The TELSEN RADIOMAG

VOL. 1
NUMBER 5
3D

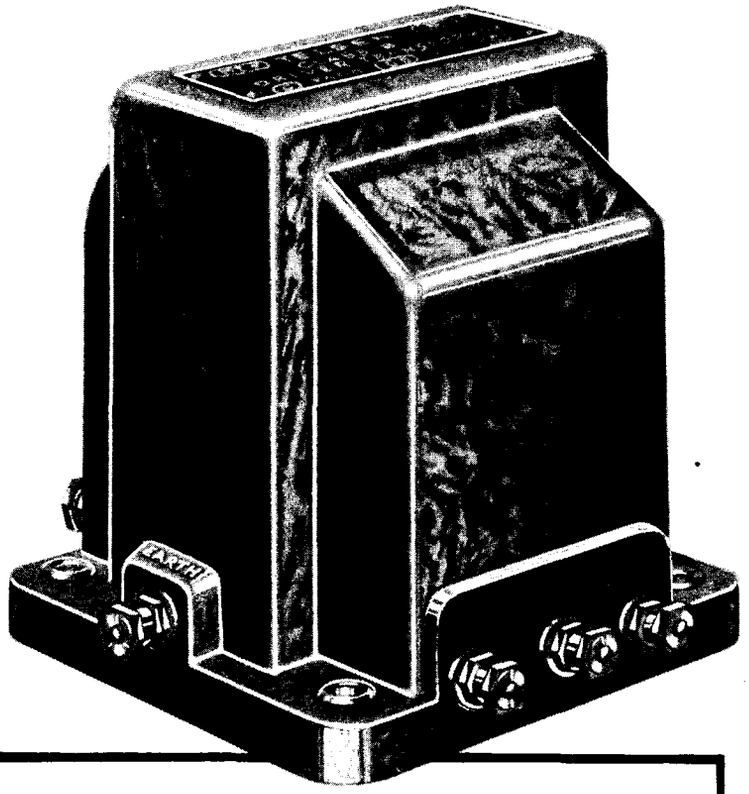
RADIO'S GREATEST HOME CONSTRUCTORS JOURNAL

Presents the most outstanding Battery Sets, Kits & All Mains Receivers of the Century

Now get MAINS OUTPUT from BATTERY INPUT with

TELSEN

"CLASS B" COMPONENTS



TELSEN " CLASS B " DRIVER TRANSFORMER

Specially designed to take full advantage of the amazing possibilities of " Class B " amplification, these latest Telsen transformers represent a veritable triumph of British radio craftsmanship providing at a reasonable cost a performance that is literally unsurpassed. The core is of generous proportions giving complete freedom from magnetic saturation and an entire absence of distortion.

Ratio 1:1. Secondary D.C. Resistance 145 ohms each half. Total Primary Inductance 25 henrys.

No. W.343 **Price 8/6**

Ratio 1.5:1 " Class B " Driver Transformer. Primary Inductance 33 henrys. Resistance half sec. 140 ohms.

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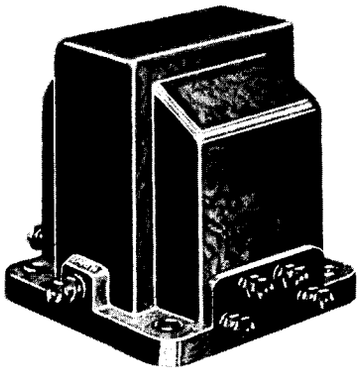

TELSEN " CLASS B " OUTPUT TRANSFORMER

Employs a core of generous proportions giving complete freedom from magnetic saturation and an absence of distortion. The very low D.C. Resistance of the primary winding is an effective safeguard against voltage drop on the heavy peak currents.

Primary D.C. Resistance, 200 ohms each half. Total Primary Inductance, 16 henrys. Ratios 35:1, 50:1 and 65:1.

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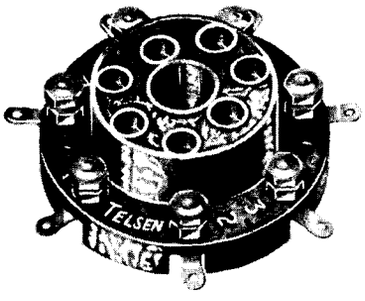
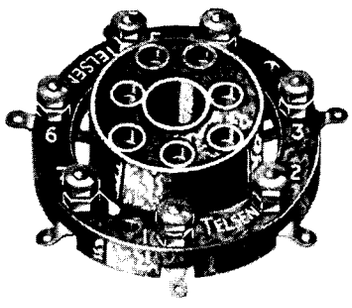




TELSEN " CLASS B " VALVE HOLDERS

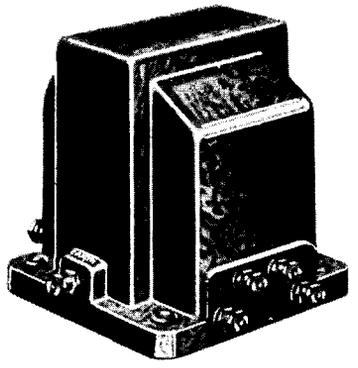
These valve-holders are accurately constructed to accommodate several new types of valve, such as the " Class B " valve. They are made in the solid and anti-microphonic types and in both types the contact sockets are extended in one piece to form the soldering tags, thus ensuring perfect connection. The terminals are numbered according to the system standardised by the R.M.A.

Rigid Type

No. W.337 **Price 1/6**

Anti-microphonic Type

No. W.338 **Price 1/9**



TELSEN " CLASS B " OUTPUT CHOKE

Provides perfect matching between the " Class B " valve and any loudspeaker which is normally suitable for use with Triodes or Pentode valves, the different ratios available enabling accurate coupling to be achieved in all cases. D.C. Resistance, 220 ohms (half winding). Total Inductance, 18 henrys.

No. W.345 **Price 8/6**

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RADIO COMPONENTS FOR LASTING EFFICIENCY

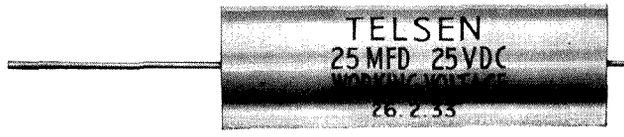
Telsen's AMAZING PRICE TRIUMPH!

A HIGH QUALITY 4 mfd.

ELECTROLYTIC CONDENSER for 3/6

THESE new Electrolytic Condensers are an outstanding achievement in condenser design and are ideal for use in smoothing circuits and other positions in which high voltage high capacity condensers are required. The special bracket and terminal supplied with the condenser enables it to be mounted on any type of baseboard or chassis.

Capacity	275 working peak voltage No.	Price	500 working peak voltage No.	Price
4 mfd.	W.393	3/6	W.396	4/6
6 ,,	W.394	3/9	W.397	5/-
8 ,,	W.395	4/-	W.398	5/6



TELSEN LOW VOLTAGE ELECTROLYTIC CONDENSERS

Ideal where a very high capacity with a fairly low voltage is required, as in automatic bias circuits for L.F. valves. Very compact, with wired ends for easy suspension in the wiring.

No. W.399 25 mfd. at 25 volts, **2/6**

No. W.400 50 mfd. at 25 volts, **3/-**

No. W.401 25 mfd. at 50 volts, **3/-**

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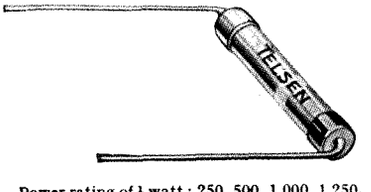
A new range of very small tubular condensers, which are quite as efficient as the larger types. Tested up to 1,500 volts. Wired ends make them very suitable for suspension in the wiring.

Capacity	No.	Price	Capacity	No.	Price
.0001 mfd.	W.402	1/-	.002 mfd.	W.407	1/-
.0002 ,,	W.403	1/-	.005 ,,	W.408	1/-
.0003 ,,	W.404	1/-	.006 ,,	W.409	1/-
.0005 ,,	W.405	1/-	.01 ,,	W.410	1/3
.001 ,,	W.406	1/-	.1 ,,	W.411	1/6

TELSEN RESISTORS WITH WIRED ENDS

Very small and light, and easily suspended in the wiring of a receiver. The resistance is identified by the standard colour code. The resistance value is also printed on the carton. Negligible self-capacity and inductance. Noiseless in use. Value remains unchanged under the most adverse circumstances. Supplied in the following values :—



Power rating of ½ watt : 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000, 25,000, 50,000, 100,000, 250,000, 500,000 ohms resistance **Price 1/-**

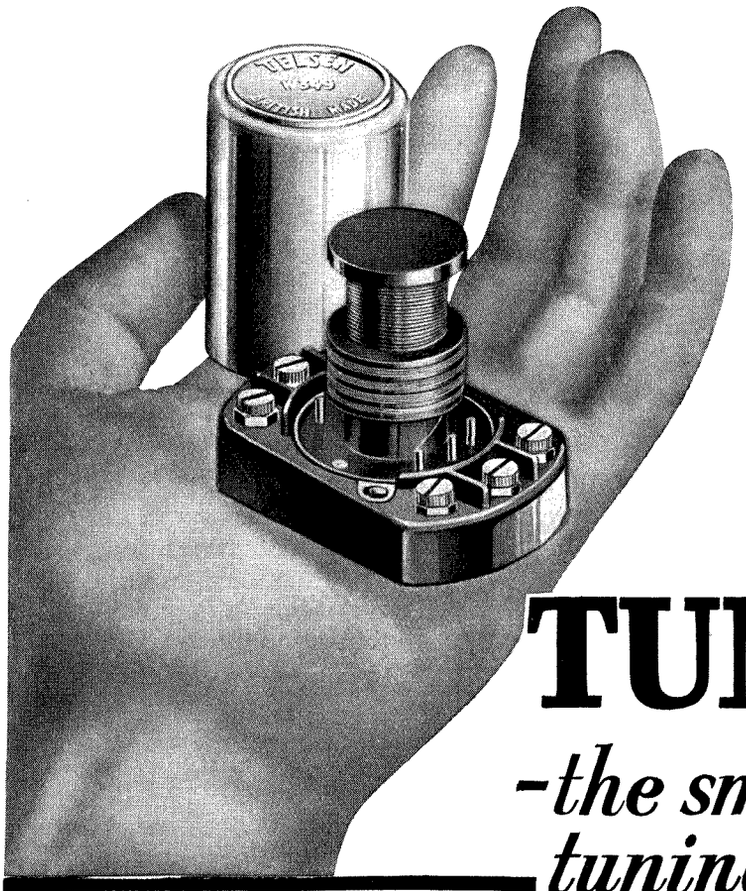
Power rating of 1 watt : 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000, 25,000, 50,000, 100,000, 250,000, 500,000 ohms resistance **Price 1/-**

Power rating of 2 watts : 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000, 25,000, 50,000, 100,000, ohms resistance .. **Price 2/-**

3 and 6 watt types can be supplied on demand.

TELSEN
RADIO COMPONENTS

This is the actual size



of one of the amazing new

TELSEN *Iron-cored* TUNING COILS

-the smallest and most selective tuning coils ever produced!

TELSEN IRON-CORED SCREENED COILS

The results of extensive research, these coils employ an iron-dust core which has enabled their size to be greatly reduced without sacrifice of efficiency, which is considerably higher than that of the majority of air-cored coils. Magnification and selectivity are correspondingly improved, while the metal screening can prevents the occurrence of unwanted interaction. These coils can be used either as aerial tuning coils or H.F. transformers, a reaction winding being included.

Single Coil .. .. No. W.349

8/6

Twin Matched Coils, No. W.422

17/-

Triple Matched Coils, No. W.423

25/6

SMALL enough to hold in the palm of your hand—only two inches high—yet it has entirely revolutionised radio reception! A big claim—but not too big for the amazing Telsen IRON-CORED Tuning Coil to substantiate. For this great little component makes an ordinary three-valver as ultra-selective as a superhet.! The brilliant new principle underlying its construction is the secret of its performance—its astounding selectivity and its tremendous magnification—while Telsen's unique application of this principle is the secret of its amazing compactness—occupying less valuable baseboard space than any other tuning coil ever produced. Insist on Telsen IRON-CORED Tuning Coils—they will make all the difference to your new set!

TELSEN
RADIO COMPONENTS

THE TELSEN RADIOMAG

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EDITORIAL COMMENT

IT has always been our desire to anticipate the needs of the home constructor when planning our programme of new components and constructor sets for the *Telsen Radiomag*, and the range will now include, among many others, "Class B" components, Iron Cored Coils, A.C. and D.C. Eliminators, Electrolytic Condensers, Tubular Condensers, Resistors, Screened H.F. Chokes, and a range of "Class B" Kits, Battery and All-Mains Sets.

We have also made enormous price reductions throughout the Telsen range of components, for instance, Interfrequency Transformer Coils have now been reduced from 12/6 to 7/6, "Ace" Transformers from 5/6 to 4/9, "Radiogrand" Transformers, ratios 3:1 and 5:1, from 7/6 to 6/9 and other ratios in proportion, Dual Range Aerial and Anode Coils from 7/6 to 5/6 and 5/6 to 4/6 respectively, 1 mfd. Paper Condensers from 2/3 to 1/9, 2 mfd. from 3/- to 2/6 and all other capacities accordingly, Single Condenser Units from 9/6 to 7/6, Twin Ganged Condensers from 15/6 to 12/6, Triple Ganged from 22/6 to 17/6, Logarithmic Variable Condensers from 4/6 to 3/6, Binocular H.F. Chokes from 5/- to 3/6 and many others, fully described and illustrated in the coloured supplement of this issue.

This year is perhaps one of the most outstanding in radio, for it is probably true to say that at no time in the past have so many new and remarkable developments been introduced, all more or less at the same time. We are, of course, referring to such revolutionary developments as "Class B" amplification, Iron Cored Coils, all-metal Valves and others, too numerous to mention.

With the addition of "Class B" amplification a new era in battery-operated receivers has been created, it is now possible for the home constructor to build a battery-operated receiver giving an output and quality of reproduction comparable to the best all-mains driven set. In view of this, we are introducing an outstanding "Class B Four" receiver and those of our readers who build this set will be astounded that such selectivity, quality and enormous volume can be obtained from a battery-driven receiver.

For those constructors who wish to build an efficient three-valve set we would refer them to the Telsen Battery Screened-Grid Three, this has the popular and well-tried favourite valve combination of Screened-Grid, Detector and Pentode Output, and, like the "Class B Four," employs the sensational new Telsen Iron Cored Coils.

With a view to making the *Radiomag* as comprehensive as possible, we are including a de-luxe A.C. Mains Super-heterodyne Receiver which employs five valves and is undoubtedly one of the foremost receivers of its type ever presented to the home constructor, embodying as it does every ultra-modern refinement. For each of the above sets a full-size 1/- Blue Print is included free in this issue.

Owing to the enormous success and popularity of the three receivers described in the previous *Radiomag* (No. 4), and in consequence of so many readers' requests we are giving abridged articles relating to these for the benefit of new readers.

Previous issues of the *Radiomag* can be obtained either from your radio dealer, newsagent or direct from us, price 6d. post free. Correspondence and suggestions relating to the *Radiomag* will be welcomed and should be addressed to the Editor, Telsen Electric Co., Ltd., Birmingham.

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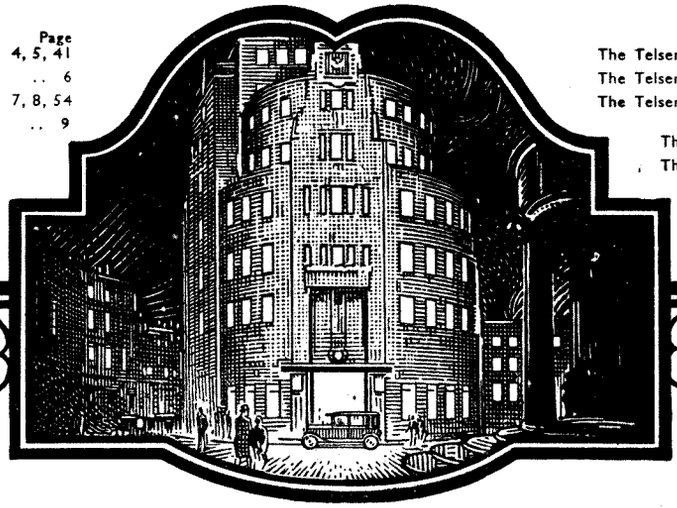

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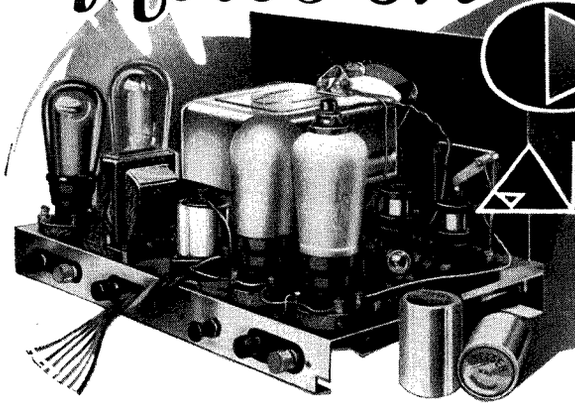


UP to the present time, the battery set user has been at a great disadvantage as compared with the mains user, in the matter of power output and quality. It is generally accepted that, to afford realistic reproduction, a radio receiver must deliver between one and two watts of undistorted power to a moving coil loudspeaker. An output of this order is easily obtained from an all electric receiver, without entailing heavy running costs, but if an attempt is made to extract it from a battery operated receiver, it involves such a heavy current drain from the H.T. battery that running costs become so high as to be out of all reason. Hence, in the interests of economy, the battery set user has usually to content himself with an output of about 250 milliwatts (¼ watt), which affords results falling far short of those given by his friends' all electric receivers.

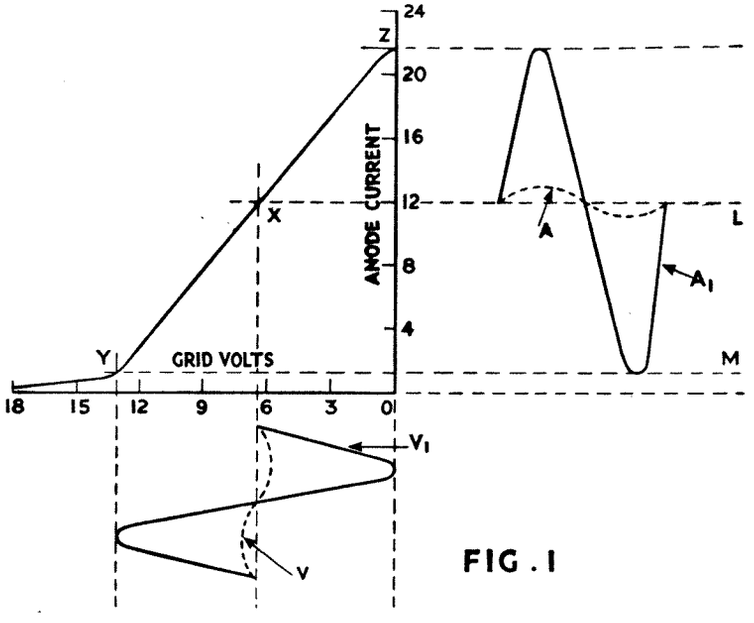


FIG. 1

All this, however, is likely to be altered by the advent of a system of amplification known as Class "B," which opens up a new era for the battery set, and which promises to put it on equal footing with the mains set, whilst maintaining great economy in running costs. Some idea of its possibilities may be gauged from the fact that, by its use, a battery set may be made to give two watts undistorted power output, without exceeding the current supply capabilities of the smallest capacity H.T. battery.

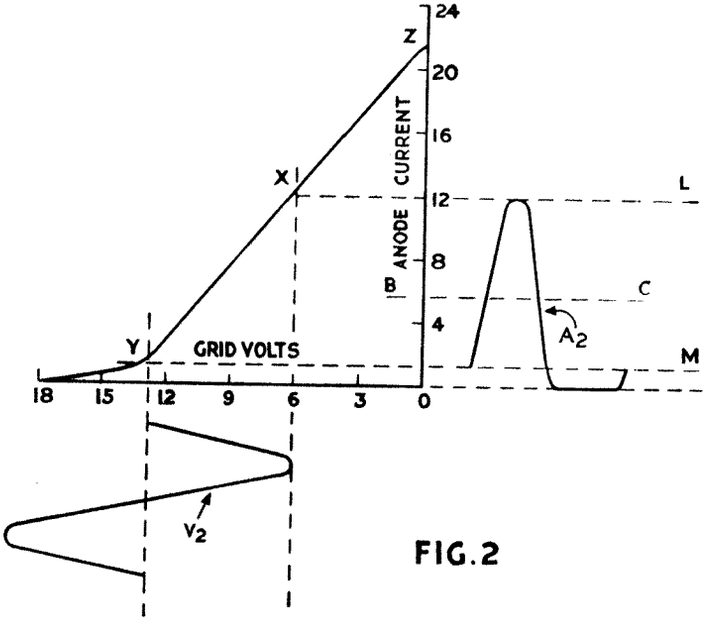
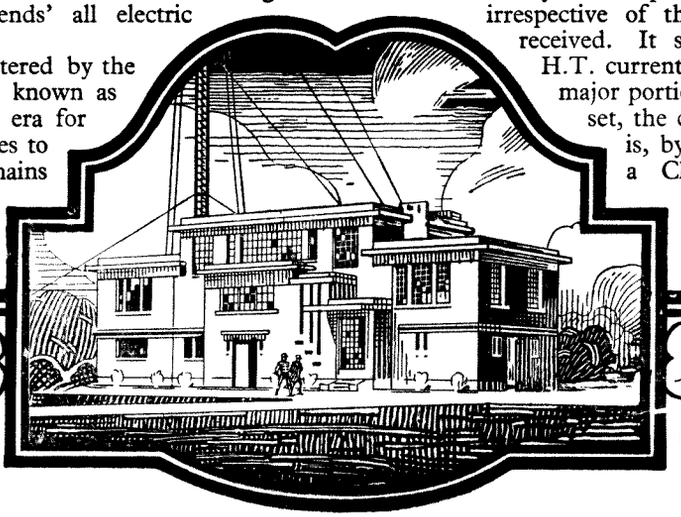


FIG. 2

At this stage, the reader naturally asks, what is Class "B"? and in what way is it different from the orthodox system of amplification?

Broadly speaking, the essential difference between Class "B" and the present system of amplification (officially known as Class "A") is that with the latter system, the anode (H.T.) current taken by the output stage is held at a steady value, irrespective of the strength of the signal being received. It should be remembered that the H.T. current taken by the output stage is the major portion of that consumed by the whole set, the current taken by the early valves, is, by comparison, quite small. With a Class "B" system, the anode current taken by the output stage is made to vary proportionately with signal strength.



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NOTES ON CLASS "B" AMPLIFICATION—*continued*

This may be more clearly understood by reference to Fig. 1, which represents the familiar type of curve relating anode current to grid voltage for a thermionic valve.

In Class "A" operation, the valve would be biassed to the point " X," so that the standing anode current, as indicated by the dotted line " XL " would be about 12 mA. The application of a signal voltage " V," to the grid of the valve, would cause the anode current to vary as shown at " A." Although the anode current is seen to vary in proportion to the grid voltage, it will be seen that during a complete input wave cycle the *average* value of the anode current remains at 12 mA., the same as if no signal was being received. In Class " A " operation, of course, the signal voltage is never allowed to carry the valve beyond the cut-off point " Y," or the region where grid current commences to flow, at " Z." When this happens, distortion results, hence, the largest signal that this valve would accommodate without distortion, is represented by " V1." It will be seen that with this large signal, the anode current ("A1") still remains at the same average value as with the small signal. The large standing anode current taken by the valve is only necessary to take care of the large voltage swings such as "V1," corresponding to extra loud passages in the broadcast matter. Now, with the average type of programme, these large signal voltages are only produced occasionally, the average signal level being only 15% or so of these large peak values. Furthermore, there are many intervals during which no sound at all is broadcast.

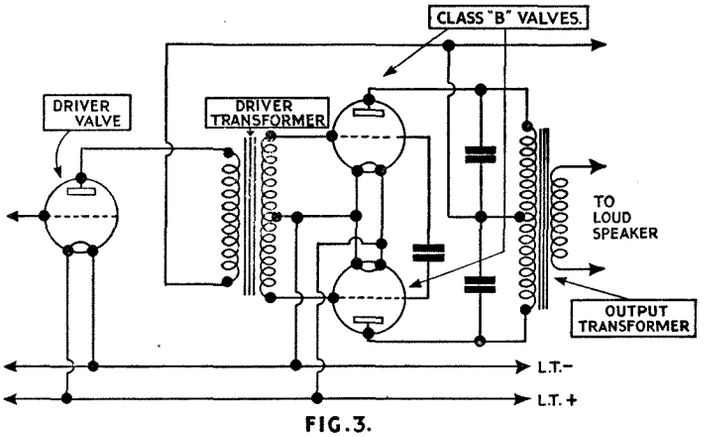


FIG. 3.

It is obvious, therefore, that a system in which H.T. current is proportional to signal strength, will effect a great saving on the present system. The method by which Class " B " achieves this result may be made clear by referring to Fig. 2.

In Class " B " operation, the valve is biassed to the cut-off point " Y," so that when no signal is being received, the anode current, as indicated by the dotted line "YM," is at a negligible value.

If now a signal voltage "V2" is applied to the grid, the anode current, as indicated by "A2," will increase proportionately during the positive half cycle and will attain an average value, indicated by the dotted line " BC." When the input voltage wave swings negative, the valve will be carried beyond the cut off point " Y," and anode current will cease to flow entirely. Under these circumstances chronic distortion would be produced, and so in Class " B " operation, two output valves in " push-pull " are used, as shown in Fig. 3, so that the input signal voltage is divided between the two valves, and, whilst positive at the grid of one valve, is negative at the grid of the other valve. Thus, each valve operates alternately, amplifying a positive half wave input voltage, whilst its companion valve is inactive. The two half wave outputs of each valve are combined in a centre tapped output transformer or choke, to produce an amplified replica of the complete input wave.

The first application of this principle, in this country, appeared recently in the " Quiescent Push-Pull " system. With this scheme, two pentodes in push-pull are biassed to the cut-off point, and operate as described, each valve amplifying alternate half cycles. This system works very well, but the two valves have to be accurately matched to each other, by individual adjustments of the voltage on their priming grids, if distortion is to be avoided. This, in practice, presents considerable difficulty, also, an output stage employing two pentodes is somewhat expensive, and so " Q.P.P." as it is called, is tending to fall into disuse. It is being superseded by a system which is known as " Positive Drive Class B " amplification, to give it its full title, but which is usually referred to loosely as Class " B."

In this system, two triode valves operate alternately in a push pull circuit, as shown in Fig. 3. Each valve operates at the point where anode current is practically cut off, so that the anode current when no signal is being received, or the "quiescent" current as it is called, is very low indeed. With the valves designed for this work, however, the cut-off point occurs at zero grid volts, instead of at a high value of negative grid bias, as with ordinary amplifying valves. When a signal is being received, the grids of the valves swing positive and run into grid current, alternately. When this happens, the grid filament paths within the valves become conductive, and power is drawn from the grid circuit. This power is supplied via the input or "driver" transformer, as it is called, from the preceding valve which is termed the "driver" valve. The half wave outputs from each Class "B" valve are combined in a push-pull output circuit.

The reason for the term " positive drive " now becomes evident. The grids of the Class " B " output valves are driven positive by the input signal voltage, instead of being driven up to zero grid volts from a high value of negative bias, as is the case with Q.P.P. When triode valves are operated as Class " B " amplifiers, great economy is obtained, but the power output is somewhat small, unless their grids are allowed to attain positive voltages.

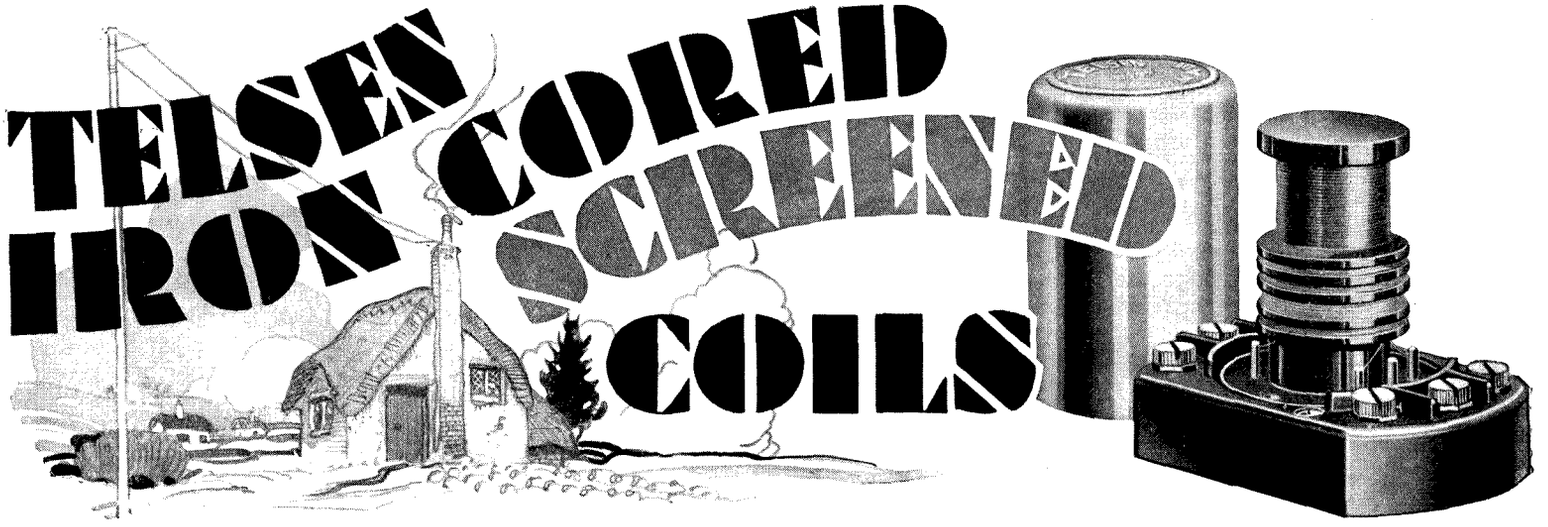
We have always been told that when an amplifying valve runs into grid current, distortion is produced. In the normal type of amplifier however, this is due to the fact that the valve input circuit (usually the secondary of an intervalve transformer) has very high impedance so that the smallest flow of grid current produces considerable " damping " with consequent distortion of the input voltage wave.

With a Class " B " system therefore, the driver transformer is designed so as to have a low impedance secondary winding, so that the grid filament load of the Class " B " valve which amounts to only a few thousand ohms, imposes negligible damping. In actual practice, the driver transformer has a step down ratio from its primary to each half of its secondary, instead of the usual step up ratio.

The reason for this is that the " driver " valve has to supply power into the Class " B " grid circuits, as we have seen, and to

(*continued on page 41*)

TELSEN IRON CORED SCREENED COILS

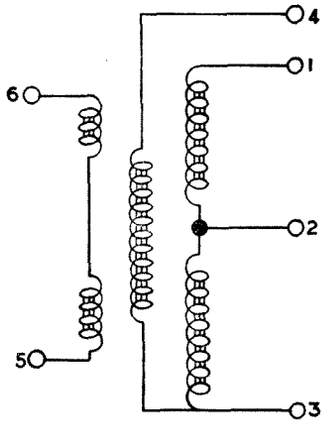


ALTHOUGH the new iron-cored tuning coils are probably the most up-to-date feature of modern radio technique, it is nevertheless a fact that inductances working on a similar principle have been employed in line telephony work for many years. However, before these principles could be extended to radio frequency coils a large number of serious difficulties had to be surmounted, and it is only after prolonged research work that Iron Cored Tuning Coils have become a practical possibility. It is the aim of this article to explain in as brief a manner as possible the difficulties encountered, and the way they have been overcome.

It is well known that the inductance of a coil of wire can be increased by increasing the number of turns, but perhaps it is not so well known that the insertion of a " magnetic " substance such as iron, nickel or cobalt, into the centre of the coil will also increase the inductance. Now in the design of a coil many factors have to be considered ; the inductance must attain a specified value, the energy losses should be low, and the physical dimensions small. Unfortunately, these requirements are in direct opposition to each other, for if we raise the inductance by increasing the number of turns of wire, we also increase the resistance and hence the losses. A reduction in physical size has a similar effect. However, by introducing a core of iron into the centre of the coil a much smaller number of turns is needed to obtain the required inductance, and in consequence the coil has a low resistance and correspondingly low losses. The former required to support the turns is also reduced in size, and it is found that the screening can may be made much smaller.

Unfortunately, the insertion of an ordinary iron core introduces additional power losses which are so great as to spoil completely the performance of the coil. This is due to the fact that circulating currents or " eddy currents " are induced in the iron itself, since iron is a conductor of electricity. Research has been carried out in the Telsen Laboratories with the object of producing a core, which, while highly magnetic, would be a non-conductor of electricity, so that no eddy-currents could flow in the core and power loss would be eliminated.

Such a core has now been produced by means of a truly wonderful process. A suitable magnetic alloy of iron is produced in the form of minute particles, as fine as dust. Each particle is lightly covered with a film of insulation, and, with millions of others and a special binding material, is moulded under great pressure into a solid block. It is obvious that although the resulting substance is composed mainly of iron, and so is highly magnetic, it is impossible for eddy-currents to be set up, since each particle is insulated from its fellow.



CIRCUIT DIAGRAM
FIG.1

A core of this material is used in the new Telsen Iron Cored Screened Coils, and in consequence though very small and compact, they are nevertheless much more efficient than the majority of air-cored coils. The windings have been very carefully designed, and are spaced from the core to reduce self-capacity to a minimum value, while the screening can, though small, fulfil its purpose with great efficiency.

Fig. 1 shows the circuit diagram of the Telsen Iron Cored Screened Coil and Fig. 2 illustrates its use as aerial tuner and H.F. Transformer.

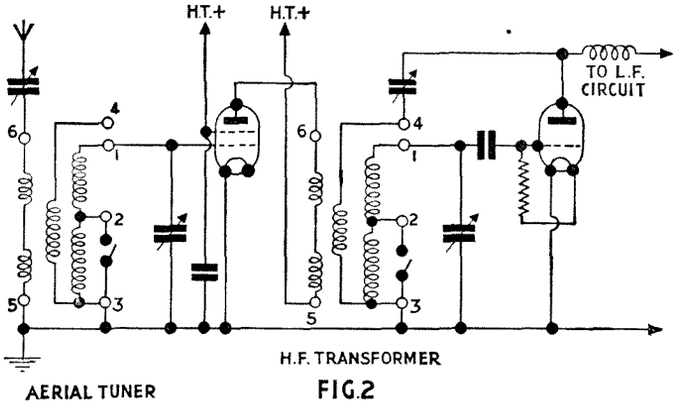
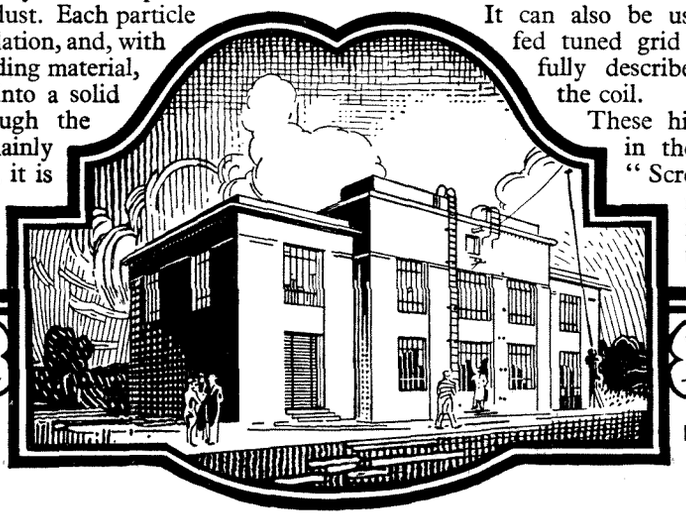


FIG.2

It can also be used as band pass tuner, parallel fed tuned grid coupling, etc., all of which are fully described in the leaflet supplied with the coil.

These high efficiency coils are employed in the " Telsen Class B Four " and " Screened Grid Three," up-to-date receivers with many other new features, which are described in detail in this issue of the *Radiomag*.



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FIXED CONDENSERS & RESISTANCES in radio reception

ALMOST every owner of a wireless set must at some time have wondered at the number and variety of fixed resistances and condensers in his set, what their precise actions are, and how they are constructed. The object of this article is to explain the fundamental principles underlying the action of these two components and to indicate a few of their uses.

Every article in the world contains particles of electricity, and these particles, called electrons, are capable of moving along inside some substances called " conductors " (such as copper) when urged to do so by an electrical pressure or " voltage." In other substances, such as mica, the particles are unable to move about and these are called " non-conductors " or " insulators." The fact that a voltage (pressure) is required to cause these electrons to flow through a conductor indicates that they are experiencing a resistance to their motion, and the relation between the quantity of electricity per second (current), the pressure (voltage) and the " resistance " of the conductor is expressed by the well-known equation called Ohm's law, which states that the pressure across a conductor (in volts) equals the current flowing through the conductor (in amps.) multiplied by the resistance of the conductor in ohms.

For example, to cause a current of 1/10 amp. to flow through a valve filament of resistance 20 ohms, we should require a pressure of 2 volts, since $2 = 1/10 \times 20$. It is important to use the correct units, either volts, amps. and ohms, or, as is usual in wireless calculations, volts, milliamps. (thousandths of an amp.) and thousands of ohms.

The electrons generate heat in their passage through the conductor and the power expended in this way is found by multiplying the pressure in volts by the current in amps. The answer is given in watts. (746 watts equal one horse power.) Thus, in the last example, the power consumed by the valve filament is $2 \times 1/10$ or 1/5 watt.

The essential requirements for a resistance used in a radio receiver are that its value must be correct and it must not change appreciably with temperature, time, or applied voltage, also it must not get hot in use and this calls for generous design. Telsen resistances of all types fulfil these conditions as well as many other requirements too numerous to mention.

Now let us consider the condenser. This consists essentially of two metal plates separated by a thin insulating sheet so that electricity cannot flow directly from one plate to the other, though they are in very close proximity. Fig. 1 (a) shows the two copper plates separated by a sheet of mica, and Fig. 1 (b) a mechanical arrangement which is analogous to an electrical condenser, namely a flat box divided into two by a flexible rubber diaphragm.

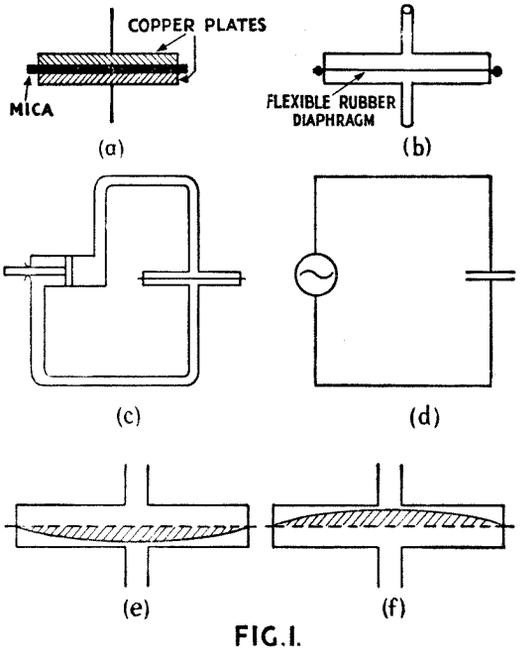
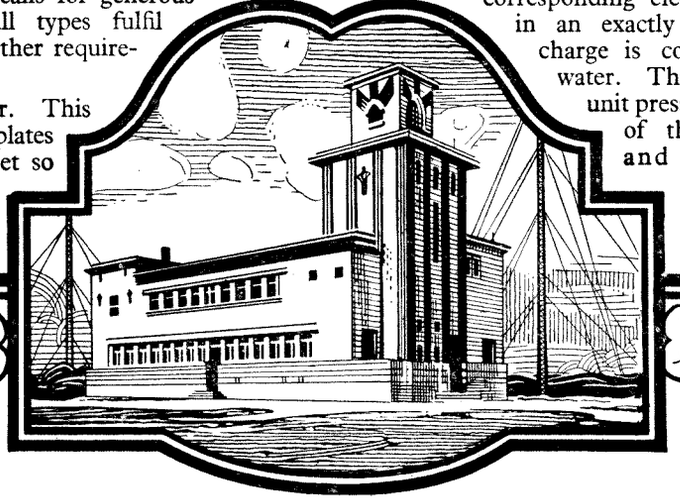


FIG. 1.

The box and connecting pipes are filled with water. Now suppose this box to be connected up to a cylinder and piston as in Fig. 1 (c). When the piston moves to the right, there will be a pressure on the upper side of the diaphragm causing it to bend as in (e). The shaded portion indicates the amount of water which is forced into the top of the box (or out of the bottom) and this may be called the " charge " of water. The corresponding electrical circuit of Fig. 1 (d) works in an exactly analogous way except that the charge is composed of electricity instead of water. The amount of charge produced by unit pressure is a measure of the "capacity" of the condenser to hold electricity and is measured in microfarads (mfd.).

Now imagine the piston to have completed its stroke to the



BUCHAREST RUMANIA

FIXED CONDENSERS & RESISTANCES—*continued*

right and to return towards the left. The diaphragm will now flatten and then bend in the opposite direction (Fig. 1 (f). If the piston is now moved rapidly to and fro the water will surge first in one direction and then the other, and we have an alternating current flowing around the circuit.

Now a double change of direction is called a " cycle " and the number of cycles performed in one second is termed the " frequency." For example, the standard frequency of power supply in this country is 50 cycles per second (50 c.p.s.). Since current is the quantity of electricity delivered in unit time (cubic feet per minute for water or amperes for electricity) obviously, the higher the frequency the greater the number of charges of electricity delivered in the same time, i.e., the greater the current. Again, if we double the capacity, or the voltage, we double the magnitude of each charge, and so the current is doubled. Thus an increase of frequency, voltage, or capacity, results in a corresponding increase of current.

It will be readily understood that since the water in the pipe possesses inertia (massiveness) it will not attian such a high maximum speed when acted upon by a pressure which varies rapidly, as it would if the pressure varied more slowly. One might almost say that being pushed first one way and then the other it is not given time to go either way. This property of inertia is also found in an electrical circuit, in which case it is called " inductance " and a coil of wire containing a large number of turns may have a very high inductance. Such a coil, whilst passing a steady current easily, offers an impedance to the passage of alternating currents which increases with the frequency.

This raises an important point in connection with the design of condensers. Large condensers of 0.01 mfd. capacity and above, are commonly made by rolling up two strips of metal foil interleaved with specially prepared paper insulation ; in this way a compact type of construction called the self-sealing type is obtained.

However, the length of these strips is considerable and their inductance by no means negligible, so that although they should pass a high frequency current easily, due to their inductance they offer considerable opposition. When employed in H.F. circuits a condenser of this kind may cause considerable trouble in the form of instability, or a reduction in amplification. With this in mind, Telsen Self-Sealing Condensers are made to have negligible inductance by making contact with the foil at frequent intervals. The current is thus conveyed to every part of the foil without having to traverse its length.

It will also be seen that if a resistance is to offer the same opposition to currents of all frequencies, it should have neither inductance nor capacity. In buying Telsen resistances of all types the reader can be sure that both inductance and capacity have been reduced to a negligible quantity.

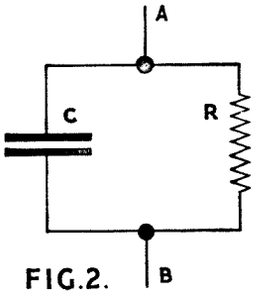


FIG.2.

Now let us consider Fig. 2, in which the resistance and condenser are connected " in parallel." It will be seen that since a direct current cannot pass through C it has to overcome the large resistance of R, thus requiring a steady pressure (voltage) between A and B to enable it to do so. However, alternating currents will experience little difficulty in passing from A to B via the condenser, especially if this is large and non-inductive. Thus the alternating pressure required between A and B is small. This arrangement is of great practical value, and, in Fig. 3, are illustrated some of its applications.

It is necessary in an amplifying valve (Fig. 3a) that the cathode should be at higher steady voltage than the grid, and that any alternating currents flowing through the valve shall not change this voltage. As we have seen, this is just what the resistance and condenser will do, since the steady component of the valve current sets up a steady voltage across R while the alternating component passes via C. For biassing L.F. valves the Telsen Low Voltage Electrolytic Condensers W.399 to W.401, which have remarkably large capacities considering their small size and low cost, are especially suitable. For H.F. valves the self-sealing 0.1 mfd. Condenser W.231 should be used. A suitable resistance should be chosen from the large range of cartridge type resistors.

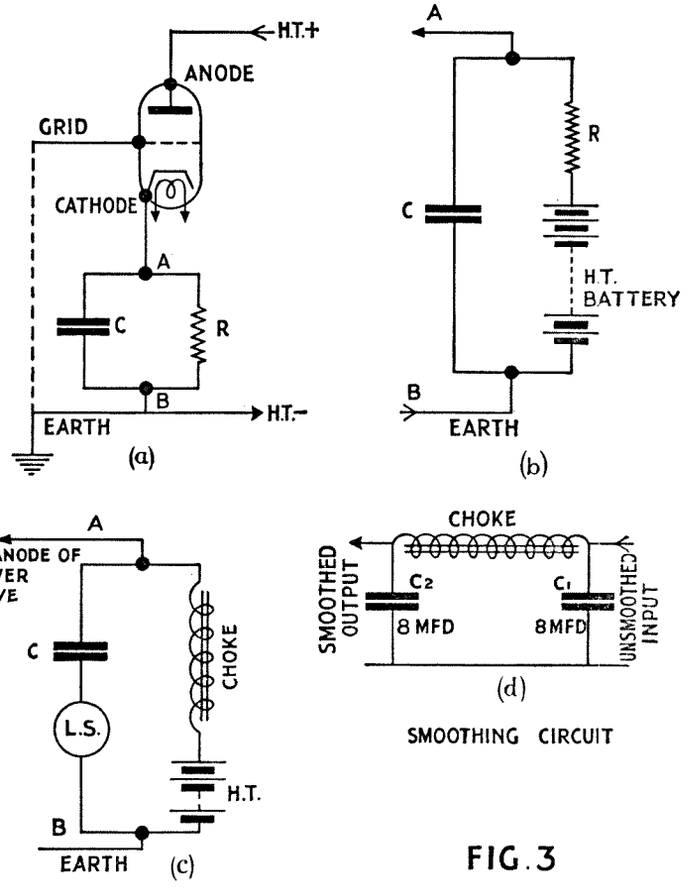
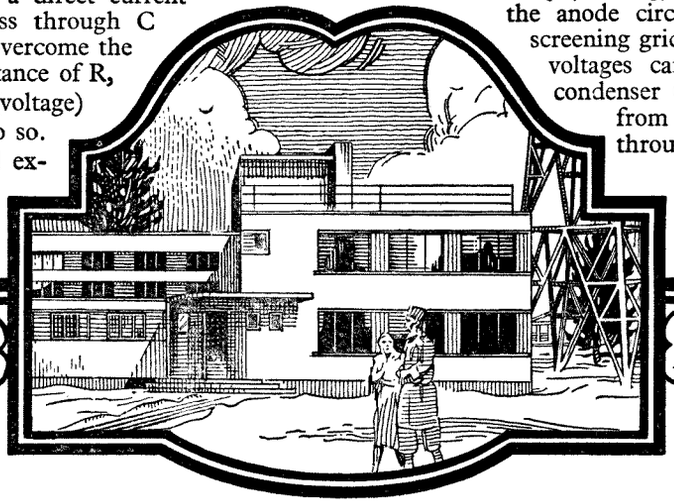
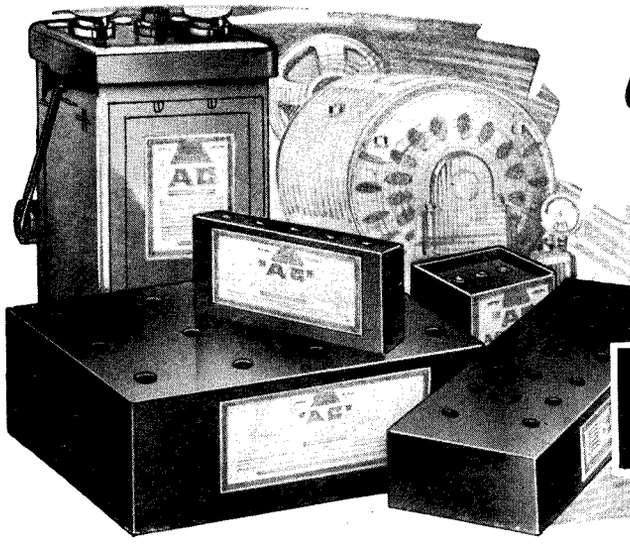


FIG.3

The circuit of Fig. 3 (b) which is really the same as Fig. 2 can be put to at least four different uses. If point A is connected to the anode circuit of a valve, the alternating currents flow through the condenser in preference to the resistance and so are kept out of the H.T. battery where they might set up instability (howling). This is known as " decoupling " the anode circuit. If A is connected to the screening grid of an S.G. valve, no alternating voltages can appear there because of the condenser C, but the steady direct voltage from the H.T. battery is applied through the resistance. The same applies to the priming grid of a pentode. However, in passing current through R, some of

(*continued on page* 54)


LWOW POLAND



The choice and care of H.T. BATTERIES

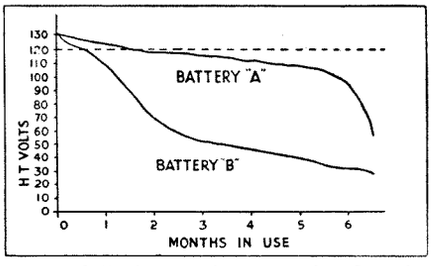
DESPITE the fact that electricity supply undertakings are to-day very extensive indeed, there are a large number of radio users who have no electricity supply mains available, and who are therefore obliged to operate their receivers from batteries. The battery user, however, is not nowadays at such a disadvantage as formerly when compared with the mains set user, for improvements in valves and batteries, and particularly the introduction of " Class B " amplification, have brought about a great reduction in running costs. Even so, neglect of a few simple precautions may offset all these advantages, and cause the wireless set to become an expensive nuisance instead of an inexpensive source of pleasure.

Three types of battery are employed in a radio receiver, the High Tension or H.T. Battery, the Low Tension or L.T. Battery and the Grid Bias or G.B. Battery. The H.T. Battery supplies power for driving the set and loudspeaker, the L.T. Battery heats up the valve filaments to a temperature at which they operate properly, and the G.B. Battery acts as a kind of throttle which limits to a reasonable amount the current drawn from the H.T. Battery.

Both H.T. and G.B. Batteries are composed of a number of " cells," each of which contributes 1½ volts, so that a battery of 80 cells would make up a 120 volt H.T. battery, or 6 cells a 9 volt G.B. battery. Desirable qualities in batteries of this type are a consistently high voltage over a long life, low internal resistance (especially for " Class B " amplification) and freedom from crackling noises. Such batteries would have large cells (with consequent long life and low internal resistance), high quality chemicals to avoid " local action " and rapid deterioration with time, good inter-cell insulation to prevent crackles and internal leakage, solid drawn zinc containers, and so on. Although these features cost money, the extra expense is slight compared with the saving in battery replacements.

It is important to remember that both good and bad batteries may give the same voltage at first, though the poor battery will deteriorate rapidly later. Consequently the user can only be sure of obtaining a good battery by buying it from a well known maker who has a reputation to maintain. This point is illustrated in the accompanying figure, which shows voltage-discharge curves for good and bad batteries. The owner of battery " A " has good quality reception throughout the long life of the battery, since the voltage remains comparatively high all the time. On the other hand, the owner of battery " B " has a short period of good reception followed by poor volume and distorted reproduction due to the rapid fall in his H.T. voltage.

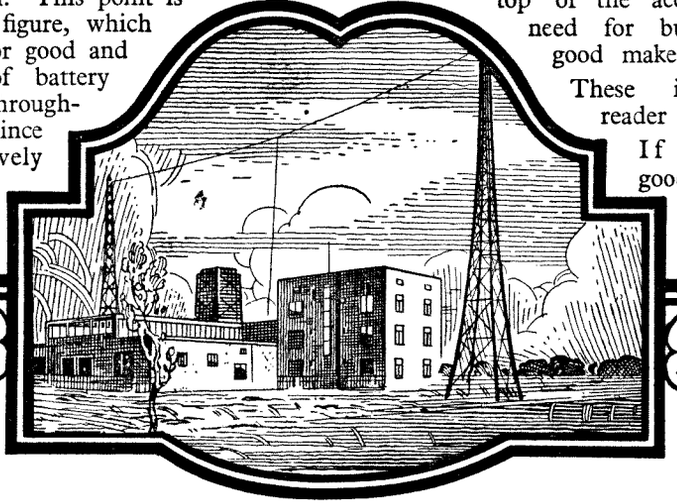
Having purchased a good battery the reader can do much to obtain the best possible service from it. He should keep it in a cool dry place, and limit the current drawn from it to a minimum value by replacing the G.B. battery every six months, and keeping the G.B. plugs at the highest negative tapping consistent with good quality.



Now let us consider the L.T. battery. Attention to detail here will enable a long useful life to be obtained. In the first place, buy the accumulator from a reputable maker, for a poor battery will not last long however carefully it may be treated. See that it is given the correct initial treatment according to the maker's instructions, and obtain either a hydrometer, or a voltmeter on which voltages of 1.8, 1.9 and 2 are easily read. In general, when the accumulator is fully charged the voltmeter should read 2.2 volts, and the hydrometer not less than 1.240. When the voltage falls to 1.8 or the hydrometer reads 1.100, the accumulator must be recharged immediately. The acid must be kept up to the level marked on the accumulator by adding perfectly clean distilled water, which may be obtained from a chemist at about 1d. per pint. On no account add " dope " of any sort as a small amount of impurity may ruin the accumulator. Keep the outside of the accumulators free from dust and acid, for besides corroding the terminals and forming a leakage path between them the acid will burn a hole in any cloth (such as a good suit) with which it may come into contact. The terminals should be kept well vaselined to prevent corrosion. On some badly designed accumulators the terminal supports become loose in the pitch, and acid continually wells up on to the top of the accumulator. This illustrates the need for buying the accumulator from a good maker.

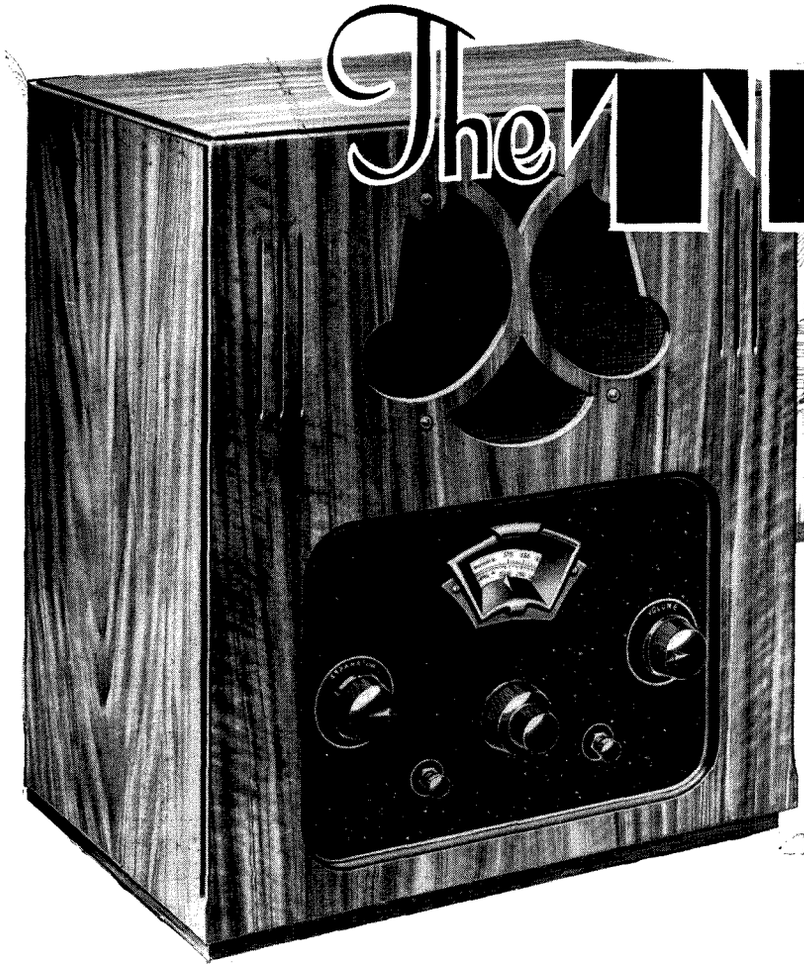
These instructions assume that the reader looks after the battery himself.

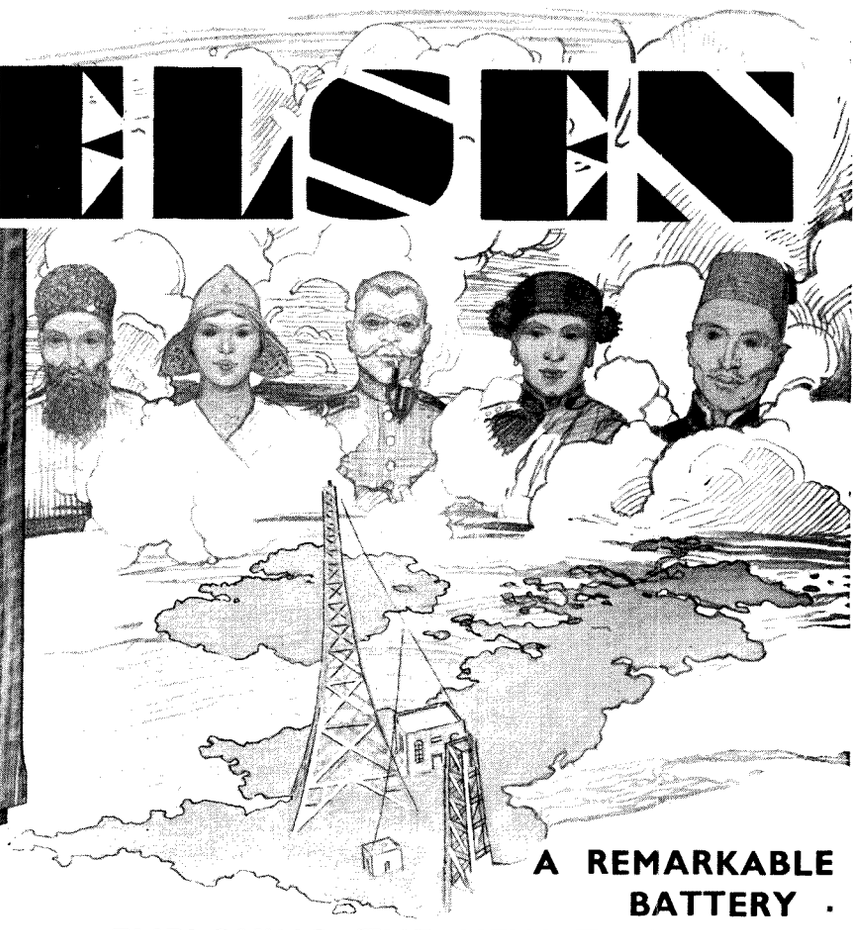
If the battery is taken to a good charging station however, proper attention will be given to it as a matter of course.



BRESLAU GERMANY

The TELSEN

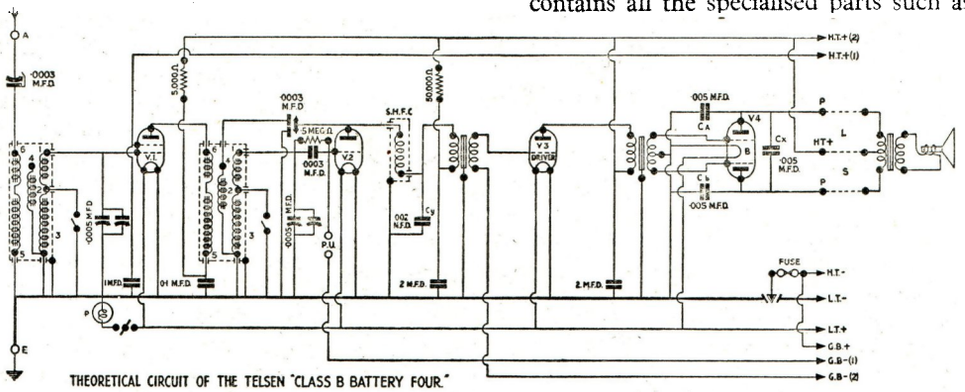




A REMARKABLE BATTERY · EMPLOYING THE NEW TELSEN IRON DESIGNED BY THE

IN the Telsen " Class B Four " two of the very latest developments in radio are made available to the amateur constructor, in a receiver of low cost and extreme simplicity of construction. The incorporation of the new Telsen Iron Cored Coils and the " Class B " system, together with careful circuit design, produces a receiver of outstanding performance, giving as it does a high power output, with exceptional sensitivity and selectivity. Without involving the user in heavy running costs, the receiver is capable of a power output hitherto associated only with mains driven sets, whilst the selectivity and high magnification afforded by the iron cored coils, are immediately apparent on handling the controls.

An all metal chassis of extremely compact design is employed in the construction of the set, and this, apart from ensuring perfect shielding, produces a very rigid and workmanlike assembly. This chassis is primarily designed to fit into a table console cabinet, having space for batteries, and fitted with a self-contained moving coil loudspeaker. This produces an extremely attractive receiver of very distinctive appearance, as will be apparent from the accompanying photographs. For those who wish to make up the receiver in this form, the cabinet and speaker are supplied together with all the receiver components, chassis, etc., as a complete kit (W.414) so that nothing else is required to build up the receiver as described.



THEORETICAL CIRCUIT OF THE TELSEN "CLASS B BATTERY FOUR."

FIG. 1.

Some constructors, however, may desire to fit the receiver into other types of cabinets, or may like to construct their own cabinets; in these cases their needs are catered for by the " Class B Four " Constructor's Kit, W.415, which contains all the components required for building the receiver, without the cabinet and speaker.

There may be another class of constructors who would like to build the receiver up, but who have several of the necessary Telsen components to hand, which they would naturally like to incorporate. With this in mind, a " Class B Four " Constructor's Outfit (Cat. No. W.416) is marketed. This outfit contains all the specialised parts such as chassis, panel, battery cord, screws, connecting wire, etc., required for building the receiver, and not obtainable as standard components. This Constructor's Outfit is also supplied of course, with the complete kits.

At the end of this article is appended a complete list of components required to build the set, so that intending constructors of this latter class, may estimate the number of components required, and on purchasing them, together with the Constructor's Outfit, may build the receiver without trouble or unnecessary expense. It will be seen that the needs of all types of constructors are catered for by these three kits, which will be found listed in the catalogue section of this magazine.

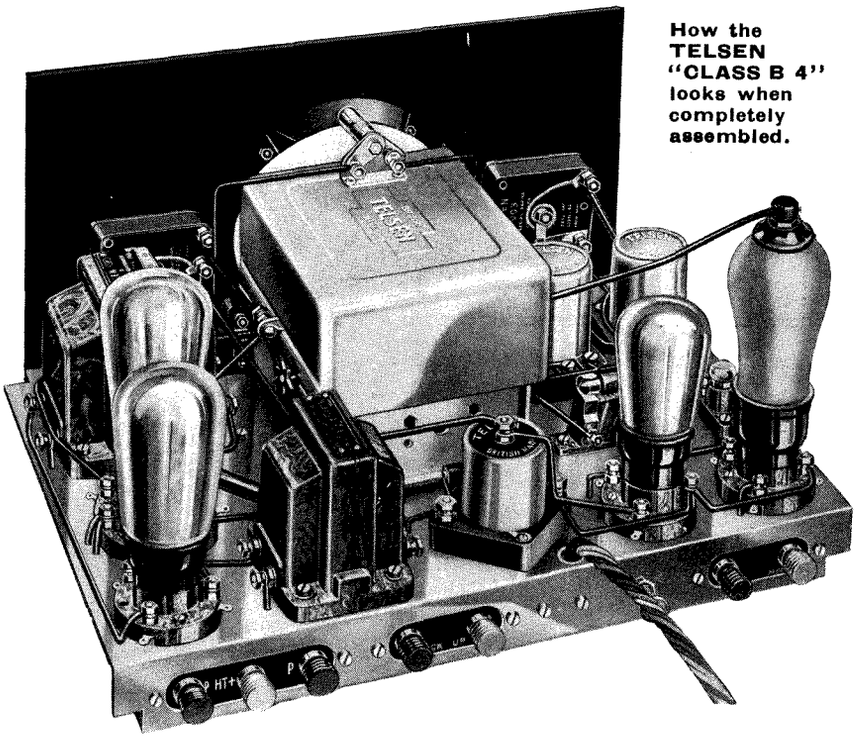
Now to revert to the actual receiver. An examination of the

CLASS B Battery

FOUR VALVE OPERATED RECEIVER CORED COILS & "CLASS B" AMPLIFICATION

TELSEN TECHNICAL STAFF

theoretical circuit diagram given in Fig. 1 will immediately convey to the reader the salient features of its electrical design. From an examination of this, it will be seen that four valves are employed as screen grid H.F. amplifier, detector, driver valve, and (Class B) output valve. The aerial is variably coupled to the input circuit of the receiver by means of a special "separator" condenser giving a wide range of selectivity and volume control. The screen grid valve is coupled to the detector by an iron cored coil used as an H.F. transformer, whilst the detector is coupled to the "driver" valve by means of an "Ace" 5:1 transformer. It will be observed that decoupling is embodied in the H.T. supply to both the detector and the H.F. valve—a precaution particularly necessary with "Class B" operation, to ensure perfect stability. Reaction is applied to the H.F. transformer, and is controlled by a differential condenser. The "driver" valve is coupled to the "Class B" output valve by a special driver transformer having an overall step down ratio of 1.5:1, which ratio is most suitable for use with the "Class B" valve recommended.



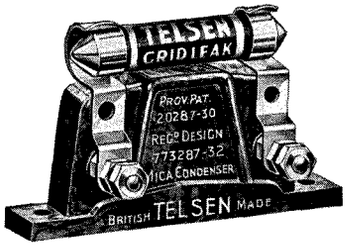
How the TELSEN "CLASS B 4" looks when completely assembled.

N.B. The special "Class B" output transformer required is fitted to the speaker supplied with the cabinet kit. If the constructor desires to use an ordinary moving coil loudspeaker, he may adapt it for use with this receiver by using either a Telsen "Class B" output choke W.345, or a "Class B" output transformer W.344. The choke should be used if the speaker is already fitted with some sort of input transformer or a high resistance speech coil, whilst the transformer is used if it is desired to make direct connection to a low resistance speech coil. Full descriptions and prices of these components will be found in the catalogue section of this magazine.

The fixed condensers associated with the output stage are of interest. The two condensers connected between the plates of the "Class B" valve and earth ("Ca" and "Cb") serve to prevent self-oscillation of the output stage—a condition to which push-pull stages are subject. The condenser "Cx" connected from plate to plate of the "Class B" valve, prevents the load impedance presented by the loudspeaker from rising with frequency, to an unduly

THE TELSEN "CLASS B 4"—ONE KNOB TUNING—

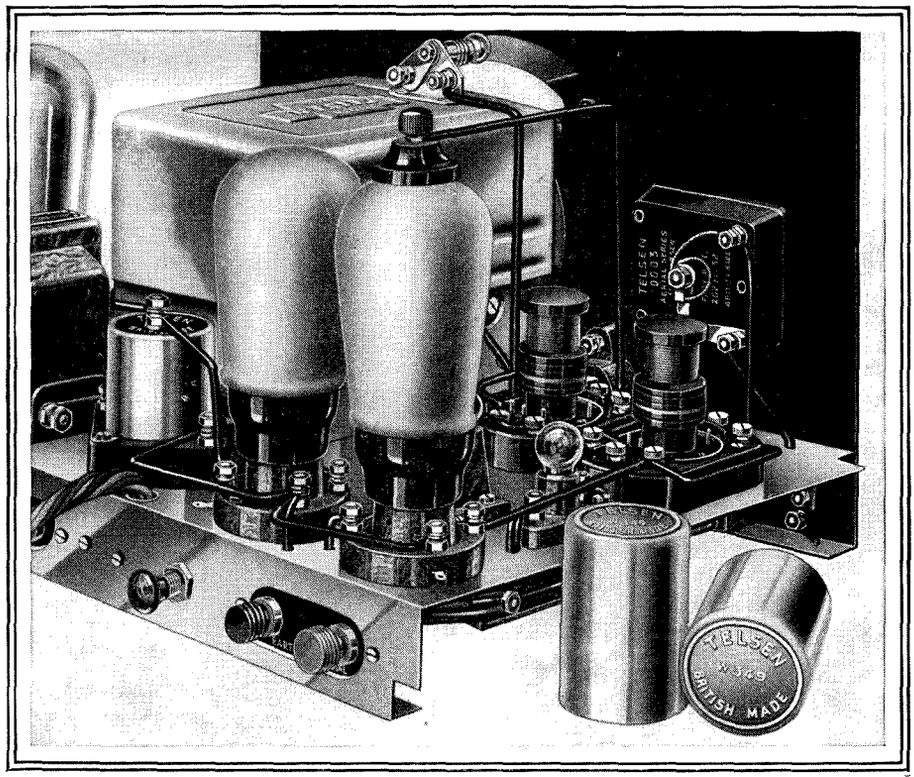
high value. If this is allowed to happen with a "Class B" output stage, two undesirable effects are produced. Firstly, over accentuation of the higher frequencies takes place, exactly as with a pentode valve, and secondly, severe distortion may be produced by variation of the input resistance of the "Class B" valve, which results from variation of the load impedance. It will therefore be seen that this condenser serves a very useful purpose.



It is desirable, however, that in a "Class B" receiver, some tone correction should take place at an earlier stage than the output circuit, as in this way an economy in H.T. consumption may be effected. In this receiver therefore, the values of the fixed condensers in the output circuit are chosen so as to maintain sensibly constant load impedance, and the small amount of further correction required, is then provided by the condenser "Cy," in conjunction with the H.F. choke in the detector anode circuit.

There are five controls mounted on the attractively finished metal panel, viz. :— wavechange switch, on-off switch, separator, volume control and tuning control. A switch is fitted to the back of the receiver, for switching off the dial lamp. This effects considerable economy as this light is only required during the process of tuning.

A full size 1/- Blue Print of this receiver is presented free with this copy of the *Radiomag*, and if this is followed in conjunction with the remainder of this article, the construction of the receiver will be simplicity itself.



View of the "CLASS B 4" showing the Telsen Iron Cored Coils with screens removed.

ASSEMBLY

Assembly of components on chassis

The first step in assembly should be to mount the components on the top of the chassis; if it is remembered that the flanges at the back and front of the chassis are turned *down* it will be clear which side is the top.

The screws should be inserted so that the heads are on the upper side of the chassis, with the nuts underneath. Two sizes are supplied—6 B.A., which are used to fasten all the components except the transformers; and 4 B.A., which are for the latter purpose. 6 B.A., of course, is the smaller size. Two lengths are supplied; the correct length to use for a particular purpose will be readily apparent. Using cheese-headed 6 B.A. bolts then, the following components should be mounted: the two iron cored coils in holes 1-2-3-4, so that the terminals numbered "1-2-3" on the coil bases face the valve holders "V1-V2" in the print, the fuse-holder in holes 5 and 6 and the valveholders "V1, V2, V3 and V4" in holes 7-8-9-10-11-12-13-14 respectively, taking care that they are placed the correct way round, as indicated by the position of their sockets in the Blue Print. The seven pin valveholder requires some care in this respect. The terminals numbered 4 and 5 (actual numbers on the valveholder base) should be nearest the valveholder, "V3." Next, assemble the grid leak and condenser as shown in Fig. 2, and mount the assembly in holes 15 and 16, then mount the "Ace" transformer and driver transformer in holes 17-18-19-20, and 23-24-25-26 respectively, taking care that the terminals face the correct way, as shown in the Blue Print; 4 B.A. cheesehead screws are used for securing these. The screened H.F. choke can now be mounted; the terminal marked "H.T.+" should be nearest the "Ace" transformer. This leaves only the twin gang condenser to be mounted on the top; this, however, is left until a later stage, and attention is turned to the assembly of the components on the underside of the chassis.

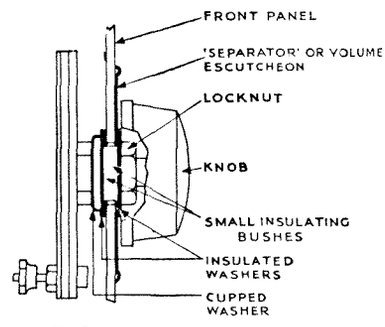
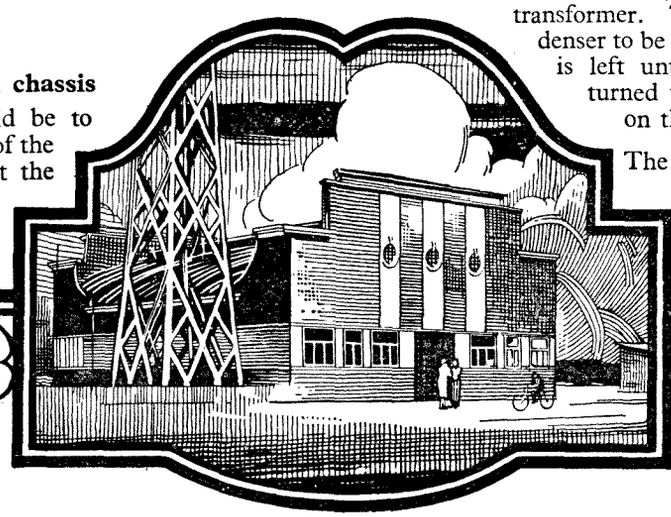


FIG. 3

The 1 mfd. condenser should first be mounted in holes 26-27, not forgetting to interpose between it and the chassis, the two



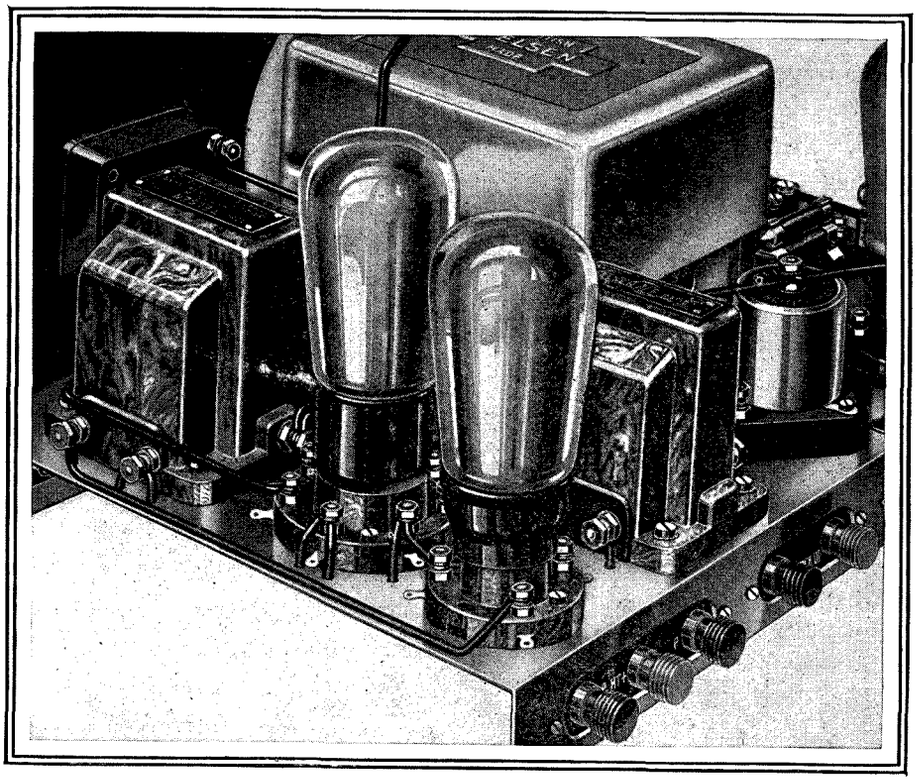
COPENHAGEN DENMARK.

MAINS OUTPUT FROM BATTERY INPUT

erinoid spacer pillars provided for this purpose. The two 2 mfd. condensers (" A " and " B " in the Blue Print) can then be mounted in holes 28-29-30-31. Next mount the .1 mfd. condenser on the inside of the front edge in holes 32 and 33; as the panel is bolted to this front edge at a later stage, countersunk headed screws must be used to fix this condenser, otherwise of course the panel will not fit closely. This point must be carefully noted—6 B.A. flat countersunk headed screws should be used.

The three terminal strips are fitted to the back of the chassis in holes 34-35-36-37-38-39. The correct positions for these—" Aerial-Earth," as distinguished from " Pick-up " or " LS "—are indicated in the print, and it should also be noted that these strips are fitted to the *inside* of the back, not the outside, so that the slots in the back expose only a portion of them.

Having fitted these strips correctly, the terminals should be mounted in them. Looking at the back of the chassis the colours of the terminal heads should run as follows, from left to right: Black-Red - Black, Black-Red, Black-Red. The fixing nuts securing these should be well tightened by means of the Telsen spanner set provided with the Constructor's Outfit. Next, mount the push-pull switch " S1 "; this is a two-point switch having two terminals, and is mounted between the "Aerial-Earth" and " Pick-up" terminal strips, on the back of the chassis.



THE TELSEN "CLASS B 4" showing the position of the Driver and "Class B" Valves, between the L.F. Transformer and Driver Transformer.

Assembly of components on front panel

Having mounted all the components on the chassis except the twin gang condenser, attention can be directed to the assembly of the controls on the panel.

Remembering that the Blue Print gives a view of the back of the control panel, as if the latter were folded forward flat, the position of the various controls will be immediately apparent. The side which has the crystalline finish is the front of the panel.

The aerial series condenser is mounted at the extreme left, looking at the front of the panel, whilst the differential reaction condenser is mounted on the right hand side. The spindles of both these components require to be insulated from the panel, and the operation of mounting them should therefore be carried out with care, using the insulating washers supplied with the condensers, as shown in the accompanying diagram (Fig. 3). The actual procedure in mounting these is as follows: First fit over the screwed fixing bush one of the cupped washers supplied with the kit, so that the cupped portion faces away from the condenser body, follow this by a large flat insulating washer, then by a small insulating washer. Next, from the back of the panel, insert the fixing bush and spindle of the condenser into the appropriate fixing hole. The condenser should be disposed so that the terminals are in the positions shown in the Blue Print. See that the cupped washer and the large flat insulating washer lie flat against the back of the panel; the small insulating washer should fit into the hole in the panel and should project at the front a little as it is slightly thicker. Over this projecting portion the appropriate escutcheon plate (" volume " or " separator " as the case may be) is fitted, and after this, another large flat washer, and the condenser fixing nut. Rotate the escutcheon plate so that its indication is at the top, and holding the whole assembly firmly, screw up the fixing nut tightly by means of the special spanner provided. After this, the knob may be fitted.

The two push-pull switches "S2" and " S3 " can now be mounted. These switches are both of the same type (3-point) but one of these ("S2") is used as an " on-off " switch, whilst "S3" is used as a wave change switch.

When fitting these to the panel, therefore, the appropriate escutcheon plate should be fitted — wavechange or on-off as the case may be. These switches do not require to be insulated from the panel.

The escutcheon plate for the tuning condenser should now be mounted, using the special screws supplied for the purpose.

This done, the panel may be secured to the chassis by means of four instrument headed (raised countersunk) 6 B.A. screws, the nuts, of course, being on the inside of the chassis. These four nuts incidentally, should be the large square ones which will be found in the Constructor's Outfit.

WIRING

The receiver is now ready for wiring, this being carried out by means of the special " pull back " wire, supplied with the outfit. This " pull back " wire consists of tinned copper wire with a cotton covering which can be slid back over the wire so that the ends can readily be exposed for bending into loops

(*continued on page 14*)

THE TELSEN "CLASS B4"—SUPER SELECTIVITY—RADIO AND

which are, of course, required when making connections to terminals. If one has a length of this wire which requires a loop at each end, one simply pushes back the covering from both ends towards the centre; in the case of a short lead, however, this may make the covering rather "lumpy." In this case a better plan is to slide the covering forward over one end of the wire for a distance equal to the length of bare wire required to produce the two loops, then cut off this projecting covering and slide back the remainder to the centre of the wire, when the required amount will be exposed at both ends, which can then be bent into loops for terminal connections.

A pair of round nosed pliers, preferably furnished with side cutters, will be found useful in forming these loops and in cutting the wire. A suitable pair may be purchased for as little as 6d.

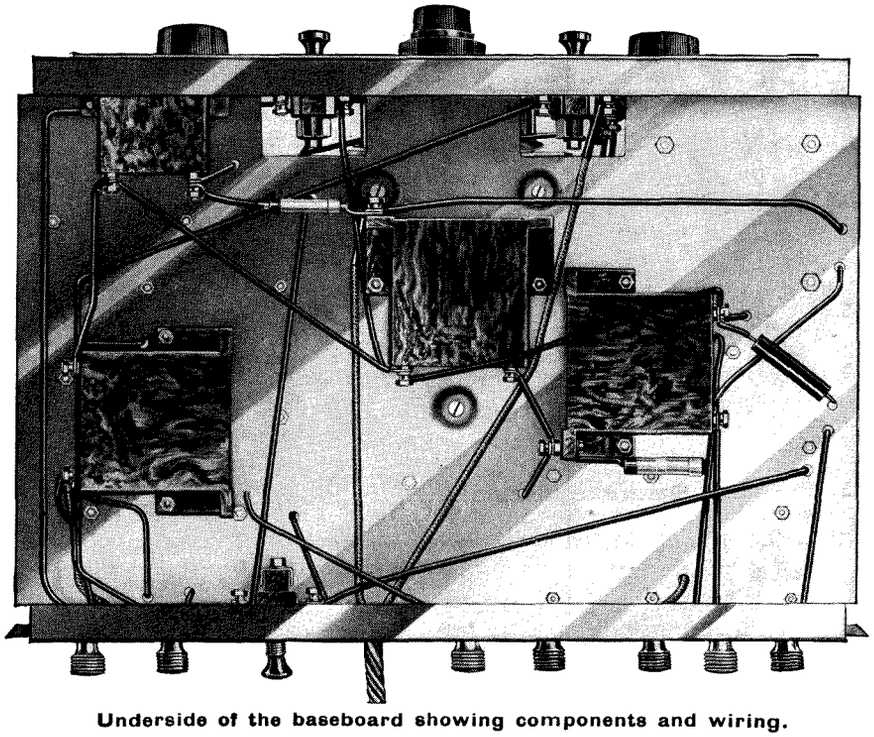
For the convenience of the constructor all the terminal wiring points are figured; it should be noted, however, that these figures exist only on the Blue Print for easy reference, and bear no relationship to the actual markings on the terminals themselves.

All holes through which wires pass, are designated by the letter "H" and the number of a terminal to which the particular wire in question is connected.

The complete wiring list here, should be followed in the order given; it is a good plan to cross off the wires in this list, as and when they are completed in the receiver

Terminals:

44 on V1 to 45 on V2.
45 on V2 through 45H to 46 (earth terminal on A-E strip).
46 to 47 on 1 mfd. condenser.
47 on 1 mfd. condenser to 48 on 0.1 mfd. condenser.
48 on 0.1 mfd. condenser to 49 on 2 mfd. condenser ("A").
49 on 2 mfd. condenser ("A") to 50 on 2 mfd. condenser ("B").
50 on 2 mfd. condenser ("B") through 50H to 51 on driver transformer.



Underside of the baseboard showing components and wiring.

Terminal 51 on driver transformer to 52 on driver transformer.
" 53 on V1 to 54 on V2.
" 54 on V2 through 54H to 55 on "S1."
" 55 on "S1" through 56H to 56 on V4.
" 56 on V4 to 57 on V3.
" 58 (aerial on A-E strip) through 59H to 59 on aerial series condenser ("separator").
" 60 on separator to 61 on coil "A."
Terminal 62 on coil "A" to 63 on coil "A."
" 63 on coil "A" to 64 on coil "B."
" 63 on coil "A" through 63H to 47 on 1 mfd. condenser.
" 65 on V1 through 65H to 66 on 1 mfd. condenser.
" 67 on grid condenser to 68 on V2.
" 68 on V2 through 68H to 69 on "Pick-up" strip.
" 70 on V2 to 71 on H.F. choke.
" 71 on H.F. choke to 72 on reaction condenser.
" 73 on reaction condenser to 74 on coil "B."
" 75 on reaction condenser to 76 on "S2."
" 77 on "S2" through 78H to 78 on fuseholder.
" 79 on "S3" to 49 on 2 mfd. condenser "A."
" 80 on "S3" to 81 on coil A.
" 82 on coil "B" to 83 on "S3."
" 111 on driver transformer to 112 on V4.
" 113 on driver transformer to 114 on V4.

At this stage, the twin gang condenser should be mounted in the holes 128-129-130.

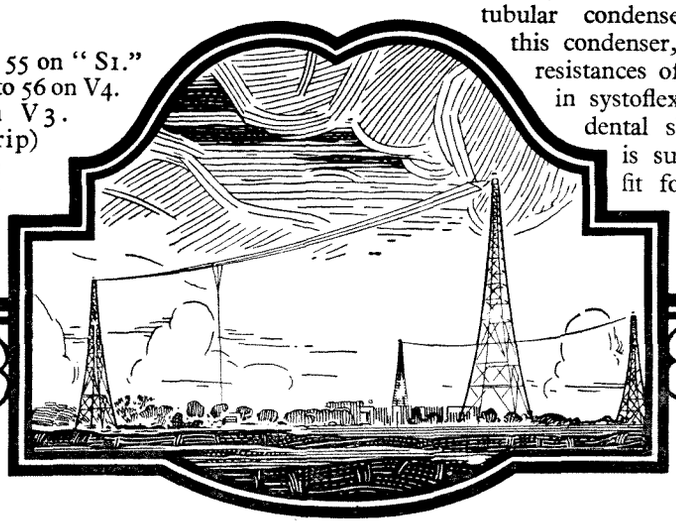
Holding the condenser in position, insert the three 4 B.A. screws provided with it, through the three holes on the chassis, so that they engage in the three holes on the condenser base. Do not screw these up tightly until the condenser has been slid backwards or forwards in the slotted fixing holes so that the tuning dial just clears the back of the escutcheon plate, and rotates without scraping it.

Having mounted the twin gang condenser, the wiring may be proceeded with as follows:

Terminals:

84 on V1 to 85 on coil "A."
85 on coil "A" to 86 on twin gang condenser.
87 on coil "B" to 88 on twin gang condenser.
88 on twin gang condenser to 89 on grid condenser.
90 on "Ace" transformer to 91 on H.F. choke.

Between 91 and 92 on the H.F. choke, connect the .002 mfd. tubular condenser. The connecting wires on this condenser, as on the other condensers and resistances of similar type, should be sheathed in systoflex to avoid the possibility of accidental short circuits. Suitable systoflex is supplied in the Constructor's Outfit for this purpose. This condenser being mounted, the rest of the wiring should be carried out as follows:—



LONDON REGIONAL LONDON

SENSITIVITY—AND OUTSTANDING QUALITY ON GRAMOPHONE

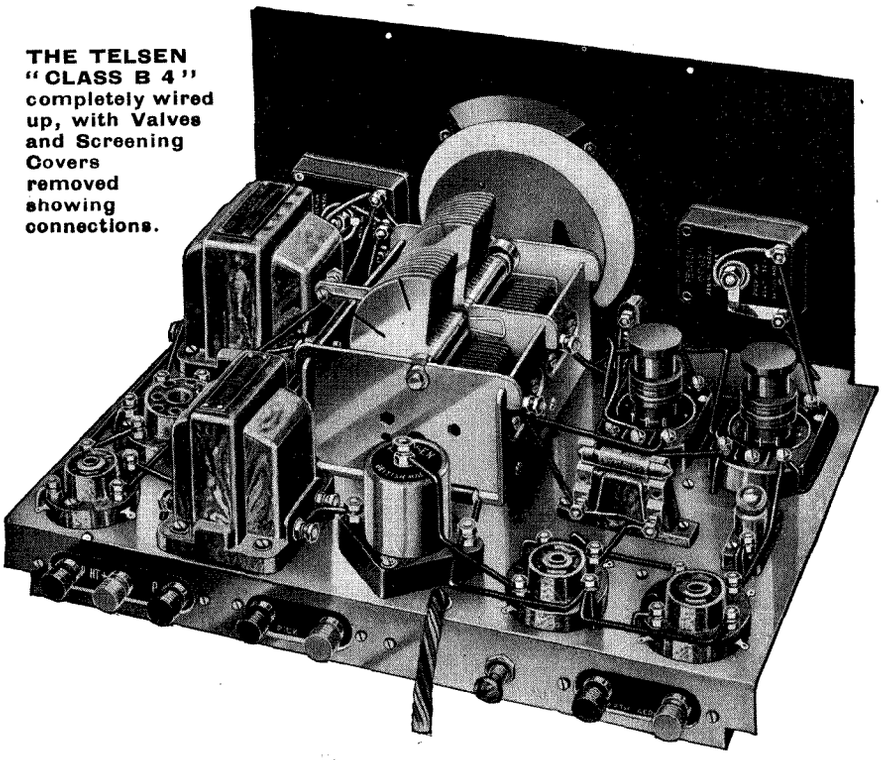
Connect 92 on the H.F. choke to 45 on V2.
„ 93 on the " Ace " transformer to 94 on V3.
„ 95 on V3 to 96 on V4.
„ 96 on V4 to 97 on " Ace " transformer.
„ 97 on " Ace " transformer to 98 on twin gang condenser.
„ 98 on twin gang condenser to 51 on driver transformer.
„ 98 on twin gang condenser to 75 on reaction condenser.
„ 100 on L.S. strip through 99H to 99 on V4.
„ a .005 mfd. tubular condenser between 99 on V4 and 97 on " Ace " transformer.
„ a .005 mfd. tubular condenser between 100 and 102 on L.S. strip. (Insulate the connecting wires on these condensers with systoflex, as before.)
„ 102 on L.S. strip through 101H to 101 on V4.
„ a .005 mfd. tubular condenser between 101 on V4 and 50 on 2 mfd. condenser " B."

One of the connecting wires for this condenser passes through the hole 101HB; particular care should be taken to insulate with systoflex as mentioned.

Now connect 103 on L.S. strip to 104 on 2 mfd. condenser " B."

Connect 104 on 2 mfd. condenser " B " through 105H to 105 on driver transformer.
„ 105 on driver transformer through 105HB to 106 on 2 mfd. condenser " A."

This terminal 106 on 2 mfd. condenser " A," and the terminal 123 on condenser " B " require some explanation. These terminals are not normally provided on these components; they are supplied loose in the kit, and are fitted by the constructor to a hole in the fixing lug of each condenser, indicated on the Blue Print. They are intended to provide fixed anchorages for the ends of the 50,000 ohm and 5,000 ohm resistances to which convenient connections can be made. To fit them, it is only necessary to insert the cheese headed stems of the terminals into the holes in the condenser fixing lugs and to tighten down on them the flat hexagon nuts, after which the connecting wires are secured under the large hexagon headed terminal nuts provided.



THE TELSEN "CLASS B 4" completely wired up, with Valves and Screening Covers removed showing connections.

Between 106 on 2 mfd. condenser " A " and 107 on the .1 mfd. condenser, connect a 5,000 ohm resistance. Do not confuse this resistance with the 50,000 ohm one—the latter has a green body, but an orange band, instead of the red one, found on the 5,000 ohm resistance.

Then connect 107 on the .1 mfd. condenser through 108H to 108 on coil " B."

Connect 110 on V3 to 109 on the driver transformer.

After placing the dust cover in position on the twin gang condenser, the pilot lampholder may be wired up as follows :—

Connect 115 on " S1 " through 116H to 116 on pilot lampholder.
„ 117 on pilot lampholder to 98 on twin gang condenser.

Then connect 122 on the " Ace " transformer through 122H to 123 on the 2 mfd. condenser " B."

Then connect 123 on the 2 mfd. condenser " B " to 124 on the 2 mfd. condenser " A."

Then connect a 50,000 ohm resistance between 123 and 104 on 2 mfd. condenser " B."

At this stage the various battery leads can be connected; these are comprised in a multi-way cord, in which the various leads can be traced through by the fact that they are given distinctive colours. The Constructor's Outfit, which contains this cord, also contains a number of suitably engraved wander plugs and a pair of spade terminals, for connection to the various leads in the cord. These should be connected as follows :—

Black	L.T. —
Red	L.T. +
Red-White (Speckled) ..	G.B. +
Yellow	G.B. —1
Green	G.B. —2
White	H.T. —
Blue	H.T. +1
Maroon	H.T. +2

Before attaching the wander plugs and spade tags, the battery cords should be separated out for a length of about 18 in.; they can, if desired, be retwisted or plaited into groups for the various batteries—a group of three H.T. leads, a group of three leads for the G.B. battery, and a pair of leads for the L.T. battery. This results in a neat appearance.

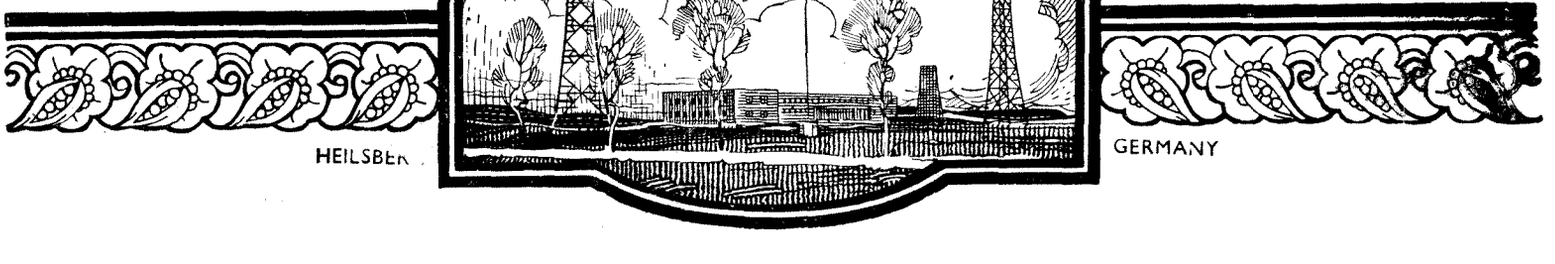
When fitting the plugs and spades, and also when connecting the cords into the set, the ends should be finished off with a short length of systoflex, which will serve to conceal the frayed ends of the coloured braiding. Suitable systoflex is provided in the Constructor's Outfit and should be fitted as follows. Push back the braiding on the cord for about one quarter of an inch and cut off the wire to the same length, then slide the braiding forward again over the wire, moisten it and screw it to a point between finger and thumb, after which a short length of the systoflex can be threaded easily over the braiding and pushed forward to the wander plug or spade tag when fitted.

To fit a wander plug, the wire is bared and bent into a loop which is gripped between the screwed collar and the insulating head on the plug.

When fitting the spade terminals the largest size of systoflex is used, which can be pushed forward over the shank of the spade tag after the latter has been fitted. To fit the spade tags, a short length of systoflex is slipped over the wire, and about one and a half inches of the wire is bared and doubled back on itself so as to form a thick wire end giving a good grip for the spade tag. After the wire end is placed in the shank of the tag, the teeth are closed over one by one, using a pair of pliers so that the wire is gripped firmly, after which the finishing sleeve of systoflex is slid forward over the shank.

Having fitted the plugs and spades in the manner described, the free end of the battery cord should be threaded through the aperture " L " into the underside of the chassis, and, leaving about twelve inches free, it should be secured under the cord clip which is fastened to the back of the chassis in holes 125-126. This cord clip will be found in the Constructor's Outfit. The free end of the cord should then be untwisted and the various leads con-

(*continued on page* 16).



THE TELSEN "CLASS B" 4—*continued.*

nected to the points indicated in the Blue Print, viz. :—

Connect L.T.— (Black) to terminal 118 on "S.2."
" L.T.+ (Red) to terminal 55 on "S.1."
" G.B.—1 (Yellow) to 119 on "Pick-up" strip.
" G.B.—2 (Green) to terminal 120 on "Ace" transformer through 120H.
" H.T.+1 (Blue) to terminal 66 on 1 mfd. condenser.
" H.T.+2 (Maroon) to terminal 106 on 2 mfd. condenser "A."

H.T.— (White) and G.B.+ (Red-White) are connected through 121H to 121 on fuseholder.

To avoid undue slack, these leads should be cut off to suitable lengths when connecting them up, and the ends should be finished off with systoflex as described.

The battery cord having been connected, attach a nine inch length of pull back wire to terminal 127 of coil "B." and bend the free end into a neat loop, for connection to the anode of the screen grid valve, after which the receiver is ready for test.

CONNECTING UP AND OPERATING THE "CLASS B FOUR"

Two Telsen Pilot Lamps W.417 are included in the kit. One of these should be screwed in the pilot lampholder on the twin gang condenser, and the other in the fuseholder. The same type of lamp should be used if replacement is required at any time.

Insert in valveholder "V1" the screen grid valve Cossor "220 S.G."; in "V2," the Osram "H.L.2"; in "V3," the Mullard "P.M.2A"; and in "V4" plug the "Class B" valve (Mazda "PD220").

Connect aerial and earth to the appropriate terminals and the special "Class B" speaker to the three speaker terminals. In general, the central one of the three terminals on a "Class B" speaker will go to the central ("+") terminal on the set, whilst the two outer terminals go to the outer ("P-P") terminals on the set. (These can be connected either way round.) This is the case with the "Class B" speaker which Telsen supply with the complete (cabinet) kit. Whatever the mechanical arrangement of terminals adopted by the manufacturer, it should be remembered the centre tap on the speaker input transformer will invariably be connected to the "+" speaker terminal on the set, although it may not necessarily be the central one of the three terminals on the speaker. This connection is illustrated in the circuit diagram of Fig. 1.

In cases where the constructor has a moving coil speaker not designed for "Class B" operation, but fitted with an input transformer or a high resistance speech coil he may, as previously mentioned, adapt it for use with this receiver by using a Telsen W.345 "Class B" output choke. The terminals on the receiver marked "P-P" and "H.T.+" should be connected to "P-P" and "H.T.+" respectively on the choke.

The leads from the speaker should be connected first, to the terminals marked "2.6" then "1.3," then to the "P" terminals on the choke to ascertain which ratio gives the best results. A 2:1 ratio may also be tried by connecting the "P-P" terminals on the set to the "1.3" terminals on the choke, the speaker being connected to the "2.6" terminals. The exact combination which will give the best results depends on the characteristics of the speaker in use. The matching of the speaker to the set has an important effect on the quality of reproduction, and it is worth while to take pains over this process. When it is desired to employ a speaker having a low resistance speech coil and no input transformer, a Telsen W.344 "Class B" output transformer should be used, it being connected exactly as shown in Fig. 1, except that the speaker may be connected to various tappings on the secondary of the transformer to obtain the best results.

With some speakers it may be found that the capacity of the condenser ("CX." in the circuit diagram) which is connected across the output circuit, may require some modification to produce the best tonal balance. The value chosen (.005 mfd.) will, however, be the most suitable in the majority of cases.

Next connect L.T.— (black lead with spade tag) to the "—" terminal of the accumulator, and L.T.+ (red lead with spade tag) to the "+" terminal. Insert the G.B.+ wander plug into the "+" tapping of a 9v. grid bias battery and insert G.B.—1 and G.B.—2 into the —1½ and —6 volt tappings respectively. Now insert the H.T.— plug into the "—" tapping of a 120 volt H.T. battery, plugging H.T.+1 into a socket giving about 72 volts and H.T.+2 into the 120 volt socket.

With the separator control set full over in a clockwise direction and the reaction (volume) control full over in an anti-clockwise direction, switch the receiver on by means of the on-off switch "S2" and with the wave change switch "S3" pulled out to the medium wave position, rotate the main tuning dial when a number of transmissions should be heard. On pushing in the wave change switch long wave stations should be received if everything is in order.

To attain maximum sensitivity, however, correct use should be made of the reaction control, and the tuned circuits should be "ganged" properly.

The twin gang tuning condenser carries two "trimming" condensers, as they are called, for ganging or balancing the tuning circuits. One of these trimmers is operated by a star wheel at the side of the condenser and is of the pre-set type, whilst the other trimmer is operated by a knob concentric with the main tuning control. These should be adjusted as follows :—Set the wavechange switch to the "medium" position and the separator control about half way over, then with the volume control set near the point where oscillation commences, so that the receiver is in a sensitive condition, tune in a station near the bottom end of the medium wave band, i.e., with the condenser vanes nearly "all out." The small knob concentric with the main tuning control should be set half way between the limits of its travel, and the trimmer operated by the star wheel should be then adjusted for maximum signal strength, adjusting the main tuning condenser if necessary to keep the station tuned in. Having set the star wheel to the position giving maximum signal strength it should not again be touched.

THE TELSEN "CLASS B FOUR"

List of Components

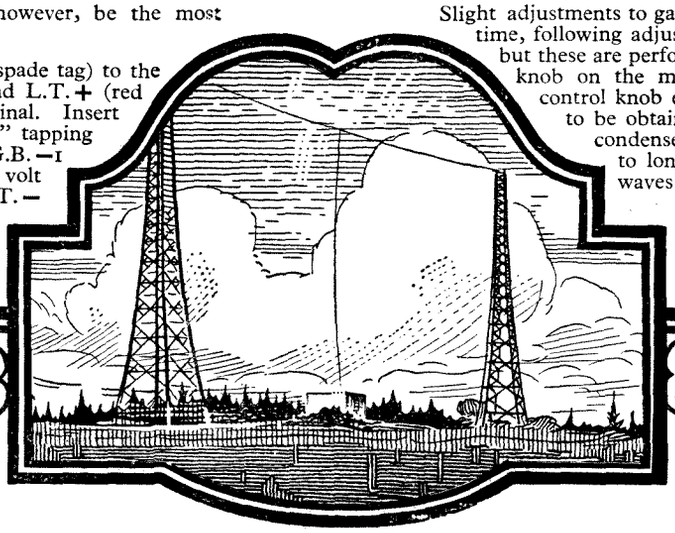
Quantity	*Description*	*Cat. No.*	*Price*
2	Iron Cored Coils	W.349	17/–
1	Twin Gang Condenser	W.306	14/6
3	4-pin Anti-microphonic Valveholders	W.222	2/–
1	7-pin Anti-microphonic Valveholder	W.338	1/9
1	"Ace" Transformer, 5:1 ratio	W.65	4/9
1	Driver Transformer, 1.5:1 overall ratio	W.359	8/6
1	Standard Screened H.F. Choke	W.341	2/6
1	.0003 Mica Condenser	W.242	–/6
1	.5 megohm Grid Leak	W.249	–/6
1	Fuseholder	W.146	–/6
1	.0003 Aerial Series Condenser	W.350	2/–
1	.0003 Differential Reaction Condenser	W.351	2/–
2	3-point Push-Pull Switches	W.108	2/–
1	2-point Push-Pull Switch	W.107	–/9
2	2 mfd. Self-sealing Condensers (500 v. test)	W.226	5/–
2	Pilot Lamp Bulbs	W.417	1/–
1	1 mfd. Self-sealing Condenser (500 v. test)	W.227	1/9
1	.1 mfd. Self-sealing Condenser (500 v. test)	W.231	1/6
1	5,000 ohm Wired End Resistance, 1 watt type	W.377	1/–
1	50,000 ohm Wired End Resistance, 1 watt type	W.420	1/–
1	.002 mfd. Tubular Condenser	W.407	1/–
3	.005 mfd. Tubular Condensers	W.408	3/–
1	"Class B Four" Constructor's Outfit	W.416	5/6

The Telsen "Class B Four," as detailed above, is supplied as a complete kit (Cat. No. W.415) at the inclusive price of £3 17s. 6d. The Telsen "Class B Four" is also supplied, as detailed above, with the addition of a specially designed Moving Coil "Class B" Speaker and Cabinet (Cat. No. W.414) at the inclusive price of £5 17s. 6d.

Slight adjustments to ganging will be necessary from time to time, following adjustment to the "separator" condenser, but these are performed by means of the small concentric knob on the main tuning control. This concentric control knob enables the most efficient performance to be obtained at any setting of the main tuning condenser or the separator. On changing over to long waves ganging carried out on short waves will still be found to hold good.

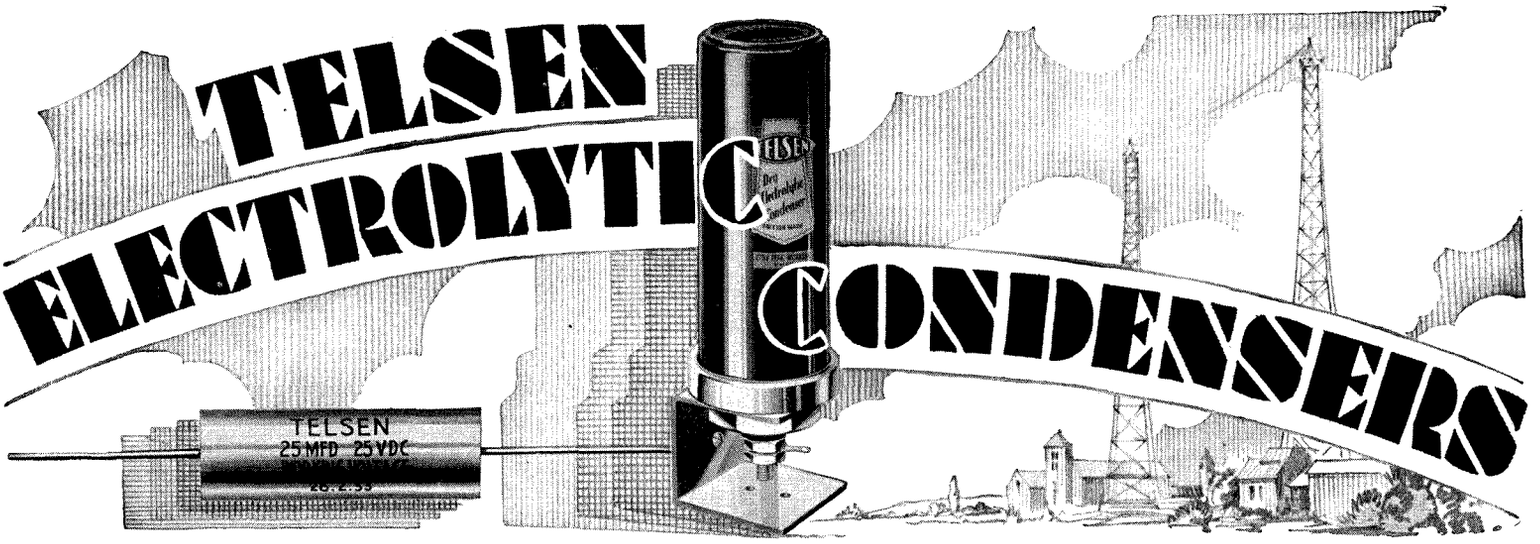
If the wavelength calibrated scale is fitted it should be adjusted to read correctly in the following way. Set the separator condenser about half

(*continued on page 41*),



MUHLACKER GERMANY

TELSEN ELECTROLYTIC CONDENSERS



AMONGST other recent tendencies in the design of manufactured receivers, the amateur may have noticed the increasing use of electrolytic condensers. The characteristics of these condensers are such that the larger sizes (4 mfd. and over) can be made much more cheaply than the standard paper or mica condenser, also, they are much more compact. In view of this, it is rather surprising that very little use has been made of them in home constructed sets. This is partly due to the fact that electrolytic condensers have in the past been designed for mounting on a metal chassis, and have not been in convenient form for use with home constructors' layouts.

After a considerable amount of research work, however, the Telsen Electric Co. have produced a range of electrolytic condensers which are not only in a more convenient form than hitherto, but which possess improved electrical qualities. These condensers have tubular bakelite cases carrying a spun metal band which forms the negative connection and makes contact with the metal chassis when the condenser is mounted in this way. A special universal mounting bracket with a terminal connection is provided with each condenser, so that when a wooden baseboard is used, convenient mounting and connection can still be made. The small low voltage types are made with wire end connections so that they may be floated in the receiver wiring. These condensers are radically different from the types previously available, indeed, their excellent mechanical and electrical features mark them as a notable advance in the design of electrolytic condensers.

As this type of condenser is not so familiar to the amateur as the ordinary Mansbridge or Mica condenser, it is felt that a brief explanation of its working principles will be of interest; the tubular container of an Electrolytic Condenser gives very little indication of what is inside it, and on this account it seems to be shrouded in mystery and regarded with some distrust, by people who are quite accustomed to the use of the Mansbridge condenser.

Actually, there is nothing very mysterious about an Electrolytic condenser. Like the ordinary Mansbridge, or the Mica condenser, it contains two electrodes separated by a dielectric, or insulator. In this case, however, the dielectric is not such a tangible object as the paper strip or mica sheet used in the ordinary condenser, but actually consists of an extremely thin film of aluminium oxide deposited on one of the electrodes, by an electrolytic process. Reference to Fig. 1 may make this clearer. This represents a phantom view of an electrolytic condenser of the wet or "aqueous" type, which is chosen as exhibiting the essential principles more clearly than the "dry" or "semi-dry" types, of which we shall have more to say later.

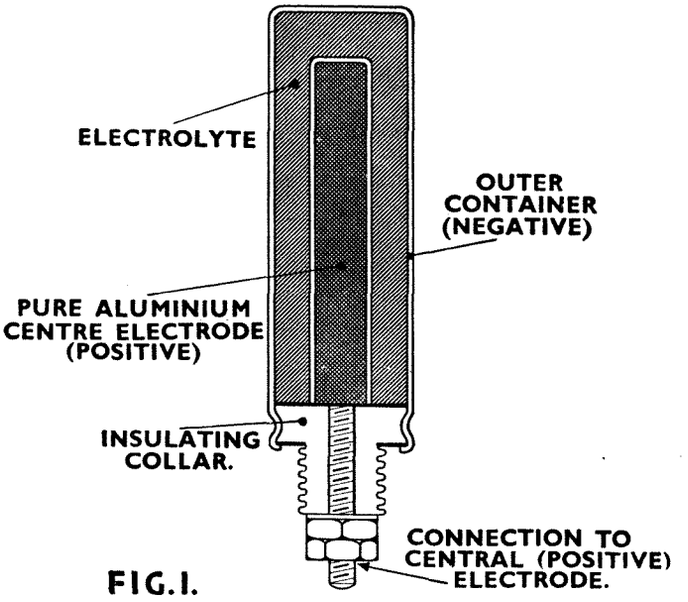
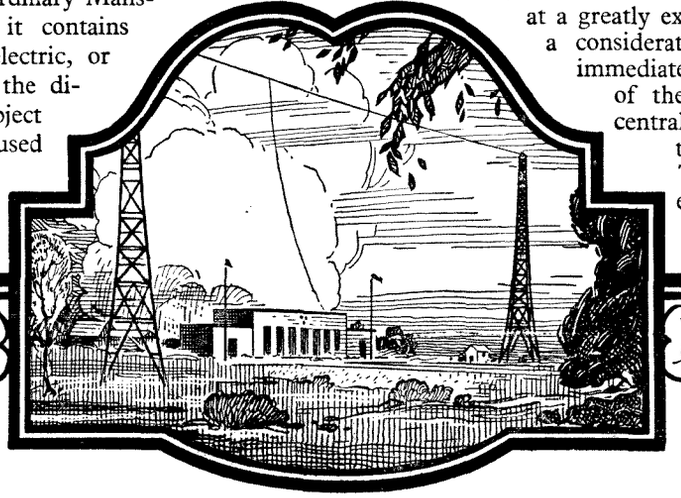


FIG. 1.

A consideration of this figure shows that the metal canister contains an aluminium electrode immersed in a liquid electrolyte with which the canister is filled, this aluminium electrode being supported at the centre of the container by the insulating bush which seals the end. This central electrode is shown as a simple rod, but in practice it assumes more complex shapes which give larger surface area. The insulating film which covers this electrode is shown in the sketch at a greatly exaggerated thickness. Now, from a consideration of this sketch, one would immediately say that the two electrodes of the condenser are formed by the central rod and outer container, but this, however, is not the case. The central rod forms one electrode, as we have seen, but

(*continued on page* 18)



MOTALA SWEDEN

TELSEN ELECTROLYTIC CONDENSERS—*continued*

the other electrode is formed by the inner surface of the electrolyte immediately surrounding, and in contact with, the insulating film. The remainder of the electrolyte (which is a conductor) and the metal container, merely serve to make contact with the inner surface of the electrolyte. Thus, whatever the size and shape of the central electrode as compared with the container, its corresponding electrode closely conforms to it in size and shape.

The surface area of the two electrodes so formed does not appear to be very large compared with the huge surfaces obtained by the yards of tinfoil strip rolled up in a Mansbridge condenser. This is one of the interesting points about an Electrolytic Condenser. The surface area of the electrodes, for a given capacity, is very much less than in any other type of condenser, the reason for this being that the dielectric film is minutely thin, so that the electrodes are extremely close together. Now, if the distance between the two electrodes of a condenser is halved, the capacity becomes, not double what it was formerly, but four times greater; in other words the capacity is inversely proportional to the square of the distance between the two electrodes. It is obvious from this that the capacity between the two electrodes of a condenser will increase very rapidly as the thickness of the dielectric is reduced—and the insulating film in an electrolytic condenser is very much thinner than paper or mica could possibly be made. The initial treatment given to the condenser to form this film, may be varied to produce a film capable of withstanding a high voltage, or a thinner film which breaks down at a low voltage, but results in a larger capacity being obtained. It is possible to obtain a condenser of 2,000 mfd. in the same space as the average Mansbridge Condenser of only 4 mfd. provided that it is only required to work at low voltages—not exceeding, say, 12 volts. Such condensers have many applications, e.g., smoothing L.T. circuits, by-passing bias resistances, etc.

The ordinary condenser is operated usually, at a voltage not exceeding one-fifth of the voltage at which breakdown occurs, because when this type of condenser does break down, through the application of excessive voltage, it becomes a dead short circuit and remains in this condition after the removal of the excess voltage.

The electrolytic condenser may be, and usually is, operated at voltages as high as 70 per cent. of its breakdown voltage, because when breakdown does occur, it has not the disastrous and permanent effect that we have noted in connection with the ordinary condenser. The small leakage current that is a feature of electrolytics increases with increasing over voltage, at first slowly and then rapidly, until a fairly large current is flowing. Unless the overload is really tremendous, however, the condenser will recover when the excess voltage is removed. In other words, it is " self-healing."

It will be noted that in Fig. 1 the central electrode is referred to as positive, whilst the container is shown as negative. In use, the condenser must always be connected like this ; if the polarity is reversed so that the can becomes positive, the insulating film will pass into solution and the condenser will be destroyed.

For this reason, also, the condenser must not be connected on raw A.C., although, fortunately, it is seldom required to connect large capacities across an A.C. source.

A sectional view of a Telsen Electrolytic Condenser is given in Fig. 2. The construction of this, as will be seen, is somewhat different from that of the simple " aqueous " type, just considered. The Telsen Electrolytic actually belongs to the category known as " semi-dry " ; a type which has all the advantages of the "aqueous" and " dry " types, with many others not possessed by either.

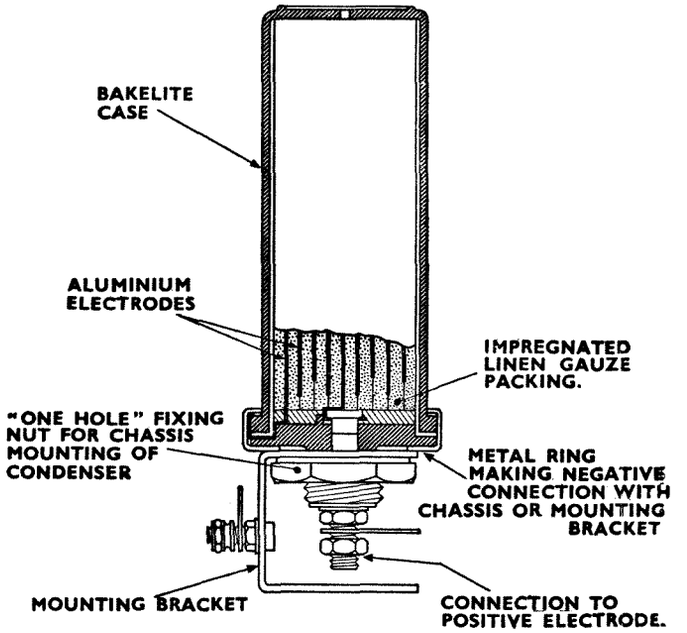


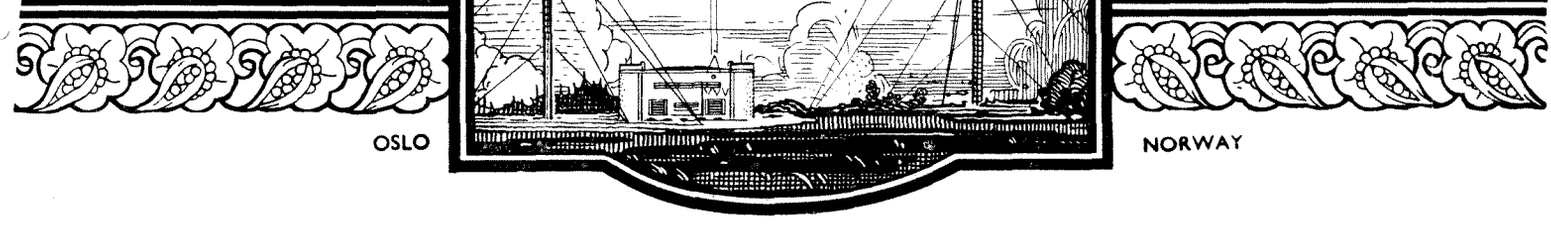
FIG. 2.

The construction comprises a pair of aluminium electrodes, in the form of strips, separated from each other by a linen gauze packing which is impregnated by the electrolyte. The electrode strips and linen packing are rolled up as in a Mansbridge Condenser, but, of course, the length of the electrode system is considerably less. The positive electrode is connected to the centre pin on the case, whilst the negative electrode is connected to the spun metal band on the outer case, which band makes contact either with the metal chassis on which the condenser is mounted, or with the special mounting bracket. This produces a condenser which is extremely compact and which has several advantages, as follows.

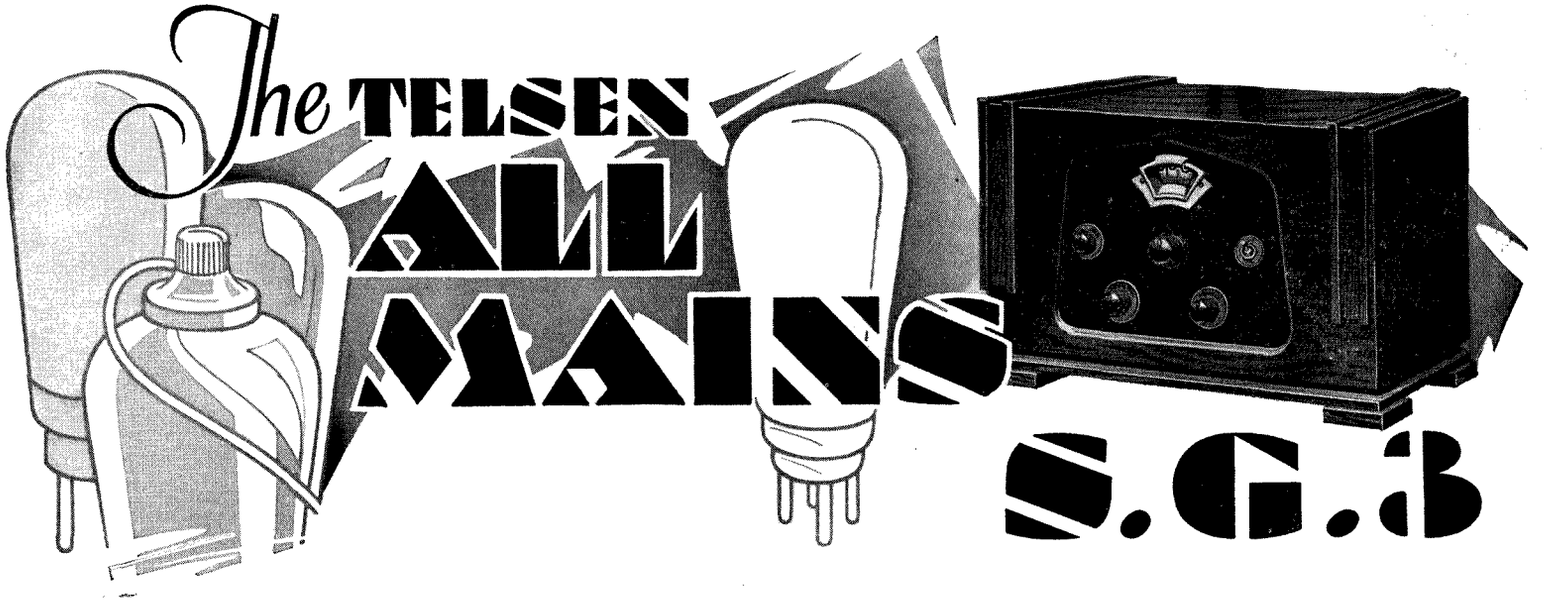
It has been mentioned that, in operation, electrolytic condensers pass a small steady leakage current. This is normally very small ; in the case of Telsen condensers it is as low as 0.1 mA. per microfarad, but after a period of idling or disuse, the leakage current becomes higher than usual, recovering after a period of use. With some varieties of electrolytic condenser the leakage current after idling is fairly heavy and recovery takes several minutes. An 8 mfd. Telsen Condenser, however, will only increase in leakage current to about 5 milliamps. at maximum voltage, and will recover in approximately 25 seconds, after several weeks idling. Furthermore, a life test of Telsen electrolytics shows no signs of change in properties after 10,000 hours at maximum voltage.

The short electrolyte path in the Telsen type of condenser results in low internal resistance, which in turn produces a condenser of low " power factor " ; in the case of Telsen condensers it is only five per cent., as compared with the 30 per cent. or so exhibited by certain other types. The term " power factor " may require some explanation. Expressed very simply, it is a measure of a condenser's efficiency, a condenser of zero power factor would

(*continued on page* 40)



The TELSEN ALL MAINS S.G.3



FURTHER NOTES ON AN OUTSTANDING QUALITY RECEIVER

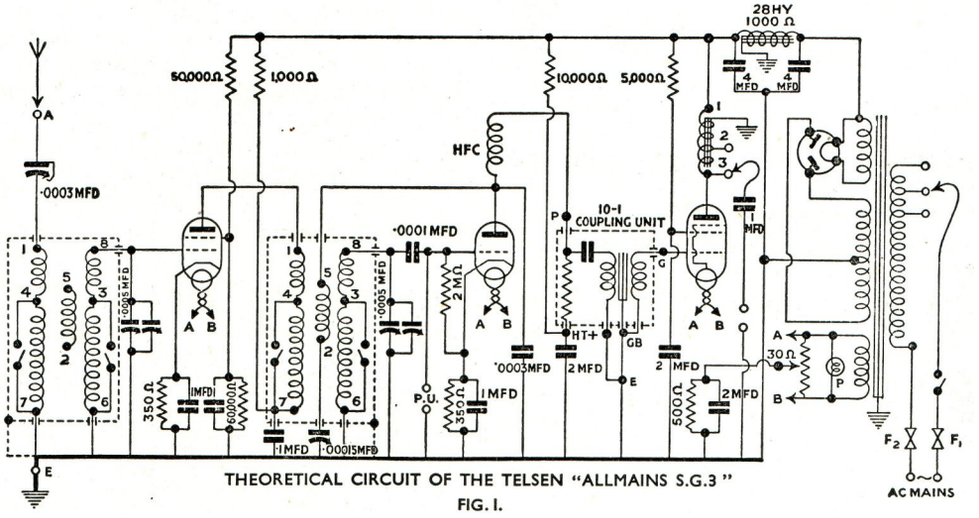
WHEN we first presented the Telsen All Mains S.G. 3 receiver in our last issue of the *Radiomag*, we felt sure it was bound to have a great reception by music lovers all over the country, but we were really surprised at the vast number of letters of appreciation sent to us by delighted constructors. However, when we examine the receiver critically, we must admit that it is such an excellent set in every way that their enthusiasm is entirely justified.

The whole set is the result of a great deal of patient experiment and research carried out by Telsen Technicians, in well equipped laboratories, and it represents the last word in three valve receiver design.

The quality of reproduction, which is a special feature of this receiver, is really superb, in fact it has been said that the Telsen All Mains S.G.3 should not be regarded as a piece of electrical apparatus but as a fine quality musical instrument. In this connection it should be noted that this receiver will reproduce gramophone records with wonderful fidelity, and is therefore especially suitable for building into the form of a radio-gramophone.

The arrangement of valves, Screened Grid High Frequency Valve, Detector, and Pentode Output Valve, is the most highly efficient arrangement possible in a 3-valve set incorporating as it does both high and low frequency amplification. Mains valves, such as are used in this set, are well known to be much more powerful and efficient than the ordinary battery valves, so that ample power is available to operate the largest speakers.

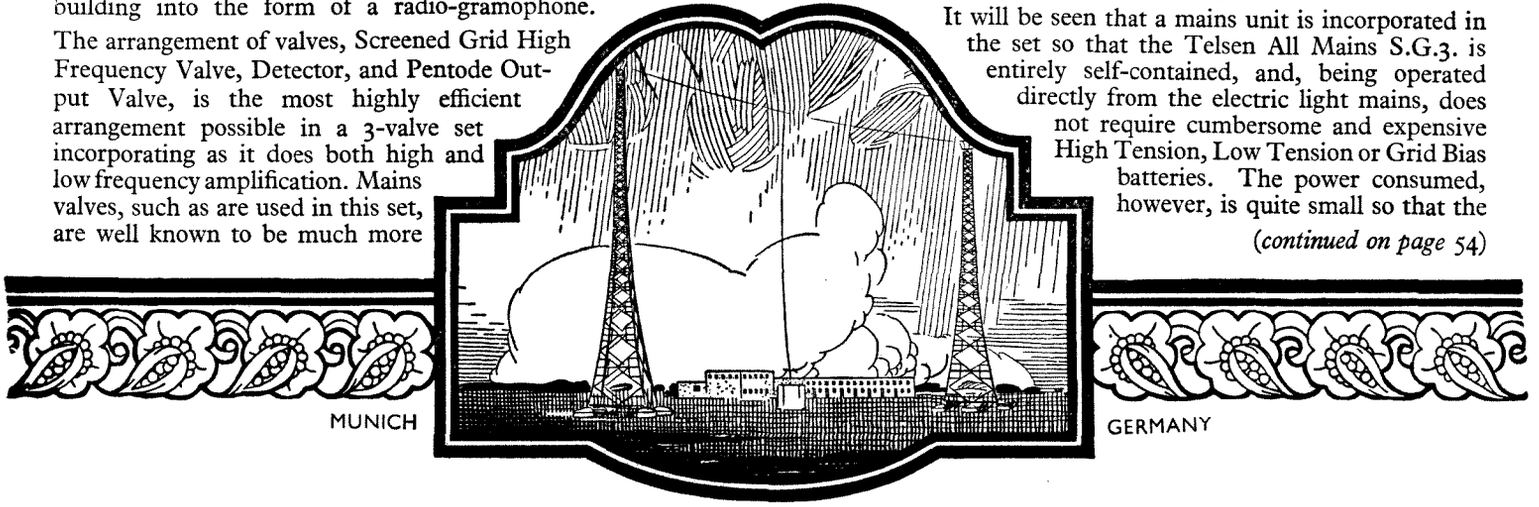
The circuit diagram of the receiver shows that the aerial is loosely coupled to the tuned circuit preceding the screened grid valve, so that damping is reduced and selectivity improved. A variable series aerial condenser or " Separator " is also incorporated, and this is a valuable control both of selectivity and volume. In the tuned grid circuit of the detector, reaction is introduced, and as it is very smooth it affords a convenient volume control and selectivity adjustment. The two tuned circuits provide ample selectivity, and they are arranged by means of the Telsen Ganged Condensers and matched Screened Coils to be operated by a single control so as to give great ease of tuning. Following the detector is the Telsen 10:1 Coupling Unit W.215, which, working in conjunction with the pentode output valve, and tapped pentode output choke W.72, provides that wonderfully even frequency response which is so appreciated by the music lover and gramophone enthusiast.

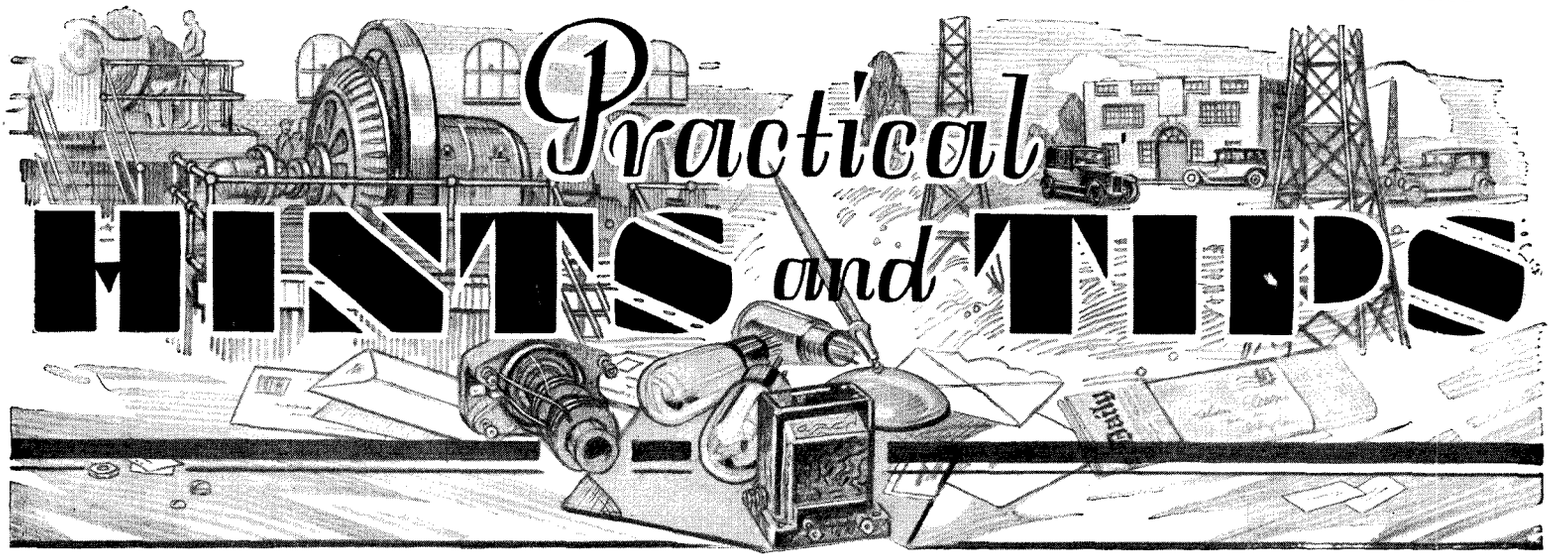


THEORETICAL CIRCUIT OF THE TELSEN "ALLMAINS S.G.3 "
FIG. I.

It will be seen that a mains unit is incorporated in the set so that the Telsen All Mains S.G.3. is entirely self-contained, and, being operated directly from the electric light mains, does not require cumbersome and expensive High Tension, Low Tension or Grid Bias batteries. The power consumed, however, is quite small so that the

(*continued on page 54*)





Practical HINTS and TIPS

MOUNTING WIRED-END RESISTANCES AND CONDENSERS

WHERE space is at a premium and where cost is a consideration, resistances and tubular condensers with wired ends, similar to the types recently introduced by Telsen, are an extremely good proposition, providing as they do, the same service as the more elaborate types whilst occupying far less space and being considerably cheaper.

In the normal way, components of this type can be most conveniently arranged to float on their connecting wires between the two fixed points to which they are to be connected.

In some cases, however, the two points between which the resistance or condenser is to be connected, are at a considerable distance apart, so that the component does not conveniently float between them without danger of sagging into some unwanted place. Again, one end of the component may not be connected to a fixed terminal point, but in some cases to, say, a battery lead, which does not provide a fixed anchorage. In such cases a convenient mounting may be contrived by using a W.204 Telsen terminal block. These blocks will comfortably accommodate all but the largest resistances and condensers in the manner shown in the accompanying figure, forming, as will be seen, a neat and efficient mounting.

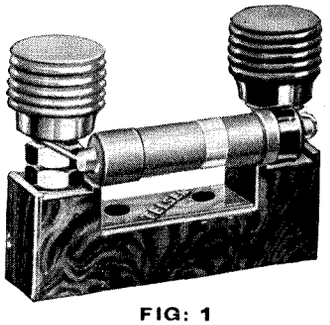


FIG: 1
Terminal Block and Resistance

As the terminal block is well insulated, the device may be employed on a metal baseboard. To secure a very large resistance or condenser, the terminal block may be sawn in two, the two halves being mounted at the required distance apart, or one half of a block may be used to support one end only of a resistance or condenser which is anchored to a component at the other end.

EARTHING CONNECTIONS IN CHASSIS BUILT RECEIVERS

The use of a metal chassis in constructing a wireless receiver, apart from producing a neater and more " professional " looking job than a " bread-board " layout, results in improved screening and a simplification in wiring, due to the fact that earth returns may be made direct to the chassis. Once a connection has been made between the earth circuits of the receiver and the chassis, all the other earth " returns " required may be obtained by connecting to the chassis the " earth " side of the components concerned. This practice should not be carried too far, however, when constructing sensitive receiving sets having several H.F. stages, and when using a plated steel chassis which may be composed of several sections screwed together.

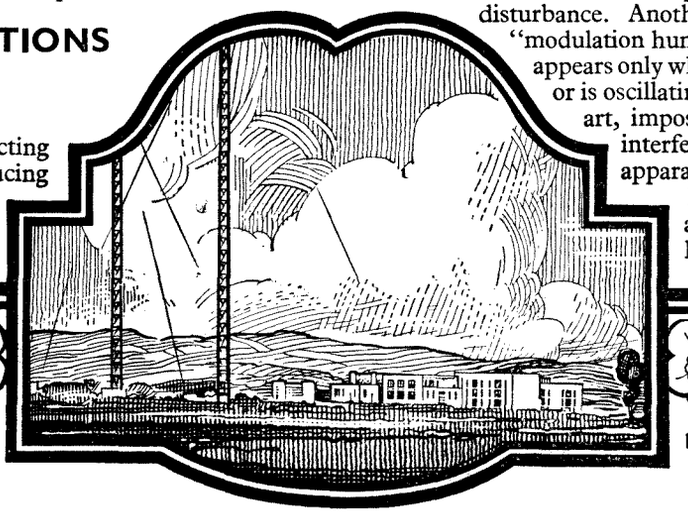
Under these circumstances, if contact with the chassis is relied upon for an earth connection to certain components (notably those in the H.F. section of the receiver) instability may be produced by the introduction of resistance common to several circuits. An example is seen in the earth connection to a multi-section ganged condenser. If contact with the chassis is relied upon to provide the earth connection to this, a resistance may be introduced common to all the tuning circuits and although quite small, this resistance, by providing common coupling, may render the receiver quite unstable.

In such cases a direct earth connection should be made to the terminal provided on the ganged condenser.

Earth connections run in this way between the various components should, at intervals, be connected to the chassis. In this way, effective " bonding " of the various portions of the chassis is obtained, and every part of the receiver is effectively " tied down " to earth. Attention to these details will often provide the remedy for obstinate and baffling instability.

REDUCING MAINS INTERFERENCE

A lot of people who use all-electric receivers or mains H.T. units, experience certain kinds of interference with their reception, not present with battery driven receivers, the reason for this being that some interference is picked up via the supply mains from faulty electrical apparatus in the neighbourhood. This form of interference manifests itself as a series of annoying clicks, or crackles, or a continuous frying noise, depending on the nature of the electrical apparatus producing the offending disturbance. Another form of interference known as "modulation hum" manifests itself as a hum which appears only when the receiver is tuned to a station or is oscillating. It is, at the present stage of the art, impossible to eradicate completely the interference produced by faulty electrical apparatus ; a few simple precautions will, however, reduce it to some extent, and will remove annoying "modulation hum" entirely.



WEST REGIONAL

ENGLAND

PRACTICAL HINTS AND TIPS—*continued*

The simplest remedy, and one that will be quite effective in the majority of cases, is to connect a condenser, which may be anything between .005 mfd. and .1 mfd. in capacity, between one side of the mains and earth. Slightly more effective results may be obtained in some cases by connecting two such condensers in series across the mains, the junction between the condensers

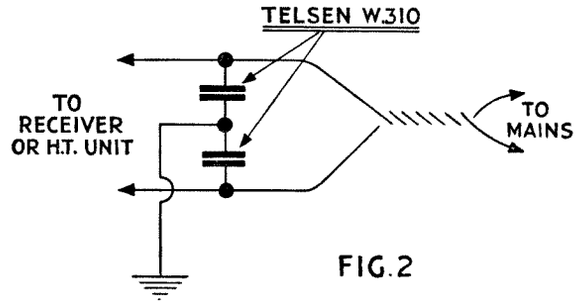


FIG.2

being earthed, as shown in Fig. 2. The condensers should be non-inductive and capable of withstanding continuously the full mains voltage. Telsen .01 mfd. mica condensers, Catalogue No. W.310, are most generally suitable. On D.C. mains supply a slightly more elaborate filter may be required, on the lines shown in Fig. 3. Here, an H.F. choke is inserted in each mains

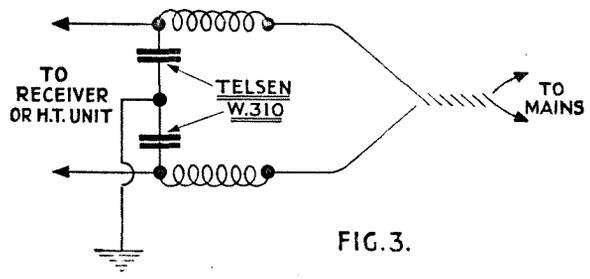


FIG.3.

lead, and a condenser bridge, with centre point earthed, is connected between them. The H.F. chokes may comprise about 100 turns of 24 gauge D.C.C. wire, single layer wound on paxolin tubes about 1½" diameter; Telsen .01 mfd. condensers (W.310) are again suitable. The chokes may be mounted quite close together, but the leads running to the input side of the filter should be well separated from those proceeding from the output side. The filter should preferably be mounted close to the receiver. This arrangement will provide considerable reduction of the severe background noise often experienced when operating sensitive receivers from D.C. mains.

CONVERTING A BATTERY SET TO "ALL-ELECTRIC"

It often happens that when A.C. mains become available, the battery set user does not wish to scrap immediately a much cherished receiver capable of giving good service for some little time, and yet he wishes to enjoy the economy of mains H.T. supply. He is deterred from the purchase of a mains H.T. unit, however, by the thought that later on, when his existing valves require replacement, he might as well change over to an all-electric receiver, when the H.T. unit would be an extra piece of apparatus to be scrapped in the change-over. In these cases, however, an alternative to building or buying a completely new receiver is to invest in a mains power unit which delivers an A.C. L.T. supply for A.C. valves as well as giving smoothed H.T. It then becomes possible to change over to complete all-electric operation in instalments, as it were. Thus, the unit is used at first to deliver H.T. only to the receiver, the original battery heated valves and battery bias being used. Then, at some later date, when the valves require replacement, they are replaced by A.C. valves which are fed from the L.T. winding on the power unit. At the same time automatic bias can be introduced, thus making the receiver completely all electric. It usually happens that the output valve requires replacement first. In this case it is quite permissible to use an A.C. heated output valve, with automatic bias, in conjunction with the original battery valves in the early stages, which are still heated by the original accumulator. These valves are then replaced all together at some later date, and the accumulator entirely dispensed with. A power unit which is extremely suitable for such a conversion is the Telsen H.T. and L.T. unit W.347, which delivers 150 volts 28mA. H.T. and 4 volts 2.5 amps. L.T., the L.T. winding being centre tapped.

PREVENTING H.T. LEAKAGE

Many battery operated receivers impose a steady current drain on the H.T. battery, even when switched off, usually due to the presence in the set of leaky Mansbridge condensers. This leakage current may be quite small, but the effect of a continuous discharge of this nature is to reduce greatly the effective life of the H.T. battery.

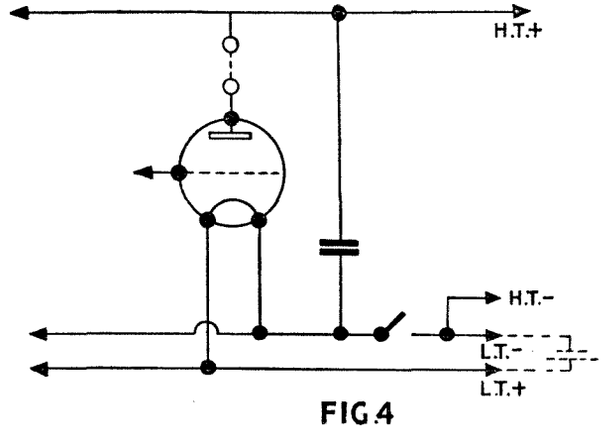


FIG.4

It is commonly thought that a switch in the common H.T.—L.T. lead switches off H.T. as well as L.T. This, however, is not the case. This assumption overlooks the fact that the negative side of the H.T. battery is still connected to the receiver circuits via the L.T. accumulator, the positive side of which is still connected to the set. This state of affairs is illustrated in Fig. 4, where it will be seen that a path for the H.T. leakage current is provided through the L.T. accumulator, which is shown in dotted lines, and which, it must be remembered, is a conductor of very low resistance.

PRACTICAL HINTS AND TIPS — *continued*

The simplest way to isolate the H.T. battery from the receiver when not in use, is to use a three-point on-off switch connected as shown in Fig. 5, a suitable switch being the Telsen three-point push-pull switch W.108. This simple precaution will entirely obviate the possibility of expensive leakage from the H.T. battery, and is a worth while refinement in any battery driven receiver.

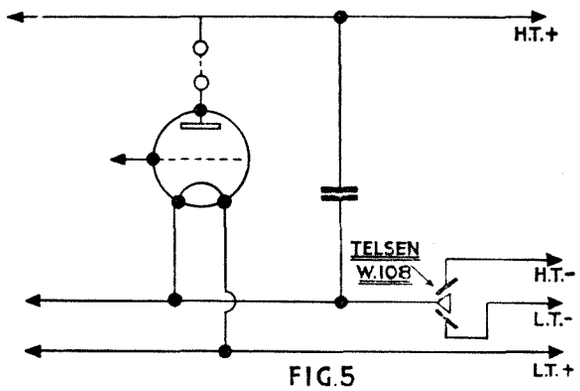


FIG.5

7-PIN VALVE HOLDERS

A NOTABLE feature of modern radio technique is the development of a number of new valves for use in special circuits. The electrode systems of these valves have become more and more complex and it has been found imperative to increase the number of external connections. For this reason a new valve-holder having seven sockets has been standardised by the Valve Manufacturers' Association, and these are being manufactured by the Telsen Electric Co., in both the solid and anti-microphonic types, the latter being illustrated in Fig. 6.

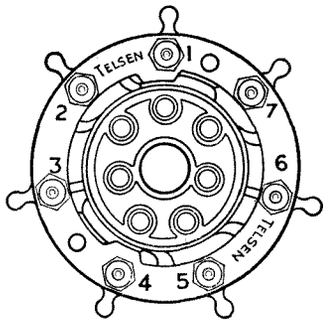


Fig. 6. The Telsen Anti-microphonic Valve Holder. The numbers are moulded in the bakelite so that the various terminals are readily identified

To prevent confusion the terminals are numbered according to the standard system, and the chart of Fig. 7 shows correct connections for five types of valve. Although the range of valves for use with seven-pin valve holders may appear at present to be somewhat restricted, it is likely that further use will be made of the seven-pin base in connection with several new types of valve, such as the "pentagrid" which is now being developed for use as a frequency changer in superhet. receivers.

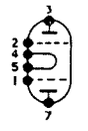
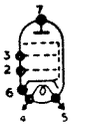
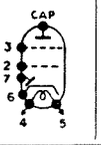
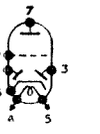
Terminal Number	Battery "Class B"	Indirectly Heated L.F. Pentode	Indirectly Heated Single Diode Tetrode	Indirectly Heated Double Diode Tetrode	Indirectly Heated Double Diode Triode
1	Second control-grid	Not used	Not used	First Diode Anode	First Diode Anode
2	First control-grid	Control grid	Control grid	Control grid	Not used
3	First Anode	Screening grid	Screening grid	Second Diode Anode	Second Diode Anode
4	Filament	Heater	Heater	Heater	Heater
5	Filament	Heater	Heater	Heater	Heater
6	Not used	Cathode	Cathode	Cathode	Cathode
7	Second Anode	Anode	Diode Anode	Screening Grid	Anode
Cap on Valve Top	None	None	Anode	Anode	Grid
Diagram of Valve Connections					

Fig. 7—*Table showing connections to 7-pin valve base*

THE R.M.A. RESISTOR COLOUR CODE

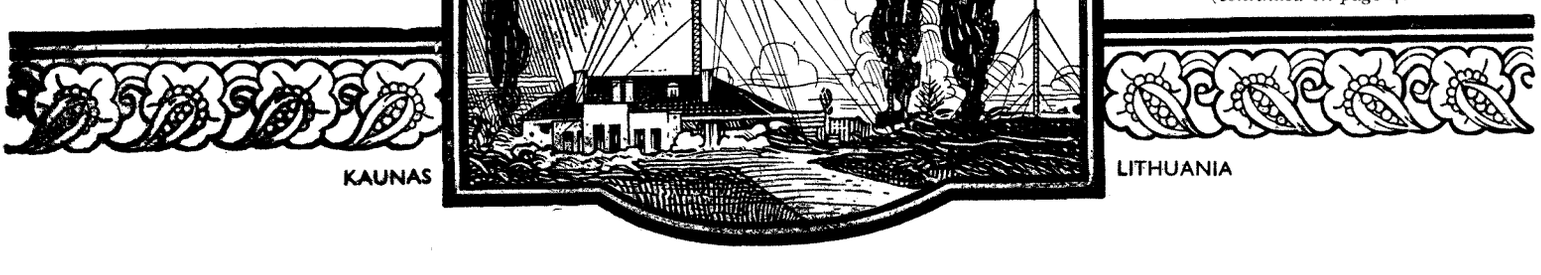
This system of colour coding has been standardised in order to render easy the identification of the values of resistors. These, when suspended in receiver wiring are often impossible to identify by a printed value which is very often not exposed to view—as a result of handling or overheating, it may, in any case, be quite illegible.

The colour code effectively overcomes this difficulty as it identifies resistors by a three stage colour scheme which is easily and permanently visible from any angle.

First of all, the figures from 0 to 9, are each allotted a definite colour, as shown in the accompanying table; the figure "5" for instance, is represented by the colour green.

The body of the resistor is then coloured to represent the first figure of its resistance value, the tip is coloured to represent the second significant figure, whilst a coloured dot on the resistor body indicates the number of ciphers (noughts) after the first two significant figures. One or two examples may make this clearer. Assume that a resistor has a green body, black tip, and orange dot. The first figure of its value is "5" (green), the second figure is "0" (black) whilst the orange dot indicates three more "0's," which makes the figure 50,000. Again, take a resistor with an orange body, green tip and brown dot. The orange body indicates that the first figure is "3," the green tip shows that the second is "5" and the brown dot tells us that there is one "0" after these figures; in other words, the value of the resistor is 350 ohms. In practice, one very soon gets used to this system, a value being as readily apparent as if it were given in actual figures.

(*continued on page 40*)



PUSH–PULL TRANSFORMERS

TELSEN "CLASS B" COMPONENTS

"Class B" amplification, which employs a special new type of valve, is capable of giving a remarkably large power output with excellent quality while it is very economical of H.T. consumption. Special transformers are, however, indispensable for this work, and the following range has been designed to ensure the best possible results with this new system.

TELSEN "CLASS B" DRIVER TRANSFORMERS

These are made in two ratios, which cover the requirements of all the "Class B" valves available at present and are supplied with comprehensive instructions.

Ratio: (Overall) 1:1; (Primary to half-secondary) 2:1.

No. W.343 **Price 8/6**

Ratio: (Overall) 1.5:1; (Primary to half-secondary) 3:1.

No. W.359 **Price 8/6**

TELSEN "CLASS B" OUTPUT TRANSFORMER

The Telsen Class B Output Transformer, which gives ratios of 35:1, 50:1 and 65:1, will provide correct matching to moving coil speakers having low resistance speech coils, and, like the Class B Output Choke, has a low primary resistance (200 ohms per half winding) and a very large core section. Supplied with full instructions.

No. W.344 **Price 8/6**

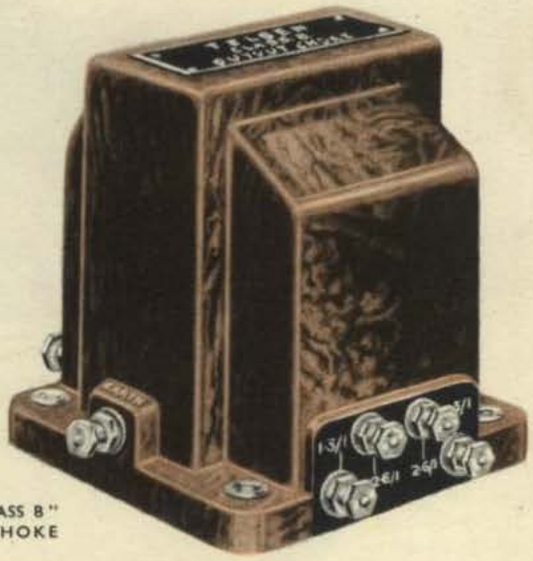
TELSEN "CLASS B" OUTPUT CHOKE

This choke provides ratios of 1:1, 1.3:1, 2:1 2.6:1, whereby a "Class B" output stage can be matched to any moving coil speaker having either a high resistance speech coil or a low resistance coil and input transformer. The low D.C. resistance of 220 ohms per half winding, and generous core section prevent the occurrence of distortion due to voltage drop or magnetic saturation on peak load. The total inductance is 18 henries, supplied with full instructions.

No. W.345 **Price 8/6**

TELSEN "CLASS B" DRIVER TRANSFORMERS

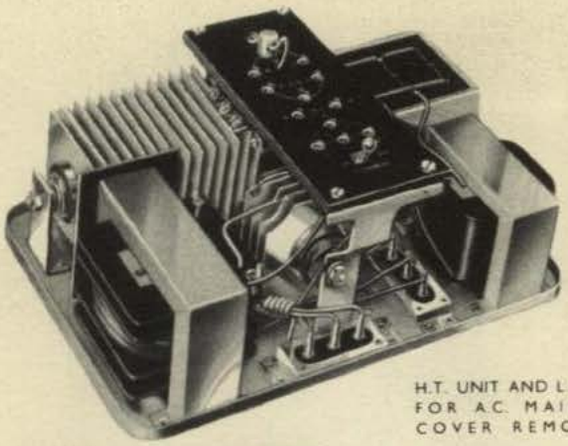
TELSEN "CLASS B" OUTPUT TRANSFORMER



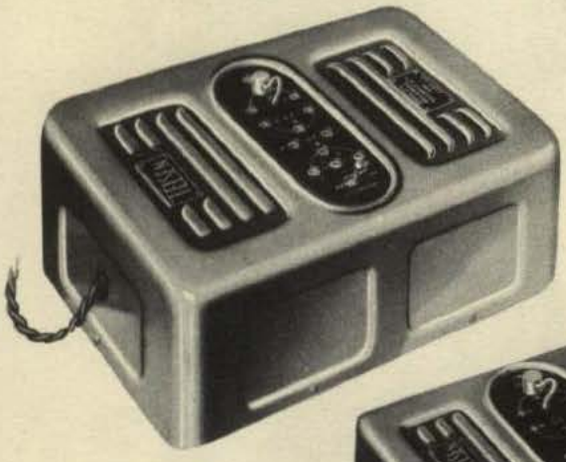
TELSEN "CLASS B" OUTPUT CHOKE

TELSEN
RADIO COMPONENTS

· MAINS UNITS · TRANSFORMERS & SWITCHES



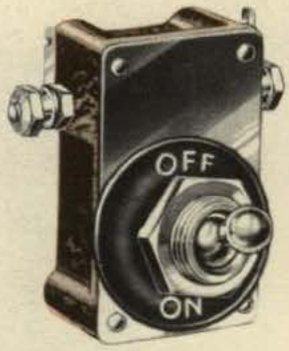
H.T. UNIT AND L.T. CHARGER FOR A.C. MAINS, WITH COVER REMOVED



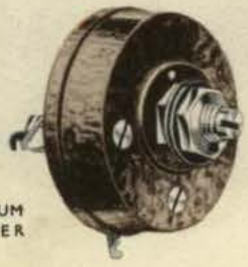
H.T. UNIT AND L.T. CHARGER FOR A.C. MAINS

H.T. UNIT FOR D.C. MAINS

TELSEN MAINS TRANSFORMERS



TELSEN MAINS SWITCH



TELSEN HUM ADJUSTER

H.T. UNIT AND L.T. CHARGER FOR A.C. MAINS

This unit, which is suitable for input voltages between 200 and 250 at 40 to 100 cycles, will be specially welcomed by owners of battery receivers who, while they desire to enjoy the economy of power supply from the mains, do not wish to discard their battery valves in favour of the A.C. variety. The unit is very solidly built and is completely screened by an artistically finished metal case. The H.T. output is 28 milliamps. at 150 volts with separate maximum, detector, and screened grid tappings, on each of which a choice of high, medium, or low voltages is available. Very generous smoothing equipment is provided to eliminate hum. Provision is made for charging 2, 4, or 6 volt accumulators, at 0.5 ampere, and the use of these facilities leads to such a saving of charging costs that the unit soon pays for itself.

No. W.346 **Price £4-17-6**

H.T. AND L.T. UNIT FOR A.C. MAINS

As regards input and H.T. output, this is similar to the "H.T. unit and L.T. charger" No. W.346, but as it is intended to provide complete power supply for receivers employing A.C. valves, the L.T. charger is replaced by a centre tapped transformer winding capable of supplying 2.5 amps. at 4 volts. It is a very well made component, and will be particularly appreciated by home constructors.

No. W.347 **Price £3-7-6**

H.T. UNIT FOR D.C. MAINS

This unit is designed for D.C. inputs of from 200 to 250 volts Adequate smoothing is provided to remove ripple, and the output is approximately 28 milliamps. at 150 volts. Three tappings are provided, the maximum, screened grid, and detector tappings, at each of which a choice of high, medium, or low voltages is available. The unit is enclosed in a well finished metal case which provides complete screening.

No. W.348 **Price 35/-**

TELSEN MAINS TRANSFORMERS

Four models are now available, the first three of which, Nos. W.291, W.300 and W.301 are alike as regards output, which is as follows :—
L.T. Filament—4 volts at 2½ amps. with centre tap.
Rectifier Filament—4 volts at 1 amp.
High Tension (for full wave rectification)—200-0-200 volts A.C. which, using a rectifying valve of the 60 mA. 250 volt class, and a Telsen L.F. Choke W.302 with 4 mfd. smoothing condensers, delivers a smoothed D.C. output of 200 volts at 32 mA.
The inputs are as follows :—
Model W.291 is suitable for 100—110 volts A.C. at 40 to 100 cycles.

Price 32/6

Model W.300 is suitable for 200—250 volts A.C. at 40 to 100 cycles.

Price 32/6

Model W.301 is suitable for 200—250 volts A.C. at 25 to 40 cycles.

Price 45/-

The new mains transformer, W.360, has an output as follows :—
L.T. Filament—4 volts at 5 amps. with centre tap.
Rectifier Filament—4 volts at 2½ amps.
High Tension (for full wave rectification)—275-0-275 volts A.C. which, using a rectifying valve of the 120 mA. 350 volts class, and the new 18 henry smoothing choke, W.361, with 4 mfd. smoothing condensers, delivers a smoothed D.C. output of 275 volts at 60 mA.
The input to this transformer is 200 to 250 volts, at 40 to 100 cycles

No. W.360 **Price 32/6**

TELSEN MAINS SWITCH

A miniature switch of very robust construction. Its rapid make and break action makes it particularly suitable as a master switch in Mains and Battery operated receivers, for switching Gramophone motors, and numerous other uses. Capable of handling up to 3 amperes at 250 volts with perfect safety. Enclosed in a neat moulded bakelite cover with one hole fixing.

No. W.297 Price 1/6

TELSEN HUM ADJUSTER

Comprises a variable centre tapped resistance designed for hum control in A.C. mains operated receivers and eliminators. Solidly constructed, it occupies very little space, and is extremely silent in operation, both electrically and mechanically. In attractively moulded bakelite case with single hole fixing.

No. W.299 **Price 2/6**

TELSEN
RADIO COMPONENTS

ELECTROLYTIC, SELF SEALING & FIXED MICA CONDENSERS

TELSEN HIGH VOLTAGE ELECTROLYTIC CONDENSERS

These new condensers are very well made and are excellent for use in smoothing circuits and other positions in which high voltage high capacity condensers are required. An example of Telsen thoroughness is seen in the special bracket and terminal supplied with the condenser which enables it to be mounted conveniently on any type of baseboard or chassis.

Capacity	275 *working* peak voltage No.	Price	500 *working* peak voltage No.	Price
4 mfd.	W.393	3/6	W.396	4/6
6 ,,	W.394	3/9	W.397	5/-
8 ,,	W.395	4/-	W.398	5/6

TELSEN LOW VOLTAGE ELECTROLYTIC CONDENSERS

Where a very high capacity with fairly low voltage is required, as for example automatic bias circuits for L.F. valves, these recently introduced condensers will be found ideal, and as they have wired ends and are very compact, they are easily suspended in the wiring. They are very carefully made in three types and are thoroughly reliable components.

No. W.399. 25 mfd. at 25 volts .. .. Price **2/6**
No. W.400. 50 mfd. at 25 volts .. .. ,, **3/-**
No. W.401. 25 mfd. at 50 volts .. .. ,, **3/-**

TELSEN SELF-SEALING CONDENSERS

Cap. Mfd.	500 *volt test* No.	Price	Cap. Mfd.	1,000 *volt test* No.	Price
.01	W.232	1/3	.01	W.239	1/9
.04	W.230	1/3	.04	W.237	1/9
.1	W.231	1/6	.1	W.238	2/-
.25	W.229	1/6	.25	W.236	2/-
.5	W.228	1/6	.5	W.235	2/-
1	W.227	1/9	1	W.234	2/6
2	W.226	2/6	2	W.233	3/6

These condensers are self-healing, non-inductive and hermetically sealed. They are offered in two types, the capacities from .01 to 2 mfd. in bakelite cases, and blocks of 4, 6 and 8 mfd. in metal cases with soldering tags.

TELSEN SELF-SEALING BLOCK CONDENSERS

Cap. Mfd.	500 *volt test* No.	Price	Cap. Mfd.	1,000 *volt test* No.	Price
4	W.175	4/9	4	W.178	6/6
6	W.176	7/-	6	W.179	9/6
8	W.177	9/6			

TELSEN MICA CONDENSERS

The new Telsen " Mica " Condensers represent an important advance in technique by which H.F. losses have been practically eliminated. The re-designed case is of more attractive appearance and can be mounted vertically or flat. Grid leaks, as before, may be mounted in series or shunt, clips being supplied free with capacities .0001, .0002 and .0003 mfd.

Cap. Mfd.	No.	Price	Cap. Mfd.	No.	Price
.0001	W.240	6d.	.0005	W.244	6d.
.0002	W.241	6d.	.001	W.245	6d.
.0003	W.242	6d.	.002	W.246	1/-
.0004	W.243	6d.	.006	W.247	1/3

The following mica condensers have also been added to the range for special purposes, e.g., band-pass filter circuits, etc., and are supplied in the Self-Sealing type bakelite cases.

Capacity .01 mfd., No. W.310 .. .. Price **2/-**
,, .02 ,, No. W.311 .. .. ,, **2/6**
,, .05 ,, No. W.316 .. .. ,, **4/6**

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. Their high insulation and low loss adapts them for a number of uses.

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

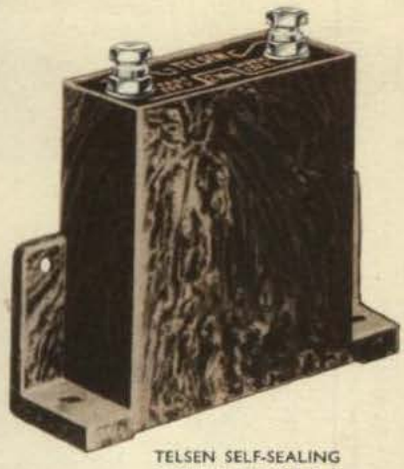
Price 1/3 each

TELSEN TAG CONDENSERS

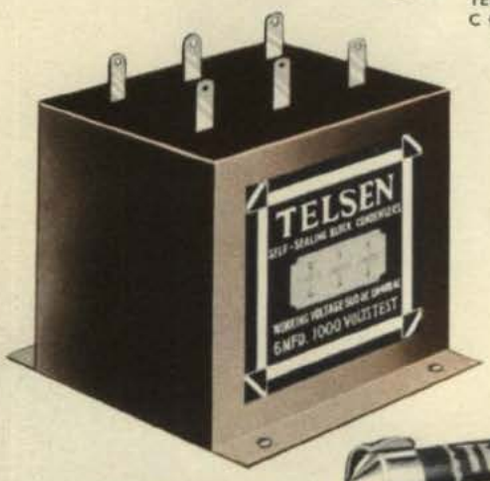
These may be mounted on either insulated or metal panels by utilising the two baseboard screw holes. The tags enable the condenser to be connected to any other component either directly or by soldering. H.F. losses are negligible.

Cap.	No.	Price	Cap.	No.	Price
.0001	W.207	4½d.	.0005	W.211	4½d.
.0002	W.208	4½d.	.001	W.212	4½d.
.0003	W.209	4½d.	.002	W.213	6d.
.0004	W.210	4½d.			

TELSEN HIGH VOLTAGE ELECTROLYTIC CONDENSERS



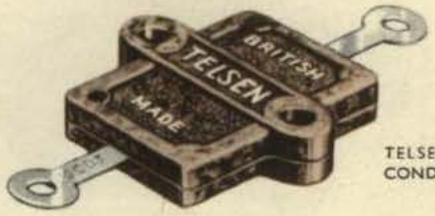
TELSEN SELF-SEALING CONDENSERS



TELSEN SELF-SEALING BLOCK CONDENSERS

TELSEN MICA CONDENSERS

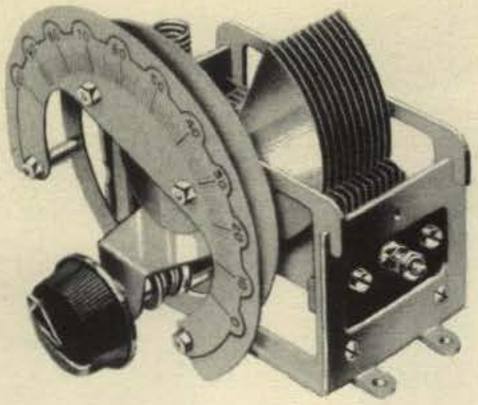
TELSEN PRE-SET CONDENSERS



TELSEN TAG CONDENSERS

TELSEN
RADIO COMPONENTS

VARIABLE CONDENSERS

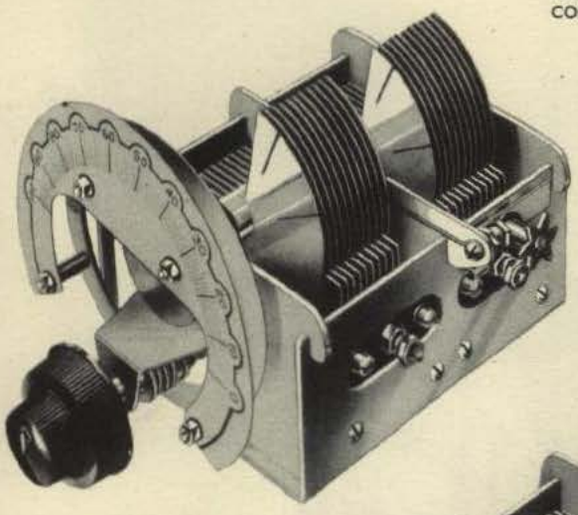


TELSEN SINGLE CONDENSER UNIT

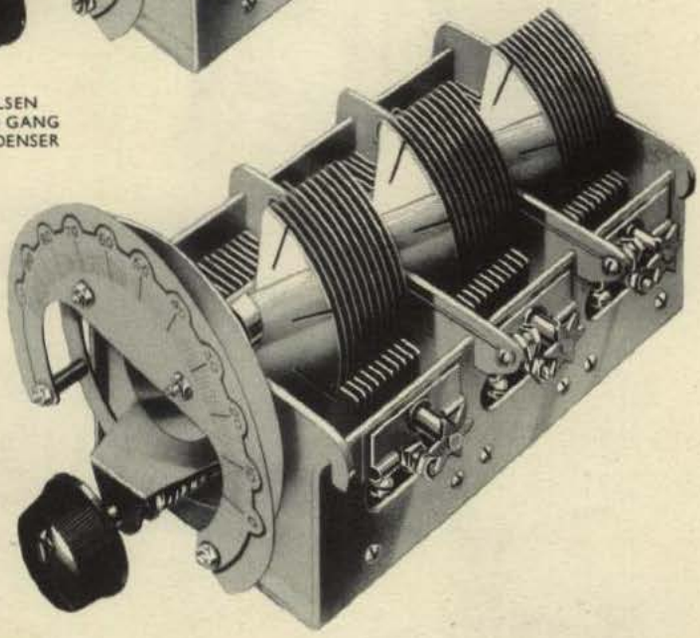
TELSEN SINGLE CONDENSER UNIT

This is a very high-class air-dielectric condenser with illuminated dial, and is intended for chassis or baseboard mounting. A skeleton framework of nickel-plated steel supports the two sets of die-cast vanes, great rigidity and low minimum capacity being achieved in the construction. A stator terminal is provided on each side of the condenser, and positive connection is made to the rotor by means of a flexible pigtail. The maximum capacity of this condenser is .00053 mfd. Two interchangeable dials are supplied, one of which is graduated in degrees, while the other is specially calibrated to give a direct indication of wave-length when the condenser is used with a Telsen Screened Coil No. W.216. Supplied with knob and escutcheon plate.

No. W.339 Price 7/6



TELSEN TWIN GANG CONDENSER



TELSEN TRIPLE GANG CONDENSER

TELSEN GANGED CONDENSERS

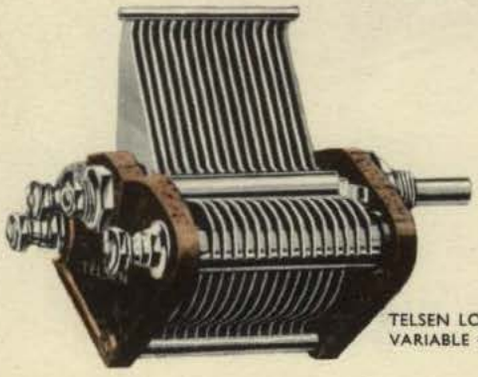
The Telsen Ganged Condenser Units have been designed for use in modern receiver circuits in which accurate and simultaneous tuning of two or three circuits is obtained by the rotation of one dial. A pressed steel frame of great rigidity completely obviates any tendency to distortion, while the rotor and stator vanes are let into one-piece high pressure die castings, ensuring accurate spacing. All sections are very carefully matched by means of split end vanes, and trimmers are provided across each section to compensate for differences in stray capacities. In the twin gang condenser the front section carries a variable trimmer operated by a knob concentric with the main tuning control. Both models have an attractive stove aluminium finish and are complete with disc drive, dust covers, escutcheon plate, pilot light holder, knob and two alternative tuning scales.

TWIN GANG CONDENSER .. No. W.306
Price 12/6

With dust cover, 2/– extra.

TRIPLE GANG CONDENSER .. No. W.307
Price 17/6

With dust cover, 2/6 extra.



TELSEN LOGARITHMIC VARIABLE CONDENSERS

TELSEN LOGARITHMIC VARIABLE CONDENSERS

The Telsen Variable Condensers are built to withstand years of service. Rigidity in construction, the effective clamping of both rotor and stator vanes, and freedom from backlash and end play have been the primary features aimed at in their design, and thereby accurate and consistent spacing is assured as long as the condenser is in service.

Capacity .0005 mfd.	No. W.132	Price 3/6 each
„ .00025 mfd.	No. W.130	„ 2/6 „
„ .00035 mfd.	No. W.131	„ 3/6 „

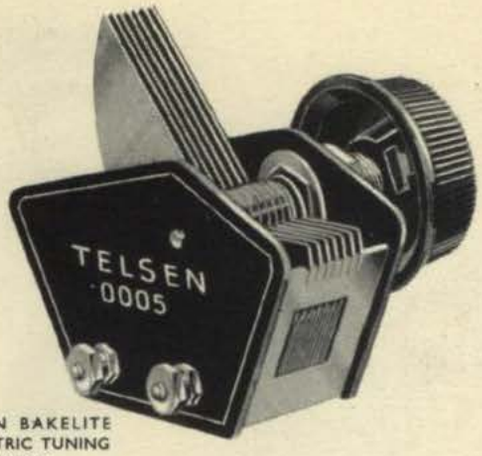
TELSEN
RADIO COMPONENTS

TUNING, DIFFERENTIAL & REACTION CONDENSERS

TELSEN BAKELITE DIELECTRIC TUNING CONDENSERS

Designed on lines of great rigidity, compactness and high efficiency, these condensers are confidently recommended for use in cases where space is limited. A high grade dielectric is employed, ensuring accuracy of tuning with minimum losses. Complete with knob.

Capacity .0005 mfd. No. W.193 ..
„ .0003 mfd. No. W.194 .. } Price 2/- each



TELSEN BAKELITE DIELECTRIC TUNING CONDENSERS

TELSEN BAKELITE DIELECTRIC REACTION CONDENSERS

These condensers have been entirely re-designed and now incorporate several valuable improvements. They are very rigidly made, and the spindle, to which positive contact is made by means of a flexible pigtail, is so constructed that all end-play, which may alter the capacity, is entirely prevented. The vanes are interleaved with finest quality solid dielectric, and the whole unit is enclosed in a strong dust-proof bakelite case which, by excluding grit, prevents the occurrence of the annoying " rustling " noises so often found in other makes. Supplied complete with knob.

Capacity mfd.	*No.*	*Price*
.0003	W.354	1/9 each
.00015	W.355	1/9 „
.0001	W.356	1/9 „
.00075	W.357	2/- „
.0005	W.358	2/- „

TELSEN BAKELITE DIELECTRIC REACTION CONDENSER

TELSEN DIFFERENTIAL CONDENSERS

These are similar in design and construction to the reaction condensers, and are supplied, complete with knob, in the following capacities.

Capacity mfd.	*No.*	*Price*
.0003	W.351	2/- each
.00015	W.352	2/- „
.0001	W.353	2/- „

TELSEN DIFFERENTIAL CONDENSERS

TELSEN AERIAL SERIES CONDENSER WITH SWITCH

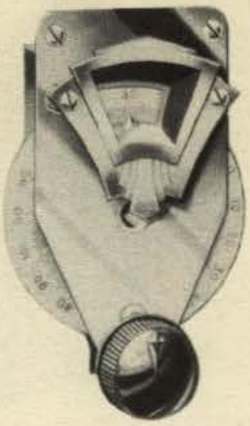
Built on similar lines to the new reaction condensers, this condenser provides an ideal selectivity and volume control. The maximum capacity is .0003 mfd. with an extremely low minimum capacity. A switch arm is keyed to the spindle whereby the condenser is short-circuited at its maximum position, giving a " straight through " aerial connection when desired, which results in a wide range of control. Supplied complete with knob.

No. W.350 Price 2/-

TELSEN AERIAL SERIES CONDENSER WITH SWITCH

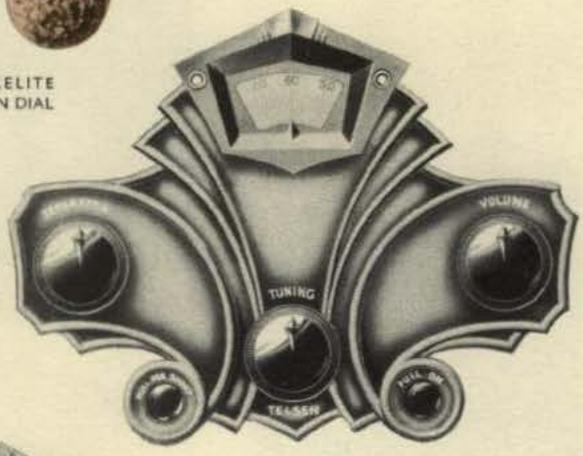
TELSEN
RADIO COMPONENTS

SLOW MOTION DIALS & DISC DRIVES

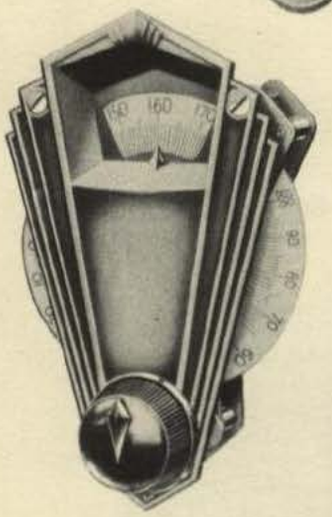


TELSEN SMALL FRICTION DISC DRIVE

TELSEN BAKELITE SLOW MOTION DIAL



TELSEN "313" DISC DRIVE



TELSEN ILLUMINATED DISC DRIVE

TELSEN "336" UNIT

TELSEN SMALL FRICTION DISC DRIVE

A low-priced Disc Drive for auxiliary controls. It is extremely robust and may be usefully employed for main tuning condensers where limitations of space have to be considered.

No. W.257

Price 2/-

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 $\frac{1}{4}$" spindle and is suitable for all panels up to $\frac{3}{16}$" thickness. Mounting instructions are included with every dial.

Black .. No. W.141

Brown .. No. W.141A

Price 1/6 each

TELSEN "313" DISC DRIVE

This is essentially an illuminated Disc Drive tuning control similar to W.184 and suitable for any standard tuning condenser with $\frac{1}{4}$" spindle. Although primarily designed for the Telsen "325 Star" receiver, this component, with its exceptionally attractive escutcheon plate, is ideal for use in any receiver employing the usual panel controls indicated. These comprise "Separator," Volume control, and Wave-change and "On-Off" Switches, thus grouping the main essentials of a complete control unit into a compact assembly. Escutcheon plate finished in Oxydised Silver.

No. W.313

Price 3/6

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 the Telsen Pilot Lamp, W.417 or W.418. A double-ended spanner to fit all Telsen "one hole fixing" nuts is supplied free with every Disc Drive.

No. W.184

Price 2/6

TELSEN "336" UNIT

(*Pro. Pat. No.* 2877/33)

The new Telsen "336" Unit heralds a revolutionary advance in radio technique, for this brilliant new component effects two distinct and outstanding improvements in any type of set, firstly, giving amplification equal to an extra L.F. stage at no extra cost, and secondly, a tremendous improvement in quality of reproduction. The Telsen "336" Unit is the only component of its kind in the world, and is covered by a special Telsen patent licence which will be found in each carton.

W.336

Price 5/6

TELSEN
RADIO COMPONENTS

H.F. CHOKES

TELSEN STANDARD H.F. CHOKE

The Telsen Standard H.F. Choke is deservedly popular in view of its remarkable efficiency at a low cost. It is particularly suitable for reaction circuits, has a very low self-capacity for its high inductance and occupies a minimum of space.

No. W.75
Price 1/6

TELSEN BINOCULAR H.F. CHOKE

In high class circuits calling for exceptionally efficient H.F. chokes, the Telsen Binocular Choke can be relied upon in every respect. Its external field is negligible due to the binocular formation, it has a low self-capacity while its inductance is as high as 180,000 micro-henries.

No. W.74
Price 3/6

TELSEN SHORT WAVE H.F. CHOKE

This choke is specifically designed to cover the complete short wavelength band, usually considered to extend from 150 to 10 metres. "Blind Spots" have been eliminated, and its extremely low self capacity makes it a thoroughly reliable and efficient component for all Short Wave circuits. Enclosed in a neat bakelite moulding it occupies a minimum of space.

No. W.221
Price 2/6

TELSEN SCREENED H.F. CHOKES

These new chokes have been very carefully designed and constructed, so that their efficiency is consistently high over the whole of the waveband for which they are intended. They are small and compact, and the metal screen, which is connected to an earthing terminal, entirely prevents interaction with other components.

Three types are available, W.341, which is designed for wavelengths between 100 and 2,000 metres, such as are met with in the ordinary broadcast receiver, W.342, which is a short wave choke for use between 10 and 100 metres, and W.340, a binocular choke suitable for "all-wave" sets working between 10 and 2,000 metres.

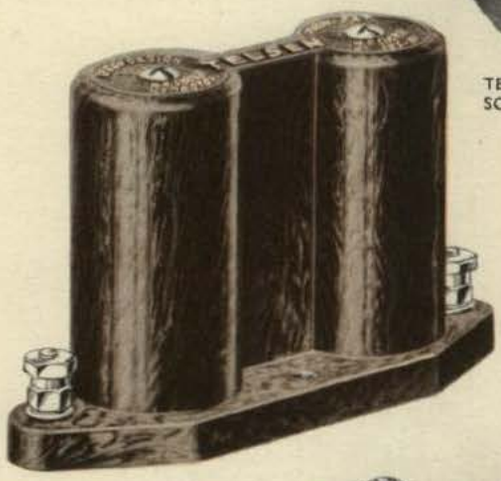
All-Wave Screened Binocular H.F. Choke.
No. W.340 **Price 4/6**

Standard Screened H.F. Choke.
No. W.341 **Price 2/6**

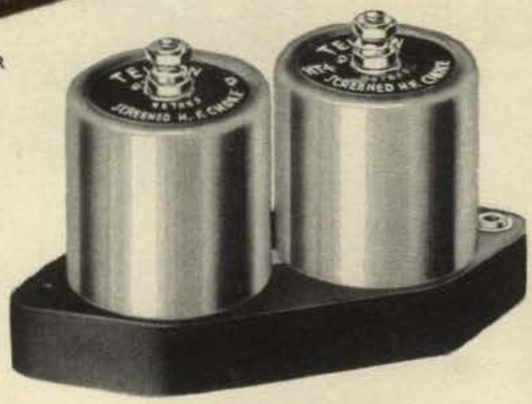
Short Wave Screened H.F. Choke.
No. W.342 **Price 3/-**

TELSEN STANDARD
H.F. CHOKE

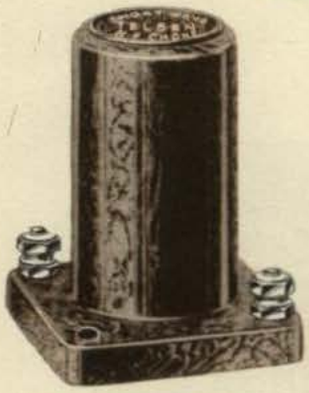
TELSEN STANDARD
SCREENED H.F. CHOKE



TELSEN BINOCULAR
H.F. CHOKE



TELSEN BINOCULAR
SCREENED H.F. CHOKES

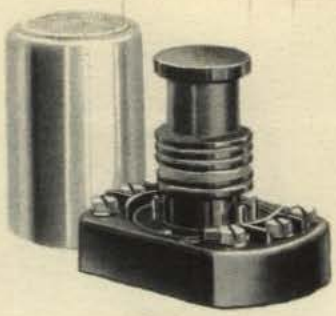


TELSEN SHORT WAVE
H.F. CHOKE

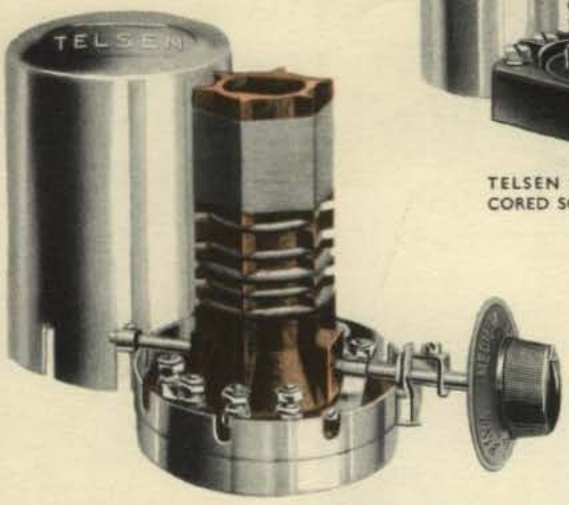
TELSEN SHORT WAVE
SCREENED H.F. CHOKE

TELSEN
RADIO COMPONENTS

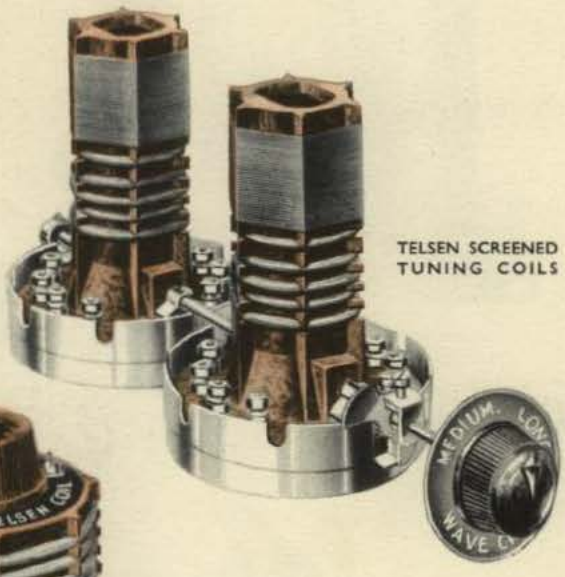
DUAL RANGE AERIAL & ANODE COILS



TELSEN "349" IRON-CORED SCREENED COILS



TELSEN SINGLE SCREENED COIL



TELSEN SCREENED TUNING COILS

TELSEN DUAL RANGE AERIAL COIL

THE TELSEN H.F. COIL

TELSEN "349" IRON-CORED SCREENED COILS

The result of extensive research, these coils employ an iron-dust core which has enabled their size to be greatly reduced without sacrifice of efficiency, which is considerably higher than that of the majority of air-cored coils. Magnification and selectivity are correspondingly improved, while the metal screening can prevents the occurrence of unwanted interaction. These coils can be used either as aerial tuning coils or H.F. transformers, a reaction winding being included.

Single Coil.	No. W.349	**Price 8/6**
Twin Matched Coils.	No. W.422	**Price 17/-**
Triple Matched Coils.	No. W.423	**Price 25/6**

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.

No. 216
Price 7/-

No. W.287 Twin matched Screened Coils **Price 14/6**

No. W.288 Triple matched Screened Coils **Price 21/6**

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 5/6

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 4/6

Radio's

TEL

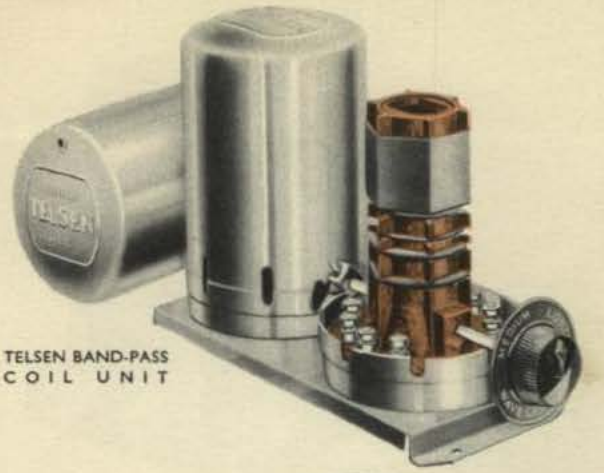
RADIO CO

BAND PASS & SUPERHET COILS

TELSEN BAND-PASS COIL UNIT

This unit comprises two accurately matched Screened Band Pass Coils wound on black moulded bakelite formers and mounted together on a single rigid plinth base. The coils are independent of each other and can be wired for any of the three types of band pass filter to give exceptional quality with selectivity. Wave-change switching is incorporated in each coil base, the switches being ganged and controlled by a single knob. Complete with escutcheon plate and knob.

No. W.290
Price 14/6

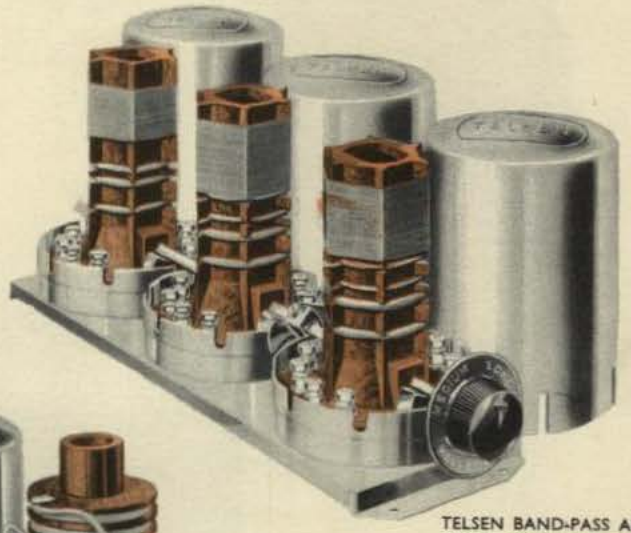


TELSEN BAND-PASS COIL UNIT

TELSEN BAND-PASS AND OSCILLATOR COIL UNIT

Comprises the Band Pass Coils and Oscillator Coils combined and mounted into a compact unit on a single metal plinth base. All wave change switches are ganged with single knob control. The ideal component for any superheterodyne circuit.

No. W.292
Price 21/6



TELSEN BAND-PASS AND OSCILLATOR COIL UNIT

TELSEN OSCILLATOR COIL

This coil is particularly suited to superheterodyne circuits in conjunction with the Telsen Band Pass Coils, for which it can be obtained separately, or in a combined unit (see W.292). It has been designed to operate at a frequency separation of 110 kilocycles from the band pass tuning range, and with a standard 3-gang tuning condenser and suitable padding condensers will maintain a constant frequency separation over both wave ranges.

No. W.293
Price 7/6

TELSEN INTERMEDIATE FREQUENCY TRANSFORMER COIL

Consists of two tuned circuits comprising a band pass intermediate frequency filter tuned to 110 k.c. by two pre-set balancing condensers fitted in the base of the coil. Small milled wheels projecting from the sides of the base enable these condensers to be adjusted for different values of stray capacities, and the filter coupling is also variable so that optimum conditions for both quality and selectivity may be attained. Totally screened.

No. W.294
Price 7/6

TELSEN INTERMEDIATE FREQUENCY TRANSFORMER COIL

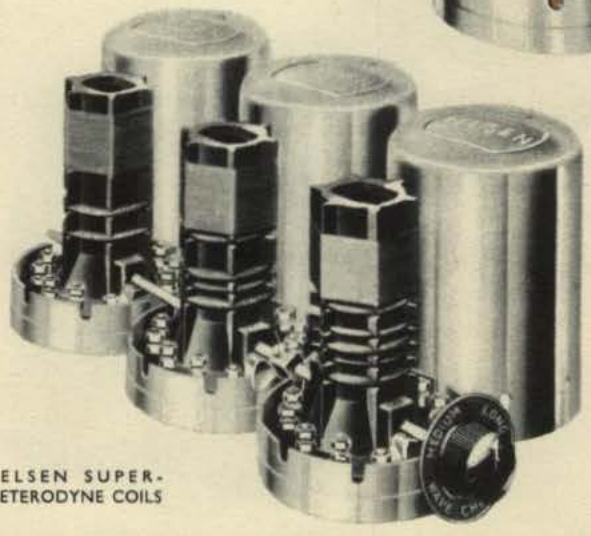
TELSEN OSCILLATOR COIL

TELSEN SUPERHETERODYNE COILS

These Telsen Superheterodyne Coils are designed to cater for those constructors who wish to make a Superheterodyne Receiver that does not employ band pass tuning in the pre-detector high frequency stages. They possess the same exceptional features of high efficiency and low losses that have made the Telsen Screened Coils No. W.216 and the Telsen Band Pass Coils No. W.290 so justly famous.

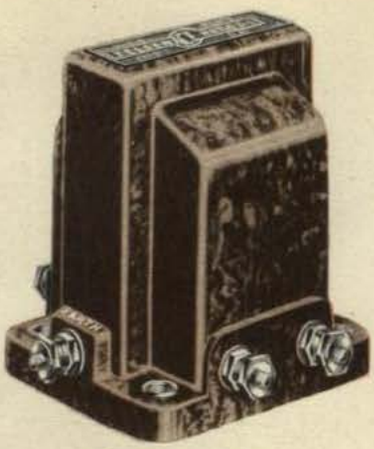
These coils are designed to work in conjunction with a triple ganged variable condenser having specially shaped vanes for maintaining a constant frequency difference of 110 kilocycles between the frequency of the oscillator and that of the aerial and grid tuning coils.

Type No. S.330
Price 21/6



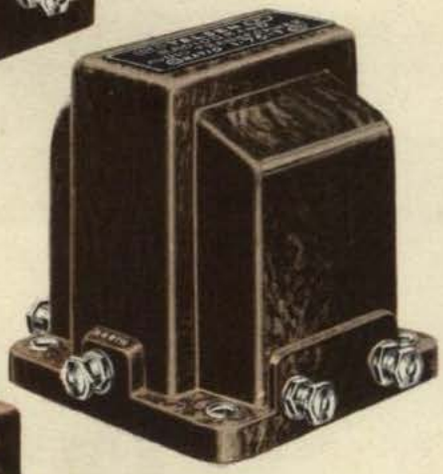
TELSEN SUPER-HETERODYNE COILS

L.F. TRANSFORMERS



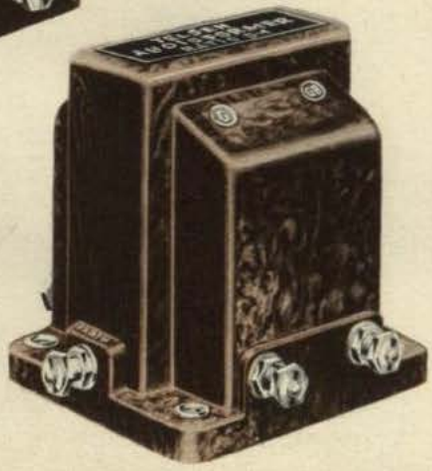
TELSEN "ACE" L.F. TRANSFORMERS

TELSEN "RADIOGRAND" L.F. INTERVALVE TRANSFORMERS



TELSEN "RADIOGRAND" LOW RATIO 1.75 : 1 TRANSFORMER

TELSEN "RADIOGRAND" HIGH RATIO 7 : 1 TRANSFORMER



TELSEN "AUDIOFORMER"

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 4/9 each

TELSEN "RADIOGRAND" L.F. INTERVALVE TRANSFORMERS

Since their introduction, these Transformers have signified to designers and constructors alike the nearest approach to the ideal in intervalve transformer design. Evolved from the results of extensive research coupled with the soundest engineering principles, every transformer is subjected to rigorous tests to ensure faultless performance and enduring efficiency.

Medium Ratios: 3—1, No. W.59;
5—1, No. W.58

Price 6/9 each

TELSEN "RADIOGRAND" LOW RATIO 1.75—1 TRANSFORMER

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 9/6

TELSEN "RADIOGRAND" HIGH 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 9/6

TELSEN "AUDIOFORMER"

The Telsen "Audioformer" solves the problem of tone compensation which has been created by to-day's demand for super-selectivity. Its fixed compensation restores all the high notes which have been lost by the cutting of the sidebands, yet it does so without any loss of amplification or reduction in bass response, and without necessitating either an extra L.F. stage or any additional components.

Absolutely self-contained, this single brilliant component is all you need to achieve that perfect reproduction which your critical ear demands.

Ratio 5:1. W.327 **Price 11/6**

TELSEN
RADIO COMPONENTS

INTERVALVE COUPLING UNITS & L.F. CHOKES

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. With an H.L. type valve it will give an amplification of about 20, while consuming negligible H.T. current.

No. 214 **Price 7/6**

TELSEN 10—1 INTERVALVE COUPLING UNIT

A filter-fed Transformer using a high permeability nickel alloy core, and enabling a 10—1 voltage step-up to be attained while preserving an exceptionally good frequency characteristic which is compensated in the higher frequencies for use with a pentode valve.

No. W.215 **Price 12/6**

TELSEN "R.C." COUPLING UNIT

No. W.285 **Price 4/-**

TELSEN INTERVALVE L.F. COUPLING CHOKES

Rating	*Normal Current*		*Max. Current*		*No.*
40 H. at 3 mA	..		10 mA	..	W.68
100 H. at 2 mA	..		6 mA	..	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.

Price 4/9 each

TELSEN OUTPUT CHOKE

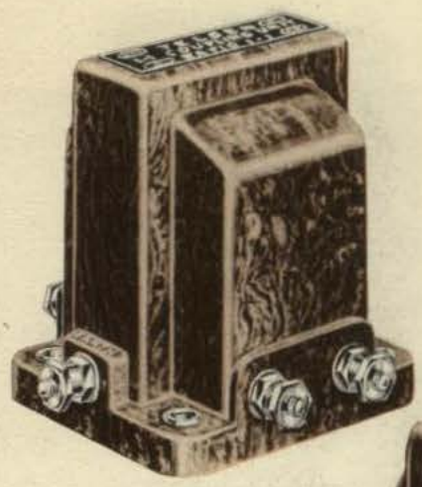
Designed for use as an output filter in conjunction with a condenser not less than 1 mfd., following any power or super power valve taking up to 40 mA anode current. Gives an ideal response curve under all conditions.

No. W.71 **Price 6/3**

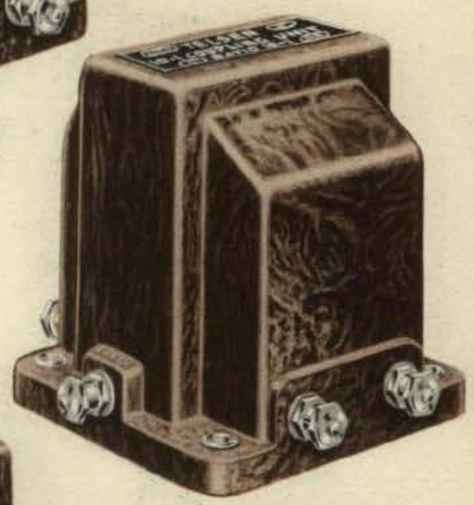
TELSEN HEAVY DUTY SMOOTHING CHOKE

This choke has the very low D.C. resistance of 420 ohms, and so is particularly useful in smoothing circuits passing comparatively heavy currents where the maximum output voltage is needed. Its inductance is 18 henrys at 50 milliamps., and the maximum permissible current is 75 mA.

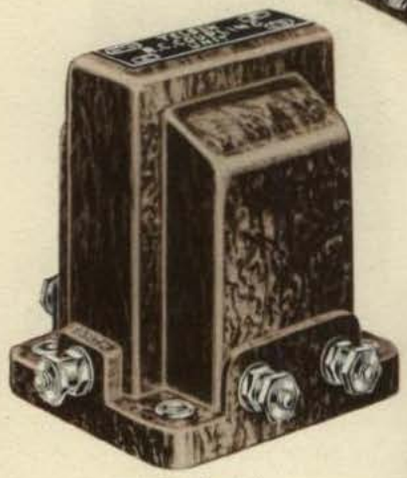
No. W.361 **Price 12/6**



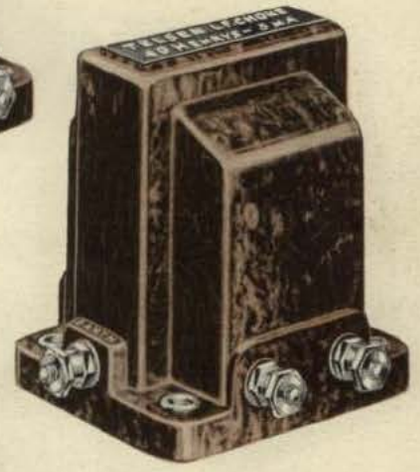
TELSEN 1 : 1 INTERVALVE COUPLING UNIT



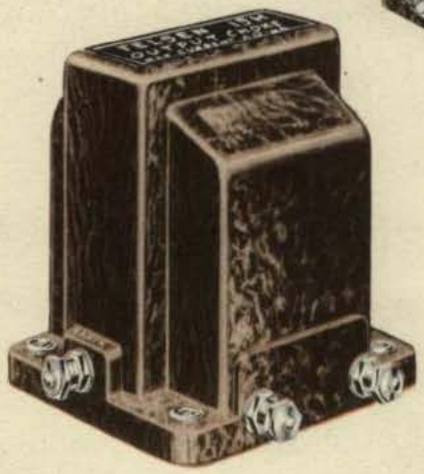
TELSEN 10 : 1 INTERVALVE COUPLING UNIT



TELSEN " R.C. " COUPLING UNIT



TELSEN INTERVALVE L.F. COUPLING CHOKES



TELSEN OUTPUT CHOKE

TELSEN
RADIO COMPONENTS

OUTPUT TRANSFORMERS & CHOKES

TELSEN OUTPUT TRANSFORMER RATIO 1 : 1

TELSEN MULTI RATIO OUTPUT TRANSFORMER

TELSEN TAPPED PENTODE OUTPUT CHOKE

TELSEN POWER PENTODE OUTPUT CHOKE

TELSEN L.F. SMOOTHING CHOKE

TELSEN OUTPUT TRANSFORMER, RATIO 1—1

This Transformer enables a high resistance type speaker to be connected to the output circuit of a receiver using a triode output valve without the necessity of passing direct current through the speaker windings. Saturation of the magnet system is thereby avoided, and the H.T. voltage is kept away from the speaker. Suitable for anode current up to 40 mA D.C.

No. W.62
Price 9/6

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 mA.

No. W.63.
Price 9/6

TELSEN TAPPED PENTODE OUTPUT CHOKE

This Choke is designed primarily for pentodes taking an anode current of not more than 20 mA. By varying the connections, ratios of 1—1, 1.6—1 and 2.5—1 are attainable, thus providing for matching under widely varying conditions.

No. W.72
Price 6/9

TELSEN POWER PENTODE OUTPUT CHOKE

The use of this Power Choke prevents direct current passing through the loudspeaker when the latter is used in conjunction with power pentode output valves carrying up to 40 mA. It also enables correct matching and good quality to be obtained through the choice of three ratios, namely, 1—1, 1.3—1 and 1.7—1.

No. W.172
Price 9/6

TELSEN L.F. SMOOTHING CHOKE

The Telsen Smoothing Choke has been designed to fulfil all the requirements of an efficient smoothing component in the rectified mains output circuit of a receiver. Its inductance is 28 henries at 25 mA the maximum permissible current not exceeding 50 mA D.C. Resistance 1,000 ohms.

No. W.302
Price 12/6

TELSEN
RADIO COMPONENTS

VALVE HOLDERS & TONE CONTROLS

TELSEN 7-PIN VALVE HOLDERS

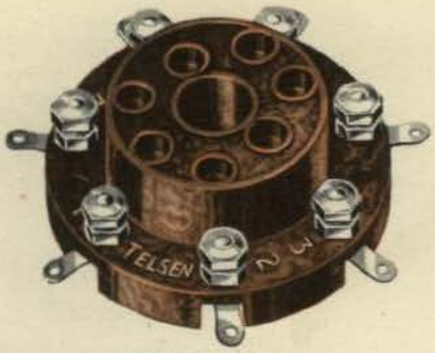
These valve-holders are accurately constructed to accommodate several new types of valve, such as the "Class B" valve. They are made in the solid and anti-microphonic types and in both types the contact sockets are extended in one piece to form the soldering tags, thus ensuring perfect connection. The terminals are numbered according to the system standardised by the R.M.A.

7-Pin Solid Type Valve-Holder.

No. W.337 Price 1/6

7-Pin Anti-Microphonic Type Valve-Holder.

No. W.338 Price 1/9

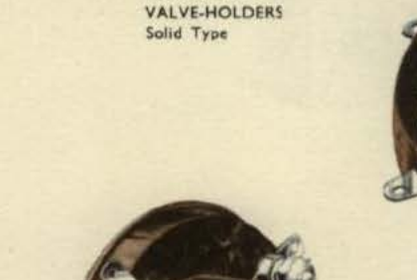


TELSEN 7-PIN VALVE HOLDERS

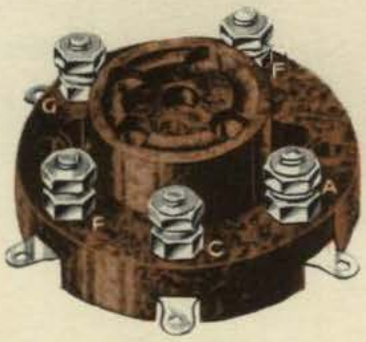
TELSEN VALVE-HOLDERS

The latest models of Telsen Valve-holders have an extremely low self-capacity and are made in both solid and anti-microphonic types. These embody special contact sockets of one-piece design with neat soldering tags and end terminals.

Solid Type		Anti-microphonic type	
No.	Price	No.	Price
4-pin .. W.224	.. 6d.	4-pin .. W.222	.. 8d.
5-pin .. W.225	.. 8d.	5-pin .. W.223	.. 10d.



TELSEN 4-PIN VALVE-HOLDERS Solid Type



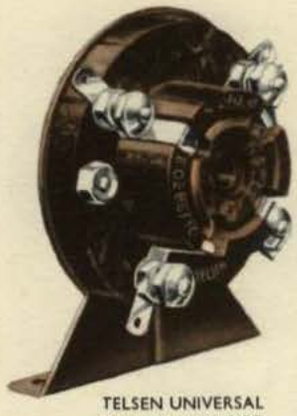
TELSEN 5-PIN VALVE-HOLDERS Anti-microphonic Type

TELSEN UNIVERSAL VALVE-HOLDER

The Universal Valve-holder provides a method of supporting a screen grid valve in a horizontal position on a baseboard, and is ideal for use in conjunction with a vertical screen. Alternatively in confined spaces it enables any valve to be mounted parallel to the surface on which the holder is fixed.

No. W.198

Price 9d.



TELSEN UNIVERSAL VALVE-HOLDER

TELSEN VARIABLE TONE CORRECTOR

Another extremely useful tone corrector that enables the experimenter to adjust the reproduction from his receiver to a balance of tone and quality suited to his own individual taste. By a turn of the knob the tone can be varied from an accentuation of the high notes to a predominance of the bass. Suitable for any output circuit.

No. W.314

Price 4/6

TELSEN VARIABLE TONE CORRECTOR

TELSEN PENTODE TONE CORRECTOR

This component has been designed to compensate for the accentuation of the high notes resulting from the use of a Pentode, and can be incorporated in the majority of circuits employing this valve in the output stage. In addition to acting as a tone corrector in this way, it gives protection to the Pentode valve by ensuring that the impedance of the output circuit does not rise to an excessive amount.

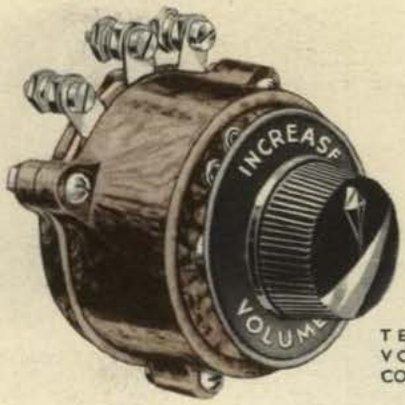
No. W.308

Price 2/6

TELSEN PENTODE TONE CORRECTOR

TELSEN
RADIO COMPONENTS

VOLUME CONTROLS & SWITCHES

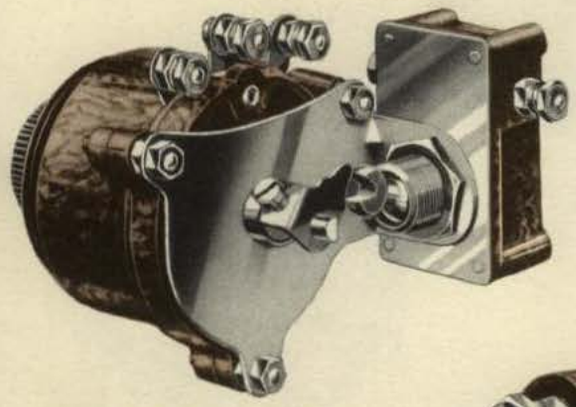


TELSEN VOLUME CONTROLS

TELSEN VOLUME CONTROLS

Telsen Volume controls are made primarily in two models, 10,000 ohms and 50,000 ohms. The resistance element is entirely wire-wound with a special alloy wire of high resistivity and great mechanical strength, ensuring constant value and noiseless operation. They are adaptable to a number of different uses in both H.F and L.F circuits, a notable feature in their construction being that, as the contact arm is insulated from the operating spindle, two or more may be ganged on the same spindle and controlled by one knob.

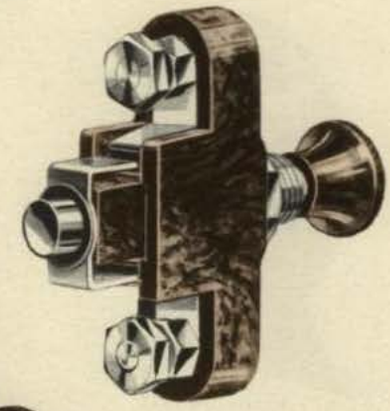
10,000 ohm	..	W.298	..	Price 3/-
50,000 ,,	..	W.295	..	,, 3/-



TELSEN 50,000 OHM VOLUME CONTROL WITH MAINS SWITCH COMBINED

TELSEN 50,000 OHM VOLUME CONTROL WITH MAINS SWITCH COMBINED

No. W.296 Price 4/6



TELSEN TWO-POINT PUSH-PULL SWITCH

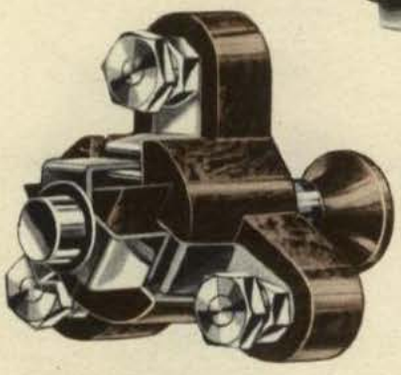
TELSEN PUSH-PULL SWITCHES

(*Prov. Pat. No.* 14125/31)

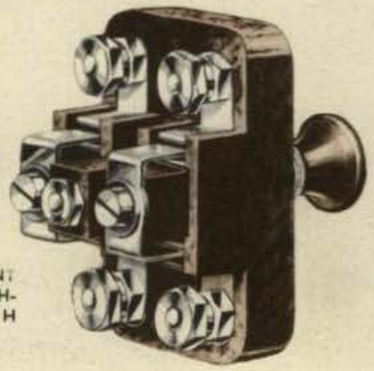
The Telsen Push-Pull Switches employ the " knife " type of self-cleaning contact, and a positive snap action. The nickel silver bridge piece is driven between the springy " fixed " contacts, and the wedge-shaped plunger squeezes the inner contacts outwards, closing the jaws in a firm grip. The series gap reduces self-capacity to a minimum, and the spindle is insulated from all contacts. They can be usefully applied for several different purposes, e.g., for the switching on and off of the high and low tension and grid bias batteries, for wave change switching where two or three contacts are employed, etc. The shape of the spindle guide prevents any possibility of the contacts becoming out of alignment.

Two-point, No W.107 Price 9d.

Three-point, No. W.108 Price 1/—



TELSEN THREE-POINT PUSH-PULL SWITCH



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

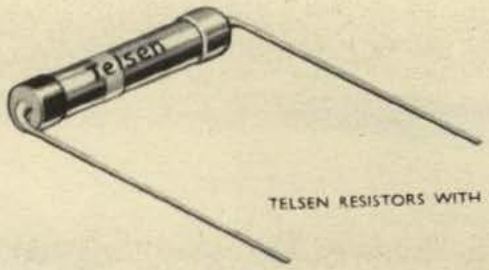
TELSEN FOUR-POINT " TWO-POLE " PUSH-PULL SWITCH

Designed on the same lines as the 2 and 3-point Switches, 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 1/3

TELSEN
RADIO COMPONENTS

FIXED RESISTANCES & HOLDERS



TELSEN RESISTORS WITH WIRED ENDS

TELSEN RESISTORS WITH WIRED ENDS

The range of these new components is very extensive both as regards resistance value and power rating. They are very small and light and are easily suspended in the wiring of a receiver, where their resistance is quickly identified by the standard colour code. For those unacquainted with the colour code, the resistance value is also printed on the carton. These Resistors have negligible self-capacity and inductance, are noiseless in use, and their value remains unchanged under the most adverse circumstances. They are supplied in the following values :—

Power rating of ½ watt : 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000, 25,000, 50,000, 100,000, 250,000, 500,000 ohms resistance.

Price 1/-

Power rating of 1 watt : 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000, 25,000, 50,000, 100,000, 250,000, 500,000 ohms resistance.

Price 1/-

Power rating of 2 watts : 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000, 25,000, 50,000, 100,000 ohms resistance.

Price 2/-

3 and 6 watt types can be supplied on request.

TELSEN SMALL TUBULAR CONDENSERS

TELSEN SMALL TUBULAR CONDENSERS

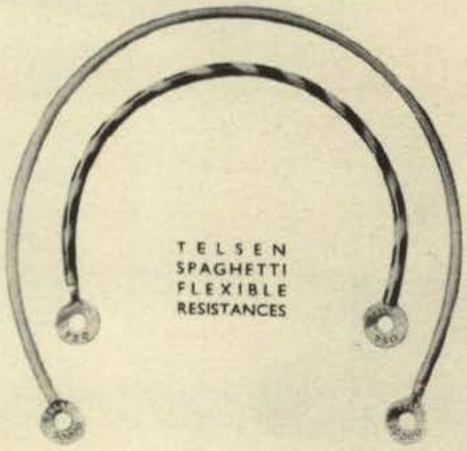
This is a new range of very small tubular condensers, which despite their small size, are quite as efficient as the larger types. They are tested up to 1,500 volts, and as they have wired ends are very suitable for suspension in the wiring.

Capacities : .0001, .0002, .0003, .0005, .001, .002, .005, .006 mfd.

Price 1/-

Capacity .01 mfd. **Price 1/3**

Capacity .1 mfd. **Price 1/6**



TELSEN SPAGHETTI FLEXIBLE RESISTANCES

TELSEN SPAGHETTI FLEXIBLE RESISTANCES

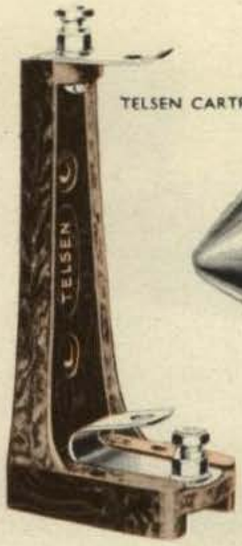
These resistances are made from the finest nickel-chrome wire, wound on a pure cotton core, stoved and impregnated so that moisture cannot attack the wire and cause corrosion. The bending of the resistance will not alter its value. Made in the following resistances :

300, 600, 750, 1,000 ohms—42 mA.
Price 6d. each

1,500, 2,000, 3,000, 4,000, 5,000 ohms—23 mA.
Price 9d. each

10,000, 15,000, 20,000, 25,000, 30,000 ohms.—6 mA.
Price 1/- each

50,000, 60,000, 80,000, 100,000 ohms—3 mA.
Price 1/6 each



TELSEN CARTRIDGE RESISTANCE HOLDER

TELSEN CARTRIDGE RESISTANCE HOLDER

Resistance Holder, No. W.286

Price 9d. each

TELSEN CARTRIDGE RESISTANCES

TELSEN CARTRIDGE RESISTANCES

These Resistances are of the 1 watt type, and maintain a constant value unaffected by change of temperature. They are enclosed within strong cartridge type cases with heavily nickelled end caps. Mounted in the Telsen Cartridge Resistance holder, which may be mounted vertically or horizontally, they present a very neat appearance. Made in the following resistances :—

300, 350, 400, 500, 600, 750, 1,000, 1,500, 2,000, 3,000, 4,000, 5,000, 10,000, 15,000, 20,000, 25,000, 30,000, 50,000, 60,000, 80,000, 100,000, 150,000, 200,000 ohms.

Price 1/- each.

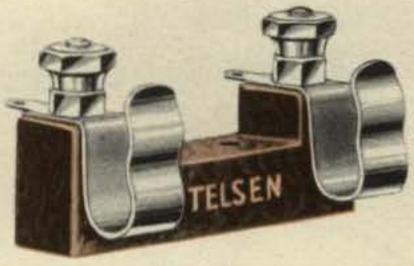
TELSEN GRID LEAKS

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.

Capacities :—5, 4, 3, 2, 1, ½, ¼ megohms

Price 6d. each



TELSEN GRID LEAK HOLDER

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

TERMINAL BLOCKS, FUSES & HOLDERS & CONSTRUCTOR'S OUTFITS

TELSEN
POWER FUSE

TELSEN POWER
FUSE-HOLDER

TELSEN
FUSE-HOLDER

TELSEN
PILOT
LAMPS

TELSEN
TERMINAL
BLOCKS

TELSEN CONSTRUCTOR'S OUTFITS

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 wire is mounted in a glass tube hermetically sealed into caps of polished nickel. Made in four values :—
Fusing Current : ½ amp., No. W.199 ; 1 amp., No. W.200 ; 2 amp., No. W.201 ; 3 amp., No. W.202.

Price 6d. each

TELSEN POWER FUSE-HOLDER

Made for mounting the Telsen Power Fuse. The end clips are securely held and are in one piece with the soldering tag projections. Ordinary wire connections can also be made under the clip screws.

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 standard type fuse bulb is held firmly, giving a perfect contact which cannot become loose.

No. W.146 **Price 6d.**

TELSEN 100 m/A FUSE BULB

No. W.318 **Price 6d.**

TELSEN PILOT LAMPS

These lamps are supplied for use with illuminated dials. Two types are available, both of which have a very low current consumption. The 6 volt lamp is suitable for use on mains sets, where it is run from the 4 volt A.C. filament supply, and the 2.5 volt lamp is ideal for battery sets using 2 volt accumulators.

6 volt pilot lamp, .2 amp. No. W.418
Price 1/-

2.5 volt pilot lamp, .2 amp. No. W.417
Price 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 independent anchorage points.

No. W.204 **Price 6d.**

TELSEN CONSTRUCTORS' OUTFITS

These outfits are supplied to facilitate the building of a Telsen Kit Set by grouping together the panel, chassis or baseboard, and all small articles such as screws, wire, wander plugs, spanners, etc., required for the construction of the receiver. Thus, when the standard components for any particular receiver have been obtained, the constructor has only to purchase the corresponding outfit to enable him to complete the entire construction of the receiver with the greatest possible ease.

TELSEN " A.C. SUPER FIVE " CONSTRUCTOR'S OUTFIT
No. W.412 Price 7/6

TELSEN " CLASS B FOUR " CONSTRUCTOR'S OUTFIT
No. W.416 Price 5/6

TELSEN " BATTERY S.G. THREE " CONSTRUCTOR'S OUTFIT
No. W.413 Price 3/6

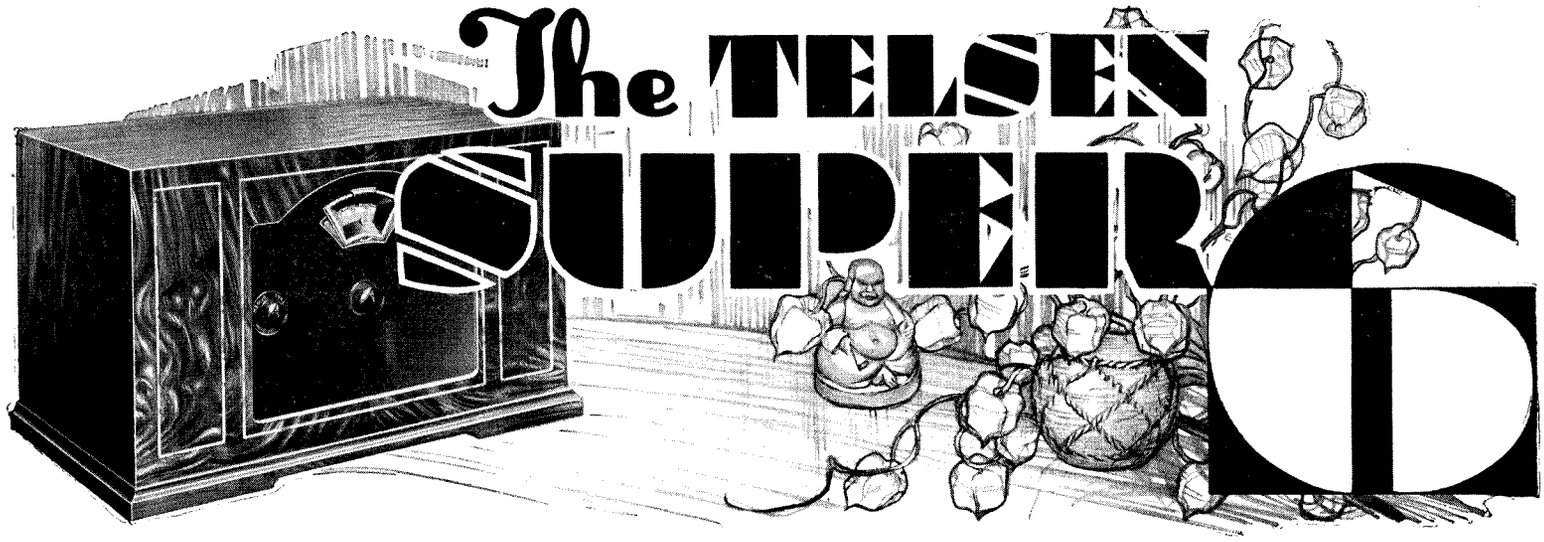
TELSEN " SUPER SIX " CONSTRUCTOR'S OUTFIT
No. W.305 Price 7/6

TELSEN " SUPER SELECTIVE FOUR " CONSTRUCTOR'S OUTFIT
No. W.304 Price 7/6

TELSEN " ALL MAINS S.G.3 " CONSTRUCTOR'S OUTFIT
No. W.303 Price 7/6

TELSEN " 325 STAR " CONSTRUCTOR'S OUTFIT
No. W.326 Price 3/6

TELSEN
RADIO COMPONENTS



The TELSEN SUPER 6

THE recent increase in the number of high power broadcasting stations in Europe has produced a condition of overcrowding in the ether which necessitates the use of a highly selective set by all who wish to receive the largest possible number of programmes without interference. No type of receiver offers such possibilities in this direction as the superheterodyne, and a great deal of intensive research work has been carried out in the Telsen Laboratories in order to evolve the very best superheterodyne circuit for the modern set constructor.

All the many difficulties which discouraged the earlier experimenters have now been overcome, and, in the last edition of the *Radiomag*, we announced the Telsen "Super Six," which incorporates a special patented circuit evolved by our Research department, and which constitutes a notable advance in the design of battery operated superheterodyne receivers. Since that time we have designed an all-electric superheterodyne for those who have electricity supply mains available, and this is fully described in this issue.

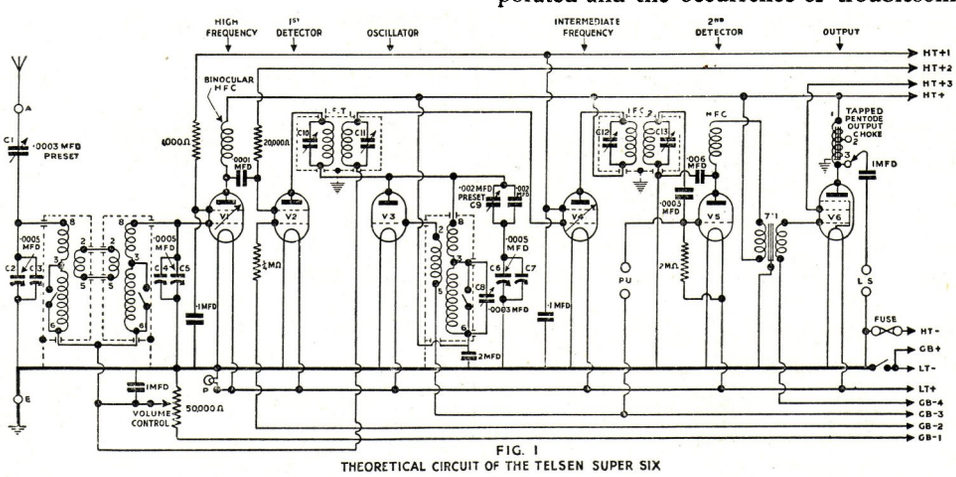


FIG. 1
THEORETICAL CIRCUIT OF THE TELSEN SUPER SIX

The Telsen "Super Six," however, was so greatly appreciated by long distance radio enthusiasts that we feel that this short description will be of interest to new readers. The theory of the superheterodyne is fully explained in the article entitled "The Superheterodyne Simply Explained," which appears elsewhere in this issue, so we need not discuss it here.

The circuit diagram of the Telsen "Super Six" is included on this page and it is of interest to note that the arrangement of the signal frequency amplifier circuit in conjunction with the band pass pre-selector is such as to keep the sensitivity of the set practically constant over the whole wave band. The two band pass intermediate frequency transformers I.F.T.1 and I.F.T.2 ensure that ample selectivity is obtained without loss of high notes, and the low frequency stage composed of the 7:1 Radiogrand Transformer, the Pentode Output valve (which has an undistorted output of one watt) and the Pentode output choke, is so balanced that an even response is given to notes of all frequencies.

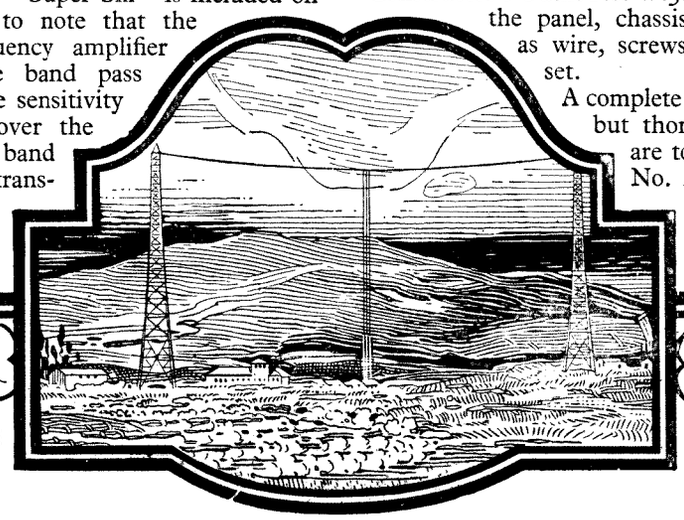
An important refinement is the use of "variable mu" valves in the high frequency and intermediate frequency stages, as in this way the most modern form of volume control is incorporated and the occurrence of troublesome "cross-modulation" entirely avoided. An on-off switch is so arranged that the set is turned off after the volume has been reduced to a minimum.

The Telsen "Super Six" is built into a strong sherardized steel chassis which affords rigid support while it provides valuable screening so that the set is absolutely stable in use. The layout is clean and efficient and the wiring short and neat. There are only three controls on the artistic black crackle finished panel, namely the volume, wave-change, and tuning controls, and the set has a very attractive appearance, especially when mounted in a suitable cabinet.

A list of components is given below. These can be obtained complete as a kit set, or a constructor who already has some of the components may buy the others separately. In this case the Constructor's Outfit No. W.305 should be obtained, as it contains the panel, chassis, and all the small articles such as wire, screws, etc., required for building this set.

A complete account of this receiver with simple but thorough instructions for building it, are to be found in the *Telsen Radiomag* No. 4, which includes a free 1/- Blue Print and which can be obtained price 6d. post free.

(*continued on page* 40)



FLORENCE ITALY

THE TELSEN "SUPER 6"—*continued from page 39*

THE TELSEN SUPER SIX
List of Components

Quantity	*Description*	*Cat. No.*	*Price*
5	Anti-Microphonic Valve-holders, 4-pin ..	W.222	3/4
1	Anti-Microphonic Valve-holder, 5 pin ..	W.223	10d.
1	2 meg. Grid Leak	W.251	6d.
1	½ meg. Grid Leak	W.248	6d.
1	1,000 ohm Anode Cartridge Resistance ..	W.268	1/-
1	20,000 ohm Anode Cartridge Resistance ..	W.276	1/-
2	Anode Cartridge Resistance Holders	W.286	1/6
1	Grid Leak Holder	W.148	6d.
1	50,000 ohm Volume Control with Mains Switch	W.296	4/6
2	.0003 Pre-set Condensers	W.151	2/6
1	.002 Pre-set Condenser	W.149	1/3
1	.0001 Fixed Mica Condenser	W.240	6d.
1	.0003 Fixed Mica Condenser	W.242	6d.
1	.002 Fixed Mica Condenser	W.246	1/-
1	.006 Fixed Mica Condenser	W.247	1/3
2	.1 mfd. Self-Sealing Condensers	W.231	3/-
2	1 mfd. Self-Sealing Condenser	W.227	3/6
1	2 mfd. Self-Sealing Condenser	W.226	2/6
1	Triple Ganged Tuning Condenser	W.307	20/-
1	Band-Pass and Oscillator Coil Unit	W.292	21/6
2	Intermediate Frequency Transformer Coils ..	W.294	15/-
1	Binocular H.F. Choke	W.74	3/6
1	Standard H.F. Choke	W.75	1/6
1	7:1 " Radiogrand " Transformer	W.60	9/6
1	Tapped Pentode Output Choke	W.72	6/9
1	Fuse Holder	W.146	6d.
1	Super-Six Constructor's Outfit	W.305	7/6

The Telsen " Super Six " as detailed above is supplied as a complete kit at the inclusive price of £5 18s. 6d.

RECOMMENDED VALVES

Makes	V1	V2	V3	V4	V5	V6
Mazda	S215VM	215SG	HL2	S215VM	HL2	PEN220A
Marconi or Osram	VS2	S21	HL2	VS2	HL2	PT2
Mullard	PM12V	PM12	PM1HL	PM12V	PM1HL	PM22
Cossor	220VSG	215SG	210HL	220VSG	210HL	220PT

Any of the above combinations of valves are suitable for use in this receiver, in the positions indicated in the circuit diagram.

For Mains operation, the following Units are suitable :—

D.C. MAINS—TELSEN D.C. H.T. Unit, W.348.

A.C. MAINS—TELSEN H.T. Unit and L.T. Charger, W.346 (this Unit incorporates a Trickle Charger).

If desired the Telsen H.T. and L.T. Unit, W.347 may be used. This is a cheaper unit than the W.346, being without a trickle charger, but delivering an A.C. low tension supply, which in this case may either be neglected or used to heat a 4 volt output valve, as described in " Practical Hints and Tips " elsewhere in this issue.

PRACTICAL HINTS AND TIPS—*continued from page 22*

The new range of Telsen wired end resistors employs this coding system, except that a coloured band instead of a coloured dot is placed on the resistor body, the band being easily visible whichever way the resistor is turned. For the benefit of people who are unacquainted with the code, the value of each resistor is printed on the containing carton in figures. The code, however, provides a reference after the carton has been destroyed.

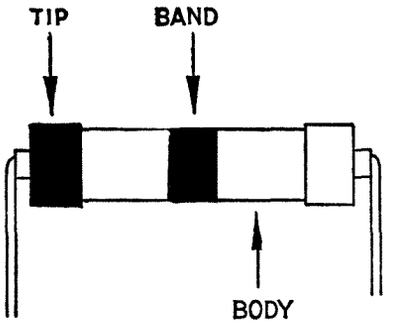


Figure	*Colour*	*Figure*	*Colour*
0	Black	5	Green
1	Brown	6	Blue
2	Red	7	Violet or Purple
3	Orange	8	Grey
4	Yellow	9	White

ELECTROLYTIC CONDENSERS—*continued from page 18*

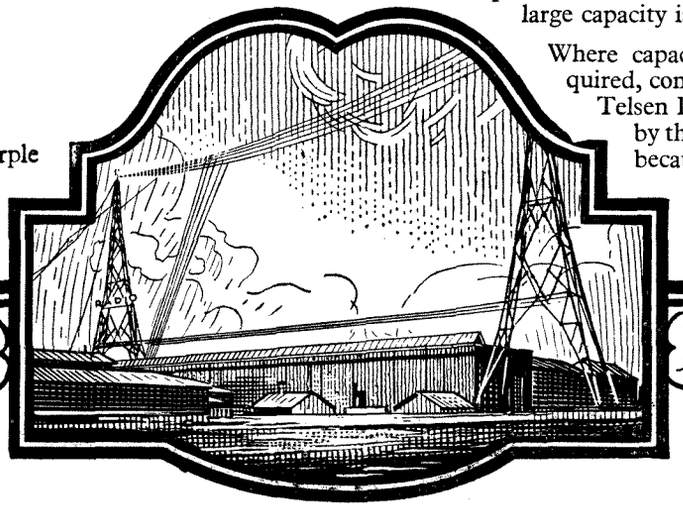
be 100 per cent. efficient in smoothing or decoupling—an unattainable ideal in practice. The figure of five per cent. for Telsen condensers represents very high efficiency for electrolytic condensers, which are somewhat less efficient than the ordinary type as a rule.

Furthermore, as Telsen electrolytics contain no free electrolyte, there is no possibility of messy leakage through the vent holes which are always provided for " breathing " in this type of condenser.

The list of Telsen electrolytic condensers, given elsewhere in this issue, includes types and sizes for every application in radio, for which electrolytics are suitable, and to this list the attention of the reader is respectfully drawn. The high voltage types find application in smoothing and decoupling H.T. circuits, whilst the large capacity low voltage types are intended for use primarily in automatic grid bias systems.

It will be seen that, far from being an article which is merely cheaper and more compact than the ordinary condenser, the electrolytic condenser is a valuable component which can offer permanent and reliable service in all cases where a large capacity is required.

Where capacities smaller than 4 mfd. are required, condensers should be selected from the Telsen Paper Condenser range, represented by the "Self-sealing" and "Block" types, because, as mentioned earlier in this article, the electrolytic condenser is not an economical proposition when made in sizes smaller than 4 mfd.



HILVERSUM HOLLAND

NOTES ON "CLASS B" AMPLIFICATION — *cont. from page 5*

do this efficiently and with a minimum of distortion, it must have a certain value of load impedance, into which it can deliver this power. This load impedance appears at the primary of the driver transformer, and is presented by the grid filament load of the Class " B " valves, multiplied by the square of the ratio between the primary and a half secondary of the driver transformer. An example may make this clear. Assume that the grid filament load of one of the Class " B " valves is 2,500 ohms (a usual figure), and that the driver valve requires a load of 10,000 ohms, for best results. The required ratio of primary to each half secondary would be $\sqrt{\frac{10,000}{2,500}}$=2:1, or 1:1 primary to complete secondary (overall ratio). Only one Class " B " valve is considered, as only one of the pair is, of course, in operation at a time. In actual practice, the two Class " B " valves are combined in one bulb, and the complete dual valve is obtainable for less than the price of a single pentode.

Another advantage of Class " B " over the Q.P.P. system is that critical matching of the valves and critical adjustment of grid bias is not necessary. All the matching required is performed by the makers in producing the dual valve, and it requires no grid bias. It is not practicable to operate the Class "B" valves direct from the detector, the "driver" valve must be in an intermediate L.F. stage, in order to obtain adequate sensitivity. Even so, the cost of the driver valve, and the dual output valve is quite low, and the steady (quiescent) anode current taken by them is only about 4.5 milliamps. for a driver and output stage capable of delivering 1.4 watts output.

This increase in power output and economy involves no sacrifice in quality, if certain specialised requirements for the driver transformer and output components are observed.

The driver transformer should have low secondary resistance and a generous core section, in order that the heavy peak grid currents flowing in the secondary do not produce distortion by voltage drop, or by core saturation. The two halves of the secondary should be most carefully balanced. The same requirements apply to the output choke or transformer, whichever is used. This should have low D.C. resistance and ample core section, in order that excessive voltage drop and core saturation may be avoided, even on the heavy peak currents occurring with Class " B " working. The two halves of the output transformer primary or choke winding should again be carefully matched.

These requirements have been most carefully considered in designing the Telsen range of Ciass " B " components. This range comprises two driver transformers, W.343 having an overall ratio of 1:1 and W.359 having an overall ratio of 1.5:1, which ratios are most suitable for the Class " B " valves at present available.

The output choke, W.345, gives four ratios and is designed to match any Class:" B " valve to any type of moving coil loudspeaker having a built-in input transformer or a high resistance speech coil, whilst the output transformer, W.344, gives three ratios and is suitable for use with moving coil speakers having low resistance speech coils.

All of these components have low resistance windings on extremely massive cores.

The centre tapped windings on these components are symmetrical not only inductively, but also on D.C. resistance, due to a special method of winding. This obviates any distortion due to out of balance effects.

A precaution which must be observed with Class " B " working is that the output stage must not be allowed to oscillate, as most push-pull circuits tend to do. In the ordinary push-pull circuit this is prevented by the use of resistances in series with the grid leads, or grid bias leads. Series resistances cannot be used with Class " B " owing to the fact that grid current flows, and a method similar to that shown in Fig 3 must be used. Here, fixed condensers, which may be anything from .001 mfd. to .0006 mfd. in capacity, are connected between each anode of the Class " B " valve, and H.T.+.

Alternatively, they may be connected across each half secondary of the driver transformer. In this latter position, fixed resistances of about 50,000 ohms value may be used, instead of fixed condensers.

Some degree of tone correction will usually be required to prevent over emphasis of upper frequencies, and this can be applied by connecting a fixed condenser between the two plates of the Class " B " valve. Its exact value will depend somewhat upon the characteristics of the speaker in use, but, in general, a value of .005 mfd. will be found satisfactory. Tone correction may also be applied by connecting a fixed condenser of about .02 mfd. between the grids of the Class " B " valve.

The salient features of a high-quality receiver employing Class " B " are all to be observed in the " Class B Four " described elsewhere in this issue, and we refer, to this article, the reader who is interested in the construction of a sensitive and economical receiver capable of a high power output.

THE TELSEN "CLASS B" BATTERY 4

—continued from page 16

way in, and tune in a station of known identity and wavelength, preferably on the medium waveband, then if the scale does not indicate the correct wavelength for the particular station being received, slacken off the nuts securing the scale to the driving disc and move the scale round relative to the condenser, until the correct wavelength figure is indicated against the index on the escutcheon plate. The scale has elongated fixing holes so that this correction can readily be made. The scale should then be clamped firmly on the driving disc by retightening the fixing nuts.

GRAMOPHONE

The Telsen " Class B Four " can be used for the electrical reproduction of gramophone records with excellent results, by connecting a pick-up to the terminals provided. A potentiometer volume control such as the Telsen 50,000 ohm model W.295 or the 10,000 ohm model W.298 should be shunted across the output from pick-up to provide the necessary volume control. With most pick-ups the 10,000 ohm type will be most suitable; this value provides in addition to volume control, a certain degree of scratch filtration.

With some types of pick-ups considerably improved results will be obtained by connecting a resistance of 25,000 to 50,000 ohms in value, across the primary winding of the " Ace " transformer. Telsen wired end resistances are suitable; type W.380 (25,000 ohms) or W.420 (50,000 ohms) should be used and should be floated between terminals 90 and 122 on the " Ace " transformer. This, whilst having little effect on the quality of radio reproduction, produces in some cases a considerable improvement in the quality of reproduction from records. The value of grid bias applied to the " G.B. −1 " tapping affects considerably the results obtainable when using a pick-up. The most suitable value will usually be found to be −1½v.

Recommended Valves

" V1 "—Cossor 220 S.G.
" V2 "—Mazda H.L.2.
" V3 "—Mullard PM2A.
" V4 "—Mazda P.D.220.

Recommended Batteries

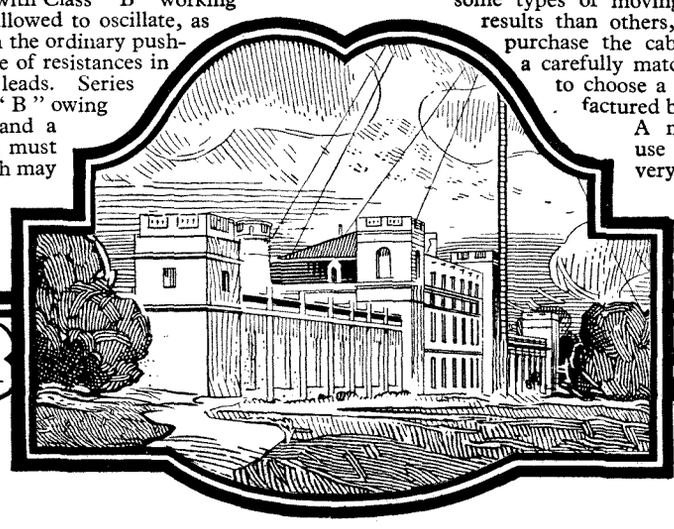
Any 120 volt battery of good make and standard capacity may be used for the H.T. supply; a larger power output can be obtained if desired by the use of a 150 volt standard capacity battery, although the output obtainable with 120 volts H.T. supply should be adequate for all normal requirements. A 9 volt grid bias battery and a 2 volt 45 ampere hour (slow discharge rate) accumulator, are the other batteries required.

This receiver is not suitable for operation from a mains unit.

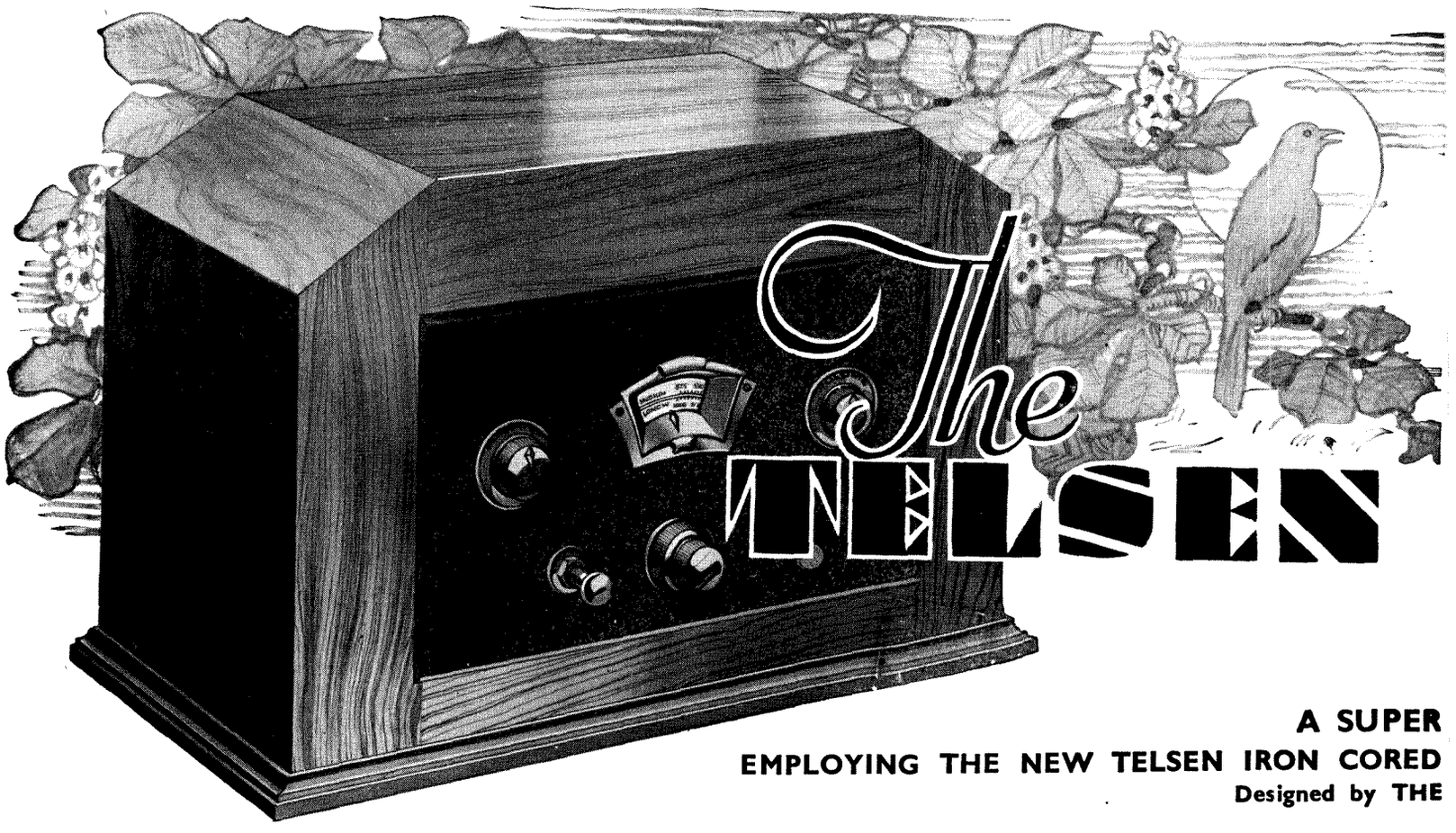
Loudspeakers for the " Class B Four "

This receiver is, of course, intended to operate a moving coil loudspeaker—a moving iron (reed) type of loudspeaker is not suitable for operation from a " Class B " receiver. Experience has indicated that some types of moving coil speakers give very much better results than others, therefore, if the constructor does not purchase the cabinet kit, which is sold complete with a carefully matched moving coil speaker, he is advised to choose a " Class B " moving coil speaker manufactured by a maker of repute.

A moving coil speaker not designed for use on " Class B " may be made to give very good results, providing that careful matching is achieved by the use of a Telsen " Class B " output choke or transformer, as described previously.



TOULOUSE FRANCE



The TELSEN

A SUPER EMPLOYING THE NEW TELSEN IRON CORED

Designed by THE

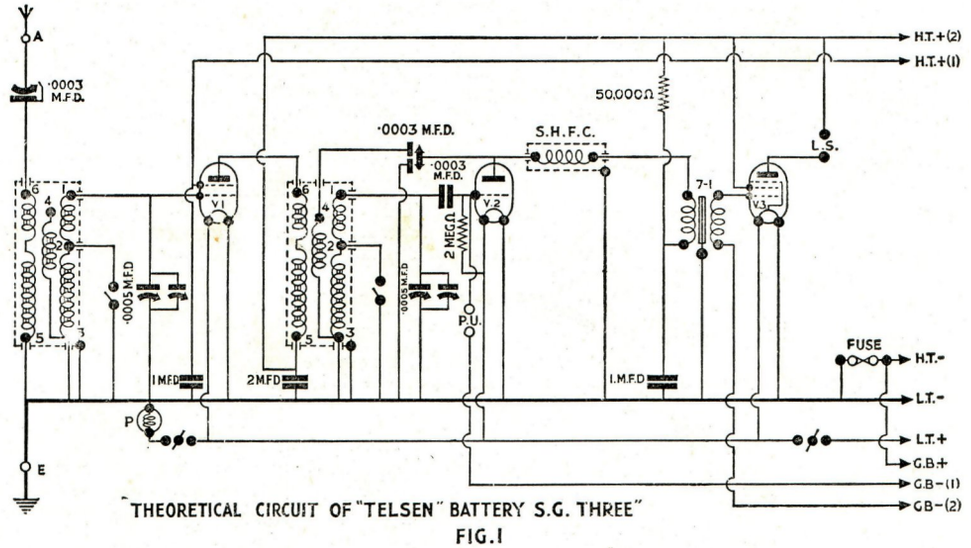
THERE is little doubt that sets using a screened grid H.F. valve, detector and pentode output valve are among the most popular general purpose receivers being produced to-day, and when properly designed and constructed so that optimum conditions are attained throughout the circuit they leave very little to be desired in the matter of range, selectivity, volume, quality of reproduction and economy.

The last named is particularly important to the battery user, and the Telsen Battery S.G. Three, which is a fine example of up-to-the-minute radio design, has been produced with the object of obtaining the very best value for money, both in first cost and running expenses. At the same time every worth-while improvement has been incorporated, and the owner of this receiver will not be slow to realise that he has a set of which he can be justly proud.

A notable feature of this set is the use of the new Telsen Iron-Cored Screened Coils which have such a small magnetic field, and are so well screened, that a metal chassis is unnecessary, and the inexpensive wooden baseboard can be employed. At the same time these coils are very compact, and this improves the layout, while their high efficiency enhances both the selectivity and the sensitivity of the receiver. From an examination of the theoretical diagram it will be seen that the aerial is loosely coupled to the tuned circuit preceding the screened grid H.F. valve, a series condenser being inserted in the aerial circuit. The latter is a valuable control of selectivity and volume as it enables aerial coupling to be adjusted to an optimum value. A shorting switch, fitted to the spindle, enables this condenser to be cut out when not required. The screened grid valve V1 provides amplification at radio frequency, thus enabling distant stations to be received at good volume, and it is coupled by means of the iron-cored H.F. transformer to the grid circuit of the detector.

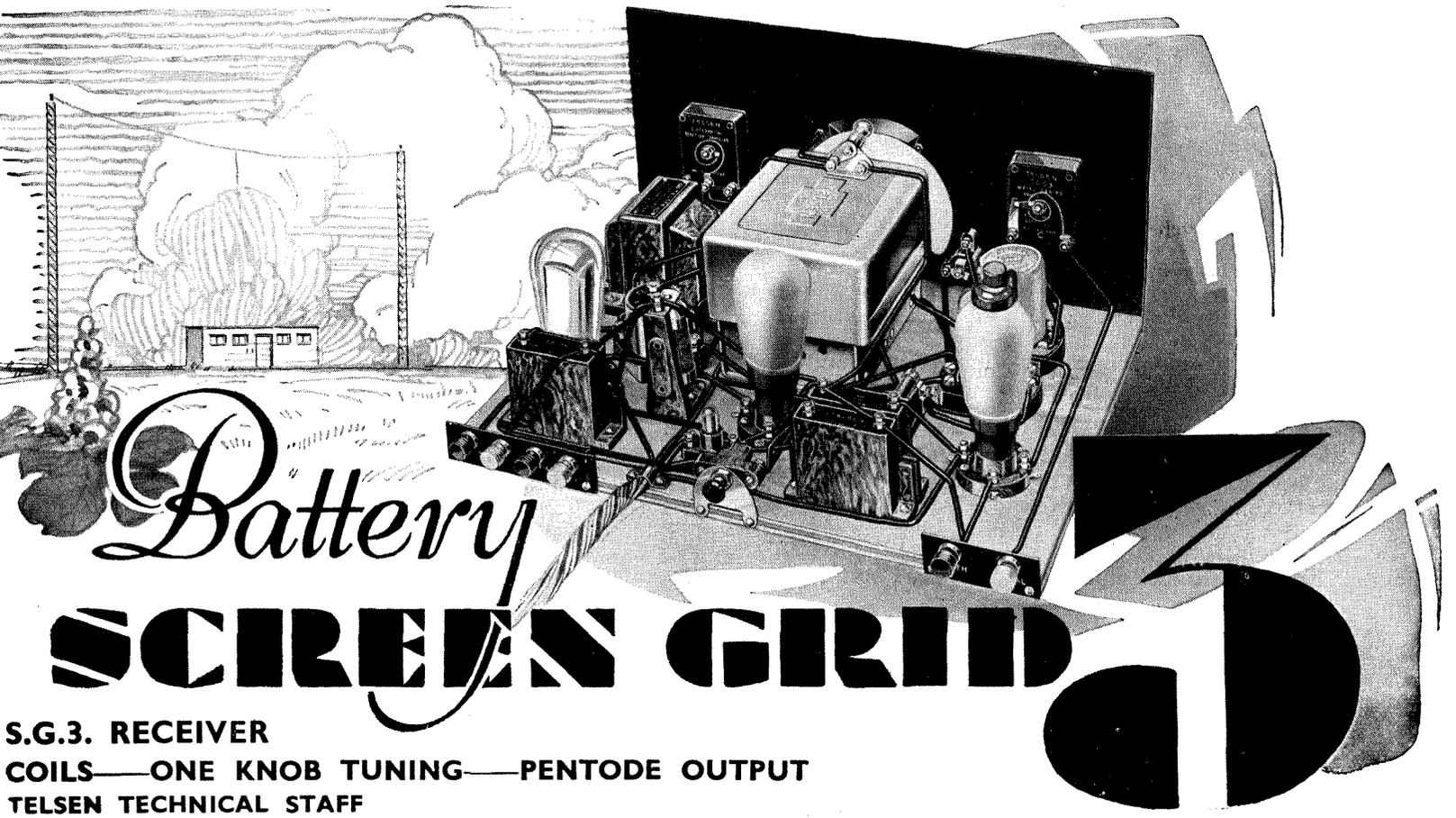
The two iron-cored screened coils are tuned by a Telsen twin gang condenser, so that tuning is effected with great ease by means of a single control. The dial is illuminated by a pilot lamp which, however, can be switched off when not required so as to economise in L.T. current. The coils and reaction circuits have been carefully designed so that reaction is smooth and consistent over both wavebands and forms a very useful control of volume and selectivity. The detector anode circuit is adequately decoupled, and all metal screening cans, etc., are connected to earth to secure perfect stability.

From the detector valve V2, audio frequency signals pass through the new screened H.F. choke and 7:1 "Radiogrand" trans-



"THEORETICAL CIRCUIT OF "TELSEN" BATTERY S.G. THREE"

FIG. 1



Battery SCREEN GRID 3

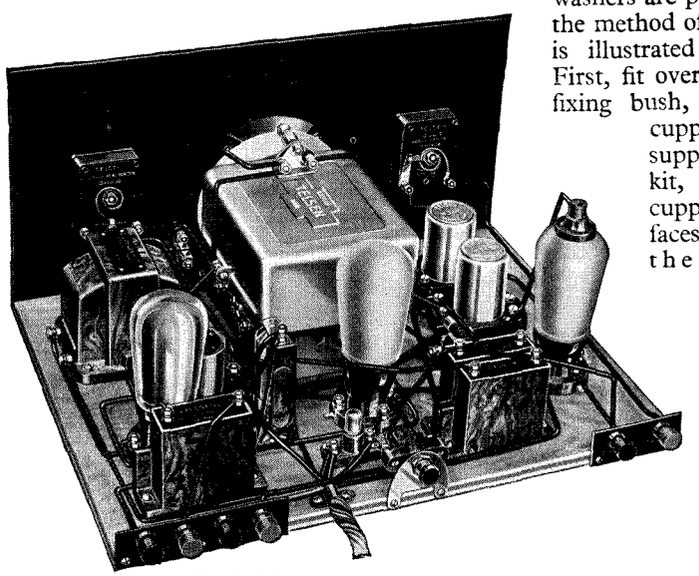
S.G.3. RECEIVER

COILS—ONE KNOB TUNING—PENTODE OUTPUT

TELSEN TECHNICAL STAFF

former to the pentode output valve, a high degree of magnification being obtained. The pentode valve may be chosen to give 1,000 milliwatts undistorted output (which is sufficient to operate a moving coil loudspeaker) or half this value, with reduced anode current, according to individual requirements. Reproduction is of excellent quality, and the connection of a pick-up to the terminals "P.U." will enable gramophone records to be reproduced with wonderful fidelity. A full size 1/- Blue Print showing the complete assembly and wiring of the Telsen Battery S.G. Three is given away free with this issue of the *Radiomag*, and with the help of this article it enables the set to be constructed easily and rapidly.

A complete list of the components required for constructing this set will be found at the end of this article. Constructors who already possess some of the components can complete the set by buying the remainder, but in any case the Constructor's Outfit W.413 should be obtained, as it contains the baseboard, panel, tools, wire, insulated sleeving and other small articles required for building this receiver. The remainder of this article deals with the construction of the Telsen Battery S.G. Three, and though simple and easy to follow, it will be found so detailed and explicit that it is almost impossible to go wrong.



THE TELSEN S.G. 3 completely assembled and ready for testing.

ASSEMBLY

The first operation is to mount the components on the panel. The escutcheon plate supplied with the ganged condenser should be placed in position on the front of the panel, and the fixing screws inserted. The nuts may then be screwed on at the back and tightened. Next mount the aerial series condenser (with switch) in the hole on the extreme left of the panel, taking care to see that the spindle is insulated. To do this special insulating washers are provided, and the method of fixing them is illustrated in Fig. 2. First, fit over the screwed fixing bush, one of the cupped washers supplied with the kit, so that the cupped portion faces away from the condenser body, follow this by a large flat insulating washer, then by a small insulating washer. Next, from the back of the panel, insert the fixing bush and spindle of the condenser into the appropriate hole. The condenser should be disposed so that the terminals are in the positions shown in the Blue Print. See that the cupped washer and the large flat insulating washer lie flat against the back of the panel; the small insulating washer should fit into the hole in the panel and should project at the front a little, as it is slightly thicker. Over this projecting portion the appropriate escutcheon plate ("volume" or "separator" as the case may be) is fitted, and after this, another large flat washer, and the condenser fixing nut. Rotate the escutcheon plate so that its indication is at the top, and holding the whole assembly firmly, screw up the fixing

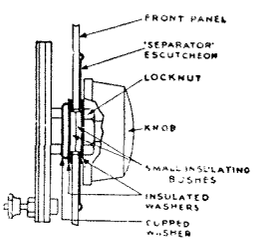


Fig. 2

(*continued on page* 44)

THE TELSEN BATTERY S.G.3. — SINGLE KNOB TUNING, PENTODE OUTPUT — *continued*

nut tightly by means of the special spanner provided. After this, the knob may be fitted.

The differential reaction condenser may now be fitted to the hole on the extreme right, and must be secured in the same manner as the aerial condenser.

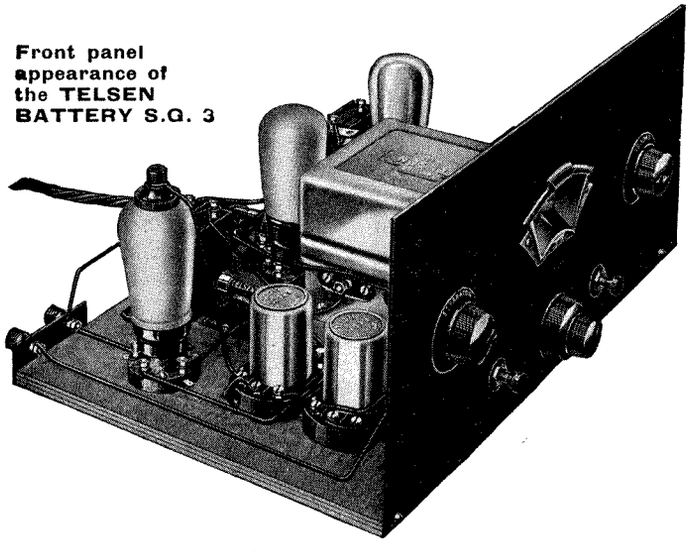
Next fit the two switches to their respective holes as shown in Blue Print. This completes the panel assembly.

The mounting of the components on the baseboard may now be proceeded with. The Blue Print is exactly full size, so no difficulty should be experienced in placing the components in their correct positions.

A good system is to place the baseboard portion of the Blue Print on to the wooden baseboard and mark the fixing holes for components by means of any sharp pointed instrument. They may then be mounted, particular care being taken to see that the valve holders are placed correctly, "V3" being mounted the opposite way to "V1" and "V2." The ganged condenser should be fixed as per instructions supplied with same. The terminal strips should now be fixed up and mounted as shown on Blue Print. The colours of the various terminals from left to right looking at the back of the receiver are black, red, black, red, black, red.

The two-point switch controlling the pilot lamp should be mounted on the switch bracket contained in the Constructor's Outfit, and this assembly screwed to the back edge of the base-

Front panel appearance of the TELSEN BATTERY S.G. 3



board. The object of this switch is to enable the pilot lamp to be switched off after the desired station has been tuned in. In this way economy in low tension current is effected.

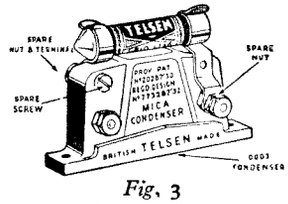


Fig. 3

The grid condenser and leak connected to the detector valve-holder "V1" should be fitted up as shown in the accompanying diagram, Fig. 3.

Having completed the mounting of the components on both panel and baseboard, the panel may be secured to the baseboard. The set is then ready for wiring.

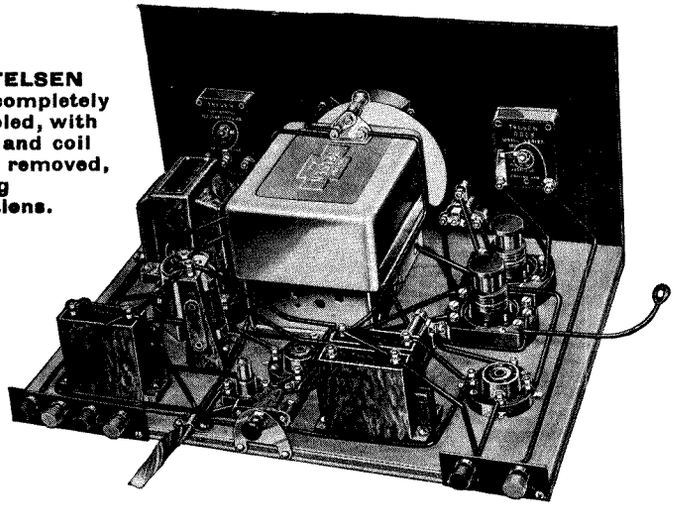
WIRING.

For those who do not wish to solder connections, the "pull-back" wire supplied may be taken to each individual terminal as shown in the Blue Print.

On looking at Blue Print it will be seen that all terminals are numbered; in the case of the tuning coils A and B, these should be mounted so that the terminals 1, 2 and 3 (the numbers actually on the coil bases) are facing the ganged condenser. The wiring should then be carried out as follows :—

Terminal 1 on Aerial-Earth Terminal Strip to 2 on V1.
" 1 on Aerial-Earth Terminal Strip to 3 on 1 mfd. Condenser to 4 on 1 mfd. Condenser to 5 on Coil B to 7 on Coil A to 9 on Wavechange Switch to 10 on Coil A.
" 5 on Coil B to 6 on Coil B (fixing down screw).
" 7 on Coil A to 8 on Coil A (fixing down screw).
" 4 on 1 mfd. Condenser to 11 on V2 to 12 on Fuse Holder to 13 on V3, to 15 on H.F. Choke to 16 on gang condenser to 17 on pilot lamp to 18 (nut and bolt holding escutcheon, to earth panel).
" 13 on V3 to 14 on 2 mfd. Condenser.
" 19 on V1 to 20 on Grid Leak to 21 on V2 to 22 on V3 to 23 on L.T. Switch.
" 24 on Aerial Earth Terminal Strip to 25 on Aerial Series Condenser.
" 26 on Aerial Series Condenser to 27 on Coil A.
" 28 on Coil A to 29 on Wavechange Switch.
" 30 on Gang Condenser to 31 on Coil A to 32 on V1.
" 33 on Wavechange Switch to 34 on Coil B.
" 35 on Gang Condenser to 36 on Grid Condenser to 37 on Coil B.
" 38 on V1 to 39 on 1 mfd. Condenser.
" 40 on 1 mfd. to 41 on Resistance Holder to 42 on Radiogrand Transformer.
" 43 on Coil B to 44 on Differential Condenser.
" 45 on Pilot Lamp to 46 on pilot lamp switch.
" 47 on Grid Leak and Condenser to 48 on V2.
" 49 on V2 to 50 on H.F. Choke to 51 on Differential Condenser.

THE TELSEN S.G.3 completely assembled, with valves and coil screens removed, showing connections.

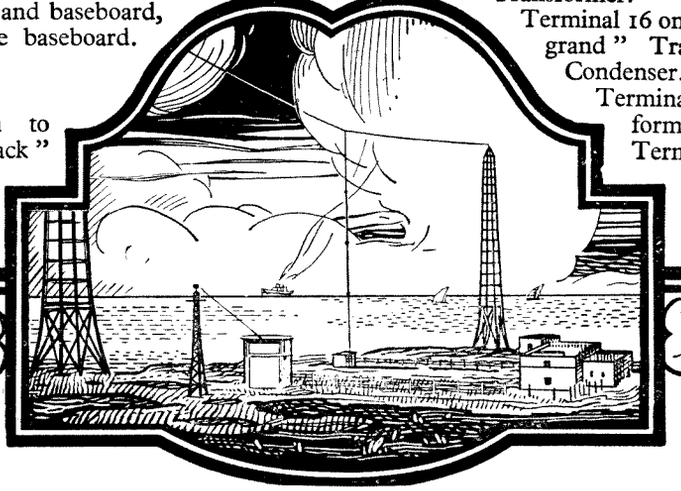


Terminal 52 on H.F. Choke to 53 on "Radiogrand" Transformer.

Terminal 16 on Gang Condenser to 54 on "Radiogrand" Transformer to 55 on Differential Condenser.

Terminal 56 on "Radiogrand" Transformer to 57 on V3.

Terminal 58 on Coil B to 59 on Resistance Holder to 60 on 2 mfd. Condenser to 61 on Terminal Strip.



TRIESTE ITALY

THE TELSEN BATTERY S.G.3 — *continued*

Terminal 62 on Coil A, a 6" length of wire, to be connected to top of S.G. Valve later.
" 59 on Resistance Holder to 63 on V3.
" 64 on V3 to 65 on Terminal Strip.
" 21 on V2 to 66 on Pilot Lamp Switch.
" 48 on V2 to 67 on Terminal Strip.

The 8-way battery cord must now be fitted, the colours for the different battery connections and wander plugs being as follows :

Red Wire	L.T.+
Black Wire.. ..	L.T.—
Blue Wire	H.T.+1
Maroon Wire ..	H.T.+2
White Wire ..	H.T.—
Speckled Wire ..	G.B.+
Yellow Wire ..	G.B.—1
Green Wire ..	G.B.—2

Although it is possible to use the battery cord just as sent out, it gives a much neater appearance to the set if the various leads are first separated. The wires can then all be run straight to their respective terminals, drawn fairly tight, and bunched together under the clip shown on the Blue Print. The ends of the flex should then be covered with a short length of black sleeving. First slide the braiding back about a $\frac{1}{4}$" and cut off the rubber covered wire to the same length. The braiding can then be brought forward again, moistened, and screwed to a point between finger and thumb. It is then easy to thread on the sleeving which can then be brought up to the terminal when the joint has been made, so covering all the loose ends of the braiding. The wires should be joined as follows :—

Red Wire	to 71 on Switch.
Black Wire.. ..	to 12 on Fuse Holder.
Blue Wire	to 38 on V1.
Maroon Wire ..	to 60 on 2 mfd. Condenser.
White Wire ..	to 68 on Fuse Holder.
Speckled Wire ..	to 68 on Fuse Holder.
Yellow Wire ..	to 69 on Terminal Switch.
Green Wire ..	to 70 on " Radiogrand " Transformer.

This now completes the wiring.

OPERATING INSTRUCTIONS

Two Telsen Pilot Lamps W.417 are included in the kit. One of these should be screwed in the pilot lampholder on the twin gang condenser and the other into the fuseholder. Insert suitable valves as indicated at the end of this article. Connect aerial, earth and a good loudspeaker to the appropriate terminals and the L.T.+ and L.T.— leads to the + and — terminals respectively of the accumulator.

G.B.+ should be plugged into the + socket, and G.B.—1 and G.B.—2 into the $1\frac{1}{2}$ and 9 volt tappings of the grid bias battery. H.T.— should go into the — socket of the H.T. battery, H.T.+1 being plugged into a socket of about 90 volts and H.T.+2 into the socket giving the maximum voltage available. The receiver should now be switched on by means of the right-hand switch, and the pilot lamp switch should be pulled " on " at the rear of the set.

A preliminary test has revealed that the receiver is working normally, and receiving signals. The wavechange switch should be set to the " medium " position and the separator control about half-way over. The volume control should be set so that the receiver is in a sensitive position, i.e., almost at the oscillation point, and a fairly weak station at the lower end of the waveband should be tuned in. Any station lying between 200/250 metres is suitable, and it should be tuned in with the trimmer on the front panel concentric with the main tuning dial, left approximately half-way between the limits of its travel. The trimmer operated by the " star wheel " on the right-hand side of the tuning condenser should now be adjusted for maximum signal strength, adjusting the main tuning condenser, when necessary, to keep the station tuned in. Having set this trimmer to the position giving maximum signal strength, it should not again be touched. Following adjustments of the separator control, which are made from time to time, to suit reception conditions, adjustments to ganging will be necessary, but these are performed by a slight movement, one way or the other, of the control knob operating the trimmer on the front panel. This control enables the most efficient performance to be obtained at any setting of the separator or main tuning control, and is of value when tuning in weak stations. Although ganging is carried out on the short waves, it will hold good on changing over to long waves—this is taken care of in the matching of coils.

If preferred, the wavelength calibrated scale can be used and adjusted to read correctly as follows :—Set the separator condenser about half-way in, and tune in a station of known identity and wavelength, preferably on the medium waveband. The scale may indicate the correct wavelength for the particular station being received, but, if not, the nuts securing the scale to the driving disc should be slackened off, and the scale, which has elongated fixing holes, should be shifted relative to the condenser, until the correct figure is indicated against the index on the escutcheon plate. The scale should then be clamped firmly on the driving disc by re-tightening the fixing nuts.

THE TELSEN BATTERY S.G. THREE
List of Components

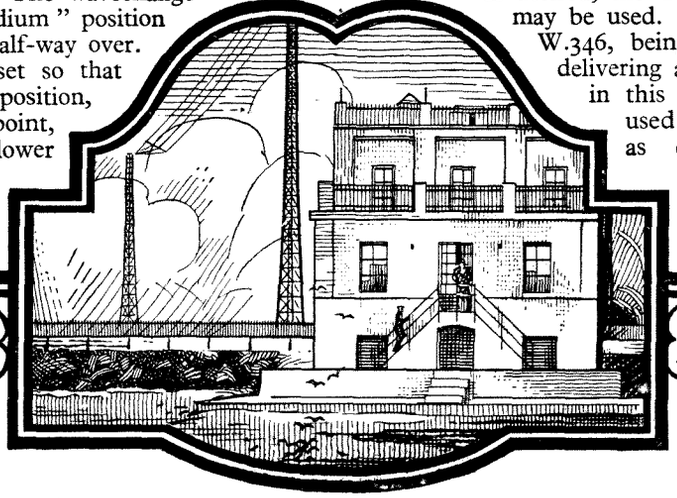
Quantity	*Description*	*Cat. No.*	*Price*
2	4-pin Anti-Microphonic Valve-holders ..	W.222	1/4
1	5-pin Anti-Microphonic Valve-holder ..	W.223	10d.
1	7:1 " Radiogrand " Transformer	W.60	9/6
1	.0003 Mica Condenser	W.242	6d.
1	2 meg. Grid Leak	W.251	6d.
1	Cartridge Resistance Holder	W.286	9d.
1	50,000 ohm Cartridge Resistance	W.279	1/-
1	2 mfd. Self-Sealing Condenser	W.226	2/6
2	1 mfd. Self-Sealing Condenser	W.227	3/6
1	Battery Type Fuse Holder	W.146	6d.
1	Standard Screened H.F. Choke	W.341	2/6
1	Twin Ganged Condenser	W.306	14/6
2	2-point Push-Pull Switches	W.107	1/6
1	3-point Push-Pull Switch	W.108	1/-
1	Aerial Series Condenser .0003	W.350	2/-
1	Differential Reaction Condenser .0003 ..	W.351	2/-
2	Matched Iron Cored Coils	W.349	17/-
2	2.5 volt Pilot Lamps	W.417	1/-
1	Telsen Battery S.G.3 Constructor's Outfit ..	W.413	3/6

RECOMMENDED VALVES

Make	V1	V2	V3
Cossor	220SG	210 Det.	220 PT
Mazda	S215A	HL2	PEN220A
Mullard	PM12A	PM1HL	PM22A
Marconi-Osram	S22	HL2	PT2

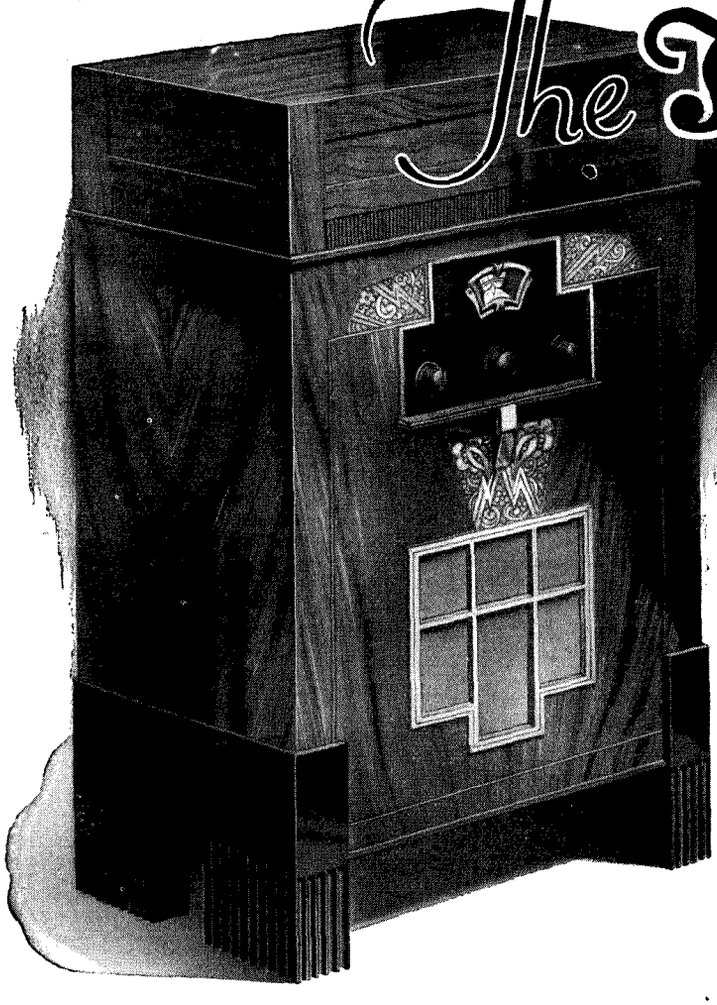
MAINS UNITS RECOMMENDED

A.C. MAINS—Telsen W.346 H.T. Unit and L.T. Charger. If desired, the Telsen H.T. and L.T. Unit W.347 may be used. This is a cheaper unit than the W.346, being without a trickle charger, but delivering an A.C. low tension supply which in this case may either be neglected or used to heat a 4 volt output valve, as described in " Practical Hints and Tips " elsewhere in this issue. D.C. MAINS—Telsen D.C. H.T. Unit W.348.



VALENCIA SPAIN

The Telsen A.C.



A POWERFUL AND SUPERSENSITIVE BAND PASS TUNING, SINGLE KNOB

DESIGNED BY THE

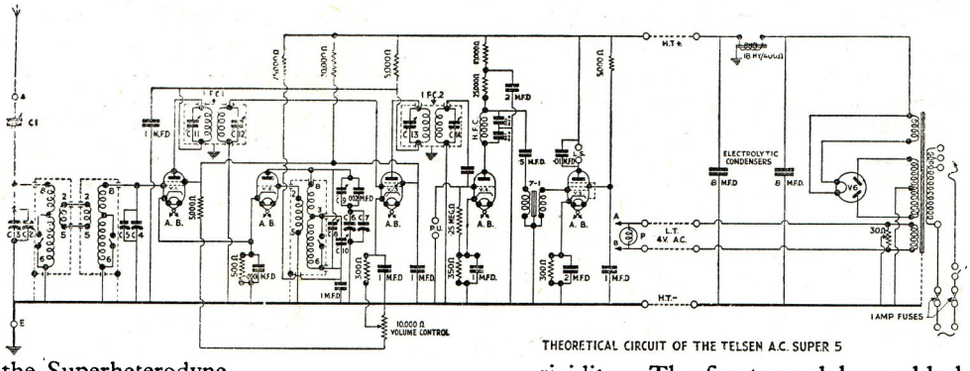
ALTHOUGH the principle of the Superheterodyne receiver has been known for many years it is only during this last year or two that it has been successfully used for the high quality reproduction of broadcasting.

High quality alone, however, is insufficient for the complete enjoyment of broadcasting, for this can only be obtained when the reproduction contains everything transmitted by the desired station and nothing from any other source. The ideal receiver, therefore, must be capable of reproducing the whole range of audible frequencies without distortion, and must be sufficiently selective to eliminate interferences from all other sources, whilst the set itself must not introduce noises.

These exacting requirements have been incapable of fulfilment in the past, but the Telsen engineers have, after intensive research work, developed the Telsen A.C. "Super 5" which exemplifies the best practice in modern receiver design.

Before describing this receiver in detail it is interesting to review the chequered career of the Superheterodyne.

It is well known that the lower the wavelength of the received signal the more difficult it is to obtain satisfactory high frequency amplification. So in the early days of the Great War, when sensitive receivers became a necessity, the Superhet. was developed, its chief feature being that it changed the wavelength of the received signal to a much higher value, thus allowing of higher amplification with stability. However, owing to difficulties in the earlier days the Superheterodyne was much neglected and it faded into the background. The recent application of the band-pass filter to the Superheterodyne has been responsible, perhaps more than any other development, for its recent revival and rapid rise to popularity.

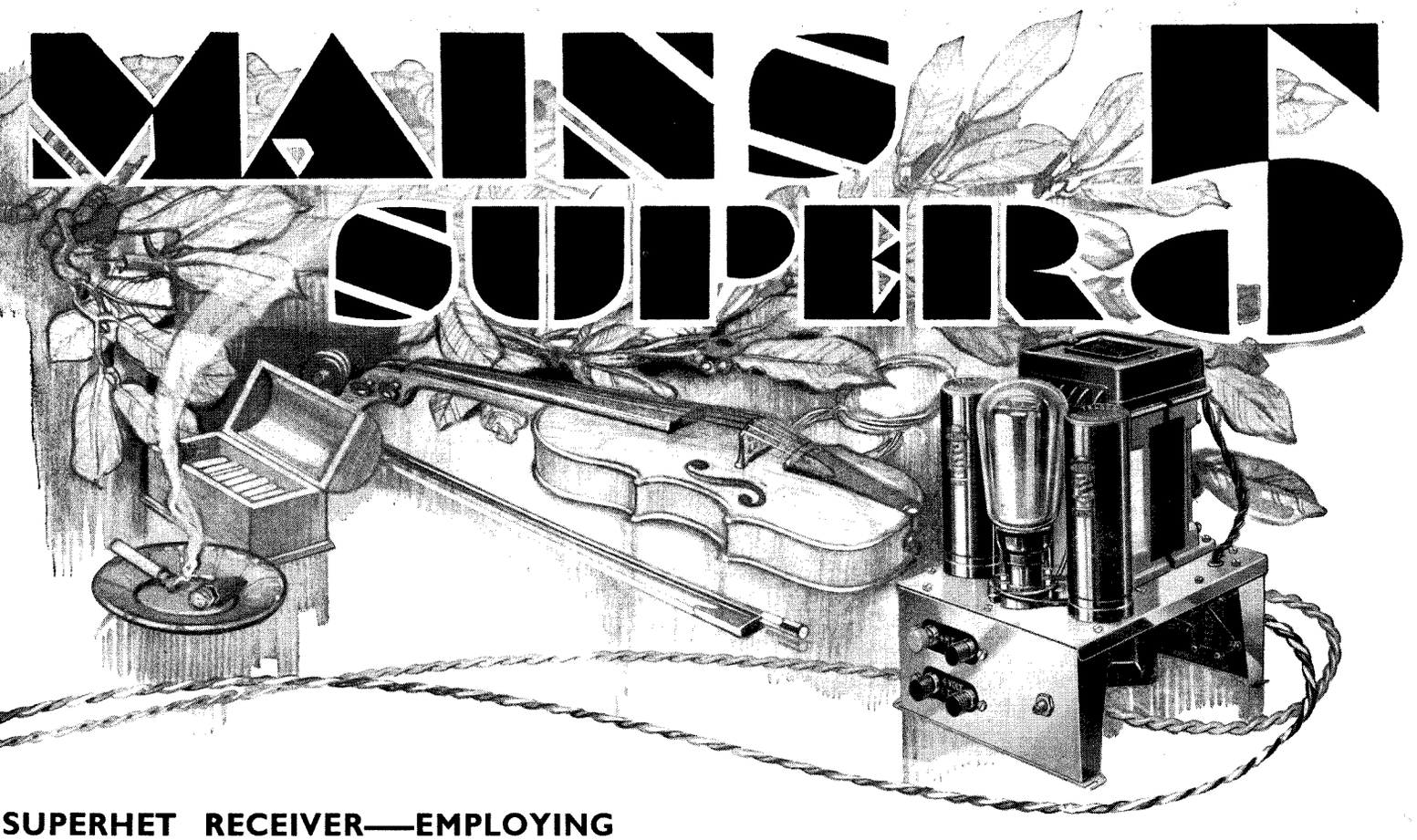


THEORETICAL CIRCUIT OF THE TELSEN A.C. SUPER 5

The leading features of the Telsen A.C. " Super-Five " may be summed up as follows : (a) Band-Pass Input ; (b) Band-Pass Intermediate frequency transformers ; (c) Volume Control by Variable-Mu Valve ; (d) Power Pentode output (2 watts undistorted) with Tone Compensation ; (e) Separate Mains Power Unit which can be mounted in Cabinet at any distance from receiver, this resulting in a compact receiver layout and obviating any mains hum through interference from the Power Transformer.

The Telsen A.C. " Super Five " is built on a Metal Chassis. This ensures maximum shielding between critical circuits of this receiver, together with perfect mechanical rigidity. The front panel has a black crystalline finish, thus imparting to the receiver a smart and neat appearance. The top panel supports the Triple Ganged Condenser, Tuning Coils, Intermediate Transformer Coils, and Valves, the whole presenting a very clean appearance, for the layout is symmetrical and the majority of the wiring is carried out beneath the panel. Considering that the receiver has five

MAINS SUPER 5

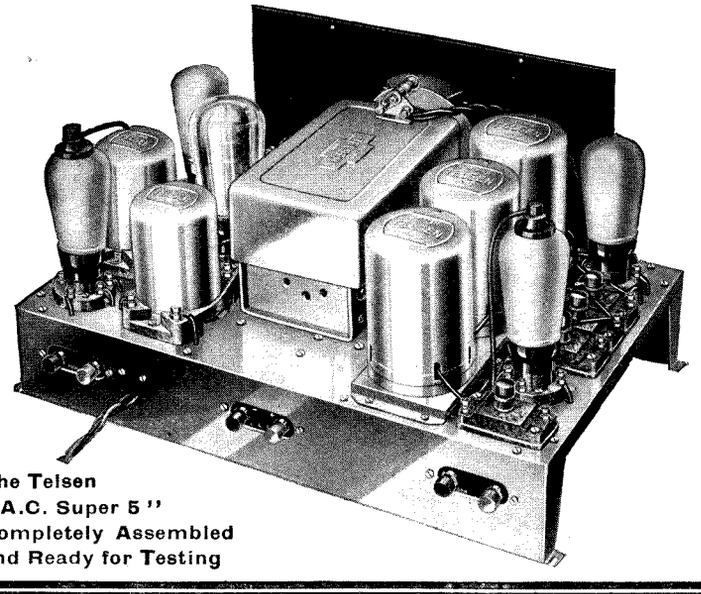


SUPERHET RECEIVER—EMPLOYING TUNING, AND GIVING 2 WATTS OUTPUT

TELSEN TECHNICAL STAFF

valves, the amount of wiring is very small and very neatly disposed.

In the Telsen A.C. " Super-Five " the theoretical circuit of which is depicted in Fig. I., we have two tuned circuits preceding the first Detector Valve V1. These are arranged as a Band-Pass filter with inductive coupling. When choosing a band-pass filter one would be inclined to select the " mixed " filter with its constant selectivity. This type of filter is, however, unsuitable for use in superhets. due to the fact that the common coupling condenser offers a high impedance to signals having a frequency approximating to the intermediate frequency. Signals of this frequency would therefore cause voltages to be applied to the grid of the first Detector Valve V1, which are then magnified by the intermediate amplifier. As a pure capacity filter produces the same effect, an inductive method has been developed to obviate this defect. Included in the aerial circuit is a pre-set condenser C.1, which can be adjusted to obtain the maximum efficiency from any type of aerial system, and to suit the conditions peculiar to the district in which the set is operated. The signals are then passed on to the plate circuit of V1. Following this valve is the oscillator valve V2, which generates oscillations and injects them into the cathode circuit of V1, in which valve they beat with the signal frequency oscillations to produce the intermeditae frequency (110 K.c.). These signals are then fed through the intermediate transformer I.F. C1, which is composed of two tuned circuits giving band-pass coupling to the grid of the intermediate amplifier V3, a variable-mu valve being used in this stage. The signals are then applied to the primary of the second intermediate transformer I.F.C.2., which again is composed of two tuned circuits giving band-pass coupling to the second detector valve V.4. The signals are here rectified and passed on through a parallel fed 7-1 L.F. Transformer to the grid of the Power Pentode Output Valve V5, which will give an undistorted output of two watts. Volume is controlled by varying the bias on the Variable-Mu Valve V3, by means of a potentiometer control on the panel. This valve possesses the unique property that whilst its efficiency is lowered as the grid bias voltage is increased, it still retains the power to handle strong signals without distortion. In practice this method affords a smooth control of volume over a very wide range.



The Telsen " A.C. Super 5 " Completely Assembled and Ready for Testing

It can therefore be seen that we have only three controls, namely, the main Ganged Tuning Condenser, the Wave-Change Switch and the Volume Control.

A 1/- Blue Print showing the complete assembly and wiring of the Telsen A.C. " Super-Five " is given away free with this issue of the *Radiomag*, which, with the help of this article, enables the

THE "TELSEN A.C. SUPER 5" SINGLE KNOB TUNING

set to be quickly constructed and adjusted for the most efficient working. A complete list of components required for building this receiver is given elsewhere, and a Constructor's Outfit containing the complete set of metal plates and panels, flex, tools and the usual gear needed for the construction of this set will be found listed in the catalogue section.

ASSEMBLY

ASSEMBLY OF COMPONENTS ON UNDERNEATH SIDE OF THE TOP PLATE OF RECEIVER

The underneath side of the top plate, which measures 16½" × 10", is distinguished by the fact that it has turned up lips at two of its ends. To simplify the assembly, all the screws holes that are used to bolt down components are numbered, and their positions are clearly indicated in the Blue Print. The Blue Print also shows the exact positions of the components. Thus, take the L.F. Transformer, W.60 and, as indicated in the Blue Print, place it so that its fixing holes coincide with holes 53, 54, 55 and 56. Insert four cheese-headed screws provided in the Kit Constructor's Outfit through these holes, so that the heads of the screws are on the top side of the top plate. Nuts are also provided in the Outfit and four of these should be tightened up on the screws. The constructor should proceed with the assembly in this manner. A complete list of the the numbered holes with the components is given below :—

Fit Anode Resistance Holder in holes .. 17—18
" " " " " " .. 19—20
" " " " " " .. 21—22
" " " " " " .. 23—24
" " " " " " .. 25—26
" " " " " " .. 27—28
" " " " " " .. 29—30
" " " " " " .. 31—32
" " " " " " .. 35—36
" " " " " " .. 37—38
" " " " " " .. 45—46
" 1 mfd. Self-Sealing Condenser in holes 15—16
" " " " " " 13—14
" " " " " " 11—12
" 2 mfd. Self-Sealing Condenser in holes 9—10
" " " " " " 7—8
" 1 mfd. Self-Sealing Condenser in holes 5—6
" .002 Mica Condenser in holes .. .. 1—2
" .0001 " " " " .. .. 3—4
" .001 " " " " .. .. 33—34
" .001 " " " " .. .. 49—50

Assemble together the .0003 Mica Condenser and ¼ meg. grid leak as shown in Fig. 2.

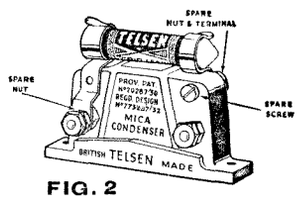


FIG. 2

Fit this assembly to holes .. 47—48
Fit H.F. Choke in holes .. 51—52
" .5 mfd. Self-Sealing Condenser in holes .. 39—40
Fit 1 mfd. Self-Sealing Condenser in holes .. 41—42
Fit 1 mfd. Self-Sealing Condenser in holes .. 43—44
Fit 7-1 Radiogrand Transformer to holes 53—54—55—56

This now completes the assembly of the underneath side of the top plate.

ASSEMBLY OF BACK PLATE

The components are assembled on this plate in a similar manner

Fit Aerial-Earth Terminal Strip to holes .. 86—87
" L.S. Terminal Strip to holes .. .. 88—89
" Pick-up Terminal Strip to holes .. 92—93
" .01 Self-Sealing Condenser to holes .. 90—91

Terminals should now be fitted to all the terminal strips; looking at the outside of the back plate, the Red Terminals go into the right-hand holes of the strips, while the Black Terminals should be placed in the left-hand holes. Securing nuts are provided with these terminals.

ASSEMBLY OF COMPONENTS TO TOP SIDE OF TOP PLATE

The constructor should proceed as before, and in the following order :—

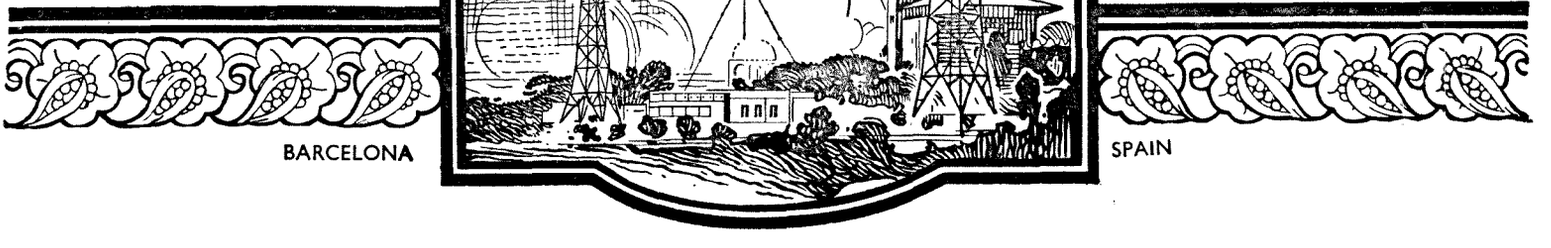
Fit Anti-microphonic 5-pin Valve Holder V1 to holes .. .. 59—60
Fit Anti-microphonic 5-pin Valve Holder V2 to holes .. .. 67—68
Fit Anti-microphonic 5-pin Valve Holder V3 to holes .. .. 73—74
Fit Anti-microphonic 5-pin Valve Holder V4 to holes .. .. 77—78
Fit Anti-microphonic 5-pin Valve Holder V5 to holes .. .. 71—72
Fit .0003 Pre-set Condenser to holes .. 57—58
" .0001 " " " " .. 61—62
" .0003 " " " " .. 63—64
" .002 " " " " .. 65—66
" I.F. Coil 1 to holes .. .. .. 69—70
" I.F. Coil 2 to holes .. .. .. 75—76

The next process is to fit the Band-Pass and Oscillator Coil Unit. This is supplied fitted to a metal plinth. Before this is fitted to top plate, the two outer coils must be removed from the plinth and interchanged so that when mounted in the receiver the oscillator coil is nearest the panel and the terminals marked 5, 6, 7 and 8 on all coils are facing the centre of the set as shown in the Blue Print. To do this, first take off Coil Cans and unslacken the screw in the switch stop which lies between two of the coils, after which the switch rod may be withdrawn. Take off outer coils by unscrewing the nuts and bolts which hold them to the plinth, and interchange as directed. After this process has been carried out the coils may be mounted on the top plate to holes 79, 80, 81 and 82.

Fit the triple gang condenser to holes 83, 84 and 85. Hold the condenser into position and insert the three 4 B.A. screws provided with it through the holes 83, 84 and 85, so that they engage in the three screwed holes in the base of the condenser. Screw up, but not too tightly.

ASSEMBLY OF BACK PLATE TO THE TOP PLATE

The constructor should just make sure that all the 6 B.A. screws and square nuts are mounted along the front and sides of the top plate, and that these are only loosely assembled. Then slide the projecting top edge of the back-plate underneath and against the front edge of the top plate, so that the slots in the top lip of the back-plate engage between the square nuts and the top plate. Holding these in position, tighten up the screws on to the nuts and the operation is completed.



SUPER SELECTIVITY—TWO WATTS OUTPUT

ASSEMBLY OF THE FRONT PANEL TO THE FRONT PLATE AND ESCUTCHEONS TO FRONT PLATE

The black crystalline finished front panel should now be assembled to the front plate. These are secured to one another with four 6 B.A. instrument headed screws, and square nuts contained in outfit. The escutcheon plates may now be fitted to the front panel. The wavechange escutcheon is for the extreme left-hand hole and is fitted with two 6 B.A. screws and nuts. These accessories are to be found contained in an envelope in the carton in which the coils are packed. In the carton containing the Triple Gang Condenser W.307 will be found the escutcheon plate belonging to this component. This escutcheon is fastened to the front panel through the two screw holes provided for this purpose, the necessary screws and nuts being supplied with the escutcheon. The Volume Control W.298 is now mounted; remove the screws, spacing washers and escutcheon plate from the Volume Control, and re-assemble as shown in Fig. 3.

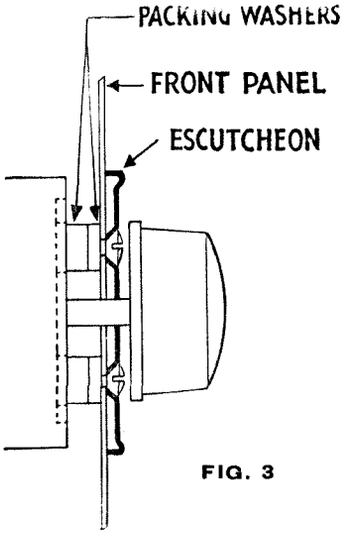


FIG. 3

ASSEMBLY OF FRONT PANEL AND PLATE TO TOP PLATE

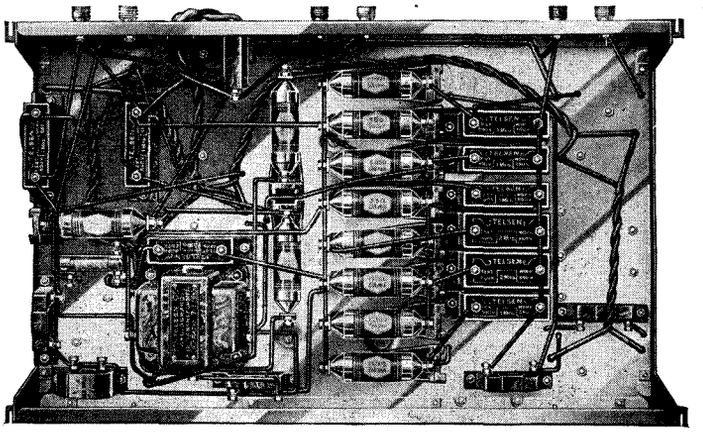
The front plate and panel should be fixed to the top plate in a similar manner to the back plate and tightened up. The gang condenser should then be tightened up in a position such that the tuning scale just clears the escutcheon.

ASSEMBLY OF POWER UNIT

Consulting the diagram shown on page 52, the components should be assembled as follows:—On the underneath side of the top plate fix smoothing choke to holes 1, 2, 3 and 4. On back plate fix Hum Adjuster to hole 13, the L.T. terminal strip to holes 16 and 17, and the H.T. terminal strip to holes 14 and 15. The terminals should now be fitted to their respective holes on strips. Fit two black terminals to the L.T. strip. Now looking at the back plate from the outside, fit the red terminal to the left hand and the black terminal to the right on the H.T. terminal strip. On the front plate fix Mains Switch to hole 22 complete with escutcheon. Next fit fuses to holes 18 and 19, also 20 and 21. The electrolytic condensers should then be mounted, one in hole 5, and the other in hole 6. The valve holder should then be fixed to holes 7 and 8. Last of all place Mains Transformer on hole 9, 10, 11 and 12, and bolt down with 4 B.A. screws and nuts. The back and front plates should now be respectively fixed to the top plate.

WIRING

For the constructor who does not wish to solder the connections, terminals are provided at each connection point. The majority of the wiring is carried out in "pull-back" wire. For conveying the high voltages on the Power Unit, pull-back wire covered with black sleeving is used, whilst twisted flex is utilised for the mains and L.T. heater leads.



Underside of the Baseboard Showing the Components and Wiring for the Telsen "A.C. Super 5"

WIRING THE RECEIVER PORTION

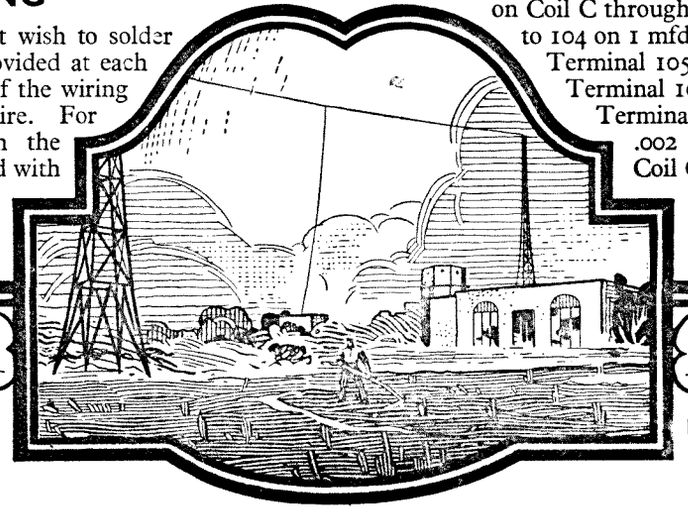
An inspection of the Blue Print will show that two views of the receiver are given, one looking at the upper side of the top panel, and the other at the underneath side. It should be noticed that the front and back plates are indicated as being laid flat, whereas they are in practice, actually in a vertical position. This is done in order to give the constructor a comprehensive view in one illustration, thereby enabling the wiring to be followed readily. Each terminal point is numbered, while each hole through which a wire passes has a corresponding number, with the letter "H" against it. It should be clearly understood that where a hole having a number with the letter "H" after it is shown, then the wire has to pass through this hole to the terminal bearing the corresponding number, notable exceptions being 135H and 196H.

In the Blue Print the coils are lettered A, B and C. The various terminals on these are indicated by the figures 1 to 8, and each particular coil connection has the coil letter in front of the terminal figure. Thus A8 refers to terminal marked 8 on coil A.

The complete wiring list is now given, and the order shown here should be closely adhered to:—

Terminal 94 on aerial terminal strip through 95H to 95 on Pre-set.
" 96 on Pre-set Condenser to A8 on Coil A to 97 on Ganged Condenser.
" A2 on Coil A to B2 on Coil B.
" A5 " " A " B5 " " B.
" A6 " " A " B6 " " B to C5 on Coil C.
" A6 " " A through 98H to 98 on 1 mfd. condenser.
" 99 on V1 to B8 on Coil B to 100 on Ganged Condenser.

Terminal 101 on .0001 Per-set to 102 on .0003 Pre-set to C6 on Coil C through 103H to 103 on Resistance Holder to 104 on 1 mfd. condenser.
Terminal 105 on .0003 Pre-set to C3 on Coil C.
Terminal 106 on V2 to C2 on Coil C.
Terminal 108 on .0001 Pre-set to 109 on .002 Pre-set to 107 on V2 to C8 on Coil C.
Terminal 109 on .002 Pre-set through 109H to 110 on .002 mfd. condenser.


BARI ITALY

TELSEN "A.C. SUPER 5"—OUTSTANDING QUALITY

Terminal 111 on Ganged Condenser to 112 on .002 Preset through 113H to 113 on .002 mfd. condenser.

" 114 on V2 through 114H to 115 on .0001 mfd. condenser through 116H to 116 on V1 through 116H to 117 on Resistance Holder.

" 118 on V1 through 118H to 119 on 1 mfd. condenser to 120 on Resistance Holder to 121 on Resistance Holder through 122H to 122 on V3.

" 123 on Aerial Terminal Strip to 98 to 124 to 125 to 126 to 127 to 128 to 129 on .0001 mfd. condenser.

" 124 on 1 mfd. condenser to 130 to 131 on 1 mfd. condenser to 132 to 133 to 134 to 135 to 136 on Radiogrand Transformer.

" 135 on Transformer through 135H to 137 on Volume Control.

" 136 on Transformer to 138 to 139 on Transformer.

" 131 on 1 mfd. condenser through 140H to 140 to 142 on I.F. Coil 2.

" 140 on I.F. Coil 1 to 141 on Ganged Condenser.

" 125 on 1 mfd. condenser to 143 on Resistance Holder to 144 on Resistance Holder.

" 145 on 2 mfd. condenser to 146 to 147 on Resistance Holder.

" 148 on 2 mfd. condenser to 149 through 150H to 150 on V5.

" 151 on 1 mfd. condenser to 152 to 153 on Grid Leak through 154H to 154 on V4.

" 155 on 1 mfd. condenser to 156 through 156H leaving about 3" of spare wire for connection to the side terminal of the Pentode Valve.

" 157 on L.S. Terminal Strip to 158 to 159 to 160 to 161 on Resistance Holder.

" 157 on L.S. Terminal Strip to 162 to 163 on Resistance Holder.

" 164 on L.S. Terminal Strip to 165 through 166H to 166 on V5.

" 167 on Resistance Holder through 135H to 168 on Volume Control.

" 169 on Resistance Holder through 135H to 170 on Volume Control.

" 171 on .5 mfd. condenser to 172 to 173 to 174 on H.F. Choke.

" 175 on Resistance Holder to 176 through 177H to 177 on V3.

" 179 on .001 mfd. condenser to 178 through 180H to 180 on V4.

" 181 on Transformer through 182H to 182 on V5.

" 183 on I.F. Coil 2 through 183H to 184 to 185 through 186H to 186 on I.F. Coil 1.

Connect 8" piece of wire to 187 on I.F. Coil 2; this is connected to top of V3 later.

" 188 on I.F. Coil 2 through 188H to 189 on .0003 mfd. condenser.

" 191 on Terminal Strip to 190 through 192H to 192 on V4.

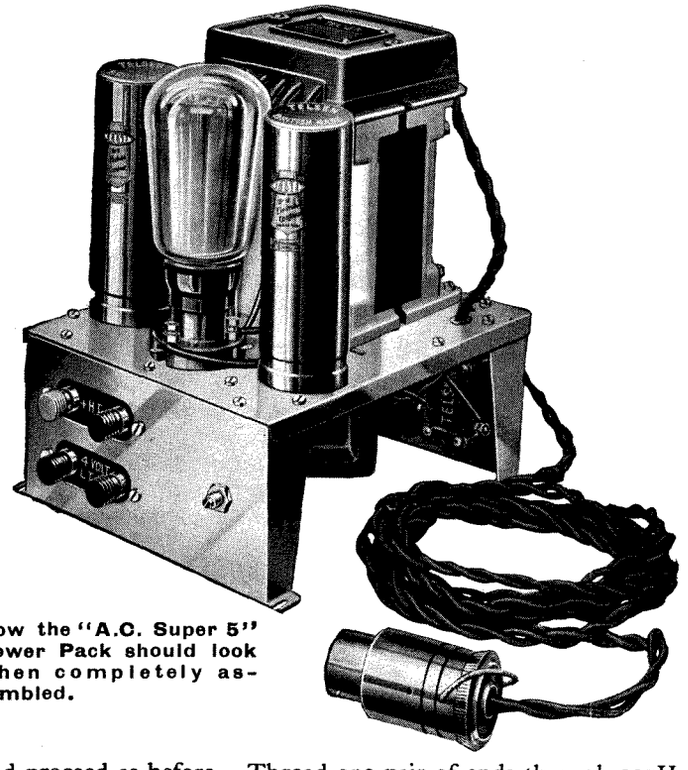
" 193 on I.F. Coil 1 through 193H through 194H to 194 on V3.

Terminal 195 on I.F. Coil 1 through 195H through 196H a length of screened wire as supplied in Constructor's Outfit leaving about 6" left projecting through 196H. A length of pull-back wire should then be twisted around the shielded wire near 196H and taken to 123.

" 197 of .5 condenser to 198 of Transformer.

This completes that portion of the wiring carried out with pull-back wire. The next wires to be fixed are those of the L.T. heaters. Here we use twisted flex of a maroon colour.

First cut off a length of 12" twin flex from the roll of flex provided in the Kit Constructor's Outfit. Untwist each end for a distance of 2", bare each single lead for a distance of a half of an inch and then twist the bare wire strands together, thus making the ends more solid. One inch of black sleeving should then be slipped over each end and slid along so that the bare wire just protrudes. This sleeving is fitted for a double purpose; firstly, to give added insulation to the wire where it goes through the panel hole, and secondly, to prevent the frayed ends of the cotton covering from showing and so looking untidy. Take one pair of ends and connect to 199 and 200 on pilot lamp holder, the other two ends to 201 and 202 on V2. Next cut off a length of flex 11" long,



How the "A.C. Super 5" Power Pack should look when completely assembled.

and proceed as before. Thread one pair of ends through 201H and 202H and connect to 201 and 202 on V2, the remaining two ends are then threaded through 203H and 204H and connected to 203 and 204 on V1. Cut off a further piece of flex 18" long, thread two ends through 203H and 204H to 203 and 204 on V1, the other two ends are then threaded through 205H and 206H to 205 and 206 on V5. Another length of flex 10" long is cut, thread two ends through 205H and 206H to 205 and 206 on V5, the other two ends are then passed through 207H and 208H to 207 and 208 on V3. A further length of flex 12" long must now be cut, thread two ends through 207H and

ON RADIO AND GRAMOPHONE REPRODUCTION

208H to 207 and 208 on V3, the other two ends must then be passed through 209H and connected to 209 and 210 on V4. Cut a further length of flex one yard long, pass one pair of ends through 205H and 206H and connect to 205 and 206 on V5. The other two ends are then passed through the large hole on the back-plate and are left for connection to the Power Unit later. The length of the Black and Red flex which is contained in the Kit Constructor's Outfit should be connected. Take one pair of ends and connect the black to 131 on 1 mfd. condenser and the Red to 162 on .01 mfd. condenser. The other pair of ends is also passed through the large hole in back-plate and is left to be connected to the appropriate terminals on the Power Unit. The cord clip should now be placed over the flex wire and fastened down to the two holes provided on the back-plate near the large fluted hole. This completes the wiring of the receiver portion. The Anode Cartridge Resistances are now clipped into the resistance holders. Each resistance has its value clearly shown on its side, and great care should be taken that the correct resistances are placed in the positions shown in the Blue Print.

THE POWER UNIT

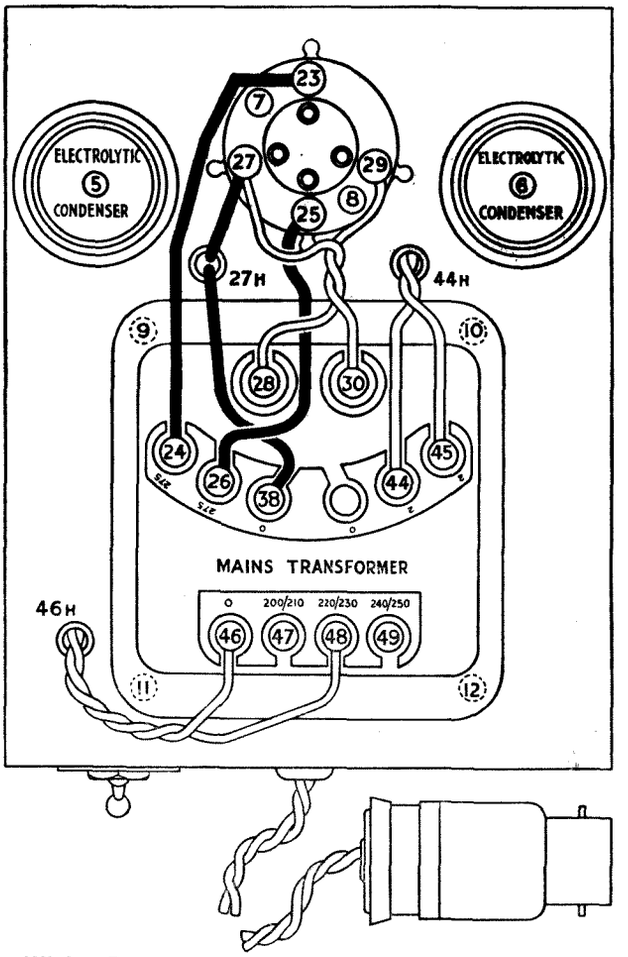
The Mains Unit should be wired with pull-back wire with the black sleeving, as supplied in the Constructor's Outfit, threaded over. Two views are given (see this page and page 52) one looking at the upper side of the top panel and the other at the underneath side, showing the front and back plates lying flat :—

Terminal 23 on Valve Holder to 24 on Mains Transformer.
" 25 " " " " 26 " " "
" 27 " " " " 28 " " "
" 29 " " " " 30 " " "
" 27 on Valve Holder through 27H to 31 on Electrolytic.
" 31 on Electrolytic to 32 on Smoothing Choke.
" 33 on Smoothing Choke to 34 to 35 on Terminal Strip.
" 36 on Smoothing Choke to 37 on Terminal Strip to 14 (locknut) to 39 on Hum Adjuster.
" 37 on Terminal Strip through 27H to 38 on Mains Transformer.

This now completes that portion of the wiring with pull back wire and black sleeving, so the next wires to be fixed are composed of twin twisted flex of a maroon colour.

First cut off 5" of twin flex from the roll of flex provided in the Constructor's Outfit and proceed to untwist, etc., as in wiring the receiver portion. Take one pair of ends and connect to 40 and 41 on Hum Adjuster, the other two ends are connected to 42 and 43 on terminal strip. Now cut off another length of flex 9½" in length, pass through 44H and join two ends to terminals 44 and 45 on Mains Transformer; the other two ends are then connected to 42 and 43 on Terminal Strip. Cut off another lead 12" in length and pass it through 46H; the two ends are then connected as follows, one to 46 on Mains T ansformer and the other to either 47, 48 or 49, depending upon the mains supply voltage available. The other two ends are then connected, one to 50 on Switch and the other soldered to 51 on Fuse Holder. Then cut a 4" length of single flex and connect 52 on switch to 53 on Fuse Holder; there should now be approx. 3 yards of maroon twin flex left over. This is used to connect the receiver to the mains supply, therefore pass one end of this flex through 54H on back plate, this hole should previously have been bushed by means of the rubber grummet supplied in the Constructor's Outfit. This is an important point, because failure to do this may result in blowing the fuses due to the flex cutting on the edge of the hole. The flex should then be knotted on the inside after a suitable length has been measured, to prevent it being pulled through. The two inner ends should then be connected to 54 and 55 on the fuse holders. Fit the Universal Mains Plug to the free end of the flex, the plug being contained in the outfit.

The Power Unit is now wired up completely. Now place the bakelite cover on the Mains Transformer, taking the leads out through the cover holes in orderly fashion.

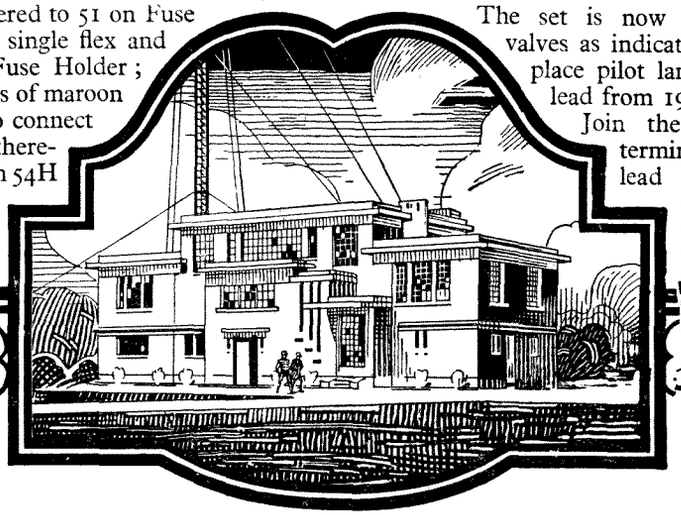


Wiring Diagram of the Top Plate for the "Super 5" Power Pack.

The constructor is advised to check over very carefully the wiring on both the Receiver and Power Unit portions. Special care should be taken to see that the mains lead is on the correct voltage tap of the power transformer.

SETTING UP AND ADJUSTING THE "A.C. SUPER-FIVE"

The set is now ready for test. Insert suitable valves as indicated at the end of this article, and place pilot lamp in its holder. Join the loose lead from 196H to the terminal on top of V1. Join the loose lead from 187 to the terminal on top of V3. Join the loose lead from 156H to the terminal on side of V5. Connect up the L.T. and H.T. leads from the receiver to their respective



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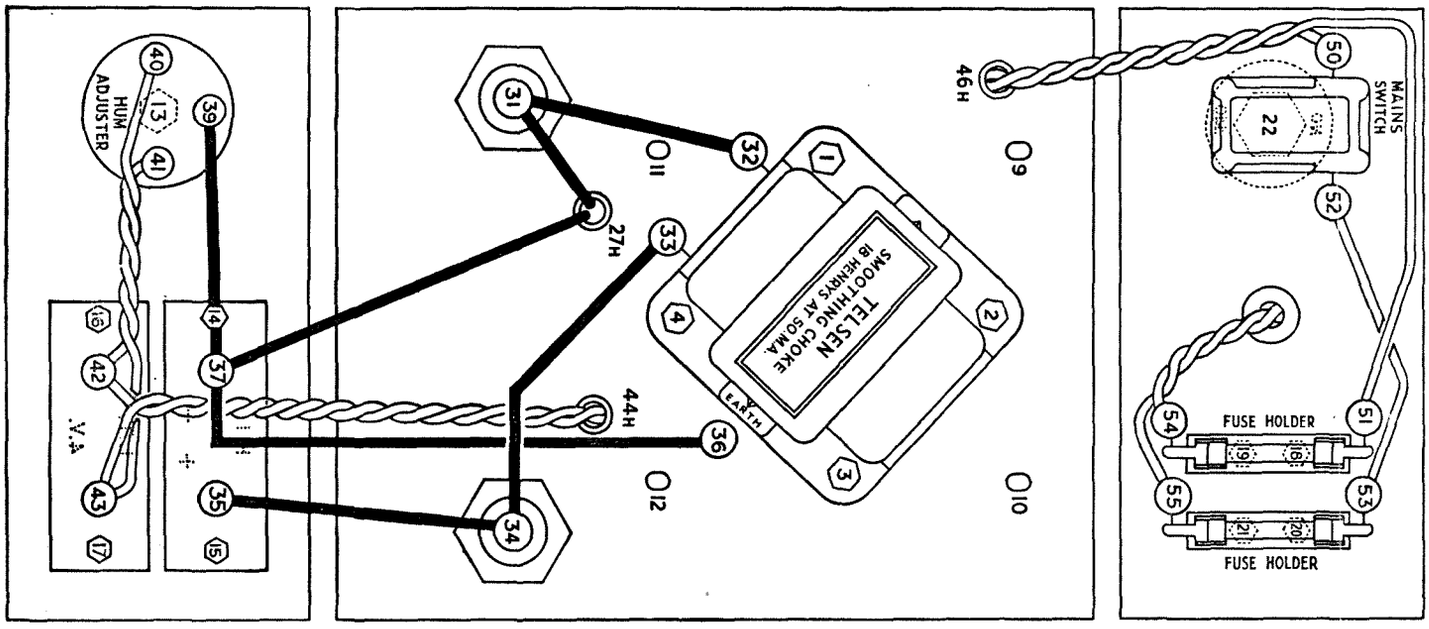
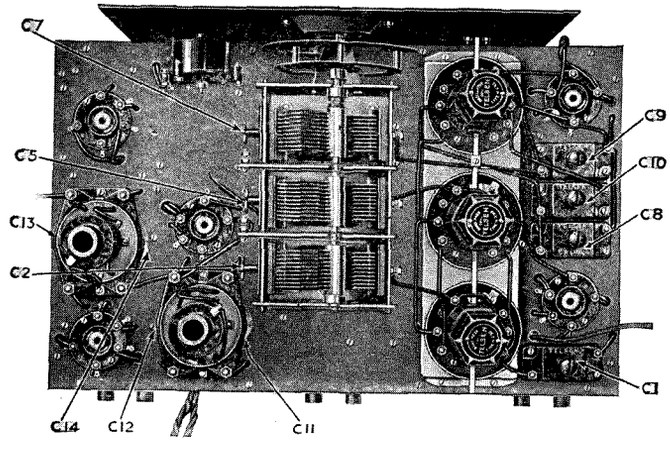
THE TELSEN "A.C. SUPER 5"—*continued.*



Wiring diagram of the Underside Baseboard for the "Super 5" Power Pack.

terminals on the Power Unit, the twin maroon on the two lower terminals and the Red and Black respectively to the " + " and " — " terminals at the top. Now connect up the loudspeaker, which should preferably be of the moving coil type with Pentode Transformer, and the Aerial and the earth leads to their appropriate terminals. Place the two Telsen 1 ampere fuses W.200 in the two fuse holder clips, connect the mains plug to a convenient supply point and the receiver is then ready to be switched on.

The trimming condensers may be adjusted temporarily as follows :—



C5—Screw in " Star Wheel " until about one half of a complete turn from being fully screwed in.

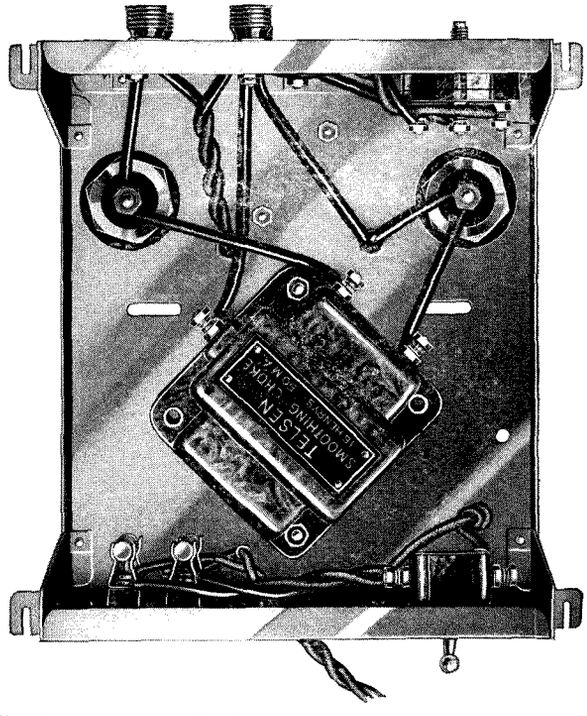
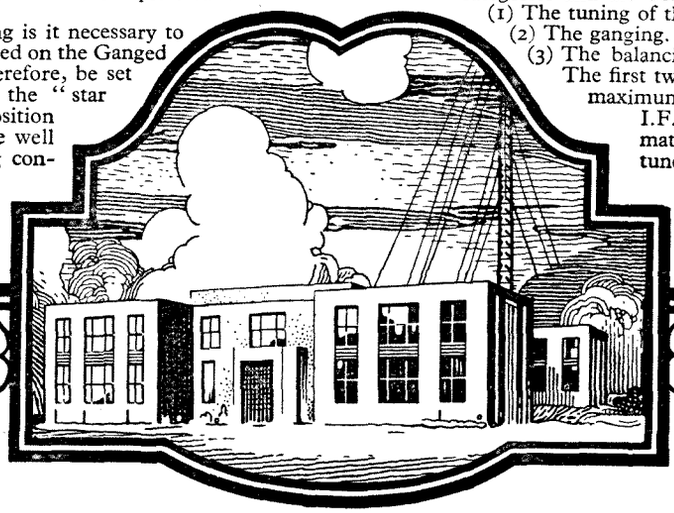


Illustration of the Underside of Baseboard—completely wired up.

C1—Screw down until about three complete turns from full in position.
C8, C9 and C10—Screw down until about one complete turn from full in position.
C2 and C7—At no time during ganging is it necessary to adjust these trimmers, which are mounted on the Ganged Tuning Condenser. They should, therefore, be set at minimum capacity by unscrewing the " star wheels " which operate them, to a position such, that the plates of the trimmer are well separated. In adjusting the trimming condensers of the " Pre-set " type, namely, C1, C8, C9 and C10, use the insulated screwdriver provided for this purpose; this will avoid any disturbing effects due to the proximity of the hand. The adjustments fall into three categories and are best carried out in the following order :—

(1) The tuning of the I.F. circuits.
(2) The ganging.
(3) The balancing of the selectivity and quality.

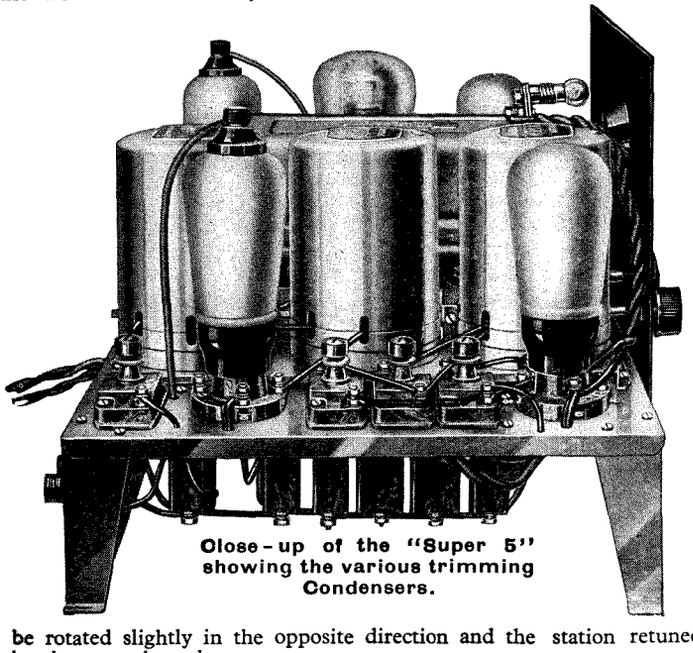
The first two processes are carried out by tuning for maximum signal strength. The coils inside the I.F. Transformers should be set at approximately one half of an inch apart and a station tuned in as accurately as possible. The strenth of this station should be adjusted to a conveniently low level by means of the volume control, so that differences of strength are easily perceptible.



SCOTTISH REGIONAL SCOTLAND

THE TELSEN A.C. "SUPER 5"—*continued.*

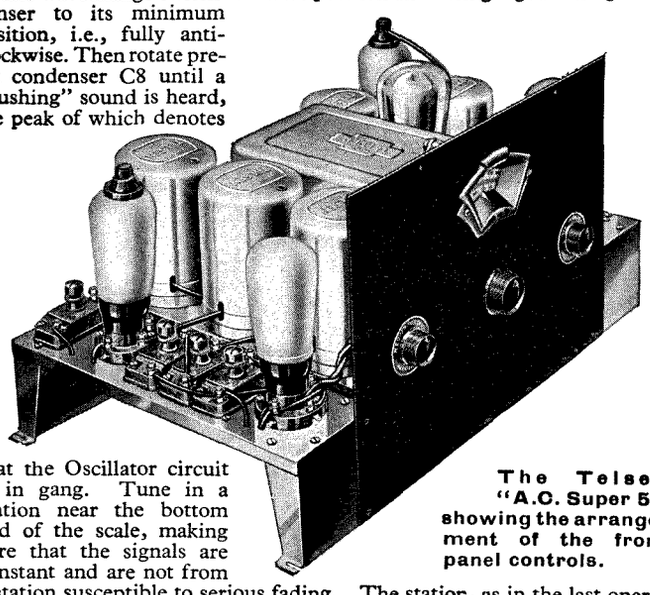
The trimming condensers C11, C12, C13 and C14 are varied by rotating the thumb wheels situated at the sides of the base of each coil. Adjustment of these trimmers must now be carried out. Starting from C11 rotate the " thumb wheel " backwards and forwards for the maximum response, repeat the same operation on C12, C13, and C14. If it is found that maximum signal strength occurs with any one of the thumb wheels rotated to the full extent of its travel, then all the other three thumb wheels should



Close-up of the "Super 5" showing the various trimming Condensers.

be rotated slightly in the opposite direction and the station retuned by the ganged condenser.

Rotate wavechange switch to M.W. position and turn ganged tuning condenser to its minimum position, i.e., fully anti-clockwise. Then rotate preset condenser C8 until a "rushing" sound is heard, the peak of which denotes



The Telsen "A.C. Super 5" showing the arrangement of the front panel controls.

that the Oscillator circuit is in gang. Tune in a station near the bottom end of the scale, making sure that the signals are constant and are not from a station susceptible to serious fading. The station, as in the last operation must be tuned in accurately, and kept at a low volume level by means of the volume control. Adjust the trimming condenser C5 for maximum response, and finally the aerial trimming condenser C1. The set is now temporarily ganged at the bottom of medium band. The next step is to rotate the triple ganged tuning condenser and tune in to a station near the top end of the medium wavelength band. An adjustment is now made with the "padding" condenser C9; each time C9 is turned, the triple ganged condenser must be rotated in the opposite direction to receive this same station, therefore, when C9 is turned in a clockwise direction, the triple ganged condenser must be rotated in an anti-clockwise direction. This adjustment should be carried out slowly and if a decrease in the strength of the signals is observed when, say, C9 is rotated in a clockwise direction, it must be rotated in the opposite direction, rocking the triple ganged condenser each time an adjustment is made to C9 until the position is found for maximum response. The top end of the medium wavelength band is now in gang and a final ganging adjustment must be made at the bottom end. To readjust rotate the triple ganged condenser to a station as near as possible to the minimum position of the tuning dial and rotate the trimming condenser C5 for maximum response.

The last adjustment to be made on the medium wavelength band is the aerial trimming condenser C1. It has been found that this should be adjusted for maximum response when the set is tuned to a station on about 400 metres. The medium wavelength band is now in gang. To gang up the long wavelength band, rotate the wavelength switch to L.W. position and with the triple ganged condenser tune in a station working on about 1,400 metres. Gang up by rotating the long wavelength trimming condenser C10. Like C9, the triple ganged condenser has to be " rocked " in an opposite direction for each movement of C10 in order to keep the station in tune. The last operation is the adjustment of the I.F. transformer coils, and these should be adjusted to give a compromise between maximum selectivity and quality so as to suit individual tastes. This is achieved by varying the coupling between the coils. Finally it may be found that a further adjustment of the I.F. Transformer trimming condensers C11, C12, C13 and C14 is necessary to give the maximum sensitivity.

Special Notice. When mounting the Anode Cartridge Resistance holders it is imperative to use the correct screws. These screws are the shortest 6BA supplied with the Constructor's outfit. If longer screws are used there is a danger of shorting out the resistance by accidental contact with the end caps.

GRAMOPHONE PICK-UP.

The receiver can be used for the electrical reproduction of gramophone records with extremely good results by connecting a pick-up together with the necessary volume control to the terminals marked " Pick-up."

THE TELSEN " A.C. SUPER-FIVE "

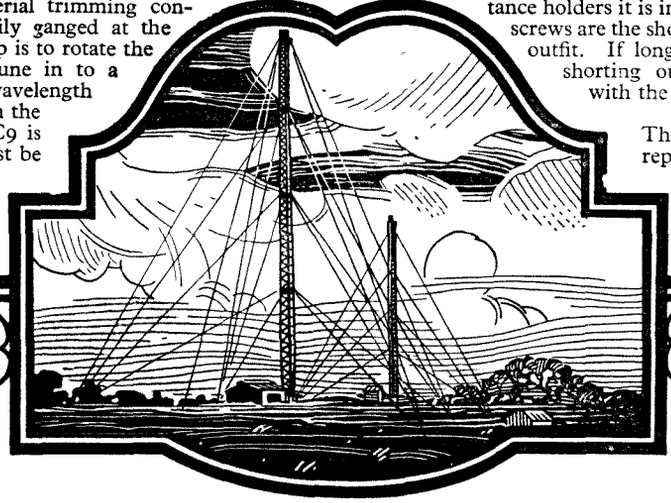
List of Components

Quantity	*Description*	*Cat. No.*	*Price* £ s. d.
5	Anti-Microphonic Valve Holders, 5-pin	W.223	4 2
1	Solid Type Valve Holder, 4-pin ..	W.224	6
2	8 mfd. Electrolytic Condensers ..	W.398	11 0
2	2 mfd. Self Sealing Condensers ..	W.226	5 0
6	1 mfd. Self Sealing Condensers ..	W.227	10 6
1	.5 mfd. Self Sealing Condenser ..	W.228	1 6
1	.01 mfd. Self Sealing Condenser ..	W.232	1 3
1	.002 mfd. Fixed Mica Condenser ..	W.246	1 0
2	.001 mfd. Fixed Mica Condensers ..	W.245	1 0
1	.0003 mfd. Fixed Mica Condenser ..	W.242	6
1	.0001 mfd. Fixed Mica Condenser ..	W.240	6
2	.0003 mfd. Pre-set Condensers ..	W.151	2 6
1	.002 mfd. Pre-set Condenser	W.149	1 3
1	.0001 mfd. Pre-set Condenser.. ..	W.152	1 3
1	Triple Ganged Tuning Condenser with Cover	W.307	1 0 0
1	Band Pass and Oscillator Coil Unit ..	W.292	1 1 6
2	I.F. Transformer Coils	W.294	15 0
11	Anode Cartridge Resistance Holders ..	W.286	8 3
2	300 ohm Anode Cartridge Resistances	W.263	2 0
1	350 ohm Anode Cartridge Resistance	W.289	1 0
1	500 ohm Anode Cartridge Resistance	W.265	1 0
3	5,000 ohm Anode Cartridge Resistances	W.273	3 0
1	10,000 ohm Anode Cartridge Resistance	W.274	1 0
1	20,000 ohm Anode Cartridge Resistance	W.276	1 0
2	25,000 ohm Anode Cartridge Resistances	W.277	2 0
1	Standard H.F. Choke	W.75	1 6
1	½ megohm Grid Leak	W.248	6
1	7:1 Radiogrand Transformer	W.60	9 6
1	10,000 ohm Volume Control	W.298	3 0
1	Hum Adjuster	W.299	2 6
1	Mains Switch	W.297	1 6
2	Power Type Fuse Holders	W.203	1 0
1	18 henry Smoothing Choke	W.361	12 6
1	Mains Transformer	W.360	1 12 6
1	A.C. Super-Five Constructor's Outfit	W.412	7 6
1	6 volt Pilot Lamp	W.418	1 0

RECOMMENDED VALVES

	V1	V2	V3	V4	V5	V6
Mazda	AC/S2	AC/2HL	AC/S1VM	AC/2HL	AC/PEN	UU120/350
Marconi-Osram	MS4B	MH4	VMS4	MH4	MPT4	U12
Mullard	S4VA	354V	MM4V	354V	PEN4V	IW3
Cossor	MSG/LA	41MHL	MVSG	41MHL	MP/PEN	442BU

In the case of the Marconi-Osram range, the "Catkin" type may be used.



ATHLONE IRELAND

THE TELSEN ALL MAINS S.G. THREE—*continued from page 19*

TELSEN ALL MAINS S.G. THREE
List of Components

Quantity	*Description*	*Cat. No.*	*Price*
8	Anode Cartridge Resistance Holders	W.286	6/-
1	60,000 ohm Cartridge Resistance	W.280	1/-
1	50,000 ohm Cartridge Resistance	W.279	1/-
1	10,000 ohm Cartridge Resistance	W.274	1/-
1	5,000 ohm Cartridge Resistance	W.273	1/-
1	1,000 ohm Cartridge Resistance	W.268	1/-
1	500 ohm Cartridge Resistance	W.265	1/-
2	350 ohm Cartridge Resistances	W.289	2/-
1	Standard H.F. Choke	W.75	1/6
3	5-pin Solid Type Valve-Holders	W.225	2/-
1	4-pin Solid Type Valve-Holder	W.224	6d.
1 set	Twin Matched Screened Coils..	W.287	14/6
1	Twin Gang Condenser, with dust cover ..	W.306	14/6
1	.0003 Aerial Series Condenser with Switch ..	W.350	2/-
1	.00015 Bakelite Reaction Condenser	W.355	1/9
1	Mains Switch	W.297	1/6
1	Hum Adjuster	W.299	2/6
1	2 megohm Grid Leak	W.251	6d.
1	10:1 Coupling Unit	W.215	12/6
1	Tapped Pentode Output Choke	W.72	6/9
2	Power Fuse-holders	W.203	1/-
1	28 henry Smoothing Choke	W.302	12/6
1	.0003 mfd. Mica Condenser	W.242	6d.
1	.0001 mfd. Mica Condenser	W.240	6d.
7	2 mfd. Self-Sealing Condensers, 500 v. test ..	W.226	17/6
4	1 mfd. Self-Sealing Condensers, 500 v. test ..	W.227	7/-
1	.1 mfd. Self-Sealing Condenser, 500 v. test ..	W.231	1/6
1	Mains Transformer .. .. W.300 or	W.291	32/6
2	1 amp. Fuses	W.200	1/-
1	Telsen "All Mains S.G.3" Constructor's Outfit	W.303	7/6
	As an alternative Mains Transformer, W.301 may be substituted for W.300 or W.291 at an extra cost of		12/6

Kit Sets

The Telsen "All-Mains S.G.3" as detailed above, is supplied as a complete Kit at the following inclusive prices :

Suitable for 200-250 volt, 50 cycles supply ..	W.320	£6 18 6
Suitable for 100-110 volt, 50 cycles supply ..	W.321	£6 18 6
Suitable for 200-250 volt, 25 cycles supply ..	W.322	£7 11 0

running costs are almost negligible. Three types of mains transformer are available, to suit all types of alternating current supply.

The Telsen All Mains S.G.3 is built on a strong chassis of stove aluminium finished steel, which provides a solid support for the substantially made Telsen components, and which by its screening action, ensures that the various components shall work together without unintentional interaction. The panel, on which the controls are symmetrically mounted, has a beautiful black crystalline finish which is found to blend harmoniously with any type of cabinet.

Full details of this set are to be found in the *Telsen Radiomag* No. 4, which includes simple but detailed instructions for building this magnificent receiver, together with a free 1/- Blue Print. Copies of the *Radiomag* No. 4 will be sent to the reader, price 6d. post free, on application to the Telsen Electric Co. A list of components is given below. Constructors who already possess some of the components can buy the remainder separately, in which case they should not forget the Constructor's Outfit No. W.303 which, besides containing the panel and chassis, includes all the other small gear required to build the set.

RECOMMENDED VALVES

Make	*H.F.*	*Det.*	*Pentode*	*Rectifier*
Mazda	ACS2	AC2HL	PEN425	UU30/250
Mullard	S4VB	904V	PM24M	DW2
Marconi or Osram	MS4B	MH4	PT4	U10
Cossor	MSG/LA	41MH	PT41	506BU

Any of the above valve combinations will give good results in this Receiver.

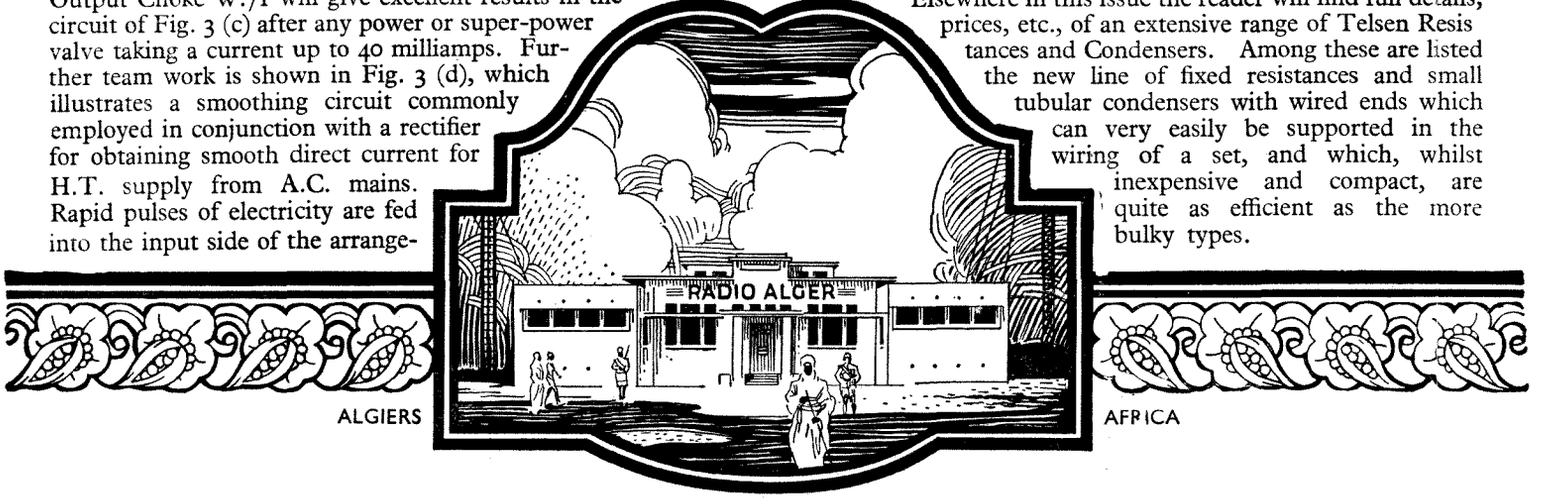
FIXED CONDENSERS AND RESISTANCES—*cont. from page 8*

the steady pressure of the H.T. battery is lost, and for output valves which require the maximum voltage, the resistance is replaced by an "inductance" or "choke" as in Fig. 3 (c) which, as previously explained, offers considerable opposition to the passage of an alternating current while it allows a direct current to pass easily. The alternating currents thus take the path through the condenser, loudspeaker, and earth and do not pass through the H.T. battery. This is called an output filter.

The Telsen 2 mfd. self sealing condenser W.226 is suitable for the circuits (b) and (c) provided the H.T. voltage is not greater than 250 volts, in which case W.233 should be used. The Telsen Output Choke W.71 will give excellent results in the circuit of Fig. 3 (c) after any power or super-power valve taking a current up to 40 milliamps. Further team work is shown in Fig. 3 (d), which illustrates a smoothing circuit commonly employed in conjunction with a rectifier for obtaining smooth direct current for H.T. supply from A.C. mains. Rapid pulses of electricity are fed into the input side of the arrangement, so keeping C1 charged up. Between the pulses, however, C1 discharges into the choke to that the gaps in the current flow are filled up and a fairly steady current passes through the choke. Any ripple still remaining is prevented from affecting the set (where it would set up a hum) by providing an easy path for it through C2 to earth.

Since the frequency is only 50 c.p.s. the condensers C1 and C2 must be of large capacity and the choke specially made to have low resistance with high inductance. Two Telsen 8 mfd. Electrolytic condensers W.396 and Smoothing Chokes W.302 or W.361 are eminently suitable.

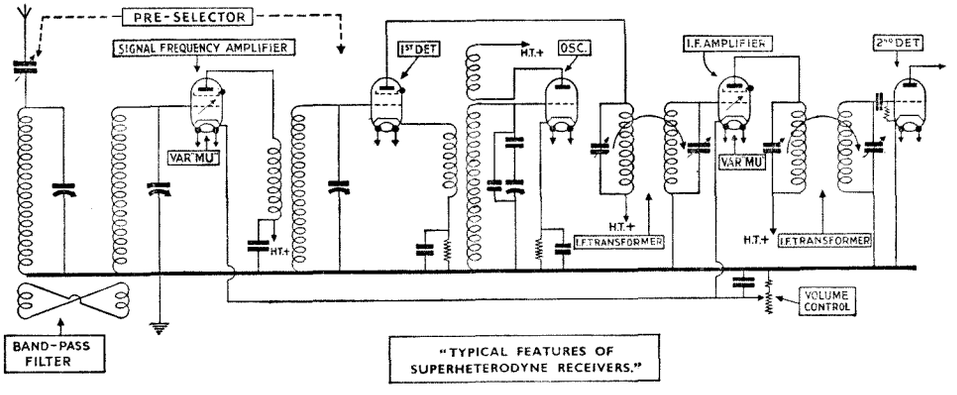
Elsewhere in this issue the reader will find full details, prices, etc., of an extensive range of Telsen Resistances and Condensers. Among these are listed the new line of fixed resistances and small tubular condensers with wired ends which can very easily be supported in the wiring of a set, and which, whilst inexpensive and compact, are quite as efficient as the more bulky types.



The SUPER HETERODYNE simply explained

THE immense popularity of the Superheterodyne type of receiver is undoubtedly due to the present congested state of the ether, and for those listeners who desire to receive distant stations clearly and without interference, the Superheterodyne receiver is, on account of its very high degree of selectivity, the nearest approach to the ideal.

In the early days of broadcasting, the Superheterodyne receiver enjoyed a spell of immense popularity, particularly in America. It soon fell from grace however, and became sadly neglected, this being due to two causes. Firstly, it required a large number of expensive valves that also were costly from the point of view of running costs, and secondly the quality of reproduction left much to be desired. Development work was therefore concentrated on the " straight " type of circuit, particularly after the introduction of the screened grid valve which permitted of efficient methods of high frequency amplification with good stability. The problem of selectivity then became of paramount importance, and as the straight receiver selectivity was considered to be a little unsatisfactory, attention was again turned to the Superheterodyne. For valves were now cheaper—and when it was discovered that the lack of good quality was not a fundamental fault of the principles involved, the revival of this type of receiver became of increasing importance—and to such an extent as to make it the most popular receiver used at the present time.



"TYPICAL FEATURES OF SUPERHETERODYNE RECEIVERS."

A skeleton diagram of a typical Superheterodyne circuit is shown above. If this is referred to in conjunction with the subject matter of this article, the various features discussed will be made quite clear, and thus a sound knowledge obtained of the working principles of the Superheterodyne form of receiver.

The use of band pass filters has been to a great extent responsible for this amazing " comeback." Before the introduction of the band pass filter, it was not possible to attain a high degree of selectivity together with good quality, whilst at the same time, second channel interference was extremely troublesome. In the latest forms of Superheterodyne sets these difficulties have been overcome chiefly by the development and correct use of band pass tuning, both in the pre-selector circuits, and in the intermediate frequency amplifiers.

The old type of Superheterodyne receivers could not be employed with an outside aerial, as the oscillator valve which is necessary for the operation of the Superheterodyne principle produced radiations in it, and so interfered with other sets. Thus a frame aerial had to be employed, and owing to the low efficiency of this device as a collector of energy, more valves had to be added to the receiver in order to make up for the loss of amplification. This meant that the ratio of valve noise to the signal strength was greatly increased, which unfortunately produced a very noisy and objectionable " background " for receiving.

The incorporation of the screened grid valve in the circuit has, however, made possible the development of non-radiating frequency changing systems. The modern Superheterodyne may therefore be used directly connected to an aerial without interference resulting. Thus the unsightly and awkward frame aerial is dispensed with and the number of receiving valves reduced, so simplifying the construction and decreasing the running expenses.

The working principle of the Superheterodyne is as follows : The station that is to be received is tuned in on the pre-selector circuit, which is usually of the band pass type, and may or may not employ a high frequency stage. This pre-selector circuit is, of course, tuned to the frequency of the incoming signal. The received frequency is then applied to what

(continued on page 56)

LWOW POLAND

PRINCIPLES OF THE SUPERHET.—*continued from page 55*

is known as the first detector valve. A separate circuit in the receiver (the oscillator circuit) is independently tuned to generate oscillations at a frequency different from the received signal frequency. This difference is always of constant value, and is in most cases 110 kilocycles per second (k.c.). These oscillations are also applied to the first detector. Here, a heterodyne or " beat " effect occurs, whereby a new frequency is produced, equal in value to the difference between the applied frequencies. Thus, assuming that the signal frequency is 1,000 k.c. (which corresponds to a wavelength of 300 metres), and that the oscillator frequency is 1,110 k.c., a " beat " frequency of 110 k.c. will be produced. In this " mixing " or heterodyning process, the original low frequency signals corresponding to speech and music which modulated the signal frequency, have not been lost. They now modulate the new " beat " frequency, which is usually referred to as the " intermediate " frequency, and is denoted by the letters I.F.

Now if a frequency of 1,000 k.c. is being received, and instead of tuning the oscillator to 1,110 k.c. which produces a beat frequency of 110 k.c., we tune it to oscillate at a frequency of 890 k.c., it is very apparent that it will again produce an intermediate frequency of 110 kilocycles. In the past with the earlier types of Superheterodyne receivers this was apt to be very disconcerting, as any station could be received at two positions on the oscillator tuning dial. In these modern days this has been remedied in the majority of designs, as the oscillator and pre-selector circuits are usually ganged together, thus giving a definite oscillator position for each setting of the pre-selector dial position.

Having produced this intermediate frequency it is passed from the first detector to the intermediate frequency amplifier. This is a fixed tuned amplifying system, which responds only to a pre-determined frequency—in this case 110 k.c. The I.F. signals are here amplified, and applied to the " second detector " valve circuit, the function of which is to eliminate the intermediate frequency and pass on to the remainder of the circuit, the low frequency signals. These are amplified to any desired strength by the low frequency amplifier, and, at the same time any tone correction that may be required is applied in the usual manner. The signals then pass on to the loudspeaker. From this it can be clearly seen that it is only in this frequency changing process that the Superheterodyne receiver differs from that of the " straight " circuits, for the pre-selector, intermediate frequency amplifier, second detector and the low frequency amplifier follow exactly the same principles as used in modern straight receivers The only difference between the intermediate amplifier and that of an ordinary high frequency amplifier is that it is worked on a single fixed frequency of a predetermined value.

The Superheterodyne method of reception just described has several outstanding advantages over the ordinary straight receiver employing the more usual variably tuned H.F. amplifier, and these will be explained at various stages of this article. For instance, in the Superheterodyne the bulk of the high frequency amplification takes place at a fixed frequency and thus the sensitivity and selectivity do not vary when passing from one end of a wavelength range to the other, as is the case with a " straight " receiver.

The high selectivity of the Superheterodyne is chiefly connected with an interesting effect due to frequency changing, which is simply explained as follows: First of all, it must be remembered that the elimination of an unwanted station depends upon *percentage* distuning, not upon a frequency or wavelength figure. In other words, mistuning a circuit by 5 k.c. when receiving a medium wavelength station will not produce the same change in signal strength as mistuning by 5 k.c. from a long wavelength station. Mistuning by five per cent. of the signal frequency concerned will, however, produce the same signal strength diminution in both cases. Let it be assumed that a station working at a frequency of 1,000 k.c. (300 metres wavelength) is being received. A station working at 980 k.c. is only two per cent. off tune. The average tuned circuit will present considerable response to a frequency two per cent. off its resonant frequency, so that the unwanted station will be heard at considerable strength unless there are two or three such tuned circuits in cascade.

Suppose now, that the signal frequency is made to " beat " with local oscillations having a frequency of 1,110 k.c. The resultant " beat " frequency will be 110 k.c. The unwanted station will also produce a " beat " frequency equal to the difference between 1,110 and 980 k.c., namely 130 k.c. If the I.F. amplifier is tuned to 110 k.c., the unwanted station is here approximately 18 per cent. off tune. At this figure it is easily eliminated and thus improved selectivity is obtained.

Another advantage emerging from the Superheterodyne principle, is due to the fact that as the I.F. amplifying system operates at a fixed frequency, a large number of circuits with fixed tuning may be employed, thus precluding difficulties due to ganging which would inevitably occur with the same number of variably tuned circuits. This again confers extra selectivity, because every tuned circuit produces a reduction in the strength of unwanted signals.

Furthermore, tuned circuits operating at a low frequency can be made very much more efficient than tuned circuits operating at higher frequencies. The more efficient a tuned circuit the greater is the magnification and selectivity it offers. The I.F. amplifier therefore, besides being very selective, is in addition a very efficient signal amplifier.

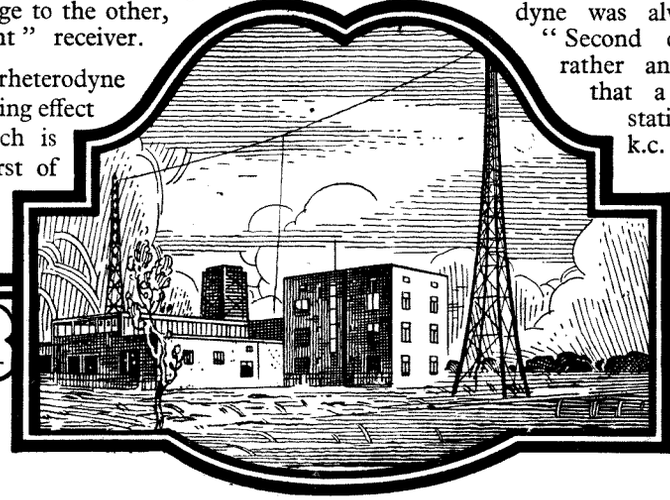
From a general consideration of the foregoing statements, one would expect the sensitivity, and in particular, the selectivity of the Superheterodyne receiver to be of a very high order. In practice this is found to be the case. The performance of a good Superheterodyne is a revelation to those who are only familiar with that of a " straight " receiver.

The designer has, in laying out the design of a Superheterodyne circuit, to deal with several forms of interference that are not found in " straight " H.F. receivers. These types of interference can be successfully dealt with, and their characteristics are now explained.

The form of interference to which the " straight " H.F. receiver is subjected is known as " adjacent channel " interference, and is caused by stations working on frequency bands very close to that of the wanted station, i.e., in adjacent frequency channels. It has been previously shown how the Superheterodyne effectively overcomes this, chiefly by the frequency changing process.

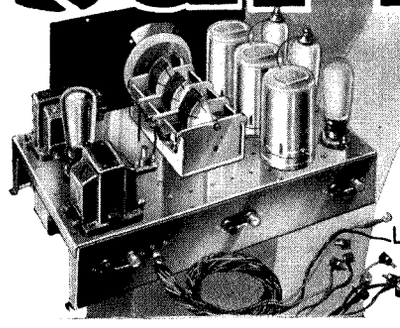
Mention has already been made, however, of " second channel " interference, and until recently, the Superheterodyne was always liable to suffer from this. " Second channel " interference occurs in rather an interesting way. Thus, assume that a Superheterodyne is receiving a station having a frequency of 1,000 k.c. In the normal way, the signal frequency (pre-selector) circuits will be tuned to 1,000 k.c., whilst the oscillator will be tuned to

(*continued on page 58*)



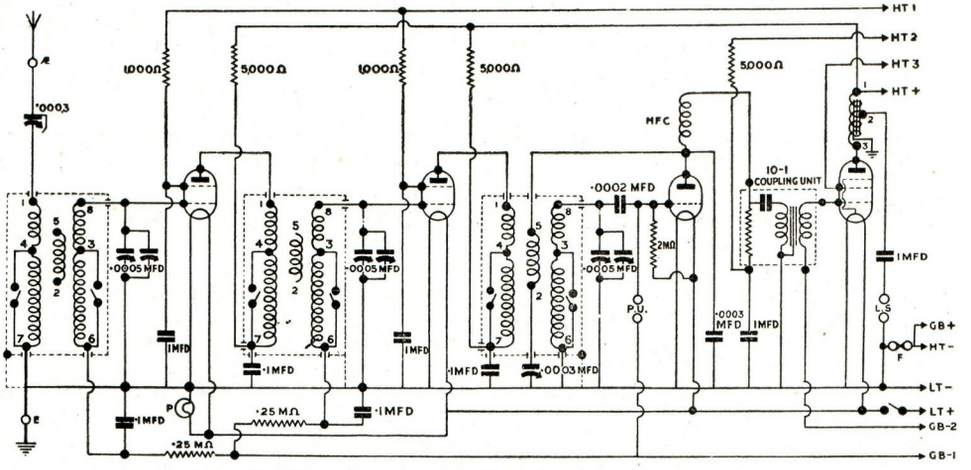
BRESLAU GERMANY

THE TELSEN SUPER SELECTIVE 4



OWING to the enormous popularity attained by the "Super Selective Four" since it was described in the last issue of the *Radiomag*, it is felt that a short description of this excellent receiver would be especially appreciated by new readers.

This set was designed to meet the demand of a large body of wireless enthusiasts who required a highly selective receiver capable of long distance reception, which would still maintain the maximum purity of reproduction. Now it is important that such a set should be highly sensitive so as to magnify the feeble signals from far off stations to the extent necessary for proper reception. However, great sensitivity is of little value unless accompanied by selectivity, for the number of stations which a sensitive set can receive under modern conditions is so large that without a high degree of selectivity, nearly every programme would be spoilt by interference from stations working on adjacent wavelengths.



THEORETICAL CIRCUIT OF THE TELSEN 'SUPER SELECTIVE FOUR'

FIG. I.

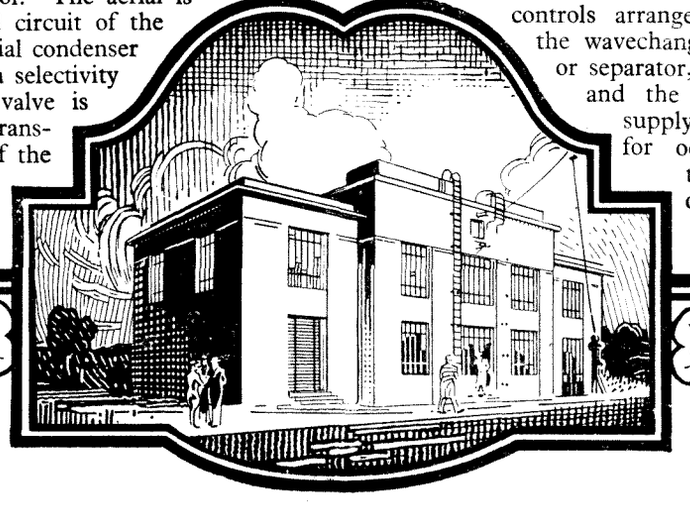
As will be seen from the accompanying circuit diagram great sensitivity is obtained in the Telsen "Super Selective Four" by the use of two carefully designed stages of screened grid valve high frequency amplification, followed by a 10:1 coupling unit and high efficiency pentode output valve. However, ample selectivity is also provided by means of three tuned circuits operated by a single tuning control. The aerial is loosely coupled to the tuned grid circuit of the first valve and a variable series aerial condenser is incorporated, which is used as a selectivity and volume control. The first valve is coupled by a high frequency transformer to the tuned grid circuit of the second valve, and this is coupled by another high frequency transformer to the tuned circuit preceding the leaky grid detector. Reaction is introduced here and is very smooth and even in operation.

The purity of reproduction is remarkably good for such a selective set, the bass response being excellent while the annoying heterodyne whistles and mush usually found on long distance reception are reduced by the 10:1 coupling which has a compensated top note register. Provision is made for playing gramophone records by connecting a gramophone pick-up to the terminals marked "Pick-Up."

As is well known, modern receivers having high magnification are very apt to become unstable unless care is taken to prevent "feed-back" by decoupling various high and low frequency circuits. Due to the extensive decoupling in the Telsen "Super Selective Four," and the screening provided by the all metal chassis, this receiver has a great margin of safety against instability.

The substantial stove aluminium finished steel chassis presents a very pleasing appearance and affords a rigid support for the triple ganged condensers, matched screened coils, and other components. The front panel has an artistic black crackle finish giving the set a beautiful appearance when placed in a suitable cabinet. The translucent tuning dial, which is calibrated directly in wavelengths, is illuminated from behind, and this feature, besides facilitating tuning, also serves as an indication that the set is switched on. There are four other controls arranged symmetrically on the panel, the wavechange switch, the selectivity control or separator, the reaction, or volume control, and the on-off switch for low tension supply. However, these are needed for occasional adjustment only, the tuning control being normally the only one used.

(*continued on page 58*)



RADIO PARIS FRANCE

TELSEN SUPER-SELECTIVE FOUR—*continued from page* 57

A full size 1/- Blue Print is given free with the *Telsen Radiomag* No. 4, which can be obtained from us price 6d. post free, and which contains such detailed instructions for building this set that it is almost impossible to make a mistake.

The detailed list of components is given below. Constructors who already have some of the components may complete the kit by buying the remaining parts singly. In this case the Constructor's Outfit No. W.304 should not be forgotten, as it contains all the small gear necessary for the construction of the set, as well as the panel and chassis.

RECOMMENDED VALVES

Make	*H.F.*	*Det.*	*Pentode*
Mazda	S215A	HL2	PEN220A or PEN220
Marconi or Osram ..	S21	HL2	PT2
Mullard	PM12	PM1HL	PM22
Cossor	215SG	210HL	220PT

Any of these valve combinations may be used.

This Receiver will give good results on Mains Units, the following being suitable :—

D.C. MAINS—TELSEN D.C. UNIT, W.348.

A.C. MAINS—TELSEN H.T. UNIT WITH L.T. CHARGER, W.346.

If desired, the Telsen H.T. and L.T. Unit W.347 may be used. This is a cheaper unit than the W.346, being without a trickle charger, but delivering an A.C. low tension supply, which in this case may either be neglected or used to heat a 4 volt output valve, as described in " Practical Hints and Tips " elsewhere in this issue.

THE TELSEN SUPER SELECTIVE FOUR

List of Components

Quantity	*Description*	*Cat. No.*	*Price*
5	Anode Cartridge Resistance Holders	W.286	3/9
2	1,000 ohm Anode Cartridge Resistances ..	W.268	2/-
3	5,000 ohm Anode Cartridge Resistances ..	W.273	3/-
1	Standard H.F. Choke	W.75	1/6
1	.0003 mfd. Mica Condenser	W.242	6d.
4	.1 mfd. Self-Sealing Condensers, 500 v. type..	W.231	6/-
1	.0002 mfd. Mica Condenser	W.241	6d.
1	2 megohm Grid Leak	W.251	6d.
2	½ megohm Grid Leaks	W.248	1/-
2	Grid Leak Holders	W.148	1/-
4	1 mfd. Self-Sealing Condensers, 500 v. type ..	W.227	7/-
1	.0003 mfd. Aerial Series Condenser with Switch	W.350	2/-
1	.0003 mfd. Bakelite Reaction Condenser ..	W.354	1/9
1	Mains Switch	W.297	1/6
3	4-pin Anti-microphonic Valve-holders ..	W.222	2/-
1	5-pin Anti-microphonic Valve-holder	W.223	10d.
1	Tapped Pentode Output Choke, 50/25 Henry, 20 mA...	W.72	6/9
1	10:1 Coupling Unit	W.215	12/6
1	Fuse Holder	W.146	6d.
1	Fuse Bulb	W.318	6d.
1	Set of Triple Matched Screened Coils ..	W.288	21/6
1	Triple Ganged Condenser with dust cover ..	W.307	20/-
1	" Super Selective Four " Constructor's Outfit	W.304	7/6

The Telsen " Super-Selective Four " as detailed above, is supplied as a complete Kit, Catalogue No. W.323, at the inclusive price of £4 18s. 6d.

PRINCIPLES OF THE SUPERHET.—*continued from page* 56

1,110 k.c. These two frequencies when " mixed " by the first detector, will produce a 110 k.c. signal, which will be readily amplified by the 110 k.c. I.F. amplifier. Assume now, that a powerful station is working at 1,220 k.c. If the pre-selector circuits present any response at all to this, this frequency will be present at the grid of the first detector, where it will " beat " with the oscillator to produce 110 k.c. It will thus be amplified and received, along with the desired signal, although it is 220 k.c. away from it in frequency.

Until the advent of the band pass filter, it was impossible to make the pre-selector circuits sufficiently selective to eliminate frequencies 220 k.c. from their tuned frequency, and " second channel " interference proved a great source of trouble. By employing a band pass filter in the pre-selector stage the Superheterodyne was endowed with sufficient selectivity to remove the offending frequency from the input circuit of the first detector, and so the trouble was overcome.

At the same time, band pass tuning was introduced into the I.F. stages, the windings of the I.F. transformers being arranged with a certain degree of coupling between them, and also each being tuned by means of a pre-set condenser. This remedied another defect of the Superheterodyne—the very bad quality of reproduction—that had, in the early days marred its reputation. This has been shown to be due to sideband cutting by the I.F. amplifier, such that the higher frequencies of speech and music were entirely lost.

The use of band pass tuning enables the I.F. amplifier to pass a sharply defined band of frequencies of sufficient width to embrace all the essential frequencies of speech and music, but to exclude adjacent channel frequencies.

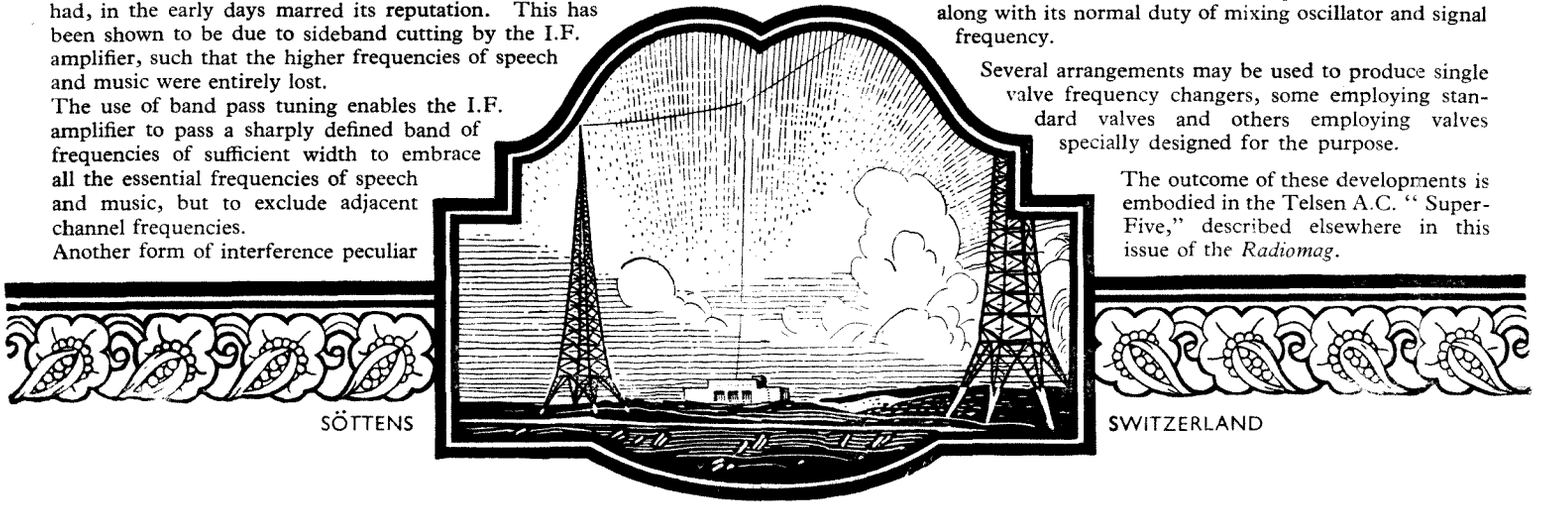
Another form of interference peculiar to the Superheterodyne is known as " beat " interference. This is due to two stations having the difference between their transmitting frequencies equal to the intermediate frequency and so " beating " with each other to produce this frequency. Thus both stations are heard at once, and are independent of the action of the oscillator. This form of interference is overcome by selecting an intermediate frequency of such a value that no two stations receivable at any strength have a frequency difference equal to it. In this country a value of 110 k.c. satisfies this requirement, and so this frequency is generally adopted.

A smooth and effective volume control is a necessity with the Superheterodyne, and the provision of this presented rather a problem, until the advent of the variable mu valve. The use of the variable mu valve enables a wide range of control to be obtained without introducing distortion or impairing selectivity. Hence, in a modern superhet., the I.F. valve or valves, are usually of the variable mu type, as is the signal frequency amplifier, if one is included. Two or three variable mu valves may, of course, be controlled by one potentiometer, so that simultaneous control in various parts of the circuit becomes easy.

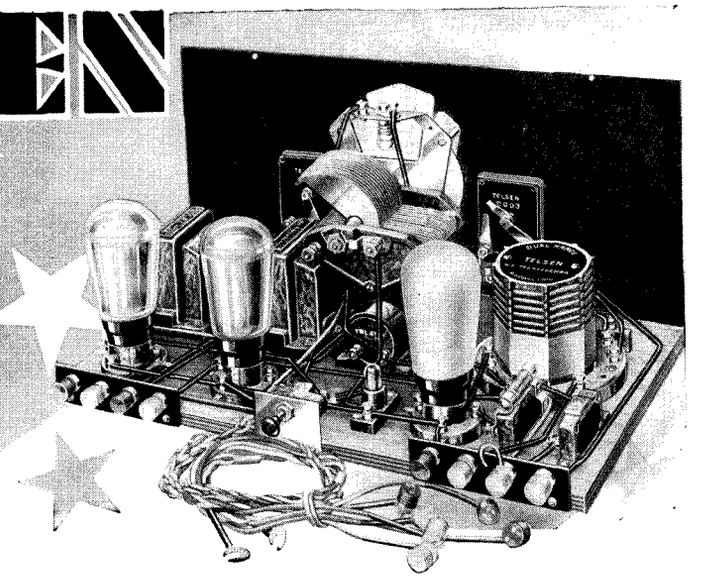
Another recent tendency is to dispense with the special oscillator valve, and make the first detector perform this function along with its normal duty of mixing oscillator and signal frequency.

Several arrangements may be used to produce single valve frequency changers, some employing standard valves and others employing valves specially designed for the purpose.

The outcome of these developments is embodied in the Telsen A.C. " Super-Five," described elsewhere in this issue of the *Radiomag*.



The TELSEN 325 STAR KIT



THE Telsen " 325 " Star is the outcome of a genuine effort on the part of the Telsen Electric Co. to provide quality radio at a price which is truly within the reach of everyone. At the price of 39/6 this three valve kit receiver must surely represent the best value for money ever offered in radio.

The set, is a detector 2-L.F. arrangement, the first L.F. stage being resistance coupled, and the second stage transformer coupled. The resistance coupling unit is of rather special design, embodying as it does a decoupling system which prevents the set from becoming unstable, and developing a howl or whistle, when operating on an H.T. Battery which has aged somewhat. This is a common and annoying fault with a lot of battery operated receivers.

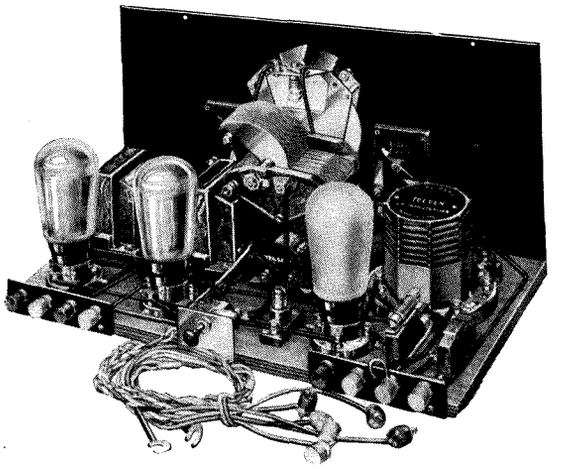
The tuning system comprises a W.154 Aerial Coil tuned by an air dielectric condenser, and coupled to the aerial by a " separator " condenser, giving a wide range of selectivity and volume control.

The mechanical layout of this receiver centres around the " 313 " disc drive which has been developed for it. This is a slow motion dial with a large and attractive escutcheon plate, on which are symmetrically arranged the selectivity, reaction and tuning controls, together with two push-pull switches which give wave-range and on-off switching. A third push-pull switch at the back of the set is provided for switching off the lamp which illuminates the translucent tuning scale. Illumination is only required when tuning the receiver, and the provision of a switch in this way effects considerable saving in L.T. current.

As already mentioned, the " 325 " Star is available as a complete kit (less, of course, valves and batteries) at the price of 39/6. For the benefit of those constructors who may have several of the Telsen components required for the set, a " 325 " Star " Constructor's Outfit " is put out, so that they may, on purchasing this outfit, and the balance of the components required, build the receiver without purchasing the complete kit. This " Constructor's Outfit " (W.326) contains all the non-standard special components, such as panel, baseboard, battery cord, and the small parts such as insulating washers, wire, terminals, etc., which are necessary.

A full size Blue Print, containing full constructional details and operating instructions together with a list of the parts required to build the " 325 Star " is supplied with each complete kit.

In addition, for the benefit of the intending constructor the Blue Print only can be obtained on application, price 1/-. It can then be decided what further components, if any are neccessary for the building of this set.



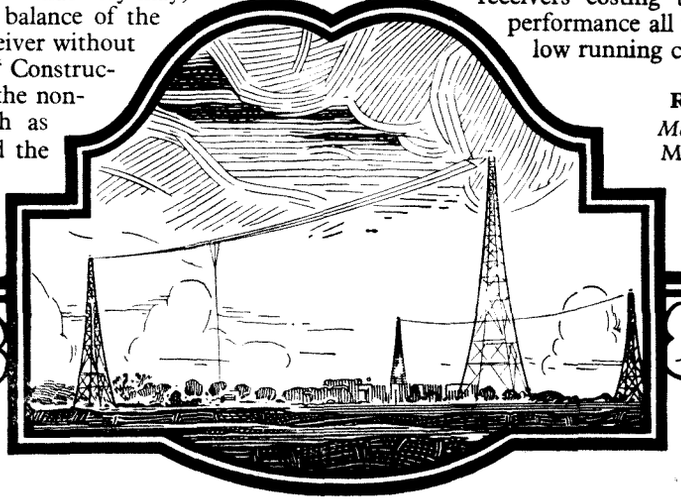
The Telsen " 325 STAR " completely assembled and ready for testing.

A left hand tuning condenser is specified, but, as the " 313 " disc drive dial has a two-way scale, a right hand condenser may be fitted if required.

The construction of the receiver is simplicity itself, and the results when finished, are equal to those given by many factory built receivers costing three or four times the price, a performance all the more satisfying because of the low running costs of the set.

RECOMMENDED VALVES

Make	*H.F.*	*Det.*	*Pentode*
Mazda	HL2	L2	P220A
Mullard	PM1HL	PM2DX	PM202
Marconi or Osram	HL2	L210	P2
Cossor	210DET	210LF	220P



LONDON REGIONAL

LONDON

TELSEN RADIO COMPONENTS

A Complete List, giving Catalogue Nos., Descriptions and Prices.

The items printed in heavy type are newly introduced. Those marked with an asterisk (*) have been re-designed or reduced in price.

Cat. No.	Description	Price
	H.F. CHOKES	
*W.74	Binocular H.F. Choke	3/6
W.340	**All Wave Screened Binocular H.F. Choke**	**4/6**
*W.75	Standard H.F. Choke	1/6
W.341	**Standard Screened H.F. Choke**	**2/6**
*W.221	Short Wave H.F. Choke	2/6
W.342	**Short Wave Screened H.F. Choke**	**3/-**
	L.F. CHOKES	
*W.68	40 hy. L.F. Choke	4/9
*W.69	100 hy. L.F. Choke	4/9
	OUTPUT CHOKES	
*W.71	Output Choke	6/3
*W.72	Tapped Pentode Output Choke	6/9
*W.172	Power Pentode Output Choke	9/6
	SMOOTHING CHOKES	
*W.302	Smoothing Choke, 28 hy.	12/6
W.361	**Smoothing Choke, 18 hy.**	**12/6**
	COILS	
W.349	**Iron Cored Coil**	**8/6**
W.422	**Twin Matched Iron Cored Coils**	**17/-**
W.423	**Triple Matched Iron Cored Coils**	**25/6**
*W.76	Dual Range Aerial Coil	5/6
*W.154	H.F. Transformer Coil	4/6
*W.216	Screened Coil	7/-
*W.287	Twin Matched Screened Coils	14/6
*W.288	Triple Matched Screened Coils	21/6
*W.290	Band Pass Coil Unit	14/6
*W292	Band Pass and Oscillator Coil Unit	21/6
*W.293	Oscillator Coil	7/6
*W.294	Intermediate Frequency Transformer Coil	7/6
*S.330	Superhet. Coils, Type No. S.330	21/6
W.217	Coil Switch Coupling Assembly	-/6
W.218	Coil Switch Knob Assembly	1/-
	TUNING CONDENSERS Air dielectric :—	
*W.130	.00025 mfd.	2/6
*W.131	.00035 mfd.	3/6
*W.132	.0005 mfd.	3/6
*W.339	Single Condenser Unit	7/6
*W.306	Twin Ganged	12/6
	With dust cover, extra	2/-
*W.307	Triple Ganged	17/6
	With dust cover, extra	2/6
	TUNING CONDENSERS Bakelite dielectric :—	
*W.194	.0003 mfd.	2/-
*W.193	.0005 mfd.	2/-
*W.350	Aerial Series, .0003, with Switch	2/-
	REACTION CONDENSERS	
*W.356	.0001 mfd.	1/9
*W.355	.00015 mfd.	1/9
*W.354	.0003 mfd.	1/9
*W.358	.0005 mfd.	2/-
*W.357	.00075 mfd.	2/-
	DIFFERENTIAL CONDENSERS	
*W.353	.0001 mfd.	2/-
*W.352	.00015 mfd.	2/-
*W.351	.0003 mfd.	2/-
	PRE-SET CONDENSERS	
*W.152	.0001 mfd.	1/3
*W.151	.0003 mfd.	1/3
*W.150	.001 mfd.	1/3
*W.149	.002 mfd.	1/3
	FIXED CONDENSERS Mica :—	
W.240	.0001 mfd.	-/6
W.241	.0002 mfd.	-/6
W.242	.0003 mfd.	-/6
W.243	.0004 mfd.	-/6
W.244	.0005 mfd.	-/6
W.245	.001 mfd.	-/6
W.246	.002 mfd.	1/-
W.247	.006 mfd.	1/3
*W.310	.01 mfd.	2/-
*W.311	.02 mfd.	2/6
*W.316	.05 mfd.	4/6

Cat. No.	Description	Price
	FIXED CONDENSERS—contd.	
W.207	.0001 mfd. Tag	4½d.
W.208	.0002 mfd. ,,	4½d.
W.209	.0003 mfd. ,,	4½d.
W.210	.0004 mfd. ,,	4½d.
W.211	.0005 mfd. ,,	4½d.
W.212	.001 mfd. ,,	4½d.
W.213	.002 mfd. ,,	-/6
	SELF-SEALING CONDENSERS	
*W.232	.01 mfd., 500 volt test	1/3
*W.230	.04 mfd. ,, ,, ,,	1/3
*W.231	.1 mfd. ,, ,, ,,	1/6
*W.229	.25 mfd. ,, ,, ,,	1/6
*W.228	.5 mfd. ,, ,, ,,	1/6
*W.227	1 mfd. ,, ,, ,,	1/9
*W.226	2 mfd. ,, ,, ,,	2/6
*W.239	.01 mfd., 1,000 volt test	1/9
*W.237	.04 mfd. ,, ,, ,,	1/9
*W.238	.1 mfd. ,, ,, ,,	2/-
*W.236	.25 mfd. ,, ,, ,,	2/-
*W.235	.5 mfd. ,, ,, ,,	2/-
*W.234	1 mfd. ,, ,, ,,	2/6
*W.233	2 mfd. ,, ,, ,,	3/6
	SELF-SEALING BLOCK CONDENSERS	
*W.175	4 mfd., 500 volt test	4/9
*W.176	6 mfd. ,, ,, ,,	7/-
*W.177	8 mfd. ,, ,, ,,	9/6
*W.178	4 mfd., 1,000 volt test	6/6
*W.179	6 mfd. ,, ,, ,,	9/6
	ELECTROLYTIC CONDENSERS High Voltage	
W.393	**4 mfd., 275 working peak voltage**	**3/6**
W.394	**6 mfd., ditto**	**3/9**
W.395	**8 mfd., ditto**	**4/-**
W.396	**4 mfd., 500 working peak voltage**	**4/6**
W.397	**6 mfd., ditto**	**5/-**
W.398	**8 mfd., ditto**	**5/6**
	Low Voltage	
W.399	**25 mfd. at 25 volts**	**2/6**
W.400	**50 mfd. at 25 volts**	**3/-**
W.401	**25 mfd. at 50 volts**	**3/-**
	SMALL TUBULAR CONDENSERS	
W.402	**.0001 mfd.**	**1/-**
W.403	**.0002 mfd.**	**1/-**
W.404	**.0003 mfd.**	**1/-**
W.405	**.0005 mfd.**	**1/-**
W.406	**.001 mfd.**	**1/-**
W.407	**.002 mfd.**	**1/-**
W.408	**.005 mfd.**	**1/-**
W.409	**.006 mfd.**	**1/-**
W.410	**.01 mfd.**	**1/3**
W.411	**.1 mfd.**	**1/6**
	CONSTRUCTORS' KITS	
W.320	All-Mains S.G.3 200/250 v. 50 cys.	138/6
W.322	All-Mains S.G.3 200/250 v. 25 cy.	151/-
W.321	All-Mains S.G.3 100/110 v. 50 cys.	138/6
W.323	Super Selective Four	98/6
W.324	Super-Six	118/6
W.325	"325 Star"	39/6
W.414	**"Class B" Four with cabinet and moving coil speaker**	**117/6**
W.415	**"Class B" Four without cabinet and moving coil speaker**	**77/6**
	CONSTRUCTORS' OUTFITS	
W.412	**"A.C. Super-Five"**	**7/6**
W.416	**"Class B" Four**	**5/6**
W.413	**Battery S.G. Three**	**3/6**
W.305	"Super-Six"	7/6
W.304	Super Selective Four	7/6
W.303	All-Mains S.G 3	7/6
W.326	"325 Star"	3/6
	COUPLING UNITS	
W.214	1 : 1	7/6
W.215	10 : 1	12/6
W.285	R.C.	4/-
	DIALS	
*W.141	Slow Motion, Black	1/6
*W.141a	Slow Motion, Brown	1/6
*W.184	Illuminated Disc Drive	2/6
*W.257	Small Disc Drive	2/-
*W.313	"313" Disc Drive	3/6
	FUSES	
W.318	100 mA. Fuse Bulb	-/6
	Mains Type—	
W.199	.5 amp.	-/6
W.200	1 amp.	-/6
W.201	2 amp.	-/6
W.202	3 amp.	-/6

Cat. No.	Description	Price
	PILOT LAMPS	
W.417	**.2 amp. 2.5 volt**	**-/6**
W.418	**.2 amp. 6.0 volt**	**1/-**
	FUSE HOLDERS	
W.146	Battery Type	-/6
W.203	Power Type	-/6
	GRID LEAKS	
W.248	.25 megohm	-/6
W.249	.5 ,,	-/6
W.250	1 ,,	-/6
W.251	2 ,,	-/6
W.252	3 ,,	-/6
W.253	4 ,,	-/6
W.254	5 ,,	-/6
W.148	**Grid leak Holder**	**-/6**
	RESISTANCES (FIXED) Cartridge Type :—	
W.263	300 ohms.	1/-
W.289	350 ,,	1/-
W.264	400 ,,	1/-
W.265	500 ,,	1/-
W.266	600 ,,	1/-
W.267	750 ,,	1/-
W.268	1,000 ,,	1/-
W.269	1,500 ,,	1/-
W.270	2,000 ,,	1/-
W.271	3,000 ,,	1/-
W.272	4,000 ,,	1/-
W.273	5,000 ,,	1/-
W.274	10,000 ,,	1/-
W.275	15,000 ,,	1/-
W.276	20,000 ,,	1/-
W.277	25,000 ,,	1/-
W.278	30,000 ,,	1/-
W·279	50,000 ,,	1/-
W.280	60,000 ,,	1/-
W.281	80,000 ,,	1/-
W.282	100,000 ,,	1/-
W.283	150,000 ,,	1/-
W.284	200,000 ,,	1/-
W.286	Cartridge Resistance Holder	-/9
	Spaghetti Type :—	
W.109	300 ohms	-/6
W.110	600 ,,	-/6
W.111	750 ,,	-/6
W.112	1,000 ,,	-/6
W.113	1,500 ,,	-/9
W.114	2,000 ,,	-/9
W.115	3,000 ,,	-/9
W.116	4,000 ,,	-/9
W.117	5,000 ,,	-/9
W.118	10,000 ,,	1/-
W.119	15,000 ,,	1/-
W.120	20,000 ,,	1/-
W.121	25,000 ,,	1/-
W.122	30,000 ,,	1/-
W.123	50,000 ,,	1/6
W.124	60,000 ,,	1/6
W.125	80,000 ,,	1/6
W.126	100,000 ,,	1/6
	VARIABLE RESISTANCES	
W.299	Hum Adjuster	2/6
	RESISTORS	
W.362	**250 ohms, ½ watt type**	**1/-**
W.363	**500 ,, ,, ,, ,,**	**1/-**
W.364	**1,000 ,, ,, ,, ,,**	**1/-**
W.365	**1,250 ,, ,, ,, ,,**	**1/-**
W.366	**5,000 ,, ,, ,, ,,**	**1/-**
W.367	**10,000 ,, ,, ,, ,,**	**1/-**
W.368	**20,000 ,, ,, ,, ,,**	**1/-**
W.369	**25,000 ,, ,, ,, ,,**	**1/-**
W.419	**50,000 ,, ,, ,, ,,**	**1/-**
W.370	**100,000 ,, ,, ,, ,,**	**1/-**
W.371	**250,000 ,, ,, ,, ,,**	**1/-**
W.372	**500,000 ,, ,, ,, ,,**	**1/-**
W.373	**250 ohms, 1 watt type**	**1/-**
W.374	**500 ,, ,, ,, ,,**	**1/-**
W.375	**1,000 ,, ,, ,, ,,**	**1/-**
W.376	**1,250 ,, ,, ,, ,,**	**1/-**
W.377	**5,000 ,, ,, ,, ,,**	**1/-**
W.378	**10,000 ,, ,, ,, ,,**	**1/-**
W.379	**20,000 ,, ,, ,, ,,**	**1/-**
W.380	**25,000 ,, ,, ,, ,,**	**1/-**
W.420	**50,000 ,, ,, ,, ,,**	**1/-**
W.381	**100,000 ,, ,, ,, ,,**	**1/-**
W.382	**250,000 ,, ,, ,, ,,**	**1/-**
W.383	**500,000 ,, ,, ,, ,,**	**1/-**
W.384	**250 ohms, 2 watt type**	**2/-**
W.385	**500 ,, ,, ,, ,,**	**2/-**
W.386	**1,000 ,, ,, ,, ,,**	**2/-**
W.387	**1,250 ,, ,, ,, ,,**	**2/-**
W.388	**5,000 ,, ,, ,, ,,**	**2/-**
W.389	**10,000 ,, ,, ,, ,,**	**2/-**
W.390	**20,000 ,, ,, ,, ,,**	**2/-**
W.391	**25,000 ,, ,, ,, ,,**	**2/-**
W.421	**50,000 ,, ,, ,, ,,**	**2/-**
W.392	**100,000 ,, ,, ,, ,,**	**2/-**

Cat. No.	Description	Price
	SWITCHES	
*W.107	2-pt. Push-Pull	-/9
*W.108	3-pt. Push-Pull	1/-
*W.153	4-pt. Push-Pull	1/3
*W.297	Mains Type	1/6
	TERMINALS, ETC.	
W.204	Terminal Block	-/6
	TONE CORRECTORS	
*W 308	Pentode Tone Corrector	2/6
*W.314	Variable Tone Corrector	4/6
W.336	"336" Unit	5/6
	TRANSFORMERS Intervalve :—	
*W.61	1.75 : 1 "Radiogrand"	9/6
*W.59	3 : 1 ,,	6/9
*W.58	5 : 1 ,,	6/9
*W.60	7 : 1 ,,	9/6
*W.66	3 : 1 "Ace"	4/9
*W.65	5 : 1 ,,	4/9
W.327	5 : 1 Audioformer	11/6
	OUTPUT TRANSFORMERS	
*W.62	1 : 1 "Radiogrand"	9/6
*W.63	Multi-Ratio "Radiogrand"	9/6
	MAINS TRANSFORMERS	
W.291	100/110 v., 40/100 cys.	32/6
W.300	200/250 v., 40/100 cys.	32/6
W.301	200/250 v., 25/40 cys	45/-
W.360	**200/250 v.,40/100 cys. H.T. 275-0-275**	**32/6**
	CLASS B COMPONENTS	
W.343	**Driver Transformer, 1 : 1**	**8/6**
W.359	**Driver Transformer, 1.5 : 1**	**8/6**
W.344	**Output Transformer**	**8/6**
W.345	**Output Choke**	**8/6**
W.337	**7-Pin Solid Valve Holder**	**1/6**
W.338	**7-Pin Anti-microphonic Valve Holder**	**1/9**
	VALVE HOLDERS	
W.224	4-pin Solid Type	-/6
W.225	5-pin Solid Type	-/8
W.222	4-pin Anti-microphonic	-/8
W.223	5-pin Anti-microphonic	-/10
W.198	Universal	-/9
	VOLUME CONTROLS	
W.298	10,000 ohms	3/-
W.295	50,000 ohms	3/-
*W.296	50,000 ohms, with Mains Switch combined	4/6
	MAINS UNITS	
W.346	**H.T. Unit and L.T. Charger for A.C. Mains**	**97/6**
W.347	**H.T. and L.T. Unit for A.C. Mains**	**67/6**
W.348	**H.T. Unit for D.C. Mains**	**35/-**
	LOUDSPEAKERS	
*W.54	Loudspeaker Unit	3/6
*W.170	Major Chassis	7/6
*W.159	Popular Chassis	5/6
*W.181	Complete Chassis Speaker	8/6
*W.182	Complete Chassis Speaker 11 in. dia.	11/6
*W.183	Complete Chassis Speaker 14½ in. dia.	12/6
	RECEIVERS	
*W.333	Air-Marshal 3 Receiver, Walnut Cabinet	97/6
W.334	Air-Marshal 3 Receiver, Moving Coil Speaker	105/-
464	**"464" A.C. Mains Receiver**	**189/-**

Printed by JAMES COND LTD., at 148-149, Great Charles Street, Birmingham, 3, and Published by the Proprietors TELSEN ELECTRIC CO., LTD., Aston, Birmingham, England.

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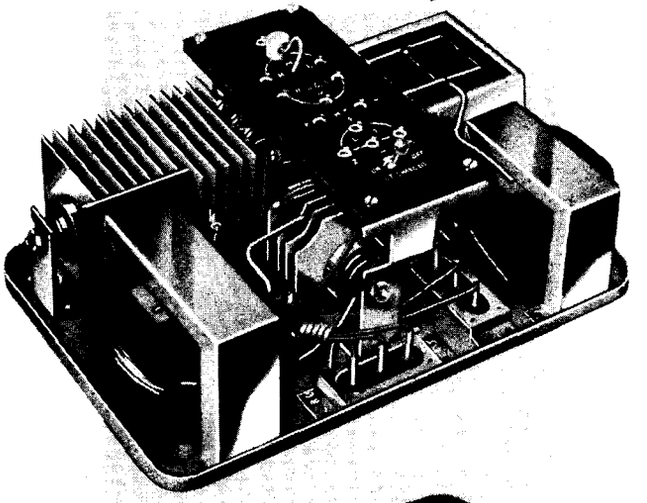
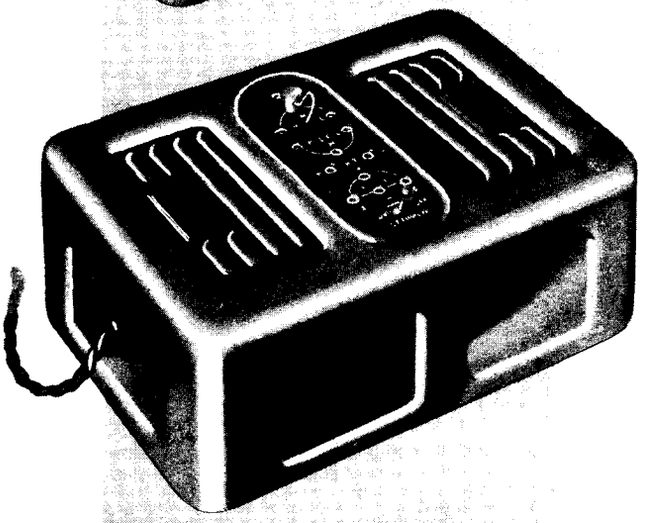
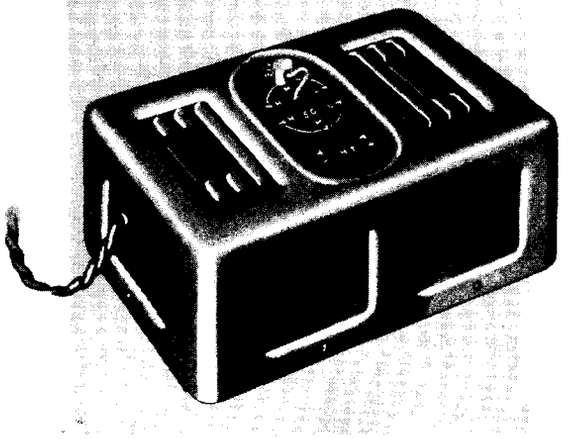
for better reception at a fraction of the cost!







THE new Telsen Mains Units are the outcome of long research and experiment by Telsen engineers. No effort has been spared to achieve their perfection, every conceivable refinement being embodied in their up-to-the-minute design. Switch over to Telsen **NOW**, and rid yourself for good of the distortion and L.F. oscillation which accompany run-down batteries, and the constant expense incurred in their replacement.

H.T. UNIT AND L.T. CHARGER FOR A.C. MAINS

This unit, which is suitable for input voltages between 200 and 250 at 40 to 100 cycles, will be specially welcomed by owners of battery receivers who, while they desire to enjoy the economy of power supply from the mains, do not wish to discard their battery valves in favour of the A.C. variety. The unit is very solidly built and is completely screened by an artistically finished metal case. The H.T. output is 28 milliamps. at 150 volts with separate maximum, detector and screened grid tappings, on each of which a choice of high, medium, or low voltages is available. Very generous smoothing equipment is provided to eliminate hum. Provision is made for charging 2, 4 or 6 volt accumulators, at 0.5 ampere, and the use of these facilities leads to such a saving of charging costs that the unit soon pays for itself.

No. W.346 **Price £4 17s. 6d.**

H.T. AND L.T. UNIT FOR A.C. MAINS

As regards input and H.T. output, this is similar to the " H.T. Unit and L.T. Charger " No. W.346, but as it is intended to provide complete power supply for receivers employing A.C. valves, the L.T. charger is replaced by a centre tapped transformer winding capable of supplying 2.5 amps. at 4 volts. It is a very well made component, and will be particularly appreciated by home constructors.

No. W.347 **Price £3 7s. 6d.**

H.T. UNIT FOR D.C. MAINS

This unit is designed for D.C. inputs of from 200 to 250 volts. Adequate smoothing is provided to remove ripple, and the output is approximately 28 milliamps. at 150 volts. Three tappings are provided, the maximum, screened grid, and detector tappings, at each of which a choice of high, medium or low voltage is available. The unit is enclosed in a well finished metal case which provides complete screening.

No. W.348 **Price 35/-**

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RADIO COMPONENTS FOR LASTING EFFICIENCY

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THE WONDERFUL NEW TELSEN '464'

A.C. MAINS RECEIVER

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VARIABLE TONE CONTROL

MOVING COIL LOUDSPEAKER

and every ultra-modern refinement, in a beautiful

WALNUT FINISHED CABINET

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Our previous experience in the all-mains field has been a valuable aid in the production of this superb new all-electric receiver, its truly brilliant circuit incorporates every conceivable ultra-modern refinement including the new Telsen Iron Cored Coils, Variable Tone Control, Moving Coil Speaker, Single Knob Tuning and wavelength calibration.

The really astounding selectivity, amazing sensitivity, exceptional volume and wonderful tone places this set in the front rank of all-mains receivers.

See and hear it at your dealers to-day, it will revolutionize all your existing ideas of radio performance.

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RADIO RECEIVERS

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO. LTD. ASTON BIRMINGHAM