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# Practical Wireless

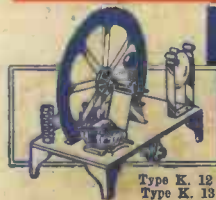
3<sup>d</sup>

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AND TELEVISION REVIEW

*Edited by F.J.CAMM*

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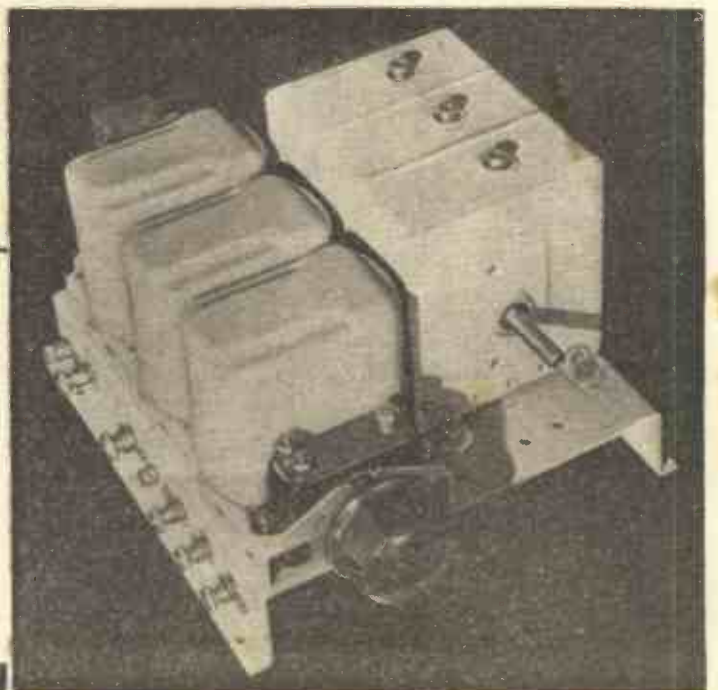
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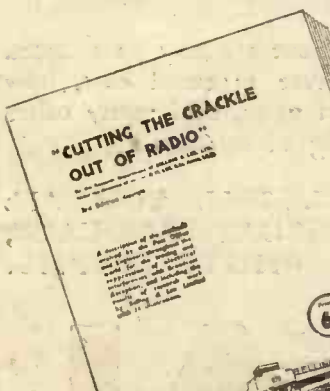
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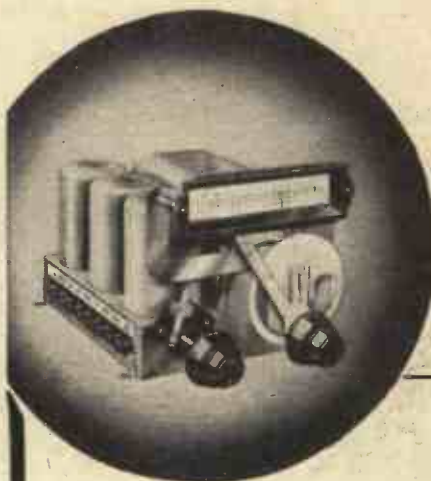
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2nd SPECIAL SHOW NUMBER



# Practical Wireless

Technical Staff:  
 W. J. Delaney.  
 Frank Preston.  
 H. J. Barton, Chapple.  
 Wh. Sch., B. Sc.,  
 A.M.I.E.E.

VOL. IV No. 101

Editor: F. J. CANN

Aug. 25th, 1934

## Military Band Concert from Portrush

A MILITARY Band concert is to be relayed from the Promenade, Portrush, on August 22nd. These concerts are a feature of the season in Portrush, but this is the first to be broadcast this year. The band, which will be conducted by Mr. George Dean (late bandmaster 1st Norfolk Regiment), will be the Belfast Military Band.

## Craigantlet Hill Climb

ANOTHER of the annual sporting events in Northern Ireland about which listeners like to hear is the Craigantlet Hill Climb, which takes place this year on August 25th. An eye-witness account will be given early on that evening by Peter Holmes.

## Talk on Caravanning

A MIDLAND Regional talk on caravanning will be broadcast by Major Vernon Brook, who is well known to listeners as the commentator on the T.T. Races and Shelsley Walsh hill-climb. Major Brook, whose talk is to be given on August 30th, is hon-secretary of the Caravan Section of the Camping Club. Recently he organized a record meet in Warwick Castle Park, where there were fifty-two caravans.

## Southport Flower Show

H. FAIRBANK, of the Cheshire School of Agriculture, will broadcast an eye-witness account of the Southport Flower Show for North Regional listeners on August 22nd. This show is one of the most important events of its kind in the country.

## "Ship Ahoy"

THIS is the title of a programme which West Regional listeners will hear on August 23rd. One hundred and seventy Merchant Navy captains have been traced as residing in the county of Caernarvon, and the programme is a relay of the proceedings at their reunion in the Assembly Rooms, Pwllheli. Stirring encounters will be recalled by those whose own experience enables them to appreciate the reminiscences, and several popular sea shanties will be sung.

## Oriental Night

THIS is the title of a special feature of the West Country Club on August 28th. It is described as a gala evening in honour of a visit by an Oriental potentate.

## Sheep Dog Trials Broadcast

THE National Sheep Dog Trials are being held on September 1st at Denton Park, Ilkley, Yorkshire, for the second year in succession. George Aitchison (who recently described the Rydal Trials) will broadcast a running commentary for North Regional listeners.

## Variety from Scottish Regional

ANOTHER excerpt from Harry Kemp's Summer Show will be relayed to Scottish Regional listeners from the Barrfields Pavilion, Largs, on August 31st. The

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artists will be: George West, Jack E. Raymond, The Jee Boys, The Clayton Sisters, Gladys Watson, Harry Carmichael and his Band.

## Organ Recital from Caird Hall, Dundee

DR. W. B. ROSS will give an organ recital for Scottish Regional listeners in the Caird Hall, Dundee, on August 28th. Dr. Ross is one of the best-known organists in Scotland and was the first to broadcast an organ recital. He was the founder of the Edinburgh Organists' Society and was its first president.

## A Caruso Concert from Blackpool

ENRICO CARUSO'S concert at the Winter Gardens, Blackpool, in the summer of 1909 is being reconstructed by G. H. Dayne, and will form the theme of a special North Regional programme to be broadcast on August 29th—exactly twenty-five years after the original concert took place. Caruso's voice will be heard again by means of gramophone records, and the scene will be described in a running commentary, attention being drawn, for instance, to the presence in the audience of Mr. Eugene Sandow and Mr. George Robey.

## Second "Schemes" Talk

THE second of the "Schemes" to be represented in the North Regional talks series of that name is Mr. Walton Maughan's project for a Tyne-Solway Canal. Mr. Maughan, who will outline this scheme on August 24th, is an engineer now resident at Holmfirth, Yorkshire. His canal would link up two of Britain's largest coalfields, and would be wide enough to accommodate battleships; it would, moreover, provide the Air Force with an excellent base. Traversing a high "catchment" area in a district of heavy rainfall, the canal could tap a great source of hydraulic power for the operation of the great vertical-lift locks which would be necessary.

## Oboe Recital from Midland Regional

LUCY VINCENT, who will give a recital for Midland Regional listeners with Arthur Roberts (piano) on August 28, was the first woman wind-instrument player in the country to be engaged with a symphony orchestra. She will play Handel's oboe concerto in C minor; three pieces by Sir Hamilton Harty, and, on the cor anglais, an Irish air, "The Bard's Legacy."

## A Tennyson Song-cycle

TENNYSON'S "Maud," like his "Locksley Hall" had a Lincolnshire scene, so a broadcast of the song-cycle composed by Arthur Somervell to its words has a Regional appeal. Arthur Cranmer (baritone) is the vocalist who will be heard in this song-cycle on August 29th. Somervell's setting of "A Shropshire Lad" was recently given from Birmingham.

# ROUND the WORLD of WIRELESS (Continued)

## Novel Broadcast Play from Manchester

**PROMETHEUS**: a tragedy of ransom and new power" is the title of D. G. Bridson's new modern industrial tragedy in the Greek manner, which will be broadcast from Manchester on August 27th. Although he follows the main lines of the story dramatized by Æschylus in "Prometheus Bound," Mr. Bridson has modernized the characters. Thus Prometheus figures not as a demi-god, but as an engineer in a Northern works; Mankind is represented by the factory workers, and the Gods of Olympus by the Board of Directors. The play is, however, strictly classical in form, embodying a chorus and antiphonal speech.

## The Roosters

ON August 30th a relay will be taken for West Regional listeners of an entertainment by the Roosters, the famous wartime all-male concert party, from the Victoria Pavilion, Ilfracombe. There were many War-time concert parties, and the Roosters was one of the few to survive. The party sprang from a scratch show given in the Balkans early in 1917, the personnel being attached to the 60th Division, which was afterwards moved to Palestine.

## A Broadcast About Hop Pickers

A **CHEERFUL** radio picture of hopping and the hopping season is to be embodied in a programme entitled "Opping 'Oiday," which Laurence Gilliam and Pat Forrest are preparing for listeners on September 15th. Laurence Gilliam is a B.B.C. producer; Pat Forrest has had a varied career as miner, tramp, farmhand, newspaper reporter, editor, and advertising man. The programme which Gilliam will produce is in four phases. The first will be a shot of hop-pickers leaving London Bridge Station at five o'clock in the morning on the "Hop-pickers' Special." The London Bridge Station sound portion will be followed by a short talk, to be given by an authority on the subject, contrasting hopping of fifty years ago with that of to-day. The third phase will consist of a series of such things as the hiring of hop-pickers, allocation to various living huts, interview with a farm manager, and a description of hopping in progress. The whole of this will be done by an actual relay from a hop farm.

## "The Sincerest Form"

NINE London radio stars, including Stanley Holloway, Mabel Constanduros, and Mrs. Feather, will be imitated by Midland contemporaries in a programme on August 28th. The title is "The Sincerest Form." Harold Pollard and Gerald Martin; Alma Vane; Alex Penney and Janet Joye are the vocalists, while Jack Wilson and Jack Hill will represent Harry Pepper and Doris Arnold at the piano. Martyn Webster, the Regional producer, has worked in London with eight of the nine stars to be imitated.

## INTERESTING and TOPICAL PARAGRAPHS

### Scottish Band Concerts

IN a concert to be given by the Scottish Studio Orchestra, directed by Guy Daines, on August 29th, Alexander Fortune (tenor) will sing a number of popular Scottish songs. The concert will be followed by a gramophone programme entitled "Holidays on Record." This will

### NEW MICRO-WAVE ACHIEVEMENT



The Marconi micro-wave beacon receiving equipment installed on the steam yacht "Elettra" for the demonstration recently when the yacht was successfully steered "blind" between two buoys 20 yards apart. Marchese and Marchesa Marconi are seen standing on the bridge in the foreground.

include past and present holiday tunes. The programme has been arranged by Gordon Gildard, dramatic producer to the B.B.C. in Scotland, and the items will be introduced by Pearl Elliott and R. F. Pearson.

Another Scottish Regional band concert will be broadcast on August 29th. The Bonnybridge and District Prize Band will be conducted by Gregor J. Grant. They will play overture, "Raymond," an excerpt from "Tannhauser," and a selection entitled "Sweethearts of Yesterday."

### Droitwich Spa Orchestra

IN the sixth of the Sunday evening concerts by the Droitwich Spa Orchestra, the violinist will be Eda Kersey. On August 26th she is to play, with orchestral accompaniment, Max Bruch's concerto in C minor, and, as a solo, "Baal Shem," in which Ernest Bloch gives pictures of Jewish life.

### "Road to Ireland"

FILSON YOUNG'S "Road to Ireland" programme will be broadcast on September 3rd in the National programme. This is in commemoration of Thomas Telford, the famous Scottish roadmaker, who died on September 2nd, 1834. The programme is described as "a romantic journey of yesterday and to-day from London to Holyhead."

The characters to be heard are a romantic traveller, a Welsh patriot, a railway porter,

a seaman, etc. There will also be the ghosts of Thomas Telford, a stage coachman, an Irish M.P., and others. In this broadcast listeners will follow Filson Young in a journey through England and Wales to the port for Ireland. That is the road that Telford built over a hundred years ago. It has seen much history since the days of the stage coach which took twenty-seven hours between London and Holyhead. Telford was a constructional genius, who most worthily expressed himself in terms of roads, bridges, and canals.

### "Humoresque"

THIS is the title of a programme of amusing pieces which Victor Hely-Hutchinson has chosen for the Midland Studio Orchestra and two pianos on September 1st. The pianists are Margaret Ablethorpe and Maurice Udloff. Gounod's "Funeral March of a Marionette" and Pierné's "March of the Little Leaden Soldiers" will be followed by Bucalossi's "The Grasshopper's Dance" and Bidgood's "A Motor Ride"; while "Le Carnaval des Animaux" by Saint-Saëns will complete the programme.

### Shakespeare Plays from Midland Regional

DURING the evening of August 30th a Midland Regional relay of the Coventry Repertory Company's performance of three scenes from Shakespeare will be broadcast. This will also be heard by Empire listeners. The scenes chosen are the Balcony Scene from "Romeo and Juliet" and two scenes from

"Twelfth Night"—the drinking scene, and that between Viola and the Duke, which precedes it. A. Gardner Davies is the producer.

## SOLVE THIS!

### PROBLEM No. 101.

Jackson found that his reception with a new three valve set was spoiled on account of interference from a nearby power station, and accordingly decided that it would be necessary to screen his receiver. He accordingly lined the cabinet with aluminium foil and earthed this, but as the noise still persisted he used a screened earth and aerial lead, with the screening earthed. The noise was substantially reduced, but in an endeavour to still further eliminate the trouble he replaced the actual aerial with the screened wire and connected the screening to earth. He found then that he received no interference and no signals. Even with reaction pushed to the limit the local station was inaudible. Why? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Entries must be received not later than the first post Monday, August 27th, 1934, and the envelopes must be marked Problem No. 101.

### Solution to Problem No. 100.

Martinson overlooked the fact that a resistance of high value was taking the place of a transformer primary of low resistance, and accordingly he should have increased the H.T. applied to the detector valve, in order to make up for the increased voltage drop. One reader appreciated the fact that in Problem No. 99 the S.G. valve was replaced as a detector and that this accounted for the majority of the troubles. A book has therefore been forwarded to W. A. Hogg, 12, Ashover Avenue, Knotty Ash, Liverpool.



# ADJUSTING- AND OPERATING THE "SUMMIT"

This Week the Method of Obtaining the Optimum Performance from this Extremely Successful Receiver is Fully and Clearly Explained

SINCE reading the constructional article last week many readers will no doubt have commenced the construction of this most efficient battery-operated receiver. It is unlikely that any difficulties will have been encountered due to the fact that the work entailed is of a particularly simple nature. There is just one point which was not stressed last week, and which should clearly be borne in mind, which is that the spindle and, hence, the mounting bush of the reaction condenser must be insulated from the metalized chassis. This does not present any difficulty, nor does it entail the use of special insulating washers, since it is only necessary to scrape away a little of the metallic surface from the three-ply front member of the chassis immediately round the mounting hole. This can be done quite easily by using the blade of a pocket knife or by means of a strip of glasspaper. Another, and rather neater, method is to remove the surface before drilling the hole; this is done by means of a centre-bit held in the brace.

## Setting the Trimmer

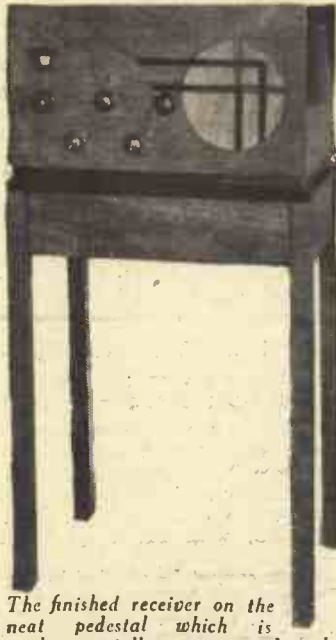
There are very few preliminary adjustments to be made, chiefly because of the fact that the tuning condenser is provided with an external trimmer, but it is best to set the star wheel of the other trimmer to about its midway (half-in) position. When this has been carried out it should be found that the external trimmer is somewhere near its midway setting when any station is tuned in. If this state does not obtain, a further slight alteration can, with advantage, be made to the star wheel.

For the benefit of beginners, it might be preferable to explain briefly the battery connections. Dealing first with the battery-cord assembly, the two spade terminals should be joined to the corresponding (red and black, or positive and negative) terminals on the accumulator respectively. The high-tension negative wander plug should be inserted in the negative socket of the H.T. battery, whilst the positive plug

should be given a voltage of 100 to 120, according to the exact battery employed. In any case, the higher voltage is to be preferred on the score of optimum performance.

## Grid Bias Voltages

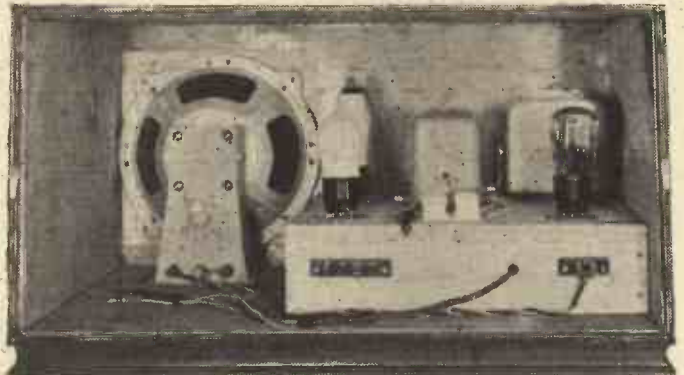
The grid-bias battery fits into the clip provided on top of the chassis, and the G.B. + plug should be inserted into the + socket, whilst the G.B.—2 plug is inserted into the 9-volt socket. The best position for the G.B.—1 wander plug depends upon the



The finished receiver on the neat pedestal which is made especially to accommodate the "Summit" cabinet.

actual voltage of the H.T. battery, but assuming this to be of the voltage recommended, the plug should be placed in the 4½- or 6-volt socket; if the battery is only of about 100 volts, however, this plug should be given from 3 to 4½ volts. No matter which battery is used, it will be worth while to try different positions for the plug, choosing the highest one at which good quality of reproduction is secured. It is important to note that no alteration should be made to the G.B. voltages while the set is switched on; switch off every time an adjustment is to be made.

It is scarcely necessary to point out that the two plugs provided with the L.S. terminal sockets should be connected to the two "outside" terminals on the loud-speaker through a short length of



This rear view of the "Summit" illustrates the simplicity of lay-out and the ample battery space.

twin flex. The earth lead should be attached to the plug marked E, whilst the aerial down-lead must be connected to the second plug, this being inserted into the socket marked A2.

When all these connections have been made set the reaction condenser to zero and turn the volume control to the full-on (clock-wise rotation) position. Turn the wave-change switch to the left or right respectively, according to whether medium- or long-wave reception is required. Then switch on and tune to the desired station by rotating the larger knob on the gang condenser. When signals are heard, the smaller (trimmer) knob can be adjusted until maximum volume is obtained. A reduction in volume can then be secured by movement of the right-hand knob.

It will have been observed in studying the circuit diagram that both tuners are fitted with primary windings having two tappings by means of which different degrees of selectivity can be obtained. When testing out the original "Summit" receivers, however, it was found that ample selectivity for all purposes could be obtained by connecting the aerial to the first tapping—that is, to terminal 2—on the type A.D. coil, and by connecting the H.F. coupling condenser direct to the end of the primary winding (terminal 1) on the T.G. coil. Should it ever be found that additional selectivity is required, for instance, when the set is being used "under the aerial" of a powerful transmitter, the aerial lead may conveniently be transferred to terminal 3. Alternatively, leads can be taken from terminals 1, 2, and 3 to the sockets marked A1, A2, and A3 respectively on the chassis terminal strip. Additionally, the lead from the tubular condenser which is shown as being connected to terminal L on the T.G. coil can be transferred to terminal 2 or 3.



It can be seen from this illustration that the top of the chassis is almost free from wiring.



The Lissen New Process H.T. battery which is recommended for the "Summit."

# MODERNIZING YOUR RECEIVER

In this Article the Author Describes Several Improvements that Can Easily be Made to the Battery Receiver. By J. EVANS

It is often argued nowadays that home construction of receivers is not worth while, as commercial sets can be obtained so cheaply. The great advantage derived from home construction does not lie in the initial saving, however, but in the fact that the circuit arrangement of the receiver is known to the owner, thereby enabling him to effect modifications with confidence when more efficient valves and components are placed on the market. The three-valve receiver employing screened H.F. valve, detector, and pentode is still the most serviceable and the most popular type for the average listener. The superhet is, of course, more selective, but it has its inherent disadvantages, and as yet does not compare favourably with the well-tried S.G. three. In this article it is, therefore, proposed to suggest certain

for the S.G. screen voltage and an anode feed for the detector valve, but in conjunction with the 2 mfd. condenser it also effectively decouples the detector anode circuit, and therefore helps to stabilize the receiver.

### Fitting a Diode Detector

It is a well-known fact that the ordinary leaky grid detector valve introduces a certain amount of distortion, because it acts as a rectifier and as an amplifier, and, owing to the fact that for effective rectification the valve has to be worked on the bend of its curve, undistorted amplification cannot be obtained. In the interests of quality reproduction it is therefore advisable to use a rectifier that will not amplify; the modern Westinghouse WX Westector fulfils this purpose admirably. The ordinary triode detector valve may then be used to

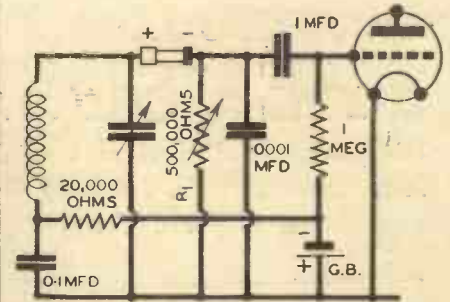


Fig. 2.—Theoretical circuit diagram showing how a WX Westector may be fitted.

If only one S.G. stage is used, the Westector should be biased to a point of optimum rectification;  $-1\frac{1}{2}$  volts is generally found adequate. The value of resistance R1 is critical, and although a 250,000 fixed resistance gives good results, it is advisable to use a 500,000 variable potentiometer, in this position. The L.F. coupling shown in Fig. 1 can still be retained if an H.F.-L.F. control is desired. If slightly greater volume is required, a 2 or 3/1 transformer connected as shown in Fig. 3 may be used, but, owing to the high impedance of the detector stage, it is not advisable to use straight transformer coupling.

### Variable Bias Coupling for the Output Valve

When a dry battery is used for supplying H.T. voltage, H.T. current economy is of paramount importance. Several economical stages have been designed recently (viz., Class B, Q.P.P., single economized pentode), but although these give very good results when the H.T. battery is supplying maximum voltage, a definite deterioration of quality is experienced as the battery runs down, and therefore frequent battery renewals are necessary.

To the average listener, the variable bias circuit shown in Fig. 4 is much more suitable. R1 is a variable potentiometer of 50,000 ohms, R2 a fixed resistance of the same value, and the bias battery should have a voltage of approximately double that specified for the valve used. When the arm of the potentiometer is at maximum setting, a bias of half the G.B. battery voltage will be applied to the valve (i.e., normal bias for maximum undistorted output), but as the potentiometer arm is moved towards zero setting, the bias voltage is gradually increased, and the output valve current consumption is consequently reduced. It will be advisable to use a three-point on-off switch with this control, having the third contact connected to G.B.—, in order that the bias circuit may be broken when the set is not in use.

This control will be found a very useful addition to any battery operated receiver, as a power pentode valve (e.g., Pen. 220A, PM 22, Z 220) may then be used to advantage. There are numerous items in the evening's programme that can be pleasingly reproduced with the output valve operating well below its optimum output, and therefore the bias control may be set near minimum setting.

Satisfactory reproduction of talks, commentaries, and light music may be obtained with the valve consuming a mere 3 to 4 m/a. When good reproduction of a symphony orchestration, piano recital, or organ recital is desired, however, the control may be set at maximum in order that maximum undistorted output may be obtained from the valve.

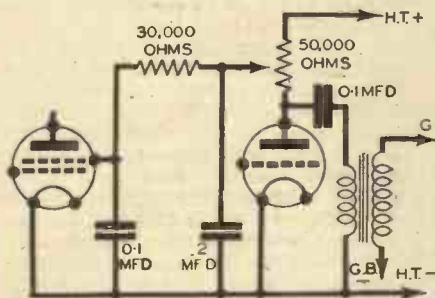


Fig. 1.—Theoretical circuit showing combined H.F.-L.F. control.

modern improvements that can be easily effected in the latter type of receiver.

### Combined Radio-Gram Volume Control

When an eliminator without a variable S.G. screen voltage control, or 60-volt wet H.T. batteries are used, it is advantageous to fit a variable control in order that optimum amplification may be obtained from the H.F. valve. It is common practice to fit a potentiometer across H.T.+ and H.T.— terminals, with the S.G. screening grid terminal connected to the centre tap, but this potentiometer has the disadvantage of consuming approximately 1 to 2 m/a. when the set is in operation. A series resistance, on the other hand, is not very reliable for dropping the voltage to the required value owing to the very low current taken by the screening grid. In Fig. 1 a control is shown which effectively controls the S.G. screen voltage, and may, if desired, be used as a combined H.F.-L.F. volume control when on radio, and as an L.F. control when on gram. The resistances should be chosen to suit the valves in use, but the necessary values are by no means critical; using an S.G. valve having an impedance of approximately 400,000, and an HL or GP valve as detector, the values shown on the diagram will be quite suitable. A study of the circuit arrangement will indicate that the variable potentiometer not only acts as a control

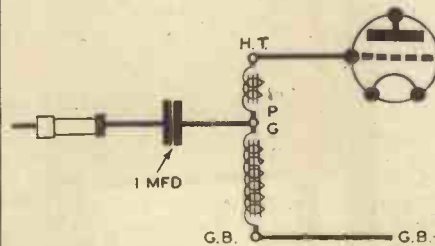


Fig. 3.—A transformer coupling is here shown.

good advantage as an L.F. amplifying valve following the Westector, and it has been found that a three-valve design of this type (S.G., Westector, L.F., Pen.) gives a slightly higher degree of amplification than the ordinary S.G., Det., Pen. combination, with better quality reproduction.

Reaction cannot be applied in the usual way when a Westector is used, of course, but the S.G. valve can easily be made to oscillate by connecting a very small condenser between anode and grid terminals, or by connecting a loop of wire from the anode of the S.G. around the preceding grid coil; oscillation may then be controlled by means of the normal variable mu potentiometer bias control, or by the screening-grid voltage control.

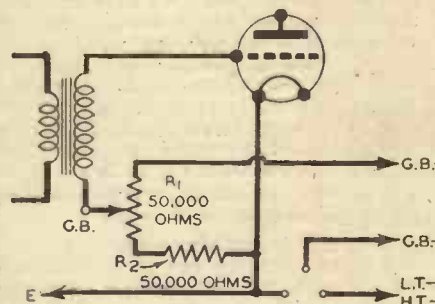


Fig. 4.—Variable output valve bias circuit using a potentiometer and a fixed resistance.



# Items of Special Interest

## AT RADIOLYMPIA

Particulars of Some of the Arrangements and Items which Are Attracting Great Attention at Olympia.

**A**N examination of the exhibits at Olympia reveals the fact that there are certain components or pieces of apparatus which possess what might be termed "novelty" and which are undoubtedly attracting the attention of visitors. These novelties may be divided into groups, and some further details are given below concerning them.

### Tuning Dials

The tuning dial has undergone remarkable changes during the past few months. It



One of the new R. & A. speakers in which a special matching transformer is fitted.

is now the exception, rather than the rule, to find on a commercial receiver a small hole behind which rotates an ivorine scale bearing some arbitrary figures. Station-named dials are fitted to practically every receiver, and to simplify tuning the dial is now of the full-vision type, in either a straight, arcuate, or square pattern. The latter is now seen on three or four manufacturers' products, and the station names are arranged in a circle after the manner of the hour markings on a clock. For indicating purposes, two pointers are provided, and as the tuning control is operated these pointers travel round the "clock face" and indicate the setting. In addition to the easy visibility of this type of dial there is also the added advantage that no doubt exists in the mind of the user concerning which way to turn the control for any desired station, and the mind automatically registers "clockwise" and "anti-clockwise."

The automatic type of dial which, in addition to showing the tuning setting,

also gives an indication of other things is also becoming popular. Messrs. Ferranti, for instance, include on the dial a separate pointer, showing the setting of the tone control; one showing the wave-range; one showing the A.V.C. setting, and so on. True, at first it may seem unnecessary to include so much on a scale, but when the receiver has been in use for a short time the advantage of having all doubts removed concerning the various adjustments is found to be quite useful. Similarly, the indication concerning the tuning range, that is, long or medium waves, is an advantage on a tuning dial. Generally it is necessary to peer rather close to the panel to ascertain where the wave range control is adjusted, but separate scales, brought into action by the wave-change switch, coloured names illuminated by appropriate coloured lamps, and separate scales and pointers are found on this year's commercial receivers.

In addition to the above-mentioned indications some novel means of showing the exact tuning point in receivers fitted with A.V.C. are seen. The H.M.V., Columbia, and Marconiphone receivers utilize a device which gives the effect of a column of light rising and falling in a short tube. The Telsen's "Pointograph" dial is designed with a pointer which indicates the wavelength setting of the tuning control as well as one which, as resonance is reached, gives an indication as a separate scale. Tuning is carried out for the horizontal position of the pointer. Other devices include rays of light or shadows which vary in width with the tuning adjustment, and all enable the volume control to be set to a silent point whilst a station is accurately-tuned-in, and then the volume may be brought up to the desired level, thus avoiding all the noises of inter-station tuning, etc. The home-constructor may, of course,

fit a device of this nature to his receiver by purchasing the new Cossor Neon Indicator.

### Loud-speakers

The majority of loud-speakers this year possess the special tapped transformer arranged so that practically any ratio



A novel type of speaker which incorporates an electric-light fitting.

may easily be obtained and thus accurately match the output valve. At last year's exhibition Messrs. Whiteley Electrical introduced this arrangement in their Micro-lode, and now various modifications of the scheme may be seen. In some models a row of sockets is provided, and by choosing any pair it is possible to obtain any ratio. In others switches are provided for the purpose of selecting the desired tapping. Better quality and greater volume is, of course, obtainable when the speaker is exactly matched to the output valve, so that this improvement in speaker design is greatly to be appreciated. Modifications in magnet design are also to be seen this year, the Blue Spot utilizing a novel form of "bolted-up" magnet in place of the more commonplace "Claw" arrangement, and the W/B speaker, although very little different in appearance, embodies a new alloy which gives greatly increased field strength and consequently increased volume and better quality, owing to the ability to modify the cone and speech coil proportions. The speaker designed especially for use with a receiver which has a built-in reproducer is also becoming popular, and is provided with a special transformer, so that it may be included in circuit without affecting the quality of response of the built-in speaker. It will be appreciated that this is a vital point,

(Continued from page 668)

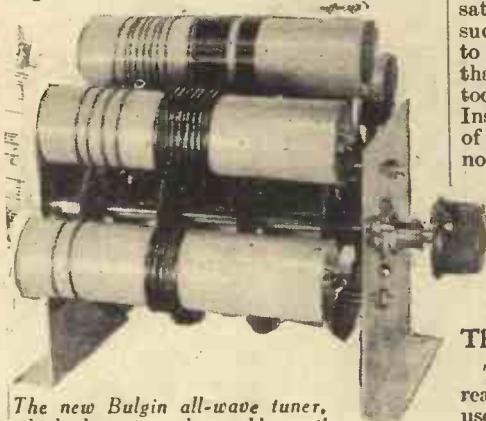


This illustration (an Ekco receiver) shows how the question of the tuning dial has been tackled.

# TUNING - CIRCUIT CHANGES

The Improvements and Modifications which Have Been Made in Connection with Tuning Coils and Variable Condensers are Described in this Interesting Article. By FRANK PRESTON

**A**T least a year ago a number of serious attempts had been made to perfect a system of tuning which is quite different from that which has been employed continuously ever since wireless receivers were first made. The old, and still universal, method of tuning by means of a coil and condenser is known to possess a number of undesirable features, the most important of which is its varying sensitivity



The new Bulgin all-wave tuner, which has interchangeable coil units.

and selectivity over even a narrow band of frequencies.

## What of Permeability?

When iron-core coils were perfected (if one may use such a word in connection with radio) it appeared only a short step to the introduction of permeability tuning. In fact, more than one so-called permeability tuner was placed on the market, but its debut proved to be premature; this form of tuning had by no means reached a truly practical stage, but there is now, at last, an efficient, ganged permeability tuner available; it is made by Varley. As is by now fairly well known, the idea of permeability tuning is that the natural frequency (wavelength to which it will tune) of a coil is varied by moving a core of ferrous material nearer to, or farther away from, the turns of wire. It was not difficult to obtain a suitable wavelength variation in this way, and the principal obstacle appeared when it was attempted to make the tuner follow some definite "law." That is, it was not found by any means an easy matter to so arrange the core and its operating mechanism that an even separation of wavelengths or frequencies could be obtained. Thus, it was found that, at certain parts of the tuning range, several stations were crowded together, while at other parts they were separated by undue amounts.

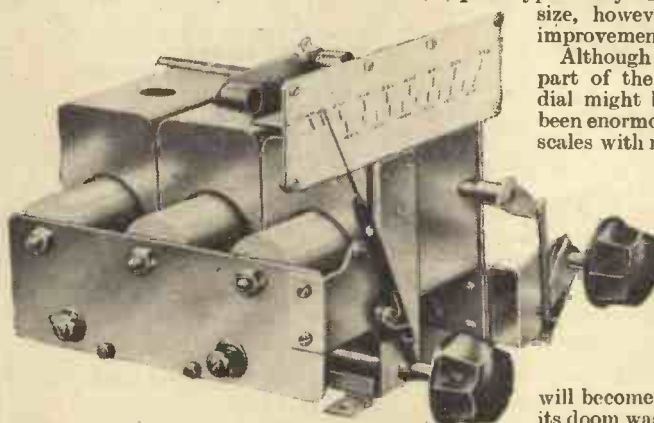
## Iron-Core Popularity

It is only about a year ago that iron-core coils became really popular, and at that time it was considered by many that in a very few months they would entirely oust

the ordinary type of air-core inductance. This opinion was, in fact, very freely expressed, but it is of interest to note that the forecast has by no means been fulfilled. There have been numerous factors which have acted against the iron-core coil, one of which has been that this kind of tuner has been produced in large quantities by several small firms who were without the necessary experience to produce a really satisfactory article, and because many such firms have been so unscrupulous as to use a core material vastly different from that which the inventor of ferrous cores took so much trouble and time to perfect. Instances have actually come to our notice of so-called iron-core coils which had nothing better than a block of hard wax for their cores! Happily, such deception has been practised by only a very few "back-street" manufacturers, and the purchaser who has been "bitten" can only blame himself for not dealing with a well-known and reputable firm.

## The Effect of the Superhet.

There is another, perhaps more important, reason why iron-core coils have not been used in such large numbers as was anticipated; this is because superheterodyne receivers have rapidly increased in popularity. The inference might not seem quite clear, but, as has been mentioned in PRACTICAL WIRELESS, the inherent selectivity of the superhet. is extremely high, and therefore the advantages of ferrous-coiled coils in this direction are not nearly



The 1935-model Varley permeability tuner.

so marked. In this respect it is significant to remark that the majority of receiver manufacturers employ ordinary air-core tuners in their superhets, with praiseworthy results. It should not be gathered from the above remarks that iron-core coils are dead, for that is by no means the case; it is probable that they will become even more popular, especially as they are gradually being reduced in price.

## Reductions in Size

Even if they had done nothing else, iron-core coils have proved extremely valuable in pointing the way in the reduction in size. They proved that coils could be made which were only a fraction of the size of those which had previously been employed, and this set designers thinking, with a result that even air-core coils have since been made considerably smaller. It is a fact that many of the air-core coils now available are very little larger than several of the earlier ones having iron cores. The efficiency of the newer coils also stimulated designers into improving the performance of air-core coils, so that to-day these have reached a high degree of efficiency.

## A Coil That is Wanted

There have been few entirely new types of coils, because these have not been found necessary. Slight modifications have been made in some instances so as to make the coils suitable for use with the special superheterodyne frequency-changing valves, such as the pentagrid, heptode, octode, etc., but it has not been found necessary to make any major alterations. There is, however, one new type of coil which the constructor would like to see. Reference is made to an oscillator coil for use in conjunction with a battery-operated pentagrid frequency-changer; a coil of this nature is used by one manufacturer of commercial receivers, but nothing of the kind intended for the home constructor has been brought to our notice.

## Condenser Improvements

There have been no revolutionary changes in variable condensers, but some of the minor modifications are worthy of note. For example, condensers have been vastly improved mechanically, with a result that they are now more rigid and their trimmers provide a more uniform variation over the movement of the adjusting device. Additionally, the present-day variable condenser is considerably smaller than its prototype of a year ago; the reduction in size, however, is accompanied by improvements in details of design.

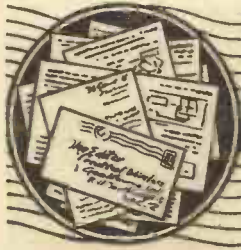
Although not being an integral part of the condenser, the tuning dial might be referred to as having been enormously improved. Larger scales with more "open" markings are notable, and full-visibility scales (on which the full range can always be seen) have become almost standardized.

In looking to the future one cannot help wondering whether or not the variable condenser will become obsolete. A year ago its doom was predicted when permeability tuning was mooted, and quite recently a form of tuning has been experimented with in which the variable condenser is replaced by a variable resistance. Although the idea has not yet passed outside the laboratory, it is claimed that it gives almost uniform response over any complete tuning range. We shall see!

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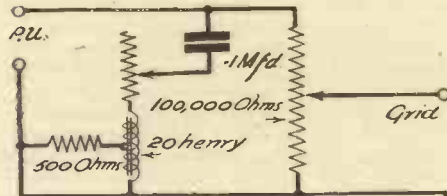
# READERS' WRINKLES

THE HALF-GUINEA PAGE



## A Novel Tone Compensator for a Pick-up

It is well known that the amplitude of the bass notes on a gramophone record below 250 c.p.s. are attenuated for recording purposes, and to get true reproduction a compensating circuit of some sort is necessary. Here is a description of a novel circuit I have evolved for use with my

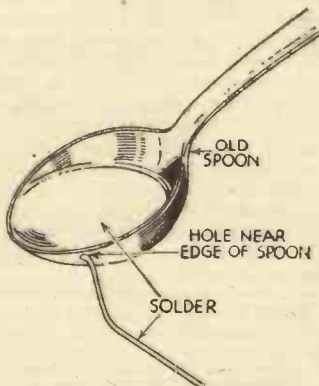


Theoretical diagram of tone compensator for a pick-up.

pick-up. The values may vary for different pick-ups. It consists of a 20-henry choke, centre-tapped, a 20,000-ohm variable resistance, and a .1 mfd. condenser in series across the pick-up terminals, one half of the choke being short circuited with a 500-ohm resistance. This is the novel part of the circuit, as without this resistance no compensation takes place. Varying the resistance varies the amount of compensation—minimum resistance, maximum bass notes. Actually this circuit absorbs the upper register, but as most pick-ups are not worked "flat out" this does not matter, and can be allowed for by advancing the volume-control.—R. V. PARSONS (Longleavens).

## Using Up Odd Pieces of Solder

MANY wireless constructors will have on hand odd pieces of solder which are too small to hold except with pliers; the accompanying sketch shows a method of making use of them. Take an old table-spoon and punch or drill a small hole near the rim. Place in the spoon the odd bits of solder, hold over a gas-ring till molten, and then run out quickly into long strips, the size of which will be governed by the hole in the spoon.—R. DOWNY (Acomb).



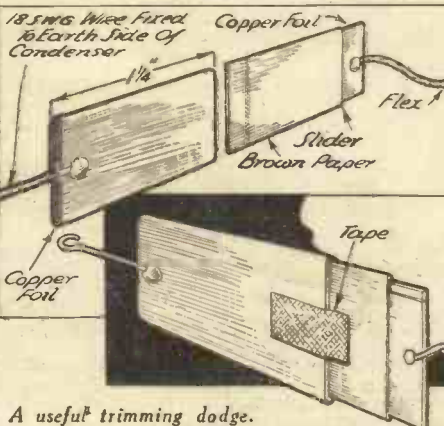
Using up odd pieces of solder.

## THAT DODGE OF YOURS!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

## A Trimming Dodge

WHEN modernizing an old set with twin ganged condensers I was in difficulties as trimmers were unknown when the set was originally constructed. The following dodge, however, answers the purpose very well. A piece of copper foil (1½ ins. by ½ in.) was wrapped with gummed paper (1½ ins. by 1½ ins.) to within ¼ in. of one end and just overlapping at the other. Round this was bent another piece of copper foil (1½ ins. by 1½ ins.) pressed together so that the wrapped piece slid inside. A piece of 18 S.W.G. wire is soldered to the outer foil, and a piece of flex to the slider. The pieces of 18 gauge wire are soldered to the earth side of the condenser, and the flex

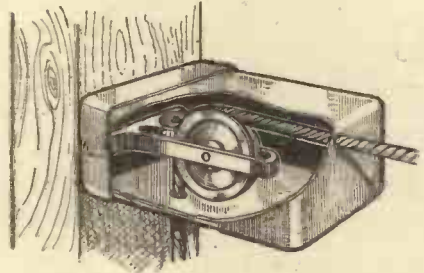


A useful trimming dodge.

to the other. Adjust by tapping the slider in or out. After the necessary adjustment was made, a bit of surgical or other adhesive tape was fixed on, as shown in the accompanying sketch.—S. R. GIBBON (Cardiff.)

## Protecting Aerial Pulleys from Rust

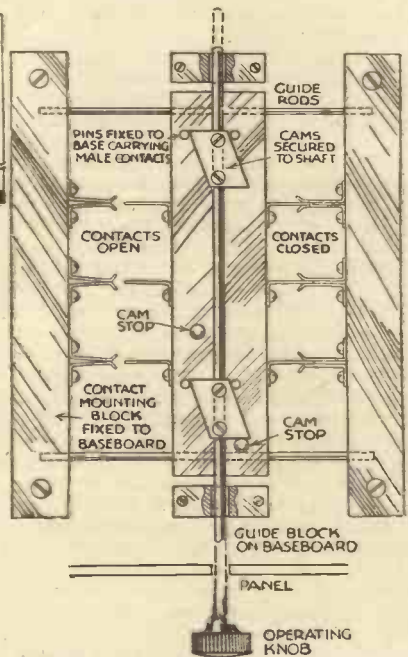
PULLEYS at the top of an aerial-mast are liable to rust and become jammed. The following dodge will prevent this annoyance. Obtain a large size Colman's mustard-tin and fix the lid and pulley to the mast (as in sketch). In the other part of the tin two holes are bored to correspond with the lanyard and the aerial. The lanyard is threaded through the aerial hole over the pulley and through the lanyard hole. The lid can be soldered to the tin and the whole can then be painted.—R. LANDELS (Hendon).



Method of protecting aerial pulleys from rust.

## A Novel Multi-pole Switch

THIS multi-pole switch converts the usual panel-controlled push-pull action into a lateral movement by means of two cams secured to the main operating shaft. The fixed contacts are arranged (to suit the actual circuit conditions) upon two ebonite blocks secured directly to the baseboard, whilst the moving (or operating) contacts are suitably arranged upon another block which slides between the two fixed blocks. The moving block is drilled to allow free lateral movement along the two guide rods, as shown in the sketch, and four vertical pins, bearing upon the cams on the shaft, are fixed firmly into the block, thus causing the advancing or receding shaft to move the "switching" contacts from side to side. Two points of importance must be noted—stops must be provided to prevent overriding the cams, and the slope upon the cams must not be excessive; this should not exceed 30 degrees.—WM. A. HARRISON (Aintree).



A novel multi-pole switch.

# SUPERHET IMPROVEMENTS

How This Circuit has Developed During the Past Year.

By W. J. DELANEY.

**D**URING the past year the superheterodyne receiver has made enormous strides, and is now probably one of the most popular of circuits. That this is definitely so may be ascertained by examining the complete receivers which will appear at the Exhibition this year. The majority are undoubtedly superhets, and the number of valves employed has now dropped to three or four, whilst still maintaining the selectivity and other features for which this type of circuit is noted. The great strides which have been made are probably due, in the main, to the development of the multi-electrode valves which are used for the frequency-changer. In the original type of superhet it was necessary to utilise an H.F. valve for providing selectivity (by the addition of a tuned circuit), following this by the first detector with a separate valve as oscillator. To-day the pentagrid, the heptode, and the octode combine in one bulb the functions of the first detector and oscillator with greatly increased efficiency, and the higher magnification of this type of valve also enables the signal H.E. stage to be dispensed with. In addition to this, the stability of this stage is greatly improved owing to the additional grids which are included in the valve, and although, theoretically, the superhet should need only the very minimum of decoupling (owing to the fact that each stage operates at a different frequency), no decoupling is really required when the modern assembly is employed.

## The Intermediate Frequency

Probably one of the greatest drawbacks of the superhet receiver, as it appeared on our market a year ago, was the whistles which arose from what is known as second-channel interference. In addition to this, the tremendous amplification which has been employed (owing to the large number of valves which were used) led to annoying background noises, valve hiss, and similar faults, which in many cases proved louder than the actual signal which was being received. Obviously, therefore, a reduction in the number of valves will result in a reduction of these stray noises, and give improved quality. The question of the intermediate frequency has received careful attention, and although last year the English manufacturer used a different frequency from that employed in American receivers (due to the fact that we need to tune in to the long-wave band), a still further modification has now been made by some manufacturers with the result that the second channel whistle has been removed. This has in its turn led to the removal of the necessity of using a band-pass tuning circuit in the first stage, and a single circuit tuner may now be used without the losses usually associated with a band-pass tuner.

The only point which has to be guarded against when using the new (higher) frequency is that losses in the necessary tuning circuits must be kept low and slightly greater care is called for in the design and construction of the coils and condensers. Several firms are now prepared to supply ganged condensers having the oscillator section shaped to provide accurate tuning with the new intermediate frequency, and although at the moment no details have been received concerning the supply of I.F. transformers for the home constructor, no doubt these will appear shortly.

## A.V.C.

The automatic control of volume has now been perfected, and the modern superhet incorporates this as a matter of course. The intermediate amplifying stage or stages is controlled, together with the first detector-oscillator stage, generally through the medium of one of the double-diode triode or similar multi-electrode valves, the second diode being used for second detector. Thus, not only has the number



Employing only 5 valves, this superhet has 7 tuned stages and the valves perform 8 separate functions.

of valves been reduced, with a consequent reduction in size and price of the finished receiver, but efficiency is much higher, whether efficiency is judged by performance or quality of output.

We have been carrying out a number of experiments for a considerable time in order to develop a superheterodyne receiver which could aptly be described as the last word for the home constructor. It must be realized that the manufacturer can turn out this type of receiver by mass production means to conform to a certain standard, but the home constructor asks that this standard should be improved upon, whilst at the same time the difficulties usually associated with the home construction of a superhet are avoided. At least two I.F. transformers are required, and in the modern component of quality both primary and secondary are tuned. Stray circuit capacities render it impossible to supply these transformers with the circuits definitely tuned, and therefore some



This modern superhet represents one of the smallest receivers employing this principle.

form of tuning must be permitted to the constructor. With two I.F. transformers this gives four adjustments, and as the oscillator tuning condenser must be accurately adjusted with the main tuning condenser, this adds at least two more adjustments, and the permutations of six adjustments makes it possible to spend weeks in endeavouring to obtain the correct setting for each adjustment. We are slowly overcoming these defects, and if it is found possible to combine all the best features of the modern components with the ease of construction of a one-valve set, we shall publish full constructional details in these pages. In accordance with our policy, however, we shall not do this until the circuit has been perfected, but the notes given above will enable the newcomer and the interested amateur to see how this important circuit has progressed from a theoretical perfection to a practical proposition, and it is quite conceivable that before long the "straight" or simple circuit will become obsolete.

## ITEMS OF SPECIAL INTEREST

(Continued from page 665)

and the special tapped transformer enables the adjustment to be carried out without any doubts arising as to whether an improvement could be effected by some other ratio of transformer.

## Components

A general reduction in size of components, including valves, has obviously taken place during the past year, and the three-gang condenser, for instance, now occupies no more space than a single condenser of just over a year ago. The introduction of the iron-core coil enabled a reduction in size to be obtained last year, and improvements have naturally been made in this component with the result that it is still more compact, and generally provided with a self-contained wave-change switch designed to operate some other component, such as an on/off switch at the same time. The valve, in addition to the incorporation of more electrodes inside the bulb, has been reduced in size and slightly modified in shape, so that now it not only takes up less room, but is free from microphony and gives much better results.

## 50 Tested Wireless Circuits

By F. J. Camm (Editor of "Practical Wireless.")

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# THE "ARMADA" MAINS THREE

## Building the Gramophone Section and Connecting Up This New All-mains Three-valve Set

**B**EFORE this novel instrument is completed it will be necessary to mount the gramophone motor and the pick-up on the upper part of the cabinet. The makers of the motor supply a very complete drilling template and instructions for this purpose, and it will be necessary first of all to find the centre of the motor board, which is the name given

up in its correct position so that accurate tracking is ensured, and the template supplied with the pick-up should be used for this purpose. Carefully follow the maker's instructions, placing the template on the motor board in the required position and marking the hole for the passage of the pick-up leads. It will be noticed that an earthing lead is included on the pick-up, and this should be joined to one of the motor retaining bolts, and this in turn joined to the H.T. negative terminal on condenser C.14 on the mains pack when this is inserted in its position. Now screw the motor into position, and attach the connection link on the motor to the correct pair of terminals as denoted on the template, and which adapt the motor for the voltage of the mains with which it is to be employed. A length of twin flex is next attached to the two terminals (see the template), and these leads are taken down and attached to the primary terminals on the mains transformer bearing a voltage marking corresponding to that with which the receiver is to be used. The two leads which are attached to the mains plug (and one of which passes via the on-off switch on the coil unit) are also attached to this pair of terminals on the mains transformer, and in this position both the receiver and the gramophone motor are rendered "alive," although the latter will not revolve until the pick-up arm is brought into the playing position. This operates a mechanical brake as well as an electrical switch, and thus avoids the necessity of fitting a separate motor switch.

### Connecting Up

Connect the heater flex to the two 4-volt terminals on the mains transformer and the H.T. + and H.T. — leads to the terminals on condenser C.14. Preferably, whilst the receiver is being ganged and adjusted, it would be better to leave

the gramophone motor and pick-up disconnected, and to connect the mains unit and receiver together whilst they are standing on a table, inserting them into the cabinet when finally adjusted. The L.S. leads should be joined to the correct pair of terminals on the Multimu speaker, again following the maker's instructions regarding the optimum load of the output pentode. Attach the aerial to the small aerial plug and the earth to the earth plug, and insert these in their respective sockets. The mains plug is of the two-pin type, and should therefore be inserted into a two-pin socket; but as this type of socket is generally fitted on the power circuit of the house wiring, it may be found that rather long leads are required in order to reach

the nearest point. If desired, therefore, the plug may be used with an ordinary lighting socket, by obtaining one of the popular combination plugs which converts a lamp socket into a two-pin socket. Before doing this, however, make quite certain that your local supply company does not prohibit the use of a radio-gramophone on the lighting circuit. In some parts of the country there is a by-law to this effect. The control knob on the coil unit has four positions, each of which is indicated by letters engraved on the knob. When turned as far as possible anti-clockwise the receiver is switched off. A quarter of a turn to the right (in a clockwise direction) brings the medium-wave band into circuit, a further quarter of a turn brings the long-wave band into circuit, and a final movement switches out the radio side of the receiver and brings the pick-up into action. The control must then be turned in the reverse direction to switch off.

### Operation

Turn the left-hand control (volume control) to a midway position and set the pointer of the tuning scale somewhere near the wavelength of your nearest station, and switch on. After a short interval a faint hum should be heard from the loud-speaker, and if all is well faint signals should also be heard. Turn the volume control until the signals are at their faintest, and then carefully adjust the trimming controls on top of the condenser assembly. As signals become louder, reduce them on the volume control until the maximum position is found for the trimmers. Carry out the trimming operation at both ends of the waveband, and use that position which gives the correct over-all balance. The receiver is then ganged, and may be placed in its cabinet and the motor and pick-up connected. The latter has one lead joined to the vacant terminal on the switch on the coil unit, and the other lead is joined to earth.



The receiver portion of the "Armada" in its cabinet. The mains unit shown on the right stands on the upper shelf.

to the upper surface of the cabinet immediately below the lid. Remove the four screws which hold this board in position, as well as the two screws retaining the lower part of the cabinet lid-stay. Lay the motor board on a flat surface, and when the centre point has been found (by lightly marking the two diagonals), place the motor template on the board with the point marked "Turntable Centre" exactly over the centre point on the board. With a sharp-pointed pencil trace round the heavy black line on the template and with a sharp point mark the positions of the retaining screws 1, 2, 3, and 4. Remove the template, and with a fretsaw or coping saw cut out the section enclosed by the black line and drill holes at the fixing screw points. It is preferable to use 6 or 8 B.A. bolts to hold the motor in position, although if thought sufficiently secure ordinary wood screws could be used for the purpose.

### Mounting the Pick-up

It is now necessary to fit the pick-



The mains section and the loud-speaker.

# INTERFERENCE SUPPRESSION

A Brief Description of Most of the Devices which are Now Available for Combating All Kinds of Electrical Interference with Wireless Reception. By FRANK PRESTON

**T**HE interference with radio reception caused by various types of electrical apparatus has presented a difficult and important problem for some years, but, far from automatically solving itself, it has gradually become worse.



The T.C.C. No. 2 interference suppressor.

Although this form of interference is as old as wireless itself, it is rather surprising to note that it was not considered at all seriously until about three years ago. Prior to that it had been looked upon as inevitable, in addition to which it was not generally so trouble-

some, due to the fact that the receivers in common use were considerably less sensitive than they have become of recent years.

That electrical interference—which evidences itself as a series of crackles, bangs, or scratching noises—can now satisfactorily be overcome is a definite fact, although this may come somewhat as a surprise to those who have not kept in close touch with radio developments during the past months and who, quite probably, gave up all thoughts of ever securing really enjoyable, trouble-free, and interference-free, reception on account of the local conditions. Right up to the summer of 1934 it has not been possible to guarantee that all forms of electrical interference could definitely be overcome without tackling the trouble right at its source; very often an impossibility. The listener is now able, in something like 90 per cent. of cases, to overcome the trouble without making any modifications outside of his own apparatus. In the other few instances a compromise can generally be made by making slight alterations to the receiving equipment and by persuading the owner of the offending apparatus to make a simple addition to his plant.

## Post-office Assistance

Before going on to detail the various types of interference suppressor which are available it would be well to point out (principally for the benefit of new readers) that in all cases of difficulty the Post Office engineers are very willing to render whatever assistance they can, and without charge. All that the listener has to do is to obtain an appropriate Form from the Post Office from which he obtained his licence, fill it in and return to the address given on it. Very soon qualified engineers will look into the matter and advise upon the steps which should be taken. If the source of trouble happens to be a fan, electric vacuum cleaner, hair drier, or similar

machine used upon the listener's own premises, or if it is in the electric supply wires or switches, the engineers will suggest a remedy and offer to put this into effect for a nominal charge; if the source is external to the listener's premises they will suggest remedies to the owner of the plant concerned. Unfortunately there is no law which prescribes that devices should be fitted to electrical equipment so as to render them non-radiating, although such legislation is in force in some of the Continental countries. In any case such laws will probably never be required, especially when one bears in mind the efficacy of the suppression devices which are available at low cost.

There are two principal forms of suppressor device, one of which is intended for connection to the apparatus which is the cause of trouble, and the other which is designed essentially for use in conjunction



Anti-interference (or impedance-matching aerial) device manufactured by Messrs. Ward and Goldstone.

with the receiver. The first type of device consists essentially of two fixed condensers, connected in series, and two safety fuses. The "free" terminal of each condenser is connected, through one of the fuses, to one terminal of the apparatus (or to one of the brushes in the case of an electric motor) whilst the series connection is joined to a convenient earthing point.

## The Suppressor Units Available

A number of these excellent suppressor units are on the market, four well-known ones being made by Messrs. Belling & Lee, Messrs. T. C. C., Messrs. Dubilier, and Messrs. Ward & Goldstone. The first-mentioned firm have two chief models, one of which was introduced a year ago and costs 10s. 6d.,

the other being a newcomer of smaller type and designed especially for use in conjunction with small electrical machines and costing 8s. 6d. Messrs. T.C.C. introduced their No. 1 model some time ago, and this, selling at 10s. 6d., employs a pair of 2-mfd. condensers. Their new model, however, which is described as model No. 2, contains two 4-mfd. condensers and is intended for use in extremely difficult circumstances, or where the smaller model does not provide a complete cure; it is priced at 12s. 6d. The other two firms mentioned above have several different models, one of which is suitable for any particular requirement.

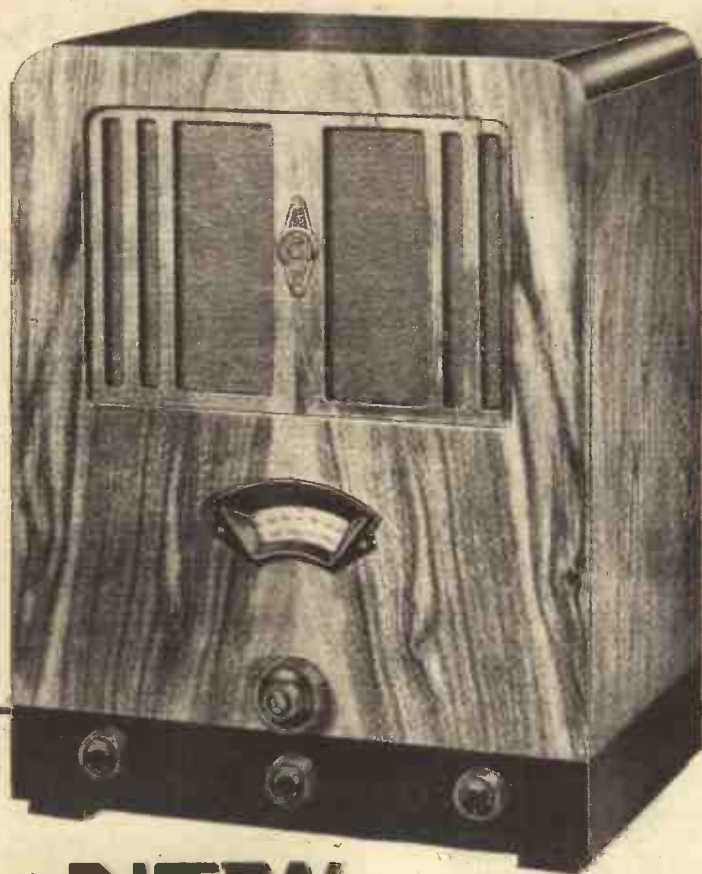
All the manufacturers referred to undertake to advise any intending purchaser regarding the type of unit most suited to his own particular circumstances, whilst Messrs. Belling & Lee provide a questionnaire, and from the answers supplied to the various questions they will give free advice regarding the steps which should be taken in order to overcome the interference.

Despite the fact that the condenser units described are intended principally for connection to electric motors and similar pieces of machinery, they can always be connected across the mains supply leads to the (mains) receiver, in which position they will considerably lessen nearly every form of interference.

## Screened Aerial Devices

When the interference nuisance cannot be completely obviated by using one of the suppressors referred to above, and it is known that the trouble is from some outside source, it becomes necessary to employ a screened down lead from the aerial, and special screening material (which has the essential feature of low capacity) for this purpose is made by Messrs. British Radiophone, Messrs. Ward and Goldstone, and others. So long as the aerial is fairly high the provision of the screened down lead will almost invariably eliminate the trouble, but it is occasionally necessary to go to still further trouble by moving the aerial to a point outside the field of interference. This might entail the use of a down lead fifty, or even a few hundred, feet in length and the capacity of the screening would then be too great to permit of the aerial functioning correctly. Even this difficulty has been foreseen, however, and special lead-in devices are on the market. The principles upon which these work have previously been dealt with in these pages, and it is briefly as follows: A step-down high-frequency transformer is inserted between the aerial proper and the end of the lead-in which is normally connected to it. At the "set" end of the lead-in there is a step-up transformer exactly matched with the first one. Because of the comparatively low H.F. voltage which passes through the screened wire the capacity has little or no effect.





**VARIABLE-MU S.G. CIRCUIT**

**SUPER-SELECTIVE IRON-CORED COILS**

**MOVING-COIL LOUDSPEAKER**

**TWO MAGNIFICENT MODELS**

**BATTERY MODEL 352**

Complete Kit of parts includes Cossor Variable-Mu Screened Grid Triode Detector and Economy Pentode Output Valves, fully screened Super-Selective Iron-cored Coils, combined On/Off, Wavelength and Gramophone Switch and all the parts for simple home assembly. Handsome walnut finished cabinet 18" high, 14" wide, 9½" deep. Permanent Magnet Moving Coil Speaker. Terminals for Gramophone Pick-up, Plug and Sockets for Extension Loud-speaker. Price **£5.19.0**

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Complete Kit of parts similar to Model 352 but with Cossor Mains Variable-Mu Screened Grid, Mains H.F. Screened Pentode Detector, Mains Power Output and Rectifier Valves. Mains Energised Moving Coil Loudspeaker. For A.C. Mains only 200/250 volts (adjustable) 40/100 cycles. Price **£7.19.0**

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Please send me full size constructional chart which tells me how to build the new Cossor Melody Maker Model.....\*

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A whole night's job becomes but a few minutes' work with the Pifco ROTAMETER.

The new De-Luxe moving coil model is amazingly accurate—it has a resistance of 200,000 ohms. The voltage scale registers up to 400 volts. In fact the ROTAMETER is a complete testing set in one handy-sized bakelite case.

Ask your dealer to show you one now, or write for fuller details to PIFCO LTD., Shudehill, Manchester, or 150, Charing Cross Road, London, W.C.2.



# 9 SEPARATE METERS IN ONE ROTAMETER-DE-LUXE

- 1 —0.5 volts.
- 2 —0.20 volts.
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- 6 —0.50 milliamperes.
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- 8 —Resist/valve test.
- 9 —Plug-in test for valves.

Without question the finest radio testing instrument in the world to-day. Entirely self-contained, it is a complete testing and radio research laboratory in miniature. Every conceivable test can be made with this amazing instrument. Size of each dial 1 1/2" x 9/16". Finished in black bakelite, complete with leads and fitted in handsome velvet-lined case.

42/-

Adapter sockets for use in testing 7 and 9 pin valves are now available. Price 3/-

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- 1 —0.8 volts. For low-tension voltage test.
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- 5 —0.20 M.A. For individual valve test.
- 6 —0.100 M.A. } For testing current taken by total valves in set.
- 7 —0.250 M.A. }
- 8 —FILAMENT AND RESISTANCE TEST (4,000 ohms.) For D.C. and rectified A.C.
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Radio testing is made easier, quicker and more accurate by the Pifco ROTAMETER. Any one of eight dials are brought into view by turning the octagonal knob at the side of the instrument. Size of each dial 1 1/2" x 1". Convenient in size and of amazing accuracy. Finished in black bakelite, complete with leads, in velvet-lined case.

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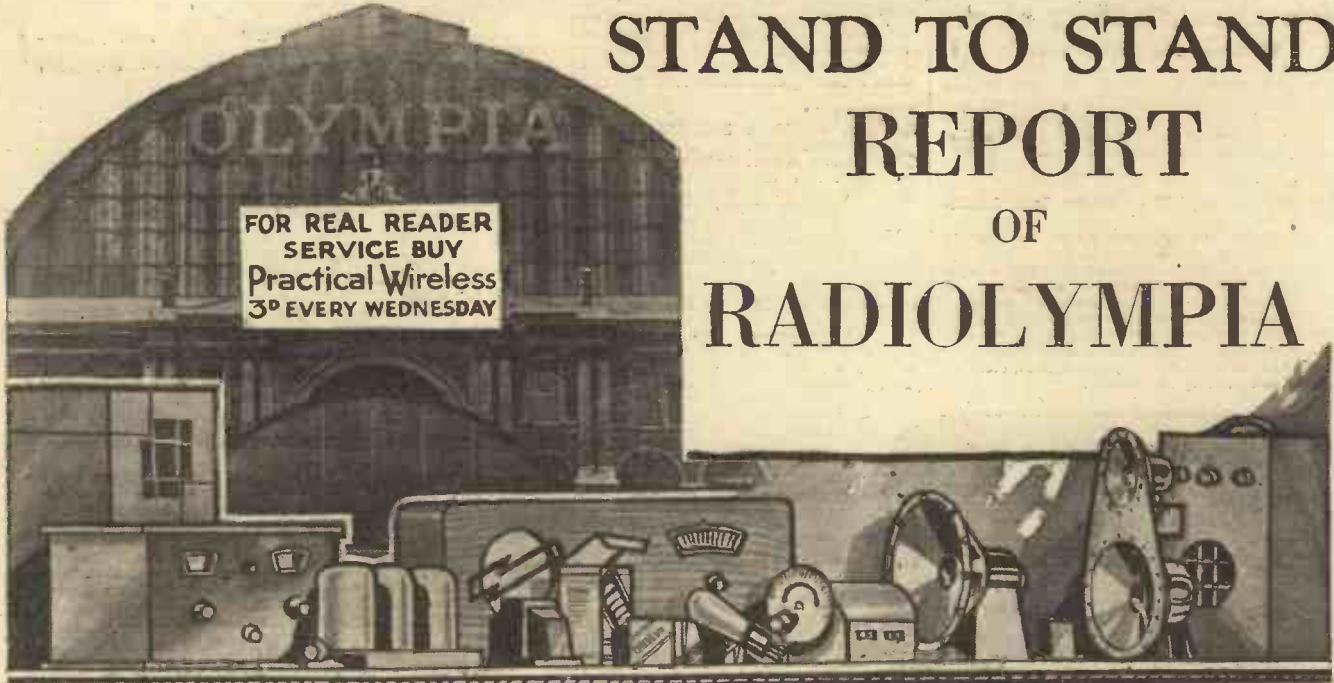
PIFCO

# ROTAMETERS

PIFCO ON THE SPOT WILL TRACE YOUR TROUBLES LIKE A SHOT

# STAND TO STAND REPORT OF RADIOLYMPIA

FOR REAL READER  
SERVICE BUY  
Practical Wireless  
3<sup>d</sup> EVERY WEDNESDAY



## DETAILS OF EXHIBITS OF OUTSTANDING INTEREST ON EACH STAND — BY THE TECHNICAL STAFF.

**STAND No. 1**  
**WRIGHT & WEAIRE, LTD., 740, High Road,**  
**Tottenham, London, N.17.**

THE range of coils shown by Messrs. Wright & Weaire seems to form the centre of attraction on this stand. The vast range which is covered by these coils, from the simple air-core dual-range coil to the latest iron-core suitable for use with the new octode and similar types of frequency-changer, enables the constructor to choose a coil to suit any type of circuit. In addition, the new I.F. transformers and other components, in which the new insulating material "Mycalex" is employed, also gives the constructor a new hope for experiment during the coming months. In addition to the coils, all the other accessories shown



A useful testing instrument which has been added to the range of Avo-Instruments.

on this stand give a good idea of the resources of Messrs. Wright & Weaire in designing and manufacturing high-class components for the home constructor who wishes to make up a receiver to give really high efficiency at a minimum of expense.

**STAND No. 2**  
**AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD., Winder House, Douglas Street,**  
**London, S.W.1.**

THE novel testing instruments, the Avominator, the Avometer, and others form a novel setting, and by the crowds which always surround the stand it would appear that at last the home constructor has realised the necessity for obtaining really good testing instruments if he wishes to carry out tests and experiments which are of prove of value to him. The novel Avodapter, which enables the various voltages and currents to be measured whilst a valve is function-

ing in a circuit, also attracts attention, and the new pattern, designed for use with 7-pin valves, shows how the need has arisen for an extension of the range of this type of accessory. In addition, the coil winding apparatus, principally of interest to the manufacturer, gives the visitor some idea of the work which is involved in the manufacture of the simple tuning coil.

**STAND No. 3**  
**C. F. & H. BURTON, Progress Works, Bernard Street, Walsall.**

THIS stand also devotes the majority of its space to an exhibition of components especially designed for the use of the home constructor. Some ingenious accessories may be seen, and the interest evinced in some of the items shows that the home constructor is becoming still keener in his knowledge regarding the why and the wherefore of the various parts which he utilizes.

**STAND No. 4**  
**CENTRAL EQUIPMENT LTD., 188, London Road,**  
**Liverpool.**

THE ingenious no-mast aerial no doubt causes many listeners to wonder whether it is still worth while putting up with the unsightly prop at the bottom of the garden. In addition, the earth device and the interest which everyone seems to show in these accessories speaks well for the results which will be obtained in the coming months if the majority decide to overhaul the aerial and earth system.

**STAND No. 5**  
**DE LA RUE & CO., 90, Shernhall Street, London,**  
**E.17.**

THE interesting range of mouldings, etc., which are shown on this stand give the visitor some idea of the extensive branches which are covered in the manufacture of radio apparatus.

**STAND No. 8**  
**GEO. NEWNES, LTD., 8-11, Southampton Street,**  
**Strand, London, W.C.2.**

MANY old friends called upon us at Stand No. 8 during the week, and we also made many new friends. It was surprising how many readers seemed to find the time to call and thank us for the various hints or knowledge which they had acquired from our publications, and many stated that they had only come to the exhibition in order to make our acquaintance. Great interest was shown in the model receivers which were on show, and the staff were kept very busy answering technical queries. We received dozens of requests for articles of various types, and careful note has been made of all the desires of our readers, and we shall endeavour to please everybody during the coming year by catering for them in the manner they desire. We must thank those readers who were unable to see for their good wishes.

**STAND No. 9**  
**HAYNES RADIO, 57, Hatton Garden, E.C.**

SOME high-class examples of receivers and amplifiers are shown on this stand, and the kits which are made up for the home constructor, in which special tool-cut metal chassis are employed, enables the constructor to build up a unit having the

appearance of the commercial product, but with the added advantage of the "hotting-up" which only the individual touch can produce.

**STAND No. 11**  
**PLEW TELEVISION, LTD., Waddon, Croydon.**

HERE at last is the home-television receiver, and by the enormous interest which is displayed it is obvious that the public is definitely television-minded. The receivers produced by this company have shown that it is possible to obtain a satisfactory television apparatus at a really competitive price and a number of novel features have been included in the receivers. A new type of lamp, simple "focusing" adjustments, and a perfect synchronizing gear render the reception of a picture as simple as the tuning in of a modern broadcast station. In addition, the provision for the reproduction of a "bottled" television transmission from a gramophone record will enable some interesting experiments to be carried out by the home constructor who is, for any reason, unable to make use of the normal television transmissions.

**STAND No. 13**  
**A. DIGGLE & CO., Reliance Works, Jane Street,**  
**Rochdale, Lancs.**

ALTHOUGH primarily of interest to the shop-keeper or service agent, the various types of charging plant which are seen on this stand interested

For the flat-dweller this type of aerial has many advantages to offer. This model is manufactured by the Central Equipment Ltd., and is known as the No-Mast Aerial.



## STAND TO STAND SHOW REPORT

*(Continued from previous page)*

the home constructor who is unable to charge his own accumulator. It is interesting to be able to see how it is done, and the plant gives some indication of the care which can be exercised in such a small matter as recharging a simple 2-volt accumulator.

**STAND No. 14**  
**ERIE RESISTOR CO., LTD.,** Waterloo Road, Cricklewood, N.W.

IN addition to the resistors which are already well known, a number of new components are seen on this stand. The new potentiometer or volume control shows that the problem of a noiseless and accurate control had been seriously tackled and overcome. In addition, the suppressors designed for use with car-radio equipment shows that this branch of radio is now becoming popular, and that the difficulty of eliminating the noise from plugs, magneto, etc., has been overcome. A very fine exhibit.



*This Television receiver, made by Plew Television, brings the low-priced television instrument to the listener.*

**STAND No. 17**  
**NOVO RADIO-ELECTRIC, LTD.,** Novo House, 34, Lovaine Place, Newcastle-on-Tyne.

THE novel receivers shown on this stand prove attractive to the visitor who is looking for originality. The circuits employed in the receivers are entirely up to date, and the cabinet work and general design reaches a high degree of workmanship and strikes a novel note in many directions.

**STAND No. 18**  
**EDISON SWAN ELECTRIC, LTD.,** 155, Charing Cross Road, W.C.2.

A REAL mine of knowledge is stored away on this stand, and the visitor finds much to interest him. From the smaller accessories, including the well-known B.T.H. pick-up, to the large cathode-ray apparatus there is something for everybody to be seen. Batteries, the well-known Mazda valves, the popular Reisz Kellogg loud-speakers, and other items are introduced to many for the first time, but to the older experimenter these show that there had been little modification in design and that these items still hold their supreme position in the various fields which they represent.

**STAND No. 19**  
**ACE RADIO, 2a, West Arbour Street, London, E.1.**

THE range of universal (A.C.-D.C.) receivers exhibited on this stand give an indication of the manner in which the problem of the two types of supply has been overcome. These receivers may be plugged into either A.C. or D.C. mains, and they function efficiently on each supply without any modification. All risks of a change-over are therefore removed, and the traveller or the resident in a district which might be changed at any moment may thus purchase one of these receivers without any worry.

**STAND No. 20**  
**CONSOLIDATED RADIO CO., LTD.,** Warple Way, Acton, W.3.

BEARING the identification term "Ranger," the receivers seen on this stand may be safely held to range throughout the ether. There is a type for everyone, from the simple battery receiver to the elaborate radio-gramophone.

**STAND No. 21**  
**BRITISH PERMEL ENAMELLED WIRE, LTD.,** Charlton, S.E.

THE various types of wire which are used in "wireless" are seen to advantage on this stand, and attract considerable interest. Nowa-

days so many components are hidden away beneath screening cans that the listener does not give much thought to the various types of instrument wire which are employed in the components, and therefore this stand attracts quite a considerable amount of interest.

**STAND No. 22**  
**LAMPEX RADIO & ELECTRIC CO.,** 62, Brewery Road, London, N.7.

SOME novel cabinet designs are to be seen on this stand, and the receivers exhibit range from simple circuits to right up-to-the-minute superhets. The very modern bird's-eye maple is seen in some of the cabinets on this stand, and there is no doubt that this type of wood will become very popular in the future, owing to its clean and intriguing appearance.

**STAND No. 24**  
**HEYBERD & CO.,** 10, Finsbury Street, London, E.C.

MAINS apparatus sums up the exhibits on this stand, although the range which is covered is really marvellous. From the simple by-passing condenser to the most elaborate charging plant, Messrs. Heyberd can supply practically any item required for use on the mains. Transformers, chokes, complete mains eliminators, trickle chargers, rectifying units, etc., all form a most interesting display, and the interesting circuit details which are obtainable from this firm will enable many to modify their receivers so as to take full advantage of the mains supply.

**STANDS Nos. 25 and 26**  
**THE EVER READY CO. (GT. BRITAIN), LTD.,** Hercules Place, Holloway, London, N.7.

BATTERIES for all purposes, from the small flash-lamp cell to the super-capacity H.T. battery, and accumulators of various types are seen on this stand. The name of Ever Ready is, of course, well known in this connection, and the exhibit attracts considerable attention and interest.

**STAND No. 27**  
**HIGH VACUUM VALVE CO.,** 113, Farringdon Road, London, E.C.

THE new A.C. mains valves attract many visitors to this stand, and the complete range of Hivac valves, at modest prices, leads many to decide to replace their old valves with more up-to-date ones and thus obtain a new lease of life from their receivers. The novel Class B plus driver valve will no doubt also introduce to many the advantages of this type of output for a battery receiver and so lead to improved results.

**STAND No. 28**  
**CELESTION, LTD.,** London Road, Kingston-on-Thames.

THE range of loud-speakers shown here proves very attractive, and in addition to the neat cabinet types of reproducer, the large auditorium speaker and the pick-up also receives much attention from visitors. The dual-balanced units are also the subject of many comments by the "quality" fans, and it is quite interesting to hear the remarks of these visitors regarding the utility of a dual speaker.

**STAND No. 29**  
**PARTRIDGE, WILSON & CO.,** Davenset Works, Evington Valley Road, Leicester.

THE range of battery chargers forms a most interesting exhibit, and the ingenious manner in which compactness has been combined with utility, and the safety device incorporating the automatic overload switches proves quite attractive. In addition, the complete range of Davenset plants, electric shop signs and other accessories form an attractive setting. The constructor will find much to interest him in the range of mains transformer and smoothing chokes.



*This Lampex "Unifive" receiver possesses novel features in circuit and cabinet design.*

**STAND No. 30**  
**STRATTON & CO., LTD.,** Eddystone Works, Bromsgrove Street, Birmingham.

THE short-wave listener is attracted to this stand and finds a great deal to interest him. Apart from the complete range of short-wave apparatus, such as coils, tuning condensers, insulators, etc., the complete receivers are highly interesting. The cabinet construction, which is designed to withstand tropical climates, shows how the manufacturer has to contend with severe changes in temperature and also demonstrates that the English manufacturer has not overlooked the advantages of the colonial markets. A fine exhibit.

**STAND No. 32**  
**A. J. BALCOMBE, LTD.,** 52-58, Tabernacle Street, E.C.2.

THE fine range of Alba receivers on this stand well repays an examination. From the simple battery receiver to the most elaborate mains radio-gramophone, the cabinet work as well as the circuit designs have obviously been the result of much experimental research.

**STAND No. 34**  
**GENERAL ELECTRIC COMPANY,** Magnet House, Kingsway.

THE G.E.C. trade mark is sufficient indication of the type of apparatus which is seen on this stand, and the range of receivers and loud-speakers is very attractive. Some interesting circuits are revealed in some of the receivers, and the cabinet work strikes a novel note in many respects. In addition to the complete receivers the loudspeakers, the A.C./D.C. conversion units, the home broadcaster, the gramophone, motors, and the H.T., G.B., and L.T. batteries also make a splendid display on the G.E.C. stand.

**STAND No. 35**  
**SUNBEAM ELECTRIC, LTD.,** Park Royal Road, North Acton, N.W.10.

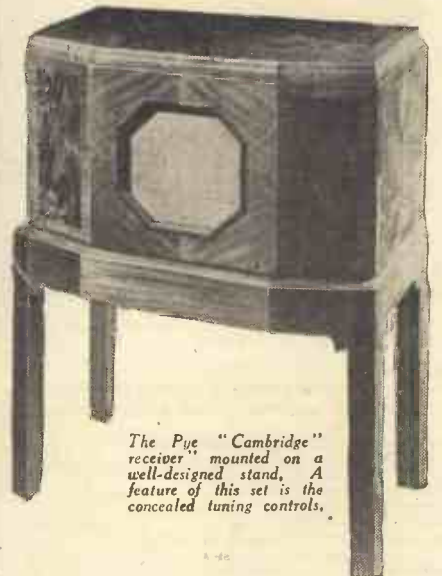
UNDOUBTEDLY the centre of attraction on this stand is the Midget receiver. All the receivers (except car radio) manufactured by this company employ the universal mains circuit suitable for A.C. or D.C. without alteration, and in the Midget they have included a most elaborate receiver in the smallest space possible. We do not doubt but that this type of receiver will be very popular in the coming year.

**STAND No. 36**  
**HALCYON RADIO, LTD.,** 83a, Valetta Road, Acton W.3.

PRODUCTS of really high class appear on this stand, and include three- and four-valve battery receivers, a nine-stage seven-valve A.C. radio-gramophone and some novel universal receivers and radiograms. The "bureau" lines of the 7-valve superhet attract a considerable amount of attention, and the two tuning controls form a novel departure from the usual style of receiver.

**STAND No. 37**  
**TELEGRAPH CONDENSER COMPANY, LTD.,** Wales Farm Road, North Acton, W.3.

THE green-cased condensers reveal the identity of this stand at a glance and the home-Constructor is already very familiar with the high grade of component which bears the T.C.C. trade mark. The exhibit is tastefully arranged, and in addition to the smaller condensers with which the home constructor is so familiar, the large transmitting and high-voltage condensers, which are tested up to 80,000 volts, and which are employed in broadcasting stations in many



*The Pye "Cambridge" receiver, mounted on a well-designed stand. A feature of this set is the concealed tuning controls.*

STAND TO STAND SHOW REPORT

(Continued from previous page)

countries, are good examples of the range of products which this firm manufactures. The interference suppressor is a component which is coming in for a good



In this splendid piece of cabinet work—a Halcyon product—the sloping baffle and bookcase form interesting departures from normal design.

deal of interest at the present time, and the T.C.C. component is a most useful accessory for this purpose. A new model is seen on the stand which retails at 18/6, and no doubt will find a large sale during the coming season.

STAND No. 38. COLVERN, LTD., Mawneys Road, Romford, Essex.

A FINE display of the Ferrocart components shows how this type of powder-iron core coil has been developed. In its latest form the bakelite housing has been considerably modified, and although the actual coil windings are unaltered, the new moulding renders the coils more robust and they may even be employed in tropical receivers without any risk of changing characteristics. The I.F. transformers and the complete range of coils and tuning pack, complete with variable condensers, make a very fine display.

STAND No. 39. THE NEW LONDON ELECTRON WORKS, East Ham, London.

THE new Globe aerial attracts a considerable amount of attention on this stand and the claims of the manufacturers show that it might have great possibilities. In addition to many other interesting lines, such as the Electron wire, the insulator pins, and so on, formed a very novel and instructive display.

STAND No. 40. DARWINS, LTD., Fitzwilliam Works, Sheffield.

THE large range of magnets which are used for the construction of loud-speakers forms a most interesting display. The various patterns in which these magnets are obtainable and the sections showing their construction enables many visitors to gain some idea of the work which is involved in this type of accessory.

STAND No. 41. BELLING & LEE, LTD., Cambridge Arterial Road, Enfield.

THE many new lines which Messrs. Belling-Lee have to exhibit attract the thousands of home-constructors who visit the exhibition. Not the least interesting feature of the exhibit is the announcement that many lines have been reduced in price, and from the smallest wauder plug to the various types of interference suppressor, a most interesting collection of components is on view. The arrival of the new universal valves has led to a demand for new valve-holders and new types of connector for the top cap, and these have obviously been added to the Belling-Lee range.

STAND No. 42. THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tarrif Road, Tottenham, N.17.

THE Magnavox speakers form the centre-piece of this display, and the new Double Six gives a very good impression. It is, of course, unfortunate in one respect that the broadcast programme cannot be tuned in, but the relayed music enables one to form a very favourable impression of the response of this model. The provision of the silk-fronted dust-bags, which enables the Magnavox speakers to be mounted direct on a baffle without any further silk backing, makes a novel feature of these speakers. The smaller accessories, such as the valve-holders, transformers, etc., also repay examination.

STAND No. 43. SONOCHORDE REPRODUCERS, LTD., Rohermel House, Canterbury Road, N.W.6.

THE peculiar appearance of the piezo-crystal and ordinary moving-coil balanced pairs attracts many to this stand, and the large range of loud-speakers well repays examination. In addition there may be seen here some new pick-ups and microphones in which the Rochelle salt principle is utilized. The Sonochorde speakers are seen in many sizes, from the interesting little midgets to the large auditorium models suitable for public-address work.

STAND No. 44. KINGSWAY RADIO, LTD., 3 to 9, Dane Street, High Holborn, W.C.1.

THE Simpsons electric turntable appears on this stand, and many constructors were pleased to note that this accessory has not disappeared from the market. The advantage of the one-hole fixing, and the avoidance of any form of speed regulating device, makes this turntable a useful accessory for the home constructor.

STAND No. 45. R. H. DENT (ARDENTE), Oxford Street, London, W.1.

THIS is Messrs. Dent's first appearance at the Radio Exhibition, and although known principally for the deaf aids, they have some other apparatus to exhibit. Their experience in the design of this type of apparatus has enabled them to develop some useful public-address apparatus and amplifiers, and they have also fitted a large number of cinemas with reproducing apparatus to enable deaf persons to obtain the benefit of the "talkies."

STAND No. 47. S. SMITH & SONS (M.A.), LTD., Cricklewood Works, London, N.W.2.

THIS attractive stand is devoted to a novel display of accumulators and the well-known Anodex batteries. They are very attractively displayed and it



A dual pair of Rola speakers designed to give a full overall response.

is noted that a new range of improved batteries has appeared for the first time. Batteries for all purposes and at prices to suit every pocket are to be seen and the complete range is very exhaustive.

STAND No. 48. THE BRITISH ROLA COMPANY, LTD., Minerva Road, Park Royal, London, N.W.10.

THE new features in the Rola speakers, by means of which dust is definitely excluded from the gap, and the new corrugated diaphragm prove very interesting. This is a fine exhibit, and a most interesting range of models may be seen, extending from the midget permanent magnet type to some very fine cabinet models. The dual balanced pairs are a novel

feature in the Rola range and eight separate types are listed.

STAND No. 49. THE BRITISH N.S.F., 188-189, Strand, London, W.C.2.

THESE components have appeared for the first time, and are now being handled by Messrs. Wingrove and Rogers. They cover a most exhaustive range and have been used for many years by complete receiver manufacturers. Fixed condensers, tubular condensers, volume controls, etc., provide a further range of components from which the home constructor can choose his accessories.

STAND No. 51. MULTITONE ELECTRIC CO., LTD., 95-98, White Lion Street, London, N.1.

IN addition to the tone-control transformers which have been made famous by Messrs. Multitone, the deaf-aid set proves very instructive. This has been developed to such an extent that it is being used in many institutions and schools for the deaf and it is a very valuable aid. The control of the higher frequencies in this, after the manner of the control on the ordinary transformers which Messrs. Multitone have introduced, forms the basis of the aid to the deaf and it is most effective in its operation. In addition, the Q.P.P. transformers (with tone control), the Class B transformers and converter are also the subjects of much interest.

STAND No. 53. REPRODUCERS & AMPLIFIERS, LTD., Frederick Street, Wolverhampton.

THE fine range of loud-speakers forms a most attractive setting, and it will be seen that there are some new lines being shown for the first time. Amongst these is the Multimu, which is, of course, used in our Armada receiver, and this speaker enables any output valve to be accurately matched. There are only two models to be seen from last year's list and all the remainder are entirely new lines. A number of interesting features are included in these speakers, and they are most robust and reliable in every way.

STAND No. 54. GARRARD ENGINEERING & MANUFACTURING CO., LTD., Swindon, Wilts.

THE gramophone motor appears on this stand in many forms. Ordinary clockwork mechanism is still required for many purposes, but in addition to this type of motor, Messrs. Garrard have also produced some very efficient electric motors, together with complete playing tables, including a pick-up which enables a radio-gramophone to be quickly constructed. The automatic record-changer is also a feature which will undoubtedly become increasingly popular.

STAND No. 56. CLIMAX RADIO ELECTRIC, LTD., Haverstock Works, Parkhill Road, Hampstead, N.W.3.

A VERY complete range of receivers is shown by Messrs. Climax, and in both circuit design and cabinet work they are extremely up to date. The double tuning escutcheon on some of the models strikes a new note, and the 4-valve Class B receiver attracts the battery-user, and shows that the battery set can still be made a most useful proposition.

STAND No. 57. BEETHOVEN RADIO, LTD., Beethoven Works, Great College Street, Camden Town, N.W.1.

COMPLETE receivers in many types are shown here, and great interest is evinced in the battery models in which the very latest circuits are utilized. The portables for which Messrs. Beethoven have become noted have been re-designed and brought up to date and still prove very popular.



Some interesting points are to be observed in this public address amplifier, which is made by the manufacturers of the "Ardenite" Deaf-aid.

## STAND TO STAND SHOW REPORT

(Continued from previous page)



A neat example of a compact superhet. The Beethoven Model 56.

**STAND No. 59**  
**GRAHAM FARISH, LTD.**, Masons Hill, Bromley, Kent.

THE once-famous Formo products appear again at the exhibition, and these are now being manufactured by the New Formo Company—a branch of Graham Farish. It is interesting to note that all the items which are manufactured by this company are produced for the home constructor only, and are not even available for set manufacturers. Thus, these components are developed especially for their high efficiency and their suitability for home constructors, and they function in a most admirable manner. The original Formodensator is still foremost as a pre-set condenser, and in addition there are the new transformers, chokes, condensers, tuning coils, and other items too numerous to mention.

**STAND No. 60**  
**McMICHAEL RADIO, LTD.**, Slough, Bucks.

IN addition to the famous Duplex Transportable, there are a number of other old friends on this stand. The portable has still further been improved, and the twin-speaker console receiver is also a most interesting item on this stand. In both cabinet work and circuit design these receivers are entirely up to date.

**STAND No. 61**  
**GRAMOPHONE CO., LTD.**, Hayes, Middlesex.

IN addition to the elaborate radio-gramophones in which the H.M.V. company have produced, there is an extensive range of smaller receivers, in which the fluid-light tuning device forms quite an interesting factor. The popular pick-up is also seen on this stand, and the chassis of some of the receivers gives visitors a good idea of the work which is involved in building up sets of this nature, whilst the average listener would no doubt hesitate to try to locate a fault in the maze of wiring which is included in these receivers. The method of colour coding the wires, however, enables the circuits to be easily traced out when once understood.

**STAND No. 62**  
**PHILIPS LAMPS, LTD.**, Charing Cross Road, London, W.C.2.

SOME very fine examples of complete receivers are shown on this stand, and it is interesting to note that in at least one case Messrs. Philips have utilized the superhet circuit. Hitherto, this firm has specialized in the use of multi-tuned circuits in preference to the superhet feature, and the super-inductance feature, as it is called, still forms the basis of the major part of their equipment.

**STAND No. 63**  
**AMPLION (1932), LTD.**, 82, Rosoman Street, E.C.

THE all-electric table model superhet, in which all the latest circuit improvements, such as the octode frequency changer, etc., have been incorporated, forms the centre of attraction on this stand, and the new loud-speakers, such as the Lion also attract interest. The Lion, which is the latest addition to the Amplion range, is one of the modern speakers, designed in the full light of modern technical knowledge, and gives promise of a very popular life.

**STAND No. 64**  
**ORR RADIO, LTD.**, 79a, Parkhurst Road, N.7.

A VERY fine range of receivers forms the basis of this exhibit. Circuits of the latest type, cabinets and layout designed in the most modern fashion, and certain items of novelty attract much attention. The "Fisherman's" set, designed primarily for use on trawlers and yachts, shows that attention has been given to markets which as yet have not received the attention they deserve, and the wave-band covered, namely 100 to 200 metres offers a number of interesting transmissions.

**STAND No. 65**  
**MULLARD RADIO VALVE CO.**, Mullard House, Charing Cross Road, London, W.C.2.

THE usual Mullard stand is easily picked out in the Exhibition, and in addition to the vast display of valves, the large models have a story to tell. Obviously the very latest valves attract the major part of the visitor's attention, especially the octode with its six grids, all arranged one above the other. In addition to this part of the exhibit, however, the new receiver, the M.B.3, proves a popular item. This is the first receiver to be manufactured by the Mullard people, and it employs three pentodes in the popular S.G., detector, and L.F. circuit. Reaction has been eliminated, and thus there are only two controls—a tuning control and a volume control—the latter combining the function of an on/off switch. As this receiver is designed for the battery user it should prove a very popular item during the coming season.

**STAND No. 66**  
**GENERAL ELECTRIC CO. LTD.**, Magnet House, Kingsway, London, W.C.2.

A FURTHER display of G.E.C. apparatus is seen on this stand, and proves as attractive as the exhibits on this company's other two stands.



Two interesting components which have been added to the Graham Farish range. The "Max" and the "Quip" Transformers.



**STAND No. 67**  
**ULTRA ELECTRIC LTD.**, Erskine Road, Chalk Farm, N.W.3.

THE popular clock-dial tuning scales which were introduced by the Ultra firm, and which have been extensively copied, give the receivers on this stand a very pleasing appearance. The circuits employed in the receivers, as well as the general arrangement of the cabinet, etc., fully meets modern day requirements, and the prices, too, are well in keeping with the present tendency.



**STAND No. 68**  
**AERODYNE RADIO LTD.**, Aerodyne Works, Walthamstow, E.17.

SEVEN different models, from the 3-valve battery receiver to the 4-valve Universal A.C./D.C. are to be seen on this stand and cover all types of design. A 4-valve Class B receiver, a 4-valve A.C. mains band-pass receiver, a 5-valve superhet, and others are built entirely on the modern style with H.F. pentodes, heptodes, and other improvements which have been introduced during the last season.

**STAND No. 69**  
**PYE RADIO LTD.**, Granta Works, Cambridge.

RADIO receivers and radio-grams in ultra-modern cabinets, in which no controls or external switches of any kind are visible, strikes an entirely novel note on this stand. The wireless set is completely disguised, and no doubt to many listeners this style of receiver represents perfection in home broadcast equipment.

**STAND No. 70**  
**FERRANTI LTD.**, Hollinwood, Lancs.

IN addition to the many receivers which Messrs. Ferranti have to exhibit are to be seen a number of new components produced especially for the home constructor. The L.F. transformers, mains transformers, chokes, and similar items have been, for many years, very popular items among home constructors, but Messrs. Ferranti have now added to the component range by including smaller items, such as fixed condensers, electrolytic condensers, resistances of the moulded type, variable resistances, and volume controls, etc., and the stand attracts many constructors who are undoubtedly pleased to note this increase in the products available for their use.

**STAND No. 71**  
**PORTADYNE RADIO**, Gorst Road, North Acton, N.W.10.

THE 6-valve transportable superhet attracts considerable attention to this stand, and the display of receivers is very tastefully arranged. The range of battery-receivers shows that this type of apparatus is still finding a ready market in spite of the low price at which some mains receivers may be obtained.

**STAND No. 72**  
**E. K. COLE LTD.**, Southend-on-Sea.

THE perfection which has been obtained in the design of moulded bakelite cabinets has enabled Messrs. Cole to produce some really elaborate cabinets for their receivers, and the latest model, in which the cabinet takes on a round shape, with the tuning dial occupying the whole of the upper half, is probably the most unusual exhibit at Olympia. Greatly improved ease of tuning is obtained in this model, and the tuning scale has certainly received a great deal of attention from the Cole engineers. The entire range of mains units, too, attracts a considerable amount of attention, and the home constructor and listener who wishes to operate a battery receiver from the mains can find a unit to suit his requirements from the Ekco range.

**STAND No. 73**  
**A. C. COSSOR LTD.**, Cossor Works, Highbury Grove, London, N.5.

THE display of valves seems to occupy the attention of visitors as much as the complete receivers, and it is certain that the entire display is of a most interesting nature. Apart from these parts the cathode-ray apparatus also proves interesting, the novel neon tuning indicator provides another useful accessory to add to receivers where A.V.C. is fitted, and will still further increase the interest of the experimenter. Television with the aid of the Cossor cathode-ray apparatus also appears to find many adherents.

(Continued on page 679)



The novel Amplion Lion loud-speaker, and a new receiver which has many novel points.

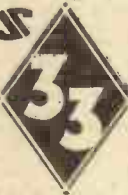
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- **WORKS ON ANY ELECTRIC MAINS (A.C. or D.C.) 150 to 250 volts without adjustment.**



This amazing new set has been designed to give the very finest possible reproduction. It is selective, easy to tune and of handsome appearance.

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The LOTUS **44**

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Variable Mu H.F. pentode. H.F. pentode detector. Output pentode. Mains energised moving coil speaker. Provision for gramophone pick-up. Works on any electric mains (A.C. or D.C.) of 150 to 250 volts. Handsome inlaid modern cabinet in walnut and avodiré.

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## The R & A "MULTIMU"

has been selected because of its amazing performance, due to the incorporation of 'Impedance Tuning,' and an entirely new magnet system.

Be guided by this and make the MULTIMU your choice, the best of its class and 12 months ahead of competitors—as usual!

- ★ New Magnet System gives amazing Sensitivity
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THE R & A MULTIMU gives instantaneous matching from 1 to 40,000 ohms, the unique 'Impedance Tuning,' enabling the reproducer to be instantaneously and permanently tuned to the receiver as accurately and simply as the receiver is to the broadcast station, regardless of make or type of output.

The MULTIMU magnet system is entirely new, and the sensitivity is even greater than many field excited moving coil models, giving unequalled brilliance and attack in reproduction.

Whatever type of receiver you own or may ever own—the MULTIMU as principal or extension reproducer will give you a brilliance of performance which must be heard to be believed, whilst ownership will compel a pride in possession never before experienced.

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The ever-moist 'earth' with maximum contact area through patent spreading antennae. No metal terminals to corrode or break away—the 8ft. lead-in is an integral part of every "Siltit" earth. Completely efficient in any soil and any climate.

COMPLETE WITH 10/6 ALL FITTINGS

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NATIONAL RADIO EXHIBITION, OLYMPIA 1934  
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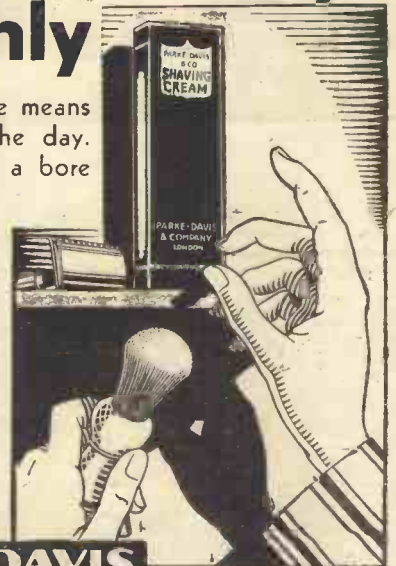
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**STAND TO STAND SHOW REPORT**  
(Continued from page 676)

**STAND No. 74**  
**RADIO GRAMOPHONE DEVELOPMENT CO. LTD.,**  
18, Frederick Street, Birmingham.

**E**LABORATE Radio-gramophones, designed round the highest quality circuit arrangements, are to be seen on this stand. Apart from the interesting cabinets, and the utilisation of twin speakers it will be noted that at least one model employs no less than 12 valves. In one model a two-stage paraphase coupled push-pull amplifier is employed to deliver an output of 6 watts.

**STAND No. 75**  
**TELSEN ELECTRIC CO. LTD.,** Aston, Birmingham.

**T**HE name of Telsen has for long been associated with components and complete receivers, and a very fine display is seen on this stand. The range of



The novel appearance of the clock and the tuning dial strike a new note in this Aerodyne receiver.

components is almost too numerous to describe, and includes such items as L.F. transformers, mains transformers smoothing chokes, H.F. chokes, tuning coils, superhet accessories, reaction and tuning condensers, and so on. In the complete receiver line some novel features are to be seen, in particular the ingenious tuning dial which employs an accurate tuning indicator.

**STAND No. 76**  
**MARCONIPHONE CO., LTD.,** 210-212, Tottenham Court Road, London, W.1.

**T**HERE is on this stand literally a set for every purpose, and no person, whatever his or her circumstances, need be without one.

There are three different types of battery receiver, one 3-valve, one 5-valve, and one 6-valve, which are capable of giving the most excellent performance in any part of the British Isles. There are five table mains superheterodyne receivers and no less than seven radio-gramophones, four of which are fitted with automatic record-changing mechanism.

There are actually two absolutely new instruments which are being introduced for the first time at Olympia, i.e., the 239 A.C., which is a 5-valve superheterodyne radio-gramophone, with automatic record changing mechanism, and the 292 A.C., which is a 9-valve superheterodyne, with automatic record changing mechanism. These two instruments contain many refinements—incorporating modern ideas, and altogether, with the other instruments, complete a range which is absolutely second to none.

There are also the well-known Marconiphone loudspeakers and pick-up on view at this stand.

**STAND No. 77**  
**SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD.,**  
38-39, Upper Thames Street, London, E.C.4.

**A**S might be expected, the exhibits on this stand are principally dry batteries of every conceivable type and capacity. There is a range of replacement batteries for every make and type of well-known commercial receiver, besides very many more of general application. An item of especial interest just now, when television is coming very much to the fore, is a special 300-volt dry battery for cathode-ray tube operation.

In addition to the dry batteries, Messrs. Siemens are showing a representative selection of accumulators.

**STAND No. 78**  
**HELLESENS, LTD.,** Morden Road, South Wimbledon, London, S.W.9.

**T**HIS stand is devoted entirely to the well-known HelleSENS' dry batteries, which are available for almost every purpose. Of chief interest will be

those types which are for H.T. purposes, and in this class there are replacement units suitable for use in any and every type of receiver, either commercial or home-made.

**STAND No. 80**  
**RADIO INSTRUMENTS, Purley Way, Croydon.**

**A** COMPLETE 3-gang superhet pre-selector and oscillator tuning chassis, using "Micrion" coils, is a special feature here. A new "Micrion" H.F. transformer, similar in appearance to the well-known adjustable inductance coil, is also being shown in conjunction with a "Micrion" H.F. choke, a new L.F. transformer with bi-ferous core, the usual range of short-wave converters, etc. No less than seven different models of the popular R.I. receivers are to be seen, among which are the following: "Ritz" twin-speaker, 5-valve, A.C. superhet; "Ritz" 9-stage, 5-valve superhet; "Ritz" 8-stage, 4-valve battery superhet, and the R.I. "Micrion" Battery Three.

**STAND No. 81**  
**BURNDIPT, LTD.,** Light Gun Factory, Erith, Kent.

**T**HE exhibits on this stand consist of receivers of particularly high grade. There is a wide range, from an A.C. mains superhet, at 18 guineas, to a magnificent A.C. or D.C. radiogram at 32 guineas. The latter is not the only universal model, however, and it is interesting to find several receivers of this modern type. All the Burndipt receivers are designed to give reproduction of a particularly "true" nature, and with this object in view every model is fitted with dual speakers mounted at appropriate angles so as to give a correct "floodlighting" effect, instead of a narrow "beam" of sound.

**STAND No. 82**  
**BUSH RADIO, LTD.,** Film House, Wardour Street, London, W.1.

**T**HERE are four different superheterodyne models to be seen on this stand, including one for battery operation. They range in price from £10 19s. 6d. to £16.



The new Electron globe aerial.

**STAND No. 83**  
**LISSEN, LTD.,** Worppe Road, Isleworth, Middx.

**T**HIS year Messrs. Lissen's exhibits are confined chiefly to receivers of the medium and low-price types. A new model which will be of especial interest is a new three-valve band-pass set. It is available for either A.C. or battery operation, the prices being £9 15s. and £8 10s. respectively. Another item which will appeal strongly to home constructors is the latest "Skyscraper" kit; this is available in various forms, all of which are eminently modern. The kit chassis for the "Skyscraper" 3 costs only 77s. 6d., whilst



the price of the A.C. version is £6 10s. Car-radio receivers are prominently displayed on this stand, and these are sure to evoke considerable interest, for they are particularly advanced design and have already achieved a considerable amount of popularity. In addition to complete receivers and



A new note in cabinet design. Another Lissen product.

kits, there is also a wide range of Lissen components, which have been popular favourites for very many years. Altogether, Lissen's exhibits will appeal strongly to the constructor and to every wireless enthusiast.

**STAND No. 84**  
**KOLSTER-BRANDES, LTD.,** Sidcup, Kent.

**R**ECEIVERS of every type and for every purpose and at every price is truly descriptive of the excellent range displayed on this stand. There is a three-valve "New Pup" with many interesting features and having a tuning range from 200-600, and from 1,000-2,000 metres, at £5 15s. complete, to a remarkable 8-valve A.C. superheterodyne radiogram at 65 guineas. The latter is fitted with dual speakers, and has full automatic volume control, noise suppression, neon tuning, automatic record changer, illuminated wavelength-calibrated tuning dials, and an output of no less than 51 watts. Additionally, provision is made for the connection of the K.B. short-wave converter for reception on wavelengths from 14 to 80 metres.

**STAND No. 85**  
**H. CLARKE & CO. (M/CR), LTD.,** Atlas Works, Old Trafford, Manchester.

**T**HE new "Atlas" receivers—designated the "7-5-8" superhets—are the chief features here. Incidentally, it should be pointed out that the figures indicate: seven tuned circuits, five valves, and eight separate functions. This is a rather unusual way of describing the sets, but it has the advantage that it is descriptive and far more informative than a single figure which simply refers to the number of valves. As was pointed out in these pages last week, "spectrum tuning" is one of the main features of the 1935 "Atlas" receivers; the idea is that the wavechange switch serves, in addition to its usual function, to illuminate the station names on either wavelength in red or green, so that no confusion can arise as to the waveband actually in use.

Besides the attractive sets there is a new range of mains units, for which Messrs. Clarke are justly famous. It would be difficult to detail every one of these, but it is sufficient to say that there is a type for every kind of receiver, and for use on either A.C. or D.C. mains.



The Lissen three-valve band-pass receiver, showing the neat design and layout.

## STAND TO STAND SHOW REPORT

(Continued from previous page)

The latest unit is the T.1030 and this gives an output of 120 to 150 volts at 30 milliamperes, and is suitable for use with power, class B, or Q.P.P. output. It is provided with three different voltage tapings and is also fitted with a trickle charger capable of charging a 2-volt accumulator at .5 amp.

## STAND No. 86

**WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD., 32, York Road, King's Cross, London, N.1.**

THIS year the new WX6 Westector makes its first appearance at a Radio Exhibition. This Westector is suitable for use in "straight" sets, or as the first detector in superheterodyne circuits, when any form of automatic volume control may be obtained.

The range of H.T. and L.T. units is now so complete that constructors will find a unit to meet their particular requirements for any type of mains receiver, battery eliminator, trickle charger, or moving-coil loud-speaker.

An example of a typical constructors' type combined H.T. eliminator and L.T. trickle charger is shown, and the life test, a familiar feature to visitors at previous Exhibitions, is also being demonstrated. The rectifiers on test have now been operating continuously at full load for over 60,000 hours, and show no falling off in output. As far as can be ascertained, they will continue to give efficient rectification for at least another 60,000 hours.

High-voltage rectifiers for cathode-ray tube supply and various instrument-type rectifiers are also on view.

Traders and owners of battery charging stations will find interest in the display of charging sets. These include the new "hush-hush" RGO 9 charger, which has been produced to meet the needs of all but the larger type of charging station, and at a strictly competitive price. Traders should make a point of seeing this new model.

## STAND No. 87

**WINGROVE & ROGERS, LTD., 188-9, Strand, London, W.C.2.**

HERE is an exhibit of especial interest to the home constructor. For in addition to several of the lines (such as Polar Minor gang condenser, Polar condenser drives, pre-set condensers and the like) which are being continued from last year, there are some excellent new mid-gang condensers of particularly robust construction and some new and improved full-vision tuning scales. Besides these, there are a number of Polar N.S.F. lines, including tubular electrolytic condensers, mid-gang resistors, volume controls, etc. These latter components are of very attractive form, and will probably be used in large quantities by home constructors during the coming seasons.

## STAND No. 89

**CITY ACCUMULATOR CO., LTD., 18-20, Norman's Buildings, Central St., London, E.C.1.**

THE C.A.C. receivers shown on this stand are a combination of well-made modern and attractive cabinet work with the very latest designs in radio receivers. The enthusiast will probably be most interested, however, in the "Superpak" tuning unit which contains three coils, a three-gang condenser, padding condenser, and 25,000 ohm volume control. The unit is designed for use in superhets in conjunction with the heptode frequency changer; it is soundly designed and guaranteed to have circuits which are matched to within one half of one per cent. The price is £2 12s. 6d. Another interesting item is a complete A.C. short-wave adaptor, consisting of two valves, plus rectifier, and covering a range from 12 to 96 metres.

## STAND No. 90

**BRITISH BLUE SPOT Co., Ltd., 94/96, Rosoman Street, Rosebery Avenue, London, E.C.1.**

AS in previous years, there is on this stand a very complete range of loud-speakers in every type required by the average listener, in addition to some pick-ups of advanced design. For those who are in search of perfection of reproduction the new "Super Dual" is of especial appeal. This speaker actually consists of two separate units mounted concentrically with each other. The larger one is designed to handle the lower and middle frequencies, whilst the smaller one deals with the higher frequencies only. To enable it to do this efficiently the cone is extremely light and the windings are of aluminium wire. Special input transformers are fitted to filter the audio frequencies and to keep all except the high notes out of the smaller unit. Visitors can judge the excellence of this latest product for themselves. A smaller speaker which has much to recommend it is the Blue Spot "Star Junior" which sells at 35s. It is of the permanent-magnet pattern, is provided with a transformer which gives 12-point matching, and has a special double cone to ensure a uniform output at all frequencies.

## STAND No. 91

**EDGE RADIO, Ltd., Bolton, Lancs.**

"DRUMMER" receivers are featured on this stand, and although these achieved considerable popularity last year they should be even more in favour now. The range has been considerably widened and includes low-priced battery models and some very interesting mains superhets.

## STAND No. 93

**ELDEGO RADIO, LTD., 62, Conduit Street, London, W.1.**

FIVE different receivers are displayed on this stand, the largest and most interesting from a technical point of view being a 9-valve Stenode radiogram. This gives a frequency separation of 5 kilocycles, is provided with amplified delayed A.V.C., has visual tuning, and supplies an output of 8 watts undistorted to a large Magnavox "Double Six" loud speaker. There are two other and smaller Stenode receivers in the range, as well as two 5-valve battery-operated superhets with Q.P.P. output.

## STAND No. 94

**BRITANNIA BATTERIES, LTD., Union Street, Redditch, Worcs.**

"PERTRIX" batteries are too well known to require any introduction to readers, and visitors will find them displayed on this stand. In addition to the range which was available last year, and included replacement models for all types of commercial receivers, there is on show an entirely new "power" series which are marked with blue labels. These batteries are especially designed for use in modern receivers having up to four or five valves, and have a safe discharge rate of 10-12 milliamperes. Most of them are provided with G.B. tapings in addition to those normally used for H.T. Those readers who require batteries for outputs of 20 milliamperes or so will find the Pertrix super power (maroon carton) batteries entirely suitable for their requirements.



The sloping control panel of this Kolster Brandes set gives it a neat appearance and facilitates tuning.

## STAND No. 95

**TANNOY PRODUCTS, Canterbury Grove, West Norwood, London, S.E.27.**

THE above firm has become very well known during recent years in connection with their excellent public-address outfits, and these are the chief features of interest. In addition to the complete equipments there are a number of special power amplifiers having outputs up to 120 watts, and also some portable amplifiers of various types. There is also a range of projection speakers for outdoor work as well as a variety of microphones. Another brand new item is the Tannoy radio gramophone, which has been designed particularly for the use of those to whom perfect reproduction is the main requirement.

## STAND No. 96

**DUBILIER CONDENSER CO. (1925) LTD., Victoria Road, North Acton, London, W.3.**

AS was naturally expected, Messrs. Dubilier are showing fixed condensers and resistances in almost every conceivable pattern. All the lines which have been so popular during the past few years are being continued and are again exhibited. Additionally, however, there are several new items, among which mention should be made of the reversible dry electrolytic condensers, which have been developed principally for use in D.C. and universal receivers, although they are equally suitable for use in any other type of set. Other interesting lines are the double electrolytic condensers which are fitted into cylindrical aluminium containers (as are the standard types), but have flexible leads for the positive connections. An 8-plus-8 mfd. condenser of this type, for 500 volt D.C. peak working, costs 9s. 6d.

## STAND No. 97

**BRITISH RADIOPHONE LTD., Aldwych House, London, W.C.2.**

THE items of chief interest on this stand are the 8-valve all-wave receivers. These cover the wavelength ranges from 15-55, 190-560, and 800-2,000 metres, excepting in the Empire model, in which the long-wave range is omitted. The receivers are very thoroughly made to proven designs and are just as suitable for use in tropical climates as they are in this country. As an example of the care which has been expended in their design, it might be mentioned that the containing cases of the Empire models are made of teak, the pieces being pinned together with brass fastenings. Special insulating material—frequentite—is employed, and this will retain its almost perfect insulating properties when subjected to heat and humidity. All the aluminium parts are anodized to resist corrosion, and the ganged condensers have separate sections for the long and short-wave ranges. Other items of topical interest on this stand are those forming a very complete range of interference suppressors for use both in conjunction with electrical machinery and with the receiver itself. Messrs. British Radiophone have produced a very useful booklet dealing with interference suppression from various angles and this is being distributed from the stand.

## STAND No. 98

**WHITELEY ELECTRICAL RADIO CO., LTD., Mansfield, Notts.**

THE chief feature of the stand is the new "Stentorian" range of speakers embodying a patented new magnetic material, and an exclusive method of speech coil assembly. The manufacturers claim that its new design brings a very marked improvement in reproduction, and volume approximately double that of previous models at a similar price.

The chief of these, Stentorian Senior (Model PMS1) is displayed in two strongly illuminated boxes at the entrance of the stand, and is also prominently featured in other positions. An oversize cone is incorporated and the price is 42s. retail. This model is now the dearest in the W.B. range, models at £3 19s. 6d., and £6 0s. 6d. having been deleted as being now unnecessary.

The Stentorian Standard, priced at 32s. 6d., employs similar features to the Senior model, but has a smaller magnet and a standard 8in. cone. Like the Senior, it is provided with an improved version of the well-known W.B. Microdole device giving multiple ratios for matching to any output and incorporating the additional feature that, by the turn of a button, the speaker may be adapted for use as an extra speaker on any set on the market.

Both the above models have a number of further detail improvements. The air gap is fully protected from dust at front, back, and sides, and a new non-resonant casting is used for the chassis construction.

Also displayed is the Stentorian Baby—a mid-gang loud-speaker, having the same features as to magnet and speech coil as the larger models but provided with ordinary tapped transformer for matching to power, pentode, or Q.P.P. output.

The well-known W.B. range of components is on display with the addition of new valve-holders for the new B.V.A. bases in both skeleton and baseboard forms. A most interesting addition is the two-way tone control, a unique component which will emphasize either bass or treble at the turn of a single knob. It may be used across the loud-speaker terminals or in any suitable part of the receiver circuit and is sufficiently robust to stand up to large potential differences if necessary. The price is 7s. 6d.

The display is completed by a range of energized and public-address models containing sufficiently interesting new features.

## STAND No. 99

**REGENTONE, LTD., Worton Road, Isleworth, Middlesex.**

REGENTONE mains units have been in great demand for some years past, and the latest model will probably prove to be even more popular than its predecessors. It is styled the V.P.30, and is for A.C. use, and has an output of 30 milliamperes at 120-150 volts; this can be reduced to 10-20 milliamperes when desired, however, by means of the special output regulator which is fitted. In addition to the H.T. supply mentioned this unit has a trickle charger with an output of .5 amp. All the other well-known Regentone eliminators are also being shown.

Another entirely new line is the AS/35 receiver, which has been introduced at Olympia. It is a modern eight-stage superhet having four multiple valves and embodying super-efficient Itz-wound coils. Automatic volume control, noise suppression, fully variable tone control, and a novel "sound reflector" cabinet are some of its many features. The price is 12 guineas.

## STAND No. 100

**ORMOND ENGINEERING CO., LTD., Ormond House, Rosebery Avenue, London, E.C.1.**

HERE there is a splendid range of components and accessories, which are of especial interest to the home constructor. All the tuning condensers, dials, L.F. transformers, speaker units, etc., which have been so popular for many years are to be seen.

(Continued on page 682)

# "You have surpassed yourselves"

## Says Mr. F. J. Camm!

(editor "Practical Wireless")



"You have surpassed yourselves with this new 'Stentorian' speaker. I thought you had reached the apogee when you introduced the 'Microlode' last year; but to this present speaker, which I have submitted to test, I unhesitatingly accord full marks for a rich and entrancing quality in tone, and for an even greater sensitivity for a given input than was obtainable from your past high standard of speaker.

I feel that your Engineers must always be at work striving after the apparently unattainable and attaining it!"

Such an opinion from one of the foremost designers of to-day is not lightly given. To a technician of Mr. Camm's experience a list of interesting technical features alone is not sufficient—he requires results to prove the value of any revised design or new discovery. In the W.B. "Stentorian" Mr. Camm found them.

A W.B. "Stentorian" will bring an unbelievable improvement to your set.

You will hear a considerable increase in volume, due to the exclusive "Nital" magnet which at the same cost provides an enormous strength never

before obtainable with a "commercial" material. Due to a new method of speech coil assembly you will find in your reproduction crisper "attack," and fuller natural bass, and a new "realism" which will astonish you.

You must not fail to hear a "Stentorian" on your set. You will be amazed at the difference. If you visit Radiolympia

### SEE IT AT STAND NO. 98

- Stentorian Senior (PMS1) - - - 42/-  
*100% dust protection. Oversize cone*
- Stentorian Standard (PMS2) - - - 32/6
- Stentorian Baby (PMS6) - - - 22/6

Write for the new W.B. Stentorian Leaflet



Model PMS1



# STENTORIAN

Whiteley Electrical Radio Co., Ltd. (Dept. D), Radio Works, Mansfield, Notts.  
 Sole Agents in Scotland: Radiovision Ltd., 233, St. Vincent Street, Glasgow, C.2.      Sole Agents in I.F.S.: Kelly and Shiel, Ltd., 47, Fleet Street, Dublin

## STAND TO STAND SHOW REPORT

(Continued from page 680)

**STAND No. 102**  
**BURGOYNE WIRELESS (1930) LTD.,** Great West Road, Brentford.

IN addition to the many receiver models which were mentioned in these pages last week, Messrs. Burgoyne are showing two entirely new models, one of which is a two-pentode three-valver, and the other a screened-grid "four." The former employs a screened H.F. pentode in the first stage and a power pentode output and is wavelength calibrated. The latter is a suitcase portable of neat and simple design. Both receivers, like others in the Burgoyne range, have "one-glance" tuning and other interesting features.

**STAND No. 103**  
**VARLEY (OLIVER BELL CONTROL, LTD.),** Bloomfield Road, Woolwich, London, S.E.18.

ONE of the most interesting exhibits on this stand is the latest Varley ganged permeability tuner, which is shown in 3-gang and 4-gang types. This is attracting considerable attention due to its neat and novel design and bids fair to become very popular during the coming season. Another new line is the Duo-Nicore I.F. transformer, which has adjustable coupling so that the band-width which it covers can be varied over wide limits according to the degree of selectivity required at any time. Nicore coils in all types are also on view, along with the well-known Varley "Power Puncher," A.V.C. unit, etc. Power transformers, L.F. transformers, chokes, and, in fact, everything which the discerning constructor requires is to be seen and can be inspected at close quarters. No constructor can afford to miss the Varley stand.

**STAND No. 104**  
**GROSVENOR ELECTRIC BATTERIES LTD.,** 2-3, White Street, Moorgate, London, E.C.2.

THE popular Grosvenor mercury dry batteries are the centre of interest on this stand, and a particularly wide range is to be seen. Batteries of every required voltage and current rating are shown for both high tension, grid bias, and low tension. In addition a variety of Grosvenor Miscantile electric torches are being exhibited. Although not quite so well known as the dry H.T. batteries, the Grosvenor high-tension accumulators are attracting much attention by those who require a heavy H.T. current over long periods.

**STAND No. 105**  
**TELEPHONE MANUFACTURING CO., LTD.,** Hollingsworth Works, Martell Road, West Dulwich, London, S.E.21.

THERE is here a very extensive range of the popular T.M.C. Hydra condensers which have recently been specified in a number of PRACTICAL WIRELESS designs. These condensers are well known because of the modern principles adopted in their construction. One special feature is that the "business" portions of all the tin-cased models are contained in transparent paper bags, with a result that the operator can see at a glance that the unit is completely covered with wax; this ensures that there shall be no air bubbles which are likely to cause premature breakdown. The tubular fixed condensers are particularly interesting components and, although introduced only within the last year, they are already being used very extensively. In addition to the usual types of condenser, there are several of the multiple, or block, units.

**STANDS Nos. 106 and 107**  
**VIDOR BATTERIES, LTD.,** Erith, Kent.

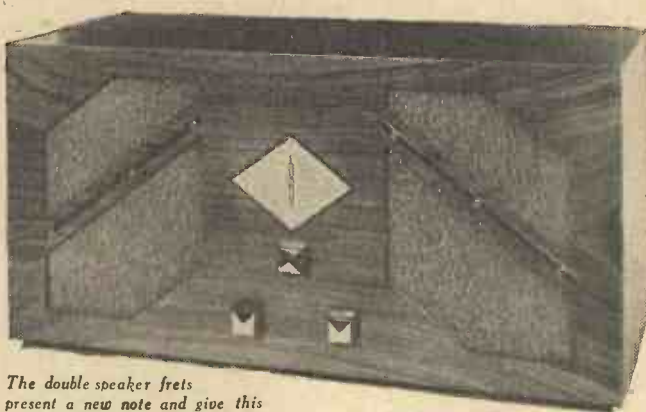
VIDOR batteries are of recent introduction, but are made in a variety of types and sizes which are useful for either home-made or commercial receivers. They are well displayed, and their special features are clearly demonstrated. The batteries are reasonably priced and are claimed to have a long, useful life.



The new pattern of the J.B. ganged condenser.

**STAND No. 108**  
**ANSON & HOPWOOD, LTD.,** 41, Cheval Place, London, S.W.

THE exhibits here will strongly appeal to those who are interested in the most modern developments, and who want the best and latest form of radio equipment. An entirely new automatic record changer is one of the principal exhibits, this being remarkable in that it not only changes from one record to another in the desired sequence, but also turns the records over so that both sides are played. Its capacity is thirty double-sided records; in other words, from three to four and a half hours' continuous programme. A complete and ultra modern radio-gramophone is also being shown, which is fitted with the "Autotrope" automatic record changer. This is a real "quality" outfit which comprises a highly-efficient superhet receiver, a high-power amplifier, and three separate rectifying valves; of the latter one feeds the receiver, another the amplifier, and the third, the field windings of the energized moving-coil speakers. The price of the complete radiogram is £150.



The double speaker frets present a new note and give this Burgoyne receiver an attractive appearance.

being no less than 200,000 ohms. The price of this multi-range meter is only 42s. Another meter which will be found of interest is the "Pifco" A.C.-D.C. "Radiometer." This is an improved model of the well-known "All-in-One" test meter, and can be used for all the tests for which the earlier model was suitable, in addition to being applicable to both A.C. and D.C. supplies. It is modestly priced at 12s. 6d.

**STAND No. 112**  
**TELEGRAPH CONSTRUCTION & MAINTENANCE CO., LTD.,** Telcon Works, East Greenwich, S.E.10

THE exhibits on this stand consist principally of alloys intended for a variety of wireless components and accessories. Two alloys which are suitable for cores in transformers, chokes, etc., as well as for various forms of magnetic screens are known as "Numetal" and "Radiometal." Another special alloy is known as "Calomic," and this is a new form of resistance material which can be drawn down to very fine gauge; its special use is in the construction of wire-wound resistors, potentiometers, and the like.

**STAND No. 113**  
**ALLWAVE INTERNATIONAL RADIO AND TELEVISION, LTD.,** 242, High Street, Bromley, Kent.

THE main item on this stand is an all-wave universal (A.C.-D.C.) superheterodyne receiver chassis having an octode frequency changer double-diode detector, providing A.V.C. and a variable- $\mu$  pentode L.F. amplifier. This chassis is of very modern design and has a wavelength range from 15 to 2,000 metres in four separate bands. A complete radio-gramophone is also shown in which the above chassis is fitted along with a pillar-box automatic record player.

**STAND No. 114**  
**JACKSON BROS. (LONDON), LTD.,** 72, St. Thomas' Street, London Bridge, London, S.E.1.

SO popular have all the last year's lines in the J.B. range proved that they are being retained for the coming season, although slight price modifications have in some instances been made. New lines which are being shown include some new midget, fully-screened gang condensers in both plain and superhet patterns, a universal model of the popular "Linacore" tuning assembly, some new full-vision drives and dials, and a baseboard-mounting disc drive. Messrs. Jackson Bros. are certainly living up to the slogan, "Precision Condensers."

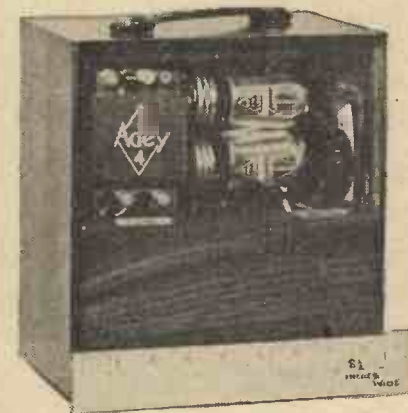
**STAND No. 115**  
**ADEY PORTABLE RADIO,** 99, Mortimer Street, London, W.1.

SO far as we are aware, the Adey portable is the smallest on the market, for it embodies some interesting new methods of construction in addition to the ingenious Adey self-coupling valves, which have inductances wound in slots formed in their bases. The "Baby" four-valve portable costs £7 10s. 6d. complete and weighs no more than 12½ pounds. Other models include a three-valve hikers' receiver and a one-valve portable of interesting design. The remarkable valves are also being exhibited in a number of different types.

**STAND No. 116**  
**H. HACKER & SONS,** Perfecta Works, Ray Lea Road, Maidenhead.

"DYNATRON" receivers in various types are here to be seen. Contrary to what has become common practice, these sets do not employ the superheterodyne circuit, but have a highly selective arrangement of Ferrocart coils which the makers claim give selectivity equal to that of any superhet, and at the same time produce better quality. One of the special features of "Dynatron" receivers is the "searchlight" tuning which Messrs. Hacker have lately introduced. In addition to receivers and radiograms, there is a short-wave unit which can be used in conjunction with any of the "Dynatron" receivers.

(Continued on page 684)



A compact portable. This is the Adey, and employs the special Adey coupling valve.

**STAND No. 109**  
**W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.,** Holborn Vjeduct, London, E.C.1.

THE display on Henley's stand comprises two ranges of the many products of this company, viz., electric soldering irons and radio wires and cables. A range of soldering irons is being demonstrated, including Solons suitable for the amateur wireless constructor or handyman as well as heavier models for radio manufacturers. Recently the design of the domestic model has been modified, although the price of 7s. 6d. remains the same. A tinned copper bit is now fitted which is oval in shape and facilitates work where space is limited. This Solon is fitted with a 6ft. length of Henley brown glass cotton-covered twin flexible together with a standard bakelite lamp-holder adaptor, and is available for two voltage ranges, 200/220v. and 230/250v. The consumption is 65 watts. Other items of interest are Henley's resin-cored solder, a variety of radio connecting wires of all kinds, and Henley's slide-back wire which is useful for set wiring and other purposes. The chief feature of the slide-back material is that it is unnecessary to strip the insulation in any way, since it can simply be slipped back by means of the finger and thumb.

**STAND No. 110**  
**AUTOMATIC RADIO GRAM. CO., LTD.,** Crown Street Hall, Brighton

**STAND No. 111**  
**PROVINCIAL INCANDESCENT FITTINGS CO., LTD.,** Pifco House, High Street, Manchester.

THIS stand is devoted largely to the exhibition of the well-known "Pifco" test meters, which are available in several forms. The meters which have been popular for several years past are again being shown, but there are also some new models which are ideal for the experimenter who desires to have a combination instrument upon which he can rely for all his experiments. One of these is a de-luxe edition of the "Rotameter"; this has a maximum voltage scale reading of 400 volts, and has the commendably high resistance of 500 ohms per volt, the total resistance

# RECEIVER DESIGNS SEEN AT THE SHOW



*The large and easily-read tuning dial is an interesting feature of this Ekco console.*



*The Aerodyne Wren.*



*One of the Lissen models.*



*The Beethoven S.G. three.*



*A distinctive note is struck by this latest Marconiphone console receiver.*



*The Halcyon console model.*



*The Multitone receiver with deaf-aid equipment.*



*A console radiogram from the extensive Cossor range of 1935 receivers.*

## STAND TO STAND SHOW REPORT

(Continued from page 682)

**STAND No. 117**  
ELECTRO DYNAMIC CONSTRUCTION CO., LTD.,  
733b, Old Kent Road, London, S.E.15.

HERE there is an interesting display of converters and battery chargers of various types. The best-known converter in the series is one for converting D.C. to A.C. and is intended for the operation of power amplifiers, A.C. receivers, etc. The input may be taken from D.C. mains, private house-lighting plants, or from L.T. accumulators, whilst an important point is that the unit is interference-free. Other lines are

alternators for supplying public address outfits; these may be driven from the engine of a car, or may be obtained complete with a petrol engine. In addition, there are several accumulator-charging plants and an H.T. converter for use with car-radio receivers.

**STAND No. 118**  
SWIFT, LEVICK & SONS, Clarence Steel Works,  
Sheffield, 4.

THE exhibits here consist of a very extensive range of various types of permanent magnets, most of which are designed for use in the construction of permanent-magnet moving-coil loud-speakers.

**STAND No. 119**  
HARTLEY TURNER RADIO, LTD., Thornbury Road,  
Isleworth, Middlesex.

THIS firm, as many readers will be aware, specialize in the production of "quality" receivers, power amplifiers, and loud-speakers, and a comprehensive array of such apparatus is to be seen on the stand. The receivers are intended more for the perfect reception of the local stations than as long-range instruments. There are four principal models, styled the M.7, M.12, S.7 and S.12, respectively; the "M" indicates that the receivers are ready-made, whilst the "S" indicates that the necessary parts are supplied as a kit; the figures "7" and "12" indicate the approximate undistorted outputs in watts. The Hartley-Turner loud-speakers are shown in three models, the first of which is for D.C., the second is for A.C. and is provided with a 20-watt rectifier for field energization, and the third is also for A.C. but has a 40-watt rectifier. The prices of the three models are 7, 8 and 9 guineas respectively.

A small number of special high-grade components, such as L.F. coupling units, mains transformers, smoothing chokes, etc., are also on view.

**STAND No. 121**  
BULGIN RADIO, LTD., Abbey Road, Barking, Essex.

THIS stand will probably prove of greater interest to the home constructor than any other at the exhibition, for it contains an extremely wide range of components of every type required for the construction of a high-grade receiver. All the lines which have been in such great demand during the last few years are again on view, but the range of accessories has been greatly extended, and is even wider than it has ever been before. Of the brand new lines which are being shown for the first time particular mention should be made of the all-wave tuner, which has a number of interchangeable coil units, so that any combination of wavelength ranges can readily be obtained. The coil assembly is fitted with an entirely new type of positive-contact multiple switch, which is also available separately. Other new lines include a complete range of stripped screened coils which are especially designed for chassis mounting, and which have soldering-tag contacts and are priced at the extremely low figure of 5s. each. Ultra-short-wave coils for television and other receivers are also newcomers which are being displayed. Other additions to the previously wide range are a new decorative signal lamp of improved design, some 60-watt variable resistances, a Q.P.P. low-frequency transformer, an all-valve testing unit,

and a neat assembly comprising a series of fixed condensers and resistances and the necessary soldering contacts. The object of this unit is to simplify receiver construction by grouping together the similar components.

**STAND No. 124**  
FULLER ACCUMULATOR CO. (1926), LTD., Wood-  
land Works, Chadwell Heath, Essex.

THIS well-known firm is again showing a variety of accumulators and high-tension batteries of several types. Among the L.T. accumulators there are three principal types known as the "Standard De-Luxe," these having capacities of 40, 60, and 80 ampere-hours respectively, at the 100-hour rate. The new H.T. accumulator is supplied in 10-volt units, and this has a number of special features, such as intercell connectors sunk into a grease barrier to prevent corrosion, and adaptors fitted to the terminals to enable ordinary wander plugs to be used for connecting purposes. A high-tension battery which will be of especial value to tropical wireless users is of the inert type. This can be stored for an indefinite period without any ill effects and it only becomes active when it has been filled with water. The H.T. batteries of normal type are intended principally for use with receivers which consume more than the average H.T. current, since they are of the heavy-duty pattern.

**STAND No. 125**  
GOODMANS (CLERKENWELL), LTD., Clerkenwell,  
E.C.1.

THE exhibits on this stand included their new Grille P.M. speaker—a de luxe instrument designed to give the most faithful reproduction possible with an 8in. speaker. The periphery of the diaphragm is supported between resilient pads, providing a "dead" suspension and ensuring the fullest bass response without boominess.

The transformer is of the multi-load type, providing ratios for most output valves. It costs 45s., or, fitted, with special extension transformer providing four low resistance tapings, four push-pull and eight high-resistance tapings, the ratios being selected by a selector switch, 52s. 6d.

The "12 watt" moving-coil speaker, with an 11in. diaphragm model, has a response range from 40 to



A neat portable deaf-aid. This is the "Ossicaide."

10,000 cps. free from audible peaks or dips. Its sensitivity enables sufficient volume for a small dance hall to be obtained from a fully loaded 2-watt Class B battery valve, whilst an output of 12 watts undistorted can be handled without distress.

The permanent magnet model costs £4 17s. 6d. Other models shown included the "12 watt" energized model at £4 10s., a public address speaker. The P.M.8, at 42s. 6d., the E.8, at 35s., and the P.M.6, at 27s. 6d.

Other exhibit included displays of coil winding, stampings, turned parts, transformers, chokes, and other manufacturing components for the trade.

**STAND No. 126**  
THE VEE CEE DRY CELL CO. (1927), LTD., Stoke  
Newington, London, N.16.

THIS Company, manufacturers of high-tension batteries, introduced for the first time at this year's Exhibition a new range of batteries suitable for discharge current up to 12 m/A, and super-capacity sizes suitable for discharge up to 25 m/A. A second range, known as the Plumax Standard Energy, are suitable for discharge current up to

8 m/A, super-capacity sizes in this range being suitable for discharge up to 12 to 20 m/A. All of them are reasonable in price.

**STAND No. 203**  
SOUND SALES, LTD., Junction Road, Highgate, N.19.

AN interesting exhibit on this stand is a special double time base for 30- and 120-line transmissions in television. This is in the form of a totally enclosed unit and may be used in conjunction with existing receivers for the reception of both 30- and 120-line transmissions, the alteration being effected by throwing over suitable switches on the control panel. Finished in a black crystalline metal case, the price complete is £12 10s. Other interesting items include a special high voltage eliminator employing a universal transformer suitable for A.C. voltages from 200 to 250, and incorporating a special smoothing circuit costing £7 10s. complete; a special cathode-ray exciter unit incorporating smoothing with focus and voltage control, universal transformer, and suitable switching arrangement to enable the cathode-ray tube heater to be fed from raw A.C. or battery—total price with valves being £7 15s., a complete series of mains transformers for television apparatus giving outputs of 1,000 to 1,500 volts especially designed for cathode-ray work, and specially designed equal ratio transformers for use in the output circuit where phase reversal is necessary owing to the picture appearing inverted. Two models are released, one for battery receivers at 10s. 6d. and another for use with mains output valves at 16s. This firm is also showing a self-contained portable charger which can be instantly connected to the car battery in order to re-charge over-night. Known as the Auto-charger, it sells at £3 12s. 6d. The Sound moving-coil speaker has been altered only in minor details, complete with transformer it costs £2, or a special matched pair of speakers without output transformer at £5.

Auto transformers were also exhibited for voltage conversion for those who wish to work 110 apparatus from 230 volt mains.

**STAND No. 204**  
RADIO SOCIETY OF GREAT BRITAIN, 53, Victoria  
Street, London, S.W.1.

**STAND No. 205**  
WHARFEDALE WIRELESS WORKS, 62, Leeds  
Road, Bradford.

THIS well-known firm exhibits their range of speakers from 32s. 6d. to 110s. in price. The Junior Model at 32s. 6d. is an excellent general-purpose speaker fitted with a new type of cone, and will handle 3 to 4 watts undistorted output and can be matched to any output valve or set. The new bronze model at 42s. 6d. was introduced two years ago and is ideal for public address work. It will handle 5 watts undistorted output. Other models are the Golden at 58s. 6d., the Auditorium at 110s., the D.C. Standard at 32s. 6d., the Rexine Junior extension speaker in cabinet at 38s. 6d., the Bijou extension in cabinet at 45s. 6d., and the Bronzoid, de Luxe, and Nubian at 65s. 6d., 92s. 6d. and 75s. 6d. respectively; transformers are available to suit most requirements.

**STAND No. 206**  
BRITISH G.W.Z. BATTERY COMPANY, Trading  
Estate, Slough, Bucks.

A FULL range of high-tension batteries and grid-bias batteries at reasonable price form the main feature of this exhibit.

**STAND No. 207**  
FILM INDUSTRIES, LTD., 60, Paddington Street,  
London, W.1.

THIS firm manufactures small public-address outfits, notably the Junior at £48 10s. and the Baby at £32 10s., the latter clearly reproduces speech at a range of 500 yards and the former within a range of 800 yards. This firm also exhibited their P1 Pedestal moving-coil microphone at £7 7s. (stand £1 1s. extra) and their full range of loud-speaker units and horns.

**STAND No. 209**  
HARMER & SIMMONS, LTD., 223, Hoe Street,  
Walthamstow.

THIS firm specializes in work for electrical undertakings in converting from D.C. to A.C. Their speciality is rectifiers for all purposes, and they also undertake to convert all A.C. mains receivers.

(Continued on page 687)



The new Plumax dry battery, manufactured by the Vee Cee Dry Battery Co.



Three Fuller products—an H.T. accumulator unit, an L.T. accumulator and a dry battery.





# SUMMIT 3 • ARMADA MAINS 3 NEW SPEAKERS—ELIMINATORS—KITS



The Pilot Kit SERVICE was founded in 1919.

## PILOT AUTHOR KIT EXACT TO SPECIFICATION

See the PILOT on the carton. It's a real guarantee.

### IMPORTANT

Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash or C.O.D. or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid (GREAT BRITAIN ONLY). OVERSEAS CUSTOMERS CAN SEND TO US WITH CONFIDENCE. We carry a special export staff and save all delay. We pay half carriage—packed free. Send full value plus sufficient for half carriage. Any surplus refunded immediately. Hire purchase Terms are NOT available to Irish and Overseas customers.

## SUMMIT 3

**KIT "A"** Author's Kit of First Specified Parts, less Valves and Cabinet. Cash or C.O.D. Carriage Paid **£4/6/0.** Yours for **7/9** and 11 monthly payments of 7/9

**KIT "B"** as for Kit "A" but with set of specified Valves, less Cabinet. Cash or C.O.D. Carriage Paid. **£5/18/6.** Or 12 monthly payments of 10/9.

**KIT "C"** as for Kit "A" but with set of Specified Valves, and Peto-Scott Summit Cabinet. Cash or C.O.D. Carriage Paid. **£6/18/0.** Or 12 monthly payments of 12/6.

**GARRARD AUTOMATIC RECORD CHANGER UNIT.** Universal A.C. or D.C. 100-250 volts. Plug pack of 8 10" or 12" records. Cash or C.O.D. Carriage Paid, **£10/17/6.** Balance in 11 monthly payments of 20/-.



### NEW SPEAKERS

**W.B. STENTORIAN BABY Permanent-Magnet M.C. SPEAKER.** With matching Transformer, suitable for Power, Pentode, Class B or Q.P.P. Cash or C.O.D. Carriage Paid. **£12/6/0.** Balance in 5 monthly payments of 4/3.  
**BLUE SPOT STAR JUNIOR Permanent-Magnet M.C. SPEAKER** with 12 point matching transformer suitable for all outputs. Cash or C.O.D. Carriage Paid. **£11/5/0.** Balance in 6 monthly payments of 5/6.  
**CELESTION P.P.M.6 Permanent-Magnet M.C. SPEAKER.** For Power or Pentode. Cash or C.O.D. Carriage Paid. **£17/7/6.** Balance in 5 monthly payments of 5/- only. If required for Class "B" or Q.P.P. state when ordering.

### EXCLUSIVELY SPECIFIED PETO-SCOTT Walnut CABINET 19/6

Specially designed at the request of PRACTICAL WIRELESS for the Summit 3. In exquisite walnut, a superb example of cabinet craftsmanship. Internal Dimensions 20" wide; 10" high; 12" deep. Carriage Paid. A strongly-built Walnut Stool, 28in. high, for the Summit 3 Cabinet. 27/6 Carriage Paid.

### "Simply Plug-In" 1935 PILOT CLASS 'B' SPEAKER-AMPLIFIER KIT

GIVE A NEW LEASE OF LIFE TO YOUR PRESENT BATTERY SET. This amazing unit will give seven times the volume with mains quality from your existing battery set. B.V.A. Class B Valve, 1935 Peto-Scott Permanent-Magnet Moving-Coil Speaker, B.H.G. Driver Transformer and 7-pin Valve Holder. Peto-Scott Baffle and Baseboard Assembly, all Wires and Screws. With full-size Diagrams and Assembly Instructions. Complete Kit as illustrated. Cash or C.O.D. Carriage Paid. Or send only 5/-. Balance in 9 monthly payments of 5/-.



### 1935 ADAPTAGRAM

Convert Your Present Set to a Magnificent Radiogram.



Here is the ideal Cabinet for converting your present set to a magnificent Radiogram. Hand French Polished by leading experts of London's piano trade. Chromium fret surround. All joints mortised and tenoned. Ready to take your set, speaker, power equipment and your own gram fittings. With ready-fitted motor board. Plain front or vignette to take any panel up to 18ins. by 8ins. or specially drilled to your own dimensioned sketch at slight extra cost.

Overall Dimensions: 36 1/2 ins. high by 22 1/2 ins. by 17 1/2 ins. deep. MODEL "A" as illustrated, Cash or C.O.D. 63/-. Packing 2/6 extra. Engraving or Wires: Yours for 8/3 and 11 monthly payments of 5/9. Baffle Board 3/6 extra. WALNUT, OAK or MAHOGANY to choice. **63/-** SEND FOR CABINET LISTS



### NEW ELIMINATORS

**ATLAS C.A.25,** for A.C. Mains, Class B and Q.P.P., four tappings: 60/80, 50/90, 120, 150 volt, 25 m.a. Cash or C.O.D. Carriage Paid. **£2/19/6.** Balance in 10 monthly payments of 6/-.  
**ATLAS C.A.12,** for A.C. Mains, 100/250v. three tappings: 60/80, 90/100, 120/150v., 12 m.a. at 120v. Cash or C.O.D. Carriage Paid. **£2/12/6.** Balance in 9 monthly payments of 5/9.  
**NEW REGENTONE UNIT, V.P.30** for A.C. Mains. 100/130 v., three tappings: 10, 20, 30 m.a. With L.T. Charger 2 v., 5 amp. Cash or C.O.D. Carriage Paid. **£2/12/6.** Balance in 9 monthly payments of 5/9.

## ARMADA Mains 3

**KIT "A"** Author's Kit of First Specified Parts, less valves and cabinet. Cash or C.O.D. Carriage Paid **£10/9/6.** Yours for **19/3** and 11 monthly payments of 19/3

**KIT "B"** as Kit "A" but with set of specified valves. Cash or C.O.D. Carriage Paid **£12/8/0.** Or 12 monthly payments of 22/9.

**KIT "C"** as Kit "A" but with set of specified valves and Peto-Scott Tablegram Cabinet. Cash or C.O.D. Carriage Paid **£14/13/0.** Or 12 monthly payments of 26/9.

### EXCLUSIVELY SPECIFIED PETO-SCOTT TABLEGRAM CABINET

Another magnificent Peto-Scott cabinet, specially designed for the Armada Mains 3. In beautifully grained woods, faultlessly constructed and hand french polished. In Oak or Mahogany to choice, no extra. State which when ordering. **45/-**



### NEW Manufacturers' KITS in Sealed Cartons

**GRAHAM-FARISH STENTORIAN.** Complete Kit for building less Valves and Cabinet. Cash or C.O.D. Carriage Paid, **£1/19/6.** Balance in 7 monthly payments of 5/-. If required complete with valves and specified B.R.G. Cabinet. Cash or C.O.D. Carriage Paid **£3/15/6** or 12 monthly payments of 7/-.  
**LISSEN A.C. SKYSCRAPER.** Complete Kit comprises all components, including set of Lissen Valves. Cash or C.O.D. Carriage Paid. **£6/10/0.** Balance in 11 monthly payments of 12/-.  
**TELSEN S.G.3 KIT,** less Valves. Cash or C.O.D. Carriage Paid. **£1/19/6.** Balance in 7 monthly payments of 5/3. If valves required, add **£1/11/6** to Cash Price: H.P., 12 monthly payments of 6/6.  
**COSSOR 352.** Three-valve Battery. Complete Kit with all components, Cabinet and Moving-Coil Speaker. Cash or C.O.D. Carriage Paid **£5/19/0.** Balance in 11 monthly payments of 11/-.

### Peto-Scott 1935 SPEAKERS TONE AND QUALITY AS NEVER BEFORE



Type S.I. PERMANENT MAGNET MOVING-COIL SPEAKER—Not a Midset—FULL SIZE CONE. Power or Pentode. Complete with Input Transformer. Send 2/6 with order; balance in 5 monthly payments of 4/-. Cash or C.O.D. Carriage Paid 19/6.



Type S3. DE LUXE P.M. 1935 MOVING-COIL SPEAKER. For Power or Pentode. A superb permanent-magnet moving-coil speaker with 7 1/2 in. cone. Gives exquisite tone. Send only 2/8; balance in 7 monthly payments of 5/-. Cash or C.O.D. Carriage Paid 11/5/0.



PETO-SCOTT CO. LTD., 77, CITY RD., LONDON, E.C.1. West End Showrooms: 62, High Holborn, London, W.C.2. Tel. Clerkenwell 9405/7. Tel. Holborn 3248.

Dear Sirs,—Please send me CASH/C.O.D. H.P. \_\_\_\_\_ for which I enclose £\_\_\_\_\_ d. CASH/H.P. Deposit.  
NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
Pr.W. 25/8/34.

Buy by Post—its Quicker—CASH—C.O.D.—EASIER

# THE BIG SUCCESS OF RADIOLYMPIA

## G.E.C. RADIO

### G.E.C. SUPERHET A.V.C. 5 for A.C. mains

The G.E.C. "Automatic Volume Control" series of receivers for A.C. mains is without equal in performance and value. The table model, illustrated above, is a masterpiece—not only in its graceful beauty of appearance, but in its remarkably brilliant performance and quality of reproduction. The specification reaches that very high technical standard to be expected of a product of The General Electric Co. Ltd.

Large energised moving-coil speaker. 3 watts output. Luminous station name indicator. Delayed and amplified A.V.C. Noise suppression and tone controls. Extension speaker connections. Internal speaker-silencing key. Pick-up connections. Internal aerial. Inlaid walnut cabinet. Voltage range: 190/250 volts, 40/100 cycles. (Radiogram 40/60 cycles only.)

PRICE including OSRAM Valves **14 GNS.**

HIRED PURCHASE TERMS: Deposit £1.5.0 and 12 monthly payments of £1.5.0.

**WRITE** for folder No. BC6922 which describes the complete range of G.E.C. Radio receivers and loudspeakers. Sent **POST FREE** on request.

**MADE IN ENGLAND**  
Sold by all Radio Dealers



**RADIOGRAM MODEL.** Price including Osram Valves 22 gns. or Deposit £2 and 12 monthly payments of £2, or £1.1.0



**CONSOLE MODEL.** Price including Osram Valves 17 gns. or Deposit 30/- and 12 monthly payments of 30/-

## G.E.C. THE SETS WITH THE BIG NAME BEHIND THEM

Advt. of The General Electric Co. Ltd., Head Office and Public Showrooms: Magnet House, Kingsway, London, W.C.2



**STAND TO STAND SHOW REPORT**

(Continued from page 684)

**STAND No. 210**  
**MITCHELL & BROWN, Turney Road, Dulwich, S.E.21.**  
 THE most interesting exhibit on this stand was the new Master Singer speaker illustrated on another page of this issue. The speaker is mounted close to the ceiling, the sound being reflected downwards by the latter. An electric light shade is suspended below the speaker, which is supplied in this combined form. The price of the Standard model Master Speaker is £12 12s. including shade, whilst the Junior model is 25 guineas.

**STAND No. 211**  
**OSSICAIDE, 447, Oxford Street, London, W.1.**  
 THIS firm exhibits a full range of amplifiers and microphones for both portable and permanent installation, and for use in cinemas and churches, etc., to enable the deaf to hear. Enormous interest was evinced in their new microphone and in their new universal portable amplifier, giving an undistorted output of 6 watts. The amplifier will work off both A.C. and D.C. mains of 200 to 250 volts.



A useful testing unit—the Radiolab which is now marketed by Messrs. Everett, Edgcombe and Co., Ltd.

**STAND No. 212**  
**EVERETT, EDGUMBE & CO., LTD., Hendon, N.W.9.**  
 THIS company exhibits a complete range of radio instruments in 2in., 2½in. and 3½in. dial sizes. These small light precision instruments are especially suitable for radio work and are available in flush or panel mounting cases of metal or bakelite.

The Radiolab valve and set tester, an instrument which has become very popular among service engineers and dealers and is manufactured by Everett Edgcombe, will also be exhibited at Radiolympia. The design of this instrument has proved so satisfactory and flexible that changes are considered unnecessary. The new 9-pin valves are easily accommodated by means of a pair of adaptors.

There were also a wide range of portable signal generators, ohm-meters, power output meters and other equipment essential to the testing and servicing departments of radio manufacturers and dealers. The firm also manufactures special meters and test gear to the customers' own requirements and invites inquiries of this nature from design and production engineers. The Colindale Works at Hendon are among the largest and best equipped in the country devoted exclusively to the manufacture of electrical measuring instruments.

**STAND No. 215**  
**NATIONAL RADIO SERVICE COMPANY, Tottenham Court Road, W.C.1.**

THIS firm specializes in repair service, comprising overhauling and repairing of any type or make of radio apparatus of British or foreign manufacture. Spares are carried for all standard makes for five years back. They also specialize in motor-car radio and motor-boat radio, as well as deaf aid service and repairs.

**STAND No. 216**  
**BRIDGER & COMPANY, Church Street, N.16.**

MAKERS of the well-known Granfona components, and a speciality on their stand is their seamless moulded cone in black linen, kraft, manilla, and mixtures of these substances. As specialists in diaphragms and cones this firm largely caters for the trade.

**STAND No. 217**  
**J. GOODMAN, 20/30, Drysdale Street, N.1.**

VENERED panels in all woods, attractively finished in quarterings and art wood veneers, are the features of this exhibit.

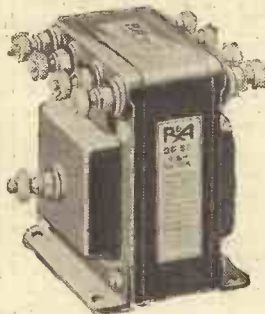
**STAND No. 218**  
**LECTROLINX, LTD., 79a, Rochester Row, London, S.W.1.**

THE components manufactured by this firm, which have been featured in almost every PRACTICAL WIRELESS receiver, include connections, valve-holders,

and terminals for every electrical purpose. New lines included American chassis-mounting valve-holders for soldered connections in four, five, and six-pin types, at 7d., 8d., and 9d. each; seven-pin continental chassis-mounting valve-holders, including a screened model for use with Ostar Ganz valves, as well as an unscreened model, a nine-pin chassis-mounting valve-holder and a new valve cap connector. All of their connections and terminals provide a smooth and positive grip contact.

**STAND No. 225**  
**GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. (See Stand No. 33).**

**STAND No. 226**  
**NATIONAL ACCUMULATOR CO., 50, Grosvenor Gardens, S.W.**



A new Universal output transformer which has been produced by Messrs. Reproducers & Amplifiers.

**STAND No. 227**  
**ECONASIGN LTD., Victoria Street, London, S.W.1.**

**STAND No. 229**  
**WILLIAM F. BROWN RADIO CO., Oscillo Radio Works, Brierley Hill, Staffs.**

INTERESTING exhibits on this stand include a modulated R.F. Oscillator for operation from A.C. mains 200 to 250 volts, 40 c.p.s. to 60 c.p.s. Only one tube is used thus making possible comparatively low price and replacement cost. The ranges are 1,500 k/c to 550 k/c, 300 k/c to 150 k/c and 140 k/c to 95 k/c, all on fundamentals. It can be supplied either with direct drive or calibration or a slow motion drive, readings being taken from a colour coded graph. Other types are the M.I.U. which is similar to M.I. except that it is designed for operation on either A.C. or D.C. 200 to 250 volts without alteration.

**STAND No. 230**  
**MAINS POWER RADIO CO., Romford, Essex.**  
 ELIMINATORS and power packs for all purposes form the main feature of this exhibit.

**STAND No. 231**  
**WIRELESS RETAILERS ASSOCIATION, High Holborn, W.C.1.**

**STAND No. 232**  
**SINCLAIR SPEAKERS, Vale Royal, N.7.**

**STAND No. 233**  
**RIST, 1927, LTD., Lowestoft.**  
 SAMPLES of every type of wire, battery cords, crocodile clips, speaker and 'phone cords, aerial wires are shown on this stand.

**STAND No. 234**  
**C. A. VANDERVELL, LTD., Birmingham.**

THIS well-known firm exhibits an attractive range of L.T. accumulators, in glass and celluloid cases, all the former with ball discharge indicator devices. Further to this a complete range of jelly-acid, non-spillable cell, as standard by many of the manufacturers of popular receivers are exhibited. An interesting introduction, however, is the new type of free acid semi-non-spillable cells, developed to suit particular makes such as Murphy. Another interesting assembly shown is their new type of mass plate L.T. cell having two positive plates enclosed by two negatives all of the same thickness. There is, of course, on exhibit also a complete range of C.A.V. dry batteries and rechargeable H.T. accumulators.

**STAND No. 235**  
**BIRMINGHAM SOUND REPRODUCERS, LTD., Old Hill, Staffs.**

THE basis of this exhibit is the well-known B.S.R. amplifiers from 12 watt to 60 watt, pre-staged microphone amplifiers, their ampligram, a neat radio chassis and high-frequency amplifier, turntables, with record changing unit, mixer control panels, twin-turntable equipments, their well-known high-class permanent-magnet speaker chassis, also complete with rectifier unit and valve for A.C. working, auditorium speakers, baffles, microphones, radio-gramophones, oscillators, and valve voltmeters. The B.S.R. 1934

five-valve receiver is constructed on a steel chassis with cadmium plated finish and lacquered. It includes a mains transformer, tapped from 190/250 volts, 50 cycles, used in conjunction with a full wave rectifier. A suitable converter is supplied for D.C. mains operation. All of the equipment supplied by this firm is of distinct and appealing quality.

**STAND No. 236**  
**NUVOLION LTD., Park Crescent, S.W.4.**  
 PUBLIC address equipment is on show here. Plants are supplied with 20, 50 and 100 watts guaranteed output. This firm caters for relay as well as ordinary public address installations.

**STAND No. 237**  
**BRITISH PIX CO., LTD., 118, Southwark Street, London, S.E.1.**

THE exhibits on this stand are too well known to need description. They include the Pix Lightning Arrestor with its £1,000 guarantee; the Pix metallized earth, the modula armchair control, the Pix invisible aerial, Pix valves, and, of course, the famous Pix.

**STAND No. 238**  
**CONCORDIA ELECTRIC WIRE CO., New Sawley, Nr. Manchester.**

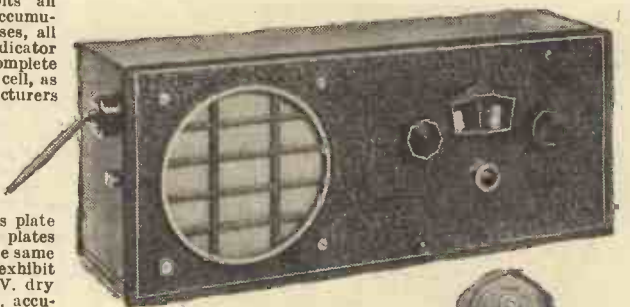
WIRES for every electrical purpose are shown here in great abundance.

**STAND No. 239**  
**WESTON ELECTRIC INSTRUMENTS CO., Surbiton.**  
 HIGH class instruments for every purpose are open to inspection on this stand. The name of Weston has always been synonymous with high-class instruments, and although nothing radically new is exhibited it would indeed seem that there is little room for improvement in any of their well known products.

**STAND No. 240**  
**EARL MANUFACTURING CO., Hanover Park, London, S.E.15.**  
 SOME really ingenious, well-made, and compact reproducers are here exhibited.

**STAND No. 242**  
**BAKERS SELHURST RADIO LTD., Croydon, Surrey.**  
 A PART from the well-known range of excellent speakers marketed by this concern, they exhibit an entirely new model the "Fydeltone." This speaker is an extension speaker supplied in a bakelite cabinet, and can be obtained in two models, the "Fydeltone Major" at 45/-, and the "Fydeltone Minor" at 35/-, or without transformer for low resistance outputs at 37/6 and 29/6 respectively. These new speakers are complete in a very attractively finished bakelite cabinet, which can be obtained in various shades and colours to match the furniture of any room, including black and chromium plated. The overall size is 8½in. x 8½in. x 3½in., which makes it convenient for use on a mantelpiece. Although small in size, this new speaker is definitely not of the midget type, as it contains a 6½in. cone and extremely large output transformer, and a highly-efficient permanent magnet of entirely new design. Each speaker is fitted with an output arrangement so that any existing receiver can be matched immediately.

In addition to the above, this firm is continuing all existing models including the Permag and Justone. Prices will remain the same, although improvements and modifications have been made. Their new car radio receiver is exhibited for the first time. The accompanying illustration shows this receiver, together with its neat steering-column control. All the necessary features, such as noise suppression, etc., have been incorporated, and the receiver is capable of a really fine performance.



Car radio is the new branch of wireless research which is represented in this new Bakers' receiver.

Our NEW monthly Magazine  
**PRACTICAL TELEVISION**  
 6D. EVERY MONTH

**STAND TO STAND SHOW REPORT**  
(Continued from previous page)



A new product by Messrs. Milnes—a universal speaker.



One of the new Ultra table console receivers.

Our **NEW** monthly Magazine  
**PRACTICAL TELEVISION**  
**6D. EVERY MONTH**



Specially produced for Television purposes, this Siemens battery has a voltage of 300.

**STAND No. 244**  
**THE 302 RADIO VALVE CO.,** Upper Clapton, London, E.5.

ON show here are all types of battery valves, A.C. and D.C. mains valves, universal mains valves, and an interesting mechanical device demonstrating the process of manufacture of the 302 A.C. mains valves. Interesting models which may be seen here are large specimens of their Battery S.G. and A.C. Mains Power Valve, and an enlarged sectional model of the 302 A.C. Mains Cathode.

**STAND No. 246**  
**ELECTRICO,** 97, George Street, Croydon, Surrey.

**STAND No. 248.**  
**THE WIRELESS LEAGUE,** 12, Grosvenor Crescent, S.W.

**STAND, No. 249**  
**MILNES RADIO CO., LTD.,** Bingley, Yorks.

WHEREAS in previous years this concern has marketed only the Milnes H.T. Supply Unit, they are this year entering other branches of the radio field, as mentioned in last week's issue. The Milnes H.T. Supply Unit is, of course, so well known that it would be sheer waste of space to give information concerning it. Their new lines consist of a new permanent magnet moving-coil speaker in which two models are available—a cheaper model with a two-claw magnet and the de Luxe model employing a special magnet of the new nickel aluminium alloy. Both models are fitted with universal transformers which permit of matching to any output valve or the existing speaker. In chassis form it costs 32s. 6d., the de Luxe chassis costs 43s. 6d., and in walnut cabinets cost 47s. 6d. and 67s. 6d., respectively. Their surprise item is the Milne superheterodyne receiver. This is a special battery-driven receiver incorporating the Milnes Speaker and designed for use with Milnes H.T. Supply Unit. The actual set employs five valves with Pentode output incorporating eight stages and nine tuned circuits. Provision is made for gramophone pick-up and for extension speaker leads. The controls consist of a combined on off wave change and gramo switch, tuning control, volume control, tone control and a change-over switch for speaker in set and extension speaker. Delayed A.V.C. is incorporated. The cabinet is a splendid example of modern design in figured walnut and lalaid macassar ebony. There are compartments for a Milnes H.T. Supply Unit 150 volt, and for the necessary L.T. accumulators for re-charging and filament supply. A special type of lever switch has been evolved so that the unit switch can be turned without reaching inside the cabinet.

**STAND No. 251**  
**COSMOCORD, LTD.,** Cambridge Arterial Road, Enfield.

THE principal item of interest to the home constructor is the newly-designed pick-up which, complete with a rest and carrier arm of the swivel type, only costs 15s. This novel pick-up is also included in the complete unit which Messrs. Cosmocord have to show, and which includes gramophone motor, for A.C. mains, complete with automatic stop, speed and volume controls, and which costs only 55s. For users of complete receivers who wish to convert their apparatus to a radio-gram, the playing desk which incorporates the motor, pick-up and other accessories mentioned above, all in a polished walnut cabinet, will have a great appeal, and costs only 75s.

**STAND No. 253**  
**AERIALITE, LTD.,** Ashton-under-Lyne.

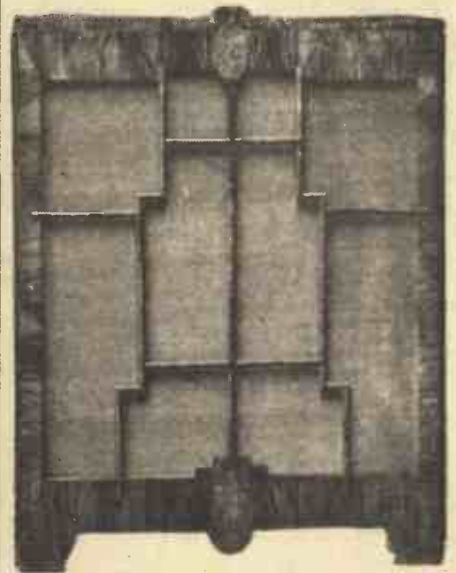
IN addition to the Aerialite aerial and earth equipment and automobile aeriels, this firm is exhibiting several new lines including their Quikfix aerial brackets at 2s. 6d. per pair, their Levenstrand super aerial with a £200 lightning assurance, 50ft. costing 1s. 9d., a neat compendium of aerial and earth equipment at 9s. 3d. and 4s. 9d. respectively, their Aerialite universal-fitting bracket for lead-in suspension, copper aerial wire and coils of flex.

**STAND No. 254**  
**CHLORIDE ELECTRICAL STORAGE CO.,** Clifton Junction, Nr. Manchester.

A FEATURE of this exhibit is the D type cells fitted with the charge indicator. The indicator consists of a dial over which moves a needle, the extreme range of movement embracing full charge, half charge and empty. The reader may here inspect an absolutely comprehensive range of Exide and Drydex batteries and accumulators.

**STAND No. 255**  
**VOIGT PATENTS LTD.,** Silverdale, London, S.E.26.

AS explained last week the main exhibit on this stand is the well-known loud-speaker units with standard and twin diaphragms.



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SUPPLEMENT TO "PRACTICAL WIRELESS"

# TELEVISION NOTES

## THE TELEVISION RADIO RECEIVER. PART 1.

By H. J. BARTON CHAPPLE, Wh.Sch., B.Sc. (Hons),  
A.C.G.I., D.I.C., A.M.I.E.E.

A Practical Article Pointing Out the Requirements of  
Modern Television Receivers, and How These Require-  
ments Can Best Be Met.

FROM the point of view of the television amateur, a television radio receiver (as distinct from the actual "viewing apparatus") comprises two sections: first, the receiver proper, that is, the radio frequency amplifier and detector stages, and, second, the low-frequency amplifier. This division may be considered arbitrary, but is very convenient for several reasons. For example, results of some sort are possible by using the radio frequency portion of almost any good set, but the low-frequency amplifying arrangements of the average domestic receiver are seldom the best for television work, for reasons which will be given later.

It therefore often happens that a television enthusiast conducts the initial experiments with his ordinary broadcast receiver, using, perhaps, a special low-frequency amplifier as he becomes more and more fascinated by his new hobby. Then, later on, he may consider the building of a radio frequency receiver specially for television work, and, of course, such a set is really essential if serious television experiments are to be carried out and the best images are desired. Two sets are also necessary for the simultaneous reception of sound and vision on the present service of medium-wave television broadcasts.

### Fidelity

It is proposed, therefore, to discuss the requirements of television receivers and to show how these requirements can best be met; the present article deals with the radio frequency side, leaving the low-frequency amplifier to be described in the second article. It will be assumed that the reader already possesses some knowledge of the principles of set design and construction, and that it is therefore not necessary to give extended explanations of basic facts.

To begin with, then, a very much higher standard of fidelity is essential for television than for sound reception, because a very considerable degree of distortion can be tolerated by the ear without annoyance, whereas comparatively slight distortion mars the image transmitted by television.

Care must be taken, therefore, in the early stages not to introduce distortion. Now, although it is not so generally recognised as it should be, there are other methods by which distortion can more easily creep into the high-frequency and detector stages of a receiver than into the low-frequency amplifier.

The most obvious form of distortion is that due to interference from a programme on a neighbouring wavelength. A reasonable degree of selectivity is therefore essential, and it is often found desirable to incorporate at least three tuned circuits. A tuned aerial circuit and band-pass coupling between the high-frequency valve and detector will give adequate selectivity, or if two H.F. stages are employed, single tuned circuits between each should be

sufficient. At the same time, selectivity must not be pushed to the limit or the image will lack definition and detail, due to the cutting of the side-bands, with consequent loss of the higher frequencies.

By the way, although carefully ganged condensers and matched coils are essential for sound reception, where the receiver has to be capable of easy and rapid tuning to a large number of stations, this is not so

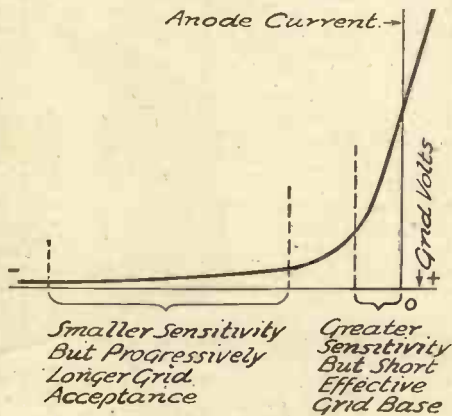


Fig. 1.—Graph illustrating the advantage of a variable-mu H.F. valve.

essential in a television receiver designed to receive the images radiated from one station only. It is quite sufficient, therefore, in many instances, to make use of components already on hand, and separate tuning condensers may be employed if desired, since it will only be necessary to calibrate the set once and for all.

### Another Cause of Distortion

The next cause of distortion which must be guarded against is the overloading of one or more of the high-frequency valves. Because valves in these stages are primarily intended for handling and amplifying weak signals, they have a limited "acceptance," and thus can produce serious distortion if called upon to handle large signal voltages from powerful or nearby stations. For this reason it is strongly recommended that variable-mu valves be employed in the high-frequency stages; for although their maximum sensitivity when used with minimum grid bias is fully equal to that of a popularly called "straight" H.F. amplifier, they will handle without distortion very much larger signals when increased bias is applied; and the fact that the overall amplification is reduced is immaterial, because the initial signal is stronger. This is clearly indicated in the explanatory diagram of Fig. 1.

The degree of high-frequency amplification to be provided depends upon two main points: first, the distance between the receiving set and the television transmitter, and, second, the type of detector valve used. It is clear that a receiver

installed within a few dozen miles of the transmitter would need less amplification than one situated several hundred miles away. Then a sensitive leaky grid detector generally will be found to give better results with comparatively small signals than an anode bend detector, which is at its best when fed with a really strong input voltage. Again, any type of triode detector gives a certain degree of amplification as well as rectification, whereas a diode detector does not amplify, but will handle without distortion very much bigger input signal voltages.

Bearing all these points in mind, therefore, the ideal television receiver would probably be one having two high-frequency stages, each employing a variable-mu H.F. pentode, and with single tuned circuits in the aerial and in both H.F. couplings. Such an arrangement would be adequate for television reception anywhere in the British Isles from the points of view of both sensitivity and selectivity, and the variable-mu characteristics of the valves would enable steps to be taken to avoid distortion through overloading. Again, the large amount of high-frequency amplification thus available would render the use of reaction quite unnecessary, thus eliminating yet another fruitful cause of image distortion.

### The Detector Stage

The next point for discussion is the detector stage. There are three main alternatives from which to choose. First of all there is the familiar leaky grid system, which, as every listener knows, is a most sensitive detector. But it is hardly sufficiently free from distortion for television reception, and is preferably avoided whenever possible.

Even the modified form of leaky grid detection known as "power grid" is scarcely good enough for the purpose, and it is better to turn to the second alternative, namely, the anode-bend detector. Provided the incoming signal can be built up by the high-frequency amplifier to really good strength, an anode-bend detector is almost, if not quite, the most satisfactory arrangement. In both cases it must be understood that triode valves only have been considered.

Now it is quite possible to use screen-grid valves, and also high-frequency pentodes, as detectors, both on the leaky-grid and anode-bend systems, but they are not the best for television detectors. Their merit, for sound reception, is that they will operate satisfactorily with quite small inputs, but for television, where a considerable amount of H.F. amplification, if not essential, is incidental to methods for obtaining adequate sen-

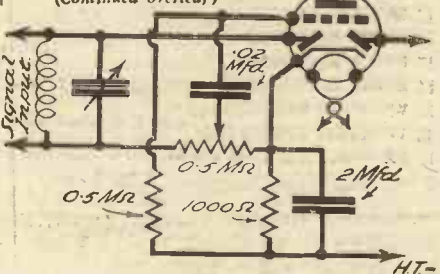
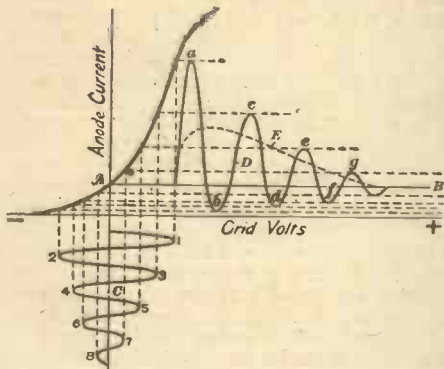


Fig. 2.—A suggested scheme for using a double-diode-triode as a combined half-wave rectifier and L.F. amplifier.

# Do You Know What This Graph Means?



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(Continued from previous page)

sitivity, the screen-grid or pentode detector, with its small working grid base is not really a workable proposition.

There is, however, a third type of detector which has interesting possibilities for television, namely, the diode detector. A properly-designed diode detector device will handle very powerful inputs without introducing distortion. It is true that, as has already been pointed out, such a valve possesses no amplifying power, but it is a simple matter to introduce additional low-frequency amplification to compensate for this.

Three methods whereby diode detection may be arranged are available. As a makeshift, or for experimental purposes, any ordinary three-electrode valve may be employed, the grid being used as the diode anode, or the grid and anode may be strapped together.

If no suitable triode is available, diode detection can be obtained by a double-diode-triode, of which types are available for battery or mains operation. Since it is scarcely necessary to consider automatic volume control in connection with a television set, it would be permissible to employ the two diodes of a double-diode-triode as full-wave rectifier, or one diode of the pair only need be employed. The use of this valve as a full-wave rectifier, plus amplifier, is not really practicable, however, unless special balanced condensers are used. The capacity of the ordinary condenser to earth renders it impossible to obtain a true electrical centre of the tuned circuit.

When employing one diode, however, the triode portion of the valve will serve as the first low-frequency amplifying stage, and, as in all the makes of double-diode-triode the triode portion is quite suitable for resistance capacity coupling, the valve falls naturally into line with modern television practice. One scheme of this character is shown in Fig. 2, where the 500,000-ohm potentiometer forms the diode load and volume control. The two diode anodes may be connected together, if desired. The audio-frequency signals reach the triode grid via the .02 mfd. condenser, while the 1,000-ohm resistor biases the triode amplifier.

One of the disadvantages of the double-diode-triode is that the triode amplifying element does tie the set-builder down to one definite form of valve. More recently, however, double-diodes without the amplifying section have been introduced, and while possessing still better signal handling capabilities, permit the constructor or designer to use practically any form of low-frequency amplifying valve he desires. These double-diodes are at present only available for mains operation; they are, however, considerably cheaper than even a triode and would appear to have quite interesting possibilities for the television receiver.

(To be concluded)

### RECORDING TELEVISION

VARIOUS details have been published in some of the daily papers lately about the recording of television signals on gramophone records, inferring

that this was an entirely new development as far as television is concerned. This, of course, is not strictly true, for Mr. Baird, as far back as the middle of 1928 carried out his original experiments on this "by-product" of television and produced the first phonovision records.

The gramophone recording machine was a very early model employing cylindrical records, while the amplifier rack was of very ancient vintage. Anyway, the equipment served to establish the principles involved, and it was subsequent to this that improvements were effected and disc type records used to replace the initial ones.

### Method of Operation

The scheme is really quite a straightforward one, its complete development being held up owing to incidental problems connected with the recording and playing pick-ups employed and not to any incorrect principles being involved. First of all, the



Fig. 3—Playing back a television record, and showing the image on a mirror standing over the rectangular aperture.

subject to be recorded is scanned by the spot-light method, the resultant light variations being converted to equivalent voltage variations by the usual banks of photo-electric cells. After amplification these signals are transferred to a recording pick-up which indents the wax record. Concurrent with this, the accompanying sound is picked up by a microphone in the same studio, converted to an electrical signal and recorded either on a second record synchronized with the vision record, or alternatively recorded on a second track running concentrically with the vision track on one record.

These records or record are then played back with double pick-ups—one for vision and one for sound. From the sound track the signals are fed to a loud-speaker, while the vision signals are transferred to a television receiver which can be distinct from, or a part of, the gramophone turntable equipment. This latter form is shown in the accompanying illustration, Fig. 4, the image being projected on to a mirror standing over an aperture cut in the box top, as shown. The motor drive for the record turntable is suitably geared to revolve the scanning disc for this purpose, this method lending itself better to the problem of synchronizing.

The electrical pick-up used for "playing" on the vision record has to be capable of passing a wider band of frequencies than is required for sound purposes, otherwise the image seen will be sadly lacking in quality owing to the absence of the higher frequencies so essential to detail.

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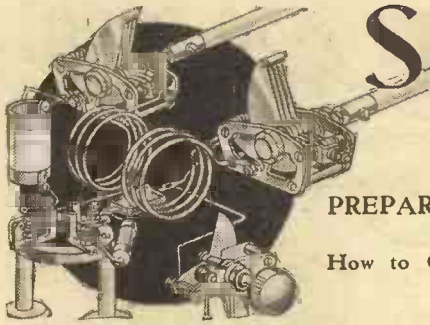
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# Short Wave Section

## PREPARING FOR THE WINTER ON SHORT WAVES.

How to Overhaul and Test a Receiver to Ensure Maximum Results.

By K. E. BRIAN JAY.

**T**HERE are some people who think that because a wireless set has few moving parts there is nothing that can go wrong, but this, of course, is a mistake; dust can creep in, nuts can get slack, the slight jars unavoidable when dusting may shake connections loose, and all these things cause the receiver to become noisy, and lose its efficiency. Any receiver will suffer in this way, but the effects will be most noticeable on short waves, where slight rubbing between metal and metal, or dust, in bearings and joints will cause bad noises in the headphones, and it is therefore very desirable that the receiver should be overhauled and its defects repaired before the winter season, when with the return of dark evenings it is likely to be much used.

In the search for sources of noise first examine the filament circuits; look for dirty joints and especially test the switch, which can be a potent noise producer; clean its contacts and bend them a little so that they press more firmly on the plunger. If it still makes a noise in the 'phones when the knob is wriggled it should be replaced, preferably by one of the Q.M.B. snap type, which is much less likely to develop a bad contact. When indirectly heated valves are used, test the resistance of the heater leads; a high resistance here will cause a bad drop in the voltage at the heater terminals.

### Testing the Wiring

Next test the whole of the wiring of the set. If the joints are soldered pull each one sharply to see that it is sound; if it seems at all loose, even although the wires do not come apart, resolder it: indifferent connections are responsible for more noise than any other single item. If the connections are made simply by means of the terminals on the components they should all be screwed tight and tested by pulling. Pay particular attention to terminals which carry flexes; often turning the screw causes the strands of the flex to spread with the result that contact depends on only two or three strands, and the remaining strands are free to rub on the terminal and so create irritating noises. In sets which are screened the screens must be examined to see that they are making good contact with the earth return and that any bolts that hold them together, such as are sometimes used in screening boxes, are screwed up tightly. Make sure also that wires that ought to be in the air are not rubbing against a screen or on a metallized base-board.

### Tuning Condensers

Now turn your attention to the tuning condensers. With the receiver switched on turn the dial slowly and listen for noises. If you hear any, as you are very likely to do, remove the condenser and clean it; a pipe-cleaner or feather can be used to remove the dust between the vanes and a small paint brush will be a help in dealing

with the bearings. Should there be any slackness in the bearings it can be taken up by means of the adjusting screw in the bottom plate, but this is an operation that requires care or the plates will be put out of alignment and will rub on one another. A tiny drop of very thin oil can be applied to the bearings when they are clean. Do not forget to look to the pigtail connections on variable condensers; the noisiest short-wave receiver I ever heard of owed all its trouble to a defective pigtail in the reaction condenser. The spirals of the pigtail must not touch one another as the moving vanes are turned nor must they rub against the spindle or bearing. See also that there is no break or weakness in the pigtail, especially if it is made of thin metal foil: While you are treating the condensers do not neglect the slow-motion dial; remove the dust from it and apply a little oil to the bearings.

### Examine the Coils

After the condensers the coils. If they are plug-in coils examine the pins and clean and spread them apart a little with a pen-knife so that they make good contact with the sockets. Return any wandering turns to their proper place, and if necessary keep them there with a spot of shellac varnish or Durofix for coils wound with very thick wire. Coils wound on valve bases suffer particularly from handling, and it is sometimes best to rewind them, quite a simple job; make sure you put on the same number of turns though, or the calibration of the receiver will be thrown far out. It will be disturbed in any case if the coils are rewound, but not very much if the same wire and number of turns are used on the original former. In receivers fitted with dual range coils the wave-change switches must be

examined and cleaned or even renewed if they are very noisy. In some home-constructed sets the wave-changing is done by means of a plug on a flex; in such a case it will probably be worth while changing the flex for a new piece. The plug and sockets must, of course, be cleaned.

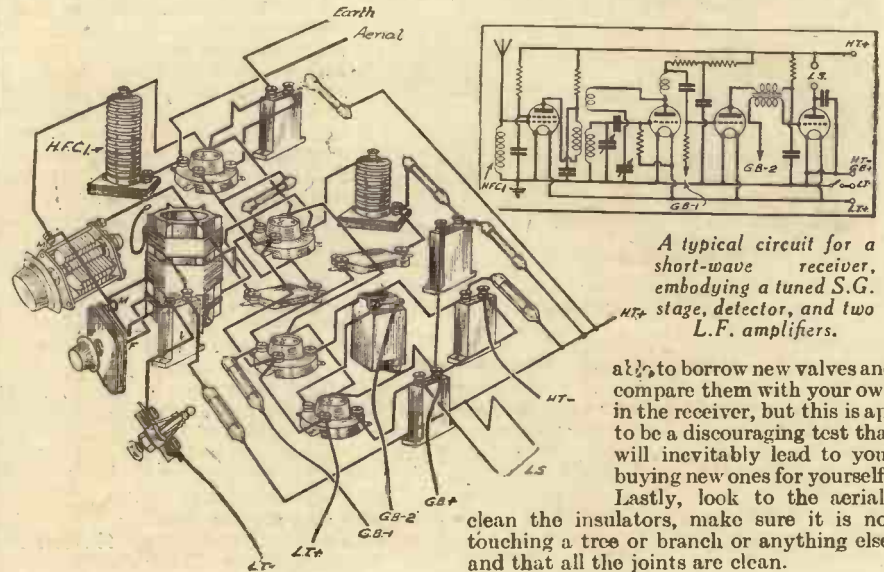
When the whole of the internal wiring is checked and the components cleaned and dusted, attend to the external wires to the batteries. Examine the L.T. leads for signs of corrosion at the accumulator end and also for broken strands at both ends; cutting off the dirty ends and cleaning a fresh part of the flex will be enough if screw type spade tags are used, but if the tags are soldered on it may be necessary to replace them with new ones. The H.T. and G.B. wander plugs must be cleaned and spread out and the connections to them tightened up [and, of course, the telephone leads must not be forgotten; if there is a great deal of noise when they are shaken there is probably an internal break and they must be replaced.

Lastly, the valve pins are cleaned and spread with a pen-knife if they fit badly. If there is any bad noise left now it almost certainly arises from a defect in some component such as a H.F. choke, L.F. transformer, resistance or grid leak, and in that case each component must be systematically tested in the way that has been described in these pages before.

### Checking the Batteries and Valves

There may still be a falling off in efficiency, and to prevent this the batteries and valves are checked. Measure the H.T. voltage when the set is first switched on and then after it has been in operation for three hours or so. Any great difference between the two readings indicates that a new battery is needed. Check the voltage of the grid bias battery, and if necessary renew it; renew it in any case if it has been in use more than a year. It is assumed that the L.T. accumulator has been properly looked after all through the summer, and therefore will not be in need of special attention now.

It is a good plan to measure the plate current of the valves and compare it with the value given in the maker's curves; a wide divergence indicates a defective valve that is probably working far below maximum efficiency, and may be noisy. If a milliammeter is not available you may be



A typical circuit for a short-wave receiver, embodying a tuned S.G. stage, detector, and two L.F. amplifiers.

able to borrow new valves and compare them with your own in the receiver, but this is apt to be a discouraging test that will inevitably lead to your buying new ones for yourself! Lastly, look to the aerial: clean the insulators, make sure it is not touching a tree or anything else, and that all the joints are clean.

# The LATEST in COILS

A Brief Summary of the Changes which Have Been Made in the Design of the Tuning Coil During the Past Season.

AT the time of last year's exhibition at Olympia it was possible to describe most comprehensive modifications which had been introduced in the design of the tuning coil during that year. Since that date, however, no such detailed changes have been seen, although there have been several interesting developments in this important section of the broadcast receiver. The introduction of the powder-iron core enabled the size of the tuning coil to be greatly reduced and also enabled Litz wire to be used with decreased H.F. resistance, and further enabled the screening of these coils to be carried out without in any way losing efficiency. Thus it might have been said that the coil was well nigh perfected. Since last year's exhibition, however, the Lucerne Plan has become effective, and this has necessitated some important modifications in the design of the coil to suit modern needs, and with the forthcoming introduction of the Droitwich transmitter (October 7th) it is highly probable that some still further alteration will have to be made.

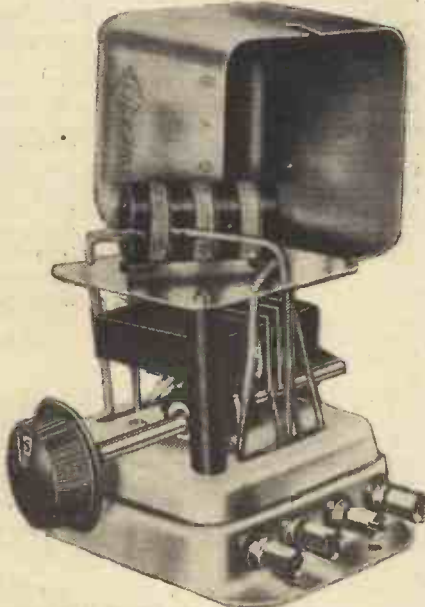
## Wavelength Range

A year ago it was customary for the coil to cover bands of 200 to 600 metres, and about 850 to 2,000 on the long waves. Under the conditions existing with the Lucerne Plan it is necessary to modify this range to include certain stations which are easily receivable in this country



A good example of the compactness obtained with modern iron-core coil assemblies. This is the Colvern assembly.

on small receivers. For instance, Fécamp is a very good station, and unless the tuning coil has a minimum tuning point some way below 200 metres it cannot be satisfactorily tuned in. The new Droitwich station will probably render it necessary to modify the long-wave range in order to take full advantage of this station and other stations in this portion of the band, bearing in mind the fact that the power of this new station will be probably in the region



An iron-core coil—this is the Wearite. Note the novel arrangement of the medium and long-wave windings.

of 150 to 200 kilowatts. The London National will cease to function when Droitwich comes into play, and thus the medium-wave band will offer more programmes to southern listeners. The demand for selectivity does not arise in every part of the country, and with the increased efficiency of the modern valve and other components it is now possible to construct a receiver in which a really efficient air-core coil will offer adequate selectivity if used in the correct manner, and accordingly several makers have, during the past few months, re-introduced this type of coil as an addition to their range of iron-cored coils. The Wearite Universal coil is a good sample

of this new method of construction, and the efficiency of the coil was demonstrated in the Leader series of receivers which we recently described. Other coils designed on these lines, that is, with air-cores but carefully designed selective windings, may be found in the Bulgin, Burne-Jones and other catalogues. They

employ metal screening cans and offer adequate selectivity for modern needs in most parts of the country. Obviously in the London area, with a large external aerial, it may be found difficult to provide sufficient selectivity to receive stations separated by only a few channels from the London stations, and it is then that the iron-core coil with probably the addition of a further H.F. stage will be found necessary.

## The Superheterodyne

With the increased popularity of the superheterodyne circuit the necessary coils have also become popular, and now practically every manufacturer who includes coils in his range of components can supply the coils necessary for this type of circuit. The introduction of the special frequency-changer valves has led to the development of oscillator coils having characteristics suitable for the pentagrid, heptode and octode valves, and thus render the construction of the superhet much simpler.

Beyond these few changes there has been nothing which is of importance to the home constructor, and Messrs. Varley are still the only firm who are marketing a complete permeability tuner in which the variation in inductance is carried out by a movement of the powder-iron core instead of the more usual parallel tuning capacity. Great things were expected of permeability tuning at last year's exhibition, but for some reason or other they have not matured during the season. It is difficult to account for this, as it is obviously a much better system of tuning than is obtained by the parallel capacity method now in use, and the losses are certainly likely to be much lower. In a way, too, it is the more logical method of tuning, but we must wait and see whether it will become the universal tuning system of the future.

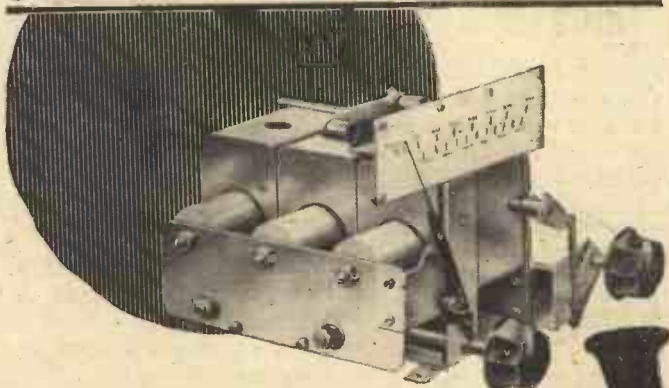


Air-core coils can also be efficient, and here is a group of Bulgin coils, with screens.



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Most wireless receiving Sets to-day are so highly sensitive that only very short aeriels are generally necessary, but this sacrifices stability. When the Aerial is a short one, your Set will be more selective, but it may be unbalanced, on the verge of oscillation, and hard to control. The new ELECTRON GLOBE AERIAL remedies this and restores balance to the set, corrects fading and stops 'blasting,' as the set is so easily controlled and maintains selectivity at a higher efficiency. The ELECTRON GLOBE AERIAL gives brilliance and sparkle to the duldest transmission, greatly improving the tone and volume. It has special insulated clamps so that it can be easily fixed to any type or size of steel or wooden mast. Its splendid on water pipes near the window for accessibility, or can be screwed to any wall or flat surface, roof, etc. A handsome ornament to the gable, or as a most efficient indoor aerial.

Standard Model .. 15/-  
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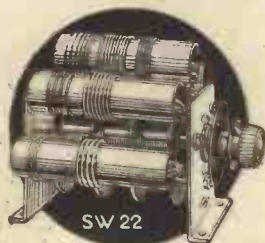
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SW 22

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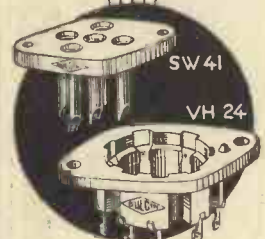
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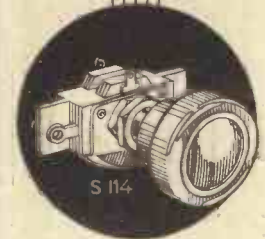
SW 41

VH 24

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**THE BEGINNER'S SUPPLEMENT**

OUR NEW COURSE FOR BEGINNERS.

In This Article the General Principle of Broadcast Transmission is Simply Explained.

**B**EFORE we can fully appreciate the varied principles which are involved in modern wireless transmission and reception it is necessary to understand the simpler method of sound propagation. Broadcasting is simply a method of transferring sound from one place to another without the intervention of any sort of wire. Sound may be described as the effect upon our ears of air vibrations produced by the vibration of an instrument emitting that sound. When a musical string is plucked or bowed we hear a sound but actually the vibration from the string does not become sound until it reaches our ear. As the string vibrates, or moves backwards and forwards very rapidly, it alternately pushes and releases a small quantity of the air in its immediate neighbourhood and this small movement is imparted to the particles of air nearby and so on, the movement spreading outwards very rapidly in all directions. The jostling and moving which takes place in the particles of air eventually reach our ear, and the very thin membrane inside our ear is, in effect, struck by the moving air waves and so caused to move in sympathy with the air movements, and in this way the original sound is "re-created" and we become aware of the noise.



An illustration of a high-power broadcast transmitter, showing the large valves and other accessories.



A modern broadcasting studio, with two microphones.

The Telephone

The instrument invented by Bell was the first satisfactory solution to the problem of conveying the sound waves from one place to another beyond the normal range of our hearing, and in this instrument a device known as a microphone is employed and the sound waves are directed so that they impinge on the diaphragm of this microphone. By means which will later be described the movement of the diaphragm (which would correspond to the movement of the drum of the ear) sets up varying electric currents in a pair of wires, and these wires are led to a somewhat similar device at the other end. Here, the varying currents flow

through a magnet and so cause another diaphragm to be varied exactly in sympathy with the original diaphragm's movements and this reproduces the sound. For wireless broadcasting exactly the same principle is utilized, but, instead of employing the wires connecting microphone and reproducer, a further change is made and the vibrations are distributed through space by means of a radio wave which travels in a manner very similar to light, at a speed of 186,000 miles per second. So far as is at present known, this radio wave is incapable of affecting any of the normal human senses, and, therefore, it is impossible to hear any broadcast matter without the aid of a wireless set.

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By F. J. CAMM  
 (Editor of "Practical Wireless")

Third Edition.

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THE FRAME



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# CLIX

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# READY MADE OR HOME MADE?

Is it Better to Make Your Receiver or to Purchase One Ready Made?  
Some Important Details Which Answer This Question

AT the present time there are a number of really cheap wireless receivers on the market, and this has led to the belief that it does not pay in these days to make a wireless set at home. It is probably safe to say that it is impossible to build a receiver at home at the price of a similar type of commercial receiver, but it is necessary to go rather deeper than this in order to ascertain whether or not it is worth while to build your own. Dealing first with price, it will probably be found that this season it is quite a simple matter to obtain components which will not cost more than the commercial receiver which contains the same number and types of parts. Hitherto, it has been the custom in the component industry to sell parts which have been fitted with ornate cases or which have been made up to sell simply as a separate component, and consequently the price has been higher than was desirable. In an endeavour to obtain a really cheap set the manufacturers of complete receivers set out to utilize components which were stripped of all unnecessary decoration, and also, in many cases, which only just served for the purpose for which they desired to use it. Thus, in the case of a smoothing choke, for instance, this was designed to use the minimum size of core, the thinnest wire, and the smallest number of turns so that it smoothed the particular supply in a cheap receiver. The cheapest choke in the component market would undoubtedly be found to be housed in a bakelite case—not for appearance necessarily, but so that it was amply protected and would not give rise to shocks when handled by the constructor. The wire would also be found to be much heavier than was really essential, and the rating would probably be found to be stated in the catalogue as suitable for "20 to 60 milliamps"—in other words, it was more of a general purpose instrument. Obviously, therefore, it would cost more than the previously mentioned component. The same applies to the other accessories in a commercial receiver; they have, in the majority of cases, been stripped down to the bare minimum and consequently a considerable amount of money has been saved.

### A Safety Factor

It does not need much imagination to see that in the event of an overload—no matter how such overload may be caused—there is every risk of a complete breakdown in more than one part. This factor is of vital importance to the user of the apparatus, not from the point of view of personal safety, but also from the point of view of economy. Should the maker's guarantee have expired a considerable amount of money may have to be expended to put the receiver into working condition again, and, furthermore, in the majority of commercial receivers, it will be necessary to send the apparatus to a service station to be attended to owing to the inaccessibility of the parts. Contrast this with the

home-built receiver described in a wireless journal. The designer, in choosing the circuit and components, will have before him not simply one list, but the lists of all the manufacturers of component parts. Thus, should he need a smoothing choke for a mains receiver, he will work out the current which is passed, and then will examine all the lists and select those which will handle that current with safety, narrowing down his choice by picking those having the highest inductance, and finally selecting that which has physical dimensions most suitable for the design which he is working upon.

Admittedly, until recently the constructor had to pay an uneconomical figure for his components owing to the method in which these components were built up, but we have taken up this point with the majority of manufacturers, and as a result of the policy which we have adopted and which resulted in the introduction of the "Leader" series of receivers, a number of components may now be obtained in a similar condition to that in which they are supplied to the receiver manufacturers, a condition known as "stripped." That is to say, instead of terminals, long leads are fitted; no elaborate case surrounds thy component, and yet the original safety factor is still there.

### Experimental Scope

There is, however, another more important point which must not be overlooked. Radio at the moment is by no means perfect, and it is quite possible for drastic modifications to be made in a very short space of time. For instance, during the past twelve months the valve alone has moved along most unthought-of lines. Listeners with a commercial receiver will find that it is almost impossible to modify the lay-out in order to take advantage of a new idea, or even to try out a new arrangement in order to satisfy themselves regarding some astounding claim. The home-made receiver, on the other hand, is readily accessible, and furthermore, when a new idea is introduced, the technical Press generally shows how the scheme may be fitted to an existing receiver which they have already described, or gives some data regarding it which will enable the listener to apply it to his receiver. It is thus conceivable that for the expenditure of a few shillings and perhaps an hour or so on a wet evening, the constructor may bring a receiver completely up to date, whilst the user of a commercial receiver will have to continue to use an out-of-date receiver or scrap it (owing to its low market value), and spend a large amount on a new receiver. It might be argued that drastic changes do not come about so suddenly, but one has only to remember the recent wavelength shuffle, and remember how many receivers were unable to separate stations, to realize that there is every possibility of similar changes occurring at any moment. And with the advent of television, this is a most vital point.

# RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

## ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

New Zealand readers of PRACTICAL WIRELESS will be interested to know that the Southland Branch of the Anglo-American Radio and Television Society has been formed by Mr. James Searle, ZL4CE. The branch rooms are at Invercargill. This branch is in regular touch with the New Zealand Headquarters by radio, the N.Z. H.Q. stations being ZL-3HD and ZL-3JQ, both in Christchurch. Mr. Searle's address is 193, Ettrick Street, Invercargill, New Zealand.

The West Middlesex and East Bucks Branch has discontinued meetings over the summer months, but an attractive programme is being drawn up for the resumed meetings. Full particulars may be obtained from Mr. Leslie W. Orton, "Kingshorpe," Willowbank, Uxbridge, England.

## SLADE RADIO

The programme of lectures, etc., for next month is as follows:—

- Sept. 6th.—Lecture by Dr. Harvey Marston. Short-wave working. R.N.W.R. Commercial and Naval, with special cine films of Rugby S.W. station.
  - Sept. 13th.—Recording and reproduction. Marcondphone Co., Ltd.
  - Sept. 20th.—Lecture and special demonstration by Mr. L. G. Coade, "H.F. Currents in connection with electro-medical apparatus."
  - Sept. 22nd.—Visit to the S.W.S. Power Station at Stourport.
  - Sept. 27th.—Ladies' Night. Illustrated lecture, "Gallipoli," by Lieut.-Commander Brewster.
  - Sept. 29th.—Midnight D.F. test.
- Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

## CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogues," PRACTICAL WIRELESS, Geo. Neuen, Ltd., 5/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.

## THE NEW AVODAPTER

It often happens when wishing to check up one's own or somebody else's set that there is a doubt as to the best way to set about the job. Of course, an ordinary meter can be used, but this may necessitate the disconnection of wires for inserting a meter, with subsequent re-soldering. This sort of thing, however, is superseded by the new AvoAdapter, which consists of a plug (instantly convertible for 4- or 5-pin valves) without loose parts, connected to a testing holder or base, which provides for the taking of voltages and currents in all the valve circuits, with comfort on the bench. The AvoCoupler is a 5- to 7-pin conversion adapter, which enables the operator to deal with multi-electrode valves also with ease and efficiency. It is used in conjunction with either plug or base depending on the type of valve to be tested. The plug is inserted in the valve-holder of the valve under suspicion, and the valve plugged into the AvoAdapter. A switch and link are provided to enable anodes, grids, screens, filament or heater currents and voltages to be measured. The currents and voltages of any circuit can be taken simultaneously or separately.

For those who already have, or wish to make up their own testing equipment, the AvoAdapter Convertible Plug can be supplied separately, complete with 6-way lead. Full particulars and prices are given in a folder just issued by the Automatic Coil Winder and Electrical Equipment Co., Ltd.

## OLON ELECTRIC SOLDERING IRON

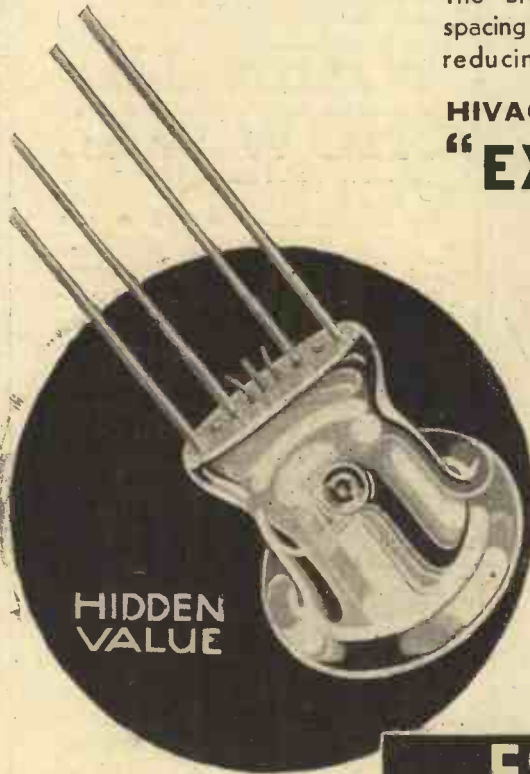
FOR making neat soldered connections quickly an electric soldering iron is a necessity, and the lightweight Solon electric iron, made by W. T. Henley's Telegraph Works Company, is specially suited for the purpose. The weight of this iron is 9½ozs.; it consumes 65 watts and is obtainable for various voltages from 100 to 250. A heavily tinned straight copper bit of oval section is provided, and the heating element is so arranged that the maximum amount of heat is at the working end of the iron. The flexible lead consists of 8ft. of Henley's tough rubber-sheathed three-core flex, which will withstand the roughest usage in service. The ends are trimmed ready for connecting to a 3-pin plug. The price of this handy iron is 9s. 6d., and an attractive folder giving further particulars of this and heavier irons can be obtained from the above-mentioned firm.

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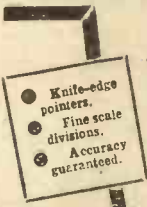
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**MAGNETIC CONTROLLED METERS.** Recommended by leading technicians for general radio and charging purposes. Guaranteed accuracy. In moulded cases 2½in. overall, 2in. hole in panel. From 7/6.

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| EXIDE H.T. Accum.     | 120v. | 60/- | 6/-        | 9 of 6/8  |
| BLUE SPOT 29PM.       | ...   | 32/6 | 4/5        | 7 of 4/5  |
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## Impressions on the Wax

By "TONEARM"

If we were to look up our dictionary for a definition of the word "practical," we should probably find, in common idiom: "putting knowledge to real use." Now knowledge, or science, or art belong to an abstract world, and whilst there seems to be no objection to putting the first two to very practical ends, there exists the fervent conviction that art should survive for its own sake—subjectively, as it were, in deference to the cliché, "Art for Art's sake."

There is no reason why the aesthetic should not contribute something of itself to the practical. This is not to say that every expression of art should be turned into money; this would be, firstly, impossible for many, and secondly, unhealthy for everybody. But there is no valid or proper reason why art should not be viewed in terms of practical values, *practical* in the sense that one may look for some new experience or sensation apart from the purely academic viewpoint which many would have us adopt. Cannot we get at the message behind the mere expression?

Let us make an attempt to do so—here, of course, we are dealing with musical art as we hear it on gramophone records. We begin to listen to, say, the Beethoven *Fifth Symphony* (I know of no better illustration), detached from any other purpose than that of listening to some "good music." Almost at once, from behind the art which inspires it, leaps out the practical. There is a message there, insistent, vital, urgent. What that message is belongs only to Beethoven and the hearer, but in it is a very real structure on which may be built many foundations, all acutely real and translatable into action or conduct. Surely this exemplifies the practical side of music.

There are two ways, and two only, of *hearing* music. There are only two ways of *talking* of music. One—the frigid analytical method, where the poor corpse is laid on the slab of polemical dissection and cold-blooded evidence delivered as to the physical structure and condition of the deceased (thus the usual form of criticism); and, two, the intimate, honest effort to describe the attributes of a *living* entity always with us and its message and influence on our lives. Art for Art's sake—heaven forbid!

We shall go much farther than that in our efforts to draw our pictures! Everybody must take something away—something which will guide towards richer practical rewards. And this end can only be achieved by a portrayal (in the practical sense) of the piece before us. Does it really mean anything to us? Will it be of any value to us this time next year? Are ordinary, intelligent folk able to sense its merits, able to understand it? These are the questions we shall ask and endeavour to answer. The composer, the poet, and the artist either worked for *you*, or they did not; we shall try to show how far their efforts have succeeded.

From time to time we must examine an opera, and at the moment *Madame Butterfly* is presented to us. Listening to opera presents a double difficulty where its language is other than our own (as in this case). And yet there is no reason to run away from it. The emotional content of the music of the best operas is, with

(Continued on page 705)



## and WHEN THE SHOW WAS OPENED . . . .

The fare at Olympia offers many surprises . . . new circuits, new tuning devices, new cabinets. But had you the time to investigate you would be more than surprised how you would find T.C.C. condensers "all over the show." Look inside the leading commercial receivers, call at the various press stands, see how often you meet the "condensers in the green case." Then go over to Stand 37 and see the range of T.C.C. condensers, the comprehensive selection of NON-INDUCTIVE paper types, the electrolytics, and the big transmitting condensers. Spare a second more, realise how their dependability has made T.C.C. the premier amongst condenser makers—realise too, you can have that dependability—for no extra cost.

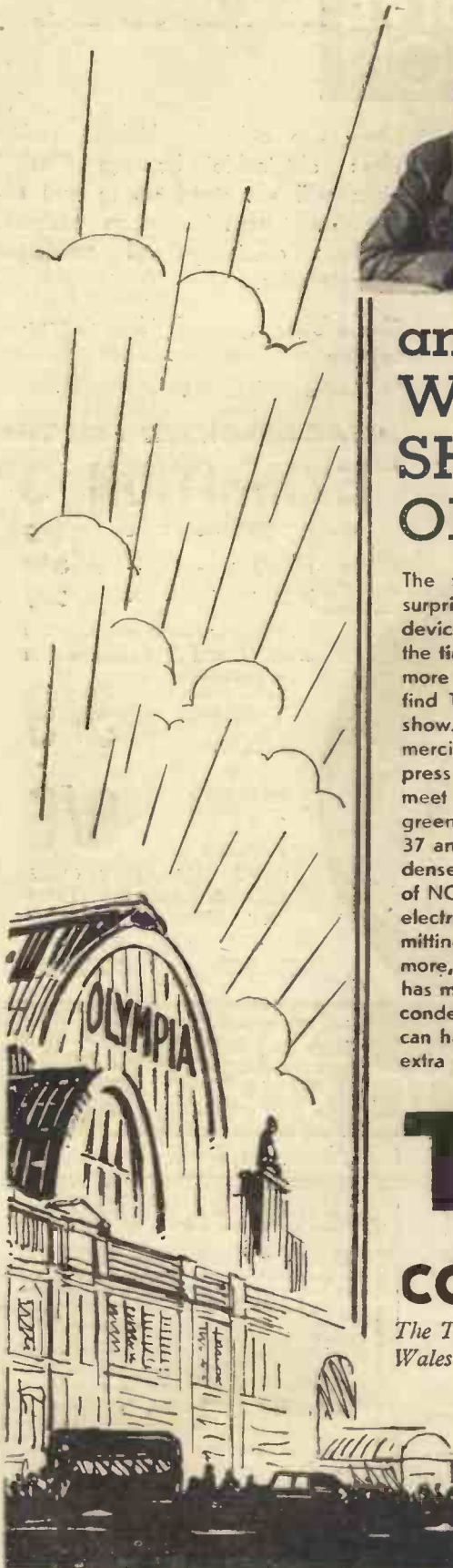
# T.C.C.

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CONDENSERS

The Telegraph Condenser Co., Ltd.,  
Wales Farm Road, N. Acton, W.3.

SEE THE  
COMPLETE  
RANGE ON  
STAND 37

CA 5434





# Random Gottings

By Jace

## Conducting in a Sound-proof Box

BY means of a new invention which was tried out recently at the H.M.V. Recording Studios in London, one of the greatest difficulties in obtaining satisfactory performances of orchestras when performing in front of a microphone for the purpose of broadcasting, or making records and films, will be solved. In the past the conductor has not been able to obtain an accurate impression of how the performance is sounding to the listeners in the case of broadcasting, or how it will sound ultimately in the case of records or films. For example, a visitor to the recording studio during a dance band session recently found himself unable to hear the vocalist who was standing only a few inches from the microphone, whilst the recorders in their room adjacent to the studios heard

### CONDUCTING IN A SOUND-PROOF BOX.



Ray Noble, the dance music composer-conductor, used for the first time recently a new invention when making records in the "His Master's Voice" studios. He conducted his orchestra from a sound-proof box, and heard their playing through a loudspeaker at his side. Thus he was able to ensure that all the instruments were perfectly balanced and managed to obtain effects that have not been possible hitherto.

studios heard through a loud-speaker the performance as it will be on the finished record. The amplifying powers of the delicatemicrophone and apparatus made the vocalist's voice stand out above the orchestral accompaniment when the performance was heard through the recordingengineers' loudspeaker.

This new invention, which has been developed under conditions of the greatest secrecy in the "His Master's Voice" studios, enables the conductors to hear the performances of the orchestras under their direction in the same way as the recording engineers, and also as they will sound on the finished records. The conductor stands in a specially made sound-proof cabinet with glass windows about double the size of a telephone booth. It is situated in the studio, and he directs his orchestra whilst inside the cabinet. He does not hear the performance direct, but listens to it through a loudspeaker which is at his side.

Ray Noble, the well-known light music conductor-composer, was the first to use this new invention whilst making some records in the H.M.V. studios of a number of the latest fox-trots.

It is believed that the idea may be extended to broadcasting and film studios,

where conductors of orchestras will find it extremely helpful, especially when conducting operatic works when vocalists have to sing with an orchestra. The H.M.V. recording official also stated that this invention would be used in future when making re-created records of Caruso and other celebrities of the past. "Conductors of symphony orchestras will," he said, "be able to hear the dead singers' voices through the loudspeaker in the cabinet whilst directing the orchestras through the window."

## Droitwich—and After

THE new B.B.C. giant station at Droitwich will not officially begin broadcasting until early in September, but unofficial testing is now taking place every night after the other stations have closed down. Every possible precaution is being taken to ensure that there will be no last-minute hitches. But there is another reason for these early tests. The Radio Exhibition opened on August 15th, nearly a month before Droitwich starts transmitting in earnest. The new station will have a power of 150 kilowatts, as against Daventry's 30 kilowatts, and it is possible that this tremendous increase will vastly alter reception conditions.

## Up-to-Date Tuning Scales

BY not waiting for the official opening of Droitwich, the B.B.C. are providing radio manufacturers with an opportunity to check the performance of their new sets against actual transmissions. An example of the thoroughness with which manufacturers are making their preparations is provided by E. K. Cole, Ltd. The new EKCO models are being issued with Droitwich already marked on the tuning scales, so that the sets will be completely up-to-date immediately transmission begins. These dials are also easily replaceable in the event of a change-round.

# Easy Terms

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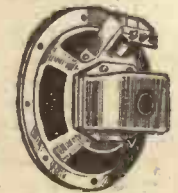
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# HOME CONSTRUCTION IN 1935

Radiolympia has Much of Interest for the Home Constructor,  
for Many New Components are to be Seen

**NINETEEN-THIRTY-FIVE** will certainly be a constructors' year. Some months ago it appeared that interest in home construction was flagging, but the introduction by PRACTICAL WIRELESS of the "Leader" series of receivers marked a change, and that change is continuing to become more pronounced. As we show on another page the prices of components for set building are certainly lower than they have ever been before, whilst the standard of home-made receiver performance is particularly high.

It might so happen that some readers of this special "Olympia" Number forsook home construction a few months ago while prices were rather high, and it is chiefly for the benefit of such people that this article is being written. Those who have not been actively engaged in home construction during the past year or so might be in some

provide the best form of volume control—either automatic or manual. When the output circuit is being considered users of mains apparatus will almost invariably desire to use an output valve giving an undistorted output of two or more watts, and such valves are readily obtainable. The battery-set user will wonder whether to employ Class B or pentode L.F. amplification; where a particularly large volume is desired the former will be preferred, but it should not be overlooked that most of the latest types of moving-coil speaker are considerably more sensitive than their predecessors, so that a really ample output for most purposes can be secured by the use of one of the many high-efficiency pentodes. In this connection it might be mentioned that the new W/B "Stentorian" speakers, for example, will give nearly twice the volume of sound for any given signal input than would last year's models.

## Tuning Components

When it comes to the choice of a tuning circuit the constructor can choose between iron-core and air-core coils. In the case of a very simple local-station receiver, or when selectivity is not of prime importance, the air-core inductance can still be used with every success. But when sharpness of tuning is a deciding factor, iron-core coils have it every time. There are tuning condensers in plenty, and we do not know of an unsatisfactory one made by any of the better-known manufacturers. Where compactness is desired recourse can be had to one of the many midget tuning condensers which are every bit as effective as their larger brethren. Such components are made by Wingrove and Rogers ("Polar"), British Radiophone, Wilkins and Wright ("Utility"), and others, whilst very attractive full-vision tuning scales of various types can be obtained for any of these.

Those who favour the superheterodyne on account of its selectivity, but who desire better quality of reproduction than this type of circuit is normally capable of providing, will be pleased to learn that it is possible to obtain oscillator coils and intermediate-frequency transformers of the adjustable type. These can be set to provide any band-width acceptance from about 6 to 12 kilocycles, so that the best possible quality can be secured from the nearby stations, at the same time as maximum selectivity is available when distant stations are wanted.

## Multiple Switches

Many constructors prefer to cut down the control knobs to the lowest convenient number, and these will find the multiple anti-capacity switches made by such firms as Bulgin and Burne-Jones ("Magnum") extremely valuable as a means of combining the functions of a number of separate units. Other combination controls are to be found on most of the complete tuning units which are to be had for any and every circuit arrangement—the Colvern-matched tuners are a case in point.

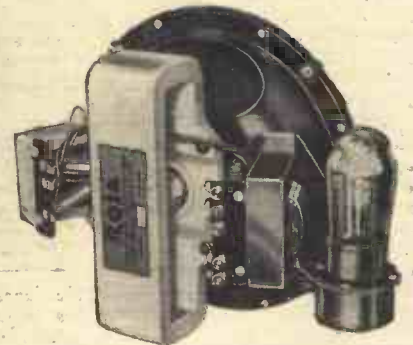


A useful volume control for the home constructor.

There are still many houses which are supplied with D.C. mains, and as these will eventually be replaced by A.C. the occupiers are often in doubt as to the most suitable type of receiver to build. This question now lends itself to a ready answer, because almost every type of valve can to-day be bought in a form which can be operated equally well from A.C. or D.C. mains. These universal valves are by no means "experimental," but are just as satisfactory in every way as their A.C. counterparts.

## All-Wave Tuning

Until this year there has been a dearth of tuners which would cover not only the



To enable a battery receiver to be converted this Rola Class B Speaker will prove invaluable.

long- and medium-wave bands, but also the principle short-wave ranges. There are now, however, two or three entirely satisfactory all-wave tuners; one of these employs interchangeable coils so that not only can short waves be received in addition to the broadcast bands, but any particular short-wave ranges can be accommodated. This tuner will go down to 10 metres and up to 2,000 metres merely by operating a switch.

Most readers are well aware that the ultra-short-waves are coming into greater prominence in connection with television, so it is not surprising to find that special coils for ultra-short wavelengths are obtainable.



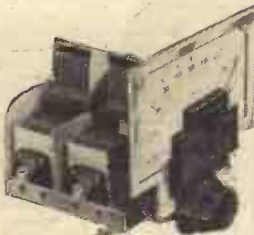
A new type of fixed condenser from the Formo factory.

doubt regarding the latest components which are now available, and perhaps in rather a quandary to know what type of set they should make for the coming "season" (if there is any "season" in wireless to-day, which we very much doubt), and a few notes concerning the available parts will prove useful.

## H.F. Pentodes

Whether it is proposed to make a superhet. or a "straight" receiver, variable- $\mu$  or plain H.F. pentode valves will be required, for these have almost entirely

A Formo double-gang tuning condenser fitted with a new and unusual form of tuning dial.



supplanted the ordinary S.G., which was previously a popular favourite. The latest valves are much more stable than their prototypes, and are capable of producing a far greater degree of sensitivity. In addition, valves of the variable- $\mu$  type



# THE NEW COMMERCIAL RECEIVERS

A Résumé of the Salient Features of the 1934-35 Ready-made Sets.

**T**HE variety of new receivers for the 1934-35 "season" will be as great as, if not greater than, for any previous year. Prices will be lower than ever before in the history of broadcasting, whilst the sets themselves will be much smaller in regard to their physical dimensions. The new models will not be so distinctive in the matter of new and unusual circuit arrangements as in respect of the many practical improvements which will be incorporated. As was the case last year, superheterodynes will predominate, and there will, in fact, probably be a far greater number of superhets at Olympia than at any previous Exhibition. "Straight" sets will not be entirely absent, but these will be featured in the lower-price range as a general rule. A rather important proof of the extra popularity of the superhet is afforded by Messrs. Philips Lamps, who last year employed their well-known "superinductance" principle in all their larger and more powerful receivers; they have not forsaken this efficient circuit, but they are producing two superhets—one for A.C. operation, and one of the universal type.

## A.C.—D.C. Operation

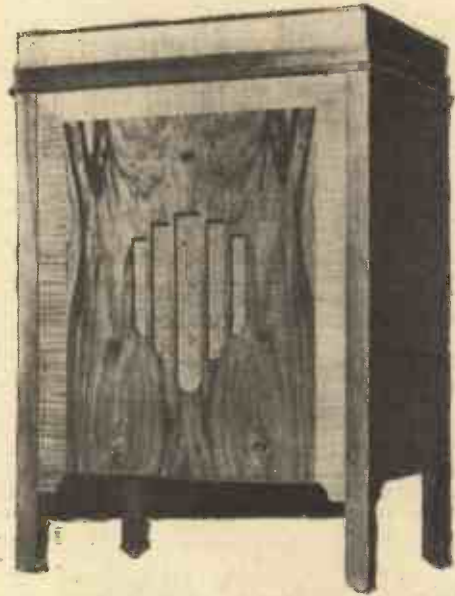
Incidentally, it is worthy of mention that most of the better-known receiver manufacturers are including one or more universal (A.C. or D.C. operation) receivers in their range. This is in response to an ever-increasing demand, and has been made possible by the comparatively recent introduction, by British manufacturers, of extraordinarily effective universal valves. Among those who are producing universal receivers mention might be made of such well-known firms as Messrs. Ekco, Messrs. Telsen, Messrs. Aerodyne, Messrs. Ultra, Messrs. Pye, and Messrs. McMichael. There are, of course, many other firms producing such sets, but it is obviously impossible to mention every one by name.

One important change which has taken place with regard to commercial super-heterodynes concerns the reduction in the number of valves. This change commenced more than a year ago, but it has now advanced to the stage at which a total of four valves is the rule rather than the exception. The reason is not far to seek, and it is that the pentagrid, octode, and other special frequency-changing valves of extremely efficient types are now available. Additionally, the double-diode-triode and double-diode-pentode have now been

practically standardized for use in the second-detector position, where they also perform the functions of first L.F. amplifier and automatic volume control.

A.V.C. is to be found in nearly every one of the new season's sets of the more pretentious type, and it is probably the popularity of A.V.C. that has still further increased the number of superhets. This statement calls for an explanation, since it might not appear at first sight that there is any close relationship between A.V.C. and the superhet. The fact is that nearly all of the automatic volume control devices function more efficiently on the higher wavelengths (lower frequencies) at which the intermediate-frequency amplifier is designed to operate. Additionally, these devices vary slightly in efficiency at various frequencies, and can therefore only produce uniformity of result when they function continuously at the same frequency.

Whilst on the subject of intermediate frequency it might be mentioned that a number of the latest superhets have I.F. amplifiers which operate at a higher frequency than heretofore. The chief advantage of this is that a wider wave-

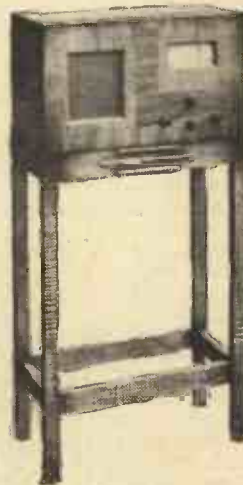


No unsightly controls and a neat and plain cabinet front form a novel departure from usual practice.

This is because the signals from any particular station remain at constant intensity over a fair number of degrees on the tuning dial, due to the "levelling" effect of the automatic control. This does not mean that selectivity is in any way impaired, but that a peculiar form of distortion is obtained if the dial is not set to the true tuning point; this is because half of the sidebands is "cut." The only real solution to this difficulty rests with the use of visual tuning, and this is a feature of most of the latest models. There are a number of methods of providing visual tuning, but one of the most popular is due to the recent development by Messrs. Cossor of a special form of neon indicator.

The device consists of a relatively long neon tube in which the two electrodes are placed at the top and bottom respectively. When the set is not tuned to a station the characteristic neon glow is very short, but as resonance is reached the glow extends towards the upper electrode. Thus, exact tuning is indicated when the glow reaches its maximum length. The neon indicator is employed in the Cossor model 535 A.C. superhet, as well as in several of the Ultra receivers, and others. There are several other types of visual tuning indicator, one of which takes the form of a milliammeter connected in the anode circuit of one of the controlled valves; the needle shows a maximum deflection when the set is exactly in tune. Other visual indicators indicate resonance by the width of a band of shadow, or of light, on a scale, whilst a particularly novel system is used on the Alba superhet. This receiver employs what the makers have called "searchlight" tuning, and a triangle of light is thrown on to the scale as the set is switched on, this rotating as the tuning knob is rotated. As the set is brought into tune with a station the width of the "searchlight" becomes less.

(Continued overleaf)



Two styles of receivers seen at Olympia. On the left a decorative cabinet, and on the right a pedestal receiver with stool.

length range can be covered by a set of this kind, and this is exactly what is wanted to cope with the conditions imposed by the Lucerne Plan.

## Visual Tuning and Noise Suppression

It has been pointed out in these pages before that the normal use of A.V.C. brings one or two difficulties in its train, not the least of which is that it is more difficult to tune the set to the exact resonance point.

(Continued from previous page)

Visual tuning at once overcomes what was at first a serious drawback of A.V.C.—the large amount of inter-station noise. This has, of course, been prevented in many cases by the provision of some type of noise suppressor, quiet A.V.C. or "squelch" device, but it can be obviated more simply and cheaply simply by turning the (L.F.) volume control to its minimum position, tuning entirely "by eye," and advancing the volume control after the desired station has been selected.

The new receivers make it more than ever evident that the old idea of describing a receiver by the number of valves it contains is quite futile. For example, a four-valve superhet fitted with one of the many types of frequency-changers and a diode-pentode second detector acts in every way as seven-valver of previous type. Thus, the idea of naming a set by the number of stages, rather than valves, which

it contains is gaining ground. We believe that Messrs. Ekco were the first to standardize this method of nomenclature last year, but it is now being used fairly generally by most manufacturers.

### New Tuning Devices

Much thought has been expended on the matter of tuning dials since last year, and it is gratifying to find that there has been a general improvement. Mention has already been made of the "searchlight" dial, and it is only fair that we should also mention "clock-face" tuning which was introduced by Messrs. Ultra. In this system the "clock face" is divided into two halves, for medium and long waves; the small hand covers the wavelengths from 200 to 550 metres, and the minutes hand from 950 to 2,000 metres. Messrs. Telsen have also introduced a new and ingenious form of tuning scale, which consists of a large replaceable station-calibrated scale over

which moves a celluloid cursor on which is engraved a sloping line. At the foot of the cursor there is also a short line that registers with a metre-calibrated scale running along the bottom of that on which are marked the station names. Against each name there is a square, and exact tuning is indicated when the sloping line passes through the middle of this. Most other manufacturers have increased the size of the tuning scale, and that on the Ekco sets, for example, is as large (in some cases, larger) as the diameter of the loud-speaker. The Atlas receivers are fitted with what the makers call a spectrum-tuning scale; when the switch is turned to the long-wave position only the long-wave stations are shown, these being in red, whilst when the switch is set for medium waves, the corresponding stations are shown in green. A further advantage of this tuning system is that the scale may be tilted to any angle so that the operator can see it without straining.

# CHECKING FREQUENCY RESPONSE

Simple Methods of Testing the Response Curve of Any Receiver.

By H. BEAT HEAVYCHURCH.

**A**M I certain that my reproduction is a faithful interpretation of the programme performed in the studio? That is a question which every listener should ask himself as soon as his receiver is built and in working order. However pure the output, quality will not be perfect unless the speaker can translate that output into sound without introducing serious distortion, and the faults most likely to occur in this particular product are poor reproduction of very low notes and of very high notes, together with undue prominence of certain notes at various parts of the scale, due to unwanted mechanical resonances which are difficult to eradicate.

### An Accommodating Ear

The human ear, however, is not equally responsive to all frequencies. As a matter of fact, it is most sensitive to frequencies of the order of 1,000 cycles per second, which corresponds to notes about two octaves above middle C of the piano. For the lower frequencies below 100 cycles, and for the extreme upper register (above 8,000 cycles), the response of the ear is much more feeble. Now, unfortunately, it is just those frequencies to which the ear is the least sensitive that some loud-speakers reproduce the worst, so the natural deficiency of the ear is aggravated by what may be termed the artificial deficiency of the speaker. On the other hand, the human ear is notoriously accommodating and is more easily deceived than any other human organ. It therefore recognises and accepts for reasonably life-like reproduction sounds which vary considerably from the original produced in the studio, and it is a fact that listeners may become so used to what is really very poor reproduction that they do not realize the extent to which the sounds produced by their loud-speaker fall short of perfection.

It is, however, not a difficult matter to carry out at home one or two practical tests which will indicate roughly what kind of response curve a speaker has. To carry out really accurate tests, expensive and very accurately designed apparatus is required, and this is generally outside the means of the average listener.

### The Equipment

To commence with the simplest and cheapest test, it can be ascertained easily whether a speaker has a reasonable bass response by applying a 50-cycle note obtained from the A.C. electric light mains. Connect a fairly long length of flex, say five or six yards, to the grid and cathode terminals of one of the low frequency valves, and run this flex as close as possible to some wires carrying the alternating current house supply, such as the mains lead to your receiver, or the flex connecting a standard lamp. No connection, of course, should be made to the light supply itself. The result will be that an appreciable alternating voltage at a frequency of 50 cycles will be picked up by the trailing flex and will be amplified by the valves and applied as a strong 50-cycle signal to the speaker. If this component has a reasonable bass response, a good volume of deep hum should be heard. Unfortunately, this test only gives an indication for one particular frequency, but if a good performance is obtained at 50 cycles it is fairly safe to say that there is nothing wrong with its bass response.

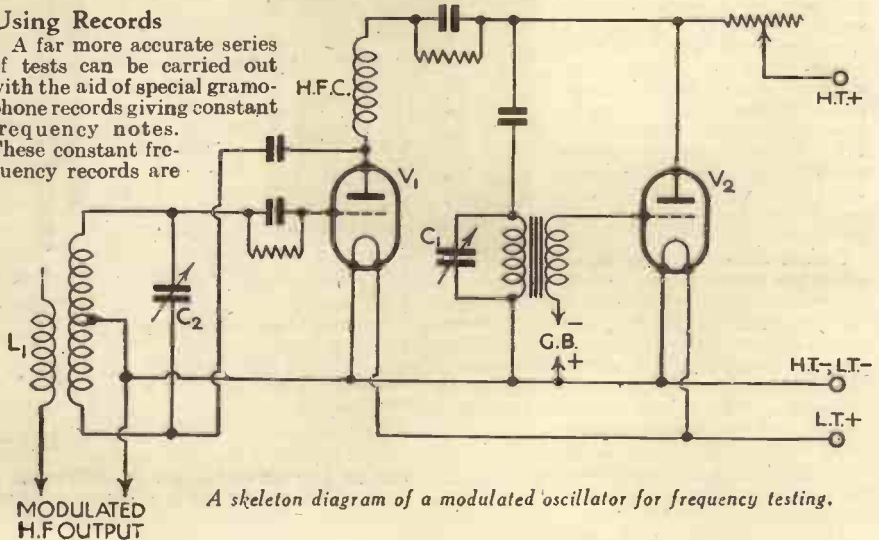
### Using Records

A far more accurate series of tests can be carried out with the aid of special gramophone records giving constant frequency notes. These constant frequency records are

not usually stocked by gramophone dealers, but they can be obtained, or it may be possible to borrow them from a progressive and up-to-date radio dealer. Each record produces a practically constant volume at given frequencies, about four different frequencies being recorded on each side. These frequencies are 25, 50, 100, 200, 500, 1,000, etc., going up in stages to 4,000.

### A Simpler Method

There are other less accurate devices which anyone can try at home if he possesses a fairly sensitive microphone. The microphone should be installed in a room away from the speaker and sounds as near as can be judged at equal intensity should be produced, running right up and down the scale. This can be done by means of a piano or by stringed instruments. If you possess a violin this will be excellent for the upper frequencies, but a 'cello will be required to give a good test in the deeper notes. With such a test, of course, it is difficult to judge when the sounds performed at the microphone are of equal intensity, but they do give a fair indication of performance.



A skeleton diagram of a modulated oscillator for frequency testing.

**Impressions on the Wax**

(Continued from page 700)

the dramatic poetry of the story, often so ennobling as to make it of intrinsic worth to us. It is therefore comforting to know that very good translations, side by side with the original, are easily obtainable. So before we begin it is possible to absorb the whole story, and thus listen intelligently. To "Butterfly," then, in abridged form on six Columbia records at 4s. each (Nos. DX500-505). The set is comprised of all the "high-lights" of the opera. The company and orchestra are of the Scala, Milan, and the Milan Symphony respectively. (You get a free portfolio and leaflet if you buy the six at once.)

**Still Beethoven**

There are no apologies due for remaining in such good company, for it may be some time before we are again so privileged. The *Third Piano Concerto* must be noticed; first, because of its almost commonplace charm, secondly, because it has no bewildering thunder-and-lightning displays, and lastly, because of the oneness of the soloist (Artur Schnabel) and the London Philharmonic Orchestra.

The theme seems almost pastoral—nature *en fête*. One can visualize woodland scenes with the intrusion here and there of humans. In the middle comes the Largo—the third movement. This is a sublime thing, almost a proud, stately lament, able to stand alone as a great work, and yet it is in essence simplicity itself. Back to our rusticity to close, through music as clear and understandable as the day. Here is a great masterpiece for lesser folk, performed with unusual harmony between soloist and orchestra. This concerto is one to treasure for years to come, and you will hear it on five H.M.V. records—DB 1940-1944.

**Two Vocalists to Enjoy**

We must now turn our attention to two singers who have given of their very best. The first is Josef Schmidt, tenor. He has recorded a really notable performance of *O Paradiso* from Meyerbeer's *L'Africaine*. This is the leading tenor solo of the opera and was immortalized by Caruso (on a record) and by Jean de Reszke, who played the part of Vasco de Gama nearly forty years ago. It is a lovely thing, sung in a most romantic scene in the opera, and I cordially commend it (and Schmidt's rendering of it) as a record to earn many times over its cost in pleasure. It is on Parlophone R1593. Also from the same company comes another treat of great appeal—a vocal setting to the *Flower Waltz* from Tchaikowsky's *Casse Noisette Suite*. I am aware that more than one criticism has been levelled at the profanity of translating a ballet into words, but when it is done as well as Emmy Bettendorf, Orchestra, and Chorus do it, we need not fear. There is one word only to describe record R1605—it is utterly pleasant. I think you will endorse my opinion.

**Lighter Moments**

We must all of us be frivolous now and again if we are to retain our balance, and here is an exceedingly jolly record, which carries its artistry to a very high degree. Sketches on records are few, but *The Invalid*, on Columbia DB 1179, is a good one—well done, funny, and as it happens founded on fact.

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# PRACTICAL LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

## "A Wonderful Gift"

SIR,—Many thanks for the camera received safely. It is certainly a wonderful gift and will always be with me on future holidays and pleasure trips. The free service is also greatly appreciated, and I think it is typical of PRACTICAL WIRELESS in being so generous as to enable its readers to benefit in this way.—F. N. BEDWELL (Stratford-on-Avon).

## Another Reader's Thanks

SIR,—Thank you for the excellent camera which came, appropriately enough, on August Bank Holiday morning. It was a great surprise, seeing that my application was posted only on the Thursday previous. Your gift service is indeed splendid, and when considered with the weekly entertainment regularly derived from PRACTICAL WIRELESS, it makes one glad to be privileged to share all these good things.—FRANK SUTTON (Cumbran, Mon.).

## "Local Experts"

SIR,—I quite agree with our friend a "Service Man" from North Shields. I do not think these so-called *local experts* realize the enormous amount of damage they do by carrying out these something-for-nothing jobs. I could quote a good many cases where very expensive receivers have been messed up completely by men who, not knowing the technical and real theory, venture to test out and reconstruct sets which call for more knowledge than is anticipated. A person knowing a little about radio is a dangerous person, and some people with the knowledge of fixing batteries think they understand all about radio, and venture to gain knowledge at someone else's expense. The only alternative is send the set back to the makers if it happens to be a commercial set.

Now this is dangerous to us service men with the knowledge of the fundamental and wide principles of radio, gramos, and similar apparatus, and also dangerous to the manufacturer, because if a receiver and circuit is understood, as it would be by every good service man, reconstructing becomes child's play. I have overhauled sets which have been ruined in appearance as well as performance by these so-called local experts. I have noticed more lately that these experts very seldom have much to do with all-mains sets, as a shock now and again with 2 or 3 amperes passing is not encouraging. I cannot do better than say that unfortunately design changes so rapidly that people become disappointed after hearing an up-to-date receiver, say, two months after buying what they thought was the best obtainable. I also venture to say that really good service men are few, but so-called *local experts* are plentiful. I hope that by the time television is commercialized some protection will be available for the really genuine service man.—W. PARSONS (Margate).

## Our Practical Journals

SIR,—Congratulations on publishing a new journal at the popular price of 6d. a month devoted solely to Television. I

wish you success with it. As an interested reader of the Television section of PRACTICAL WIRELESS I have long felt that much of the information you gave had necessarily to be considerably curtailed in order to get it into the available space. With *The Practical Motorist*, PRACTICAL WIRELESS, *Practical Television* and *Practical Mechanics*, you have four sound journals which are much appreciated in my district.—S. J. (Birmingham).

## The Price Question: "Practical Television"

SIR,—I read with extreme interest your leading article on the Price Question in PRACTICAL WIRELESS dated August 11th. I am sure that your policy has had a great deal to do with the favourable terms on which it is now possible to make an excellent wireless receiver. It has always been my contention that a home-constructed wireless set is immeasurably better than a commercial receiver at a popular price, and I am glad to think that my favourite weekly radio journal has ensured that it is now possible to make a set at a price which takes away the appeal of the cheap commercial sets. I am pleased also to note that you have entered the field with *Practical Television*, and am sure you will take the lead in this young industry as you have done in the wireless field. I subscribe to all of your Practical journals and wish you continued success.—E. G. (Llandudno).

CUT THIS OUT EACH WEEK.

## Do you know

—THAT the choice of the intermediate frequency in a super-heterodyne receiver will affect the occurrence of whistles throughout the tuning range.

—THAT artificial resonances may be introduced in a circuit to give emphasis to certain frequencies so as to make up for defects in a reproducing unit.

—THAT electrolytic condensers must not be used on a raw A.C. supply.

—THAT mica dielectric condensers are preferable, and almost essential, in high-powered R.C. amplifiers.

—THAT the reason for the above rule is to be found in the fact that a positive voltage must not be impressed on the grid of the amplifying valve.

—THAT to obtain maximum performance from a dual speaker system, a filter circuit should be fitted to limit the frequencies handled by each unit.

—THAT a plate of metal fixed high up on the side of a house will furnish a good aerial system for a flat-dweller who cannot erect the orthodox type of aerial.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO



QUERIES and ENQUIRIES by Our Technical Staff

The coupon on Page iii of cover must be attached to every query

If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

SPECIAL NOTE

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
  - (2) Suggest alterations or modifications of receivers described in our contemporaries.
  - (3) Suggest alterations or modifications to commercial receivers.
  - (4) Answer queries over the telephone.
- Please note also that all sketches and drawings which are sent to us should bear the name and address of the sender.

Aerial Impedance Transformer

"I have purchased a special interference eliminator which has no name, but which is embossed with some figures and what appears to be the letters U.S. These are stamped on a tin plate at the bottom of the unit, and this has been bent and straightened, thus blotting out the maker's name. I have connected this to my aerial, using a screened down lead joined to the terminals ANT and GD, and have followed the recent articles by you on the subject of these impedance matching transformers. On the medium waves the device seems to work quite well, reducing interference and giving practically no loss in signal strength. On the long waves, however, it completely cuts out all signals, and I cannot even hear Daventry. I cannot account for this, as there is no switch or anything which could be faulty on the unit. Can you help?" —T. G. (Barnet).

The device is undoubtedly of American origin, and in that country they do not utilize the long waves. Consequently the transformer has been designed to function on the medium waves only and it upsets the remainder of your tuning circuit on the long waves. Although similar units are

on sale in England, these are of either English manufacture, or have been designed for our market and they therefore function more or less satisfactorily on both wavebands.

Coil Data Required

"I have recently obtained a pair of screened coils, but no circuit diagrams or explanations of connections were given. The only means of identification upon them is the Patent Nos. and the following is transferred on the base: DSG/2. Each coil has six terminals and wave-change is effected by means of a worm-drive. I wonder if you could supply any information concerning them?" —W. C. (Tankerton).

We regret that we have no details concerning these particular coils. They were made by the London Electric Wire Company, and if you write to them they may be able to assist you. Their address is:—Church Road, Leyton, E.10.

Telsen Coil Connections

"I have a Telsen screened coil No. W.216. Unfortunately I have lost the connecting instructions and should be glad if you could tell me the numbers for the various leads." —R. S. D. (Portsmouth).

Terminal 1 is for Aerial or Anode; Terminals 7 and 6 are to be joined to earth. Terminal 8 is the grid connection; Terminal 5 is the anode side of the reaction winding, and terminal 2 is the earth side of this winding. A three-point wave-change switch is required, one pole of which is joined to earth, and the other two poles to terminals 3 and 4.

Coil Winding Particulars

"I have an old ebonite former for 6-pin base, 1 1/2 in. diameter, 3 in. long. It has 8 slots 1/2 in. apart and about 1/4 in. deep. I wish to rewind it for medium and long waves. Will you kindly let me have number of turns per slot? I will fill up

any slots if necessary with Chatterton's Compound. What is the best capacity for a short-wave coil for reaction and tuning?" —E. F. P. (Liverpool).

Fill in all but 6 of the slots on your coil (on each rib), and for the medium waves wind on 65 turns of 26 gauge D.C.C. wire. For the long-wave section wind 60 turns of 34-gauge enamelled wire in each of 5 slots, and join this winding in series with the first winding. For reaction purposes wind 45 turns of 34 enamelled in the first slot next to the medium-wave winding. All turns must be wound in the same direction. For tuning on short waves you will find a .00015 mfd. condenser most suitable, with a .0002 or .0003 mfd. reaction condenser.

Ventilating a D.C. Set

"I am going to construct a D.C. set, but must use a 100-watt lamp for voltage dropping purposes. What is the best way of arranging ventilation for this set so that the heat will not damage the cabinet or other wireless parts?" —R. Y. (Bristol).

It will be very difficult to arrange a lamp to avoid damage to the wireless components. A small metal box without a back could be constructed and lined with asbestos sheeting if desired, but it would have to be arranged that the lamp was well clear of the cabinet side and speaker. A better arrangement is to purchase a special D.C. resistance or resistance mat of the correct type, and fit this in the receiver, when the question of heat dissipation will not be found so serious. Suitable resistances may be obtained from advertisers in this journal.

Complete Diagrams

J. S. (Worthing), R. A. W. (Hull), and others.

As explained many times on this page, we regret that we cannot supply complete circuit diagrams to individual requirements.

The Queries Coupon appears on Page iii of cover.

OSTAR-GANZ

UNIVERSAL HIGH VOLTAGE MAINS VALVES (MADE IN VIENNA) are the only Universal Valves that can be wired in Parallel. There's no wider, finer or more up-to-date range available. They work equally as well on either D.C. or A.C. supply without alteration, off the full Mains Voltage and they do not require Transformers, Barretters or Breakdown Resistances. Because of their remarkable efficiency they have been specified and are fully recommended by "Wireless Press."

KITS SUPPLIED FOR ALL TYPES OF RECEIVERS—RADIOGRAMS—AMPLIFIERS.

It is simple to CONVERT Battery or any mains set to Universal AC/DC with Ostar-Ganz valves. Full details and circuits free.

Technical assistance free. EUGEN J. FORBAT, 28-29, Southampton St., Strand, London, W.C.2. Tel.: Temple Bar 8608.

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The Finest range of "Universal" All-Wave Receivers They operate on either AC or DC Mains from 100 to 250 volts.

ALL models except the "Miniature" cover, Ultra Short Bands as well as medium and long wavebands!

ALL models are available as "Universal" Radiograms in modern table or console cabinets!

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ALL models owing to the use of Ostar-Ganz Super Power output valves give a greater undistorted output than corresponding sets on the market!

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Write at once for full details and prices. Telephone: Temple Bar 4985.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type and/or capitals are charged double this rate...

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SPECIAL Offer of P.M. and Energized M.C. Speakers: Purchased from well-known gramophone company...

TYPE 10071C, 9in. diameter, 2000 ohm field, 40/70 m.a.; Pentode transformer. Handles 4 watts, 17/6.

TYPE 10055F 9in. diameter, 11,650 ohm field, 20/30 m.a. auditorium type power transformer. Handles 10 watts, 30/-.

TYPE 10055H, 9in. diameter, 115 ohm field, 350/400 m.a. auditorium type Pentode transformer. Handles 10 watts, 30/-; A.C. Kit, 20/-.

TYPE 4180, 9in. diameter, permanent magnet. Handles 4 watts, 7 ohms speech coil, 13/6. Multi-ratio transformer, 4/6 extra.

PREMIER SUPPLY STORES announce the Purchase of the Complete Stock of a World Famous Continental Valve Manufacturer; all the following standard mains types, fully guaranteed, 4/6 each...

THE following Type, 5/6 each; 350 v. and 500 v., 120 milliam full wave rectifiers, 23 watt indirectly heated pentode.

THE Following American Types at 4/6: 230, 227, 112, 171, 210, 245, 26, 47, 24, 35, 51, 58, 53, 37, 80 and the following types, 6/6 each; 42, 77, 78, 2575 38, 33, 83, 39, 44, 53, 6A7, 6B7, 2A5, 2A6, 2A7, 21B7, 523, 6C6, 6A4, 6D6, 6F7.

866 Valve, Filament 2.5 v., Filament Current 5 amp. Plate volts, Inverse peak 7,500, Plate Current Peak 0.6 amps. Price 25/-.

ELIMINATOR Kits, including transformer, choke, Westinghouse metal rectifier, T.C.C. condensers, resistances and diagram, 120v., 20 m.a., 20/-; trickle charger 8/- extra; 150v., 30 milliamperes, with 4v., 2-4 amps. C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v., 60 milliamperes with 4v., 3-5 amps, C.T., L.T., 30/-; 300v. 60 m.a. with 4 volts, 3-5 amps., 37/6; 200v. 100 milliamperes, 39/6.

PREMIER chokes, 40 milliamperes, 25 hys., 4/-; 65 milliamperes, 30 hys., 5/6; 150 milliamperes, 30 hys., 10/6; 60 milliamperes, 80 hys., 2,500 ohms, 5/6; 25 milliamperes, 20 hys., 2/9.

ALL Premier Guaranteed Mains Transformers have Engraved Terminal Strips, with terminal connections, input 200-250v., 40-100 cycles, all windings paper interleaved.

PREMIER H.T. Transformer, output 135v. 80 m.a. for voltage doubling, 8/6; 4v. 3-4a., C.T. L.T. 2/- extra; with Westinghouse rectifier giving 200v. 30 m.a., 17/6.

PREMIER HTS and 9 Transformers, 250v., 60 m.a., and 300v. 60 m.a. rectified, with 4v. 3-5a. and 4v. 1-2a. C.T. L.T. and screened primary, 10/-; with Westinghouse rectifier, 18/6.

PREMIER H.T. 10 Transformer, 200v. 100 m.a. rectified with 4v. 3-5a., and 4v. 1-2a. C.T. L.T., and screened primary, 10/-; with Westinghouse rectifier, 19/6.

PREMIER Mains Transformer, output 250-0-250v. 60 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.) with screened primary, 10/-.

PREMIER Mains Transformers, output 350-0-350v. 90 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.) with screened primary, 10/-.

PREMIER Auto Transformers, 100-110/200-250v. or vice versa, 100-watt, 10/-.

WESTERN ELECTRIC Mains Transformers, 300-0-300v. 65 m.a., 4v. 1-2a., 4v. 2-3a., 6/6; 500-0-500v. 150 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 2-3a., 4v. 1a. C.T., 4v. 1a. C.T., 19/6; 1,000-0-1,000v. 250 m.a. 4v. 3a. C.T., 4v. 3a. C.T., 49/6; 2,000-0-2,000v. 150 milliamperes, 49/6.

SPECIAL Offer of Mains Transformers, manufactured by Phillips, input 100-200v. or 200-250v., output 180-0-180 volts 40 m.a., 4v. 3 amp., 4v. 3 amps., 4/6; 200-0-200v., 4v. 1a., 4v. 3a. 4/6.

PREMIER L.T. Charger Kits, consisting of Premier transformer and Westinghouse rectifier, input 200-250v., A.C., output 8v. 1 amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. 1/2 amp., 11/-.

B.T.H. Trussed Induction Type (A.C. only) Electric Gramophone Motors, 100-250v.; 30/- complete; COLLARO Gramo. Unit consisting of A.C. motor, 200-250v. high quality pick-up and volume control, 49/-; without volume control, 46/-.

SPECIAL Offer B.T.H. Gramophone Motors, A.C. and D.C., 100/250v., 30/-. Listed £23/3/-.

DISON Bell Double Spring Gramophone Motors, complete with turn-table and all fittings, a really sound job, 15/-.

SPECIAL Offer of Wire Wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8-watts, any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

WIRE Wound Potentiometers, 15,000 ohms, 1/6; 50,000 ohms 2/-; 500,000 ohms, 3/-; 1,000 ohms wire-wound semi-variable resistances, carry 150m.a., 2/-.

CENTRALAB Potentiometers, 400 ohms 1/-, 50,000, 100,000, 1 meg. any value, 2/-; 200 ohms, wire wound, 1/-.

POLAR Star, manufacturers' model, 3-gang condensers, fully screened, 7/6; with trimmers, 8/6.

AMERICAN Triple Gang 0.0005 Condensers, with trimmers, 4/11; Utility Bakelite 2-gang 0.0005 screened with uninkob trimmer, 3/6; Polar Bakelite condensers, complete with knob, 0.00015, 0.00035, 0.0003, 0.0005, 1/-.

ORMOND Condensers, 0.0005 2-gang semi-shielded, 2/6; brass vanes, with trimmers, 3/6. British Radiophone 110 kc/s. Intermediate, 3/-.

MAGNAVox D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C.152 magna, 2,500 ohms, 37/6, all complete with humbucking coils; please state whether power or Pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M. 7in. cone, 18/6.

RELIABLE Canned Coils with Circuit, accurately matched, dual range, 3/- per coil; ditto, iron-cored, 3/6.

RELIABLE Interval Transformers, 2/-; multi-ratio output transformers, 4/6.

HELLESEN 8 mf. Electrolytic Condensers, 435 volts working, 2/3; Mershon ditto, 1/9.

POLAR 2-gang Uniknob Condenser with Trimmers and complete slow-motion Dial, 0/-.

WESTERN ELECTRIC Condensers, 250v. working, 2 mf., 1/-.

T.C.C. Electrolytic Condensers, 550v. working, 650v. peak, 8 mf., 4/-; 4 mf. or 8 mf. 440v. working, 3/-; 15 mf. 50 v. working, 1/-; 25v. working, 25 mf., 1/3; 6 mf. 50v. working and 2 mf. 100v. working, 6d.

T.C.C. Condensers, 250v. working, 2 mf., 1/9; 2 mf. 1,500v. working, 6/-.

H.M.V. Condensers, 400 v. working, 4+4+1+1+1+1+1+0-1+0.1+0.1+0.1, 4/9; 4+2+1+1+1+1+1+0.5, 3/9.

DUBILIER Condensers, 8 or 4 mfd. dry electrolytic 450v. working, 3/-.

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5-VALVE Class B Super-het, Chassis by Plessey, wired ready for use, with 5 Mullard valves, new, in sealed cartons, £3/17/6; (list £12/12); valves alone are priced £3.

EKCO A.C. Eliminators, each new and boxed in original sealed cartons, type K25, with trickle charger, 25 milliamperes, 30/6 (list £5/7/6); type A.C.25, 33/6 (list £3/17/6); type K12 with trickle charger, 37/- (list £3/17/6); Ekco trickle chargers, type T.C.1, for 2-4 and 6-volt accumulators, 20/- (list 42/-).

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SPECIAL Offer of Lewcos Spaghetti Resistances, all sizes, in original sealed boxes, 4/- per dozen, assorted.

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COLVERDYNE (Ferrocot) 7/6; Dubilier or Erie resistors, 1 watt type, 7d., 2 watt type, 1/2, Marconi K19 pick-ups, 2/6. Radiophone IF transformers, 110KC or 117.5K C. 6/6.

WESTINGHOUSE rectifiers, HTS, 9/6, HTP, HT10, LT4, LT5, 11/-.

Regentone transformers for HTS or HTP with 4v-4a LT winding, 7/6.

MAINS transformers, 350-0-350v., 60 ma., 4-4a, 4v-2a, 12/6. Eliminators, outputs, 150v. 25ma, S.G. and detector. A.C. type with Westinghouse rectifier, 25/-.

D.C. type, 12/6. Collaro gramophone motors, 100-250v. A.C., 34/-.

DUBILIER dry electrolytic condensers, 8mf. or 4mf. 500v. working, 50v. 50 mf. 3/6.

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ALL types of brand new American valves in stock, A first-class makes, guaranteed. 247, 235, 551, 89, 18, 19, 46, 50, 6A7, 15, 42, 41, 38, 39, 78, 75, 57, 58, 24, 44, 36, 43, 12/-.

UX171A, UX190, UX280, UX245, UX226, UX227, 8/-.

UX250, UX281, UX210, 18/-.

BTH-RK speakers, 6v field, suitable for P.A. work, 27/6. A.C. type with field rectifier, £2/7/6.

MAGNAVox speakers, complete with hum-bucking coils, output transformers, etc., 152 (9in. cone), 22/6. 154 (7in. cone), 15/9. Rola F6 (7in. cone), 17/6, with all 2,500 or 6,500 ohm fields. Magnavox PM254, 18/-.

Magnavox, PM252 (9in. cone) 22/6. Carriage paid, cash with order or C.O.D.

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REPAIRS-OVERHAULS, Quotations free. Bargains in receivers, components, etc. Lists 1d. post free.—E. F. Archbold, Radio Engineer, Lonsdale Terrace, Jesmond, Newcastle-upon-Tyne.

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6/6 WESTERN ELECTRIC PENDANT MIKES (list 15/6), a real quality microphone.
5/11 ORMOND TWIN GANG condensers with S.M. disc drive (list 12/6).
5/11 BALDWIN UNITS, for horns. Public addresses, etc. (list 21/-).
5/- SAMPLE BARGAIN SUNDRIES PARCEL. Guaranteed value, 15/-—20/-.
4/11 A.V.C. UNITS (list 10/-), with full instructions for any battery receiver.
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