full-wave rectifier, to be known as D350B. This will have a 50-milliamper output and will thus be of more general interest than the existing Eta D380B.

From the brief details I have been able to give in this survey of the new valves, readers can easily see what a lot of development and research work has been going on among our enterprising valve makers

Our Broadcast Critic Talks About — VAUDEVILLE

THE vaudevilles are improving in some respects, but not in others. I strongly criticise the tendency which comedians have to make their visible audience laugh by means of what they *do* rather than what *we* hear them say. It is a little irritating.

Sandy Rowan is still as good as ever, but his patter is far ahead of his songs. "Jenny MacIntyre" was about the only one worth hearing the other night.

The ukulele is an invention of the Devil. At least, I thought so when I heard it as an accompaniment to Joan and Nancy Allen-Brown. I liked their singing, but the breathing of one of them was very evident. She must have been a little too near the microphone.

The Four Fayre Sisters, I expect, are beautiful to look upon—but *those concertinas!*

Tommy Handley, is of course, splendid. His views on "The Passing of Summer" were *really* funny. Please, can we have more of him? However, I have one complaint: his songs are not nearly as good as his patter. Come on, Tommy! Get hold of some respectable lyrics; your last song was not up to your previous patter! You made an anticlimax. Did you know that?

I was very bored with Mabel Marks. Her songs had not a good line in one of them.

The scene at the end, where the Hulberts were interrupted by a lady singer who wished to sing in their stead, was misplaced; it should have been in the Children's Hour.

The Temple Quartet is well worth hearing. I thoroughly enjoyed their singing, especially the Morley motet. It is altogether delightful to hear four men sing so well together. Charles Hawkins is an alto of the very first grade.

I listened to the organ at All Saint's, Margaret Street, being played by Allen Biggs. I thought his arrangements of Couperin and Handel were delightful and thoroughly suitable for a church organ, which is more than I can say for some of the arrangements I have heard. By "arrangements" I mean works not originally written for the instrument.

As a Bach player, I fear I do not admire Mr. Biggs. He made a sorry affair of the "Great A-minor Fugue." Bach has brilliance; I wish some of the organists who broadcast would realise it.

I feel inclined to be very critical on the subject of the Foundations of Music. To my way of thinking, they should be absolutely beyond reproach.

They may be for the few, and not for the many; probably they will never be anything else. But *Foundations of Music* is a very *lofty* title, if I may be allowed an expression that seems a contradiction in terms.

Dale Smith was good in the English songs the night I heard him; his diction was almost perfect. I am always grateful when I can hear the words of a song.

Eleanor Toye, on the other hand, was not quite good enough for 6.10 p.m. I am sorry to put it quite so bluntly, but the standard *must* be kept up. Honestly, I did not think her singing up to what *should be* Foundation standard.

I intend to watch the Foundations every week and to complain loudly if any weaknesses appear.

I suppose Mr. James Agate must appeal to business men. I had to switch him off, not in anger against him, but in sorrow that I could not appreciate the quality of his remarks. I fear I shall never be a Big Business man. All the same, he might take the hint that his talks may possibly miss some of his hearers, whereas it might be the other way, and his hearers might take care not to miss his talks.

I hope George Grossmith will continue his chats on his experiences at Hollywood for long enough. If he does go on, do not miss him if you can avoid it. He is fascinating. I thoroughly enjoyed every moment of the only talk of the series I have been able to hear.

Naturally, I have listened to some Proms. I was very impressed with the Vaughan Williams night. Did you hear "The Wasps"? It is one of his best pieces of programme music; that is to say, of music written with a direct idea of *imitating*

something. Those fiddles buzzed a merry buzz; the work is an extremely clever piece of orchestral writing.

The "Flos Campi" suite contained some perfectly beautiful passages for female chorus, supported by a solo viola, played by Bernard Shore. On the other hand, I noted some rather harsh effects. I sincerely trust Dr. Williams is not joining the hyper-modernists. Steady, sir, *please!* Don't go Bolshie at your time of life!

Keith Faulkener sang the Vaughan Williams songs splendidly. His diction is so good that I want him to make it unimpeachable. Come on, Keith! You've got good teeth! Let us have *every* syllable!

The Saturday-night Prom. was a bit variable in quality. Harold Williams possesses a fine voice, but I do not look upon him as one of our most intelligent singers. He made a dull show of the Sullivan aria.

I admire Lauri Kennedy as a cellist. I thought his tone extremely appealing. Whether the work (by Böellmann) which he played was *worth* playing is a matter upon which I am not any too sure. Too much repetition of a rather poor theme, to my way of thinking; also, I became sick of the key of A major.

I was interested in Dr. Dyson's setting of Chaucer, but I do not know how the unaccompanied parts sounded to you. I was not so much in love with Isabel Baillie's voice that I wanted to hear her by herself. However, the work has points in rhythm.

The great success of the evening was Strauss' tone poem "Till Eulenspiegel," which seemed to send the audience mad. I can always listen to Strauss, because he has what so many modern writers lack—*scholarship*.

Those of you who are anxious to appreciate modernity in music had better watch for Strauss. He makes a good beginning.

The Kursaal concert from Belgium on the Sunday night was very disappointing to me. The band played out of tune, for one thing. I will be hanged before I will listen to bad intonation in *any* symphony orchestra.

I was none too stuck with the baritone, for that matter. Still, we may have better luck next time. I say that because one of the finest concerts I *ever* heard broadcast came from that direction.

After an excruciating passage, played by trumpets and trombones, I tuned in to the other programme and caught Tom Jones at work in Eastbourne. I rarely hear him—not because I do not wish to, but because he nearly always broadcasts when I want to listen to something else.

He was very welcome; he at least played *in tune*. I think he is deservedly popular. WHITAKER-WILSON.



An Impression of W. A. Arnold, the dulcimer soloist

In this brief survey of developments in the new season's broadcast receivers, our contributor, "Set Tester," indicates the main essentials to be noted by visitors to the Radio Exhibition and by those contemplating the purchase of a new set.



A super-het of neat design—the Kolster-Brandes

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EVEN a world-wide depression has not been able to suppress the enthusiastic enterprise of the radio industry in this country. This is not a pat on the back, but just a plain statement of fact, as those who visit the Radio Exhibition can surely prove for themselves.

The outstanding aspect of 1932 radio is the great cheapening of sets and components. Some of the set prices are really startlingly low. Many causes have contributed to this reduction. Probably the industry is now settling down to modern production methods, which are designed to cut down the cost of raw material and labour to a bare minimum. Another factor is the great faith of the radio industry in the response of the British public. Then we cannot help noting how the B.B.C. licence figures have



The chassis of an R.I. receiver of striking design

What Next Sets Will be

1931



The Corsor New Empire Kit Set—battery model

increased, so that at the time of writing the four million mark is within sight. A considerable proportion of this number of listeners is interested in the purchase of wireless sets. Probably many have been waiting only for the present time to see what developments have been taking place during the last year.

Well, I can assure all intending set-buyers that this season's sets incorporate the very latest ideas in circuit technique. What is more important, these circuit principles have been interpreted in a way that will appeal to non-technical buyers. I mean that the appearance of the new sets is very much better than in previous years. Improvements in the finish of cabinets are most marked. The use of bakelite and kindred materials for cabinets has also contributed to the improvement in their appearance.

I shall probably be doing readers the best possible service if I indicate, first of all, the



A particularly neat set—the Varley Square Peak Mains 4-valver

general lines along which developments have taken place. I would stress the appearance aspect, because I know many set-buyers have, in the past, been put off sets that were technically sound simply because their appearance was extremely crude.

Allied to the improved appearance is the simplification in control. Many of the new sets have a total of only three knobs—one is for tuning, and this is often operating three



Kolster Brandes Radio-gramophone

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or four separate tuning circuits. The second control is for volume, and the third control combines the functions of a wave-change switching, power supply switching, and gramophone pick-up switching.

The reduction in the number of controls in the new season's sets is bound to appeal to non-technical set-buyers, who are apt to be intimidated by the array of knobs that so often characterised sets in the past. At last the set-makers have awakened to the necessity of doing something for the man in the street in simplifying control. I mean the tuning dial is now more frequently cali-

Season's Sets

Like

1932

brated in wavelengths than in so many meaningless degrees. Of course, this wavelength calibration is only possible in sets that do not rely on reaction for high-frequency sensitivity. Some of the more outstanding sets have the additional advantage of actual station calibrations, which are surely the last word in tuning simplicity. It is significant that the modern set is designed for the reception not merely

of the local B.B.C. station, but of a considerable number of foreign stations.

Volume control has been more scientifically tackled this year, so that we can now reduce the strength of local stations to a modest output or, if necessary, to inaudibility. In some of the sets this has been achieved by the use of a local-distance switch. The local-distance switch enables the high-frequency sensitivity of the set to be considerably reduced when the local stations are being received. In this way the danger of overloading the low-frequency side of the set is avoided.

Some sets are content with just a volume control, but others include an auxiliary control for tone. This usually takes the form of a high-note filter, so that the effect of increased bass-note reproduction is obtained by suppressing high notes. Such a tone control is also very useful in cutting down the annoyance of a high-note heterodyne whistle, created by a station working too closely to the frequency of the station required.



The Tannoy All-electric Midget Receiver



A close-up of the H.M.V. radio-gramophone showing the record changer



It is claimed that over 90 stations can be received on the H.M.V. 9-valve super-het self record-changing radio-gramophone

The third control, combining the different switching functions needed in the modern set, is a welcome improvement. After all, it is a comparatively simple mechanical development to combine coil-switching and pick-up switching under one knob.

When we come to consider circuit developments incorporated in these new sets, there is a great deal to talk about. Whereas last year the aim common to all set-makers was the production of a straight three-valver for A.C. mains operation, this year there is a much greater diversity of endeavour. The



H.M.V. 4-valve Table Radio-gramophone for mains operation

past season has shown the inadequacy of the average three-valver with two straightforward tuning circuits to cope with modern conditions in the ether.

I am glad to see that set-makers have taken a lead from the amateurs in incorporating band-pass tuning in sets with only one stage of high-frequency amplification. But the set-maker has gone even farther. I mean there are many sets now with two efficient stages of high-frequency amplification, employing three or more separate stages of tuning. The resulting improvement in selectivity and sensitivity has to be heard to be appreciated. Apart from the increased selectivity of three and four-valvers, this



H.M.V. pick-up and control for use with portable gramophone

year is noticeable for the introduction of several sets employing the super-heterodyne circuit, which was undoubtedly popularised in this country by the AMATEUR WIRELESS and *Wireless Magazine* super-hets designed by W. James.

On the low-frequency side, sets have been

"WHAT NEXT SEASON'S SETS WILL BE LIKE" (Continued from preceding page)

improved out of all recognition, because power output valves are now so much better. Sets with an undistorted power output of 2 or 3 watts are quite common, compared with the $\frac{1}{2}$ -watt of last year. With some power in hand, the latest sets naturally give much better quality reproduction than when the output is pushed to the limit.

As my space is fairly limited, I can give



Among the new radiograms is this fine Tannoy instrument. Senior and Junior models are available

only a few details of actual sets examined, but readers can rest assured that during the coming season I shall, in the Sets of Distinction feature, deal faithfully with all the worth-while sets of the season. One of the biggest firms is, of course, the General Electric Company, Ltd., which has produced a complete new range of low-priced sets for the new season. I am particularly impressed with the Gecophone A.C. four-valver, price 20 guineas. This has two high-frequency stages and the three tuning circuits are operated by a single control mounted on the side of the cabinet. The dial is calibrated in wavelengths. A set that is bound to appeal to the listener of moderate means is the Gecophone three-valver for A.C. mains operation with self-contained loud-speaker. For those wanting a de-luxe installation, the new Gecophone radio gramophone, with inductor dynamic or moving-coil speaker, will, no doubt, be considered.

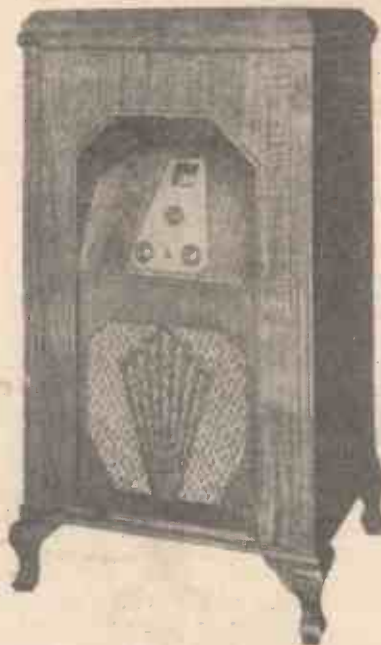
In the Columbia range is an inexpensive two-valver that should make quite a stir at the Exhibition. This self-contained set is only £5, complete with valves, loud-speaker, and all the necessary batteries. One of the new Columbia sets likely to appeal to a wide

market is the pedestal model 333, price 29 guineas. This set is for A.C. mains operation, and includes three screen-grid valve stages. The Columbia radio-gramophone range has been augmented with two further models.

Incorporated in the Varley four-valve mains set are the now well-known Varley Square Peak tuning coils. There are two stages of high-frequency amplification and the tuning control operates a calibrated dial marked in wavelengths. The volume control also works the gramophone pick-up switch.

A New Station Indicator

An outstanding feature of the new Ekco range of sets, made by E. K. Cole, Ltd., is the Ekco station indicator. This patented device consists of a combined tuning con-



This is the new A.C.-operated radio gramophone produced by the General Electric Co., Ltd.

trol, station indicator, wave-change, and radio gramophone switch. A pointer moves round a large scale, marked in actual stations, fitted round the periphery of the moving-coil loud-speaker fret. I think the

Ekco Consolette model RS3, which includes four valves, will prove very popular, for its price is only 24 guineas.

Kit sets in all the leading makes are greatly improved this season. The Mullard, Osram, and Cossor kits are all very fine three-valve sets for the amateur. A newcomer to the kit-set market is the British Zonophone Co., Ltd., who are bringing out a three-valve kit set at the extremely moderate price of 6 guineas, including three Marconi valves and the Marconiphone cone loud-speaker chassis. The Zonophone kit set is a product of the

The Kobra Junior, one of the later table type sets produced by Kolster Brandes and incorporating the new chassis



H.M.V. Research Laboratories, but it will be marketed by all the Zonophone record dealers.

Another sensationally priced set is the new Lotus all-mains three-valver, with self-contained moving-coil loud-speaker. This is only 14 guineas.

The H.M.V. Range

The H.M.V. range of sets is calculated to increase the prestige of our radio industry in no small degree. One of the most interesting of the H.M.V. products is the table-model radio gramophone, which will sell at the popular price of 29 guineas. Included in the H.M.V. range is a de-luxe radio gramophone with a nine-valve super-het circuit, but the man of moderate means is also catered for with some very inexpensive H.M.V. sets.

Value for money is the key-note of all the sets I have examined or heard about this season. In general, I think I am right in saying that set-buyers will this year get at least 50 per cent. more for their money than last year. This is a remarkable tribute to the energy and confidence of the British radio industry.

FROM SCOTTISH "B.H."

THE first of the public concerts to be held in the big studio of Scottish Broadcasting House during the winter season will take place on September 25. The B.B.C. intends to open this season with a good light concert of the variety type, and this will be presented by the Radioptimists. The stage at Scottish Broadcasting House is peculiarly suited for variety programmes. It is wide, but not very deep, and can take a large number of singers ranged in a single line or against the deep black curtain, which shows up the strong contrast of the figures in their coloured garments. The first part of this concert will be broadcast; the rest of the concert will be intended only for those present in the studio.

OUR EXHIBITION SET

"A.W."S" star exhibition set this year bears the appropriate title "The Olympian Three." First details will be given next week, but an "A.W." Correspondent who was present at final tests of this new receiver a few days ago says most emphatically that in performance it is a real winner. Stations came rolling in, and the selectivity was bettered only by a set of the six-valve "Century Super" calibre.

A COMPLETE GUIDE
TO THE SHOW IN
NEXT WEEK'S "A.W."

A CANDID OPINION

THE B.B.C. attempt to force upon country children the actor's English of Savoy Hill will fail, I am glad to say. Detached observers must be interested to note the increasing tendency on the part of the B.B.C. to interfere in what does not concern it. Let it stick to its role of entertainer, and continue to delight our ears with frightful lumps of Bach and our intellects with patronising lectures by cranks on subjects that nobody under the canopy of Heaven cares twopence about.—"Beachcomber" in the *Daily Express*.

LET "A.W." SOLVE YOUR
WIRELESS PROBLEMS.

Mr. Kendall's services are at the command of every Ready Radio customer



Mr. Kendall will be in attendance daily at our Stand No. 6, National Radio Exhibition, Olympia.

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G. P. Kendall
 now Chief Engineer,
 Ready Radio

As still further proof of our aim to maintain an unrivalled service, both before and after sales, we have now taken on the full time services, as our Chief Engineer, of Mr. G. P. Kendall, B.Sc., for many years the well-known Chief of Research for "Popular Wireless" and "Modern Wireless."

★ When you buy Ready Radio Kit Components you are definitely assured that they are the finest possible for their particular job. Mr. Kendall is your surety. Every Ready Radio Kit Component is chosen by him only after submission to stringent laboratory and broadcast tests. And again before despatch, they are tested and passed under his personal direction.

★ Should you ever be in difficulties with your set you can avail yourself of his wide and experienced technical knowledge, FREE. Mr. Kendall controls the new Ready Radio Technical Department, formed mainly for the purpose of helping you out of your radio troubles.

THE £3 3s. FOUR KIT A

(less valves and cabinet) **£3 : 11 : 0**
 or 12 equal monthly instalments of 6'6

KIT B
 (With valves) **£5 : 18 : 6**
 or 12 equal monthly instalments of 11/-

OVERSEAS
Everything Radio can be supplied against cash. In case of doubt regarding the value of your order, a deposit of one-third of the approximate value will be accepted and the balance collected by our Agent upon the delivery of the goods. All goods are very carefully packed for export and insured. All charges forward.

THE CENTURY SUPER KIT A £6 : 18 : 6

(Less Valves and Cabinet but including Wound Frame aerial.) **12/8**
 or 12 equal monthly instalments of

KIT B £10 : 14 : 6
 (Including Valves, Wound Frame Aerial, but less Cabinet.) **19/8**
 or 12 equal monthly instalments of

KIT C £11 : 9 : 6
 (Including Valves, Cabinet and Wound Frame Aerial.) **21/0**
 or 12 equal monthly instalments of

Completely assembled with valves, cabinet and wound frame aerial, ready for use and aerial tested. **£14:10:0**
 or 12 equal monthly instalments of **26/6**

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 159 Borough High Street, London Bridge S.E.1
 Tel. Nos.—Head Office Lee Green 5678; Showrooms . Hop. 3000. Grams: Readrad, Sedist.

CASH ORDER Please despatch to me at once the goods specified for which I enclose payment in full of £ _____

C.O.D. ORDER Please despatch to me at once goods specified for which I will pay the sum of £ _____

EASY PAYMENT ORDER Please despatch my Easy Payment order for the goods specified for which I enclose first deposit of £ _____

Name

Address

Kit required



IN MY WIRELESS DEN

WEEKLY TIPS—
CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

Rating Resistances

RESISTANCES and other similar parts, such as potentiometers, are usually rated to carry a given maximum value of current.

If this value of current is exceeded, heating occurs and may damage the component and eventually lead to further damage in the set.

Heating depends upon the square of the current passing and, of course, upon the freedom with which heat is radiated or carried away. Thus if the part carrying current is enclosed in a confined space it is much more likely to heat up than when it is in a well ventilated position.

This must be remembered when arranging parts. Take flexible resistances as an example. If these are working with the maximum value of the current flowing and they are arranged above the baseboard of the set, they will probably remain cool. But if they are tucked away below the baseboard they may well become hot and eventually break down.

I have had a number of instances in which the resistances would not carry the rated current without becoming hot. The better makes are satisfactory in this respect, but some types will only just carry the rated current.

Choosing a Condenser

Fixed condensers of the non-inductive type are usually to be preferred to the ordinary rolled paper patterns, for the reason that their impedance is lower.

When we connect a condenser in a high-frequency circuit we usually want the impedance to be as low as possible. In a condenser there is, naturally, principally capacity, but there is also resistance and inductance. The resistance may not amount to much and the inductance may be small, but still, these factors affect the impedance.

A good condenser should be connected with short wires between the two points across which the currents are to be carried.

Thus in the case of a screen-grid valve the condenser should be joined between the screen grid and the filament or cathode terminals at the valve holder rather than to other parts in the circuit.

By-pass condensers in the detector circuit, too, are best arranged when they are wired directly between the contacts on the valve holder. Paper condensers on the whole, are satisfactory, but sometimes a faulty one is issued. It is, therefore, a good idea to try another if the expected results are not obtained.

Tendency to Howl

Troubles such as a tendency to howling

and instability may often be traced to the position of a high-frequency choke.

If this is near the grid condenser or other part included in the high-frequency circuit, peculiar effects may be obtained. Owing to its size, there may well be a fairly large electrostatic coupling between the choke and other part, with the result that the stability is affected.

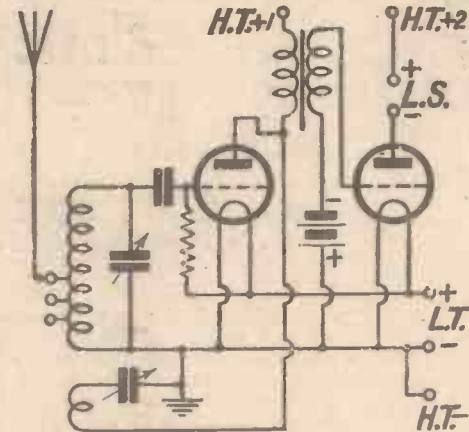
It is easy enough to make a screen for a choking coil and to place it round the choke but not too close to it. The screen should be earthed.

If an improvement is found when the screen is added, a permanent one may be fitted and be screwed down. There is always the chance that couplings will occur, and high-frequency chokes, like tuning coils, could well be screened.

How Much Reaction?

It is sometimes thought that reaction will compensate for a poor tuning coil. This is not true.

If you compare the results obtained using a good coil and a poor one, both having reaction, you will soon decide in favour of



A tapped coil enables the aerial damping to be varied

the good coil. The selectivity is, without doubt, better and signals are stronger.

NEXT WEEK :

A COMPLETE GUIDE

TO THE

EXHIBITION

I suppose that not many people actually compare coils in this way. With the good coil the aerial can be connected nearer the earth end. If tappings are provided as in the accompanying diagram you can easily note the effect of taking the aerial to the various points.

Selectivity and signal strength both vary when the tapping point is changed. Full advantage is not taken of this. Aerials vary in their characteristics and the best point for one aerial is not the best for a different size of aerial.

Further, one amateur may be prepared to sacrifice a little strength in order to gain in selectivity, whilst another may prefer the maximum strength. The reaction coil should be wound near the end of the aerial coil connected to earth. No more turns of wire should be included in the reaction coil than are necessary for full reaction to be obtained.

Battery Connections

I do not use many dry batteries, but I often notice that the connecting sockets vary greatly in size.

The plug fits tightly in some sockets and loosely in others. Battery makers ought to take greater care. There appears to be too great a variation in the size of the sockets and no one wonder plug will fit them all.

Noises from Condensers

Tuning condensers used in circuits providing considerable magnification ought to be so well made that noises do not occur. There must be a satisfactory contact between the moving set of vanes and the connecting terminal.

In some condensers the contact is not positive enough, with the result that the resistance varies slightly as the condenser is turned. This variation in the resistance produces noises during tuning.

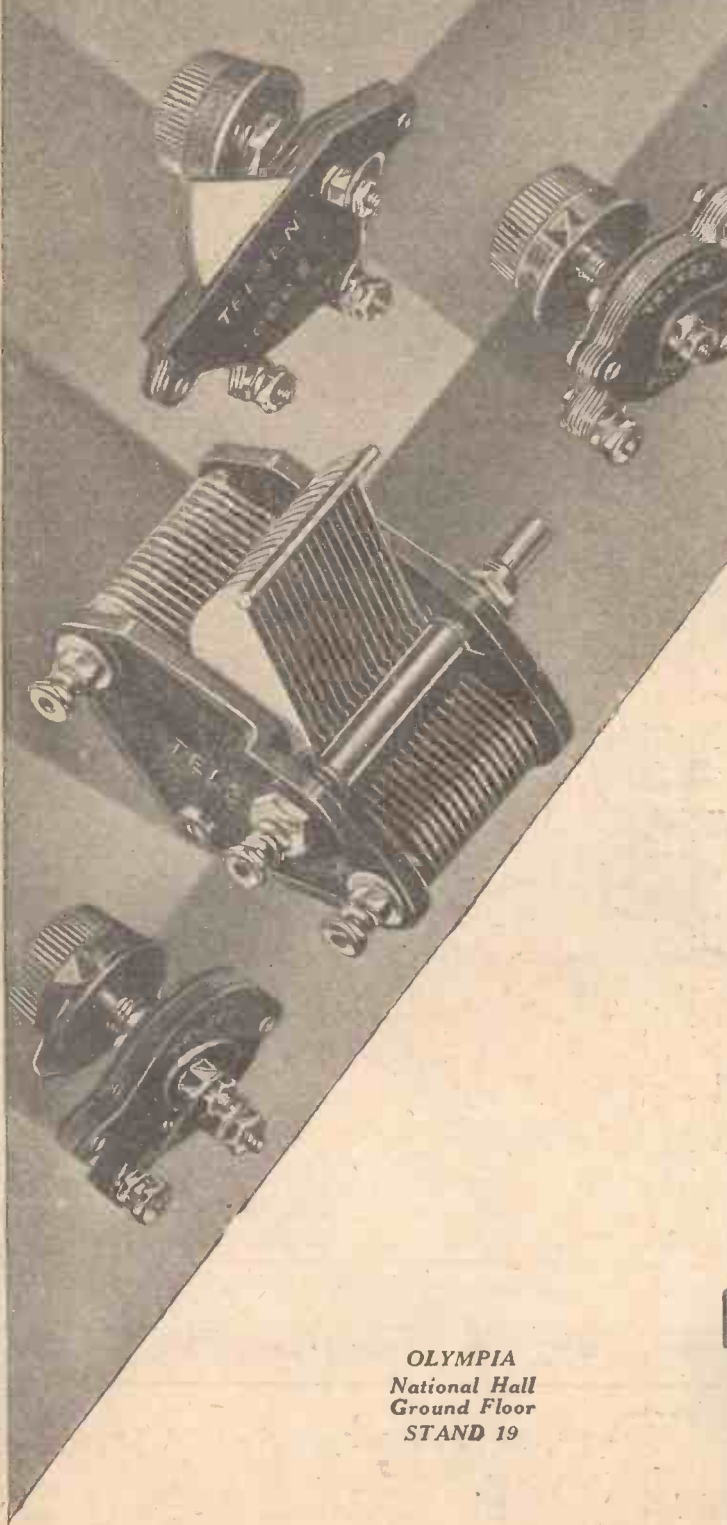
Sometimes a noise can be traced to a loose screw provided for the purpose of holding down the pig tail. In other condensers the pig tail is of bare wire, and as the moving vanes are turned, parts of the pig tail rub together. This also will produce noise when the set is a sensitive one.

Tracing a Hum

A common cause of hum in alternating-current mains sets is a poor contact in a valve holder. In particular, the grid pin must make a good contact with its socket.

The detector valve position is usually the most sensitive, so that special care must be taken that the pins of this valve make good contact with the sockets in the holder.

The choice of experts



TELSEN BAKELITE DIELECTRIC CONDENSERS
 These Condensers are of a new and improved type and of exceptionally compact dimensions. The moving vanes, which are interleaved with finest quality bakelite, are keyed on to the spindle so that they cannot be pushed out of line, and there is a definite stop at each end of the travel. The connection to rotor is made by means of a phosphor-bronze pigtail so that there is no crackling due to rubbing contacts. The connection to the stator vanes is absolutely positive—a very important point.

- Telsen Bakelite Dielectric Differential Condenser—
 Made in capacities of .0001, .00015, .0005 Price **2/-**
- Telsen Bakelite Dielectric Reaction Condenser—
 Made in capacities of .0001, .00015, .0003 Price **2/6**
- Telsen Bakelite Dielectric Tuning Condenser—
 Made in capacities of .0003, .0005 ... Price **2/-**

TELSEN LOGARITHMIC VARIABLE CONDENSERS
 The Telsen Logarithmic Variable Condenser is of robust construction and high insulation. The H.F. losses are very low and the frame is braced at three points, so that the possibility of distortion and short circuiting is negligible. Substantial terminals are provided with alternative connection to the stator.

- Telsen Logarithmic Variable Condenser—
 Made in capacities of .0005, .00035, .00025. Price **4/6**

TELSEN PRE-SET CONDENSERS
 These Condensers have been carefully designed to give proper separation of vanes when the adjustment is unscrewed, which results in a very low minimum capacity, giving a wide range of selectivity adjustment when used in the aerial circuit.

Telsen Pre-set Condenser—
 Made in capacities of:

Maximum capacity	Minimum Capacity	Price
.002	.00025	Price 1/6
.001	.00004	Price
.0003	.00005	Price
.0001	.00001	Price

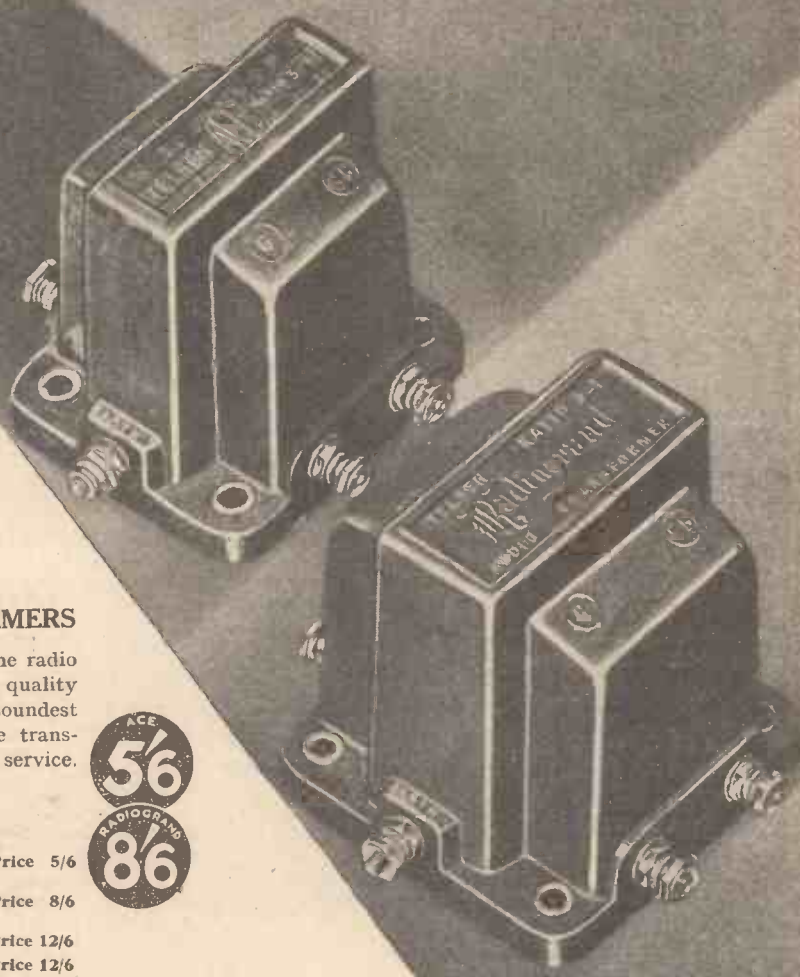
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TELSEN L.F. & OUTPUT TRANSFORMERS

Telsen transformers have achieved fame in the radio world on account of the high standard of their quality and performance. Designed and built on the soundest engineering principles, these robust, full-size transformers will give not only efficient but enduring service.

TELSEN L.F. TRANSFORMERS

- Telsen "Ace" Transformer, Ratios 3-1, 5-1 ... Price 5/6
- Telsen "Radiogrand" Transformer, Ratios 3-1, 5-1 ... Price 8/6
- Telsen "Radiogrand" 7-1 Super Ratio Transformer ... Price 12/6
- Telsen Intervalve Transformer, Ratio 1.75-1 ... Price 12/6



TELSEN OUTPUT TRANSFORMERS

- Telsen Multi-Ratio Output Transformer, giving three Ratios of 9-1, 15-1, 22.5-1 ... Price 12/6
- Telsen Output Transformer, Ratio 1-1 ... Price 12/6
- Telsen Pentode Output Transformer ... Price 12/6

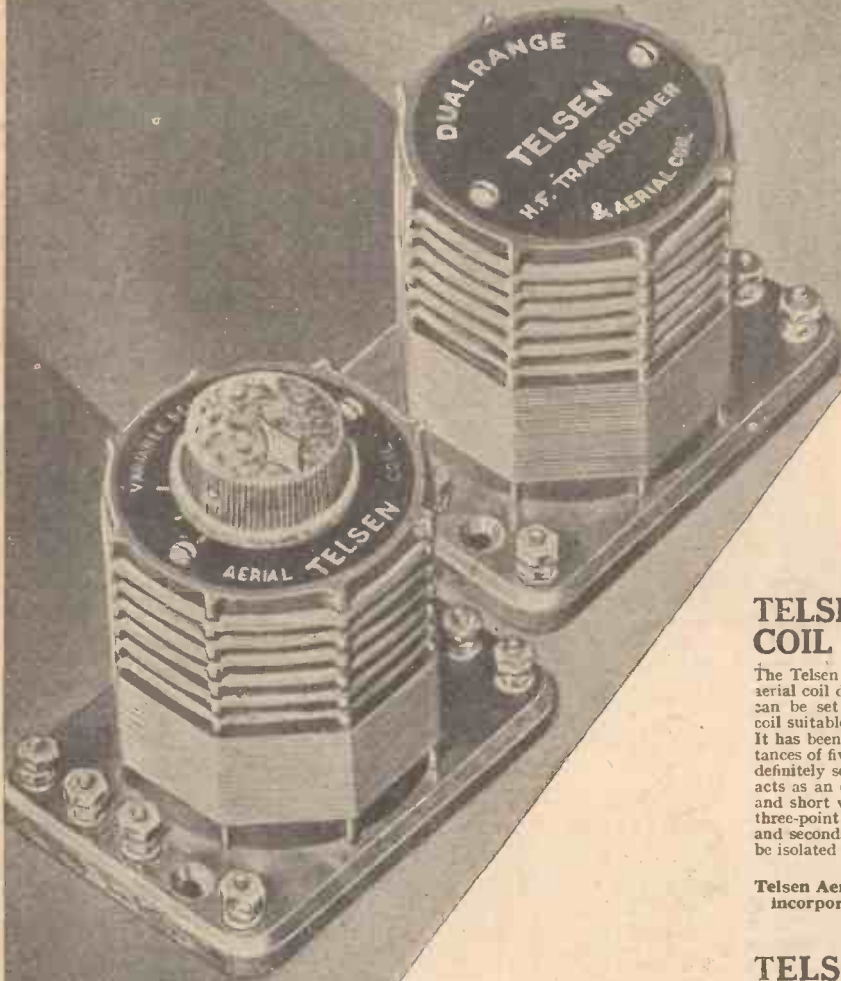
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One of Telsen's latest achievements



TELSEN DUAL-RANGE AERIAL COIL

The Telsen Aerial Coil is the very latest development in dual-range aerial coil design. It incorporates a variable series condenser which can be set to give any desired degree of selectivity, making the coil suitable for all districts whatever reception conditions may be. It has been tested in various parts of the country, and down to distances of five miles from Regional stations, a single tuned circuit will definitely separate the Regional programmes. This adjustment also acts as an excellent volume control and is equally effective on long and short waves. The waveband change is effected by means of a three-point switch. A reaction winding is provided and the primary and secondary windings are separated so that the aerial circuit can be isolated in mains driven or screen-grid receivers.

Telsen Aerial Coil with Variable series Condenser incorporated

76

TELSEN H.F. TRANSFORMER AND AERIAL COIL

This Coil is primarily designed for H.F. amplification in conjunction with screen-grid valves. It is arranged so that it can be connected as a tuned-grid or tuned-anode coil, or alternatively as an H.F. Transformer.

It also makes a highly efficient aerial coil where the adjustable selectivity feature is not required. A reaction winding is incorporated. When used as an H.F. Transformer the wave-change is effected by means of a two-pole (four-point) switch. When connected otherwise a three-point switch should be used.

Telsen H.F. Transformer and Aerial Coil

56

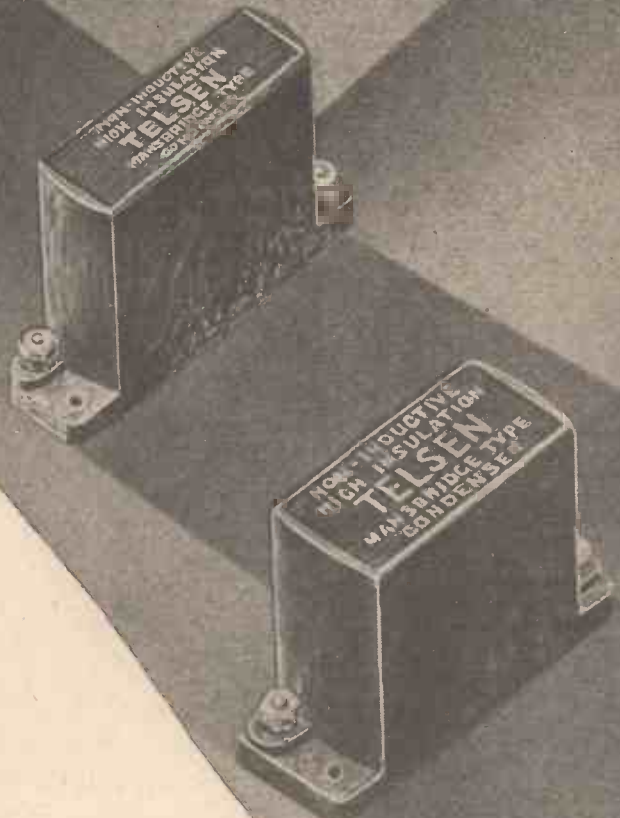
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Another Telsen achievement



TELSEN MANSBRIDGE Type CONDENSERS *From* **1/6**

Telsen have installed the most advanced plant in the world for the manufacture of Mansbridge Type Condensers. Only genuine Mansbridge foil paper and the finest linen tissue are employed in the exclusive method of manufacture. Every Telsen Mansbridge Type Condenser is hermetically sealed from the atmosphere and Post Office standards of insulation are adopted throughout.

The preliminary research, the most modern plant in the world, the finest raw materials, the latest methods of manufacture and the final test, all combine to give Telsen Mansbridge Type Condensers a high insulation through years of service with freedom from breakdown. The type of construction employed makes them genuinely non-inductive.

The following values are guaranteed within 5 per cent:—

Cap. mfd.	500 Volt Test		1,000 Volt Test	
	Price		Price	
.01	1/6	2/6		
.04	1/9	2/9		
.1	1/9	2/9		
.25	2/-	3/-		
.5	2/3	3/3		
1.0	2/3	3/6		
2.0	3/-	5/-		

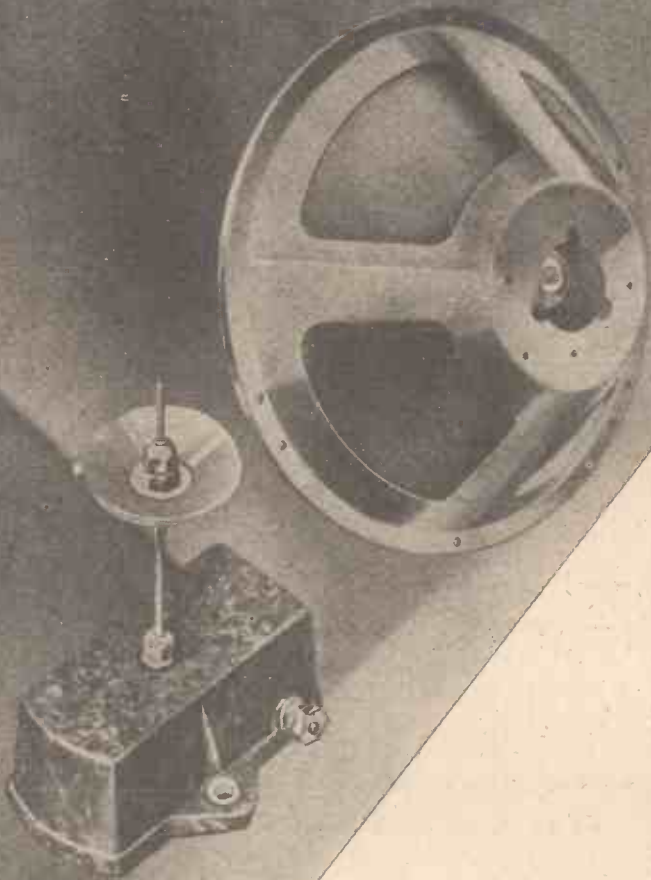
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Telsen for better reproduction



TELSEN LOUD-SPEAKER UNIT

The Telsen Loud-speaker Unit is pleasing to the most sensitive ear. The deep notes of the bass, the brilliance of the soprano, and the crispness of diction are clearly reproduced without any distortion.

It employs cobalt steel magnets, and the detachable rod which carries the cone is fitted with cone washers and clutch. The entire unit is enclosed in a beautifully moulded bakelite dust cover.

Telsen Loud-speaker Unit ... Price

56

TELSEN LOUD-SPEAKER CHASSIS

The fully floating cone mounted on a flexible felt surround renders the Telsen Loud-speaker Chassis very sensitive, giving perfect balance of tone. It is unaffected by damp conditions because the cone material is practically non-hygroscopic. The Telsen Loud-speaker Chassis is substantially made and it is light in weight. Holes are provided for easy attachment to most of the popular makes of loud-speaker units.

The Chassis may be readily fixed to a baffle board or cabinet by three or more wood screws.

Telsen Loud-speaker Chassis ... Price

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They build better on Telsen

TELSEN BINOCULAR H.F. CHOKE

An inductance of 180,000 microhenries . . . a self-capacity of .000002-microfarad . . . figures which prove that the Telsen Binocular H.F. Choke fulfils its purpose to the utmost and meets the demand of modern set designers and builders. Owing to the binocular formation the external field, and therefore unwanted reaction effects, are reduced to an absolute minimum. It covers the whole broadcast band and it is free from parasitic resonances. Resistance 750 ohms.

Telsen Binocular H.F. Choke **5/-**

TELSEN STANDARD H.F. CHOKE

The Telsen Standard H.F. Choke utilises the minimum baseboard space. It is designed to cover the whole broadcast band and has an extremely low self capacity. The inductance is 150,000 microhenries and the resistance 400 ohms.

It has proved very popular and has been incorporated by set designers in many of the leading circuits.

Telsen Standard H.F. Choke **2/-**



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Typical of Telsen value



6d
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TELSEN VALVE HOLDERS (Prov. Pat. No. 20280/30)
The Telsen four and five-pin valve-holders embody patent metal spring contacts, which are designed to provide the most efficient contact with split and non-split valve legs, and are extended in one piece to form soldering tags. Low capacity and self-locating.
Telsen 4-pin Valve Holder Price 6d.
Telsen 5-pin Valve Holder Price 8d.

TELSEN FIXED MICA CONDENSERS
(Prov. Pat. No. 20287/30)
Telsen Fixed Mica Condensers are made in capacities from .0001-microfarad to .002-microfarad. They can be mounted upright or flat and the .0003-microfarad Telsen fixed mica condenser is supplied complete with patent grid leak clips to facilitate series or parallel connections. All Telsen fixed mica condensers are tested at 500 volts.
Telsen Fixed Mica Condensers Price 6d.

TELSEN GRID-LEAK HOLDER
The Telsen grid-leak Holder will hold firmly any standard size or type of Grid-leak. Ample clearance is provided between the terminal screw leads and the baseboard (underneath), preventing any surface leakage upsetting the value of the grid-leak. The terminals and fixing holes are accessible without removing the grid-leak.
Telsen Grid-leak Holder Price 6d.

TELSEN SPAGHETTI FLEXIBLE RESISTANCES
These are made in a range of values from 300—200,000 ohms with a maximum current varying from 42 m/a. to 1½ m/a. The terminal tags are firmly fixed to the wire and clearly marked with their respective resistance values; they are impregnated with special insulating compound which renders them proof against corrosion.
Telsen Spaghetti Flexible Resistances from 6d

TELSEN FUSE HOLDER
This is a neat and inexpensive device which should be incorporated in every set as a precaution against burnt out valves. The Telsen Fuse Holder firmly grips the standard radio fuse giving a perfect contact.
Telsen Radio Fuse Holder Price 6d

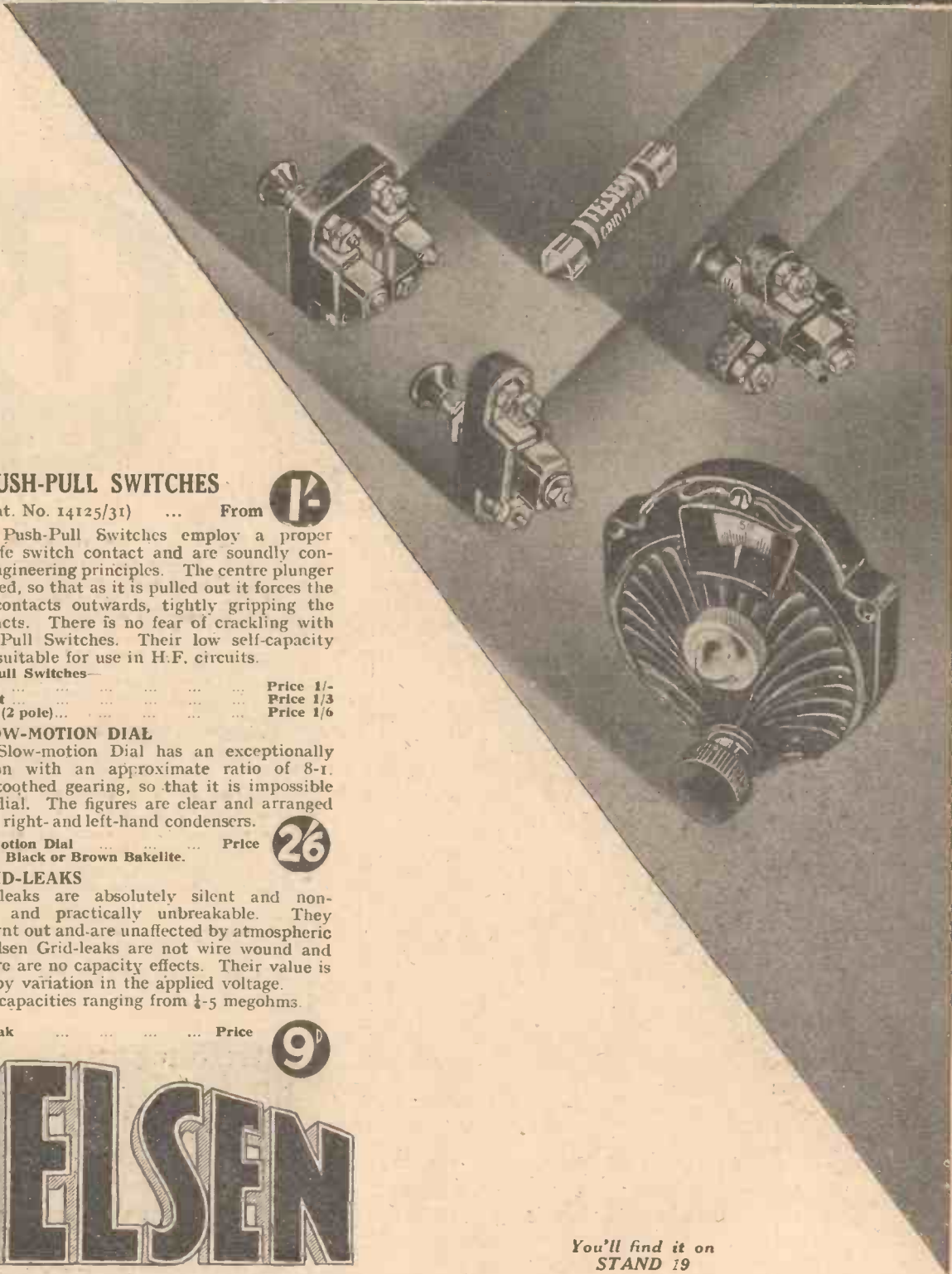
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RADIO COMPONENTS

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Switch over to Telsen



TELSEN PUSH-PULL SWITCHES

(Prov. Pat. No. 14125/31) ... From **1/-**

The Telsen Push-Pull Switches employ a proper electrical knife switch contact and are soundly constructed on engineering principles. The centre plunger is wedge-shaped, so that as it is pulled out it forces the inner fixed contacts outwards, tightly gripping the moving contacts. There is no fear of crackling with Telsen Push-Pull Switches. Their low self-capacity makes them suitable for use in H.F. circuits.

Telsen Push-Pull Switches—

Two-point	Price 1/-
Three-point	Price 1/3
Four-point (2 pole)	Price 1/6

TELSEN SLOW-MOTION DIAL

The Telsen Slow-motion Dial has an exceptionally smooth action with an approximate ratio of 8-1. There is no toothed gearing, so that it is impossible to strip the dial. The figures are clear and arranged to provide for right- and left-hand condensers.

Telsen Slow-motion Dial ... Price **2/6**
Supplied in Black or Brown Bakelite.

TELSEN GRID-LEAKS

Telsen Grid-leaks are absolutely silent and non-microphonic, and practically unbreakable. They cannot be burnt out and are unaffected by atmospheric changes. Telsen Grid-leaks are not wire wound and therefore there are no capacity effects. Their value is not affected by variation in the applied voltage.

Made in capacities ranging from 1/5 megohms.

Telsen Grid-leak ... Price **9/-**

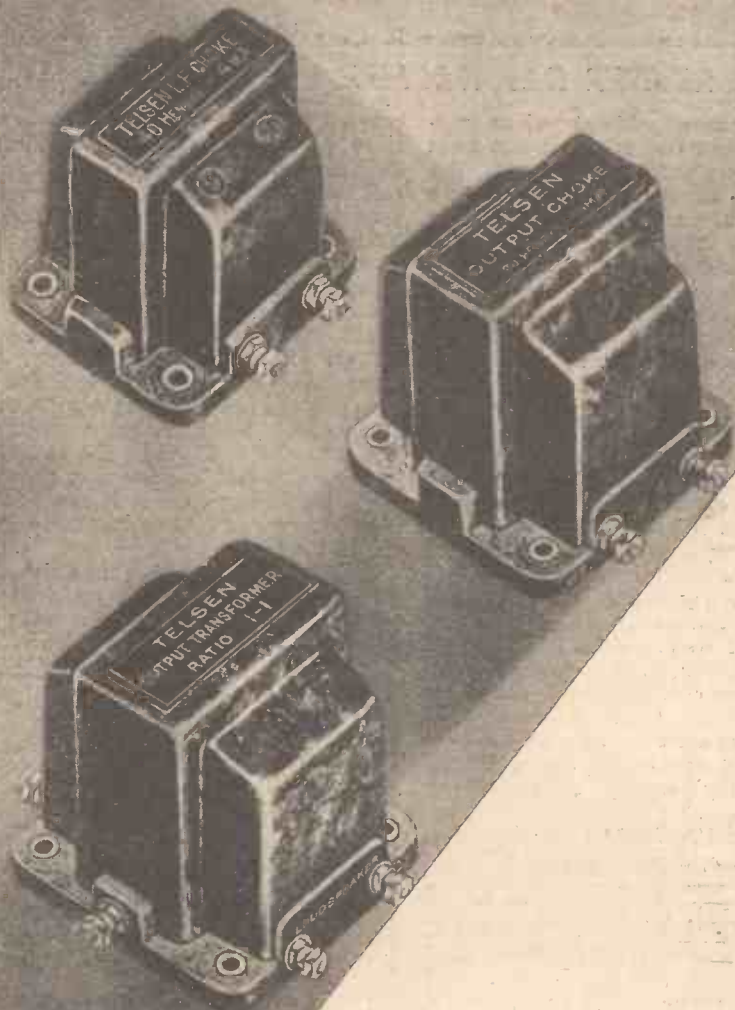
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Telsen for better reception



TELSEN L.F. INTERVALVE COUPLING CHOKE
 Specially designed for use as a coupling choke in the L.F. stages of a modern radio receiver. Made in a range of three inductances :—
 40, 100, and 125 henrys Price **5/-**

TELSEN HEAVY DUTY POWER GRID L.F. CHOKE
 Most modern Radio Circuits now employ some form of Power Grid Detection. The Telsen Power Grid L.F. Choke fulfills this need.
 Telsen Heavy Duty Power Grid L.F. Choke, 40 henrys Price **8/-**

TELSEN OUTPUT CHOKES (TAPPED AND PLAIN)
 Designed for use as Output Filter Chokes, and should be used with a Coupling Condenser of not less than 2 mfd. capacity. For last stage valves of 3,000 ohms or less the plain Choke should be used with all Loudspeakers having impedances of about 3,000 ohms.

Telsen Output Choke, 20 henrys Price **8/-**

Telsen Tapped Output Choke, 20 henrys... Price 8/6

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TELSEN

ALL-BRITISH
 RADIO COMPONENTS

WE TEST FOR YOU

A weekly review of
new components



and tests of
apparatus.

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

Readi-Rad Transformer

AN interesting component which we have just received for test is the Ready Radio Instamat output transformer. The purpose of this product, as the name implies, is the instant matching of one's loud-speaker to different output valves, or vice versa. The experimenter who is continually trying different speakers, or altering his output circuit in some parti-



The new Readi-Rad tapped transformer

cular, will often have experienced the need for an output transformer in which the ratio may be continually varied in fairly close steps over an average range.

A large range is not required because the general constants of the circuit are not likely to alter very much, so that a range from, say, 10-1 at one end to 25-1 at the other, as is provided on this new Ready Radio product, will be quite satisfactory.

Actually the transformer is built up on a heavy iron core 3 in. by 3½ in. by 1½ in. thick. The coils are assembled on this core and the whole is held in place with cast aluminium brackets. A small panel is mounted on the top having two switches, one on the primary and one on the secondary side, and by suitable combinations of these figures ratios of 10, 12½, 14, 16, 20 and 25 to 1 are obtainable.

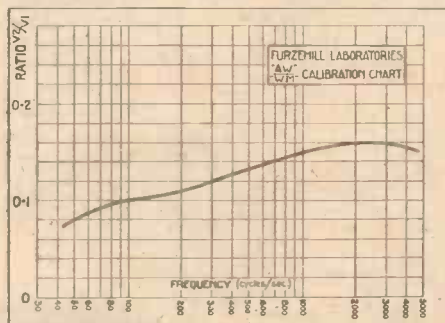
Low resistance, of course, is the important feature in an output transformer, and this has obviously been borne in mind by the designers. The primary resistance on the maximum tapping is only 35 ohms, while the secondary resistance is under 2 ohms.

The inductance of the primary depends upon the tapping which is used. (Both primary and secondary are tapped for obtaining the various ratios.) On the maximum tapping the adjustment with no D.C. flowing is 9 henries, this value falling to 2.4 henries at 100 milliamps. The transformer is therefore capable of handling a

large steady current without serious saturation, as indeed one might expect from the massive core which is employed. The actual value of the inductance, is, we think, a little low, and will tend to produce a bass cut-off. The response curve of the transformer which accompanies this report, however, shows that this cut-off is not of a serious character. Certainly, on an aural test the bass is quite well in evidence.

The response curve shown illustrates the ratio of voltage developed on the secondary to that applied across the primary when the transformer is actually in use in an output valve circuit feeding into a resistance corresponding to the load. A P240 valve was used, for which the optimum load resistance is 5,600 ohms. The 10-1 tapping was employed, and a resistance of 56 ohms was shunted across the secondary. The voltage across this resistance should be 0.1 times the voltage across the primary, and it will be seen that the actual voltage varies from a little below this value to about 60 per cent. greater in the upper frequencies. In practice, however, this variation is not of importance, particularly as the impedance of the loud-speaker begins to vary rapidly in the upper frequencies.

The instrument sells at a price of 37s. 6d., this particular model being specially



This curve shows the performance of the Readi-Rad output transformer

intended for moving-coil loud-speakers. It is, of course, not an instrument that everyone will require, but the serious experimenter will certainly be interested.

Rooke Bros. Coil

THE advantages of a band-pass tuning system over one employing a single coil are too well known to require naming here, and it suffices to say that a receiver using this type of tuner is capable of giving a high standard of selectivity and quality with very simple circuit arrangements.

The Rooke Brothers filter which we have tested this week belongs to the inductively

coupled type. It consists of two separate formers each 2 in. in diameter by 4 in. long. On the first of these is wound the short- and long-wave aerial windings, and on the second the grid and reaction windings. The short-wave windings are wound on the formers, while the long-wave windings are wound separately and inserted inside the main former.

The ends of the windings are taken to sockets mounted on the former. The wave-change switch is not included with the coils, the one three-point switch which is required being mounted separately. When mounting the coils the formers are placed end to end, and to ensure the correct operation of the filter it is essential that they be mounted in the correct way according to the instructions.

It is important to note here also, that if correct ganging is to be obtained it is essential to mount the coils with good clearance from any metal screen. A two-



A new coil made by Rooke Bros.

gang .0005-microfarad condenser is required for tuning, and the makers state that a trimmer is desirable across one winding.

On test the filter was found to be satisfactory, it being possible to separate the two London stations when only six miles from Brookmans Park with a simple detector-L.F. receiver. A trimmer was required across the grid coils, as suggested and a reaction condenser of .0003 microfarad was sufficient.

The filter being of the inductively-coupled type, is not constant in band width but gives sharper tuning at the upper end of the scale. Our measurements showed an average peak separation of about .15 kilocycles, which is a convenient figure, giving good selectivity without too sharp tuning.

The signal strength was a little low, being about 40 per cent. of that on a single coil at 360 metres. The North Regional programme could just be tuned

in in daytime. The wave range was 265 to 600 and 1,100 to 2,200 metres.

Telsen Choke

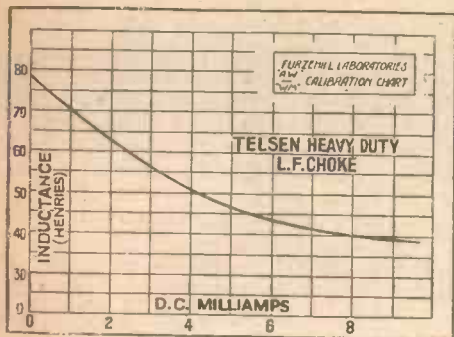
WE have tested this week a Telsen 40-henry choke rated to carry 6 milliamperes and designed for power grid detection. The choke is wound on the large Radiogrand core, and is finished in the customary brown mottled bakelite usually associated with Telsen products. There are two terminals at the bottom of



One of the wide range of Telsen components, the 7 to 1 ratio intervalve transformer. All Telsen transformers are housed in neatly moulded bakelite cases

the moulding, and one side terminal connected to core for earthing purposes, if this is required. The dimensions of the component are 2 3/4 in. by 3 in. by 2 3/4 in.

We tested the choke with 1 milliamperes A.C. flowing and varying polarising currents up to 7 1/2 milliamperes. We found that even at this latter figure the inductance of the choke was above the rated value, the variation in inductance being as shown



Characteristic curve of the Telsen heavy-duty choke tested

on the accompanying chart. A good feature is that the inductance does not fall away very rapidly at first so that it will not introduce serious distortion.

At the low price of eight shillings this choke can be considered a very satisfactory proposition.

The new 60-kilowatt Poste Parisien transmitter, which is being erected in the neighbourhood of Paris, is to be completed before the end of the current year. Large studios are being specially constructed in the Champs Elysées and the cables connecting them with the broadcasting station will be laid without delay.

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A.W. 12/9/31.



A Temporary Voltmeter

SIR,—Apropos the note in "On Your Wavelength" of your issue dated August 29, I already possess a Ferranti milliammeter reading 0.50 milliamperes and, not having a voltmeter, I decided to follow your advice. I purchased the necessary 10,000-ohm resistance, as recommended, and then tested the output voltage from my mains unit with the receiver under working conditions. As the reading only indicated 90 volts, I borrowed a Ferranti voltmeter having a resistance of 1,000 ohms per volt, and got a reading with this of 140 volts. How do you account for the milliammeter arrangement giving an incorrect indication of the voltage? R. F. (Nottingham).

The use of a milliammeter connected up in the way suggested is of very little value when testing the voltages from a mains H.T. unit or when testing the voltages in a receiver which is being worked from a mains unit. Even when testing the voltages where an ordinary H.T. battery is used, the readings will only be approximate. The theory, upon which the suggestion to use the milliammeter in this manner was based, is that of Ohm's Law, where voltage equals the current in amperes times the resis-

tance in ohms. If the meter reads up to 50 milliamperes at full-scale deflection and a resistance of 10,000 ohms be connected in series with the meter, then a full-scale deflection of the needle will now show the voltage of the supply to be $50/1,000 \times 10,000 = 500$ volts. We divide 50 by 1,000 to bring milliamperes to amperes. The inaccurate reading, however, is due to the fact that the resistance of the valve circuits, in parallel with which the "voltmeter" is connected, is not taken into consideration. A parallel path causes a division of the current from the source of supply and this gives rise to a voltage drop. A low-resistance voltmeter, therefore, always gives an erroneous indication of the true voltage available across the points across which it is connected. Even an extremely high-resistance voltmeter only gives an approximate indication of the true voltage available but the degree of error with such an instrument is too small to be of any real consequence from the amateur or amateur-experimenter's point of view.—Ed.

Accumulator Frothing

SIR,—I have a batch of three 2-volt accumulators all purchased some three years ago. The cells have always been used for working 6-volt valves, therefore each cell has been subjected to the same treatment as regards charge and discharge. Recently the middle cell began frothing long before the battery as a whole was half charged.

Thinking that this middle cell was more fully charged than the others, I tested the acid and even went to the trouble of renewing the acid in each cell. The frothing trouble still persists and now seems to be spreading to the other two cells. I know the acid to be of correct specific gravity and I also know the cells are not anywhere near fully charged when they begin to froth, so am at a loss

to account for this peculiar trouble. Can you suggest anything? H. G. (Surbiton).

Although you do not say so in your letter, we believe your accumulators to be of the celluloid-container type. The trouble you are experiencing is common with such accumulators after two or three years' service. It is due to action between the acid and the celluloid. Fresh life can be given to the batteries by a suitable application of certain chemicals, among which is one sold under the trade name of D.A.R.—Ed.

Free-Bias Resistances

SIR,—I am using a spaghetti resistance of 1,000 ohms for biasing a Mullard A.C. .044 mains valve and, although the resistance is rated to carry 30 milliamperes, I have had two such resistances burn out during a matter of a few days. Is this to be expected, and if so, how can I overcome the trouble? D. W. (Croydon).

The Mullard A.C. .044 mains valve consumes 30 to 32 milliamperes at full load and you are working your spaghetti resistance too near to its maximum load. You should use a power-type resistance to carry the current or you could try connecting four 4,000-ohm spaghetti resistances in parallel. As these can carry 15 milliamperes each, the four in parallel will be capable of carrying a total of 60 milliamperes or twice the normal anode current of your last valve. Paralleling spaghetti resistances should not be overdone, however, as, being inductively wound, they are liable to cause trouble in a receiver.—Ed.

Record Making and Tracking

SIR,—The paragraph in AMATEUR WIRELESS of July 25, page 120, relating to the Daptacon pick-up and carrier arm raises the question as to the method employed in the manufacture of gramophone records, whether the grooves thereon are cut by an instrument (1) travelling in a straight line from circumference to centre (similar to the Daptacon tracking) or (2) tracking identically to that followed by the tonearm and sound box fitted to all present-day gramophones.

Some time ago I had the opportunity of witnessing a public exhibition of a film depicting the various processes in the manufacture of a well-known make of record, and the method shown in the making of the records appeared to be as first mentioned.

I wrote to the company concerned for confirmation, but they refused to give any information on the point.

It is very obvious that unless a record is reproduced on the same tracking as it was manufactured, unnecessary scratch coupled with rapid wear is present and that records otherwise reproduced can in no sense be termed "non-scratch."

The "Daptacon" pick-up and arm is, therefore, most interesting and if it can be ascertained that records *are* made on the same tracking, then it certainly is an advance over the gramophones of to-day.

J. C. B. (Glasgow).



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THE British Association celebrates its centenary during September and, in addition to General Smuts' Presidential Address on September 23, already announced in these columns, listeners will hear Sir Oliver Lodge on September 15 and the Secretary of the Association, Mr. Howarth, on September 14.

The first act of Dame Ethel Smyth's opera, *The Wreckers*, is to be relayed from Covent Garden Opera House, on September 24 (Regional). This is the first English work to be performed in the season of opera in English, which opens on September 14. National listeners will hear the overture to this opera when it is broadcast from a Promenade Concert on September 19.

The thoughts of a man who is motoring from London to Land's End form the theme of a novel broadcast to be heard Nationally on September 18 and Regionally on September 19. Mr. Filson Young is responsible for this monologue.

The "March of the Crusaders," from the Drury Lane play, *Decameron Nights*, which

is to open the programme of Herman Finck's works on September 7, was dedicated to the late Arnold Bennett. Mr. Finck will conduct this programme.

A microphone debate of special interest called "As Others See Us," will be heard by National listeners on September 18, when a discussion about England, between

COMPLETE GUIDE TO THE EXHIBITION NEXT WEEK

a Dutchman, Dr. G. J. Renier, and a German, Dr. Karl Silex, is to be broadcast.

A "diagonalised vaudeville programme," called "A Party Affair," will be heard by National listeners on September 12.

Sir Philip Sassoon's broadcast on the eve of the contest for the Schneider Trophy will be relayed from the roof of the Pier Pavilion, Ryde. His talk will be followed by a brief description by the B.B.C. Outside Broadcast Director of the arrangements for broadcasting the race on September 12.

A group of four songs by Bantock, Birmingham's famous composer, is a feature of a studio concert for Midland Regional listeners on September 20.

Frances Bond, who appears in the concert to be given by the Midland Studio Orchestra on September 21, has recently returned from the U.S.A., where she broadcast regularly from the American stations.

The fourth relay from the Floral Pavilion, New Brighton, of an excerpt from the revue, *Pleasure on Parade*, will be broadcast to Northern listeners on September 15. It is performed by the Super-Optimists and produced by Frank A. Terry.

Among the many well-known bands in the North the Irwell Springs Band holds a high place. It will broadcast again to London and Northern Regional listeners on September 17.

"Ex-Colonel X" will make another of his brief appearances before the North Regional microphone on September 18, when he will relate some of his experiences. Like A. J. Alan, his identity is shrouded in mystery.

On September 19 Bill and Sarah Brown and their son, Herbert, and a friend, Mary Entwistle, will pay a visit to the Tower Circus in Blackpool. Northern listeners will be able to hear their comments on the various turns.

Piccolo duets will be heard in the Belfast Military Band concert on September 25. They will be played by Harry Dyson and Sidney H. Darvill.

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OUR LISTENING POST

By JAY COOTE

SOME little time ago Continental wireless papers published distressing news to the effect that the Italian broadcasting authorities had decided to replace their women announcers by mere men. Various reasons were put forward for the change, the two most fantastic being that the lady officials did not take their duties sufficiently seriously and that the mail bags contained too many letters penned by love-sick swains. The E.I.A.R. has now officially denied these rumours and state that, far from contemplating such a drastic measure, they have engaged other ladies for both Palermo and Trieste. In the meantime, however, perturbed by these disquieting rumours, not only Italian, but thousands of foreign listeners have poured in protests to the individual studios, and the mail bags have assumed even greater proportions.

Listen for the new Copenhagen interval signal, as with the opening of the local Radio Exhibition both this station and Kalundborg have adopted something more original and distinctive than usual. Once heard, never forgotten.

On a recent Sunday, casually turning to Milan, I picked up the sounds of the tolling of a big bell. It was that of Rovereto, a monster of many tons which is struck in memory of all soldiers, irrespective of nationality, who fell in the Great War. This ceremony takes place daily towards sunset, but once yearly the transmission is broadcast by all Italian stations.

To hear the tests from the new Prague "giant" you need no longer switch on the receiver in the early morning hours, for during

the past week the station has been experimenting at the end of the days programme. On two occasions I heard the broadcasts after midnight. The call, including wavelength (487.1 metres) and power, is given out at frequent intervals in Czech, French, German, and English. Believe me, it is some signal.

Last week I mentioned that I had had a whisper from Reykjavik, a station which had disappeared from my log since March; this week the whisper has developed into ordinary conversational tones and almost nightly I have been able to follow its broadcasts. Bear in mind that Iceland's standard time is two hours in advance of B.S.T. A new feature has been added to the programmes, for relays are now often made of foreign stations. Through this channel on one evening I picked up dance music from Berlin. The call has been curtailed to Utvarp Reykjavik (*Ray-hee-ya-vik*) and the studio still has a lady announcer.

Both Brussels No. 1 and No 2 should be starred in your log as very reliable transmissions. Moreover, during September they are liberally dipping into the concerts offered by the Ostend Kursaal and the new Casino at Knocke Le Zoute. On those nights when special artistes are engaged the broadcasts are S.B. from both transmitters. In some of the programmes you will find the names of English singers.

Have you noticed at what great power the Warsaw signals are now received? Some interference is caused by Eiffel Tower, but so soon as the French station has closed down the Pole simply roars in. I am told that the studio will give us more operatic performances than

of yore, as, in view of the depressed financial conditions in that country, the cities and towns are no longer able to subsidise the theatres, the majority of which have been compelled to close down. Unfortunately, a new Russian transmitter would appear to be working in its immediate vicinity. In the intervals you will find no difficulty in hearing speech in the background. It is not Moscow Komintern, but a newcomer to the ether.

By the way, Marseilles PTT lately suffered so much from a fire that for the time being the station is out of action. No doubt, it is an ill wind, etc., for this suspension has cleared Radio Vitus, Paris, and you will be able to add a further Frenchman to your chart.

DECOUPLING RESISTANCES

THE object of using decoupling-resistances is to reduce the effect of any "stray" fluctuating voltages that may get into the amplifier circuits. The point to be guarded is the high-tension supply, because this is common to all the plate circuits, and is therefore a possible path for back-coupling and the production of motor boating. The decoupling-resistance in effect dissipates any stray voltage to such a degree that only a very small fraction of it can reach the H.T. supply. The greater the internal resistance of the supply (whether H.T. eliminator or battery), the more liable it is to set up motor-boating, unless each valve is adequately decoupled.

B. A. R.

On September 26 Captain R. L. Henderson will give a talk on the "Past Season's Yachting in Belfast Lough."

TANNOY RADIO



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MIDGET SUPER-HET RECEIVER

Comprising a high-grade chassis which embodies pre-detector H.F. amplification multi band-pass tuning, with corrected L.F. amplifier.

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Price (complete) Mains Operated 28 gns.
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This Radio receiver and Gramophone combined has a high-grade chassis which embodies a pre-detector H.F. multi band-pass tuning super-het receiver and corrected L.F. amplifier.

Radio and Gramo switching are provided. Automatic brake on Gramo Motor which works on any make or size of record without independent setting. Housed in a beautifully-figured polished walnut cabinet of Tudor design. This instrument is not mass produced, but is individually built for a discerning buyer. All models incorporate specially matched moving-coil speakers.

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Similar in appearance to the Junior Model but incorporating a considerably larger Radio and Gramophone output.

Price - Mains Operated 55 gns.

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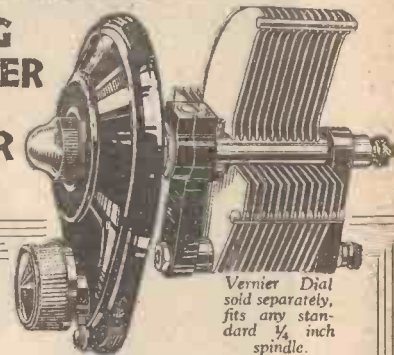
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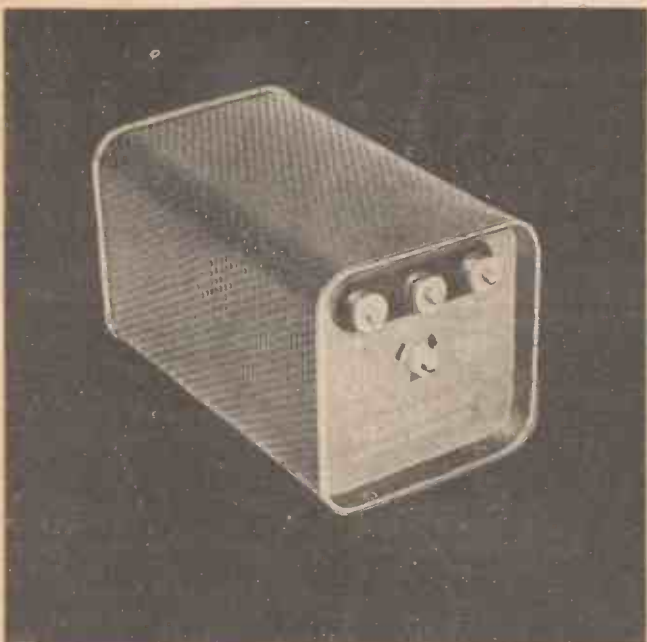
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See also page 369

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Speaker of
the year



Built into a beautifully designed cabinet with a unique fret design, the R.P.M.8b has ability to handle great volume without distress. This speaker possesses extraordinary tonal range and has remarkable sensitivity. A suitable step-down transformer is included and four terminals at the back allow different output valves to be matched. Price in Oak, £5 : 10 : 0

VISIT OUR STAND, No. 40, AT THE
NATIONAL RADIO EXHIBITION, OLYMPIA



Write for full descriptive literature to:

CELESTION LTD., LONDON ROAD, KINGSTON-ON-THAMES.
London Showrooms: 106 VICTORIA STREET, LONDON, S.W.1

Mention of "Amateur Wireless" to Advertisers will Ensure Prompt Attention

A NEW ACCUMULATOR INDICATOR

ALL Fuller accumulators for 1932, except the jelly-acid and the H.T. wet types, are to be fitted with a new form of charge indicator known as the Fuller



One of the range of Fuller cells fitted with the new indicator, and (inset) a "close-up" of the two balls which show the state of charge

photograph. Small coloured balls floating in the electrolyte provide a clearly-visible indication of the state of charge. When the accumulator is fully charged both the red and white balls float. Partial discharge is indicated by the white ball sinking, and the accumulator needs recharging when the red ball sinks. This novel idea will be appreciated by battery users, for it prevents the accumulator being used in a low-charged condition.

THE "MODEL ENGINEER" EXHIBITION

THE annual "Model Engineer" Exhibition, open until September 12, at the Royal Horticultural Hall, Westminster, reveals all the finest craftsmanship in model making in Britain. Models ranging in size from a motor the size of a postage stamp to a 14-ft. model of Southampton Docks have been made by men and women in all walks of life, from a bishop's secretary to a barge repairer, from a milk roundsman to a retired colonel.

The leading societies connected with model-making are all making special displays of their members' work.

Twenty model locomotives are running continuously on a 72-ft. track, carrying visitors.

PREVENTING OVERLOADING

Life Preserver. A cell fitted with one of these is shown by the accompanying

QUITE often one comes across a set which is "blasting" either because the initial input is too great or because one

stage is overloading. If one stage alone is affected then perhaps the battery voltages are wrong. It is quite likely, though, in a big set used fairly close to a local station, the detector may overload, although the high-frequency stages are working well within their capabilities, and this is a clear sign of the need for a high-frequency volume control.

WHAT IS MAN?

THIS is the title of a series of six talks that is bound to create a stir among feminine listeners! Broadcast on Wednesdays, from 7.30 to 8 p.m., through National stations, this series will be given by Professor Julian Huxley and Dr. John Baker. The B.B.C. considers this series one of the most important in its talks programme.

On November 7 Vienna will supply the third in the series of International concerts to be relayed to a number of European transmitters. The programme will be devoted to Lehar compositions executed by the Vienna Philharmonic Orchestra. The soloist for the evening will be Richard Tauber.

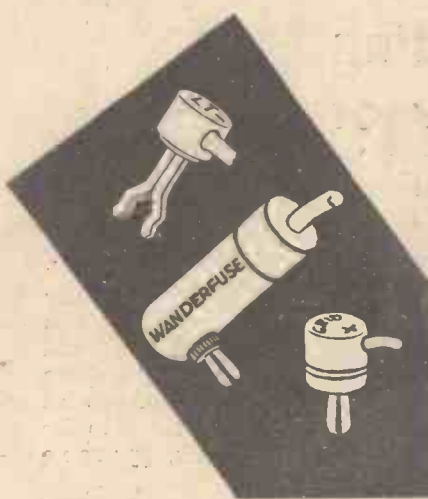
When 139 transmitters recently relayed a broadcast from the Salzburg (Austria) festival it was thought that a record had been established in radio history. This figure was easily beaten with the relay from Bayreuth of the opera *Tristan and Isolde* (Wagner). On that occasion the performance was taken and re-broadcast by 190 stations!

THE BEST SETS ARE WELL CONNECTED

Set manufacturers, Government Departments, technical experts, the leading wireless journals, ALL use and specify Belling-Lee Radio Connections. Make them your choice.

BELLING-LEE BATTERY CORDS

as illustrated, complete with engraved Wander Plugs and spring grip Spade Terminals, and 54" cords in 5, 6, 7, 8, 9 and 10 way, from 4/- to 6/6, and 30" cords from 2/6 to 5/- . With fuse 1/- extra.



THE WHOLE FLEX GRIPPED—

copper, rubber and fray. A feature of all Belling-Lee Plugs. No loose straggling ends to cause short circuits. And for absolute safety you should put a Wanderfuse in the H.T. lead instead of the ordinary Wander Plug. It is a Wander Plug and Fuse combined, and takes no extra head-room.



BELLING-LEE
FOR EVERY RADIO CONNECTION

For the OTHER END of the CORD!

The Belling-Lee Battery Cord is the neatest method of connecting set to battery, for all leads are enclosed inside one outer silk covering. To make a sound job at the set end also, fit your receiver with either Belling-Lee Terminals or Plugs and Sockets. Then you can't go wrong.

- Belling-Lee Wander-fuse, with 60 m/a fuse 1/6
- Engraved Wander Plug 2d.
- Spade Terminal 2d.

- Belling-Lee Terminals Type "R" 3d.
- Type "M" 4jd.
- " " Plug and Socket 6d.
- " " S.G. Safety Anode Connect. 6d.

Advertisement of Belling & Lee Ltd., Queensway Works, Ponders End, Middlesex.

FULLOTONE for GREATEST VALUE

RADIO-GRAM 203

16.16.0

Carriage Paid U.K.
Or 30/- secures and 14 monthly payments of ... 24/3



Specification: Four-valve R.G. Circuit (B.V.A. Valves), Super-power Battery, large Accumulator, Diapason Pick-up, Cone Speaker, powerful Motor, and Record Compartment, etc. Royalties paid.

Ten years ago Fullotone took the gramophone trade by storm with a range of beautiful models at less than half the prices then prevailing. To-day they are achieving an equally big success in the radio world with many wonderful high-class instruments at amazingly low prices. The models illustrated exemplify Fullotone value, which cannot be equalled anywhere.

FULLOTONES ARE SOLD ONLY AT FULLOTONE SHOPS

TWO-VALVE SET No. 200. This wonderful Two-valve Radio Set will be welcomed by enthusiasts and novices alike because it is so compact. Sent complete with Accumulator, Batteries, 2 B.V.A. Valves, and Fullotone Cone Speaker in handsome Oak-finished Cabinet, 19 in. high. Efficient with outdoor or indoor aerial. Selective & powerful.

6.17.6

Or 12 monthly payments of 12/6



If you cannot get to the Exhibition, call at your nearest Fullotone Branch, or write or phone for a free beautifully illustrated Brochure of Radiograms, Radio Sets, Loud-speakers, Eliminators, and Trickle Chargers, all obtainable on deferred terms.

ART COLOUR BOOKLET SENT FREE ON REQUEST

RADIO-GRAM 202

11.11.0

Carriage Paid U.K.
Or 25/- secures and 14 monthly payments of ... 16/4



Specification: Two-valve Circuit (B.V.A. Valves), Super-power Battery, large Accumulator, Diapason Pick-up, Cone Speaker, powerful Motor, etc. Royalties paid.

FULLOTONE ELIMINATORS AND TRICKLE CHARGERS

Run Your Radio off the Mains—it's cheaper, more reliable, and improves any set! Fullotone are now able to offer a complete range of Mains Units at extremely reasonable prices, from a D.C. Eliminator at 30/6 or A.C. Eliminator at 46/6

FULLOTONE GRAMOPHONES (1929) LTD.

(Dept. A.W.1.), 73, Camden Road, LONDON, N.W.1 Phone—Guliver 1017.

Also Branches at CROYDON—41 George Street; LIVERPOOL—13 Paradise Street; EAST HAM—149 High Street; MANCHESTER—85 Oxford Road; TOTTENHAM—561 High Road; BOLTON—47 Bradshawgate; HULL—Monument Bridge; GLASGOW—312 Argyle Street.

EMPIRE STAND 201

If you study Price— yet insist on Performance

*your choice
must be*

There is no questioning the superlative merits of the R. & A. "100." Ask your dealer to demonstrate, and compare it with any other permanent-magnet moving-coil speaker. The result will amaze you and convince you that it is impossible to buy a speaker of its type at any price, to equal its performance.

Every detail of design and construction combines to produce the ideal reproducer; a musical instrument in the highest sense of the word, which is so sensitive that perfect results are achieved with inputs from small as well as large receivers.

The more critical you are, the more you will appreciate its beauty of tone, its brilliant response, its remarkable sensitivity and fidelity.

The R. & A. "100" is the reproducer for the connoisseur, notwithstanding its very low price.

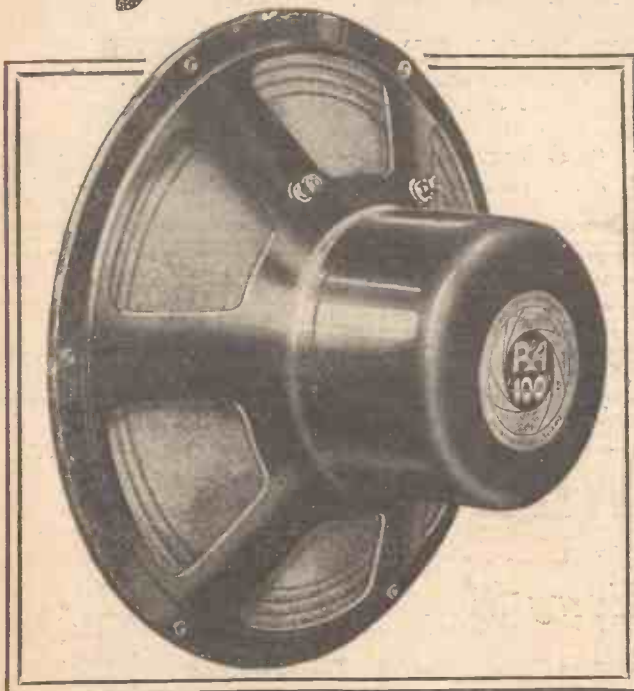


45/-

At the forthcoming Radio Exhibition, Olympia, R. & A. Reproducers will be exhibited on the stands of the leading Distributors.

Descriptive Leaflet sent Free on request

REPRODUCERS & AMPLIFIERS LTD., FREDERICK ST., WOLVERHAMPTON



Advertisers Appreciate Mention of "A.W." with Your Order

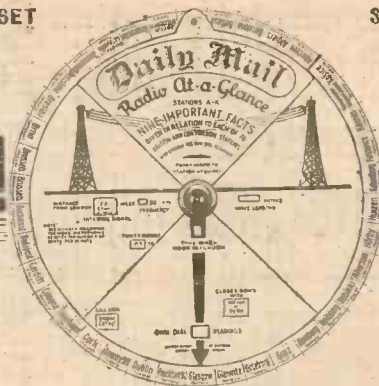


CAPT. P. P. ECKERSLEY late of the B. B. C.

is contributing a weekly review of the latest developments in every phase of wireless exclusively to *The Daily Mail* every Wednesday. World-famous as one of the pioneers of broadcasting, both in connection with the Marconi Company and the B. B. C., his expert knowledge and unique experience are at your service.

*See
The Daily Mail
every Wednesday!*

NO WIRELESS SET
IS COMPLETE
WITHOUT IT!



SIMPLE ENOUGH
FOR A CHILD
TO USE!



— EACH

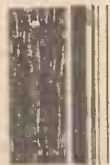
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9 1/2 INCHES.
2-SIDED.
IN COLOURS.

DAILY MAIL

“Radio At-a-Glance”

With the aid of this attractive and ingenious chart stations are easy to identify, and when your own dial readings have been recorded in the blank opening provided, anybody can immediately tune in to any station required.

ASSISTS LISTENERS—



Gives 76 British and Continent Stations with closing down announcement. Frequency, Wavelengths, Power, Interval Signal, etc. On Sale at all Wireless Dealers, Stationers, Bookstalls, etc. If any difficulty, write direct to Frank Pitchford & Co., Ltd., Well St., London, E.C.1.

A FASCINATING PASTIME FOR THE WINTER EVENINGS

Amateur Wireless HANDBOOKS

each 2/6 net.

Wireless-Controlled
Mechanism for
Amateurs

The Practical Wire-
less Data Book

THE BOOK OF THE NEUTRODYNE

by J. H. Reyner, B.Sc. (Hons.), A.M.I.E.E.
Price 1/6 net, or post free for 1/9



Of all Newsagents and Booksellers, or by post 3d. extra, from Cassell & Co., La Belle Sauvage, E.C.4.



You MUST have the
“Wireless Magazine”

Every Month Price 1/-

Postcard Radio Literature

For Station Loggers

I HAVE just had literature describing the automatic station log produced by Frank Pitchford & Co., Ltd. This gives details of all the leading European stations and shows instantly wavelengths, powers, call signs and many other useful factors.

349

A Handy Indoor Aerial

Here's a fine idea: the new screen aerial produced by the New London Electron people. It is a most useful indoor aerial, better than the usual improvised indoor wire, costing only a few shillings, and designed to be slung in any convenient corner. It is ideal for flat dwellers and I advise all owners of sets capable of working on an indoor aerial to write through my free catalogue service for a folder describing this useful accessory.

350

Good Cabinets

No matter whether you have a small table type set or a big radio-gramophone outfit you will find a suitable cabinet for it in the Camco range. If you think I am exaggerating then write for a free copy of the new Camco booklet which gives illustrations and full measurements.

351

New Telsen Prices

In view of the drastic price reductions which have been made in Telsen parts I think every set builder should have a copy of the booklet which describes the whole range. This can be had free.

352

Stop Crackling!

A set user who is troubled with crackling noises caused by faulty switch contact should get a folder describing the several models of Busco push-pull switch. There are 2-point, 3-point, double-throw radio-gramophone and fuse switches available.

353

Oldham Batteries

If you have not tried the Oldham "lively O" high-tension battery, then get a free copy of the folder just issued and choose from the standard or triple range the battery most suited to your set.

354

New Clix Parts

Clix connectors and terminals maintain their popularity because of the excellent contact they afford. I was interested to have a little folder giving details of the new anode connectors, terminals, wander plugs and sockets.

355

GET THESE CATALOGUES FREE.

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

Faraday House tests prove the merit

DURING tests carried out by the famous Faraday House Testing Laboratory, a 3,000-ohm Bulgín Spaghetti was subjected to a current of 40 m/A. for ONE HOUR. Would any of the imitations of Bulgín Spaghetts stand this severe test? The secret of Bulgín constancy lies in a combination of features possessed by no other wire-wound resistance, including the unique Electrical Spot Welding of element.

Send 2d. postage for the new and enlarged 75-pp. edition of the famous Bulgín Catalogue and Manual which also details the new Bulgín Technical Service.

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ELECTRICALLY SPOT-WELDED

NOTE REVISED PRICES		
Ohm.	M/A.	Price
200	50	6d.
300	50	6d.
400	45.	6d.
500	40	6d.
600	35	9d.
1,000	32	9d.
1,500	28	9d.
2,000	26	1/-
3,000	21	1/-
4,000	20	1/-
5,000	14	1/-
7,500	12	1/-
10,000	10	1/-
15,000	8	1/-
20,000	8	1/3
25,000	8	1/3
30,000	8	1/3
40,000	8	1/6
50,000	5	1/6
60,000	4	1/6
80,000	4	1/9
100,000	4	1/9
	4	2/3
	4	2/6

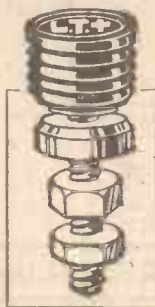
MORE

CLIX

STAND
202,
Radio Exhibition
OLYMPIA.

aids to set builders

PANEL TERMINAL



Strongly made with two lock-nuts and soldering hole for contact. Insulated knob with easily read markings. For use with Clix Hook, Ring or Spade Terminals and all standard fittings. Adds to the efficiency and appearance of any set.

3d.

"VICEGRIP"

A Wander Plug of entirely new design with a powerful spring-prong contact and metal to metal wiring connection. Fits any battery socket.

1 1/2d.



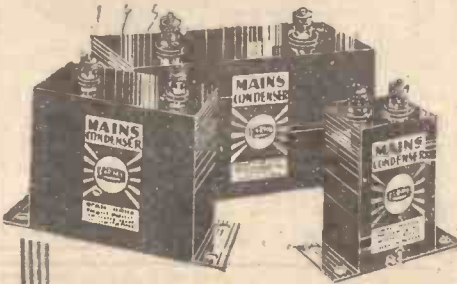
Obtainable from most dealers.
If any difficulty, order direct.

Cheapest PERFECT Contact

Lectro Linx Ltd., 254 Vauxhall Bridge Rd., S.W. 1



MAINS CONDENSERS



NEW VACUUM PROCESS achieves highest insulation resistance

These new Formo Condensers represent the greatest advance yet made in Mains Condenser construction. They are tested by the sudden application of the test voltage and not, as is usual, through a non-inductive series resistance. In this way the Condensers receive a surge test in addition to the steady application of the test voltage. Higher test and working voltage result, plus an insulation resistance of high value. Use always Formo Condensers and be certain of the greatest possible efficiency. Obtainable from all radio dealers.

2.0 Mfd. 3/3 1.0 Mfd. 6.0 Mfd. 8/-
4.0 Mfd. 5/6 2/6 8.0 Mfd. 10/6

Complete Catalogue from:

ARTHUR PREEN & Co. Limited

GOLDEN SQUARE, PICCADILLY CIRCUS, LONDON, W.1. CROWN WORKS, SOUTHAMPTON

See also page 364

VISIT STAND 61, RADIO SHOW



2 New Models

Responding to the insistent demands of Set-makers, Heayberd have designed two more Mains Transformers for use in the latest Receivers. Powerful and accurate voltage delivery assured. Post the coupon for full details.

MODEL W.30
Rectified Outputs.
200 v. at 60 m.a. using tapping 175 v. with Rect. H.T.8.
250 v. at 60 m.a. using tapping 200 v. with Rect. H.T.8.
Price - - - 20/-
L.T. 4 v. 6amps. for A.C. Valves 5/- extra.

MODEL W.32
Rectified Outputs.
175 v. at 25 m.a. using tapping 110 v. with Rect. H.T.6.
200 v. at 28 m.a. using tapping 135 v. with Rect. H.T.7.
L.T. 4 v. 7 amps. for A.C. Valves.
Price - - - 25/-

I enclose 3d. stamps for full lists of Heayberd Transformers and circuit diagrams.

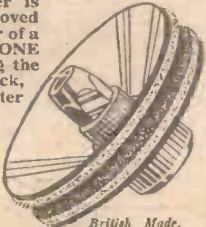
Name.....
Address.....



10 Finsbury Street, LONDON, E.C.2

THE IMPROVED TONAX CONE ADAPTOR

Greater value than ever is given in this vastly improved "Tonax." Every builder of a SINGLE or DOUBLE CONE SPEAKER can, by using the Patented "Tonax" Chuck, avoid all distortion, chatter and rattle caused by badly fitting cones.



Of perfect precision construction. Practical efficient design. Easily fitted to any unit. Two extra chucks, both deep and standard metal washers, etc. and linen washers, and all instructions contained in every box.

Single Cone Type 1/-
Double Cone Type 1/6

From all dealers. If any difficulty send P.O. direct to Dept. A.

GARRATT STORES, 193 Garratt Lane, Wandsworth, London, S.W.18

STAND 215 OLYMPIA

They're all going to see -

WUFA
(OPPOSITE OLYMPIA)
SEPT. 18-26

TAYLEX WET H.T. BATTERIES
New Prices: Jars 1/3. Sacs 1/2. Zincs 1 Od. Sample doz. 18 Volts complete with bands and electrolyte 4/1 post 9d. Sample unit 6d. Illus. booklet free. Bargain list free.
AMPLIFIERS, 30/- 3 VALVE ALL-STATION SET 5/-
A. TAYLOR, 57, Studley Road, Stockwell, LONDON.

Let "A.W." Solve your Problems

BROADCAST TELEPHONY

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

Kilo-Metres	Station and Call Sign	Power (Kw.)	Kilo-Metres	Station and Call Sign	Power (Kw.)	Kilo-Metres	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			FRANCE			NORTH AFRICA		
25.53	11.751 Chelmsford (G5SW)	10.0	315.8	951 *Marseilles (PTT)	1.5	363.1	825.3 Algiers (PTT)	13.0
542	1.238 Belfast	1.2	328.2	914 Grenoble (PTT)	3.0	413	721 Kaou Marou (Rabat)	10.0
261.3	1.148 London Nat.	68.0	345.2	869 Poste Parisien	1.2	NORWAY		
288.5	1.040 Newcastle	1.2	370.4	810 Radio LL (Paris)	0.5	235.5	1.274 Kristianssand	0.63
288.5	1.040 Swansea	0.10	447.1	671 Radio Toulouse	8.0	240.6	1.247 Stavanger	0.02
288.5	1.040 Plymouth	0.10	460	644 Paris (PTT)	2.0	364.1	824 Bergen	1.35
288.5	1.040 Edinburgh	0.4	1,445.2	207.5 Eiffel Tower	15.0	307.6	816 Frederiksstad	0.8
288.5	1.040 Dundee	0.16	1,724.1	174 Radio Paris	17.0	453.2	662 Porsgrund	0.9
288.5	1.040 Bournemouth	1.2	1,724.1	174 (testing)	85.0	493.4	603 Trondheim	1.35
301.5	925 North National	70.0	* temporarily closed			500	536 Hamar	0.83
309.9	938 Cardiff	1.2	GERMANY			1,033	277 Oslo	75.0
350.3	842 London Reg.	70.0	31.38	9,560 Zeesen	15.0	POLAND		
376.4	797 Glasgow	1.2	217.1	1,382 Königsberg	1.7	214.2	1,400 Warsaw (2)	1.9
398.9	752 Midland Reg.	38.0	218.5	1,373 Flensburg	0.6	234	1,283 Lodz	2.2
479.2	626 North Regional	70.0	227.4	1,319 Cologne	1.7	244.1	1,229 Wilno	21.0
1,554.4	193 Daventry (Nat.)	35.0	227.4	1,319 Münster	0.6	312.8	959 Cracow	1.5
AUSTRIA			227.4	1,319 Aachen	0.3	335	896 Ioznau	1.9
219	1,369 Salzburg	0.6	232.2	1,292 Kiel	0.31	381	783 Lvov	21.0
246	1,220 Linz	0.6	240	1,255 Nürnberg	2.3	408	734 Katowice	16.0
283	1,058 Innsbruck	0.6	245.9	1,220 Cassel	0.3	1,411.3	212.5 Warsaw	—Raszyn 153.3
332	851 Graz	9.5	253.4	1,184 Gleiwitz	5.6	PORTUGAL		
453.2	666 Klagenfurt	0.6	259.3	1,157 Leipzig	2.3	290.5	1,033 Lisbon (CTIAA)	2.0
517.3	531 Vienna	20.0	269.8	1,112 Bremen	0.2	also on 42.0 m.		
also testing on 1,255 m. from 8.0 p.m. (Mon. Wed. Sat.)			276.5	1,085 Heilsberg	75.0	ROMANIA		
			283.6	1,053 Magdeburg	0.6	320.5	768.5 Bucharest	16.0
			283.6	1,053 Berlin (E)	0.6	RUSSIA		
			283.6	1,053 Stettin	0.6	427	702.5 Kharkov	25.0
			318.8	941 Dresden	0.3	497	603.5 Moseow	1.2
			325	923 Breslau	1.7	511	585 Archangel	1.2
			360.1	831 Mühlacker	75.0	720	416.6 Moscow (PTT)	20.0
			372.3	805 Hamburg	1.7	803	375 Kiev	20.0
			390	770 Frankfurt	1.7	840	357 Nijni Novgorod	1.8
			419	716 Berlin	1.7	937.3	320 Kharkov (RV20)	25.0
			453.2	662 Danzig	0.6	1,030	301 Leningrad	100.0
			472.4	635 Langenberg	17.0	1,063	283 Tiflis	10.0
			532.9	563 Munich	1.7	1,073	279.0 Kostov Don	4.0
			559.7	535 Kaiserslautern	1.7	1,103	272 Moscow Popoff	40.0
			559.7	535 Augsburg	0.3	1,301	230 Moscow (Trades Unions)	165.0
			566	530 Hanover	0.3	1,431	202.5 Moscow (Koua)	40.0
			569.3	527 Freiburg	0.3	SPAIN		
			1,020	185 Norddeich	10.0	252.3	1,189 Barcelona (EA J15)	1.0
			1,034.9	183.5 Zeesen	75.0	266.6	1,125 Barcelona (EA J13)	1.0
			2,525	119.3 Königswusterhausen	15.0	349	860 Barcelona (EA J1)	8.0
			(press)			366.9	817.7 Seville (EA J5)	1.5
			2,000	103.5 Königswusterhausen	15.0	424	707 Madrid (EA J7)	2.0
			(press)			453.2	662 San Sebastian (EA J3)	0.6
			HOLLAND			505.9	593 Valencia (tests)	8.0
			31.28	9,599 Eindhoven (PCJ)	30.0	SWEDEN		
			298.8	1,004 Huizen	8.5	230.3	1,304 Malmö	0.75
			298.8	1,004 Radio Idzerda (The Hague)	3.0	257.3	1,165 Hôrby	15.0
			1,071.4	280 Scheveningen Haven	10.0	306.9	977.7 Falu	0.05
			1,875	160 Hilversum	8.5	322	932 Göteborg	15.0
			550	543 Budapest	23.0	435	603 Stockholm	75.0
			1,200	250 Reykjavik	18.0	512	554 Sundsvall	15.0
			IRISH FREE STATE			770	389 Ostersund	0.7
			224.4	1,337 Cork (8CK)	1.5	1,229.5	244 Boden	0.75
			413	725 Dublin (2RN)	1.5	1,352	221.9 Motala	40.0
			ITALY			SWITZERLAND		
			25.1	Rome (3RO)	9.0	244.1	1,229 Basle	0.61
			247.7	1,211 Trieste	15.0	246	1,220 Berne	0.5
			296.4	1,012 Turin (Torino)	8.5	403.5	733 Stiens	32.0
			312.8	959 Genoa (Genova)	10.0	459	653 Beromünster	75.0
			332	905 Naples (Napoli)	1.7	704	395 Geneva	1.5
			441	680 Rome (Roma)	75.0	TURKEY		
			453.2	662 Bolzano (IBZ)	0.2	1,204.8	249 Istanbul	5.0
			501	599 Milan (Milano)	8.5	1,535	195 Ankara	7.0
			542.5	553 Palermo	3.7	YUGOSLAVIA		
			LATVIA			308.3	973 Zagreb (Agram)	0.7
			525	572 Riga	13.0	431.7	695 Belgrade	3.0
			LITHUANIA			574.7	521 Ljubljana	2.8
			1,035	155 Kaunas	7.0			

WHEN SUBMITTING QUERIES

Please write concisely, giving essential particulars. A Fee of One Shilling (postal order), a stamped addressed envelope, and the coupon on the last page must accompany all letters. The following points should be noted.
Not more than two questions should be sent with any one letter.
The designing of apparatus or receivers cannot be undertaken.
Modifications of a straightforward nature can be made to blueprints, but we reserve to ourselves the right to determine the extent of any alteration to come within the scope of a query. Modifications

to proprietary receivers and designs published by contemporary journals cannot be undertaken.
Readers' sets and components cannot be tested at this office. Readers desiring specific information upon any problem should not ask for it to be published in a forthcoming issue, as only queries of general interest are published and these only at our discretion. 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 and conform with the rules.

Listeners who remember *Neighbours' Childer*, by J. H. McIlveen, which was broadcast from Belfast some time ago, will look forward to a new comedy about the McIntosh family. Mr. McIlveen's next play is called *The Wheat and the Chaff*, and it will be heard on September 28.

Radio Espana (EAJ2), Madrid, has resumed its daily transmissions and now shares the wavelength of 424 metres with Madrid (EAJ7). Broadcasts are to be heard daily between 5 and 7 p.m. with an additional concert on Mondays between 10 p.m. and 12.30 a.m.

BRISTOL RADIO WEEK

BRISTOL'S fifth Annual Radio Week, which will be held from September 19 to 27 inclusive, has been specially arranged this year to coincide with the first Bristol and West of England Radio Exhibition, to be held in the Colston Hall from September 21 to 30. In the centre of the Exhibition a large broadcasting studio is being erected with glass panels so that the broadcasters may be seen.

Special programmes have been arranged. On September 19 Mr. H. G. Tanner, Sheriff of Bristol, will give an introductory talk for West Regional listeners, and on September 20 an orchestral concert representative of Bristol and West Country composers will be given. The Lord Mayor of Bristol will broadcast an appeal for the Lord Mayor's Wireless for Hospitals Fund on September 20. This Fund was started some years ago and all Bristol hospitals have now been equipped. There still remains, however, the problem of funds for maintaining the installations.

On September 21 the first relay from the studio in the Exhibition at the Colston Hall will be given, when the Victor Olof Sextet will play. The most important dramatic feature of the week will be *Ghosts of the Footlights*, or *Re-visiting Bristol's Old Theatre*, by Froom Tyler, to be given on September 22. Bristol had many famous theatres in the past and the "ghosts" will come over the centuries from 1660 onwards. On September 23 a concert arranged by the Bristol Children's Concert Society will be relayed from the Central Hall. A recital will be heard in a concert to be

relayed from the Exhibition studio. A concert to be relayed from the Exhibition on September 24, will be given by the City of Bristol Police Band.

Vaudeville will be relayed from the Exhibition studio on September 25. Gillie Potter, Elsie Griffin, Kingsley Lark, Mona Grey, and William Parsons will take part in the programme.

Len Corbett, the ex-England Captain, will broadcast a running commentary on the Bristol v. Coventry match on September 26. This match takes place at the Bristol Memorial Rugby Ground.

MUSIC AT THE EXHIBITION

IN connection with music at the Show this year, we hear that H.M.V. are arranging a series of programmes of their latest releases of records, which will provide the music distributed by the B.B.C. to the speakers on the various stands when suitable broadcast music is not available. The programmes of records will be based on those that H.M.V. have compiled specially for use in the "His Master's Voice" Modern Hall of Music opposite Olympia. These records have been chosen specially in order that the capabilities of the various types of speaker may be demonstrated.

SUNDAY COMMENTARY?

IF the weather conditions do not permit, the Schneider Trophy race to be flown on Saturday, the B.B.C. may create a precedent by relaying it on Sunday, assuming that that day is chosen by the authorities. O.B. engineers are very excited about this relay.



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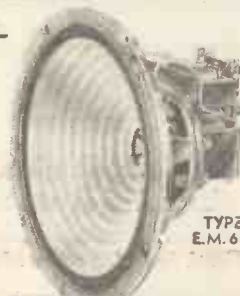
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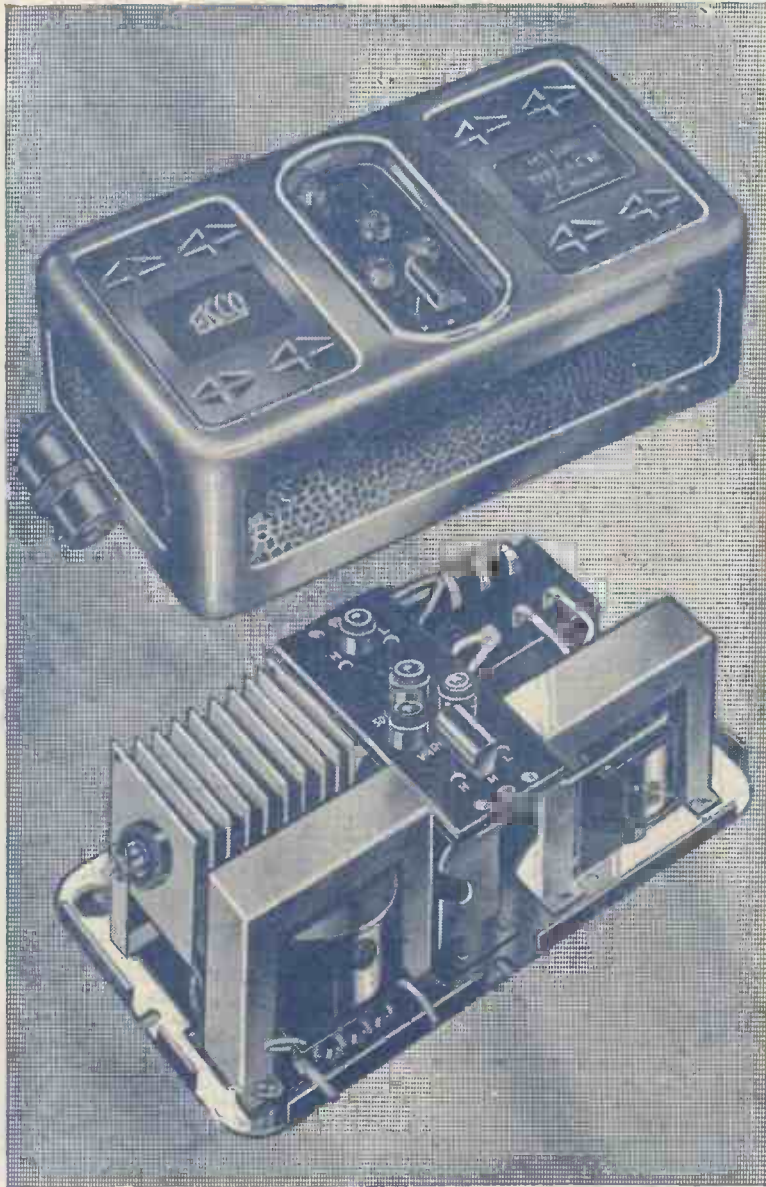


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