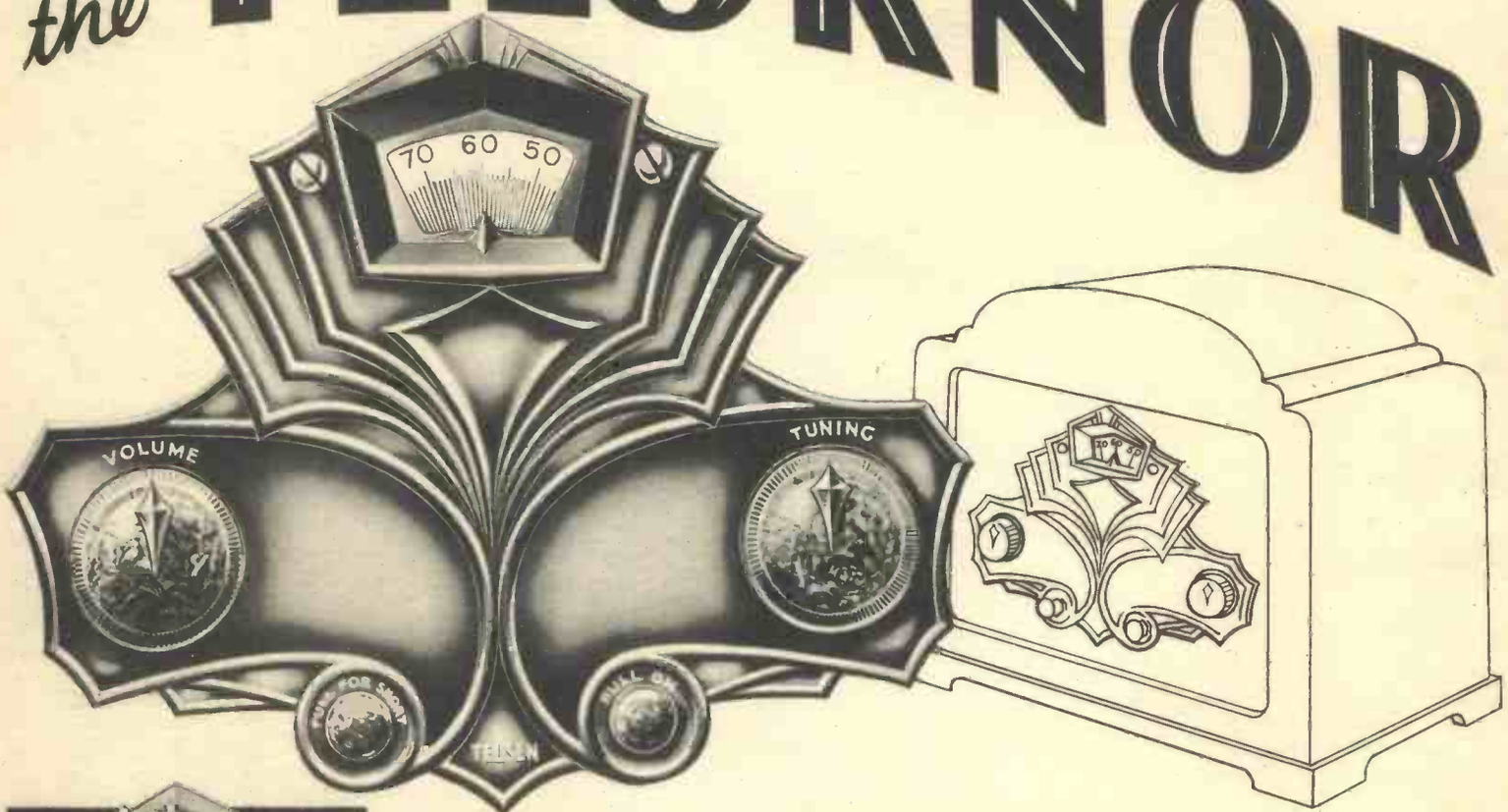
The TELSEN RADIOMAG

NUMBER 3
PRICE
6D

INCLUDING THREE FULL SIZE 1/- BLUE PRINTS OF THE LATEST TELSEN CIRCUITS

Assemble all your set controls on one handsome escutcheon

with the TELORNOR



Back View of Telornor showing how the components can be mounted.

Three-quarter Front View of the Telornor.

Give your home-built set the dignity of an expensive commercial radio receiver with the new Telsen TELORNOR. It makes better sets easy to build ! The handsome silver oxydised escutcheon plate, complete with the Illuminated Disc Drive adds immensely to the "good looks" of your set, and permit, with the minimum of trouble, a very effective grouping of your Volume, Tuning, Push-Pull and On-Off controls. Ask your dealer to show you a TELORNOR Illuminated Disc Drive. It will make your new set a set to be proud of—in *appearance* as well as in performance.

CAT. No. 206
PRICE **7/6**

TELSEN
RADIO COMPONENTS

Good Radio is a joy forever

The EDISWAN 'HIKE-LITE'

(Prov. PATENT NO. 16491/32)

Multi-purpose Electric Torch

AN ABSOLUTE BOON TO HIKERS, MOTORISTS, ANGLERS, FARMERS AND IN THE HOME

Have you ever seen a portable search-light with such a multitude of useful and practical features! Study the details of the 'Hike-Lite' and ask yourself whether 10/- could be spent to better advantage!

10/-
COMPLETE
with Battery & Spare Bulb
MADE IN ENGLAND

HAND TORCH. The 'Hike-Lite,' fitted with focussing adjustment, projects a beam 300 feet and is also fitted with an Ediswan New Process Long-Life Battery.

HINGED PROTECTING COVER with metal loop for belt or rucksack, prevents damage to the bevelled plate glass lens. Fitted inside the cover is a mirror which can be used for shaving and many other purposes.

DAY AND NIGHT ALL-POINT COMPASS. The advantages of having a compass always to hand are too obvious to need stressing. The compass can be illuminated for use at night.

THREE-WAY SAFETY SWITCH with "Off," "On" and "Intermittent" positions.

READING LAMP. The 'Hike-Lite' can be stood upright, and a steady flood of light thrown in any desired direction by means of the mirror.

SPARE BULB. The annoyance of being stranded miles from anywhere without a light owing to bulb failure is completely avoided by the provision of a spare bulb in a special holder in the base of the 'Hike-Lite.'

Apply to your Electrical Dealer. In case of difficulty write to the nearest Ediswan Depot in any of the following towns:

BIRMINGHAM	CARDIFF	EDINBURGH	LEEDS	LONDON	NOTTINGHAM
BRIGHTON	DUBLIN	GLASGOW	LEICESTER	MANCHESTER	SHEFFIELD
BRISTOL	DUNDEE	HULL	LIVERPOOL	NEWCASTLE	SOUTHAMPTON

AEI ASSOCIATED ELECTRICAL INDUSTRIES LTD.

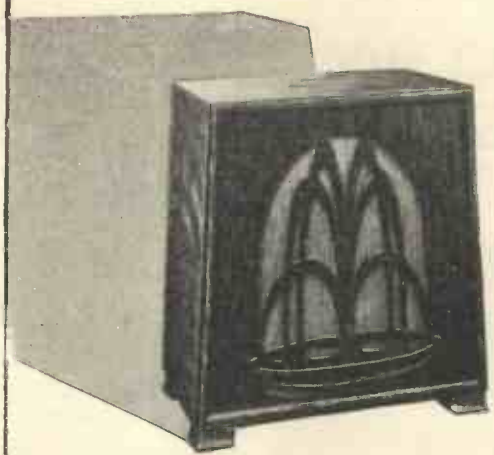
Advt of. THE EDISON SWAN ELECTRIC CO. LTD., PONDERS END, MIDDLESEX

Use EDISWAN BATTERIES For RADIO and all GENERAL PURPOSES

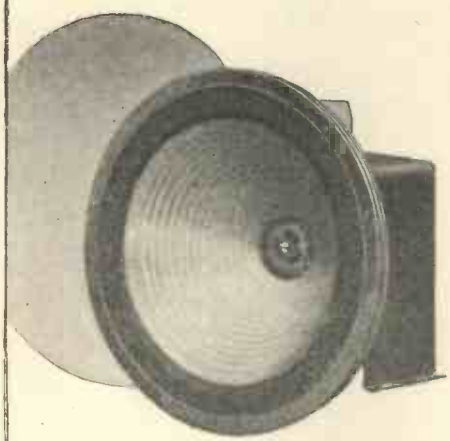
B 162

2

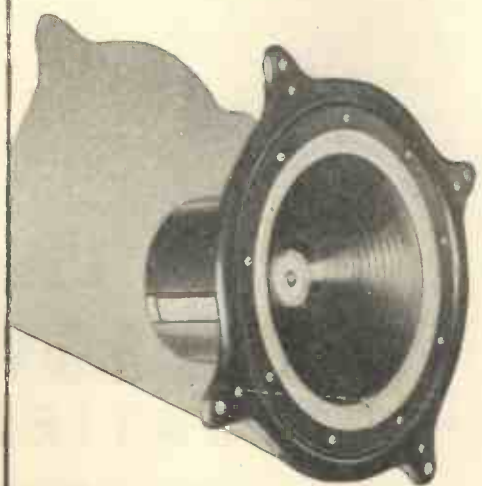
YOU GET THE BEST YOUR SET CAN GIVE YOU WITH A B.T.H.



PermanentMagnet Minor R.K. *speaker in handsome oak cabinet complete with transformer* **Price £2.17.6.**



Senior R.K. *A.C. model. 10" corrugated cone. Incorporates Westinghouse metal rectifier. Price £7.15.0. D.C. model. Similar to A.C. model, but without metal rectifier and suitable for mains excitation.* **Price £5.5.0.**



Senior R.K. *Permanent magnet model. Incorporates the highest grade cobalt steel magnet, and 10" corrugated cone.* **Price £5.12.6.**

RK

MOVING COIL LOUDSPEAKER

If you want the best possible reproduction of which your set is capable, you need a B.T.H. R.K. reproducer. There are models available for every purpose and to suit every pocket. Your dealer will willingly demonstrate them to you.

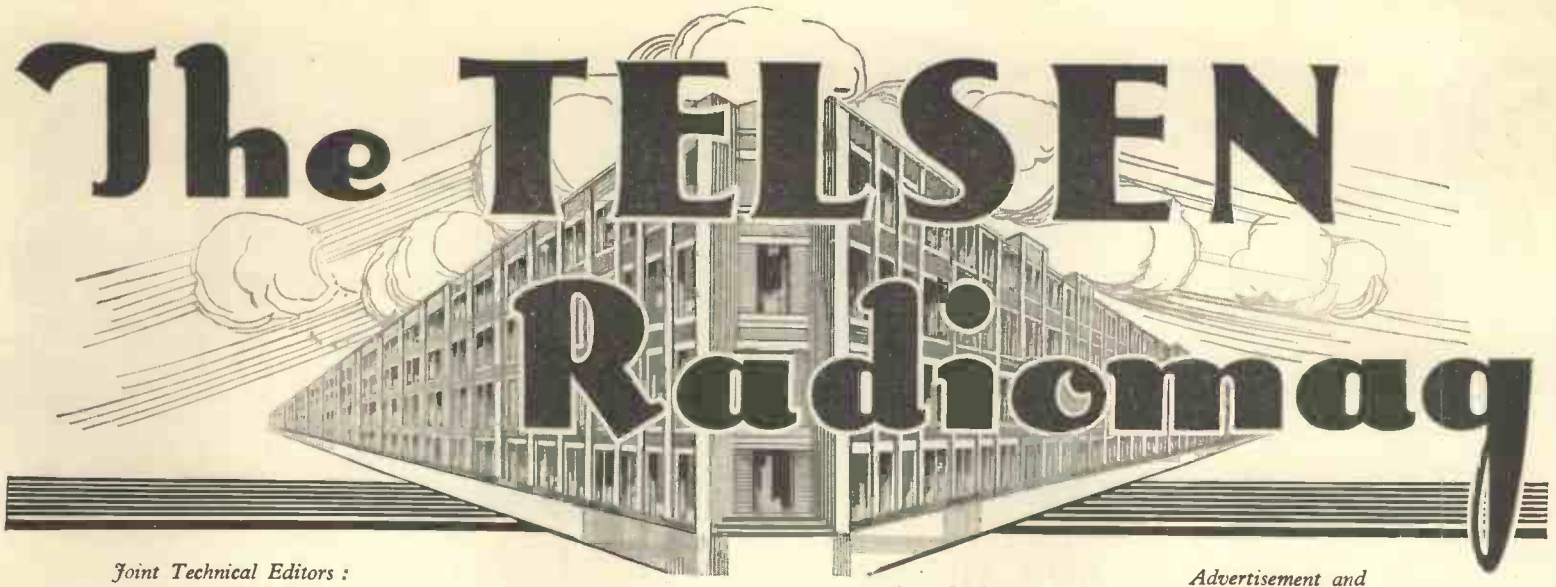
Write for the new R.K. catalogue.

EDISWAN RADIO—100% BRITISH

THE EDISON SWAN ELECTRIC CO. LTD. — 155 CHARING CROSS ROAD, LONDON, W.C.2

W.191

The TELSEN Radiomag



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EDITORIAL COMMENT

THE enormous success of previous issues of *The Telsen Radiomag* has necessitated considerably increasing the size of our current number, and we feel sure both past and present readers will appreciate this issue in its new and enlarged form.

No effort has been spared to make it both interesting and informative to all radio enthusiasts—bigger—better—packed with items of universal interest from cover to cover, in simple non-technical language, profusely illustrated with a host of photographs, diagrams, theoretical circuits and operating instructions. Among the many items of interest, it gives the home constructor complete building and operating instructions for the three full-sized 1/- Blue-prints given free in this issue, these show the complete layout and wiring diagrams of the Telsen "Nimrod 2," "Ajax 3" and "Jupiter S.G.3." These three circuits, together with the "Triple 3" and "Short Wave Adaptor," are the ultimate outcome of prolonged experimental and technical research by Telsen Radio Engineers. The circuits are extremely simple to construct and operate, and their performance will give to radio enthusiasts that great thrill of achievement which can only be appreciated by those who build their own sets.

In the centre of the *Radiomag* is a 12-page supplement in two colours illustrating the new and complete range of Telsen Radio Components, embodying the highest technical advance in design and manufacture that modern radio science can produce. These components are matched to give the utmost efficiency and perfect quality of reproduction when used individually or collectively in the construction of all radio circuits. No greater testimony to the unfailing efficiency of Telsen components can be found than the fact that they are specified by radio engineers again and again.

Elsewhere in this issue is a complete guide to Continental stations on the short, medium and long wavebands, together with a broadcasting map of Europe which will be of considerable assistance when checking up dial readings for recording purposes.

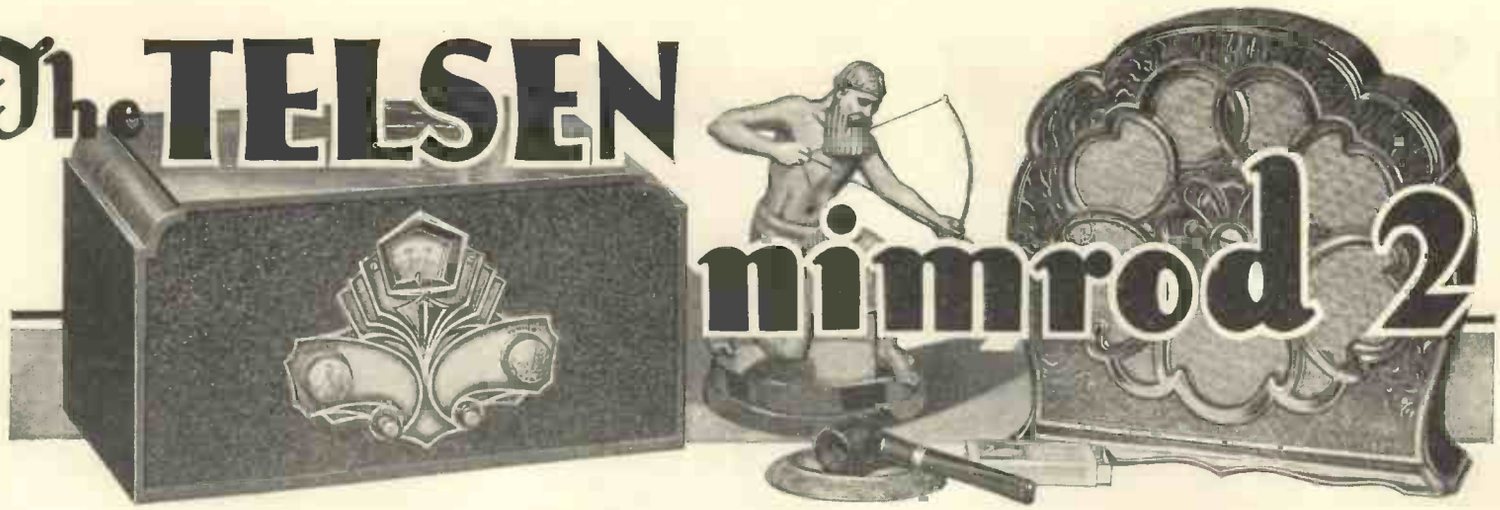
It is our constant aim to improve *The Telsen Radiomag*, and we shall endeavour to further the interests of radio constructors by increasing subsequent issues, not only in new circuits and radio components, but in all matters appertaining to better radio.

Correspondence and suggestions should be addressed to the Editor and marked "Radiomag" in the top left-hand corner of the envelope.

CONTENTS

Good Radio is a joy forever

The TELSEN nimrod 2



A POWERFUL AND HIGHLY SELECTIVE TWO-VALVE RECEIVER FOR LOCAL RECEPTION. Designed by the TELSEN TECHNICAL STAFF.

THE advent of the pentode has given a new lease of life to the two-valve circuit, particularly as the pentode itself has been immeasurably improved during the last two years. It used truthfully to be said that using a pentode was " penny wise, pound foolish." One certainly saved the cost of one valve and its associated coupling, but the cost of high-tension was excessive. An ordinary dry battery in the days of these greedy fellows would not have lasted a week, but nowadays the consumption is very little higher than that of a decent power valve, and much lower than that of a super-power.

The " Nimrod " circuit is designed to meet the requirements of the listener who wishes to build the simplest possible receiver which will give good loudspeaker strength from stations within reasonable range, and adequate selectivity to separate twin-wave Regional transmitters at only a short distance from the aerials. Within the swamp-area of a powerful transmitter, when a set employing two or three tuned circuits is required to get rid of the local, the " Nimrod " may be used for purely local reception with a small power valve in place of the pentode, which reduces the running costs to negligible proportions.

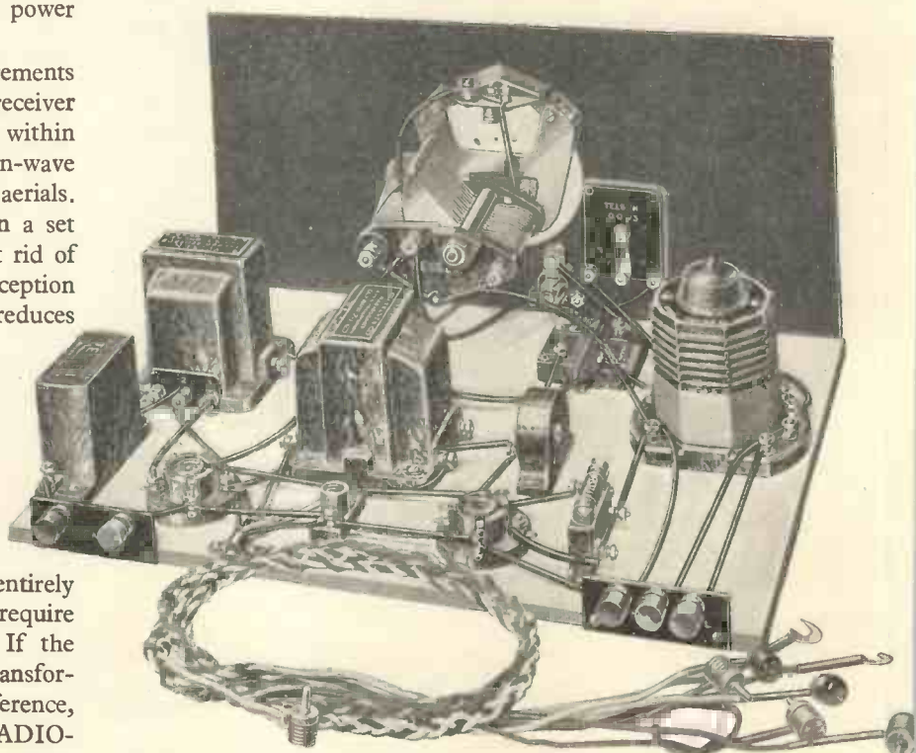
The circuit, as will be obvious to the initiated on reference to the diagram, consists of a reacting detector valve coupled to the aerial in the normal way through a Telsen tuning coil. There is no need to extol the virtues of this coil. Everyone who really knows anything about radio admits that it is the most selective and efficient unshielded tuner available to the general public and, in conjunction with the .0005 log. condenser, makes an entirely satisfactory combination for simple circuits which do not require screening. The low-frequency coupling is optional. If the most extreme economy is necessary, a Telsen " ACE " transformer (5—1) may be used; after that, in order of preference, come the 5—1 " RADIOGRAND," the 7—1 " RADIOGRAND " and the 10—1 COUPLING UNIT, the connections in each case being identical, though with the " ACE " or 5—1 " RADIOGRAND," unless a super-power valve or pentode is used, there is little point in fitting the output choke and condenser, which are employed to prevent overload of the loudspeaker and to apply a modicum of tone-correction in the case of the pentode valve.

Having decided which coupling and valve you wish to use and obtained the necessary components a start may be made on the panel.

ASSEMBLY OF THE COMPONENTS ON PANEL AND BASEBOARD.

The front panel is first assembled. This is identical with the panel of the " AJAX " receiver, the instructions for which may profitably be read in conjunction with this article.

The baseboard components are placed in position on the 14" × 10" baseboard, the fixing holes being pricked through and afterwards enlarged to facilitate the starting of the screws. The valve-holders are in line 1½" from the back edge with the terminals marked " G " pointing to the aerial end of the baseboard. The coupling unit or transformer and high-frequency choke are centred on a line 4" from the back edge.



The "Nimrod 2" completely assembled and wired up.

Finally the terminal strips are screwed on to the back edge of the baseboard and the terminals assembled. The red terminals are for A1, A2 and loudspeaker +, whilst the black ones are for earth and loudspeaker —.

THE TELSEN "NIMROD TWO"—*cont.*

BASEBOARD WIRING.

For those who do not propose soldering the joints, we thoroughly recommend the " thin wire and sleeving " method.

The first wire is " A." This runs from loudspeaker+ to 20, 16, 14, Earth, 7, 6, 34, 28, and output choke E. The actual, lengths of sleeving required here are 1¼", 2¾", 2¾", 2½", 6", ½", 1¼", 4" and 2¾". The lengths of the sleeving for all baseboard wiring may be measured from the blue print. To make a series of connections with one wire such as " A," one end of the wire is fastened to the first point mentioned, the appropriate lengths of sleeving threaded on to the wire, a turn of bare wire taken round each terminal in turn *in a clockwise direction*, the turn pressed down on to the terminal seating and the nut screwed up finger tight. The complete list of baseboard wiring is as follows :—

Wire A. Loudspeaker +, 20, 16, 14, Earth, 7, 6, 34, 28 and Choke (E). In addition attach 4" of wire to 28.
B. 11, 12.
C. A2, 2.
D. A1, 1.
E. 15, 24, 36.
F. 25, 27.
G. 18, 29.
H. Choke (3), 21.
I. 23, loudspeaker —.
J. Choke (2), 22.

Now go over all the terminals, with the exception of 16, and finally tighten them up. Other leads have to be attached to 16, so this is left finger tight.

PANEL WIRING.

Only one wire can be entirely completed here, and that is wire " K," which joins 44, 32, 39, 37.

Lengths of wire should now be cut off as follows and attached to the appropriate terminals.

Wire L. 6½" long attached to terminal 41.
M. 8" " " " " 42.
N. 9½" " " " " 43.
O. 4" " " " " 40.
P. 25" " " " " 38, 45, the connection between 38 and 45 being 6" long. Tighten up these terminals.

Now lay the panel and baseboard edge to edge and complete the wiring and sleeving by joining :—

Wire L to 5.
M to 3.
N to 33, 4.
O to 35.
P to 19, 13, 10.

Tighten up these terminals and proceed to fit the battery cord, which is contained in the Constructor's Outfit. Here it is advisable to read the *special note* regarding the battery cord contained in the article on the " AJAX " receiver. The connections are as follows :—

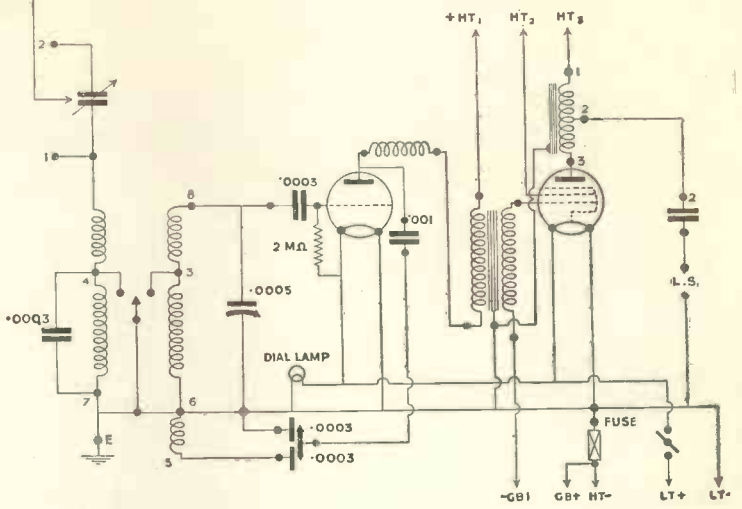
Spade Terminal	(red wire) ..	Terminal 46.
" "	(black wire) ..	" 16.
H.T.—	(Black wander plug)..	" 17.
H.T.+1	(Red wander plug) ..	" 26.
H.T.+2	(Red wander plug) ..	Attach to valve terminal between sockets 21 and 19.
H.T.+3	(Red wander plug) ..	Attach to choke (1).
G.B.+	(Red wander plug) ..	Terminal 17.
G.B.—1	(Black wander plug)..	" 30.

Now raise the panel to its normal position and screw it to the front edge of the baseboard, when the final wiring may now be completed.

The 4" wire previously attached to 28 should now be joined to terminal 32, and wire "Q" 31 to 8 and 9, the terminals being tightened up.

The wiring is now completed and should be carefully checked over against the Blue-print and photograph. The instructions given in the chapter entitled " Before you switch on " now call for attention. Tuning is dealt with in a separate chapter and this should also be consulted.

THEORETICAL CIRCUIT "NIMROD TWO"
(TRANSFORMER COUPLED)



"NIMROD TWO."
List of Components.

Quantity	*Description*	*Cat. No.*	*Price*
1	Valve Holder, 4-pin	W.224	9d.
1	Valve Holder, 5-Pin	W.225	1/-
2	.0003 Mica Condensers	W.242	2/-
1	.001 Mica Condenser	W.245	1/-
1	H.F. Choke (Standard)	W. 75	2/-
1	2 meg. Grid Leak	W.251	1/-
1	2 mfd. Mansbridge Condenser	W.226	3/-
1	Tapped Pentode Output Choke	W. 72	7/6
1	Radiogrand Transformer, 7—1	W. 60	10/6
1	Variable Selectivity Aerial Coil	W. 76	7/6
1	Fuse Holder	W.146	6d.
1	" Telornor " Friction Drive	W.206	7/6
1	.0003 Differential Reaction Condenser	W.185	2/6
1	Two-point Switch	W.107	1/-
1	Three-point Switch	W.108	1/3
1	.0005 Log. Condenser	W.132	4/6
1	Constructors Outfit " Telornor "	W.220	3/6
	Total		57/-

As an alternative, 10—1 Coupling Unit, W.215, 12/6, may be substituted for Radiogrand Transformer at an extra cost of 2/-

" NIMROD " TWO-VALVE RECEIVER.

1st Valve Combination.

Mazda H.L.2. Pen. 220.
HT+1, 72 v. HT+2, 96 v. HT+3, 103 v. GB—1, 3 to 4.5 v.

H.T. Battery	..	Ediswan	103 volt.	Cat. No. 69718.
G.B. "	..	Ediswan	9 volt.	Cat. No. 69804.
L.T. "	..	Ediswan	2 volt.	Type E.L. M.4.

Recommended Mains Units.

Regentone.

D.C. Eliminator, for H.T. only. Type D.C.1.
A.C. " " H.T. only. Type W.1.F.
D.C. " with Trickle Charger. Type D.C. combined 2.
A.C. " " " " Type A.C. W.W.5.B.

2nd Valve Combination.

Mazda H.L.2. Pen. 220A.
HT+1, 72 v. HT+2, 96 v. HT+3, 103 v. GB—1, 9 to 10.5 v.
D.C. Eliminator, H.T. only. Type D.C.1.
A.C. " H.T. only. Type W.1.C.
D.C. " with Trickle Charger. Type D.C. combined 2.
A.C. " " " " A.C. W.5.A.

6

Announcing THE 1933 RANGE OF B.T.H. ELECTRIC GRAMOPHONE PICK-UPS

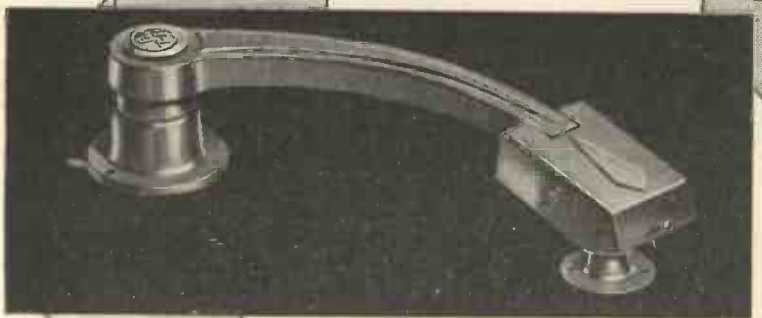
The B.T.H. "minor" pick-up has been redesigned and improved and now includes a special volume control fitted in the base of the tone arm pillar. This model is constructed in a one-piece moulding of B.T.H. "Fabrolite" and is recommended to those requiring a highly efficient but inexpensive pick-up.

PRICE 25/-

B.T.H. SENIOR PICK-UP (1933 model)
This has been completely redesigned and gives an even better response curve than hitherto. Free coupling of the head to the tone arm reduces pressure on records and facilitates needle changing, and a ball-bearing universal joint on the tone arm support ensures easy tracking. An independent and specially designed volume control of correct value is supplied with this connoisseurs' model.

Price (including volume control): £2-2-0 complete

B.T.H. pick-ups are also supplied for fitting to existing standard tone arms. Price (with four adaptors): 27/6 complete.



By the introduction of this new range of B.T.H. pick-ups, another stage in the development of electric gramophone reproduction is reached. For years B.T.H. pick-ups have represented the highest peak of efficiency in electrical reproduction. These 1933 models set an even higher standard. They are the outcome of the accumulated technical knowledge gained by long manufacturing experience and by intensive and original research.

There are now three models in the B.T.H. range. All good radio dealers are stocking them. Full details will be found in the new pick-up folder.

EDISWAN RADIO—100% BRITISH

THE EDISON SWAN ELECTRIC CO. LTD. (A.E.I.) 155 CHARING CROSS ROAD, LONDON, W.C.2

W.190

PRACTICAL HINTS and TIPS

HOLES IN BASEBOARDS

THERE are three proverbs which apply to the construction of wireless sets with peculiar force :—

" If a thing's worth doing, it's worth doing well."
" Lazy people always take the most pains."
" Well begun is half done."

We are all lazy people in the sense that we do not want to have to do a job twice over, and we can reduce this possibility to a minimum by taking a few simple precautions. One wonders how many valves have been burnt out due to a transformer breaking loose from its moorings and barging an H.T.+ terminal up against a wire which should go to L.T.+ ! Screwing short screws into plywood baseboards is no easy task unless the screws are driven dead square and a clearance hole is made first. The top ply has a tending to " rag," and if you get through that the cemented joint resists the entry of the screw and lifts the loosened wood away as the screw rotates. Extra pressure possibly tilts the screw sideways and burrs the slot up, and when the job is finally screwed down it is about as safe as a house on a quicksand. The screw is holding by one thread, the middle ply is split, the top ply is ragged and the screw head looks bad. If you want to do the job properly file an old bradawl or screwdriver to a point $\frac{3}{8}$" long, leaving a shoulder. The diameter of the point where it meets the shoulder should be about $\frac{3}{32}$".

This can be hammered into the baseboard, allowing the point of the screw to cut its way and at the same time not splitting the ply, which often happens where an ordinary bradawl is used. If you are the fortunate possessor of a hand drill you can make your assembly even easier by filing the point of a screw of the same gauge as those you propose to use in the manner shown.

The head can then be cut off and the screw held in the chuck of the hand drill with $\frac{3}{8}$" projecting. This will cut a thread for the holding down screw, which can then be screwed in without the slightest difficulty.

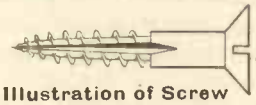


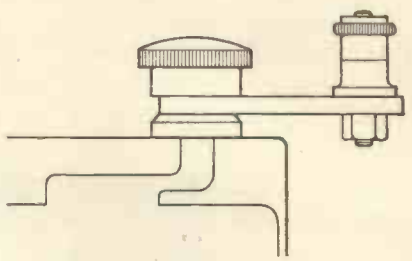
Illustration of Screw

One or both of these methods should always be used on the edges of plywood boards in order to prevent splitting, and it is a good tip to squeeze a little " Croid " or " Seccotine" into the holes before screwing up. This strengthens the wood round the hole if there is any tendency to split when the panel or terminal strip is strained.

CORRODED TERMINALS

Corroded terminals of accumulators may be freed by steaming or by the judicious use of ammonia, washing soda or sal-ammoniac. The steaming should be carefully performed as if the steam proceeding from the spout of the kettle impinges upon the glass case the latter may crack. The jet of steam should be directed upon the terminal itself. In the case of ammonia or other alkaline reagent care should be taken to see that none of the liquid or powder enters the cell, as this would have deleterious effect upon the electrolyte. If a terminal persistently corrodes it is best to make a subsidiary connection with a lead bas-bar thus:—

The lead bar can be clamped under the terminal which has a predilection to corrosion, after liberally smearing with vaseline, the extra terminal being left permanently connected and used in the ordinary way.



Celluloid accumulators sometimes split at the seams or corners, and while this is generally an indication that the cell is "done for," owing to expansion of the plates, a repair may be effected which will last for some time by the use of celluloid cement. The battery should be laid on its side so that the affected portion is away from the acid. The part around the split is then cleaned with fine emery cloth or by scraping with a knife, after which the surface of the celluloid should be scratched with a pin or needle in order to roughen it. A piece of scrap celluloid may with advantage be pushed into the split if it is a serious one, and the whole liberally coated with the cement. Celluloid cement loses about nine-tenths of its bulk in drying, so the coating should be put on fairly thick. If you can spare the time several thin coats are better.

The cement can be bought ready made, but if you wish to do it yourself file or scrape a piece of celluloid until you have a mass of white fluff. A few spots of Amyl Acetate will convert this into a jelly which is ready for immediate use. Avoid lumps in the fluff, as although they will apparently mix up all right they will not be absorbed into the mass, and will stick out in a very untidy manner when the cement is dry.

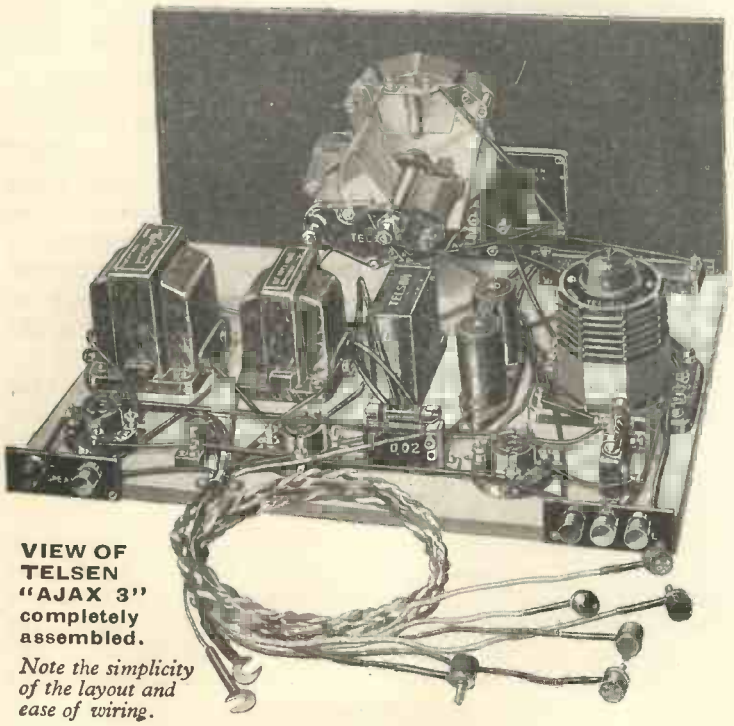
The TELSEN ajax 3

AN EFFICIENT AND EASILY CONSTRUCTED STRAIGHT THREE-VALVE RECEIVER DESIGNED BY THE TELSEN TECHNICAL STAFF.

NO circuit has ever enjoyed greater popularity than the "straight three," and the Telsen versions have, ever since their inception, led the field. Here is the latest edition of this arrangement which has been designed by the Technical Department at the Telsen Works, and incorporates the latest manufactures of the Company. One component has, in fact, been specially designed for inclusion in this and similar circuits.

The circuit consists essentially of a detector valve coupled to the aerial by the "W.76" aerial coil and to the succeeding valve by a de-coupled resistance-impedance combination. The de-coupling has two interesting effects. Firstly, it improves the quality of reception, and secondly it enables satisfactory results to be obtained from a high tension battery which is no longer in the first-flush of its youthful vigour.

The 1/- Blue-print given free with this issue will enable the most non-technical listener to construct the set without difficulty.

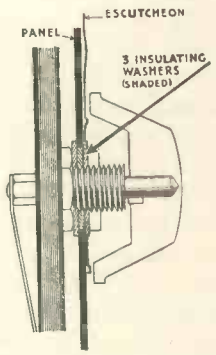


VIEW OF TELSEN "AJAX 3" completely assembled.

Note the simplicity of the layout and ease of wiring.

A complete list of the components required is given at the end of this article, and a Constructor's Outfit containing metal panel, baseboard, terminal strips, terminals, connecting wire, battery cord, wander plugs, insulating bushes, sleeving, five spanners and screws, is now available. This will be found listed in the catalogue section and will simplify the construction still further.

The first stage in the construction is the panel. Remove the knobs and locknuts from the switches, reaction condenser and "Telornor." Fix the latter to the panel according to the instructions in its own box. Fit the reaction condenser and two switches in the positions shown, making sure that the reaction condenser has one larger washer on its spindle before putting it into the hole in the panel (see diagram). The small washer should then be slipped into the hole from the front and kept in place by the remaining large washer, after which the nut can be put on and the whole assembly tightened up. The switches are, of course, simple to fit. The .0005 variable condenser should then be put in position and tightened up as shown with the bottom edge parallel with the bottom of the panel.



The necessary components are now assembled on to the 14" × 10" wooden baseboard contained in the "Telornor" Outfit. These are placed in position one by one, and the holes for fixing the screws pricked through with some pointed instrument such as an awl or darning needle. The holes in the baseboard should then be enlarged slightly to facilitate the screwing down of the components. The valve-holders should be placed in a row 1½" from the back edge, and the rest of the components (with the exception of the two fixed condensers near the tuning coil) disposed along a line 4½" from the back of the baseboard. Note particularly that the binocular high frequency choke and the 2 mfd. mansbridge condenser are not centrally disposed about this line, but are set nearer to the back of the baseboard. Before proceeding to the next stage of the assembly, fix length of wire about 7" long under the terminal nuts "P" and "HT" on the transformer (Nos. 34 and 35 on the Blue-print) and connect one end of the spaghetti resistance and a 4" length of wire to the terminal of the 100 henry choke No. 32. This will facilitate wiring later on, so it is as well to see to this first. Having done that, screw all the components down to the baseboard in the positions indicated. Note this especially with regard to the following components :—

The Grid Condensers and Leaks. The correct assembly of these is shown in the sketches. The .0003 condenser and 2 meg. leak are the nearest to the aerial, while the .002 and 1 meg. are fixed between the first two valve-holders.

FIG. 1

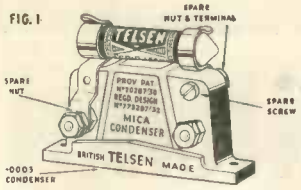
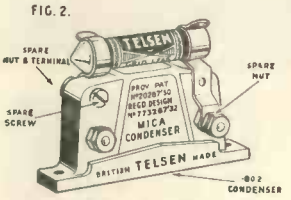


FIG. 2.



Now fit the two terminal strips to the back edge of the baseboard as shown in the photograph. Five terminals, three red and two black, are provided for use with these strips. The red ones should be utilised for aerials A1 and A2 and loudspeaker+ respectively, and the black terminals are for earth and loudspeaker —.

We strongly advise the "thin wire and sleeving" method of wiring in the case of constructors who do not propose to solder their joints, and all the instructions for circuits given in this issue assume the employment of this method. In the case of the "AJAX" the first wire is "A." This runs from 36 to 33, 30, 40, 6, 7, E, 14, 21, 55 and 25. Measure the distance between the actual points to be connected and cut the sleeving accordingly.

The best way of doing the long wires is to fasten one end of the wire to the first-named terminal on the list. The lengths of sleeving can then be cut off and slipped over the wire from the free end. As you come to each terminal, take a turn round it with the bare wire and screw up the nut as tight as is possible with the fingers.

The complete list of baseboard wires is as follows :—

Wire A. 36, 33, 30, 40, 6, 7, earth, 14, 21, 55 and 25.
B. 24, 20, 13, 10.
C. 37, 23.
D. 35, speaker+ (already attached to 35).
E. 34, 22 (,, ,, ,, 34).
Spaghetti 32, 16 (,, ,, ,, 32).
F. 32, 29. (,, ,, ,, 32).
G. 16, 27.
H. 18, 19.
I. 11, 12.
J. 41, 28, 15.
K. 26, speaker—.
S. A1, 1.
T. A2, 2.

Another wire, not lettered on the Blue-print, runs from terminal 30 to the moving vanes of the .0005 variable condenser, terminal 52. Attach this now to 30; 6" will be needed.

It is advisable, at this stage, to go over all the terminals with the exception of loudpseaker+, 20 and 21, and finally tighten them up.

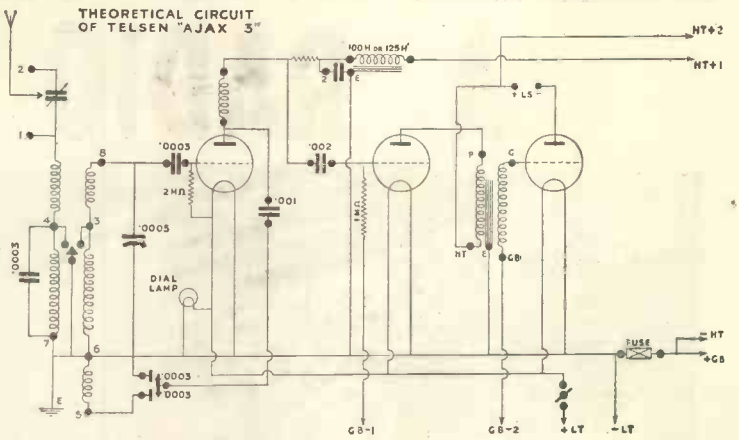
There is only one wire on the panel which can be finished outright. That is wire "L," which connects 44, 52, 48 and 53. Wire "M" connects 54 to 46, running up between the variable condenser and the framework of the "Telornor," but as 46 has later to be connected to a valve-holder on the baseboard, about 10" of wire should be allowed extra to the distance between the the two terminals. Lengths of wire should then be cut off as follows and attached to the terminals :—

Wire N. 10" long, attached to terminal 51.
O. 6½" ,, ,, ,, ,, 49.
P. 8" ,, ,, ,, ,, 50.
Q. 11" ,, ,, ,, ,, 43.
R. 9" ,, ,, ,, ,, 45.

Now lay the panel and baseboard edge to edge, the bottom of the panel adjacent to the front edge of the baseboard. Connect the free end of each of the following wires to the terminal indicated and in the order given, covering the wire with sleeving as you go.

Wire O to 42. Wire Q to 39, and on to 4.
P to 5. R to 3.

The battery cord now claims attention. The envelope in which it is contained states the colours which are used for the different battery connections. The wander plugs and spade terminals should be attached to the wires in accordance with instructions on the envelope.



SPECIAL NOTE.—Although it is possible to use the battery cord just as sent out, it gives a much more "professional" look to the job if it is all separated first. The wires can then all be run straight to their respective terminals, drawn fairly tight and bunched together under the clips shown on the Blue-print near the middle valve-holder.

It also improves the appearance of the set if the ends of the flex are cased with any spare bits of sleeving you may have. Slide the braiding back about ¼" and cut off the rubber covered wire to the same length. The braid can then be brought forward again, moistened, and screwed to a point between finger and thumb. It is then easy to thread on an odd half-inch of sleeving, thus :—

which can be brought up to the terminal when the joint has been made, thus covering any loose end of braiding. If you are not sure of your terminal gripping the wire properly, make a knot in the flex and slip the loop over the screw.

The plugs and spade terminals and the terminals to which they are connected are listed below.

Spade terminal (red wire)	Terminal	47.
,, ,, (black wire)	,,	21.
H.T.+ Black wander plug	,,	56.
H.T.1 Red wander plug	,,	31.
H.T.+2 Red wander plug	,,	Speaker+
G.B.+ Red wander plug	,,	56.
G.B.—1 Black wander plug	,,	17.
G.B.—2 Black wander plug	,,	38.

Now raise the top of the panel to its normal position and screw the panel to the front edge of the baseboard with the screws provided. This done, the remainder of the wiring can be

(*continued on page 17*)

10

BRITISH TECHNICIANS SOLVE A RADIO PROBLEM!

HERE IS A SUPER BATTERY AT A BARGAIN PRICE

Ediswan engineers have turned radio battery buying from an affair of "hit or miss" into a certainty. The new Ediswan, costing 6/9 for 60 volts, represents the finest value ever offered to the radio public. All good radio dealers are now stocking Ediswan H.T. in standard sizes.

FREE Ask your local Radio dealer for a copy of this new Radio Publication: "Get the most out of your H.T. Battery," or write to Battery Dept., The Edison Swan Electric Co. Ltd., Ponders End, Middlesex. This booklet is packed with useful information about receiver maintenance and includes such valuable data as wavelength charts, etc., etc.

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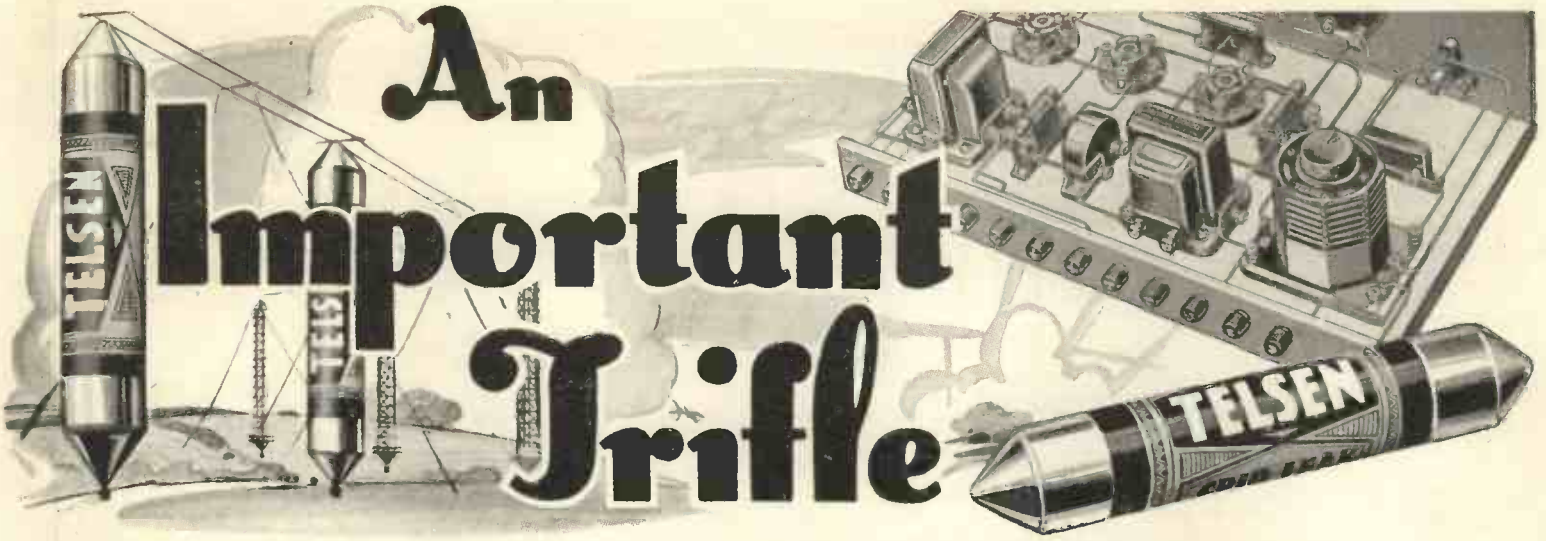


An Important Trifle

HOW A CHANGE OF GRID LEAK IMPROVED A TELSEN "CONQUEROR 3"

HOW long have you had your grid-leak? Funny thing, you know, how many constructors are using "duds" or leaks of unsuitable value. We just put in the usual .0003 fixed and 2 meg. and leave it at that. The set works, and we promptly forget all about the grid leak. The .0003 condenser, if of reliable make, will give no trouble, and if it is a doubtful one will give proof of its fickleness in no uncertain manner, particularly if preceded by a screen-grid stage. The grid leak, on the other hand, within very wide limits, will function somehow.

Theoretically, you know, the grid condenser and leak should have a separate set of values for each wave-length, and should certainly be changed when switching over from medium to long waves, and on the ultra short waves should have values of .0001 and 5 megohms as a general rule. Most of us are too lazy to bother about this, but my recent experience with a "Conqueror 3" has impelled me to write this article for the guidance of constructors in a similar situation. At my home, which is nearly 100 miles from the nearest transmitter, I have found that a grid leak of 4 megohms gives me better results than the standard 2 meg. value, and that on the long wave-band the results are better still if the leak is connected *across* the grid condenser instead of running from the grid side of it to the X filament.

The discoveries made in this connection prompted me to try experiments in other directions. I commenced by altering the clips on the grid condenser so that the leak could be connected across the condenser, as shown in the illustration. I then connected two extra grid leak holders as shown, both connected to the detector-valve grid at the one end, the other ends being attached to the filament legs. That gave me an alternative of three positions for the grid leak. The theoretical circuit arrangement makes this quite clear.

Position II is the one normally used in the "Conqueror 3," and position I the one I found better. Hamburg, for some reason which I am not sufficiently technical to explain, came through better with the leak in position III.

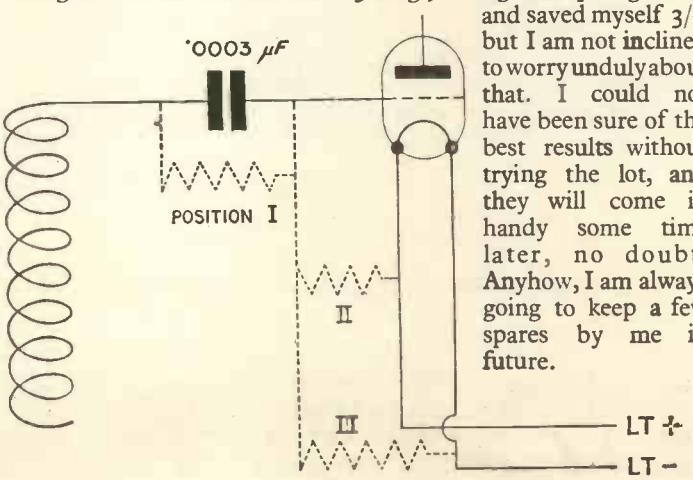
For some time I had been trying to get decent results with a pickup on my set, and had given it up in disgust. I found that when it was connected across the detector grid circuit I got a lot of noise but no quality, and if I put it on to the middle valve the results, though admirable from the point of view of quality, were not as good as my acoustic gramophone as to volume. On a friend's advice I effected a compromise between the two. I purchased a 5—1 Telsen "Ace" transformer, and connecting the secondary to the grid of the middle valve and grid bias in the ordinary way I attached my pickup across the primary. The effect of this delighted me beyond measure, only on the heaviest passages was there any trace of overload, and this I eased by putting a 1/4 meg. grid leak in another clip across the secondary of the "Ace" 3—1 transformer immediately before the power valve. This, however, reduced the signal strength on radio, so I finally moved this to the grid circuit of the second valve, where it has a pronounced effect in cutting down needle hiss. I then altered the wiring of the set so as to place the 1 meg. leak in the first L.F. stage permanently across the secondary of the 5—1 (pickup) "Ace" transformer, and the set is now all that I could wish.

The alterations appear to complicate the circuit to a considerable degree, but the added complication is apparent rather than real, and the conversion should be easily carried out by any constructor who has built his own set. The inclusion of a fuse between the H.T. terminal and the L.T. wiring is a desirable feature, and in view of the cost of a set of new valves, is well worth while, costing as it does less than 1/-.

My total expenditure in connection with these experiments was as follows :—

4 meg. Grid Leak	1/–
3 meg. „ „	1/–
1 meg. „ „	1/–
½ meg. „ „	1/–
¼ meg. „ „	1/–
"Ace" Transformer, 5—1 ..	5/6
2-point Switch	1/-
3 Grid Leak Holders at 6d. ..	1/6
	13/–

I might have done without the 3 meg., 1 meg. and ½ meg. leaks and saved myself 3/-, but I am not inclined to worry unduly about that. I could not have been sure of the best results without trying the lot, and they will come in handy some time later, no doubt. Anyhow, I am always going to keep a few spares by me in future.



A useful Spaghetti anchorage

AS fast as new components appear complications of design become inevitable, and the spaghetti resistance is no exception to this rule. The radio enthusiast who likes everything on his baseboard to be neat and tidy often experiences considerable trouble in laying out a circuit which contains a spaghetti, due to the fact that its resistance is proportional to its length, and a low value resistance will sometimes not reach the terminal with which it should connect. Spaghettis are fragile; the ends should always be secured under a terminal and laid out as straight as possible so that there is no chance of their being bent about while changing valves, gridleaks, etc.

Our experimental department have found this out to their cost on many occasions, and they made a practice of securing the battery ends of their spaghettis to the baseboard with a screw, extending as much as necessary with a piece of wire. This was quite all right in its way, but was not a really workmanlike job, and impossible with a metal baseboard. Their ingenious solution of the difficulty is worth noting. They now use half a " Telsen Terminal Block."

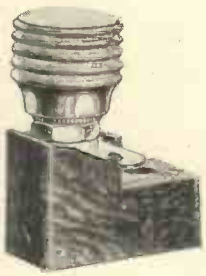
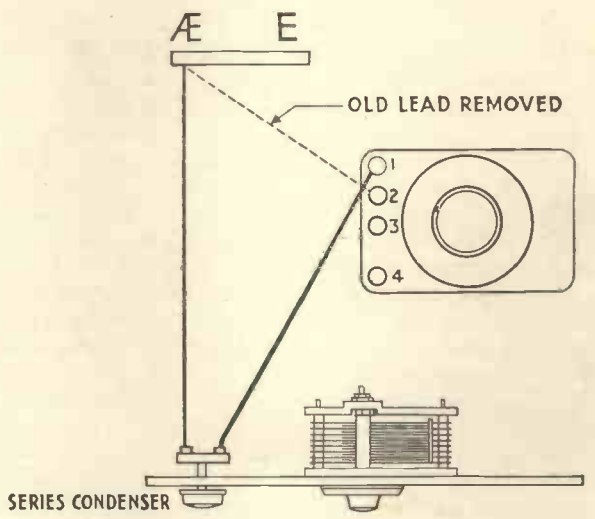


Illustration of half a Telsen Terminal Block

This is easily secured to any baseboard with one screw and, as the insulation material is perfect, there is no possibility of leakage. Moulded bakelite is not too easy to cut, but if it is done Japanese fashion there is little risk of breakage. The hacksaw should be held upside down in a vice or between the body and the bench or table and the object to be cut drawn up and down the edge.

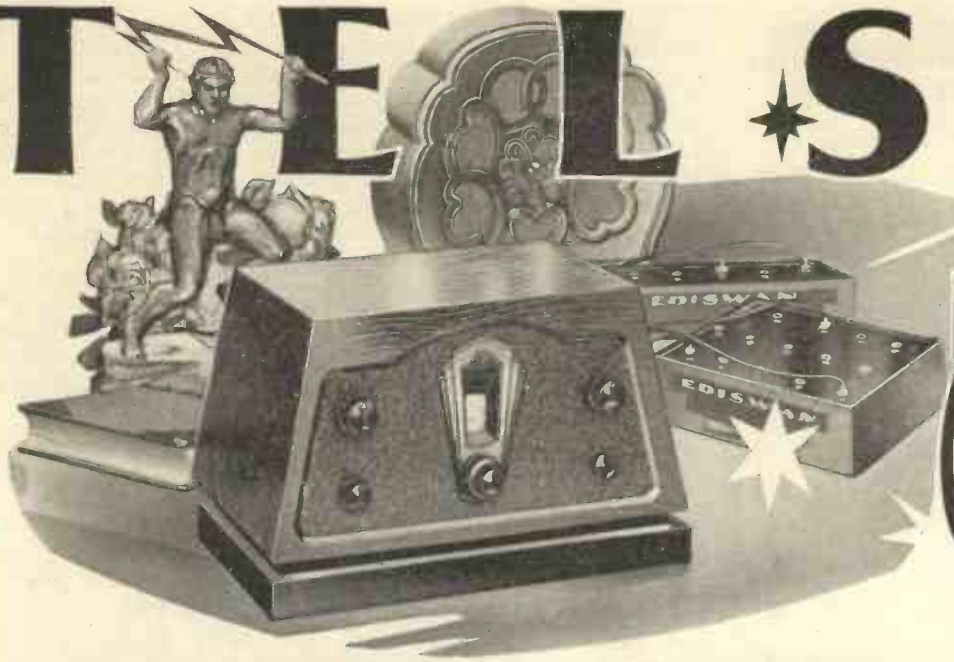
A CONVENIENT METHOD of SELECTIVITY CONTROL

The series condenser illustrated herewith is intended for use in the aerial circuit of screen-grid receivers for the purpose of increasing selectivity and as a volume control. The minimum capacity is very low, so that even a powerful mains-driven screen-grid set can be reduced almost to inaudibility right under the aerial of a Regional transmitter. The maximum capacity is .0003, and a switch is incorporated which cuts the condenser out altogether when it is not required. The Telsen W.76 Aerial Coil has always incorporated a variable series condenser, but the aerial lead to the coil has to be moved from terminal 2 to No. 1 when the condenser was not required. That meant opening the lid or removing the back of the cabinet, which was also necessary even to effect an alteration in the capacity of the condenser. The new condenser is designed to mount upon the panel, thus rendering this unnecessary. Those constructors who already have the variable selectivity aerial coil (W.76) and wish to avail themselves of the new component should remove the lead which runs from terminal 1 or 2 on the coil to the aerial terminal. A longer wire should be connected to the aerial terminal and one of the terminals on the condenser. The other terminal should be connected to No. 1 on the aerial coil. The wiring is shown in the sketch.



The same instructions apply, of course, to the aerial and H.F. transformer coil (W.154), except that there is no No. 2 terminal on this, the aerial being connected to No. 1 in the ordinary way. In the case of the canned coil, the leads should run from aerial to series condenser, and from the remaining condenser terminal to No. 1. The series condenser has been specially made for use in the Macnamara all-electric receivers, but will be extremely useful on battery driven sets in situations where frequent changes of series capacity are necessary.

TELSEN



Jupiter S.G.3

A VERY POWERFUL AND HIGHLY SELECTIVE RECEIVER—THE CIRCUIT CONSISTING OF SCREENED-GRID—DETECTOR—PENTODE

Designed by the TELSEN TECHNICAL STAFF

TO every right-minded man there comes, sooner or later, the urge to build one of those sets of whose performance his friends boast every morning on the 8-15. He realises, with a sigh, that these Herculean receivers are expensive to build and costly to maintain, but that does not lessen his desire to possess one which will bring in at full strength those stations which are only an elusive whisper on his own set. If only there was a way——

Let him take heart! Telsen have solved the problem for him. The "Jupiter III" is quite cheap to build and the battery consumption is very little higher than that of an ordinary "straight" three-valve circuit.

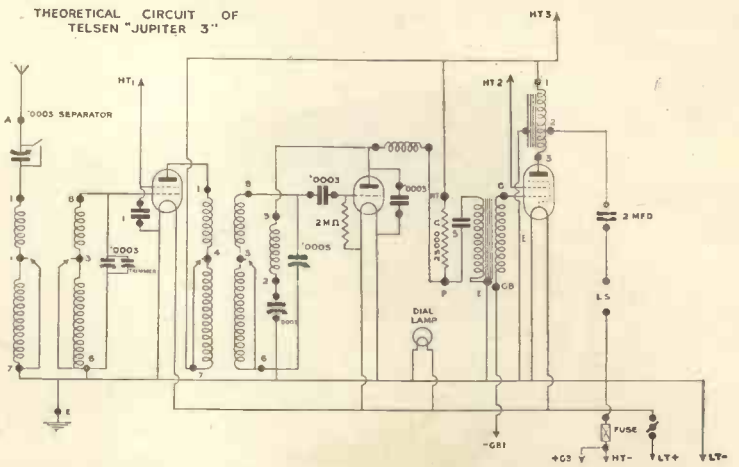
After much intensive research and development work our Technical Staff have evolved a vastly improved type of matched screened coil, a ganged condenser with drum drive, and a 10—1 low frequency intervalve coupling unit. Each plays its part in making the "Jupiter III" a unique receiver.

It is well known that the most efficient three-valve receivers embody a screened grid valve, with a detector followed by a pentode valve. The "Jupiter III" is of this type. The drawback to the usual design is that whilst ample volume of sound is obtained, stations that are close together in wavelength cannot be separated—the set being unselective. The new matched screened coils allow of ample volume with razor-edge selectivity, and with the drum driven ganged condensers they enable two tuned circuits to be operated by one control, thus ensuring the maximum ease of operation.

The semi-technical reader may, at this point, say "But what about band-pass tuning?" Band-pass, like charity, covers "a multitude of imperfections." Quite frankly, it is of no use in a single stage receiver. The selectivity is fixed and definite, but so is the sensitivity, and a distant station which is free from interference cannot be brought up to full strength as is the case with the "Jupiter." The same consideration was before us when the "Macnamara" receiver was designed. Band-pass tuning would have eliminated one control but also have limited the number of stations receivable.

For sets operated in districts exceptionally near to a powerful broadcasting station a further control called the "separator" enables you still further to increase the selectivity. A volume control is also fitted. Wavelength switching is performed by a very professional looking wavelength switch that operates both coil switchings with one movement of a small knob.

To complete the excellence of design the new "Telsen" 10—1 coupling unit is incorporated. This gives a very high step-up in



amplification to the output pentode valve which, in conjunction with the tapped pentode output choke, ensures realistic reproduction of every programme within range.

The set is exceptionally easy to construct and will give uniformly good results without those many adjustments which tend to spoil the average "distance getter."

A 1/- Blue-print is given away with this issue and which, with the help of this article, enables the veriest tyro to construct the set with ease and assurance of the final results being very satisfactory. A complete list of components is given elsewhere, and a constructor's outfit containing the necessary metal panel, baseboard, battery cord, tools and the usual small gear needed for receiver construction will be found listed in the catalogue section.

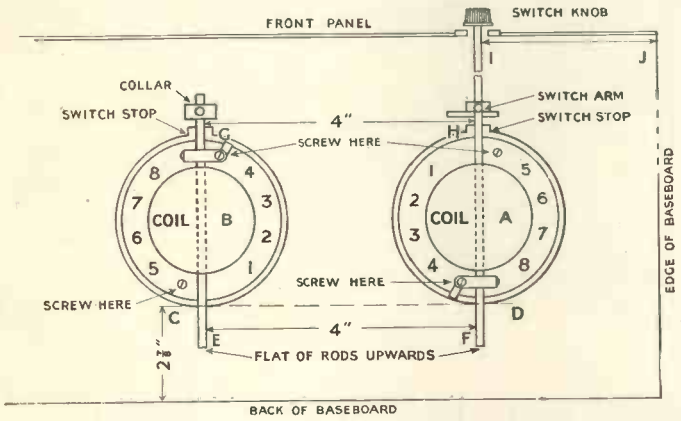
(*continued on next page*)

TELSEN JUPITER S.G.3—*continued.*

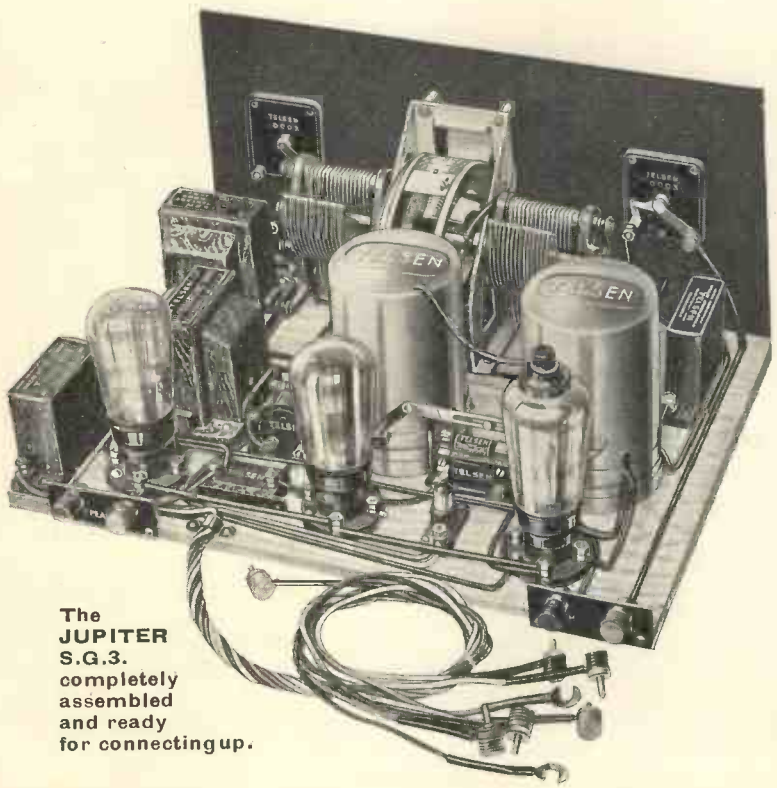
This should be obtained as it further simplifies construction, and the following instructions assume that this outfit is being used.

FRONT PANEL AND BASEBOARD ASSEMBLY

Remove the knobs and locknuts from the reaction condenser, aerial series-condenser (separator) and push-pull switch, and screw on to each spindle its appropriate spacing nut found in the constructor's outfit.

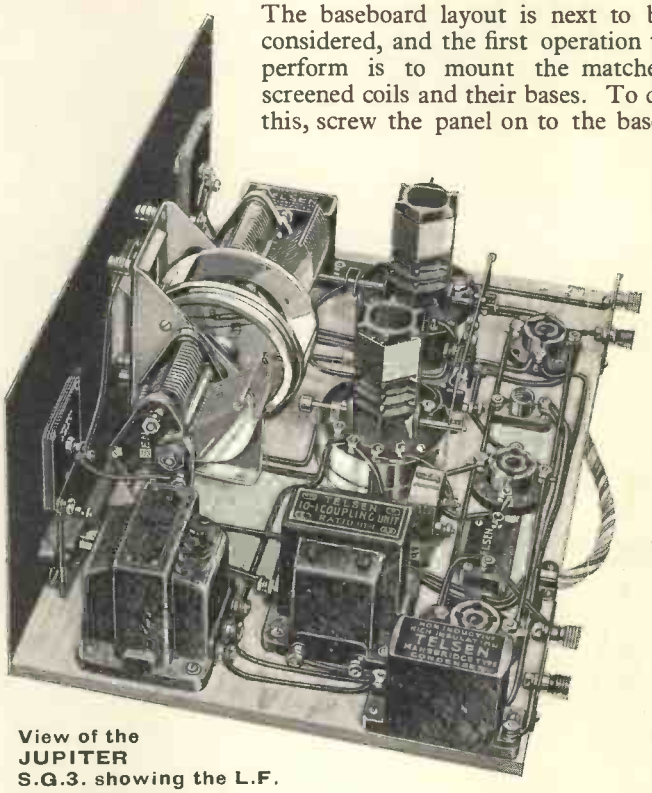


From the back of the panel insert the reaction condenser spindle into the upper right-hand hole, first slipping the thin insulating bush over the spindle so that it locates snugly between the latter and the panel. Note, however, that this is merely a packing piece. The bush of the condenser is at earth potential. The hole is oversize so that the panel may be used for other circuits, and the washer is only employed so as to prevent one corner of the nut entering the hole and throwing the condenser out of truth. Fit the "volume" escutcheon as described in the Constructor's Outfit Instructions. Now screw on the locknut and replace the knob. Next assemble the push-pull switch and its on-off escutcheon plate in the lower right-hand hole. The aerial series condenser locates in the upper left-hand hole. As this component is entirely insulated from the front panel great care should be taken in its assembly, which is as follows :—



The JUPITER S.G.3. completely assembled and ready for connecting up.

Place a large insulating washer over the spindle and then insert the spindle into the hole. Slide the thick insulating collar down the screwed bush to rest between the latter and the walls of the hole and then place the "separator" escutcheon plate over the projecting part of this bush. Slide on a large insulating washer and screw home the locknut. Next fit the wavelength escutcheon plate to the lower left-hand fixing holes with the nuts and screws provided. Replace all the knobs and the panel is ready for the drum drive and ganged condensers. Instructions for the fitting of these are to be found in the containing carton.



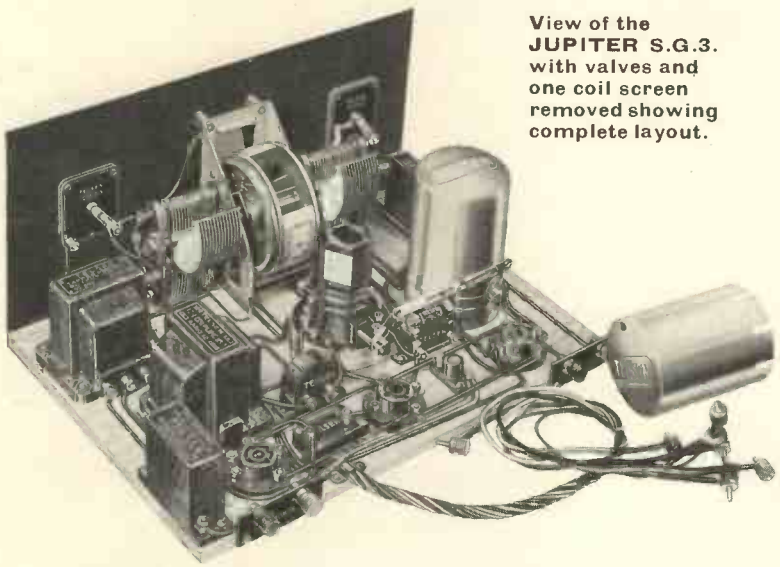
View of the JUPITER S.G.3. showing the L.F. end of the set.

The baseboard layout is next to be considered, and the first operation to perform is to mount the matched screened coils and their bases. To do this, screw the panel on to the baseboard through the four holes along the panel bottom edge. Next draw a line along the baseboard parallel to and $2\frac{7}{8}$" from the back edge. Insert the long switch rod into coil "A" switch hole, slide the switch arm on to that end nearest terminals 1 and 5 and with these same terminals nearest to the front panel pass the switch rod through its panel hole. Place the shield base under the coil with the switch stop pointing towards the panel and then a plinth support on which the whole stands. Now get the screw holes in line with one another and drop a $1\frac{1}{8}$" No. 4 wood screw through each fixing hole, having first placed the switch rod in position as shown in the sketch. Place the whole assembly so that firstly the back edge of the plinth support is on the line CD, secondly the switch rod is square to the front panel and parallel to the right-hand baseboard edge, and thirdly that the switch rod does not foul the shield base edges. The best way to get the rod parallel to the baseboard side is to cut out a rectangular piece of cardboard, place it near to the front panel and standing on the baseboard, slide along until it touches the switch rod at point I and then make a pencil mark IJ on the cardboard against the edge of the baseboard. Then set the cardboard up against the extreme end of the rod, move the assembly until the pencil mark IJ is coincident with the baseboard edge. The rod should now be square; this process should be gone through again to check up. Now screw the coil down, holding the assembly firmly to stop it shifting position. Place the switch knob on the rod, and adjust the rod in position so that the knob just clears the escutcheon plate. Turn the rod so that the flat portion is facing upwards and then fasten down the switch arm. As with all screws that "bite" on to the switch rods see that the flat portion is in contact with the screw end.

TELSEN JUPITER S.G.3—*continued.*

Coil " B " is now positioned. Place a short switch rod through coil " B " switch socket and fasten on the small metal collar at the end nearest terminals 8 and 4. Place the coil in its shield base with the switch stop at the back and the coil " B " terminals disposed as shown in the sketch. Place under the whole a plinth support and get the screw holes of all three in line, drop in two 1⅛" No. 4 wood screws, with switch rod in position, and place the back of the whole assembly along line CD. Rotate the switch rod so that the flat side is upwards, move the coil assembly along CD until the distance EF and GH are equal to 4" and then screw coil " B " into position. The switch coupling link is now fitted in accordance with the instructions sent out with this component and the coil assembly is completely finished.

The switch knob is now removed and the front panel taken off to facilitate the mounting of the other component and make the wiring easier.



View of the JUPITER S.G.3. with valves and one coil screen removed showing complete layout.

The baseboard assembly comes next. The valve holders are in line 1¾" from the baseboard back edge, the H.F. choke and grid condenser assembly are centrally disposed on a line 2⅞" from the baseboard back edge. The positions of the rest of the components are easily seen from the blue-print. All the components should first be placed in position, and the holes for the fixing screws pricked off with some sharp instrument. Then enlarge these holes to facilitate the screwing down of the components. Particular care should be taken in the grid leak grid-condenser assembly. Looking at the blue-print terminal 24 is the common point of the two components, 23 goes to the other end of the grid leak and 22 is the free end of the grid condenser. By looking at the sketches of this assembly shown in the constructional article on the " Ajax " receiver (page 8), no difficulty will be experienced here. Now fix the aerial-earth and the + loudspeaker — strip to the back edge and the assembly of the baseboard is complete.

WIRING

Baseboard Wiring

For those who do not wish to solder connections we strongly recommend the " thin wire and sleeving " method which incidentally is here used.

On looking at the blue-print it will be noticed that all terminals are numbered, and all wires lettered. The first wire is " A." This runs from the earth terminal to 10 (valve-holder), to 53 (fuse-holder), 14 (valve-holder), 18 (valve-holder), 28 (.0003 condenser), and finally to loudspeaker+. To connect up wire " A," first cut off lengths of sleeving to insulate the wire in its travels from point to point. These lengths in order are 2½", 2¼", 1⅝", 4⅛", 1⅞" and 2". Now fasten one end of a length of wire on to the earth terminal, thread on the 2½" of sleeving, take a turn of bare wire round screw 10 in a *clockwise direction* and screw down the terminal finger tight. Now proceed to the next terminal in a similar fashion until the whole run is completed. All the baseboard may now be done. It should be noted that in some cases the leads run round the inside of the coil shields, being led in through the slots in the sides of the base. The blue-print shows these leads very clearly and should be closely followed, the leads being neatly disposed on or just clear of the baseboard. The complete list of wires is as follows :—

Wire A. Earth, 10, 53, 14, 18, 28, loudspeaker+.
B. 24, 13.
C. Coil B5, 25, 27, 16.
D. Loudspeaker—, 34.
E. C3 (pentode choke), 20.
F. 31, 17.
G. C2 (pentode choke), 33.
H. 12, 50.
I. 10, coil A 7, coil A 6, 49, leaving 5" of spare wire.
J. Attach 13" of wire to aerial terminal.
K. Attach 13" of wire to 9, sleeve and connect to coil A8, put sleeving on the remainder of wire and run it round the coil base to issue from the slot between terminals coil A 1 and coil A 2.
O. Attach 14" of wire to coil B2, put sleeving on it and run out of the slot as indicated on the blue-print.
P. Coil B 7, 30, C1 (pentode choke).
Q. Attach 8½" of wire to coil B1 and place 8" of sleeving on it.
R. Coil A7 to 51. To connect 51 slacken off the screw and loop the wire round it.
S. Coil B6 to 52. To connect 52 slacken off the screw and loop the wire round it.
T. Attach 9" of wire to coil A1. U26, 29. Tighten up all nuts except 18, 6, 12, 14, 30, which have other wires attached to them at a later stage.

Panel Wiring

Wire L. Is 33" long. Attach to 42, solder to 43, leaving the rest of the wire spare.
M. Attach 12" of wire to 39.
N. Is 11½" long. Solder to 44 and attach to 37, 38, leaving a spare length of wire.

Now tighten up all the used terminals on the front panel. Lay the bottom edge of the panel against the front edge of the baseboard and connect the free ends of each of the following wires to the terminals indicated, covering the sleeving as you go.

Wire I. To 45.
J. To 48.
K. To 46.
L. 23, 11, 15, 19.
M. To 8, 22.
N. To 36, 35, 6, 14.
O. To 41.
T. To 47.

The battery cord is now fitted. The envelope in which it is contained states the colours which are used for the different battery connections. The wander plugs and spade terminals should be attached in accordance with the instructions on the envelope. It is here well worth reading the special note on cord fixing contained in the article on the " Ajax " receiver (page 8).

The plugs and spade terminal are fitted as follows:—

Red spade terminal (red wire)	..	Attach to terminal	40.
Black spade terminal (black wire)	..	" " "	18.
H.T.—	Black plug	" " "	51.
H.T.+1	Red plug	" " "	12.
H.T.+2	Red plug	" " "	21.
H.T.+3	Red plug	" " "	30.
G.B.+	Red plug	" " "	51.
G.B.—1	Black plug	" " "	32.

(*continued on page* 49)

HOW TO TUNE YOUR SET

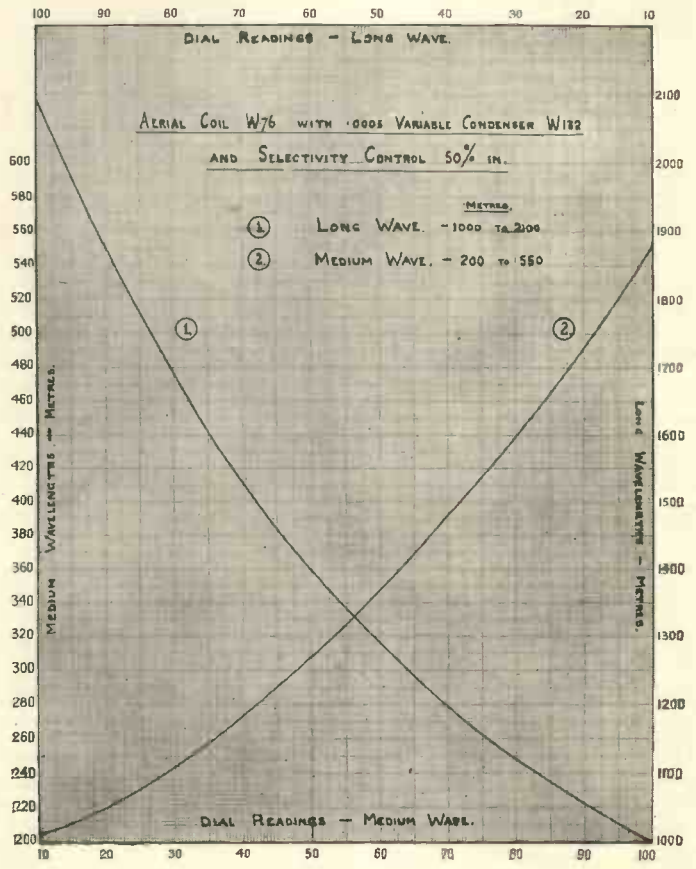
THE tuning of a straight receiver is as simple as the five-finger exercise on a piano, but as in the case of the five-finger exercise the touch of the expert is plainly discernible as soon as the performance has commenced. The inexperienced operator of a radio receiver soon makes the night hideous with screeches and wails and, though he may get his station in the end, anyone who really understands tuning can go to the set and get it a little bit better.

The straight receiver has generally two controls in addition to the switches ; a tuning condenser and a reaction control. This latter is variously labelled " Reaction," " Volume," " Oscillator," " Tickler " (this only on American sets) or " Increase." Its purpose is the same in every case. It is a device for feeding back energy from the plate circuit of the valve into the grid. Used in moderation it increases volume and makes the reproduction more acceptable, but carried to excess it ruins quality and causes interference with your neighbours' reception.

The golden rule, therefore, with straight sets is *tune in with reaction at minimum.* That generally means with the knob turned as far to the left (or counter-clockwise) as it will go. Some manufacturers reverse this, but " increase to the right " is standard practice with all the best people. Your local station should be easily found now by rotating the main tuning condenser knob. Find the position in which it is loudest and then increase volume a little. Re-adjust the main tuning knob to make sure that the setting you had at first was absolutely correct. If you are still not satisfied with the volume increase the reaction a little more, but beware when the reception tends to become " rough." If you suspect that you have passed the limit just try a slight variation of the tuning condenser again. If your suspicions are correct the set will go into a squeal each side of the dead-tune position. Then, if you have a conscience, reduce the reaction a little.

Distant stations are a more difficult proposition, but if you follow these instructions you will be able to log as many as your receiver will reach without making a single whistle. Set your main condenser at minimum capacity, that is, with the vanes right open. On Telsen condensers this is " O " on the dial. Increase reaction until you hear the set go into " silent oscillation." This is a misnomer, as the oscillation can be heard, but there is no whistle. A faint rushing noise is the only sound audible, and it should build up gradually as the reaction knob is turned. If it " plops "—technically known as " fierce " reaction—the voltage on the detector valve is too high. As soon as the rushing sound commences, reduce the amount of reaction and commence to rotate the main tuning condenser towards maximum position very slowly. It is best to commence from the minimum position, as owing to reasons which need not be gone into, reaction is much more effective on short wave-lengths, and if the reaction control is set so that the receiver is in a condition of maximum sensitivity when the main tuning condenser is at zero, there is no danger of breaking suddenly into oscillation when the tuning condenser is rotated, which would be the case if tuning commenced from the maximum-capacity position.

When a station is heard, the same adjustments can be made as were described in the third paragraph, and when the station has been logged, in other words when the dial setting has been noted, you can repeat the process with the next few degrees on the scale. It is of considerable assistance at this stage to prepare a tuning chart similar to the one which is reproduced on this page. A sheet of squared paper is required, which is marked off in one direction with condenser readings, and in the other direction with wave lengths. It will soon be found that the points which indicate the tuning and the wave length of the stations when joined together give a diagonal line, slightly curved, from which the approximate position of stations which



(*continued on page* 50)

Actually TESTED and proved the BEST

IT is not often possible to test a condenser as thoroughly as was the case with the specimen shown in the illustration. Mr. Edwards, of Higher Cranmere, Birkenhead, writes as follows: "I am sending you herewith one of your 2 mfd. condensers, which was one of the components in my set. You will no doubt recollect the thunder storm which was pretty general last Friday. My set was switched off at the time, but the aerial and earth were still connected. At the time the flash occurred nothing was noticed, but some time later a smell of burning was observed, and this of course led to the discovery of the burnt-out condenser. The peculiar thing is that no other damage was done, and the set still functioned, though volume was greatly reduced."

It is an almost unheard-of thing for lightning to register a direct hit upon the aerial of a receiving set, which is well for the peace of mind of listeners, and although we sympathise with Mr. Edwards we cannot repress a feeling of gratification that such an excellent opportunity to prove the efficiency of our condensers was given by the thunder-storm in question. The condenser on arrival at these works was carefully tested and was found to be still a perfect condenser, although the capacity had naturally been greatly reduced. It withstood both the 500 volt and 1,000 volt tests in a perfectly normal manner. This was no doubt due to the self-sealing principle which is employed in all Telsen paper dielectric condensers. The foil used is of the purest quality, and is subject to rigorous tests to ensure that no weak spot is likely to develop. Should the condenser break down under excessive over-load, the damaged part is immediately burnt out and automatically re-insulated.

THE TELSEN "AJAX 3"—*continued from page* 9.

completed. The wire left attached to terminal 30 can now have a 4" length of sleeving slipped over it, and the free end connected to terminal 52 on the variable condenser in the centre of the panel. Wire "M" is the next job. This runs to terminal 20 of the middle valve-holder. "N" is connected to terminal 8 on the coil, thence to 9 of the grid condenser and leak assembly. Tighten up all terminals. The wiring is now completed and should be carefully checked over against the Blue-print and the photograph. The instructions given in the chapter entitled "Before you switch on" now calls for attention. Tuning is dealt with in a separate chapter which refers to sets of this character.

TELSEN "AJAX" THREE
List of Components.

Quantity	*Description*	*Cat. No.*	*Price*
3	Valve Holders, 4-Pin	W.224	2/3
2	.0003 Mica Condensers	W.242	2/-
1	.001 Mica Condenser	W.245	1/-
1	.002 Mica Condenser	W.246	1/-
1	1 meg. Grid Leak	W.250	1/-
1	2 meg. Grid Leak	W.251	1/-
1	2 mfd. Mansbridge Condenser	W.226	3/-
1	Radiogrand Transformer, 1.75—1	W. 61	10/6
1	100 Hy. Choke	W. 69	5/-
1	Variable Selectivity Aerial Coil	W. 76	7/6
1	Fuse Holder	W.146	6d.
1	Binocular Choke (H.F.)	W. 74	5/-
1	Telornor Disc Drive	W.206	7/6
1	50,000 ohm. Spaghetti Resistance	W.123	1/6
1	.0005 Log. Condenser	W.132	4/6
1	.0003 Diff. Reaction Condenser	W.185	2/6
1	2-point Switch	W.107	1/-
1	3-point Switch	W.108	1/3
1	Constructor's Outfit "Telornor"	W.220	3/6
	Total		61/6

"AJAX" THREE-VALVE RECEIVER.

1st Valve Combination.

Mazda H.210. H.L.2. P.220.

HT+1, 72 v. HT+2, 103 v. GB—1, 1.5 v. GB—2, 4.5 v.

H.T. Battery	Ediswan 103 volt.	Cat. No. 69718.
G.B. ,,	Ediswan 9 volt.	Cat. No. 69804.
L.T. ,,	Ediswan 2 volt.	Type E.L. M.4.

Recommended Mains Unit.

Regentone.

D.C. Eliminator, H.T. only.	Type D.C.1.
A.C. ,, H.T. only.	Type W.1.F.
D.C. ,, with Trickle Charger.	Type D.C. combined 2.
A.C. ,, ,, ,,	Type A.C. W.5.B.

2nd Valve Combination.

Mazda H.210. H.L.210. P.220A.

GB—1, 1.5 v. GB—2, 9 to 10 .5v.

D.C. Eliminator for H.T. only.	Type D.C.1.
A.C. ,, ,, H.T. only.	Type W.1.C.
D.C. ,, with Trickle Charger.	Type D.C. combined 2.
A.C. ,, ,, ,,	Type A.C. W.5.A.

In my laboratory

THE great majority of wireless experimenters are introduced to radio as constructors, who, finding the need for broadcast entertainment, feel that they would prefer to build their own receiver rather than purchase a complete factory built set. The experience thus gained brings an immediate desire to know "how it works," and is followed by the purchase of wireless periodicals or text-books, which, backed by his own private experimenting, soon gives a good groundwork of wireless knowledge. After some time the experiments become more systematic, usually following some particular line of development until ultimately he feels the need for a measuring instrument of some kind. On the acquisition of a meter a remarkable transition occurs: what was previously a workshop now becomes a laboratory, and work which was merely modest experimenting, now becomes dignified by the designation "research." We must be tolerant of this touch of vanity when our memories are fresh with the wonderful work performed by pioneers with apparatus of the simplest kind.

The most useful instrument for an amateur to have is one of the multi-range type usually having three ranges: high voltage, low voltage and milliamperes. A good example of this type is the "Pifco" All-in-One Radiometer which also, by reason of a self-contained battery, has provision for making circuit continuity tests, this additional property being of great use in the testing of valve filaments, transformer and coil windings, etc. The meter should work with as low a current consumption as possible, this property usually being expressed in "ohms per volt," at full scale deflection. Thus the higher the "ohms per volt" the less will be the load imposed by the meter and hence the more accurate will be the indicated voltage. In this respect the "Pifco" de Luxe model is particularly good, having a resistance of 500 ohms per volt, thus taking only 2 m/a. at full scale deflection.

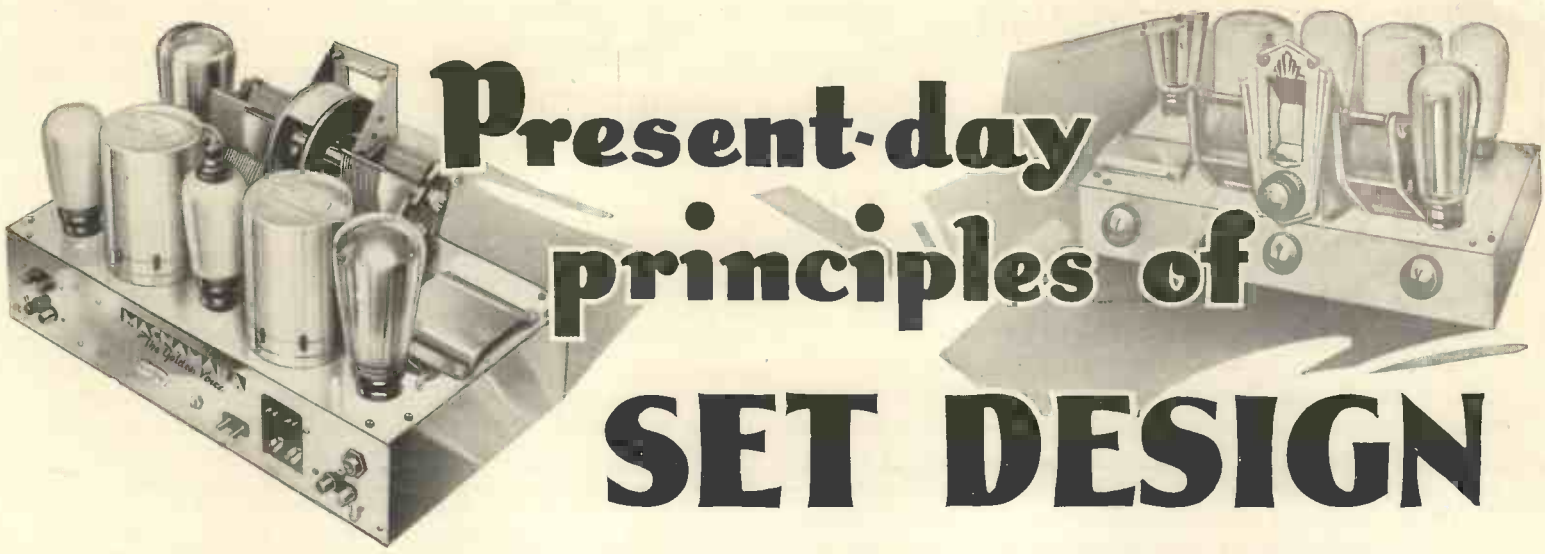
The first tests to make are the measurement of the voltage of the battery. By connecting the meter cables to the 6 v. range terminals and touching the testing contacts on the accumulator terminals a reading of 2.0 volts should be indicated on the meter. This should be done with the set connected and switched on, and if the reading is below 1.8 volts the accumulator is run down and should be charged immediately. A freshly charged battery may read as high as 2.2 volts. If the meter needle kicks backwards, reverse the testing prods on the accumulator terminals. To test grid bias batteries having a voltage greater than 6, test in sections and add together the voltage indicated on each section. With most grid bias batteries the voltage between each tapping will be $1\frac{1}{2}$, or taken three together $4\frac{1}{2}$ volts. For testing the H.T. battery use the high voltage range and take the reading from the appropriate scale. In a similar manner the output voltages from various eliminator tappings may be measured, but it should be remembered that the voltage from an eliminator varies greatly with the milliamperes of current taken and so all voltage measurements should be made with the set connected and switched on.

To test a receiver for continuity of wiring, start by testing the voltage across all the filament terminals, then test from negative filament to anode. The reading thus obtained will be to some extent dependent on the total resistance of components in the anode circuit, so that when testing anode voltage in a circuit employing resistance capacity coupling or using the Telsen 1—1 Coupling Unit do not be surprised if the indicated voltage is much less than the H.T. voltage. If in any particular circuit no reading is obtained, leave the negative meter lead on the negative filament connection and trace back the positive circuit lead until the fault is found or until you arrive at the battery. Then trace back the negative circuit lead. It is not possible with ordinary instruments to check grid bias in circuits which include high resistance grid leaks, but in this case the voltage from negative filament to the end of the leak remote from the grid will be sufficient indication, as there being no D.C. current in the grid circuit of normal amplifiers, the resistance of the leak does not affect the voltage on the grid.

By using the milliampere range it is quite a simple matter to measure the high tension current supplied to each valve separately by connecting in the corresponding positive battery lead or, if connected in the negative lead, the total anode current may be obtained. The meter may be left permanently connected in the anode circuit of the power valve when it will provide a good indication of distortion, shown by flickering of the meter on loud passages. Distortion due to incorrect bias may be detected and corrected in this manner. If the meter needle kicks upwards less bias should be used and vice-versa, but the bias should never be left at a value which gives an anode current greater than that recommended by the valve manufacturers for the particular valve in use. When a pentode valve is in use, it is a common experience for bad distortion to be accompanied by violent downward kicks in the anode current meter. This is due to overloading in the anode circuit and may be cured by a reduction in anode circuit impedance, i.e., by using a lower step-down ratio on the output transformer or choke.

The ganging of circuits may be carried out if a sufficiently sensitive meter is included in the detector anode circuit. It may be found that the detector anode current is too small to be conveniently readable on a meter with a full scale deflection of 30 or 40 m/a., and in this case the low voltage range terminals may be used as a low reading milliammeter. The full scale deflection in milliamps. will then be given by 1,000 divided by the "ohms per volt" of the meter, e.g., for a meter having 500 ohms per volt, full scale deflection would indicate 2 m/a. In all leaky

(*continued on page 44*)



Present-day principles of SET DESIGN

THE radio industry has in the past been excused many things on the plea of infancy, so it is with some diffidence that we suggest that it has now grown up, and indeed may be considered as the parent of such lively youngsters as electric gramophones, home recorders, television and many more minor applications of thermionic amplifiers made possible only by the rapid development of the valve stimulated by the demand for better radio.

In the early days the radio-expert was the amateur who by reason of his enthusiasm amassed great stores of experimental data, which became the basis for the present day theories. These amateurs were enlisted by the industry, and were responsible for the original designs of factory-built broadcast receivers which, in the light of our present knowledge, were remarkably successful. As the industry developed, however, it demanded more precise methods in the evolution of its apparatus, and it was soon realised that the problems which presented themselves were rather outside the scope of the electrical engineer, demanding as they did a profound knowledge of electricity, in its aspect almost purely scientific. It was then that the aid of the physicist was sought and he responded nobly to the call, realising that here was an industry in which his knowledge could be directly applied to the study of phenomena and solution of problems hitherto encountered only in the laboratory. As a result of several years of painstaking research and careful mathematical analysis on the part of some hundreds of physicists all over the world, the radio designer now has at his disposal a collection of formulæ which enables him to choose his materials and get out the specifications for many of the component parts of a radio assembly confident in the knowledge that the final result will be, for all practical purposes, identical with the standard of performance which he set out to attain.

There are several qualities of a receiver which must all be considered in order to obtain an estimate of overall performance, the first, and what is generally considered the most important, being fidelity. Fidelity may be defined as the ability to reproduce sounds identical in form (not necessarily in intensity) with those which impinge on the microphone in the broadcasting studio, a condition which demands that in its overall result the amplifier must not differentiate between the various frequencies in the audio range (frequency distortion), and must not introduce any additional frequencies (amplitude distortion). There must also be no background noise such as hum, mush and "crackling." It is usual to make an assumption of perfection with regard to the broadcast as it reaches the receiving aerial, an assumption which is perfectly justified except in the case of some of the older transmitters.

The receiving equipment can conveniently be divided into four sections each of which is liable to introduce its own particular form of distortion. They are :—

(1) The high frequency tuning and amplifying circuits.
(2) The detector circuit.
(3) The low-frequency amplifying and power output circuit.
(4) The reproducer, which is responsible for changing the amplified electrical energy into sound.

It is here convenient jointly to consider some of the other desirable qualities of a receiver, namely, sensitivity and selectivity, the former being the ability to receive a highly attenuated radiation emanating from a distant station and the latter denoting the property of being able to receive any one transmission to the exclusion of all others. We now come to the unfortunate fact that, owing to the finite band width (about 15 k.c/s) of the broadcast transmission, any effort made to eliminate a nearby signal will with normal circuit arrangements eliminate also some of the outer side-bands of the desired transmission, resulting in a loss of top notes. So it must be realised that although we can increase both sensitivity and selectivity by the use of low loss circuits, or by using strong reaction, we shall do so at the expense of the quality, which in the absence of the high notes will sound woolly and lack definition. Many attempts have been made to overcome this difficulty, such as the use of a multiplicity of low gain high loss tuned H.F. stages and more recently by the design of coupled circuits having more or less square topped resonance curves (band-pass filters), but the first is uneconomical and the second has to be a compromise owing to the practical impossibility of obtaining constant shape of response curve without the simultaneous variation of several of the circuit constants during tuning. It also requires extreme accuracy of matching in inductances and variable ganged condensers, and lack of permanence in adjustment of these components calls for periodic attention to the trimming devices if the initial standard of performance is to be maintained. It is interesting to note in this connection that the superheterodyne

(*continued on next page*)

PRINCIPLES OF SET DESIGN—*continued.*

receiver avoids this difficulty by the use of fixed tuned circuits, the resonance curves for which may be adjusted to any required shape. All incoming signals are changed to this frequency at which they pass through an almost perfect band-pass amplifier. The present tendency is to allow this distortion in the H.F. stages but to correct for it later on in the L.F amplifier, thus if the sharply tuned circuits enhance the bass register and the L.F. intervalve couplings are arranged to boost the treble, a substantially uniform overall result will be obtained.

The second link in the chain is the detector valve, which converts the modulated high frequency currents into audio frequency current, the variations of which should correspond to the modulation envelope of the high frequency wave. The form of distortion peculiar to this stage is that called " amplitude distortion," due to the fact that it is very difficult to design a detector circuit which has equal efficiency of rectification at all values of voltage input. Usually the efficiency increases with the input with the result that a pure sine wave modulation corresponding to a pure musical tone of say 400 cycles per sec. gives a peaky audio wave which, while still having the fundamental frequency of 400 c.p.s., will also contain harmonics of 800, 1,200, 1,600, etc., c.p.s., which tend to give a harsh colouration to the previously pure note. This type of distortion has been much aggravated and so brought to the fore by the tendency of modern broadcast stations to use an increased depth of modulation, and some improvement may be obtained by use of increased anode voltage on the detector with a careful choice of grid leak value together with a greater amplification of the signal prior to detection. The value of grid leak depends mainly on the valve used as rectifier, and it is quite wrong to assume that the low values, such as ¼ megohm, usually associated with what is popularly called " power grid detection," are necessarily the best from the point of view of quality.

The signal after rectification passes on to the audio-frequency amplifier, the design of which is quite straightforward. If an efficient H.F. amplifier and detector and pentode output valve is used it may be sufficient to use quite a modest step-up in the intervalve coupling such as 3—1, in which case such a transformer can have a relatively high primary inductance and low secondary self-capacity, and if it has a well built core of high grade iron its response characteristic will be practically perfect. Any increase in ratio must result in some loss in uniformity of response, unless the size is materially increased or unless a special alloy is used for the core laminations. By the use of these expensive alloys of nickel and iron in place of the ordinary silicon iron remarkable results both as regards fidelity of response and voltage step-up may be obtained. The most outstanding achievement in this direction is undoubtedly the " Telsen 10—1 Coupling Unit," which comprises a high-permeability nickel-iron cored transformer complete with feed resistance and coupling condenser wired as a unit, thus taking the place of the ordinary intervalve transformer without any complications to the wiring. This unit enables a stage gain of 500 to be obtained using modern A.C. valves. The " Telsen 1—1 Coupling Unit " has its application in circuits where, owing to lack of H.F. amplification or the need for extra large output, using a high power output valve, two stages of L.F. amplification are necessary. This unit, as may be seen from its response characteristic, gives an amplification of about 20 times, which is perfectly uniform at all audio frequencies, and as it is completely decoupled its use will introduce no distortion whatever. The following stage may embody a low ratio transformer (e.g., 1.75—1) which ensures practical perfection in the overall result. The output valve should be a triode, the type being chosen according to the power output required, and the output coupling device should be designed to match speaker resistive load to approximately twice the valve internal resistance (" impedance "). It should, however, be fully realised that with no loudspeaker is the load purely resistive, it usually being predominantly inductive, and so its impedance increases rapidly with frequency. Best results are generally obtained by taking the impedance at some frequency in the middle of the audio range (usually 400 cycles per sec.). The average moving iron loudspeaker impedance at this frequency is 4,000 ohms, and hence when used with an output valve of impedance 2,000 ohms, will need no transformer for matching purposes. In this case, however, a choke filter output circuit, or 1—1 transformer will serve a useful purpose in isolating the loudspeaker windings from the D.C. anode current supply.

When using a pentode valve the load impedance must be kept small compared to the valve impedance, otherwise, owing to the peculiar nature of the pentode characteristic, distortion will occur. The optimum load is usually given by the valve manufacturers and has a value usually from 5,000 to 20,000 ohms, from which it can be seen that on the assumption of a 4,000 ohm loudspeaker load, a step-down transformer will be required for matching purposes, the ratio of which will be found by obtaining the square root of the ratio of optimum load to speaker resistance, in this case 4,000 ohms. Thus to obtain the optimum load of 10,000 ohms as specified for Mazda AC/PEN the ratio should be

$$\sqrt{\frac{10,000}{4,000}} = 1.6$$ (use 1.7—1 tap on Power Pentode Output Choke).

For Pen. 220 the ratio = 2.1—1 (2.5—1 tap on Tapped Pentode Output Choke), and for Pen. 220A, 1.37—1 (1.33—1 tap). While these connections will give optimum output it is sometimes desirable with certain speakers to mismatch the impedances deliberately, thus obtaining an improvement in the tone. In order to obtain adequate bass response from a pentode valve the inductance of the output choke or transformer must be high compared with that required for a power valve, e.g., AC/PEN. requires at least 30 henries in order that the power loss at 50 c.p.s. should be inaudible. With the pentode matched for maximum output at 400 c.p.s., the frequency at which sensitivity is a maximum may be 5,000 c.p.s., resulting in an excess of high notes, which must usually be compensated for by fitting a high pass filter across the transformer primary or secondary. This usually takes the form of a condenser and resistance in series, the values of which depend on the speaker characteristic and individual taste, and must be found by trial. Common values are .01 mfd. and 10,000 ohms. From all this it will appear that the use of a pentode output valve requires more care in design of components and choice of loudspeaker, and this is in fact true, but the efficiency of the resultant combination is much higher than is possible by the use of a triode output valve, making it possible to obtain big volume with quite a modest consumption of power.

The most difficult unit to design both from the point of view of prediction of characteristic and measurement of performance in experimental models, is the reproducer. This depends so largely for its sensitivity on the production of a multitude of resonances that it would seem at first sight to nullify all our previous efforts in striving after perfection in the preceding stages. If, however, these resonances can be equalised and the average response in the various regions of the audible spectrum made reasonably uniform, the result is aurally pleasing. While it would seem that an exact reproduction of the original sound is the limit of ambition to a radio designer, he has to contend with a large body of people who prefer to have some artificial colouration to their music, and others who, due to an aural deficiency apparently consequent with increasing age, demand such enhanced treble as would be intolerable to a normal person. These facts and the insistent clamour for still greater simplification of control are providing radio engineers with much food for thought, and although every confidence is expressed as to ultimate success, this will not be obtained in a mood of carefree optimism.

Choice and care of BATTERIES

BY far the greater part of the running expenses of a radio receiver, in these days of reliable valves and components, is attributable to power supply, particularly in those sets which derive part or the whole of their current from batteries. This cost is in many cases more than is necessary, due to insufficient attention both at the purchase of the batteries and to their subsequent care. It seems peculiarly difficult for some people to realise how uneconomical it is to buy a cheap battery four times a year rather than a good battery twice a year, and also the saving to be effected by the purchase of a testing instrument such as a hydrometer for the accumulator, or a volt-meter for dry batteries. The cheap battery not only has a short life, but also may cause much trouble in the appearance of " frying " noises, leading the unsuspecting amateur to dismantle his set and test all components and valves before arriving at the real root of the trouble. Typical of the better class in radio batteries is the Ediswan range, which includes good quality batteries for every need at very reasonable prices.

The power output which a receiver is capable of giving can be measured in watts just as ordinary electric power is reckoned, and this gives a direct indication of the volume obtainable. This output power depends almost entirely on the input power supplied to the set from the H.T. batteries, the L.T. current being merely incidental, and not giving any of its energy to the production of sound. The efficiency of the set as defined by the ratio of output power to power supplied is found to increase with H.T. voltage, and hence it is more economical to use a high voltage H.T. battery and to restrict the anode current than to use a low voltage battery and a large current drain. Added to this is the fact that the total ampere-hours obtainable from a battery is increased by taking a smaller current.

The most noticeable effect of a failing high tension battery is usually bad quality, especially on loud passages, and also increasing difficulty of control and the incipient instability. On some modern receivers, and in particular the Telsen S.91, S.92 and S.93 sets, these ill effects are much reduced by careful attention to design, and the H.T. battery will accordingly last for a correspondingly longer period, and indeed may be used until its voltage is so reduced that lack of reaction effect makes it necessary to obtain a replacement. The battery should be of a capacity suitable to the demands of the set which it has to supply, thus for the average two or three valve set taking not more than 10 m/a. the Ediswan Standard Capacity Battery can be recommended and for all other receivers consuming up to 20 m/a., the Super Capacity should be used. The use of small accumulators for H.T. supply has many advantages, but they need rather more attention to upkeep than the dry batteries. If kept in good condition, clean, and regularly charged and topped up, they will give good service free from " crackling " noises, and they have a low internal resistance, thus giving a steady voltage on load.

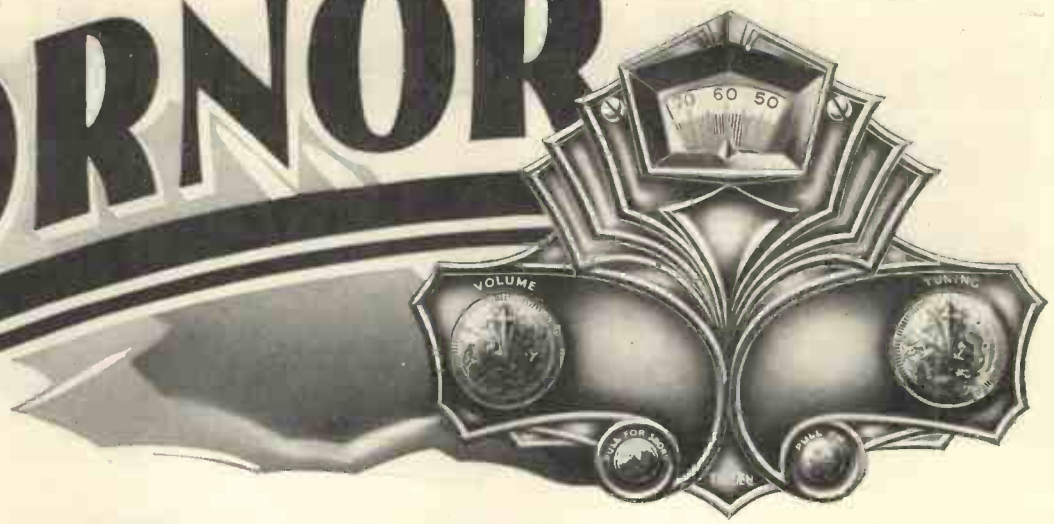
The grid bias battery needs so little attention that it is often forgotten altogether if the set is working reasonably well. It is not called upon to supply any current. but it gives the control voltages to the grids which limit the flow of anode current. Hence a failure of the grid bias battery will result in the rapid depreciation of the H.T. battery, and for this reason it is well worth while to obtain a voltmeter and make a periodical test. In the event of a voltmeter not being available the bias battery should be renewed every six months.

The low L.T. current consumption of the modern receiver makes the Mass Plate Type Accumulator the most suitable, good examples of these being the popular Ediswan trio, Little Loten for most 2-valve sets, Minor Loten for 3-valve sets consuming not more than .5 amp., and Major Loten for all other cases.

The symptoms caused by failing L.T. batteries are very characteristic and once experienced cannot fail to be recognised. The first indication of a run down accumulator is a gradual loss of power, the music decreasing slowly to inaudibility. Switching off the set will then allow the battery partly to recuperate and on switching on again the volume will appear normal for a few minutes but will quickly fade and fail altogether. This should not normally be allowed to happen and may be prevented by the use of a hydrometer to test the specific gravity of the acid at regular intervals according to the makers' recommendations, or alternatively have the accumulator recharged regularly, say every fortnight, when, if its capacity is suitable for the load imposed by the set, it will never be completely run down.

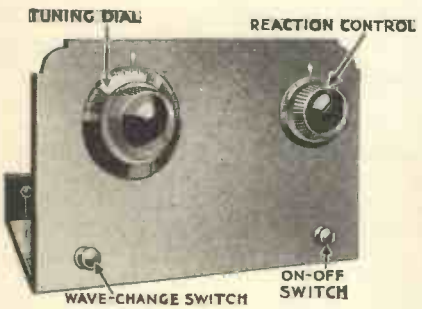
For those who do their own accumulator charging it is best to adhere strictly to the makers' maximum charging rate, as bulging plates and a thick sediment of loosened paste are common results of too rapid charging. The charging current should be reduced when the accumulator begins to gas or if the acid gets warm. The appearance of a white compound on the plates (sulphation) is a sign of neglect in over-discharging and if detected in the early stage may be cured by the following method. Replace the acid with water and give a prolonged charge, then put in acid of original density, charge, empty out and refill with fresh acid of 1.240 sp. gr., when the accumulator will be again ready for service.

the TELORNOR



THE balancing of a panel has been a problem ever since the days of swinging-coil reaction. Nothing looks worse than a receiver with controls—possibly differing in size and type—mounted in unsymmetrical positions and it was to overcome this difficulty, particularly noticeable in the case of "straight" circuits, that the " Telornor " was designed.

The example given below will sufficiently illustrate the revolution which the " Telornor " has effected in panel design. The first photograph shows the panel of a receiver of which the circuit was given in a radio publication earlier in the year, and it is one of hundreds of similar layouts which have appeared for the last ten years, ever since the vertical panel became fashionable.

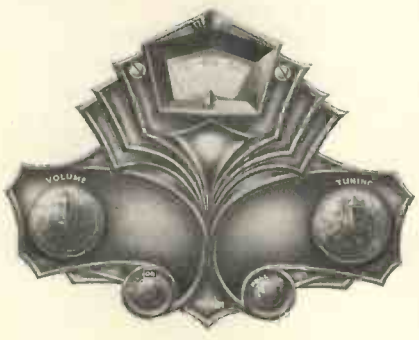


It is unnecessary to fit a slow-motion device to the reaction condenser in any ordinary receiver, but set-builders who are fastidious regarding the balance of their panels have been in the habit of doing so in order to match up with the main tuning control. This necessity is now removed by the advent of the " Telornor." The tuning and reaction controls are identical in appearance, though different in operation, and are mounted symmetrically upon an escutcheon which is additionally pierced for two switches and the dial reading. The right hand knob controls the tuning condenser through a slow-motion device which has a reduction ratio variable between 7 to 1 and 10 to 1 at will. This is an entirely novel feature, and one which will be welcomed by every serious long-distance listener, and in particular by the short wave enthusiast. In order to ensure absolute silence of operation no metal-to-metal drives are employed, as these are noisy on all wave-lengths below about 60 metres. The drive is taken from the knob by a bakelite disc through spring-steel dished wheels, which in turn drive the translucent scale. The " silkiness " of this drive has to be experienced to be believed.

The reaction condenser is placed to the left because this shortens the leads carrying high-frequency. The aerial is generally to the left of the receiver, and as it is advantageous to place the tuning coil at that end of the baseboard also, the reaction leads are of necessity somewhat long if the condenser is to the right of the tuning dial. The neatness of the wiring when the " Telornor " is employed is particularly noticeable in the " Ajax Three," of which a blue-print is given free with this issue. Owners of the " Victor Three " or " Telsen Three " will now be able to modernise these circuits by the addition of the " Telornor " with a considerable increase in efficiency and ease of manipulation.

Among the other advantages of the " Telornor " must be counted the fact that the escutcheon makes a very good anti-hand-capacity shield when used on an ebonite, wood or bakelite panel. Metal is unquestionably the best panel material in these days of almost universal " grounded rotor " methods, although is is still generally necessary to insulate reaction and series condensers. Nevertheless, the insulating panel still commands a ready sale, principally because it can be drilled easily by the amateur and is supplied ready finished. At the worst it only gets scratched if it is carelessly handled, and a touch with an oily rag soon renders this quite inconspicuous. Metal, on the other hand, is not too easy to work. Finishing it is essentially a factory process, and if a drill slips the resulting scar is painfully obvious. If, therefore, you use a panel of wood, ebonite or bakelite and find hand-capacity troublesome, the fitting of the " Telornor " will decrease the nuisance to an almost negligible extent.

As in the case with other Telsen components, the " Telornor " is distinguished by its beauty of line. It is a tradition with the Company that its products shall not only *be* good, but *look* good too, and after the technical design of any component has been designed the particulars are submitted to an artist, who decides the physical proportions and is given a free hand provided that the essential dimensions are respected. No one with a spark of artistic feeling can fail to be delighted with the simple line of the "Telsen" transformers and tuning coils, for example and the " Telornor " is a worthy associate of these masterpieces of pleasing design. It has a certain quiet dignity which does not thrust itself upon the notice of the observer, but at the same time if it is thrown into prominence by sharp contrast with its background it pleases the eye with its graceful proportions and superlative finish.



The " Telornor "

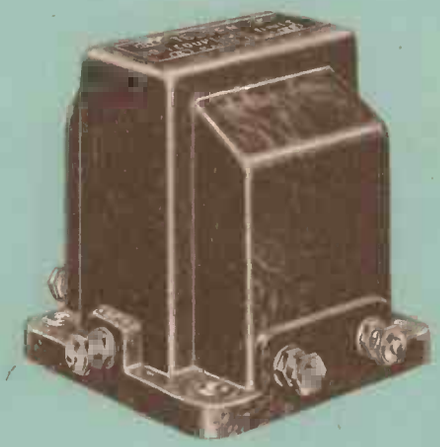
TELSEN
RADIO COMPONENTS

TELSEN 1—1 INTERVALVE COUPLING UNIT

This is a modern development of the one time deservedly popular R.C. units. It incorporates a low pass filter feed in its anode circuit, thus effectively preventing "motor boating," "threshold howl," and other forms of instability arising out of common couplings in eliminator and battery circuits. Used with an H.L. type valve it will give an amplification of about 20 and a perfect frequency response, at the same time consuming negligible H.T. current.

No. 214

Price 7/6



TELSEN 10—1 INTERVALVE COUPLING UNIT

This is a filter-fed transformer using a high permeability nickel alloy core, which enables a 10—1 voltage step-up to be attained while preserving an exceptionally good frequency characteristic. The response curve is compensated in the higher frequencies for use with a pentode valve, this combination giving an amplification greater than anything previously achieved and equal to two ordinary L.F. stages, but with better quality of reproduction.

No. 215

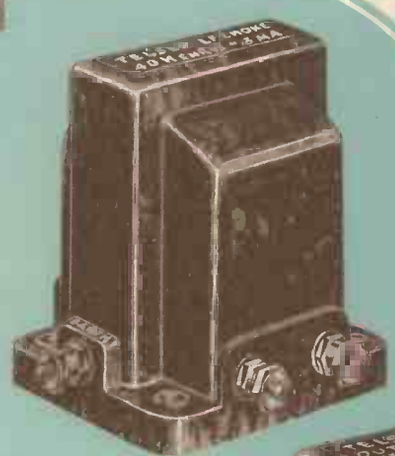
Price 12/6

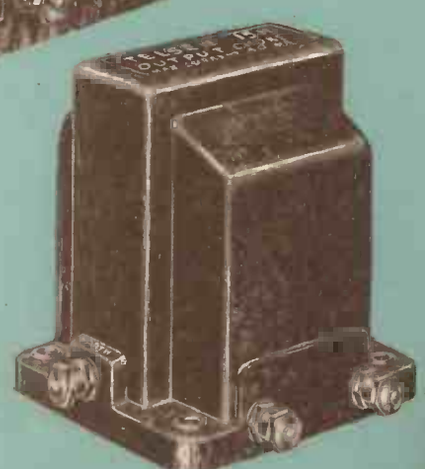
TELSEN INTERVALVE L.F. COUPLING CHOKES

Rating	*Normal Current*	*Max. Current*	*No.*
40 H. at 3 m/a.	.. ..	10 m/a.	W.68
100 H. at 2 m/a.	.. ..	6 m/a.	W.69

These popular L.F. Chokes are primarily intended for use as coupling chokes in the anode circuits of modern radio receivers, but may be used in any circuit not carrying more than the stipulated maximum current. The 100 H. type should be connected in the anode circuit of an H. or H.L. type valve.

Price 5/-





TELSEN OUTPUT CHOKE

Designed for use as output filter in conjunction with a condenser not less than 1 mfd., following any power or super power valve taking up to 40 m/a. anode current. Gives an ideal response curve under all conditions.

No. W.71

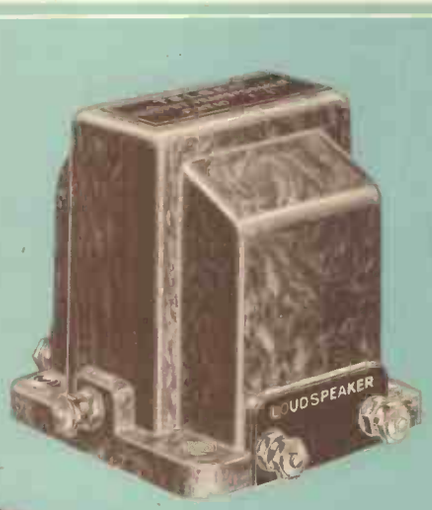
Price 7/-

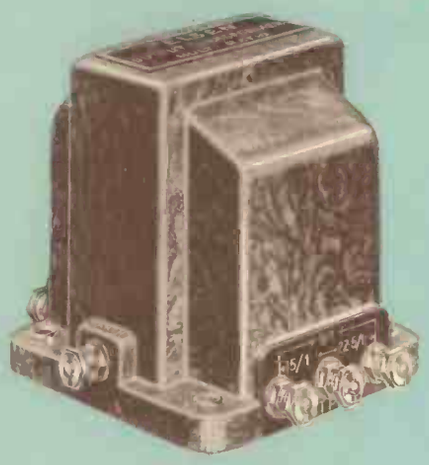
TELSEN
RADIO COMPONENTS

TELSEN OUTPUT TRANSFORMER, RATIO 1—1

This transformer is intended for connecting the loudspeaker to the output stage of the receiver, using a triode output valve. Its object is to avoid saturation of the loudspeaker magnet system, by isolating the direct current from the speaker windings and also serves to keep H.T. voltage from the speaker and its lead, which is especially important when using a D.C. eliminator. Suitable for anode current up to 40 m/a. D.C.

No. W.62. Price 10/6





TELSEN MULTI RATIO OUTPUT TRANSFORMER

This is designed for use with moving coil loudspeakers having a low impedance speech coil winding. It has three ratios: 9—1, 15—1 and 22.5—1, which allows the correct matching of speakers of widely varying characteristics. Suitable for anode currents up to 40 m/a.

No. W.63

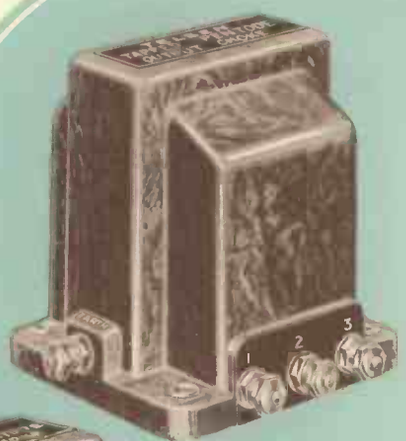
Price 10/6

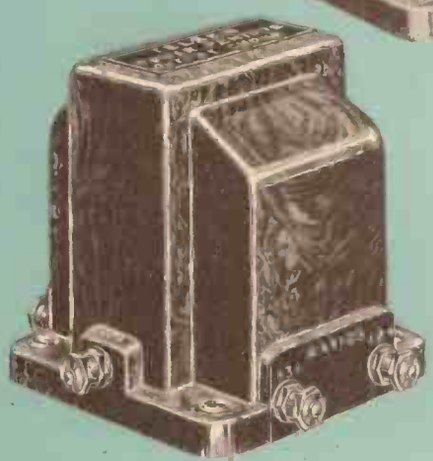
TELSEN TAPPED PENTODE OUTPUT CHOKE

This Choke is designed primarily for pentodes taking an anode current of not more than 20 m/a., which includes the ordinary battery operated types. The single tapping provided gives (by reversing) ratios of 1—1, 1.6—1, 2.5—1, which provide for matching under widely varying conditions. The choke is equally suitable for matching a low impedance speaker with an ordinary power valve. A coupling condenser of 1 mfd. is recommended.

No. W.72

Price 7/6



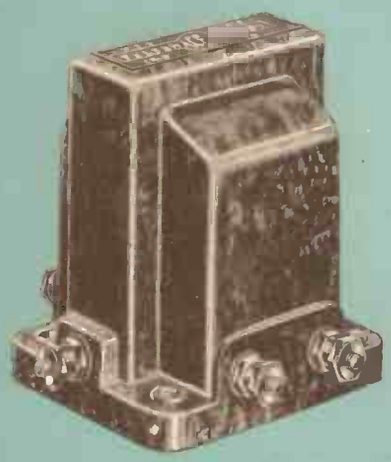


TELSEN POWER PENTODE OUTPUT CHOKE

The purpose of this power pentode output choke is to prevent direct current passing through the loudspeaker, and also to match the speaker to the pentode valve. By using this choke in conjunction with a condenser of 1 mfd. the quality obtained from a pentode becomes quite equal to that expected from a normal super power valve, and the volume is much increased. This model is suitable for mains power pentodes carrying currents up to 40 m/a. and for correct matching gives the choice of three ratios, viz.:—1—1, 1.3—1 and 1.7—1.

No. W.172. Price 10/6

TELSEN
RADIO COMPONENTS

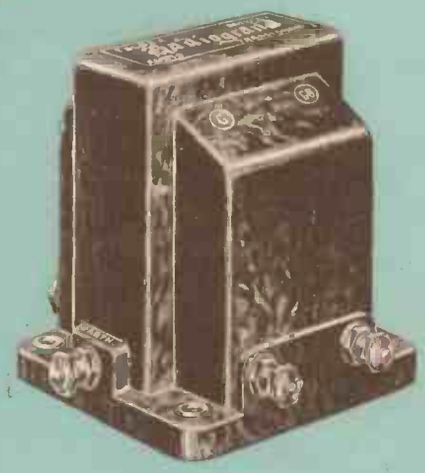


TELSEN " ACE " L.F. TRANSFORMERS

The Telsen " Ace " is eminently suitable for receivers where highest efficiency is required at a low cost and where space is limited. Its characteristic will bear comparison with that of any other transformer

Ratio 3—1. No. W. 66
Ratio 5—1. No. W. 65

Price 5/6



"RADIOGRAND" L.F. TRANSFORMERS

Telsen " Radiogrand " Transformers have signified to expert designers and enthusiastic constructors all that is finest in British radio craftsmanship. The design is based on the results of recent research coupled with the soundest engineers' principles and tested rigorously, for immaculate performance and enduring efficiency.

Ratio 3—1. No. W.59.
Ratio 5—1. No. W.58.

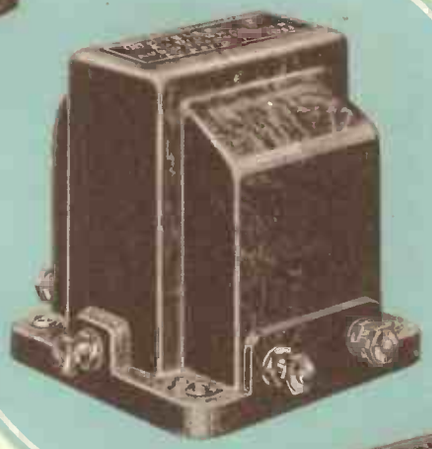
Price 7/6

TELSEN " RADIOGRAND " RATIO 7—1 TRANSFORMER

This Transformer is designed to give extra high amplification on receivers employing only one stage of L.F. amplification. It is not recommended for use in receivers employing two L.F. stages as overloading is likely to occur.

No. W.60

Price 10/6



"RADIOGRAND" INTERVALVE TRANSFORMER, RATIO 1.75—1

For use in receivers employing two stages of L.F. amplification, where exceptionally good quality is desired. When used following an L.F. stage employing choke or resistance coupling it will be found to give ample volume with remarkable reproduction.

No. W.61

Price 10/6

TELSEN
RADIO COMPONENTS

TELSEN DUAL RANGE AERIAL COIL

Incorporates a variable selectivity-device, making the coil suitable for widely varying reception conditions. This adjustment also acts as an excellent volume control, and is equally effective on long and short waves. The wave-band change is effected by means of a three-point switch and a reaction winding is included.

No. 76

Price 7/6

THE TELSEN H.F. COIL

May be used for H.F. amplification with screen grid valve, either as an H.F. transformer or alternatively as a tuned grid or tuned anode coil. It also makes a highly efficient aerial coil where the adjustable selectivity feature is not required.

No. 154

Price 5/6

TELSEN SCREENED TUNING COILS

The result of much research and experiment, these coils embody the ultimate efficiency attainable in a perfectly shielded inductance of moderate dimensions. Provided with separate coupling coils for medium and long waves they are suitable for use as aerial coils or as anode coils following a screen grid valve, giving selectivity comparable only with a well designed band-pass filter. The coils are fitted with cam operated rotary switches with definite contacts and click mechanism, and are supplied complete with aluminium screening cans and link couplings for switch ganging.

No. 216

Price 8/6

No. W.287
Twin matched Screened Coils.

Price 17/-

No. W.288
Triple matched Screened Coils.

Price 25/6

TELSEN COIL SWITCH COUPLING ASSEMBLY

When it is desired to mount two or more of the Telsen Shielded Coils in a line parallel to the panel, and to control the wave change switching by a single knob on the panel, this switch coupling assembly will be found indispensable.

No. W.217 Price 6d.

TELSEN COIL SWITCH KNOB ASSEMBLY

This knob is specially designed for use with the Telsen Shielded coupling coils. The extension on the knob spindle fits over the switch rod supplied with the coils, a firm coupling to the rod being ensured by tightening the small screw provided.

No. W.218 Price 1/-

TELSEN COMBINED DUAL RANGE SHORT WAVE COIL UNIT

This unit for the first time brings the construction of short wave receivers in line with the simplicity of modern practice. When tuned by .00025 condenser, a wave range of 20 to 80 meters can be covered by the operation of a switch as in ordinary broadcast practice. The unit incorporates windings for aerial, tuning and reaction circuits, all coils being wound with stranded wire. The coil is also suitable for use with sets covering all wave bands with a .0005 tuning condenser. In this case the Dual-Range feature is not employed.

No. W.174 Price 4/6

TELSEN
RADIO COMPONENTS

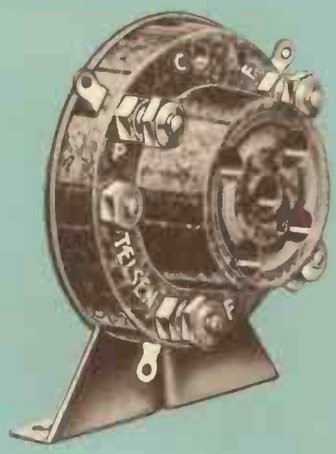
TELSEN VALVE-HOLDERS

A new range of valve-holders has been introduced in both solid and anti-microphonic types. These embody special contact sockets of one piece design with neat soldering tag ends and terminals. They have an extremely low self-capacity and are easily mounted.

Solid Type	No.	Price	Anti-microphonic Type	No.	Price
4-Pin	W.224	9d.	4-Pin	W.222	1 -
5-Pin	W.225	1/-	5-Pin	W.223	1/3

TELSEN UNIVERSAL VALVE HOLDER

The Universal valve-holder is used in conjunction with the Telsen N.167 screen and provides a method of supporting a screen grid valve in a horizontal position on a base-board. A secondary use is for mounting valves vertically on the face of panels in hospital or similar multiple installations where accessibility of valves is an important factor.



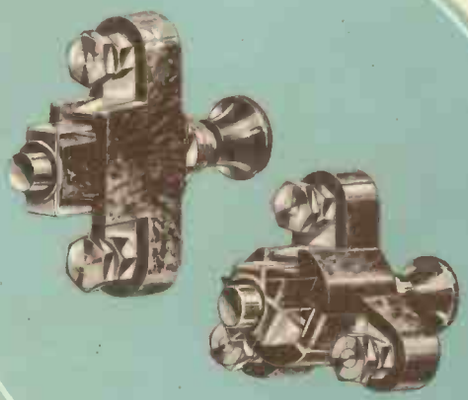
No. 198 Price 1/-

TELSEN PUSH-PULL SWITCHES

(Prov. Pat. No. 14125/31)

The Telsen Push-Pull Switches employ the "knife" type of self-cleaning contact, and a positive snap action. The nickel silver bridge piece is driven between the springy "fixed" contacts, and the wedge-shaped plunger squeezes the inner contacts outwards, closing the jaws in a firm grip. The series gap reduces self-capacity to a minimum, and the spindle is insulated from all contacts. For use as battery switch, or as wave-change switch with the Dual Range Short Wave Coil Unit.

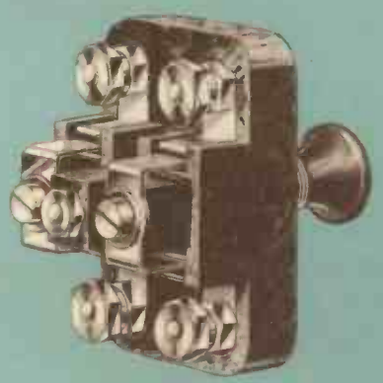
Two-point.
No. W.107
Price 1/-



TELSEN THREE-POINT SWITCH

This is a three cornered switch on the same lines as the two-point push-pull switch and can be used in a number of circuits where three points are required to be connected together or broken simultaneously, e.g., wave-change switching. It can also be usefully applied in the switching on and off of the High Tension and Grid Bias batteries in addition to the Low Tension supply usually controlled by a two-point switch. The switch spindle is insulated from all contacts, and the triangular guide prevents any possibility of the contacts from becoming out of alignment.

No. W.108 Price 1/3



TELSEN FOUR-POINT "TWO-POLE" PUSH-PULL SWITCH

This model is a two-pole switch highly suitable for use in wave changing on two coils or an H.F. transformer, or for switching pick-up leads or an additional loudspeaker.

No. W.153 Price 1/6

TEL
RADIO CO

TELSEN SMALL FRICTION DISC DRIVE

A low-priced Disc Drive for auxiliary controls. It is extremely robust and may be used for main tuning condensers when such a course is advisable owing to considerations of space.

No. W.257

Price 2/6

TELSEN BAKELITE SLOW MOTION DIAL

Made in black or brown moulded bakelite, this elegant little dial has a gear ratio of 8—1, the disc being graduated from 0 to 100 in both directions. It can be fitted to any of the Telsen Tuning and Reaction Condensers, or other standard makes having a ¼" spindle and is suitable for all panels up to ⅛" thickness. Mounting instructions are included with every dial.

Black .. .. No. W.141
Brown .. .. No. W.141A

Price 2/-

TELSEN REACTION CONDENSERS

These condensers are of an improved type, of great rigidity and precise construction. The rotor vanes are keyed to the spindle, and fitted with definite stops. The vanes are interleaved with finest quality solid dielectric. A strong nickel silver contact makes connection to the rotor, and a positive connection is made to the stator vanes. Supplied complete with knob.

Reaction Condensers

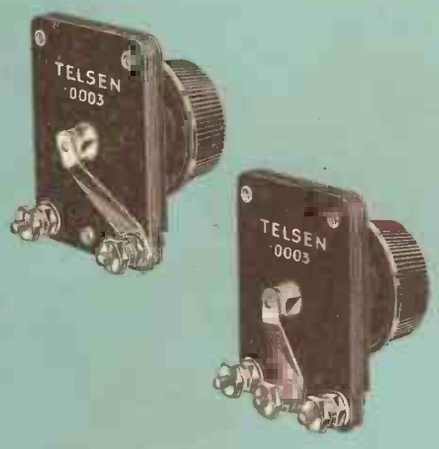
Capacity	*No.*	*Price*
.0003	W.188	2/-
.00015	W.189	
.0001	W.190	2/6
.00075	W.191	
.0005	W.192	

TELSEN "TELORNOR"

This consists primarily of a variable ratio disc drive tuning control, and is supplied with an attractive escutcheon plate finished in Oxidised Silver. The Tuning Control Knob is off-set on the escutcheon plate, which is also pierced to accommodate a standard Bakelite Reaction Condenser and two switches. A small bracket on the back of the chassis frame provides for the mounting of a Telsen .0005 logarithmic variable condenser, or any standard "one-hole fixing" condenser with ¼" spindle. The scale is clearly graduated, and may be illuminated by means of an ordinary flash lamp bulb screwed into the holder provided. A double ended spanner is also supplied with every "Telornor" for mounting the condensers and switches.

No. W.206

Price 7/6



TELSEN DIFFERENTIAL CONDENSERS

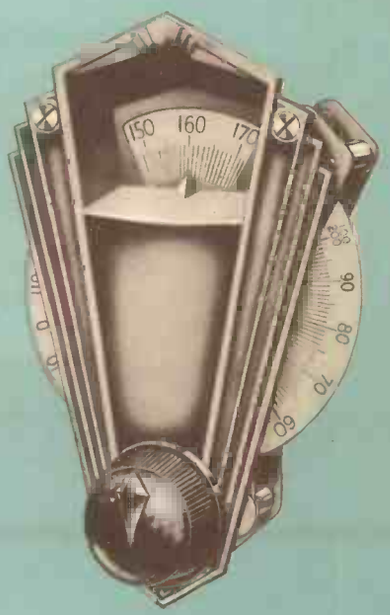
Capacity	*No.*	*Price*
.0003	W.185	2/6
.00015	W.186	
.0001	W.187	

TELSEN ILLUMINATED DISC DRIVE

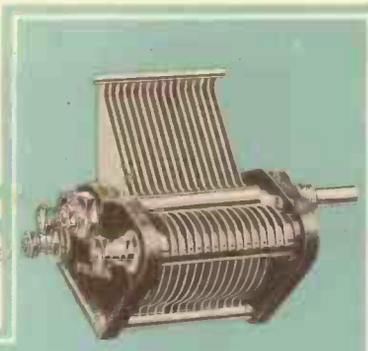
Fitted with a handsome oxydised silver escutcheon of modern design, this drive incorporates an improved movement. The gear ratio of approx. 5—1 and the bold and well-proportioned figures make for delightfully easy tuning. The dial may be illuminated by means of an ordinary flash lamp bulb. A double-ended spanner to fit all Telsen "one hole fixing" nuts is supplied free with every Disc Drive.

No. W.184

Price 3/6



SEN
IPONENTS



THE TELEXOR

The Telexor represents a new development in radio set construction, and renders unnecessary all existing wave change methods by switching or changing coils. In conjunction with the Telsen Dual Range Tuning Coil the whole of the medium and long wave broadcast band may be covered by one turn of the dial, without any operation being necessary to change wave lengths. Briefly, incorporates a special design of tuning condenser, covering the full circle and giving "log law" tuning in both directions, together with an automatic wave change switch and illuminated disc drive.

No. W.180. **Price 10/6**

TELSEN LOGARITHMIC VARIABLE CONDENSERS

The Telsen Variable Condenser is built to stand years of service. The steady frame is braced by three solid pillars and the effective clamping of the vanes, each held at three points, makes distortion impossible. The rotor also is built into a rigid unit, the vanes being held at both ends. Generous bearings provided against backlash or end play and the spacing will remain accurate as long as the condenser is in service.

Capacity .0005. No. W.132
,, .00025. No. W.130
,, .00035. No. W.131
Price 4/6

THE TELSEN LEFT-HAND LOGARITHMIC CONDENSER

This is a reversed edition of the standard .0005 mfd. air dielectric variable condenser. Together with a drum drive and a standard .0005 variable condenser it gives a ganged condenser assembly without the additional luxury of trimmers.

Capacity .0005. No. W.256 .. **Price 4/6**

THE TELSEN RIGHT-HAND LOGARITHMIC CONDENSER, WITH COMPENSATOR

Is similar in construction to the standard .0005 mfd. air dielectric condenser. In addition, it has incorporated in the bakelite end plate a compensator of a maximum capacity of 60 micro-micro farads, for the purpose of balancing out stray capacities, thus greatly facilitating ganging.

Capacity, .0005 .. .. No. W.261 .. .. **Price 5/-**

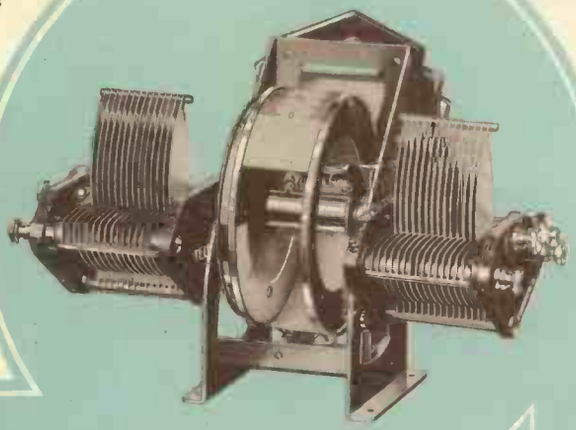
THE TELSEN LEFT-HAND LOGARITHMIC CONDENSER, WITH COMPENSATOR

Capacity, .0005 .. .. No. W.260 .. .. **Price 5/-**

TELSEN DRUM DRIVE AND CONDENSER ASSEMBLY

The Telsen Drum Drive and Condenser Assembly comprises a complete ganged condenser tuning unit incorporating several distinctive features. Two Telsen .0005 logarithmic variable condensers with right and left handed movements, and fitted with compensators, are mounted and ganged together through a rigidly constructed drum drive control. Mounted on the same spindle axis as the main tuning drive is a trimmer, giving a swinging movement of about 10° to the stator vanes of the left hand variable condenser, thereby enabling perfect matching of the condensers to be maintained throughout the tuning range. Two scales are supplied with the unit, one marked in wavelengths and one in graduations from 0—100. The scale is illuminated and has the additional advantage of being easily removable when it is desired to fit one of special calibration.

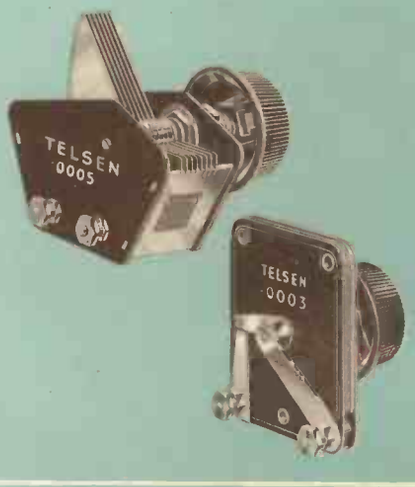
No. W.262 **Price 17/6**

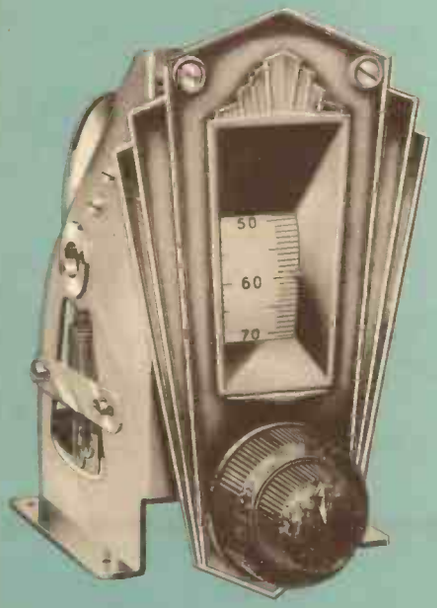


THE TELSEN DRUM DRIVE

A drive generally following standard practice, but embodying several detail refinements, among which may be instanced the cord drive which is arranged to reduce wear to a minimum and to prevent over-run, and the rocking stator trimmer which gives variation of 20° and visual indication of setting. For use with Telsen screened coils an extra scale marked in wavelengths is supplied free of charge.

No. W.255 **Price 8/6**





TELSEN BAKELITE DIELECTRIC TUNING CONDENSER

Redesigned on an entirely new principle giving great ridigity with compactness and high efficiency, this condenser may be used with confidence where space is limited. The well-braced vanes are interleaved with a minimum of highest quality solid dielectric and complete accuracy of tuning is obtained. Supplied complete with knob.

Capacity .0005, No. W.193
.0003, No. W.194
Price 2/6

TELSEN AERIAL SERIES CONDENSER

This component forms an ideal volume and selectivity control. The internal construction permits of an extremely low minimum capacity. Keyed externally on the spindle is a switch arm which connects with a contact on the fixed vanes when rotated to maximum position. This short circuits the condenser for maximum volume. The rotor movement is limited by definite stops. The vanes are interleaved with the finest quality solid dielectric, and solidly constructed throughout. Supplied complete with knob.

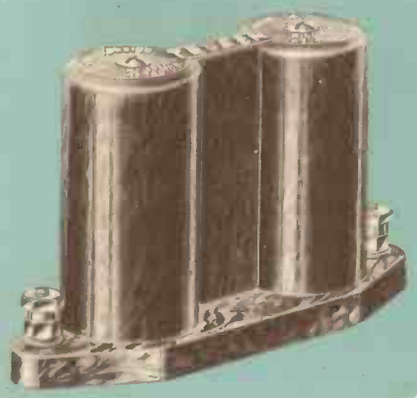
Cap. .0003 *No.* W.205 **Price 2/3**

TELSEN
RADIO COMPONENTS

TELSEN STANDARD H.F. CHOKE

The Telsen Standard H.F. Choke which utilises the minimum baseboard space, is designed to cover the whole broadcast band and has very low self-capacity. It is highly suitable for reaction circuits. The inductance is 150,000 micro-henrys and the resistance 400 ohms. It has proved very popular and has been incorporated by set designers in many of the leading circuits.

No. W.75 .. Price 2/-



TELSEN BINOCULAR H. F. CHOKE

In H.F. amplification the performance of a choke is of supreme importance. The Telsen Binocular H.F. Choke is called for wherever the highest efficiency is required. It has a high inductance of 250,000 m/h. low self-capacity and a negligible external field due to the binocular formation, making it the ideal choke for a high class circuit.

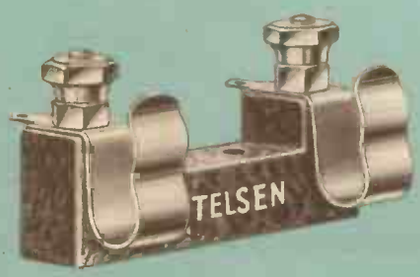
No. W.74 .. Price 5/-

TELSEN GRID LEAKS

These are absolutely silent and practically unbreakable and do not vary in resistance with application of different voltages. They are non-inductive and produce no capacity effects.

Cap. Megohms		*No.*
5	..	W.254
4	..	W.253
3	..	W.252
2	..	W.251
1	..	W.250
½	..	W.249
¼	..	W.248

Price 1/-

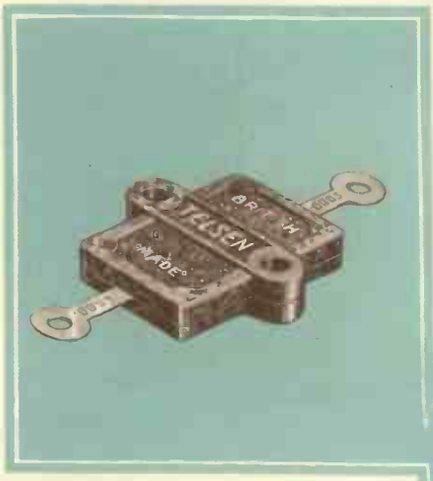


TELSEN GRID LEAK HOLDER

This will hold firmly any standard size or type of grid leak. The spring contacts are extended in one piece to form soldering tags, and the terminals and fixing holes are accessible without removing the grid leak.

No. W.148 .. Price 6d.

TELSEN
RADIO COMPONENTS



TELSEN TAG CONDENSERS

These may be mounted on either insulated or metal panels by utilising the two baseboard screw holes. The tags enable the condenser to be connected to any other component either directly or by soldering. H.F. losses are negligible.

Cap.	*No.*	*Price*	*Cap.*	*No.*	*Price*
.0001	W.207	6d.	.0005	W.211	6d.
.0002	W.208	6d.	.001	W.212	6d.
.0003	W.209	6d.	.002	W.213	6d.
.0004	W.210	6d.			

TELSEN "MICA" CONDENSERS

Cap. Mfd.	*No.*	*Price*
.0001	W.240	1/-
.0002	W.241	1/-
.0003	W.242	1/-
.0004	W.243	1/-
.0005	W.244	1/-
.001	W.245	1/-
.002	W.246	1/-
.006	W.247	1/3

The New Telsen "Mica" Condensers represent an important advance in technique. H.F. losses have been practically eliminated even in the larger capacities. In order to distinguish them from the earlier type, now to be discontinued, the new condensers are enclosed in a redesigned case which, while possessing all the adaptability of the previous one as to flat and vertical mounting, is of more attractive appearance. Grid leak clips may, as heretofore, be mounted in series or in shunt, and are supplied at no extra charge with capacities .0001, .0002 and .0003 mfd.

TELSEN MANSBRIDGE TYPE CONDENSERS

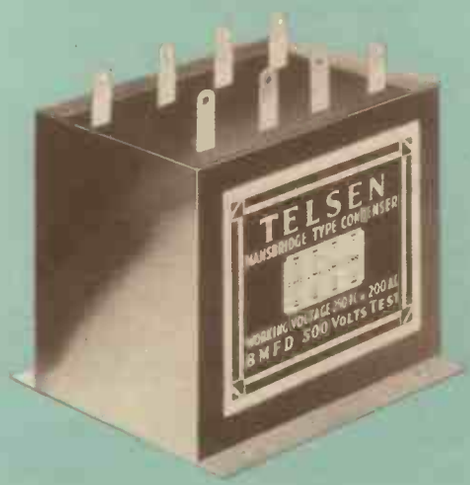
Cap. Mfd.	500 volt test *No.*	*Price*
.01	W.232	1/6
.04	W.230	1/9
.1	W.231	1/9
.25	W.229	2/-
.5	W.228	2/3
1	W.227	2/3
2	W.226	3/-

Cap. Mfd.	1,000 volt test *No.*	*Price*
.01	W.239	2/6
.04	W.237	2/9
.1	W.238	2/9
.25	W.236	3/-
.5	W.235	3/3
1	W.234	3/6
2	W.233	5/-

These are made by the most advanced processes from the finest materials it is possible to obtain, and subjected during manufacture to a series of stringent tests under laboratory conditions. They are of the true Mansbridge type, self-sealing, non-inductive and hermetically sealed. They are offered in two types, the capacities from .01 to 2 mfd. in bakelite cases, and in blocks of 4, 6 and 8 mfd. in metal cases with soldering tags.

TELSEN MANSBRIDGE TYPE BLOCK CONDENSERS

Cap. Mfd.	500 volt test *No.*	*Price*	1,000 volt test *No.*	*Price*
4	W.175	5/6	W.178	9/6
6	W.176	8/-	W.179	14/6
8	W.177	10/6		



TELSEN
RADIO COMPONENTS

TELSEN LOUDSPEAKER UNIT

Has been designed to provide at a low price a reliable Loudspeaker Unit which will give a performance pleasing to the most sensitive ear. Employs cobalt steel magnets. A detachable rod, which carries the cone, is fitted with cone washers and clutch. The entire unit is enclosed in a beautifully moulded Bakelite dust cover.

No. W.54.

Price 5/6

TELSEN W.181 LOUDSPEAKER

An inexpensive combined Loudspeaker Cone Chassis and Unit, which gives a pleasing and natural balance of tone and will handle all the output necessary for ordinary reception. Fitted with a fully floating cone of damp resisting material and mounted in a rigid pressed frame of 11″ diameter.

No. W.181

Price 10/6

THE TELSEN CABINET SPEAKER

A thoroughly reliable Loudspeaker, giving a very fine performance, pleasing to the most sensitive ear. The natural resonances have been adjusted so that a good tone balance is obtained. The artistic bakelite cabinet is finished in polished mottled walnut and will harmonise with any surroundings. Size : 11″ high, 11½″ wide, 3½″ deep.

No. W.53

Price 25/-

TELSEN W.182 LOUDSPEAKER

This complete Loudspeaker Chassis incorporates a powerful unit with a high degree of sensitivity and is capable of handling large power outputs. The tonal range is exceptionally fine, combining both depth and brilliance to a remarkable degree. The fully floating cone of special damp resisting material is mounted in a rigid pressed frame. Telsen W.183 Loudspeaker Chassis is fitted with a unit of similar design but the cone dia. is 14½″.

No. W.182 (Dia. 11″) Price 17/6

No. W.183 (Dia. 14½″) Price 22/6

TELSEN LOUDSPEAKER CHASSIS

The fully floating cone of specially prepared damp-resisting material is mounted on a flexible felt, surrounded in a rigidly constructed, light pressed aluminium frame. The material and proportions of the cone have been selected to give an exceptionally natural balance of tone free from objectionable resonances. Combined with the Telsen Unit, it forms an ideal inexpensive combination, which, for natural reproduction and all-round performance rivals the highest priced units.

Telsen "Major" Loudspeaker Chassis. Dia. 14½″. No. W.170. Price 10/6

Telsen "Popular" Loudspeaker Chassis. Dia. 11″. No. W.159. Price 5/6

TELSEN
RADIO COMPONENTS

TELSEN POWER FUSE

These efficient little power fuses utilise a special fuse wire having a very small "timelag" when the fusing current has been attained. The fuse wire is mounted in a glass tube hermetically sealed into caps of polished nickel.

Made in four values :—

Fusing Current	*No.*	*Price*
½ amp.	W.199	6d.
1 ,,	W.200	6d.
2 ,,	W.201	6d.
3 ,,	W.202	6d.

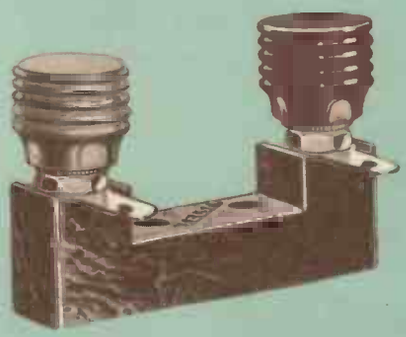
TELSEN TERMINAL BLOCKS

Two insulated terminals are mounted upon a bakelite moulding as employed in the grid leak holder and power fuse mount.

They may conveniently be used for aerial and earth, loudspeaker, pick-up or extra battery connections or for anchorage points inside the set itself.

No. W.204

Price 6d.



TELSEN SCREENS

These are beautifully finished, and a series of holes is provided for fixing in different positions the movable terminals which are supplied. Size 6" deep × 9¼" wide.

In model No. W.167 a hole is provided for mounting the screened grid valve in a horizontal position.

No. W.166 Price 2/-

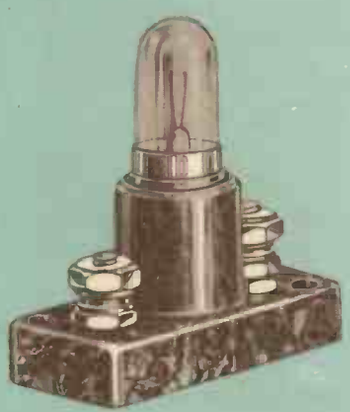
No. W.167 Price 2/6

TELSEN POWER FUSE HOLDER

Made for mounting the Telsen Power Fuse. The end clips are firm and positive in action, although allowing the fuse to be easily removed. Soldering tag connections are provided, but wire connections may also be made under the clip screws. The base is of bakelite and is attractively finished.

No. W.203

Price 6d.



TELSEN FUSE-HOLDER

A neat and inexpensive device which should be incorporated in every receiver as a precaution against burnt out valves. The terminals are easily accessible and the fuse bulb is held firmly, giving a perfect contact which cannot become loose.

No. W.146

6d.

NOTE.—The illustration shows the Telsen fuse-holder in use with the standard type fuse.

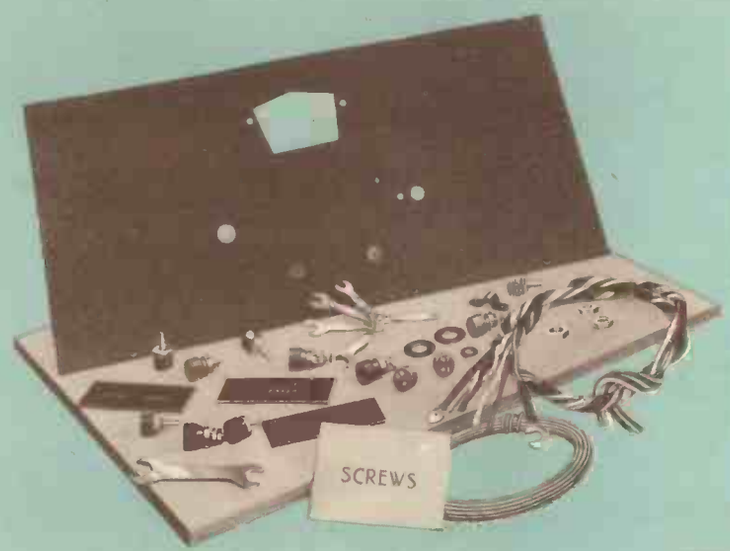
TELSEN
RADIO COMPONENTS

TELSEN PRE-SET CONDENSERS

The very low minimum capacity of the Telsen Pre-set Condensers gives a wide range of selectivity adjustment when used in the aerial circuit. They are substantially made, easily adjusted and provided with a locking ring. High insulation and low loss.

Max. Cap. Mfd.	*Min. Cap. Mfd.*	*No.*	*Max. Cap. Mfd.*	*Min. Cap. Mfd.*	*No.*
.002	.00025	W.149	.0003	.000016	W.151
.001	.000052	W.150	.0001	.000005	W.152

Price 1/6



CONSTRUCTORS' OUTFIT— DRUM DRIVE AND CONDENSER ASSEMBLY

This is an invaluable accessory to the constructor building up any of the Telsen Kit receivers employing the Drum Drive and Condenser assembly (e.g., the "Jupiter 3"). The various components and accessories included in the Outfit are similar, with slight modifications, to those listed opposite for the Telornor.

No. W.219

Price 3/6

CONSTRUCTOR'S OUTFIT—TELORNOR

This outfit contains all the sundry requirements for the construction of the Telsen Kit receivers using the "Telornor." Of these, the "Triple 3," the "Ajax 3," and the "Nimrod 2" will suffice as examples. Included in the Outfit are the following components :—

- Specially cut and drilled crackle-finished panel.
- 14" x 10" baseboard.
- 8-way battery cord.
- Complete set of wander plugs suitably engraved and spade terminals.
- Terminals for aerial, earth and loudspeaker.
- Engraved terminal strips.
- An ample supply of 22 s.w.g. tinned copper wire and necessary sleeving for wiring up the set.
- A double-ended spanner for mounting the single hole fixing components.
- A 4-way spanner for tightening up all terminal nuts.
- A good assortment of wood screws and sundry other small accessories contributing to the complete assembly of the finished receiver.
- All are supplied neatly packed in a carton together with instructions.

No. W.220 Price 3/6

TELSEN SPAGHETTI FLEXIBLE RESISTANCES

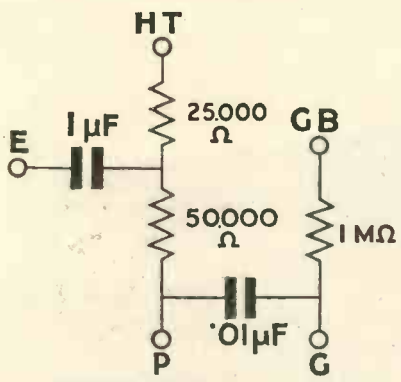
These resistances are made from the finest nickel-chrome wire, wound on a pure cotton core, stoved and impregnated so that moisture cannot attack the wire and cause corrosion. The bending of the resistance will not alter its value.
Made in the following values :—

No.	*Resistance Ohms.*	*No.*	*Resistance Ohms.*	*Max. Curr.*	*Price*
W.109	300	W.110	600	42 m/a.	6d.
W.111	750	W.112	1,000	42 m/a.	
W.113	1,500	W.114	2,000	23 m/a.	9d.
W.115	3,000	W.116	4,000	23 m/a.	
W.117	5,000			23 m/a.	
W.118	10,000	W.119	15,000	6 m/a.	1/-
W.120	20,000	W.121	25,000	6 m/a.	
W.122	30,000			6 m/a.	
W.123	50,000	W.124	60,000	3 m/a.	1/6
W.125	80,000	W.126	100,000	3 m/a.	

A review of new TELSEN components

THE "Telsen Coupling Units," illustrated on Page (1) of the coloured supplement, are two components of great interest to the enthusiastic constructor. They eliminate several wires and their associated joints, enable a neater layout to be obtained, and save space.

The 1/1 coupling unit is intended as a first-stage coupling in a set incorporating two stages of low frequency amplification. It includes, as will be seen from the accompanying diagram, a standard resistance-capacity coupling consisting of anode resistance, coupling condenser and grid leak, and in addition a de-coupling resistance and its associated large-capacity Mansbridge-type condenser. These are contained in a bakelite case similar to that of the famous Telsen "ACE" transformer, into which they are hermetically sealed, thus safeguarding the individual components against damage due to atmospheric humidity. An additional advantage is the absence of exposed spaghetti resistances which are, by their very nature, somewhat fragile.



THEORETICAL CIRCUIT
1-1 COUPLING UNIT

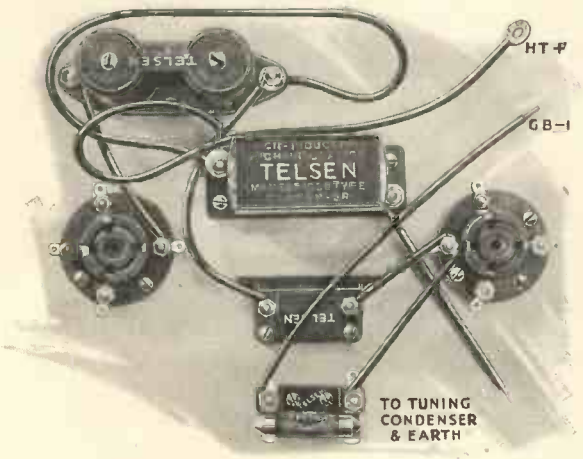
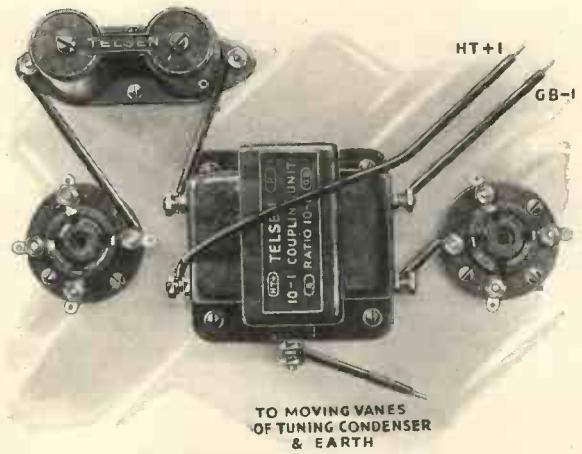
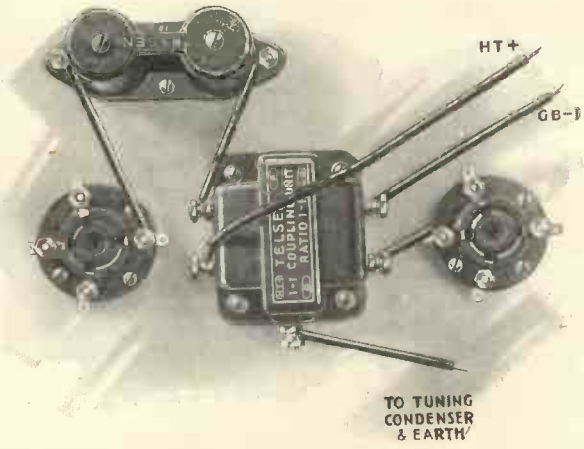


Diagram of De-coupled R.C. Coupling.



Pictorial Diagram of connections to 10—1 Coupling Unit.

The comparison between the coupling units and the standard coupling arrangements is well illustrated in the accompanying photographs. The circuits are identical in both cases, and the simplicity which the coupling unit makes possible is apparent at the first glance.



Pictorial Diagram of connections to 1—1 Coupling Unit.

As most radio enthusiasts are aware, it is essential, in these days of high-efficiency valves, to de-couple the detector valve when it is followed by two stages of low-frequency amplification. The reason for this needs no explanation to the expert, but to the uninitiated it is a complicated subject, quite outside the scope of a short article such as this. The simplest explanation is that the

(*continued on page* 48)

The TELSEN triple 3

LONG WAVE
MEDIUM WAVE
SHORT WAVE

THE "Triple Three" receiver, as its name implies, has been designed to cover three wave bands, namely short, medium and long.

While keeping this receiver simple to construct, its efficiency has been brought up to a very high standard and the constructor will be truly amazed at its performance. A special feature of this receiver is the incorporation of the "Telornor" which, through the agency of its variable gear ratio, allows for the fine tuning necessary on short waves.

The circuit, as can be seen from the diagram, consists of a detector and two note magnifying valves. A reasonably high degree of selectivity is obtained by using the "Telsen Dual Range Selectivity Coil Unit." This coil, when tuned with the .0005 mfd. condenser, covers all the useful broadcasting stations on medium and long waves, the change over being effected by a push-pull switch located on the left-hand side of the escutcheon. For the short wave band, the "Telsen Short Wave Coil Unit" is incorporated. The dual-range feature of this coil is not employed as the .0005 mfd. tuning condenser covers the short wave band of 20-50 metres and so eliminates the complication of an additional switch. When changing over to short waves, it is only necessary to pull out the four-point switch, which is situated at the back of the baseboard near to the aerial terminal.

The new and very efficient "Telsen RC Coupling Unit" is used for the inter-valve coupling, between the detector and first amplifier, while the last stage is coupled with a "Telsen Radiogrand 3—1 Transformer." This arrangement gives very even amplification over the whole audio frequency range and so gives that quality of reproduction which can only be described as life-like. To secure these results it is very necessary to keep to the components specified, as the receiver has been designed for these and any change will only result in considerable loss of quality and general performance.

Before laying out the components on the baseboard, it is necessary to cut out from the baseboard on the back left-hand side a "T-" shaped portion to allow room for the four-point switch, which when mounted sinks below the level of the baseboard. To do this, mark out the exact position in pencil from the blue-print. Saw down the side of the lines marked out, and cut away the unwanted portion with either a chisel or a knife.

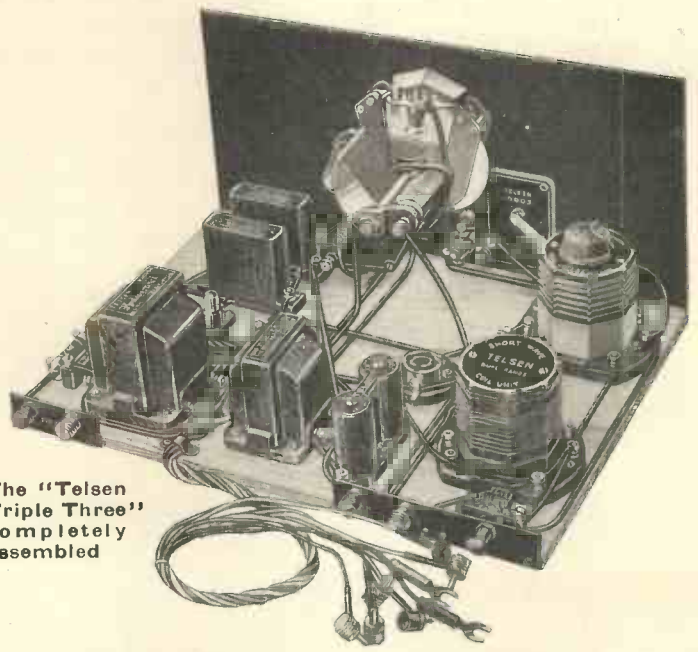
ASSEMBLY OF COMPONENTS ON PANEL AND BASEBOARD

In making the start on the layout, it is advisable to assemble the front panel first. This is identical with the "Ajax" receiver, instructions for which are given on page 8.

The baseboard components are next placed in position on the 14"×10" board and screwed down, the correct location for these parts being taken from the print provided. Before mounting the four-point switch, it is necessary to link the two moving contacts by slacking off the two screws in the centre of each contact, and connecting them with a loop of wire, as shown in the blue-print. Now tighten up the screws, taking care that the contacts are not displaced. Finally mount the terminal strips on the back edge of the baseboard, assembling the terminals in the holes provided, black terminals going in the holes marked loudspeaker — and "E" while the red terminals go in the holes marked loudspeaker + and aerial.

BASEBOARD WIRING

On wiring this receiver, we recommend the "thin tinned copper wire and sleeving" method. This looks neat when finished and is simple to use.



The "Telsen Triple Three" completely assembled

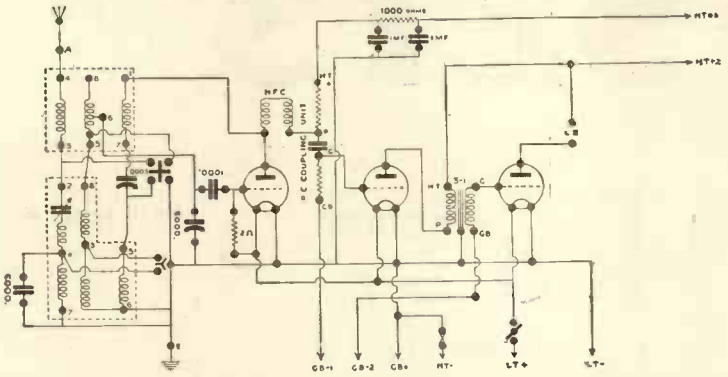
The first wire is "A." This goes from Earth terminal to points 36, 32, 28, 25, 47 and 48. For those who wish to use the terminals instead of soldering, place the end of the wire once round the terminal screw in a clockwise direction, then tighten the terminal head. The actual lengths of sleeving for all baseboard wiring may be scaled off from the blue-print. When making several connections with one wire such as "A," one end of the wire is secured to the first point stated, the correct length of sleeving threaded on the wire, then take a turn of bare wire round the next terminal point and so on from point to point, this being the general principle throughout. The complete list of baseboard wiring is as follows :—

THE "TELSEN TRIPLE THREE"—*continued.*

Wire A. Earth, 36, 32, 28, 25, 47, 48.
B. 23, 30, 34, 42.
C. 37, Earth, 13, 18.
D. 20, 21.
E. 22, 19, 24.
F. 16, 29.
G. 14, 31.
H. 33, 9, 1 (on coil "A").
I. Loudspeaker+ and 17.
J. Loudspeaker—, 26.
Wire K. 40, 5 on coil "A" to 8 on coil "B."
L. 2 on coil "B," 3 on coil "A," 39.
M. Aerial, 4 on coil "A."
N. 35, 43.
O. 12, 49; also fit spaghetti resistance between 49 and 46.
P. 38, 5 on coil "B," leaving loose end 3½" long.

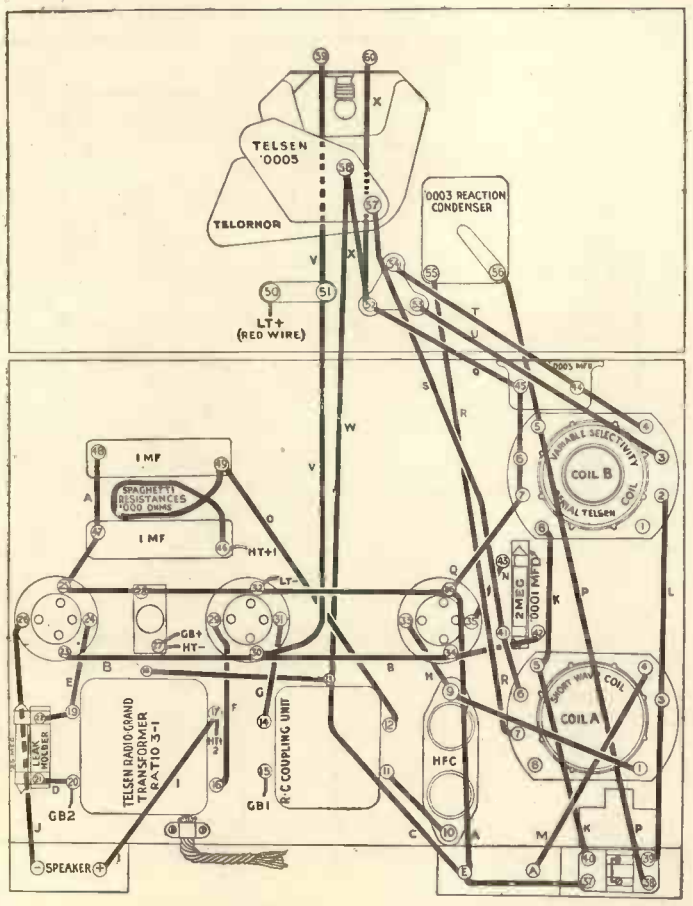
Tighten up all terminals with the kit constructor's spanners except terminals 13, 17, 20, 30, 32, 36, 46, to which further wires have to be attached later on.

THEORETICAL CIRCUIT OF TELSEN "TRIPLE THREE" RECEIVER



Having wired the baseboard to this extent, the next procedure is to start on the panel. The first wire here is "X," which joins 60, 52, 58. Also join wire "V" to 59, 51, leaving a length of wire 8½" long. Now place the panel on the front edge of baseboard so that they lie flat edge to edge and continue the wiring as before.

Wiring Diagram



Join the loose end of wire "V" to 30 and the loose end of wire "P" to 56.

Wire Q joins 36, 7 and 6 on coil "B," 45, 52.
R ,, 55 to 7 on coil "A."
Wire S joins 6 on coil "A," 41, 57.
W ,, 58, 13.

Next fit the battery cord which is contained in the Constructor's Outfit. (See special note on cord fixing, in the "Ajax" receiver.) The connections are as follows :—

Red spade terminal (red covering L.T.+)	..	Terminal 50.
Black spade terminal (black covering L.T.—)	..	,, 32.
H.T.— (Black wander plug)	..	,, 27.
G.B.+ (Red wander plug)	..	,, 27.
H.T.+1 (Red wander plug)	..	,, 46.
H.T.+2 (Red wander plug)	..	,, 17.
G.B.—1 (Black wander plug)	..	,, 15.
G.B.—2 (Black wander plug)	..	,, 20.

Now place the panel in the correct position against the baseboard and screw down. Then join wire "T" to 54, 44 and 4 on coil "B" and wire "U" to 53 and 3 on coil "B." All terminals should now be carefully gone over and tightened up, also checking up the wiring from the blue-print and photograph.

"TELSEN TRIPLE THREE"
List of Components.

Quantity	*Description*	*Cat. No.*	*Price*
3	Valve-Holders (4-pin)	W.224	2/3
1	.0001 Mica Condenser	W.240	1/-
1	.0003 Mica Condenser	W.242	1/-
2	1 mfd. Mansbridge Condensers ..	W.227	4/6
1	.0005 Log. Variable Condenser ..	W.132	4/6
1	.0003 mfd. Reaction Condenser ..	W.188	2/-
1	Two-point Switch	W.107	1/-
1	Three-point Switch	W.108	1/3
1	Four-point Switch	W.153	1/6
1	2 meg. Grid Leak	W.251	1/-
1	½ meg. Grid Leak	W.248	1/-
1	Grid Leak Holder	W.148	6d.
1	Aerial Coil and Selectivity Adjustment	W. 76	7/6
1	Dual Range S.W. Coil Unit	W.174	4/6
1	R.C. Unit	W.285	4/-
1	Radiogrand Transformer, 3—1 ..	W. 59	7/6
1	1,000 ohm Spaghetti Resistance ..	W.112	6d.
1	Binocular H.F. Choke	W. 74	5/-
1	Fuse Holder	W.146	6d.
1	"Telornor" Friction drive	W.206	7/6
1	Constructor's Outfit Telornor ..	W.220	3/6
	Total		62/-

TRIPLE THREE VALVE RECEIVER.

1st Valve Combination.

Mazda H.L.2 L.2. P.220.
HT+, 88 v. HT+2, 103 v. GB—1, 3 v. GB—2, 9 to 10½ v.

H.T. Battery	Ediswan 103 volt.	Cat. No. 69718
Grid Bias Battery	Ediswan 9 volt.	Cat. No. 69804
L.T. Battery	Ediswan 2 volt.	Type EL. M.4.

Recommended Mains Units.

Regentone.

D.C. Eliminator, H.T. only. Type D.C.1.
A.C. ,, H.T. ,, Type W.I.F.
D.C. ,, with Trickle Charger. Type D.C. combined 2.
A.C. ,, ,, ,, ,, Type A.C. W.5.B.

2nd Valve Combination.

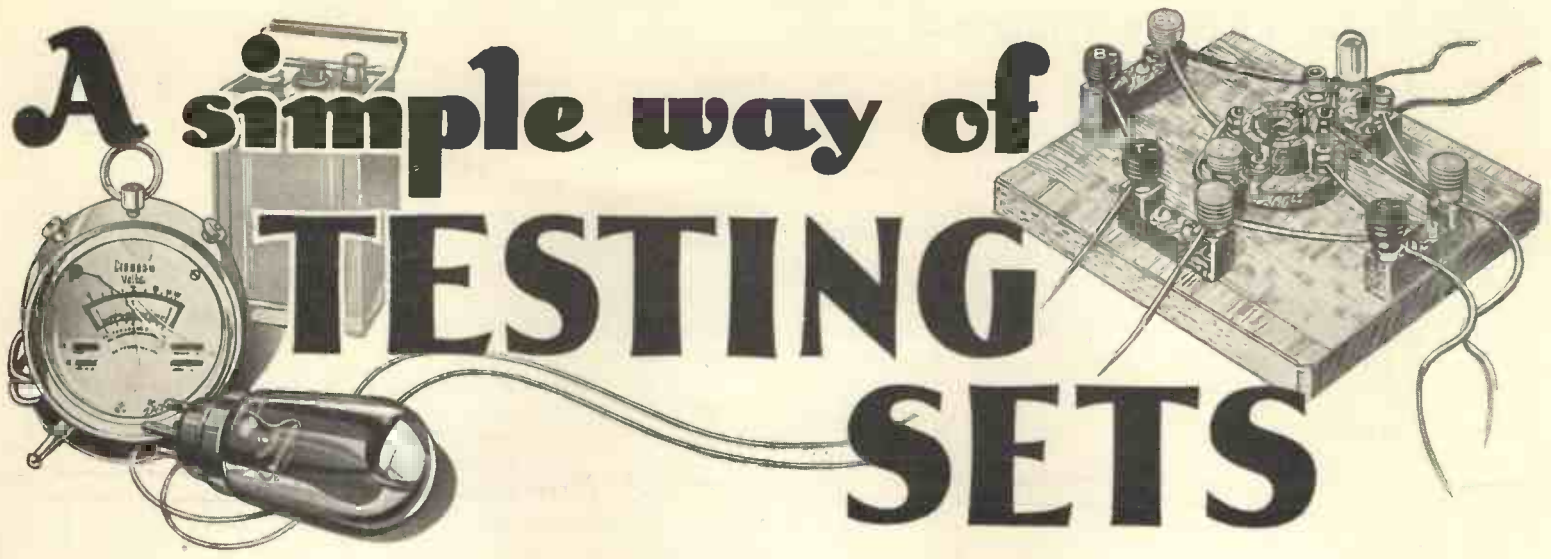
Mazda H.L.2. L.2. P.220A.
GB—2, 4½ volts.
D.C. Elinimator, H.T. only. Type D.C.1.
A.C. ,, H.T. ,, Type W1.C.
D.C. ,, with Trickle Charger. Type D.C. combined 2.
A.C. ,, ,, ,, ,, Type A.C. W.5.A.

Constructors are advised to carefully read once and adhere to the instructions given with these eliminators by the makers.

THIS APPLIES TO ALL RECEIVERS.

When using these receivers with eliminators, bias should be adjusted to suit the H.T. voltage.

A simple way of TESTING SETS

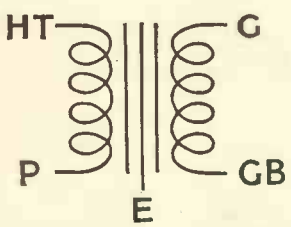


EVERY listener who builds his own set should know something about testing, which is really quite simple when reduced to a system, and it is the purpose of this article to give some idea of the tests which can be carried out by the amateur with the very modest apparatus which should be in his possession.

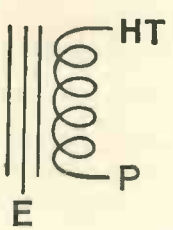
A radio receiver is merely a collection of electrical circuits, and there are only two faults with which we need concern ourselves, short circuits and open circuits. Short circuits, generally known as " shorts," mean that current is flowing where it should not do so, or is very much in excess of its proper value, and an open circuit, also referred to as a " break " or " dis " (short for disconnection) means that a circuit which should be continuous has been interrupted.

The components which are most likely to suffer from " shorts " are condensers, which consist in effect of two sets of metal plates, interleaved with one another and separated either by mica, bakelite or waxed paper, or air-spaced. The general construction will best be seen in the ordinary air dielectric condenser. All the vanes on the spindle are connected together and insulated from the fixed vanes, which again are all bonded. If one set of vanes touches the other set the condenser is useless. From the diagrams, which show the theoretical signs for different kinds of condensers, it is quite obvious that no direct current should pass the gap.

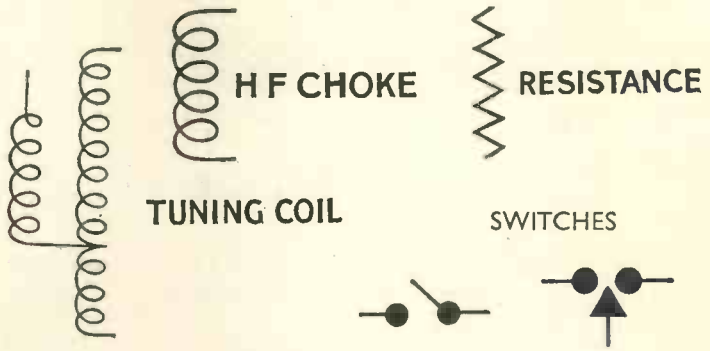
It is equally obvious that the following circuits *do* offer a path for current.



L.F. transformer. Should pass current between P. and H.T. and between G. and G.B. but nowhere else.

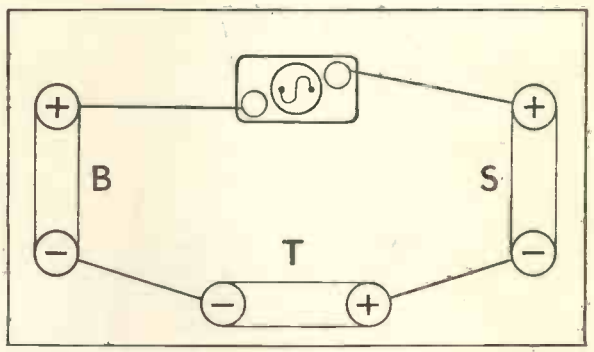


Low frequency choke. Passes current between P. and H.T. only.



Switches are naturally subject to both defects, and should be tested for " dis " when closed and for " short " when in the " off " or " long wave " position.

Now a word as to apparatus. The simplest tester consists of three terminal blocks and a fuse-bulb holder mounted on a piece of wood, as shown.



The wiring is too simple to require any explanation. A 2 volt battery is connected to the terminals marked "B," a speaker to "S" and two lengths of wire to " T " which stands for " Test."

It is as well to have the theoretical diagram for this, which is as follows :—

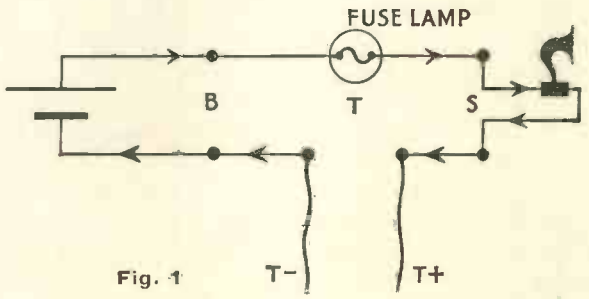
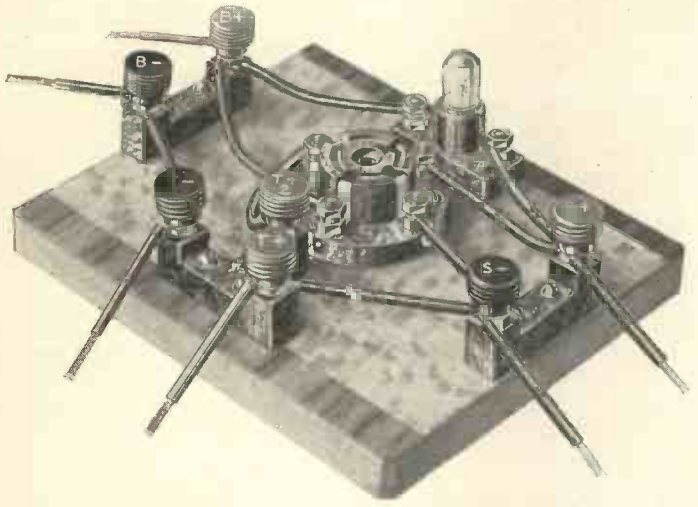


Fig. 1

AN ARTICLE OF INTEREST FOR EVERY RADIO ENTHUSIAST

If the ends of the two wires T+ and T— are now connected together current will flow in the direction indicated by the arrows, and a click will be heard in the loudspeaker. The fuse-bulb will not light up, because the resistance of the speaker is probably of the order of 2,000 ohms, and as a 2 volt battery is connected, only one milliampere (1/1,000 part of an ampere) will flow.



View of Testing Board made up with Telsen Components.

The fuse-bulb probably requires 40 milliamperes before it even glows dull red, and in order to make it light brilliantly it would be necessary to raise the voltage of the battery to such a point that damage would be done to the windings of the loudspeaker, which are generally only wound to carry 12 to 20 milliamperes.

While we are on the question of resistances it might be as well to quote Ohm's law, on which all such electrical circuits depend. It states that the current flowing in a circuit is directly proportional to the voltage and inversely proportional to the resistance. Where " I " is current in amperes, " R " is resistance in ohms, and " E " is the voltage :—

$$I = \frac{E}{R}, R = \frac{E}{I} \quad \text{and} \quad E = R \times I.$$

You see now how we know that the current flowing through the fuse-bulb was only one milliampere.

$$I = \frac{E}{R} = \frac{2 \text{ (volts) voltage of battery.}}{2{,}000 \text{ (ohms) resistance of loudspeaker.}}$$

$$= \frac{1}{1{,}000} \text{ amperes.}$$

This does not include the resistance effect of the fuse bulb, which is negligible.

The apparatus is now ready for any continuity test. If you turn to the " AJAX " circuit diagram it will assist you in this respect. If all valves are taken out, aerial and earth, loudspeaker and all batteries disconnected and the battery plugs and terminals laid out on the table so that they do not touch, clicks will be heard when one wire is touched on to 25 and the other on to the following points : 55, 21, 14, E, 7, 6, 40, 30, 52, 44, 48, 53, 33 or 36. This tests the whole of the earth circuit.

Clicks will also be heard between :—

6 or 7 and 4.	Long wave primary or coil (wave change switch open).
4 and 1.	Medium wave primary of coil.
8 and 3.	Medium wave grid coil.
3 and 6 or 7.	Long wave grid coil (wave change switch open).
6 or 7 and 5.	Reaction coil.
27 and 28.	H.F. choke.
31 and 32.	L.F. choke.
35 and 34.	Primary of transformer.
37 and 38.	Secondary of transformer.

The spaghetti resistance and the grid leaks will not pass sufficient current to make a click, but in the case of the former the current can be *tasted* by putting the ends of the S+ and S— leads on the tip of the tongue about $\frac{1}{4}$" apart, T+ and T— being connected, of course, to the ends of the resistance. A slightly acid taste indicates that current is passing. It is just possible to test a grid leak by the same means if your tongue is sufficiently sensitive.

The variable condenser may here be tested for shorts between the moving and fixed vanes. Take off the lead from 51 and place T+ and T— on 51 and 52 respectively. Slowly rotate the condenser vanes and if a click or grating noise can be heard at one or more positions the vanes are touching at the points indicated. Such shorts should be cleared.

We can now change over to visual testing by means of the fuse-bulb.

Disconnect the loudspeaker from the " S " terminals and connect the terminals together with a plain piece of wire. This test can only be utilised to detect absolute dead shorts or continuity of low-resistance circuits. The bulb should *refuse to light* when the wires are touched on terminals :—

56 and 55.	(Fuse bulb of set out, of course. If you have a spare bulb and insert it in the holder both this and the bulb in your tester will light with equal brilliancy, about half as bright as when the testing wires are touched together.)
9 and 11.	Grid condenser.
16 and 18.	Coupling condenser.
35 and 36.	Primary to earth.
34 or 35 and 37 or 38.	Primary to secondary.
31 or 32 and 33.	Coil of choke to earth.
29 and 30.	Decoupling condenser.
47 and 46.	(Switch off).

Remove connections from 42 and test across 42 to 41.

Remove connection from 50 and test from 50 to 49, 50 to 48 and 49 to 48, rotating the reaction control for each test.

Test across terminals 2 and 1, rotating the control knob.

It should light with the wave change switch open, with varying degrees of brilliancy between :—

8 and 1.	Very dull.	Sections of the tuning coil.
8 and 4.	Dull.	
8 and 7.	Brighter.	
8 and 3.	Full brilliance.	
1 and 4.	Full brilliance.	
6 and 5.	Practically full brilliance.	Reaction winding.

If a meter can be obtained and connected to terminals " S " in place of the loudspeaker the usefulness of the tester will be increased considerably. The better the meter the more useful it will be, but quite a cheap one will be better than nothing. The standard model at present seems to have two readings, 0-6 volt and 0-120.

TESTING SETS—*continued.*

Three-reading meters are available at an extra cost, and have two extra terminals and an additional scale marked " milliamperes." The internal construction is the same, and the milliampere terminals simply go to the connections of the low voltage range. If you ask your local wireless dealer he can probably tell you the current consumption of your meter at full-scale deflection, and you will be able to work out the ratio between volts and milliamps. If the meter reads to six volts and takes 30 milliamps at that voltage, 1 volt=5 m/a., 2 volt = 10 m/a., and so on. At present, however, we are considering comparative tests rather than quantitative and the milliamps. do not matter.

It is the 6 volt reading we shall use at this stage, connected as follows :—

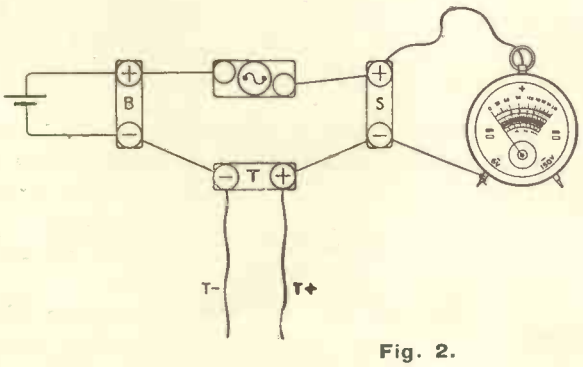
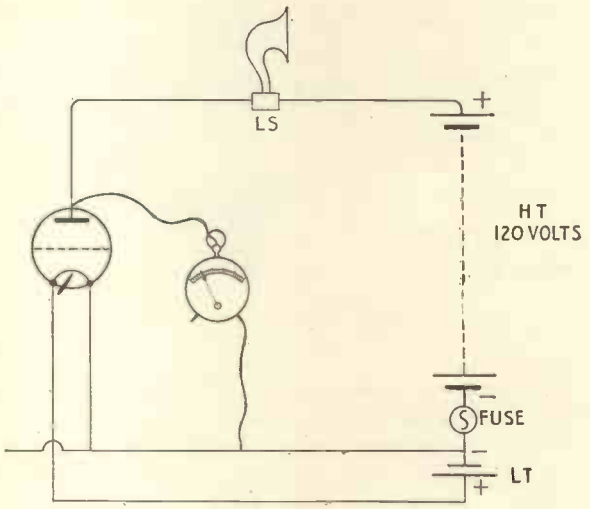


Fig. 2.

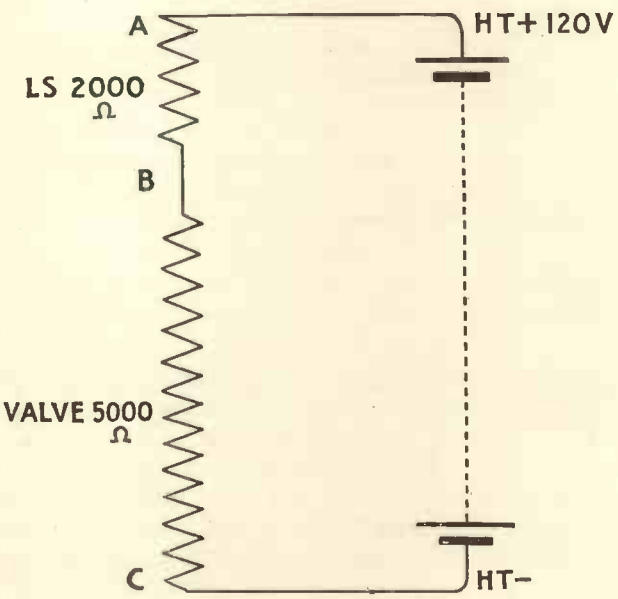
As the meter reads to 6 volts and we only have a two-volt battery connected to terminals " B," any readings we may obtain will be somewhat cramped, only 1/3 of the total scale being available. More pronounced readings may be had by using 6 or more volts of a grid bias battery or even a section of a high tension battery, but in this connection it is as well to make sure that nothing is tested by this arrangement which could be damaged by the higher voltage, having due regard to the fact that the meter will probably pass about 30 milliamp. at full deflection, while the fuse bulb would probably go to 150 milliamp. before burning out. A little experimenting with 6 volts (which is reasonably safe) and various components will soon give a rough idea of comparative readings for say, H.F. chokes, loudspeakers, headphones, transformer primaries and secondaries and spaghetti resistances. It will be noticed that a 2,000 ohm resistance gives twice as high a reading on the meter as a 4,000 ohm, and once the relation between resistance and dial reading is firmly established in your mind you will have begun to grasp the first principles of the science of radio.

Tests with the set in operation are generally rough and ready, but are not to be despised, as they narrow down the field of enquiry to a considerable degree. These tests should always commence from the power-valve end. With the set switched on, all batteries connected and valves in place touch the grid terminal of the power valve holder with some metallic object such as a screwdriver. When doing this be sure that you do not at the time touch something else with the blade edge. A scraping sound should be heard in the speaker. If nothing is heard the fault is in the valve, high tension battery or speaker. See that the grid bias applied to the valve is of the correct value. The grid of the next valve should then be touched in the same way. This time the scraping sound should be louder, as the amplification of both valves is used. If it is the same, or weaker, or if there is absolute silence, either the valve itself or the transformer (or choke or resistance coupling) between it and the last valve is at fault. The same process can be carried right up to the aerial terminal, which is connected either direct or through a condenser to the grid of the first valve, whether this is a detector or high frequency amplifier of screen grid or triode type.

Anode or plate testing is simple. In every set there is one long wire which joins several points together and to earth. L.T.—, G.B.+ and H.T.— are also joined to it, the latter two through the fuse. If the — terminal (120 volt scale) of the volt meter is connected to this wire and a flexible lead attached to the + point some indication of the voltage at the various valve anodes may be obtained. Note, however, that this is not a true reading. Ohm's law comes into this, too. The following circuit will make this plain.



The valve has a certain definite direct-current resistance. This has a relation to, though it is not coincidental with the " impedance " which is stated by the makers. This D.C. resistance is almost invariably higher than the resistance of the meter. Let us assume that it is 5,000 ohms. The loudspeaker is another 2,000. They are virtually joined in series across the H.T. battery thus.

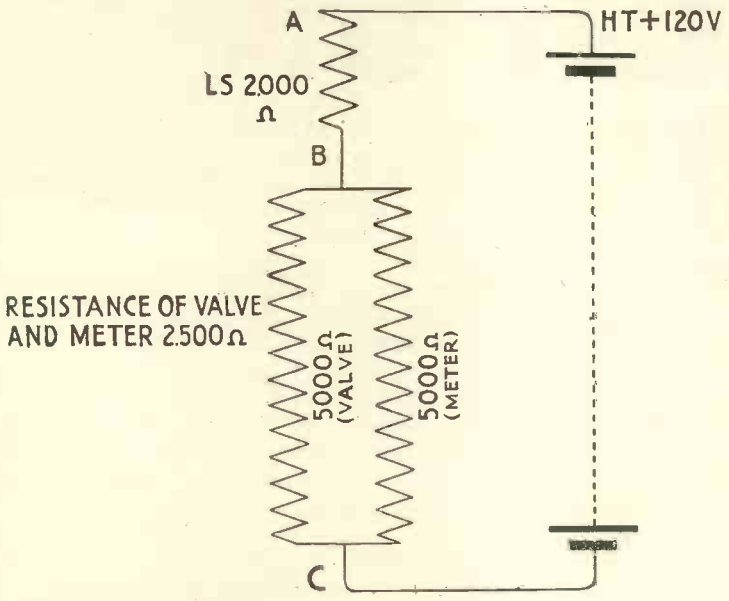


TESTING SETS—*continued.*

By Ohm's law the current which will flow $I = \frac{E}{R}$ which equals $\frac{120 \text{ volts}}{7{,}000 \text{ ohms}} = .017$ amps. (17 milliamperes) and by the same law :—

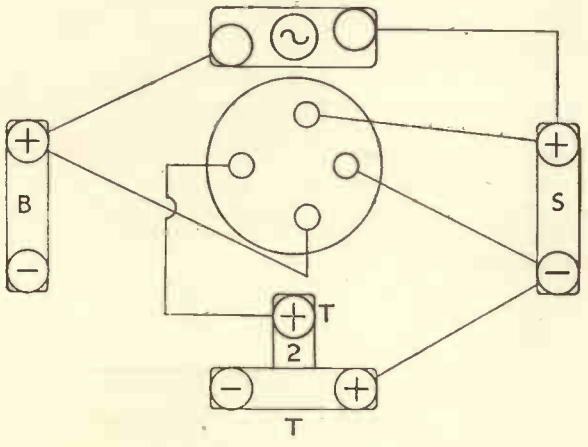
$E = R \times I$
$= 5{,}000 \times .017$ (valve resistance × current flowing).
$= 85$ volts, which is the actual voltage at " B."

If, however, we connect the voltmeter across " B " and " C," we get a different reading, because we are virtually putting two resistances where one was before. As these are of equal value the nett result is as follows.

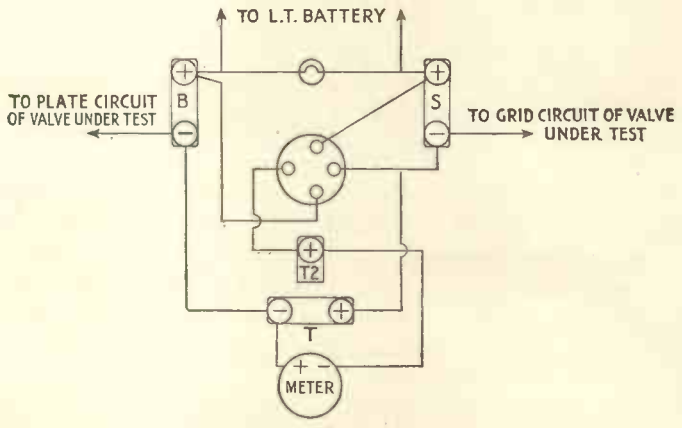


$I = \frac{E}{R} = \frac{120 \text{ v.}}{4{,}500} = .0265$ amperes $= 26\frac{1}{2}$ m/a. approx.
$E = R \times I = 2{,}500 \times .0265 = 67$ volts approx.

You see, we are 18 volts out already, and as we are considering the easiest type of valve to test, one which takes a fairly high current and has a low resistance in its anode circuit, you may well imagine how far from accurate the results would be on a detector valve passing only $\frac{1}{4}$ milliampere and with a 100,000 ohms resistance in the anode circuit. Still, we can get a rough indication, and provided that the meter needle *does* give signs of life we can say that the anode circuit is intact and that the valve is passing the current. It is then a good point to find out just how much is going through, and this can be done by disconnecting the anode lead and connecting the meter between the anode terminal and the wire which is normally connected to it. That is rather a nuisance, and if you want to be really technical the proper thing to do is to make another addition to your tester. Switch off the set.



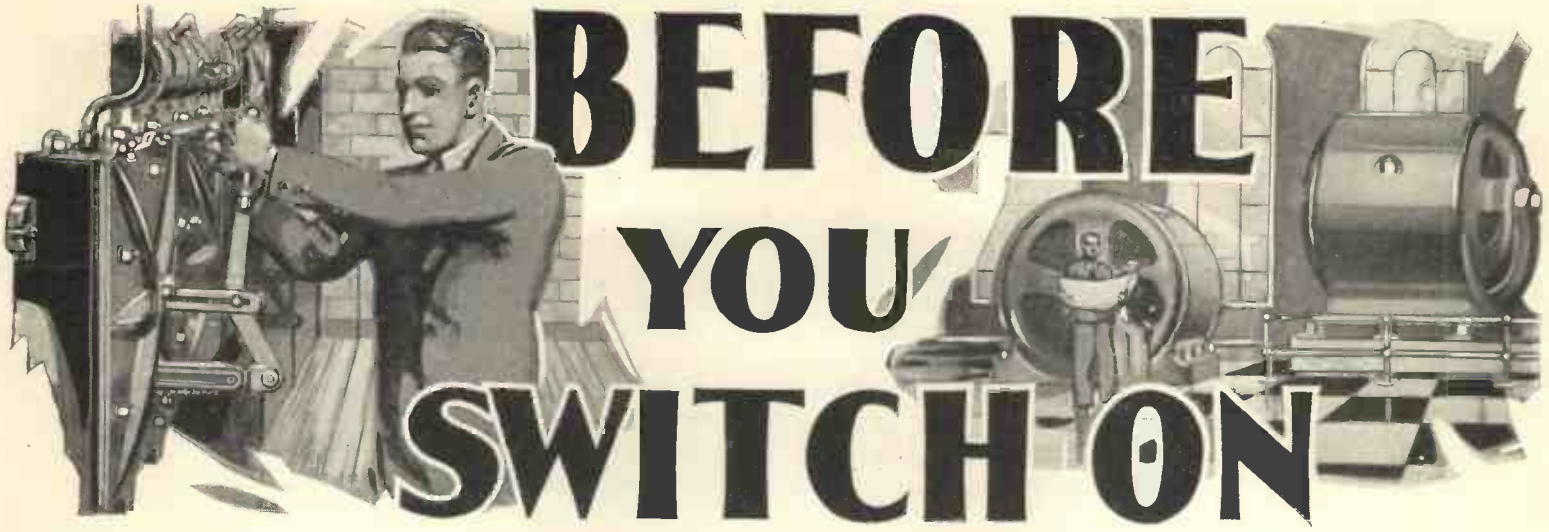
A valve holder and half a terminal block are required and are connected up as shown in the sketch in bottom left hand corner of this page. Connect B+ and S+ across the low tension battery, which is also left attached to the set. The way round B+ and S+ are connected to the battery is immaterial. Then remove the valve which it is desired to test and insert it in the tester valve holder. Connect the 6 volt + terminal of the meter to T—. Remove the T+ lead from the T+ terminal and connect one end to T+2 and the other to the — terminal of the meter. Connect B— to the plate or anode terminal of the empty valve socket on the set and the S— wire in the same way to the grid terminal. Two spare wander plugs are useful for this purpose, in which case the *sockets* of the empty valve holder should be utilised instead of the terminals. The circuit is now as follows, and what we have actually done is to transfer the valve under examination to an external valve holder with a meter in its plate circuit. This is easily seen from the diagram below.



Next switch on the set. The fuse bulb in the tester glows and the needle of the meter should at once move away from the zero mark. If no deflection occurs either the valve or the component between the anode terminal and the H.T. battery is faulty. If everything is in order the set should be switched off and the process repeated with the next valve. System in even the smallest details is advisable in dealing with radio, and if the same procedure is followed with each valve the possibility of damaging a valve will be obviated. Remove the valve from the tester and lay it down where it cannot roll off the table. Take out the next valve and put it in the tester. Change the leads over to the now empty holder, making sure that they do not get reversed, B— to plate and S— to grid. Replace the first valve in its own socket and switch on.

One interesting point remains to be noted. When the power valve is tested you will see that the needle of the meter goes further over than is the case with any of the other valves. Notice too, that when the set is receiving loud signals there is a slight fluctuation of the needle in unison with the music or speech which is coming over. It is almost impossible on any ordinary set to eliminate this fluctuation altogether, although it is desirable to aim at reducing it to a minimum, as it is an indication of distortion. If the needle swings wildly from one side of the

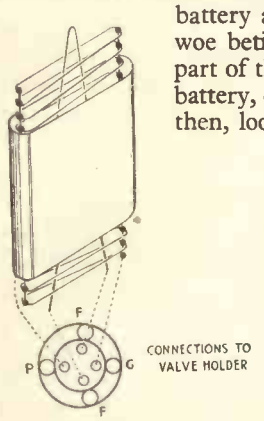
(*continued on page* 52)

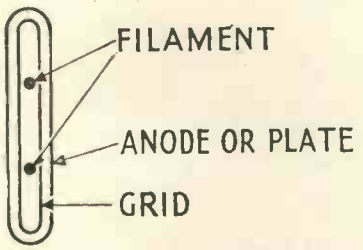


BEFORE YOU SWITCH ON

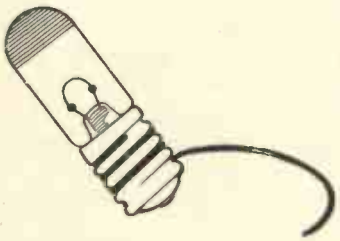
THE new listener looks at his set with some trepidation as a rule when he has completed it. He has heard tales of burnt-out valves and of tuning coils that got red hot when the set was switched on, and unless he is reckless by nature it is some time before he can bring himself to switch on. It is hoped that this little article will give him confidence in himself and his handiwork, at the same time eliminating the likelihood of damage to the valves or components.

The valves are naturally the most vulnerable part of the circuit. Internally they consist of a filament, " V," " N " or " W " shaped, which is heated by the low tension accumulator. Around this filament, very near but not touching it, is a grid, which is generally made of a spiral of fine wire electrically welded to two supports, and outside the grid at about the same distance as that which separates the grid from the filament is the anode or plate, a flattened tube of nickel. This anode is connected to the high-tension battery at the " live " or " positive " end, and woe betide your filament if the anode, or any part of the wire connecting it to the high tension battery, comes into contact with it. The valve, then, looks something like this inside.





It will therefore be seen that the first thing to make sure of is that the filaments of the valves get *sufficient* voltage, but not too much. The fuse bulb is useful for this. Generally speaking these lamps take 2 volts at .06 amperes. (They must not be confused with ordinary flash-lamp bulbs, which are useless for fuses.) Take a short length of wire and wrap it round the screw of one of the fuse-bulbs as in diagram.

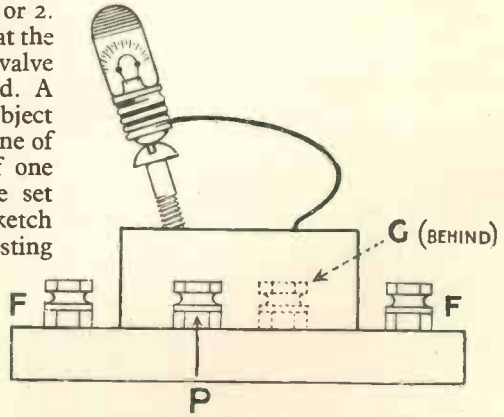


Now connect up your batteries. The low tension accumulator has two terminals, one red (positive or plus, +), the other blue, black or green (negative or minus, —). The first job is to connect these. The correct leads from the set are generally marked in some way and in the case of the Telsen circuits red and black wires are employed.

The grid bias battery is very important. There are several different ways of marking the terminal sockets and it is essential to make sure that the plugs go to the correct holes irrespective of the markings. The grid bias plus plug goes into the socket marked plus on the battery. Grid bias —1 is generally given as 1½ volts, and if there is a socket marked with this figure (or 1.5, which is the same thing) *next to the positive socket* you may, provided that the 1½ volt value is specified in your particular circuit, insert the G.B. —1 plug into it. If the 1½ socket is at the *other* or negative end of the battery this does not apply. The grid bias values are always *relative to the positive end*, and if the battery is marked —, 1½, 3, 4½, 6, 7½ and 9 (or plus), as is the case with many foreign grid bias batteries, the plug should be inserted in the " 7½ " socket, which is, of course, 1½ volts negative with respect to the plus or 9 volt socket. G.B. —2 should next be placed in the — socket if the value given corresponds to the total voltage of the battery, or, if it does not, into the socket separated by the stated voltage from the + end.

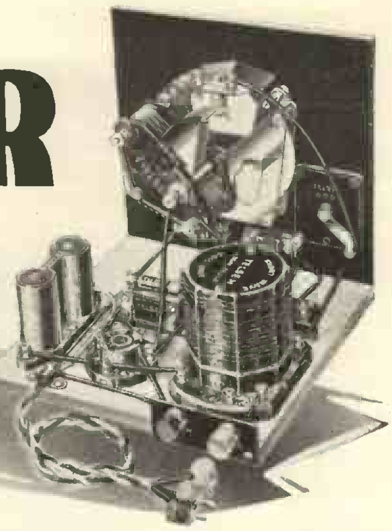
H.T.— is now inserted in the — socket of the high tension battery and the other H.T. plugs into the appropriate sockets. Tables will be found elsewhere which give the high tension and grid bias values for all circuits in this issue, and these should be strictly adhered to.

The spare fuse-bulb should now be screwed into the baseboard holder. Watch it carefully as you screw it in. If there is anything wrong with your wiring it may burn out as it makes contact with the bottom of the holder, in which case it will have saved you a new set of valves, and you had better go over your wiring again and find out where you have gone wrong. The most likely points at which errors can occur are the spindle of the reaction condenser, which should be insulated if a metal panel is used, the coupling condenser if a choke or resistance coupled L.F. circuit is used and the main tuning condenser, the moving vanes of which may be fouling a terminal or some component connected to H.T.+ 1 or 2. Assuming, however, that the bulb does not flash, the valve holders should be tested. A screw or other metal object should be inserted in one of the filament sockets of one of the holders and the set switched on. The sketch shows the method of testing better than words can do. Note that we are only concerned at the moment with the *filament* sockets, the terminals of which



(*continued on page* 50)

The TELORNOR short-wave adaptor



THIS adaptor has been designed to meet the requirements of the constructor who at present possesses a radio receiver covering the normal wavelength bands and desires to receive stations on the short wavelength range. With this adaptor he can do so at a minimum of extra cost and with maximum efficiency. This, because firstly by using the principles employed here the cost of duplicating the low frequency amplification components is avoided by using his present receiver to fulfil the functions involved, and secondly because of the proved design of the short wave coil and other components employed in this adaptor.

It is exceptionally easy to construct, and it will be seen that it employs the " Telornor " tuning unit. By suitable adjustment a very low gear ratio on the tuning condenser may be had, this facilitating the ease of tuning in. The normal wavelength band covered is 50 to 18 meters, which includes the most important stations found on the short wavelength broadcast.

It is necessary for the constructor to provide himself with a 7″×7″ wooden baseboard, and a 7″×7″ panel. And it is *advisable* to purchase the " Telornor Kit Construction Outfit " to assist him in building this adaptor, but if the constructor does not wish to be put to this expense he can purchase suitable parts separately from his dealer.

The mode of construction is to assemble the components on the front panel and also on the baseboard, wire up each assembly as far as possible, then wire two layouts together, finally giving the finishing touches to the wiring. It would be to the constructor's advantage to glance through the constructional article on the "Ajax " receiver on page 8 taking particular notice of the assembly of the " Telornor " unit to the front panel, the method of wiring by using sleeving and thin wire, the easiest way of mounting the baseboard components, and the neatest way of finishing the cord. The instructions given here, together with the blue-print and photographs in this article, will enable you to put this adaptor together in a short time.

Thus having assembled the components on the front panel lay the baseboard components in their correct positions and fix down with wood screws.

Now do the baseboard wiring. Following the procedure as with the "Ajax " receiver, the wiring is as follows:—

Wire A. Earth terminal, 10, 5, leaving a length of wire 11″ long beyond terminal 5.
B. 6, 9, 13.
C. Aerial terminal, 4.
D. 16, 8, 18, leaving a length of wire 3″ long.
E. 15, 12.

Referring to the panel :—

Wire F. 29, 21, leaving a length of wire 4″ long.

Now lay the panel with its edge to the edge of the baseboard as shown in the Blue-print, and continue the wiring thus :—

G. 23, 6.
H. 7, 24.

and join the loose end of the wire " D " to 22.

Next fit the battery cord. This should be of three colours Red, Black, White. The black lead is fixed to the Earth terminal, the red lead to the terminal 20, and the white lead to terminal 14. Then tighten up all terminals on the panel that have been wired, and also those on the baseboard except 10. Now raise the front panel to its correct position and screw it correctly and firmly to the baseboard.

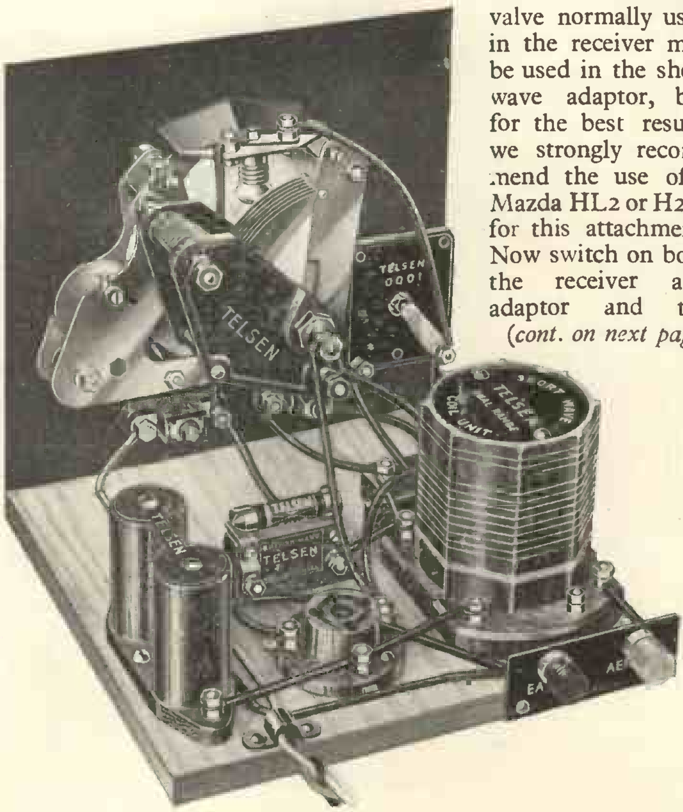
Continuing the wiring, proceed thus :—

Wire I. 19, 26.
J. 27, 10.
A. Join the free end of wire from 5 to 25, 28.
F. Join the free end of wire from 21 to 17, 11.

Now tighten up all the terminals, check the wiring over with the blue-print and photographs.

To the free end of the cord white lead secure a red wander plug. Also fasten spade terminals to the remaining red and black leads. To connect the adaptor to the broadcast receiver, remove the detector of the latter and plug into the plate socket (the one marked " P " on the valve holder), the plug at the end of the white wire. Connect the remaining two leads to the appropriate terminals of the L.T. accumulator. In many cases it will be found that the detector valve normally used in the receiver may be used in the short wave adaptor, but for the best results we strongly recommend the use of a Mazda HL2 or H210 for this attachment. Now switch on both the receiver and adaptor and the

(*cont. on next page*)



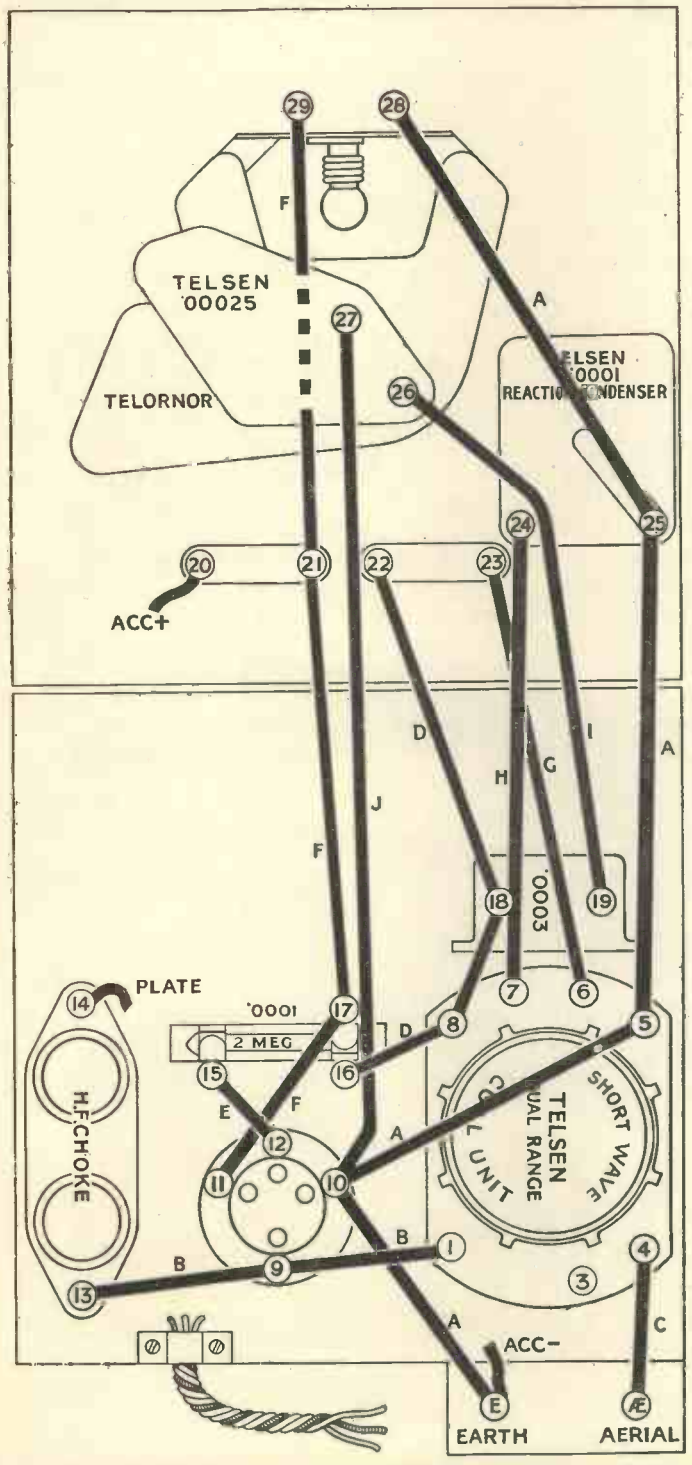
Good Radio is a joy forever

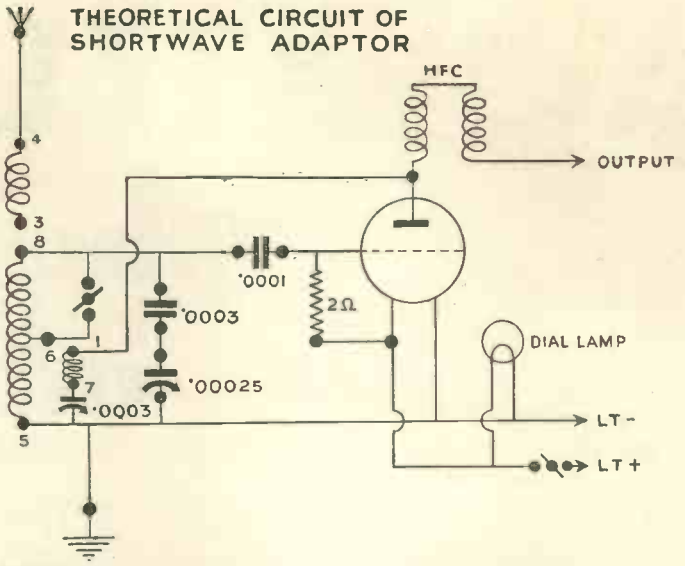
TELORNOR SHORT WAVE ADAPTOR—*continued*

combination is ready for receiving. Now tune by means of the adaptor controls just as if you were operating a normal broadcast receiver except that the "Telornor" tuning control should be very slowly rotated and the reaction kept very lively without oscillating, in order to ensure maximum sensitivity. A little practice will enable the constructor to pick up many stations with ease and certainty.

It is interesting to note that when receiving on the short waves it sometimes happens that there is a noticeable rapid variation in the strength of the received stations. This is at first very puzzling, but it is a phenomenon which in no way is due to the adaptor; when this is experienced do not alter the tuning of the set, but leave the controls unaltered, when the station will quickly regain its normal volume.

Finally, remember that with short wave work a really efficient earth is very necessary.





TELORNOR SHORT-WAVE ADAPTOR.
List of Components.

Quantity	*Description*	*Cat. No.*	*Price*
1	Telornor Friction Drive	W.206	7/6
1	.00025 Variable Log. Condenser ..	W.130	4/6
1	.0001 Reaction Condenser	W.190	2/-
1	.0003 Mica Condenser	W.242	1/-
1	.0001 Mica Condenser	W.240	1/-
2	2-point Push-Pull Switches	W.107	2/-
1	2-meg. Grid Leak	W.251	1/-
1	4-Pin Valve Holder	W.224	9d.
1	H.F. Binocular Choke	W. 74	5/-
1	Short-Wave Coil Dual Range	W.174	4/6
	Total ..		29/3

IN MY LABORATORY—*cont. from page* 18

grid detector circuits the anode current is reduced on the arrival of a signal and the amount of reduction is proportional to the intensity of the signal. So by tuning in some fairly powerful local station, preferably at the lower end of the dial, the trimmers may be adjusted until maximum response is obtained as indicated by the meter. By slowly tuning through a station some idea of the response curve may be obtained by watching carefully the meter needle. Double-peaking in band-pass circuits can thus be readily detected, and should be eliminated by reducing the band-pass coupling.

Measurement of resistance values can be readily carried out by the use of a 6 volt battery. The battery should be connected in series with the meter and the resistance under test, the meter being set at the low voltage range. The meter then indicates V volts and the ohmic value of the external resistance is given by the simple formula.

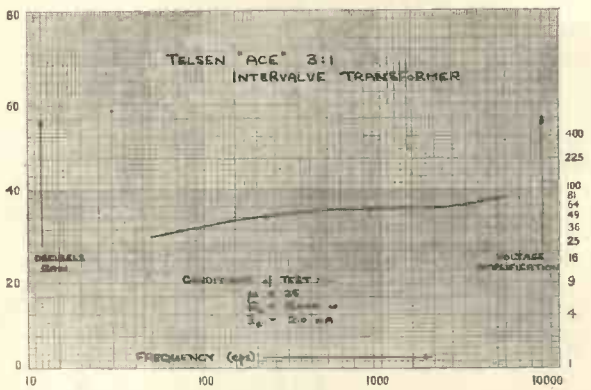
$$R = \frac{6-V}{V} \text{ Rm.}$$

where Rm is the resistance of the meter on the particular range in use. By this means resistances from 100 to 20,000 ohms may be measured and by using a high voltage dry battery and the high voltage range, resistances up to 3 megohms can be checked.

Many more applications will suggest themselves to the student who has a knowledge of Ohm's Law, thus the voltage on the anode of a resistance fed valve can be computed by measuring the anode current. This multiplied by the value of the coupling resistance gives the volts dropped across the feed resistance which, subtracted from the battery voltage gives the actual anode potential. The insulation of a leaky condenser can be found by measuring the leakage current with the meter in series with an H.T. battery and the condenser. The resistance in ohms is then equal to the H.T. voltage divided by the current in milliamps. and multiplied by 1,000.

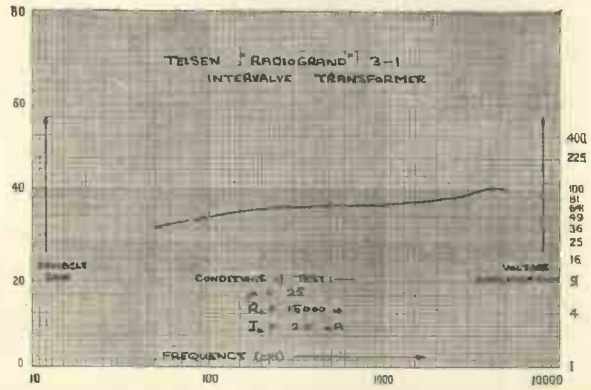
RESPONSE CURVES & what they mean

WHEN we come to components which perform some electrical function in the receiver such as resistances, condensers, chokes and transformers, it is essential to specify some of their electrical characteristics, in order to provide some guide to their sphere of usefulness and for comparison between similar components of different manufacture. Whereas condensers and resistances usually require no more than a simple statement of capacity and ohmic value respectively, with safe working voltage and current values, components such as coils, chokes and transformers which have to work under varying conditions of frequency require a statement of efficiency at each frequency in the radio or audio frequency band for which they are designed. To give a list of figures of merit for each of a few selected frequencies would be unsatisfactory, providing as it would, only partially complete data, and requiring careful inspection in order to form some idea of the value of the component for some particular function. The whole story, however, can be told and appreciated immediately by means of a curve drawn on squared paper, the vertical lines being usually marked as indicating various frequencies, and the horizontal lines being used to mark different levels of efficiency, amplification or some other essential property of the component under review. It is essential in these diagrams to make the visible variations in the curves correspond to the aural variations which they would represent if the component were working in its place in a receiving set, and also the frequency scale must not be uniform as this would result in a disproportionate amount of the diagram being devoted to the higher frequencies. The natural scale of music, as appreciated by the ear, progresses in equidistant octaves, e.g., starting at 50 cycles per sec., which is the lowest frequency appreciable as a note by the human ear, the next octave higher is 100 c.p.s., then 200, 400, 800, 1,600, etc. Similarly, with volume of output it is found that doubling the volume of sound, as indicated by a measuring instrument, is just discernable by the ear as a slight increase, and redoubling the volume gives again an equal slight increase, so that to express the output power in a scale of equidistant watts or volts gives no true indication of aural results. In order to overcome this difficulty another unit is used, called the decibel, which bears a similar relation to voltage and power as an octave does to frequency, this relation being called a logarithmic one. We can either plot our curves on ordinary squared paper and mark the scales in octaves and decibels, or by using what is called logarithmic graph paper we can plot direct in frequencies and volts and obtain an identical shape of curve. The frequency scale must be arranged to cover, in the case of audio frequency components, the complete audible spectrum, usually considered to extend from 50 to 5,000 c.p.s., and the voltage or decibel scale must be open enough to show a marked change in height for a just audible change in output, arbitrarily set at 3 decibels. The conditions under which the test is made should be as nearly as possible the average working conditions in a set, and in any case must be stated in order to effect comparison of response curves.



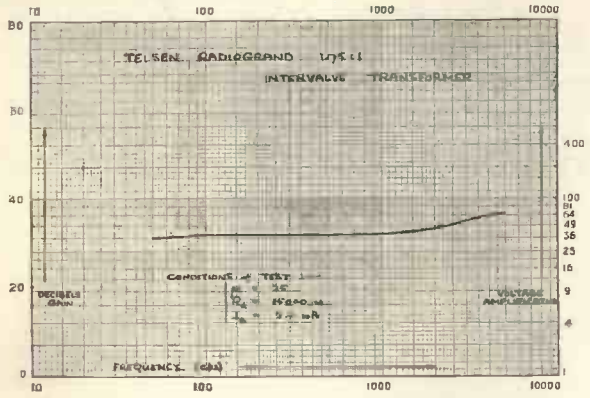
We are now in a position to examine the first curve illustrated, which shows at a glance the results to be obtained from the famous " Ace " transformer. The first impression gained is the remarkable uniformity of the characteristic curve of this modestly priced component, thus at a frequency of 50 c.p.s. the response is reduced only to the extent of five dB. from the general level, with a slight increase at 5,000 c.p.s., this being with a steady current of two m/a. in the primary winding and with a valve of 15,000 ohms impedance and amplification factor of 25. The general level of amplification for such an amplifying stage is seen to be about 60. In this connection it is perhaps as well to mention that whereas greater amplification can be obtained with any transformer by using a valve with a higher magnification factor (H type), such a valve will inevitably have a higher internal impedance resulting in loss of low frequencies. Conversely it can be assumed that increased uniformity of characteristic can be obtained by the use of a low impedance (L type) valve, but the general level of amplification will be reduced.

Turning next to the " Radiogrand " 3—1 it can be seen that the

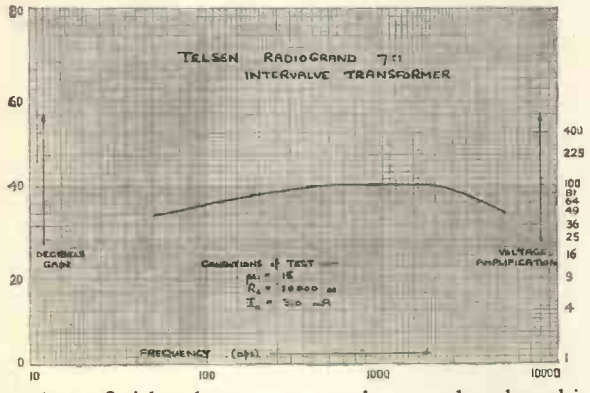


general level of gain is slightly higher, indicating more efficient transformation and the bass respon e is definitely better.

The " Radiogrand " 1.75—1 transformer has a perfect response down to 50 c.p.s. and a slightly increased step-up at 5,000 c.p.s., thus compensating to some extent for the inherent deficiencies of selective tuned circuits (see " Present Day Principles of Set Design " elsewhere in this issue). A two-stage amplifier with a very high standard of performance can be constructed, using this transformer in the second stage in conjunction with a 1—1 coupling unit in the first stage, and using valves HL, L and Super power in that sequence.

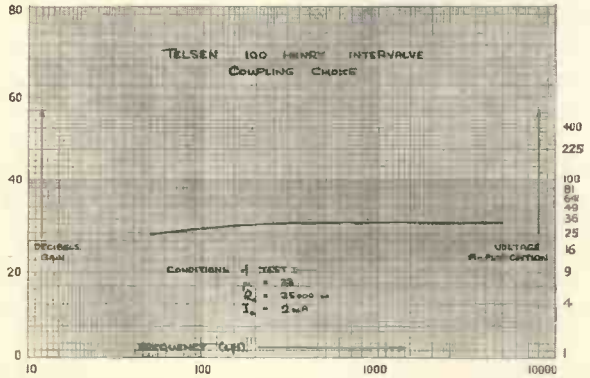


The chief point of note with regard to the " Radiogrand " 7—1 is the high level of gain achieved, viz., 100 times or 40 decibels, this in combination with a valve of amp. factor 15 and impedance 10,000 ohms passing a current of 3 milliamperes in the primary winding. This high figure of merit has been achieved without

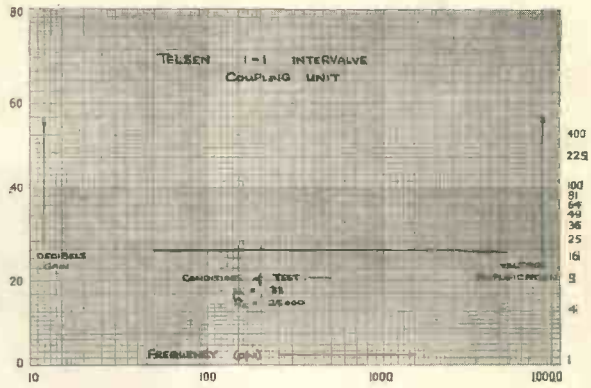


serious loss of either bass or top register, and makes this component ideal for use in sets using a single stage of L.F. amplification and pentode output valve.

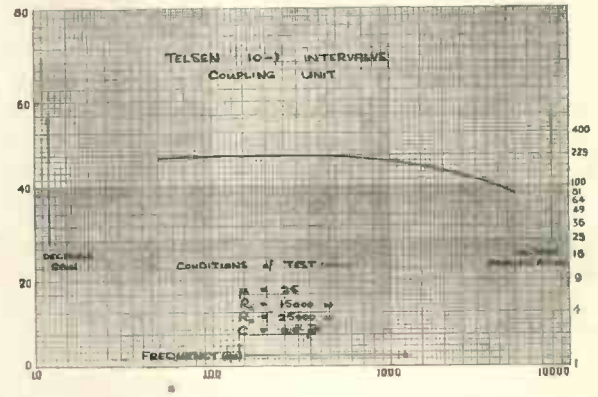
One of the most popular components is the 100 henry coupling choke, and its characteristic taken in a circuit using .01 mf. coupling condenser and 1 meg. grid leak, fully justifies its success. Although this, in common with the 1—1 coupling



unit provides no step-up ratio it may be used with a high amp. factor valve (H. type), thus giving a stage gain of approx. 30 with an almost perfect response curve. The 1—1 coupling unit,

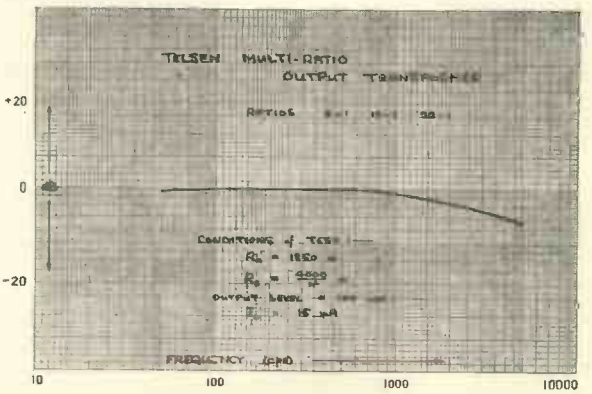


which is complete in itself, needing no external condensers or grid leak, shows a curve with no measurable variations at any frequency and its low stage gain is no drawback in sets employing two or more L.F. valves while it is perfectly stable under all conditions.



Outstanding among all iron-cored components, unique in its capabilities and representing the limit of achievement in transformer design using a high permeability nickel alloy core, the 10—1 coupling unit has the remarkable properties of giving perfect bass response coupled with a stage gain of 225 times with an HL type battery valve, or in conjunction with an AC valve, an amplification of 500 is easily attained. In addition the top register is compensated to reduce " hiss," " needle-scratch " and heterodyne interference, particularly when used with a pentode output valve. The unit incorporates the necessary filter condenser and feed resistance and may thus replace any ordinary transformer in an existing set, without alteration to the wiring.

Output chokes and transformers require a somewhat different treatment, as instead of being used in combination with a valve as a voltage step-up device they are power converters, and the relative efficiency of conversion on different frequencies is the important thing. The curves are hence plotted from an arbitrary level taken at 600 c.p.s. and the scale is marked in dB. up and down. The interpretation of the curves, however, is as before.

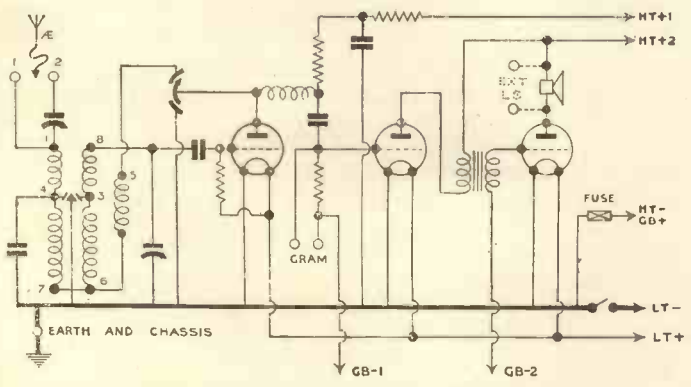


(*continued on page* 49)

TELSEN RADIO RECEIVERS

THE purchase of a ready-built receiver requires rather more consideration than the assembly of a home constructed one, for in the latter case, if the results are not all that is required, alterations can generally be effected which will bring the performance into line with the wishes of the constructor, but in the case of a complete receiver, little or no alteration is possible. Considerations of price, performance, maintenance charges and appearance have all to be closely examined by the prospective purchaser and undue haste in the selection of a set will in all probability lead to dissatisfaction later on. The new TELSEN bakelite receivers described in this article compromise between the four points mentioned above.

The first cost is sufficiently moderate to satisfy the most economically minded purchaser. The maintenance charges are singularly low, and the appearance as may be judged from the illustrations, leaves nothing to be desired. The three types are alike, housed in tastefully designed brown bakelite cabinets, which will regularly harmonise with any furniture. Type S.91 incorporates a built-in loudspeaker, and provides accommodation for all the necessary batteries. Type S.92 requires an extended speaker, in which case the " Telsen W.53 " is strongly recommended and Type C is the receiver alone, which will be particularly useful in the case of the purchaser who desires to use high tension accumulators for anode current supply.



Theoretical Circuit of Models S.91, S.92 and S.93 Telsen Radio Receivers

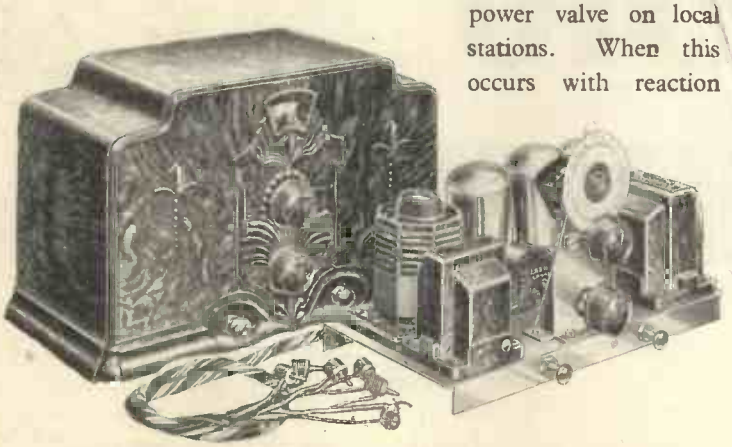
The outstanding features are power, selectivity and unexceptionable quality and improvements in stability and control of reaction, properties which were previously adversely affected by the use of a run down H.T. battery, have been obtained by the inclusion of the new " Telsen 1—1 L.F. Intervalve Coupling Unit."

This unit incorporates a low pass filter feed in the H.T. circuit, thus effectively preventing such troubles as " threshold howl " and L.F. oscillation due to feed-back across the internal resistance of a partly discharged H.T. battery. With most battery driven receivers the H.T. battery needs replacement long before its total energy is exhausted, simply because the changing state of the electrolyte causes increased resistance which makes the quality become progressively worse until finally the set gives a continuous howl. From this it will be realised that these new " Telsen " sets provide a real economy in running expenses as the H.T. battery has a longer useful life. The L.T. consumption, using Mazda valves HL2, L2, P220A, is only .4 ampere. This is within the capacity of the small size accumulator now so popular (Ediswan type E.L.C.25), which has a capacity of 25 ampere hours, from which it is readily seen that, allowing an average of five hours listening per day, this should last a fortnight with ease. It is inadvisable to delay recharge until discharge is complete, a condition indicated by complete failure of the receiver, and so a regular fortnightly recharge will prolong the life of the accumulator and prove more economical in the long run. The grid bias battery is not called upon to supply any current and will, if fresh at purchase, probably last for a year, but should be tested after six months.

The performance of the receivers will prove to be an eye-opener to those who have come to consider a " Straight Three " as a rather modest combination which cannot possibly have long range ambitions. The volume obtained from the local and Daventry 5XX is, of course, overpowering, and yet is fully under control and may be eliminated with ease in favour of one of a large selection of foreign stations which are always available. This remarkable selectivity is comparable to that of

(*continued on next page*)

an expensive band-pass set using gang condenser and is already a familiar phenomenon to many thousands of users of the " Telsen Dual Range Aerial Coil. It is here desirable to add a word of warning that the volume of undistorted sound output obtainable is dependent entirely on the characteristics of the power valve and the high tension supply, and while the Mazda P220A used in conjunction with a 120 volt battery will give ample volume for all domestic needs, the overall amplification of the receiver is so great that it can easily overload the power valve on local stations. When this occurs with reaction



TELSEN S.93 Radio Receiver removed from Bakelite Cabinet—showing the all metal chassis constructed set.

control at zero the music can be reduced to any desired level by adjustment of the selectivity control on top of the aerial coil, and this adjustment once made will require no further attention. Tuning is simplicity itself and consists merely in the rotation of a single knob driving the indicator dial through a delightfully smooth slow-motion device which, while enabling the separation of stations to be made without effort, is yet fast enough to make a change of programme easy and rapid.

A point which is as yet too often neglected in the consideration of the value of a broadcast receiver is reliability. In this respect the Telsen S.91, S.92 and S.93 receivers obtain full marks, for every detail, both mechanical and electrical, has been given careful consideration during design and is subjected to exacting tests during assembly, and indeed the components themselves come of fine pedigreed stock, having already established themselves among amateur constructors in the past.

Finally, it will suffice merely to mention the minor refinements which are fitted as standard on these sturdy sets. Sockets are provided for gramophone pick-up, thus providing for electrical reproduction of gramophone records and the valves are safeguarded by the provision of a fuse in the high tension lead. Alternative aerial tappings give further adaptability to conditions. The S.91 set has sockets for an additional external speaker, while S.92 and S.93 sets may be made to supply two speakers, connecting these in parallel in the L.S. sockets.

From this it will be seen that for those who, by reason of expense or lack of electric mains supply, must use a battery fed receiver, one or other of these three sets will prove eminently suitable, giving absolute satisfaction by its unvarying service during a long and useful life.

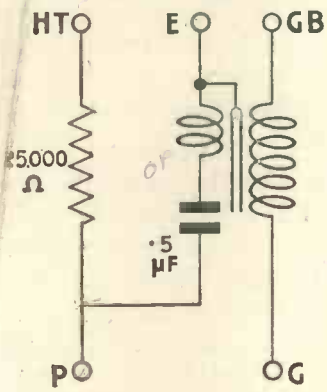
REVIEW OF TELSEN COMPONENTS

—*continued from page* 35

de-coupling circuit prevents low-frequency oscillation in the set in the same way as " breaking step" prevents it while a regiment of soldiers marches over a bridge. Were they to keep in step, the bridge, unless very solidly constructed, would be seriously damaged by the steady impulses regularly imparted to it by a thousand feet meeting the roadway in unison.

The values of the condenser and resistances are not critical in themselves, but they have a certain definite relationship to the impedance of the detector valve and the values of the coupling components. The Technical Department at Aston have made a series of experiments, extending over several months, to ensure the best possible results, and their findings are embodied in the 1/1 coupling unit. Any set incorporating two stages of low-frequency amplification, whether the first stage is resistance, choke, dual-impedance or transformer coupled, can be improved by the use of the coupling unit, unless it is already de-coupled, as is the case with the " AJAX 3 " described in this issue. We definitely state that it will give purer tone, decrease or totally eliminate L.F. oscillation, and increase the useful life of the high tension battery by an thing between 20 per cent. and 50 per cent. That annoying whistling and " motor-boating " which generally denotes that the high tension battery has had its day, is banished for ever. The results will naturally get weaker, but provided that the grid bias is decreased in proportion to the drop in H.T. voltage, the purity of tone will be retained to the last.

THEORETICAL CIRCUIT 10-1 COUPLING UNIT



The 10/1 coupling unit, while serving the same purpose of amplifying at low-frequency, has an entirely different application. It is particularly recommended for single-stage receivers, such as the "NIMROD TWO" and the " JUPITER THREE," especially when followed by a pentode valve. Single L. F. circuits of this type do not require de-coupling, as the " common impedance " effect is less marked, but on the other hand, it is essential, in view of the greatly increased "step-up" required, to take special precautions in order to avoid primary overload.

The Telsen 7/1 " RADIOGRAND " employed the highest ratio possible in the straight-coupling transformer, and is still unparalleled in its own particular sphere. The new coupling unit, however, has the hitherto unattainable ratio of 10 to 1, and takes full advantage of this unprecedented step-up ratio by virtue of the parallel-feed circuit which is incorporated with it, assembled within the same bakelite casing. The resistance, inductance, impedance and capacity values have been most carefully selected from the viewpoint of tone-correction, so necessary in the case of couplings followed by pentode output valves, and we confidently aver that in conjunction with the recommended valves the " Telsen 10/1 Coupling Unit " will give fuller tone and more " vital " reproduction than any other form of coupling used with the same valves, in addition to the increase in volume, which is obvious to the ear immediately a comparative test is made.

No direct current passes through the primary of the transformer, which cannot therefore burn out. The primary is of an appropriate value to produce a tone-correction effect in the input to the pentode valve. The charts of the Research Laboratory, reprints of which are enclosed in the boxes, will convince the expert more than any mere words of ours of the outstanding merit of these latest Telsen contributions to the science of radio. We commend them to the earnest attention of every wireless enthusiast who wishes to get the best out of his set.

TELSEN JUPITER S.G.3

—continued from page 15

Now go over every terminal connection and tighten up. Then raise the front panel to its normal position and rescrew it into its former position as at the beginning of the article. The wiring is now completed, so the leads should be tidied up and neatly disposed in the set. Carefully check over the connections and wiring with the help of the blue-print and the photographs. The instructions contained in the article on " Before you switch on " and the chapter on " Tuning " should be carefully read.

Having read these two articles and arrived at the stage where the set is functioning, the final adjustment for ganging the tuning condensers may be carried out.

First unscrew the compensator adjustment on the tuning condenser near to the output choke. Switch on the set, and by means of the trimmer control set the pointer behind the scale so that its shadow coincides with the indicator markings on the escutcheon plate. Now tune in on the medium wavelength band a fairly weak station between 350 and 200 metres. Do not touch the compensator control. Now operate the " separator " control until the station is very weak, and turn the volume control till the set just oscillates. Turn the main tuning control until the silent point of this oscillation is reached. This is located when the slightest turn of the control knob in either direction causes the set to squeal. Rotate the volume control until the set is just off oscillating point, and turn the trimming adjustment on the tuning condenser behind coil "A" until maximum signal strength is obtained for the station under test. The process should be repeated on a still weaker station when the set will be fully ganged up for both the medium and long wavelength band.

JUPITER III.

List of Components.

Quantity	*Description*	*Cat. No.*	*Price*
1	.0003 Bakelite Reaction Condenser ..	W.188	2/-
1	.0003 Aerial Series Condenser ..	W.205	2/3
1	Two-point Push-Pull Switch	W.107	1/-
1	Drum Drive and Condenser Assembly	W.262	17/6
1 set	Twin Matched Screened Coils ..	W.287	17/-
1	Switch Coupling Link	W.217	6d.
2	Four-Pin Valve Holders	W.224	1/6
1	Five-Pin Valve Holder	W.225	1/-
2	.0003 Mica Condensers	W.242	2/-
1	Grid Leak, 2 megohm	W.251	1/-
1	Tapped Pentode Output Choke, 50/25 H. 20 Ma.	W. 72	7/6
1	10—1 Coupling Unit	W.215	12/6
1	Standard H.F. Choke	W. 75	2/-
1	Fuse Holder	W.146	6d.
1	2 mfd. Condenser	W.226	3/-
1	1 mfd. Condenser	W.227	2/3
1	Constructors Outfit Drum Drive ..	W.219	3/6
	Total		77/-

" JUPITER " S.G. THREE-VALVE RECEIVER.

1st Valve Combination.

Mazda S.G.215. H.L.2. Pen. 220.
HT+1, 50-75 v. HT+2, 96 v. HT+3, 103 v. GB—1, 3 to 4.5 v.
H.T. Battery .. .. .. Ediswan 103 volt. Cat. No. 69718.
G.B. ,, ... Ediswan 9 volt. Cat. No. 69804.
L.T. ,, ... Ediswan 2 volt. Type E.L. M.4.

Recommended Mains Units.

Regentone.

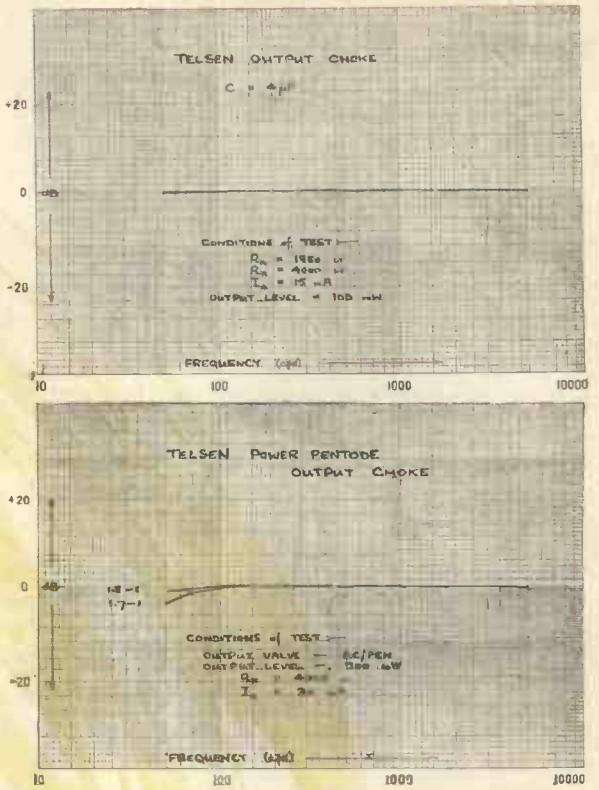
D.C. Eliminator, for H.T. only. Type D.C.1.
A.C. ,, ,, H.T. only Type W.1.C.
D.C. Eliminator, with Trickle Charger. Type D.C. combined 2.
A.C. ,, ,, ,, ,, Type A.C. W.5.A.

2nd Valve Combination.

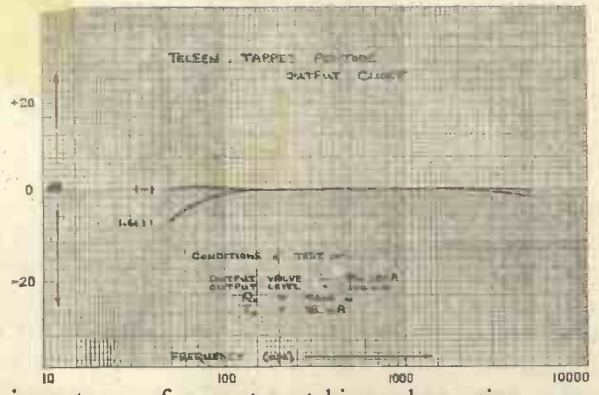
Mazda S.G.215. H.L.2. Pen. 220A.
GB1, 9 to 10.5 v.
D.C. Eliminator, for H.T. only. Type D.C.1.
A.C. ,, ,, H.T. only. Type W.1.C.
D.C. ,, with Trickle Charger. Type D.C. combined 2.
A.C. ,, ,, ,, ,, Type A.C. W.5.A.

RESPONSE CURVES—*continued from page 46*

The output transformers, 1—1 and multi-ratio provide means of matching loudspeakers of various impedances, at the same time keeping the DC anode current out of the LS windings. These, as may be seen from the curves, have ample primary inductance to ensure good low note reproduction, even with 30 m/a. DC primary current, and small leakage loss at high frequencies.



The 15H output choke in combination with a 4 mfd. condenser gives an output filter with an ideal response and will tolerate a primary current up to 40 m/a., at which there is only a 10 volt DC drop.



The importance of correct matching when using a pentode output valve is nowadays becoming more fully realised, and for this purpose the " Tapped Pentode Output Choke " and " Power Pentode Output Choke " are ideal, having the requisite high inductance necessary for pentode working and selection of ratios to permit close matching. With these chokes a gain in bass response is obtained by using a 1 mfd. coupling condenser in place of the more usual 2 or 4 mfd.

These response curves serve to illustrate the reason for the phenomenal success of Telsen transformers and chokes, and by careful production testing on every component manufactured, supplemented by frequent tests in the lavishly equipped Telsen laboratories, every endeavour will be made to maintain in the future the enviable reputation at present enjoyed by the components in the familiar brown bakelite cases.

HOW TO TUNE YOUR SET

—*continued from page* 16

have not previously been received can be estimated. The curve given is for a standard W.76 coil used in conjunction with a .0005 air dielectric Telsen log. condenser, and should be of great assistance to the listener who has not had much experience of tuning.

By utilising the graph on page 16 you will be able to tune immediately to any station which is within range of your aerial and by increasing the reaction slightly and making a small adjustment to the main tuning condenser, the station should be brought in loud and clear, unless it is being actually heterodyned by another transmitter.

In this case a high-pitched whistle will be heard which does not vary with a slight change of tuning. This is interference between two transmitters as distinct from that howl which is heard when the receiver reaction is misused.

When the stations are even closer together in wavelength the whistle will be lower in pitch—in fact so low as to give the impression that the signals are being "chopped up." If you have either of these effects you may as well give up the question of receiving these stations for that night.

Owing to their greater power, it is customary to fit screen grid receivers with some form of volume control, which may conveniently take the form of a series condenser in the aerial lead. Such a condenser is built into the W.76 aerial coil as standard in order to adjust the selectivity of the coil to local conditions. Once set, it rarely needs to be touched on a straight circuit, but if screen grid H.F. amplification is employed it is advantageous to have it controlled from the panel, as is the case with the " Jupiter 3 " in this issue.

One thing which is known to all experts but to few novices is that there is no such thing as increasing selectivity without loss of volume. There are numerous gadgets on the market at fancy prices which are nothing more nor less than series aerial condensers, and if you could read the confidential reports of the testing laboratories on the claims made by the makers you would be extremely amused.

If therefore, your set incorporates a series aerial condenser mounted on the panel bear in mind that the sharper it makes your tuning the less the volume will be. For local stations this does not matter, but on distant reception the loss of volume is a somewhat serious factor, and you should not make use of the separator more than is necessary in order to cut out the unwanted stations or to reduce the volume of sound to comfortable proportions.

The main tuning and reaction controls are with one exception the same as with the straight circuit. It is not yet practicable to " gang " the two tuning condensers necessary with the screen grid circuit so as to give absolute single knob tuning. It is done by many makers of repute, but only at the expense of selectivity and sensitivity. Some form of adjustment of the relative capacities of the tuning condensers must be provided, generally referred to as the " trimmer." A useful analogy to this is found in field-glasses. The main adjustment moves both tubes together, but having regard to the fact that the sight of both eyes is seldom the same and that the disparity is increased by the magnification of the lenses the best makes incorporate a separate adjustment on one only of the eyepieces. As with the condenser gang, if the trimmer is adjusted the main control requires a little further alteration. If this detail is not attended to it is impossible to get a sharp image or, in the case of the condensers, sharp tuning.

We will presume that you have found your main stations and logged them, but that there is a gap in your log between 72°—Scottish Regional and 69°–Muhlacker. Your *World Radio* tells you that Hamburg should be somewhere around there, but there is no sign of him. Tune into the Scottish Regional, and gradually decrease the separator setting until the signals are very weak. Try slight adjustments first of the trimmer and then of the main tuner until he is as loud as you can get him. Decrease the separator setting still further until he is barely audible and repeat the adjustments. Then, when Scottish Regional is tuned in dead sharp and is at the same time very weak, turn your main tuner (being careful not to move the trimmer) to where Hamburg should be according to your graph. Then, and not until then, turn your separator as far to the right as it will go, bringing the " Sunday Switch " into action. Increase the reaction until the set is just oscillating and sweep the dial between the Scottish Regional and Muhlacker settings. You should get a double whistle starting on a high note, going to a very low one, then a gap, followed by a gradually rising note until the commencing pitch is reached. Go back to that silent point—which is the " dead-tuned " position. A slight slacking of the reaction control and a readjustment of the main tuner should bring your station in quite clearly. If interference from another station is experienced the separator setting should be decreased a little.

BEFORE YOU SWITCH ON

—*continued from page* 42

are indicated by the letter "F" on the mouldings. Be careful that your wire does not go into any of the other sockets, especially the "A" (anode or plate) socket. If this happens the bulb will certainly burn out. With the bulb, wire and screw in the position shown in the sketch and the set switched on, the bulb should light.

If one valve holder is right it is reasonable to assume that they are all in order, but it is just as well to try them individually. Having passed this stage of the test connect up the loudspeaker, aerial and earth, remove the screw from the valve holder and switch off the set.

Now unscrew the fuse bulb in the baseboard holder about one turn, just sufficient to clear the bottom contact, and insert the valves in their respective sockets. The great moment has now arrived. Switch on the set and then screw down the fuse bulb until it makes contact. There should be a click from the speaker and a sigh of relief from you.

All this sounds very complicated, perhaps, but care in connecting up is a sign of the expert. " Fools rush in where angels fear to tread." You would no doubt be quite safe, having followed the careful wiring instructions in the **Radiomag**, in switching on and risking it, but twenty minutes spent in testing step by step is cheaper than a new set of valves—and you *might* have done something wrong.

"WE SHALL CONTINUE TO SPECIFY REGENTONE ELIMINATORS FOR ALL TELSEN CIRCUITS"....

Telsen specify Regentone for all their circuits. Experts have praised Regentone for their efficiency, for their unfailing reliability, for their simplicity.

It takes only two minutes to replace those old batteries—continually wearing out, continually costing money—with a new Regentone Mains Unit.

And what a difference in your radio! Unfailing power, giving you greater volume, clearer tone, more perfect radio, for an almost negligible running cost.

Regentone Mains Units are economical. You can buy one for your radio set—any set, any portable—for as little as 50/-. And thence forward your radio will cost only a few pence a week.

Change from batteries to mains—but change with Regentone—the one the experts recommend.

Each Regentone Mains Unit incorporates these exclusive features:

Each model is housed in a solid drawn steel case, attractively designed, with a Florentine bronze finish.

Each model is provided with tappings divided into three main groups: SCREEN GRID, DETECTOR and POWER. The screen grid and detector supply each have high, medium and low outputs. The power supply has one output only.

All mains units incorporate a LINE VOLTAGE REGULATOR, by means of which the voltage fluctuation can be compensated for in the main supply line.

The Line Voltage Regulator and voltage tappings are carried by a specially moulded distributing block; the sockets carrying voltage are sunk into the insulating medium.

REGENTONE

SPECIALISTS IN ALL-ELECTRIC RADIO SINCE 1924

REGENTONE LTD., Regentone House, 21 Bartlett's Buildings, Holborn Circus, London, E.C.4. Telephone: Central 8745 (5 lines).

Northern Distributors: W. E. Beardsall & Co., Victoria Bridge, Manchester. *Irish Free State Distributors: Kelly & Shiel, Ltd., 47 Fleet Street, Dublin.*

TESTING SETS—*continued from page 41*

scale to the other something is radically wrong with the transformer secondary (the portion between terminals "G" and "GB" — or with the bias battery, and the trouble will be equally obvious to the ear, but if the trouble is less pronounced the ear, which is a most accommodating organ, may pass the results, while the high-tension battery, as it were, bleeds to death.

You will soon see how this can come about if you note the position of the needle; switch off the set, move the grid bias plug connected to the last transformer one socket up or down and switch on again. If you have moved the plug nearer to the G.B. + end of the battery the needle will go even further over the scale, and any fluctuation of the needle will become more pronounced. The reverse case also holds good. The thing to strive for is to get the needle practically stationary except on very heavy passages in music or speech and then to kick *upwards* (away from zero) very slightly. If it kicks downwards you have too much grid bias, which, though very economical in H.T., reduces the handling capacity of the valve and introduces another form of distortion.

Now we have assured ourselves that the power valve is behaving properly it would be interesting to know how much current it is taking. If you have a three-reading meter this has only to be read off the scale, and it is a matter of simple conversion if the full scale deflection is known. If you have omitted to obtain this information from your dealer, however, there is still one more chance of finding it out. The face of your meter may be marked with a number or two numbers followed by an ohm sign, and if the dial is printed in two colours the numbers will also be different in colour. Take the one printed in the colour of the scale you have been using (it is generally the lowest number).

$$I = \frac{E}{R}$$

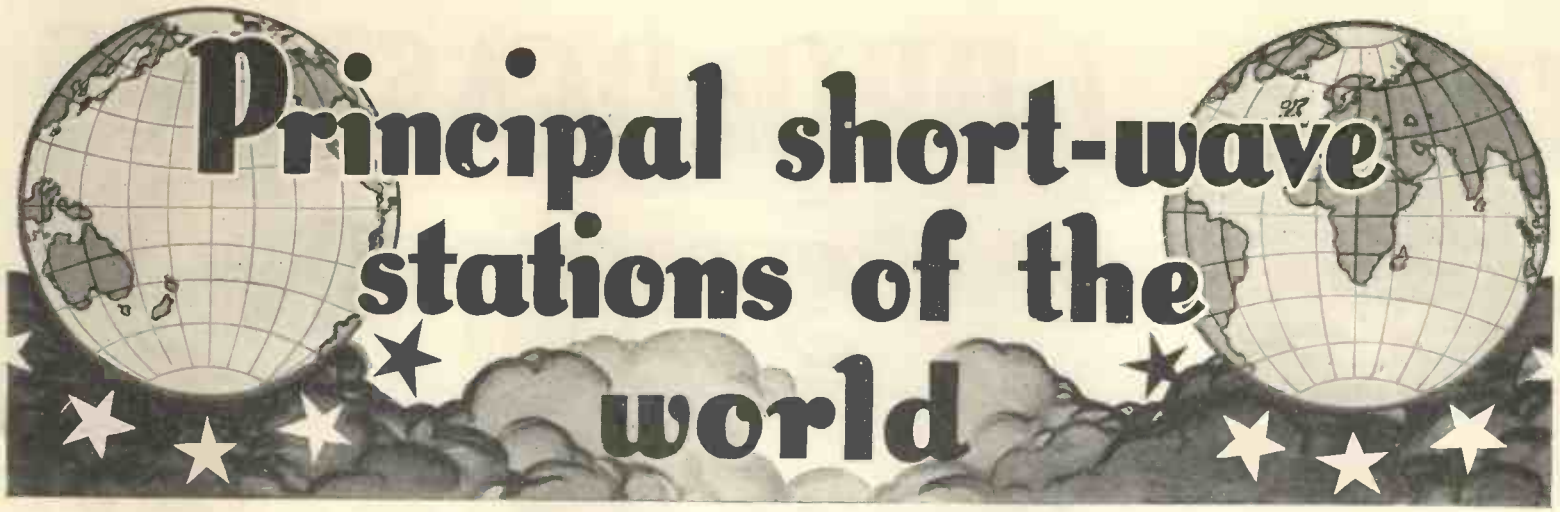
$$= \frac{6 \text{ volts}}{200 \text{ ohms}} \text{ (in the case of the writer's meter).}$$

$$= \frac{3}{100} \text{ amperes.}$$

$$= 30 \text{ milliamp.}$$

Now the reading with the meter in the anode lead of the power valve is $1\frac{1}{4}$ volts, therefore the current passing is about $6\frac{1}{4}$ m/a. which, provided that the requirements of the other valves are fairly low, is quite within the reasonable service range of a standard dry battery. Let us see what the total consumption of the set is.

Switch off. Remove the plugs or terminals from the power valve holder. Replace the power valve in the set. Disconnect the tester and reconnect the T+ lead to its proper terminal. Connect the meter up again as in Figure 2 and leave the "B" terminals disconnected instead of connecting a battery to them. The black (H.T.—) wander plug should now be inserted into the filament socket of the valve holder in the tester, which is connected to terminal "S"+ and the T+ lead from the tester inserted in the H.T.—socket of the H.T. battery. Now switch the set on and the meter will read the total consumption of the set. If it is a straight two- or three-valve set it will probably be about 25 per cent. over the power-valve reading. A screen grid three will probably take twice as much. The "Jupiter 3," of which a Blue-print is given in this issue, has been designed so that if the specified components and the exact valves and batteries are used the total consumption is only $7\frac{1}{2}$ to 9 m/a., according to whether a pentode or power valve is used, which is a remarkable figure for this class of receiver and brings it well within the dry-battery class.

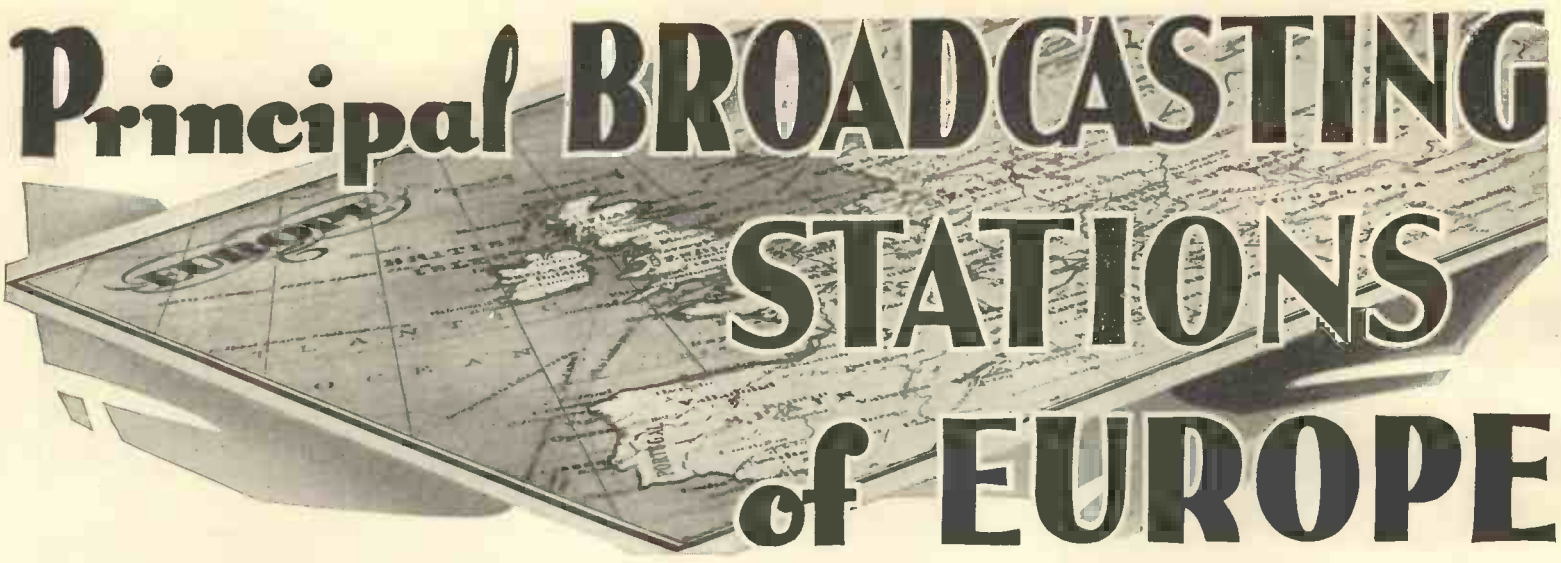


Principal short-wave stations of the world

Wave-length Metres	F'qu'cy Kilo-cycles	Call Sign	Station	Dial Readings Left	Dial Readings Right	Country
14.55	20,618	PMB	Malabar			Java
14.83	20,229	DGW	Nauen			Germany
15.0	20,000	—	Prangins (Radio Nations)			Switzerland
15.07	19,907	LSG	Monte Grande			Argentine
15.14	19,815	WM1	Deal Beach			U.S.A.
15.198	19,739	EAQ	Aranjuez			Spain
15.44	19,430	OQH	Elizabethville			Belgian Congo
15.5	19,350	PCP	Kootwijk			Holland
15.5	19,350	VK2ME	Sydney			Australia
15.51	19,342	WNC	Deal Beach			U.S.A.
15.57	19,268	PPU	Rio de Janeiro			Brazil
15.62	19,206	ORG	Ruysselede (Bruges)			Belgium
15.93	18,830	PLE	Bandoeng			Java
16.1	18,634	GBU	Rugby			Great Britain
16.3	18,404	PCK	Kootwijk			Holland
16.32	18,380	FZA	Saigon			Indo-China
16.36	18,337	GBS	Rugby			Great Britain
16.54	18,137	GBW	Rugby			Great Britain
16.57	18,105	W9XAA	Chicago, Ill.			U.S.A.
16.66	18,007	WAJ	Rock Point, N.Y.			U.S.A.
16.8	17,857	PLF	Malabar			Java
16.9	17,750	HSP	Bangkok			Siam
18.41	16,300	PCL	Kootwijk			Holland
18.5	16,216	GBX	Rugby			Great Britain
19.56	15,337	W2XAD	South Schenectady, N.J.			U.S.A.
19.68	15,244	FYA	Pontoise			France
19.72	15,210	W8XK	East Pittsburgh, Pa.			U.S.A.
19.73	15,200	DJB	Zeesen			Germany
19.84	15,121	HVJ	Vatican State, Rome			Italy
20.26	14,808	WQV	Rock Point			U.S.A.
20.49	14,641	W2XBJ	Deal, N.J.			U.S.A.
20.5	14,630	XDA	Chapultepec			Mexico
23.5	12,766	IAC	Coltano			Italy
24	12,500	CT3AQ	Funchal			Madeira
24.98	12,010	FZR	Saigon			Indo-China
25.14	11,933	FYA	Paris			France
25.16	11,924	RW50	Moscow, Popoff			U.S.S.R.
25.2	11,905	FYA	Pontoise			France
25.25	11,880	W8XK	East Pittsburgh, Pa.			U.S.A.
25.27	11,870	VUC	Calcutta			India
25.34	11,840	W9XAA	Chicago, Ill.			U.S.A.
25.4	11,810	2RO	Prato Smeraldo, Rome			Italy
25.42	11,800	VE9GW	Bowmanville			Canada
25.46	11,777	F3ICD	Saigon			Indo-China
25.5	11,765	XDA	Chapultepec			Mexico
25.53	11,750	G5SW	Chelmsford			Great Britain
25.63	11,705	FYA	Pontoise			France
26.22	11,440	DHA	Nauen			Germany
28.2	10,365	PLR	Bandoeng			Java
28.98	10,350	LSX	Buenos Aires			Argentine
29	10,345	DEQ	Nauen			Germany
30.4	9,869	EAQ	Madrid			Spain
30.57	9,814	LQE	Buenos Aires			Argentine
30.64	9,791	GBW	Rugby			Great Britain
30.77	9,750	WEL	Rock Point			U.S.A.
30.94	9,696	LQA	Buenos Aires			Argentine
31.1	9,640	HS2PJ	Bangkok			Siam
31.2	9,615	YV8BC	Maracay			Venezuela
31.25	9,598	CT1AA	Lisbon			Portugal
31.26	9,596	PCJ	Eindhoven			Holland
31.28	9,590	VK3ME	Melbourne, Victoria			Australia
31.28	9,590	VK2ME	Sydney			Australia
31.3	9,582	W3XAU	Philadelphia, Pa.			U.S.A.
31.35	9,570	W1XAZ	East Springfield, Mass.			U.S.A.
31.35	9,570	SR1	Posen			Poland
31.38	9,560	DJA	Zeesen			Germany
31.48	9,530	W2XAF	Schenectady, N.Y.			U.S.A.
31.51	9,520	OXY	Skamleback			Denmark
31.55	9,510	VK3ME	Melbourne, Victoria			Australia
31.75	9,450	WEJ	Rock Point			U.S.A.
31.86	9,415	PLV	Bandoeng			Java
32.26	9,300	—	Rabot (Radio Maroc)			Morocco
32.85	9,130	HB90C	Zurich			Switzerland
33.5	8,928	TGX	Guatemala City			S. America
34.66	8,656	VE9AP	Drummondville			Canada
34.68	8,650	W2XV	Long Island, N.Y.			U.S.A.
35	8,571	—	Daker			Fr. West Africa
36.92	8,125	PLW	Bandoeng			Java
37.2	8,060	OU1TH	Vienna			Austria
37.5	8,000	JKBB	Tokio			Japan
38	7,890	PK3BK	Soerabaia			Java
38.65	7,762	PDN	Kootwijk			Holland
39.4	7,612	X26A	Nuevo Laredo			Mexico
39.7	7,556	HKF	Bagota			Columbia
39.74	7,549	CKS	Calgary, Alb.			Canada
40.4	7,426	SP1AX	Warsaw			Poland
40.54	7,400	WEM	Rock Point			U.S.A.
40.7	7,370	X26A	Nuevo Laredo			Mexico
41.5	7,230	HB9D	Zurich (Radio Club)			Switzerland
41.6	7,211	EAR58	Las Palmas (Teneriffe)			Canary Isles
41.7	7,195	VSIAB	Singapore			Malay States
42	7,143	VK2HR	Sydney			Australia
42.3	7,092	D4XAA	Stuttgart			Germany
42.8	7,009	2RO	Rome			Italy
42.8	7,009	F8BP	Rugles			France
42.9	6,993	CT1AA	Lisbon			Portugal
43	6,977	PK3BK	Soerabaia			Java
43	6,977	EAR110	Madrid			Spain
43.6	6,881	D4AFF	Koethen			Germany
43.75	6,857	F8LH	Paris			France
44.9	6,682	DGK	Nauen			Germany
45.31	6,620	PRADO	Riobamba			Ecuador
45.38	6,611	REN	Moscow			U.S.S.R.
46.18	6,496	OQH	Elizabethville			Belgian Congo
46.67	6,426	VE9BY	London, Ontario			Canada
46.69	6,425	W3XL	Bound Brook, N.J.			U.S.A.
46.72	6,421	RW62	Minsk			U.S.S.R.
47	6,383	IAC	Coltano			Italy
47	6,383	HC1DR	Quito			Ecuador
48	6,250	CN8MC	Casablanca			Morocco
48.05	6,243	HKD	Barranquilla			Columbia
48.2	6,220	2RO	Rome			Italy
48.5	6,186	ON4FB	Brussels			Belgium
48.62	6,170	HRB	Tegucigalpa			Honduras
48.65	6,167	X1F	Mexico City			Mexico
48.8	6,147	VE9CL	Winnipeg			Canada
48.86	6,140	W8XK	East Pittsburgh, Pa.			U.S.A.
48.95	6,127	YV11BMO	Maracaibo			Venezuela
49.18	6,100	W3XAL	Bound Brook, N.J.			U.S.A.
49.2	6,096	JB	Johannesburg			S. Africa
49.22	6.095	VE9GW	Bowmanville, Ont.			Canada
49.34	6,080	W2XCX	Kearny, N.J.			U.S.A.
49.4	6,072	UOR2	Vienna Experimental			Austria
49.4	6,072	ZTJ	Johannesburg			S. Africa
49.43	6,069	VE9CS	Vancouver, B.C.			Canada
49.5	6,060	W3XAU	Philadelphia, Pa.			U.S.A.
49.5	6,060	W8XAL	Cincinnati, Ohio			U.S.A.
49.5	6,060	CMCI	Havana			Cuba
49,59	6,050	VE9GX	Halifax			Nova Scotia
49.67	6,042	W2XAL	Coytesville, New Jersey			U.S.A.
49.8	6,023	XEW	Mexico City			Mexico
49.83	6,020	W9XF	Chicago			U.S.A.
49.96	6,005	VE9DR	Montreal (Drummondville)			Canada
49.96	6,005	HRB	Tegucigalpa			Honduras
50	6,000	RW59	Moscow			U.S.S.R.
50	6,000	ZL3ZC	Christchurch			New Zealand
50	6,000	HKD	Barranquilla			Columbia
50.26	5,969	HVJ	Vatican State, Rome			Italy
50.6	5,928	HKO	Medellin			Columbia
51.22	5,857	XDA	Chapultepec			Mexico
52.5	5,714	HCJB	Quito			Ecuador
54.4	5,515	RV38	Moscow			U.S.S.R.
54.52	5,502	W2XBH	New York (Brooklyn)			U.S.A.
58	5,172	OK1MPT	Prague			Czecho-Slovakia
58.3	5,145	PMY	Bandoeng			Java
60.3	4,975	G6RX	Rugby			Great Britain
60.3	4,975	GBC	Rugby			Great Britain
62.5	4,800	WOO	Deal Beach			U.S.A.
62.5	4,800	W2XV	Long Island			U.S.A.
67.65	4,435	DFK	Doeberitz			Germany
70.2	4,273	RV15	Khabarovsk			U.S.S.R.

Good Radio is a joy forever

Principal BROADCASTING STATIONS of EUROPE



Wave-length	Name of Station	Dial Readings	Country
211.3	Newcastle		Great Britain
214	Aberdeen		Great Britain
214.4	Warsaw (No 2)		Poland
221.7	Fecamp		France
224.4	Cork		Irish Free State
230.6	Malmo		Sweden
	Karlstad		Sweden
	Halsingborg		Sweden
232.2	Kiel		Germany
234	Lodz		Poland
235 5	Kristianssand		Norway
236.2	Bordeaux-Sud-Ouest		France
238.9	Nurnberg		Germany
240.2	Stavanger		Norway
242.3	Belfast		Ireland
244.1	Basle		Switzerland
245.9	Cassel		Germany
	Linz		Austria
247.7	Trieste		Italy
249.6	Juan-les-Pins		France
251.5	Barcelona		Spain
253.3	Gleiwitz		Germany
255.1	Toulouse		France
257	Horby		Sweden
259.3	Leipzig		Germany
261.5	London National		Great Britain
263.8	Moravska-Ostrava		Czecho-Slovakia
265.8	Lille		France
267.6	Valencia		Spain
271.5	Rennes		France
273.7	Turin		Italy
276.5	Heilsberg		Germany
278.8	Bratislava		Czecho-Slovakia
281.2	Copenhagen		Denmark
283.6	Magdeburg		Germany
	Berlin		Germany
	Stettin		Germany
	Innsbruck		Austria
286	Montpellier		France
287.3	Radio Lyon		France
288.5	Swansea		Great Britain
	Plymouth		Great Britain
	Aberdeen		Great Britain
	Edinburgh		Great Britain
	Dundee		Great Britain
	Bournemouth		Great Britain
291	Viipuri		Finland
294	Kosice		Czecho-Slovakia
296.1	Hilversum		Holland
298.8	Tallinn		Estonia
301.5	North National		Great Britain
304	Bordeaux		France
307	Zagreb (Agram)		Yugo-Slavia
	Falun		Sweden
308.6	Natan Vitus (Paris)		France
309.9	Cardiff		Great Britain
312.8	Cracow		Poland
	Genoa		Italy
316	Marseilles		France
318.8	Naples		Italy
321.9	Goteborg		Sweden
325	Breslau		Germany
328.2	Grenoble		France
	Poste Parisien		France
331.5	Milan		Italy
334.4	Poznan		Poland
337.8	Brussels (No. 2)		Belgium
341.7	Brunn		Czecho-Slovakia
345.2	Strasbourg		France
348.8	Barcelona		Spain
352.1	Graz		Austria

Wave-length	Name of Station	Dial Readings	Country
355.8	London Regional		Great Britain
360.6	Muhlacker		Germany
363.4	Algiers		North Africa
364	Bergen		Norway
367.6	Fredriksstad		Norway
368.1	Helsinki		Finland
369.4	Radio LL (Paris)		France
372	Hamburg		Germany
376.4	Scottish Regional		Great Britain
379.7	Seville		Spain
380.7	Lwow		Poland
385.1	Radio Toulouse		France
389.6	Frankfurt		Germany
394	Bucarest		Roumania
398.9	Midland Regional		Great Britain
403	Sottens		Switzerland
408	Katowice		Poland
413	Dublin (2RN)		Irish Free State
416	Radio Maroc		North Africa
419	Berlin		Germany
424	Madrid (EAJ7 & EAJ2)		Spain
431	Belgrade		Yugo-Slavia
435.4	Stockholm		Sweden
441	Rome		Italy
447.1	Paris (Ecole Sup. PTT)		France
	Tartu		Estonia
453.2	San Sebastian		Spain
	Danzig		Danzig
	Klagenfurt		Austria
	Porsgrund		Norway
459	Beromuenster		Switzerland
466	Lyon-la-Doua		France
472.4	Langenberg		Germany
480	North Regional		Great Britain
488.6	Prague		Czecho-Slovakia
493.4	Trondheim		Norway
500.8	Florence		Italy
509	Brussels (No. 1)		Belgium
517.2	Vienna		Austria
525	Riga		Latvia
533	Munich		Germany
542	Palermo		Italy
	Sundsvall		Sweden
550	Budapest		Hungary
559.7	Kaiserslautern		Germany
	Augsberg		Finland
	Hamar		Norway
565	Wilno		Poland
566	Hanover		Germany
569.3	Freiburg		Germany
574.7	Ljubljana		Yugo-Slavia
720	Moscow (Exp)		Russia
937.5	Kharkov		Russia
1,000	Leningrad		Russia
1,071	Tiflis		Russia
1,083	Oslo		Norway
1,116	Moscow Popoff		Russia
1,153	Kalundborg		Denmark
1,200	Reykjavik		Iceland
1,229	Boden		Sweden
1,304	Moscow (T.U.)		Russia
1,348	Motala		Sweden
1,411.8	Warsaw		Poland
1,446	Eiffel Tower, Paris		France
1,481	Moscow (Kom.)		Russia
1,538	Ankara		Turkey
1,554.4	Daventry (National)		Great Britain
1,634.9	Zeesen		Germany
1,724.1	Radio Paris		France
1,796	Lahti		Finland
1,875	Huizen		Holland
1,935	Kaunas		Lithuania

Good Radio is a joy forever

TELSEN
BROADCASTING MAP OF EUROPE

Wave-length	Name of Station	No.
211.3	Newcastle	1
214.4	Warsaw (No. 2)	2
221.7	Fecamp	3
224.4	Cork	4
230.6	Malmo	5
	Karlstad	6
	Halsingborg	7
232.2	Kiel	8
234	Lodz	9
235.5	Kristianssand	10
236.2	Bordeaux-Sud-Ouest	11
238.9	Nurnberg	12
240.2	Stavanger	13
242.3	Belfast	14
244.1	Basle	15
245.9	Cassel	16
	Linz	17
247.7	Trieste	18
249.6	Juan-les-Pins	19
251.5	Barcelona	20
253.3	Gleiwitz	21
255.1	Toulouse	22
257	Horby	23
259.3	Leipzig	24
261.5	London National	25
263.8	Moravska-Ostrava	26
265.8	Lille	27
267.6	Valencia	28
271.5	Rennes	29
273.7	Turin	30
276.5	Heilsberg	31
278.8	Bratislava	32
281.2	Copenhagen	33
283.6	Magdeburg	34
	Berlin	35
	Stettin	36
	Innsbruck	37
286	Montpellier	38
287.3	Radio Lyons	39
288.5	Swansea	40
	Plymouth	41
	Aberdeen	42
	Edinburgh	43
	Dundee	44
	Bournemouth	45
291	Viipurl	47
294	Kosice	48
296.1	Hilversum	49
298.8	Tallinn	50
301.5	North National	51
304	Bordeaux	52
307	Zagreb (Agram)	53
	Falun	54
308.6	Natan Vitus (Paris)	55
309.9	Cardiff	56
312.8	Cracow	57
	Genoa	58
316	Marseilles	59
318.8	Naples	60
321.9	Goteborg	61
325	Breslau	62
328.2	Grenoble	63
	Poste Parisien	64
331.5	Milan	65
334.4	Poznan	66
337.8	Brussels (No. 2)	67
341.7	Brunn	68
345.2	Strasbourg	69
348.8	Barcelona	70
352.1	Graz	71

Wave-length	Name of Station	No.
355.8	London Regional	72
360.6	Muhlacker	73
363.4	Algiers	74
364	Bergen	75
367.6	Fredriksstad	76
368.1	Helsinki	77
369.4	Radio LL (Paris)	78
372	Hamburg	79
376.4	Scottish Regional	80
379.7	Seville	81
380.7	Lwow	82
385.1	Radio Toulouse	83
389.6	Frankfurt	84
394	Bucarest	85
398.9	Midland Regional	86
403	Sottens	87
408	Katowice	88
413	Dublin (2RN)	89
416	Radio Maroc	90
419	Berlin	91
424	Madrid (EAJ7)	92
431	Belgrade	93
435.4	Stockholm	94
441	Rome	95
447.1	Paris (Ecole Sup. PTT)	96
	Tartu	97
453.2	San Sebastian	98
	Danzig	99
	Klagenfurt	100
	Porsgrund	101
459	Beromuenster	102
466	Lyon-la-Doua	103
472.4	Langenberg	104
480	North Regional	105
488.6	Prague	106
493.4	Trondheim	107
500.8	Florence	108
509	Brussels (No. 1)	109
517.2	Vienna	110
525	Riga	111
533	Munich	112
542	Palermo	113
	Sundsvall	114
550	Budapest	115
559.7	Kaiserlautern	116
	Augsberg	117
	Hamar	118
563	Wilno	119
566	Hanover	120
569.3	Freiburg	121
574.7	Ljubljana	122
720	Moscow (Exp.)	123
937.5	Kharkov	124
1,000	Leningrad	125
1,071	Tiflis	126
1,083	Oslo	127
1,116	Moscow Popoff	128
1,153	Kalundborg	129
1,200	Reykjavik	130
1,229	Boden	131
1,304	Moscow (T.U.)	132
1,348	Motala	133
1,411.8	Warsaw	134
1,446	Eiffel Tower, Paris	135
1,481	Moscow (Kom.)	136
1,538	Ankara	137
1,554.4	Daventry (National)	138
1,634.9	Zeesen	139
1,724.1	Radio Paris	140
1,796	Lahti	141
1,875	Huizen	142
1,935	Kaunas	143

TELSEN RADIO COMPONENTS

A Complete List giving Catalogue Nos., Descriptions and Prices

* The items marked with an asterisk and printed in heavy type have been introduced, re-designed or revised in price since the last issue of *The Telsen Radiomag*.

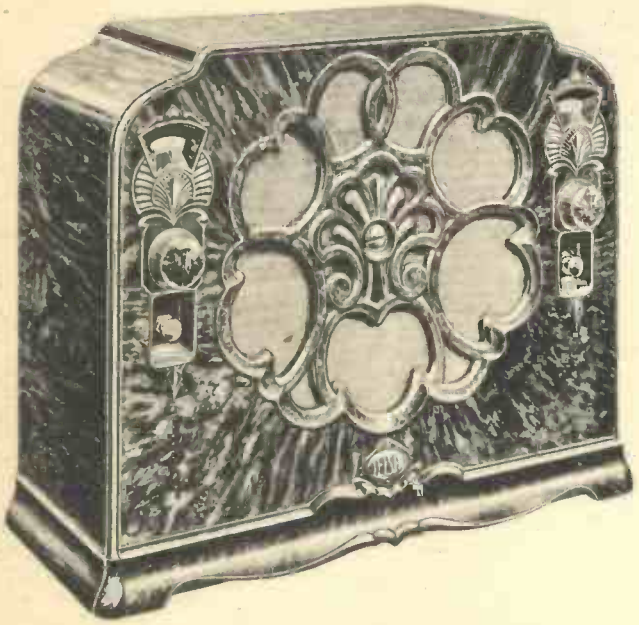
Cat. No.	Description	Price
W. 53	Cabinet Loudspeakers, 5 col.	25/-
W. 54	Loudspeaker Unit	5/6
*W. 58	**Radiogrand Transformer, 5—1**	7/6
*W. 59	" " 3—1	7/6
*W. 60	" " 7—1	10/6
*W. 61	" " 1·75—1	10/6
*W. 62	" " 1—1	10/6
*W. 63	" " **Multi Ratio**	10/6
W. 65	Ace Transformer, 5—1	5/6
W. 66	" " 3—1	5/6
W. 68	L.F. Choke, 40 h.	5/-
W. 69	" " 100 h.	5/-
*W. 71	**Output Chokes**	7/-
*W. 72	**Tapped Pentode Output Choke**	7/6
W. 74	Binocular H.F. Choke	5/-
W. 75	Standard H.F. Choke	2/-
W. 76	Dual Range Aerial Coil, I.D.	7/6
W.107	Push-Pull Switch, 2-point	1/-
W.108	" " " 3-point	1/3
W.109	Spaghetti Resistance, 300 ohm	6d.
W.110	" " 600 ohm	6d.
W.111	" " 750 ohm	6d.
W.112	" " 1,000 ohm	6d.
W.113	" " 1,500 ohm	9d.
W.114	" " 2,000 ohm	9d.
W.115	" " 3,000 ohm	9d.
W.116	" " 4,000 ohm	9d.
W.117	" " 5,000 ohm	9d.
W.118	" " 10,000 ohm	1/-
W.119	" " 15,000 ohm	1/-
W.120	" " 20,000 ohm	1/-
W.121	" " 25,000 ohm	1/-
W.122	" " 30,000 ohm	1/-
W.123	" " 50,000 ohm	1/6
W.124	" " 60,000 ohm	1/6
W.125	" " 80,000 ohm	1/6
W.126	" " 100,000 ohm	1/6
W.130	Logarithmic Variable Condenser, .00025	4/6
W.131	" " " .00035	4/6
W.132	" " " .0005	4/6
*W.141	**Slow Motion Dial, Black**	2/-
*W.141a	" " " **Walnut**	2/-
W.146	Fuse-Holders	6d.
W.148	Grid Leak Holders	6d.
W.149	Pre-set Condenser, .002	1/6
W.150	" " .001	1/6
W.151	" " .0003	1/6
W.152	" " .0001	1/6
W.153	Push-Pull Switch, 4-point	1/6
W.154	H.F. Transformer Coil	5/6
W.159	Popular Chassis	5/6
W.166	Metal Screen	2/-
W.167	" " with Hole	2/6
W.170	Major Chassis	10/6
*W.172	**Power Pentode Output Choke**	10/6
W.174	Combined Dual Range Short Wave Coil	4/6
W.175	Mansbridge Condenser, 500 v., 4 mfd.	5/6
W.176	" " 500 v., 6 mfd.	8/-
W.177	" " 500 v., 8 mfd.	10/6
W.178	" " 1,000 v., 4 mfd.	9/6
W.179	" " 1,000 v., 6 mfd.	14/6
*W.180	**Telexor**	10/6
W.181	Loudspeaker	10/6
W.182	"	17/6
W.183	"	22/6
*W.184	**Illuminated Disc Drive**	3/6
W.185	Bakelite Differential Condenser, .0003	2/6
W.186	" " " .00015	2/6
W.187	" " " .0001	2/6
W.188	" Reaction " .0003	2/-
W.189	" " " .00015	2/-
W.190	" " " .0001	2/-

Cat. No.	Description	Price
W.191	Bakelite Reaction Condenser, .00075	2/6
W.192	" " " .0005	2/6
W.193	" Tuning " .0005	2/6
W.194	" " " .0003	2/6
W.196	Aerial Coupling Condenser, .00004	2/-
W.197	S.T.300 Coil pair	11/6
*W.198	**Universal Valve-Holders**	1/-
*W.199	**Mains Fuses, amp. .5**	6d.
*W.200	" " **amp. 1**	6d.
*W.201	" " **amp. 2**	6d.
*W.202	" " **amp. 3**	6d.
*W.203	**Power Fuse-Holder**	6d.
*W.204	**Terminal Block**	6d.
*W.205	**Aerial Series Condenser with Switch**	2/3
*W.206	**Telornor**	7/6
*W.207	**Tag Condenser, .0001**	6d.
*W.208	" " .0002	6d.
*W.209	" " .0003	6d.
*W.210	" " .0004	6d.
*W.211	" " .0005	6d.
*W.212	" " .001	6d.
*W.213	" " .002	6d.
*W.214	**Coupling Unit 1—1**	7/6
*W.215	" " 10—1	12/6
*W.216	**Screened Coils**	8/6
*W.217	**Coil Switch Coupling Assembly**	6d.
*W.218	**Coil Switch Knob Assembly**	1/-
*W.219	**Constructor's Outfit, Drum Drive**	3/6
*W.220	" " **Telornor**	3/6
*W.222	**Anti-MicroValve-Holder, 4-pin**	1/-
*W.223	" " 5-pin	1/3
*W.224	**Solid Type Valve-Holder, 4-pin**	9d.
*W.225	" " " 5-pin	1/-
*W.226	**Mansbridge Condenser, 500 v., 2 mfd.**	3/-
*W.227	" " 500 v., 1 mfd.	2/3
*W.228	" " 500 v., .5 mfd.	2/3
*W.229	" " 500 v., .25 mfd.	2/-
*W.230	" " 500 v., .04 mfd.	1/9
*W.231	" " 500 v., .1 mfd.	1/9
*W.232	" " 500 v., .01 mfd.	1/6
*W.233	" " 1,000 v., 2 mfd.	5/-
*W.234	" " 1,000 v., 1 mfd.	3/6
*W.235	" " 1,000 v., .5 mfd.	3/3
*W.236	" " 1,000 v., .25 mfd.	3/-
*W.237	" " 1,000 v., .04 mfd.	2/9
*W.238	" " 1,000 v., .1 mfd.	2/9
*W.239	" " 1,000 v., .01 mfd.	2/6
*W.240	**Fixed Mica Condenser, .0001**	1/-
*W.241	" " " .0002	1/-
*W.242	" " " .0003	1/-
*W.243	" " " .0004	1/-
*W.244	" " " .0005	1/-
*W.245	" " " .001	1/-
*W.246	" " " .002	1/-
*W.247	" " " .006	1/3
*W.248	**Grid Leak, ¼ meg.**	1/-
*W.249	" " ½ meg.	1/-
*W.250	" " 1 meg.	1/-
*W.251	" " 2 meg.	1/-
*W.252	" " 3 meg.	1/-
*W.253	" " 4 meg.	1/-
*W.254	" " 5 meg.	1/-
*W.255	**Drum Drive**	8/6
*W.256	**Log. Variable Condenser, Left-Hand, .0005**	4/6
*W.257	**Small Friction Disc Drive**	2/6
*W.260	**Log. Var. Cond., .0005, L.H., with Compensator**	5/-
*W.261	" " " .0005, R.H., " "	5/-
*W.262	**Drum Drive and Condenser Assembly**	17/6
*W.285	**R.C. Coupling Unit**	4/-
*W.287	**Twin Matched Screened Coils**	17/-
*W.288	**Triple Matched Screened Coils**	25/6

Printed by JAMES COND LTD., at 148-149, Great Charles Street, Birmingham, and Published by the Proprietors TELSEN ELECTRIC CO. LTD., Aston, Birmingham, England.

and now ***TELSEN*** *offers you the world's finest value in*

COMPLETELY ASSEMBLED RECEIVERS!



Designed by Britain's leading radio technicians, and built throughout of Telsen Components in Britain's largest and most completely equipped radio factory, these new TELSEN RADIO RECEIVERS in their handsome Walnut Bakelite Cabinets, are undoubtedly the finest receivers of their kind in the world—yet they are offered to you at the LOWEST PRICES in radio history! They definitely set a new standard in radio values, bringing Telsen quality reception within the reach of the man who doesn't care for a "Kit," yet can't afford expensive ready-built radio. Hear them at your dealer's to-day and realise how easily you can now afford to enjoy the best that radio can offer!

MODEL S91. Self-contained 3 Valve Battery Receiver, complete in cabinet with built-in Loud Speaker and accommodation for all batteries.

SPECIFICATION:

Alternative aerial tappings and Selectivity Control. Medium and Long Wave Range. Circuit: Det.—L.F.—Power. Loose coupled aerial coil to tuned grid detector with Differential Reaction. Resistance capacity (decoupled) and Transformer coupled. L.F. stages followed by Power Output. Provision for Gramophone Pick-up and additional Loud-speaker.

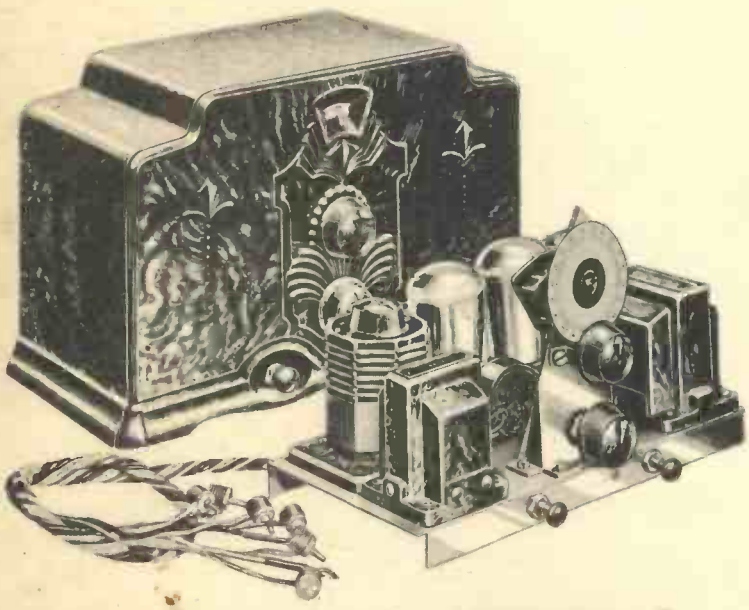
105/-

Complete with Mazda Valves and built-in Speaker.

MODEL S92. 3 Valve Battery Receiver similar to S91, but in cabinet of different design, having accommodation for all batteries, but not including Loud-speaker or providing for Loud-speaker.

85/-

Complete with Mazda Valves.



MODEL S93. 3 Valve Battery Receiver similar to S92, but in smaller sized cabinet containing Receiver only. The illustration shows the all-metal chassis constructed Receiver removed from the Cabinet.

75/-

Complete with Mazda Valves.

TELSEN

RADIO RECEIVERS

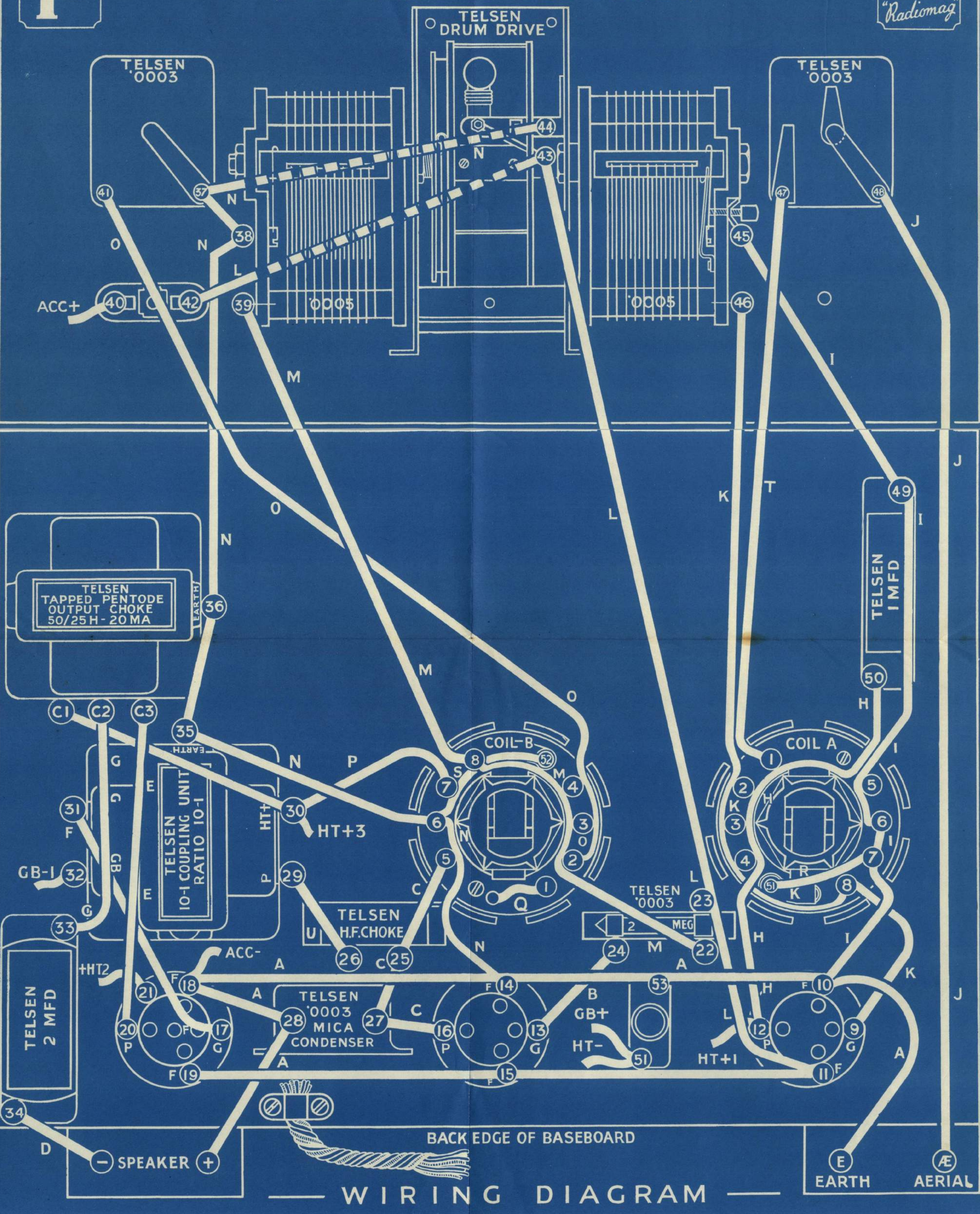
Good Radio is a joy forever

PRICE 1/-

THE TELSEN "JUPITER" 3

(SCREENED GRID – DETECTOR – PENTODE)

ISSUED FREE WITH THE TELSEN "Radiomag"

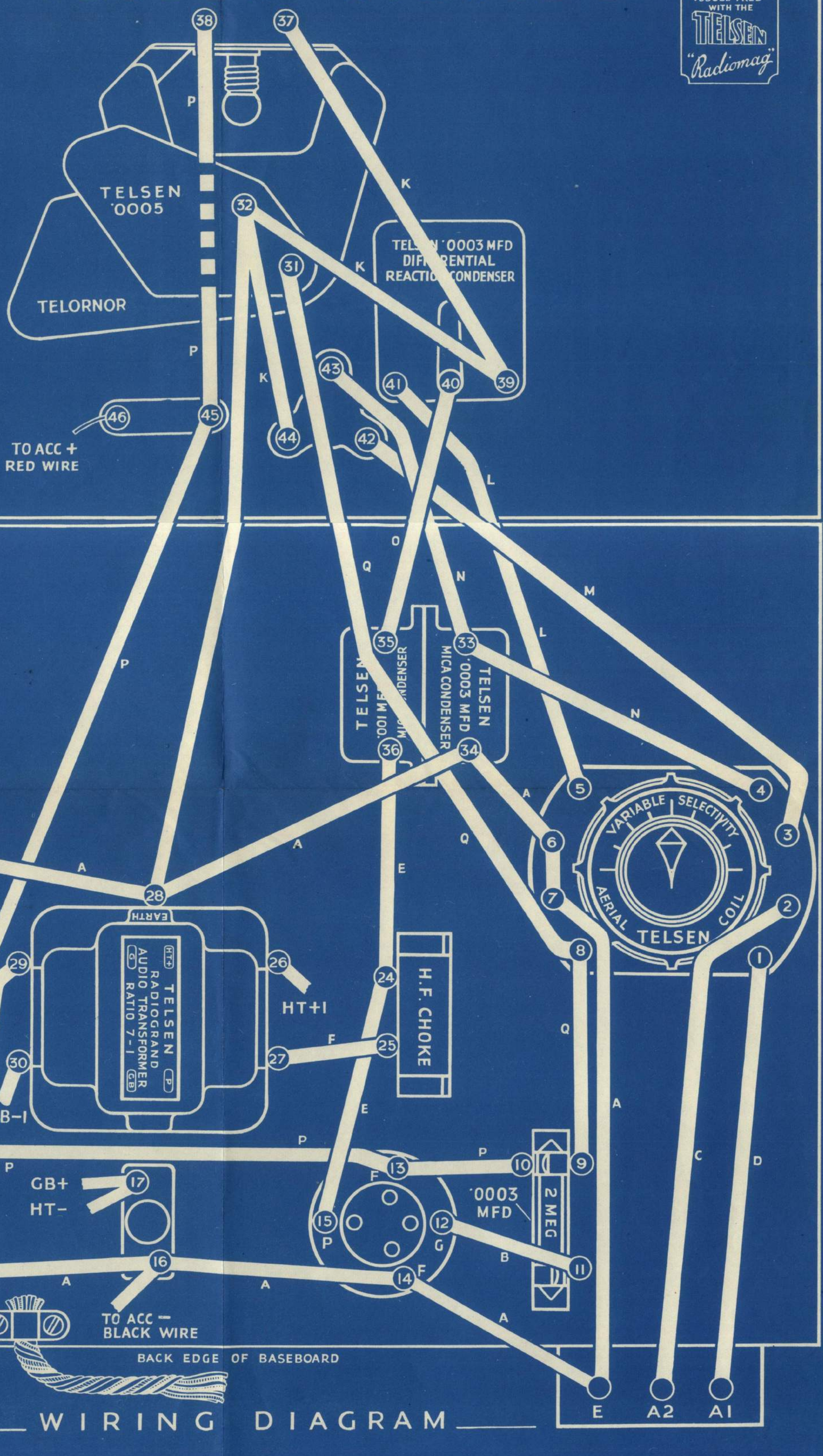


WIRING DIAGRAM

PRICE 1/-

THE TELSEN "NIMROD" 2

ISSUED FREE WITH THE TELSEN "Radiomag"

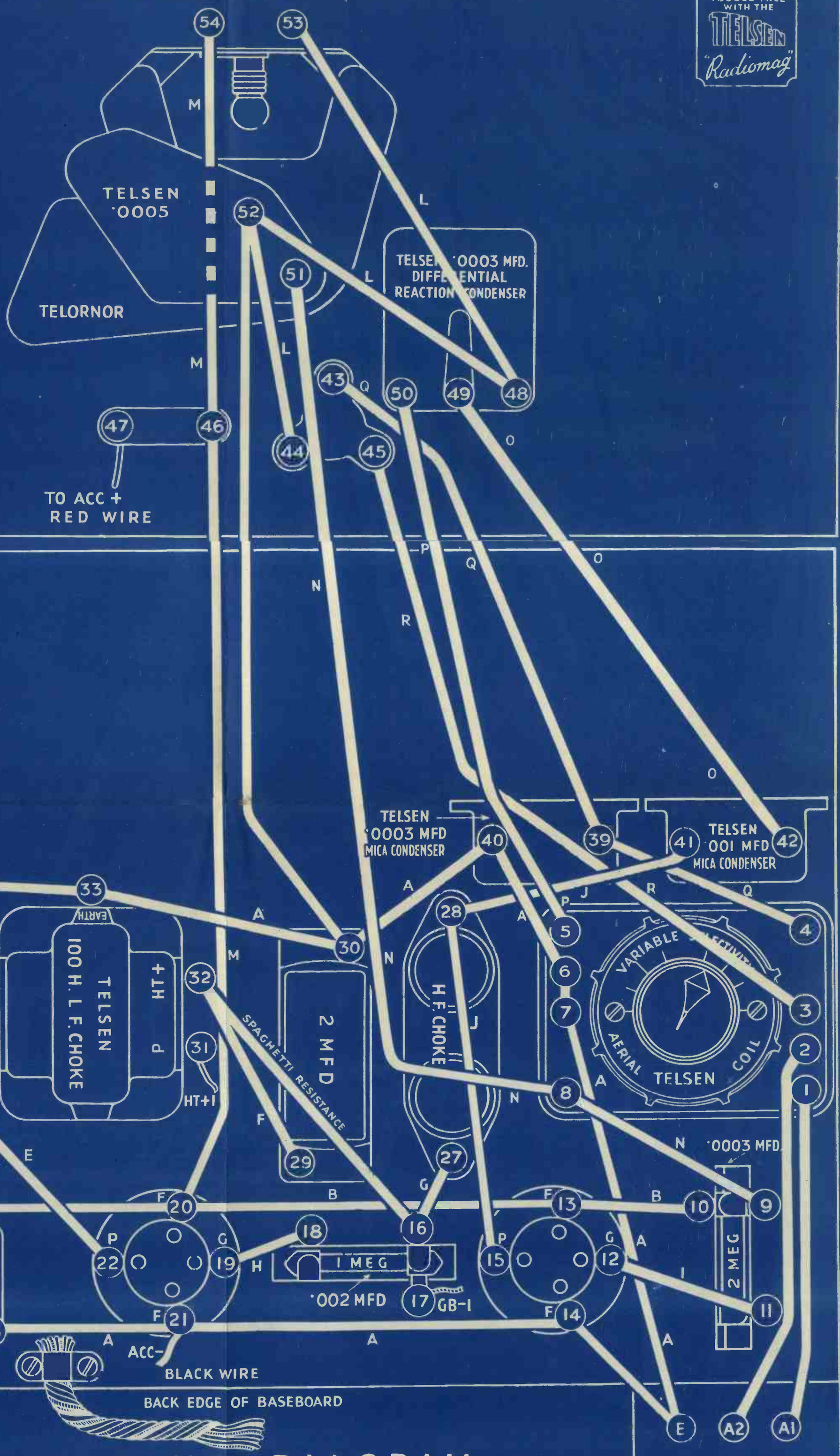


WIRING DIAGRAM

PRICE 1/-

THE TELSEN "AJAX" 3

ISSUED FREE WITH THE TELSEN "Radiomag"



WIRING DIAGRAM

MAGNAMARA

The Golden Voice

ELECTRIC RADIO

Employing a new circuit arrangement giving a performance of outstanding brilliance and consisting of four valves—S.G., Detector, Pentode, Rectifier, Loose-coupled aerial with tuned H.F. Transformer intervalve coupling, followed by a parallel-fed transformer coupled to a pentode operating a powerful built-in Moving Coil Speaker. Single dial ganged tuning with Compensator Aerial Selectivity Control, Volume Control and Ganged Wavechange Switching. Gives an undistorted output of 2 watts.
Power consumption 52 watts.

MODEL 312
IN PLAIN UNSTAINED CABINET

12 GNS or can be had on 12 monthly payments of 20/-

After payment of initial deposit of 35/-

MODEL 315
IN DE LUXE SOLID WALNUT CABINET

15 GNS or can be had on 12 monthly payments of 25/-

After initial payment of 45/-

Good Radio is a joy forever

C.P.H.

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