The TELSEN RADIOMAG

Volume I | Price Threepence | Number 2

How to !
THE TELSEN SP
THE TELSEN S
THE TELSEN TRI
THE TELSEN SONGST
THE TELSEN CONQUEROR THREE
THE TELSEN COMMODORE THREE
THE TELSEN EMPIRE FO

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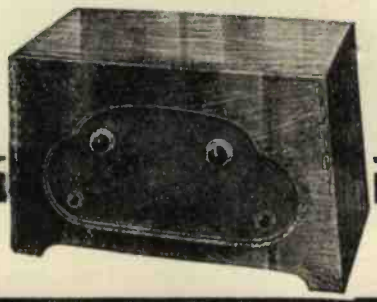

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The TELSEN RADIOMAG

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Thomas Street, Aston, Birmingham.

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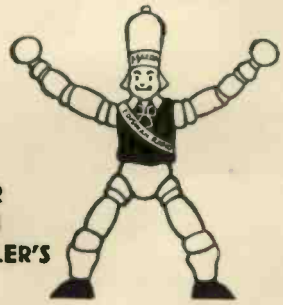
TYPE	PRICE
† H.210	8/6
HL.210	8/6
†★ HL.2	8/6
L.210	8/6
†★ L.2	8/6
† P.220	10/6
† P.220A	13/6
P.240	13/6
PEN.230	20/0
† PEN.220	20/0
PEN.220A	20/0
† S.G.215	20/0
†★ S.G.215A	20/0
†★ S.G.215B	20/0

★ Metallised

† Specified for the Telsen Circuits



LOOK FOR "EDDY" IN YOUR DEALER'S WINDOW

Never, in the history of 2-volt valves, has there been such an amazing range as this—so much evidence of brilliant engineering—so many valves with outstanding characteristics. Instance the Pen. 220; a pentode valve which at once presents the solution to the output stage problem in portable sets, giving an extraordinary large output for a combined screen and anode current of under 5mA. It is a valve for which dry battery users have long waited.

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Filament Current - - 0.2 amps.	Screen Voltage (Max) - 150 volts
Anode Voltage (Max) - 150 volts	Mutual Conductance - 2.5 mA/V

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V135

Radio in 1932?

MAY we expect any startling developments in 1932? Can we anticipate some discovery that will upset all previous conceptions of perfect reproduction?

The designers and research engineers can give us little indication of the trend of developments. Even they are waiting—waiting for that sudden flash of genius which solves hundreds of problems in as many seconds.

Whilst the possibilities of radio are infinite, it is very difficult to imagine any remarkable improvements in the quality or efficiency of reception.

The reproduction afforded by a modern quality receiver is surprisingly life-like, yet amongst the millions of listeners very few are familiar with that purity of tone and perfection of performance. Numbered amongst them are thousands of amateurs—home constructors who have built super receivers employing the latest devices . . . more valves have been added, selectivity units have been incorporated, but little attention has been paid to the *quality* of the final results.

No opportunity has presented itself for undivided attention to the performance and efficiency of the individual components. Yet these play no mean part in faithful reproduction.

Every constructor knows that the breakdown of one component means that volume and tone are considerably impaired and in some cases the reception of broadcast programmes impossible.

The range of a receiver has been the all important feature, but now that it is possible to receive stations hundreds of miles distant, let us halt and consider the quality of reception. After all, there is very little pleasure in listening to a world-famous orchestra from the other side of the ocean if the reproduction is poor.

Each component should be suited to its individual task, yet so matched that a perfect balance of tone and crispness of speech is obtained. Too much stress cannot be placed upon this matter, for satisfactory reception depends as much upon the components employed as the ability of the broadcasting station to radiate wireless waves.

The amateur can be assured of individual efficiency and perfect matching if Telsen components are chosen. These famous components are designed by prominent radio engineers and manufactured with meticulous care and precision.

" THEY BUILD BETTER THAN THEY KNOW WHO BUILD ON TELSEN."

"Radio is the greatest of all entertainers"

Governing Director, Telsen Electric Co., Ltd.

"IT is very seldom that an opportunity occurs for me to talk about radio as entertainment. But quite recently I was in the Telsen Experimental Laboratories when a new development was being tested. The chief research engineer was demonstrating the simplicity of tuning and in the course of a few minutes we had listened to 23 stations. In the present day, of course, this is not remarkable, but I was impressed by the variety of programmes offered to the listener. Music, talks, comedy, drama, religion, sporting events and some very sound advice . . . all being broadcast during that trip round Britain and the Continent.

For a few moments my mind went back to the old days when it was impossible even for a millionaire to obtain such a wealth of entertainment in so short a time. The radio industry is giving employment to many thousands throughout the world, and considering that only a few years ago radio was a scientific toy, the growth is truly amazing.

In the Telsen works alone there are nearly five thousand employees, all engaged in manufacturing entertainment; and every person, whether they be designer, toolmaker, winder, assembler or packer, takes a pride in the production of every individual component.

Wireless is by far the cheapest form of entertainment. There is nothing to rival it. The upkeep of a really modern receiver is wonderfully cheap, and when you consider the complete components for the Telsen "Conqueror 3" can be bought for a modest 32/3—well, it is certainly the cheapest amusement I've found.

It has always been my aim to bring the pleasures of wireless within everyone's reach. With this object in mind, Telsen components are designed to perform their various functions with the greatest efficiency and manufactured on a production basis which enables them to be sold at a popular price.

There is another great joy in radio which many people miss—that is the actual construction of a receiver. Those who have never built their own sets do not know, and possibly, cannot imagine, the increased pleasure in listening to a receiver which they themselves have constructed. The constructional details published in "The Telsen Radiomag" make it a very simple, yet very enjoyable task. I often wonder how many radio engineers of to-day commenced their careers by constructing their own receivers. For those who only listen, radio is very entertaining; but for those who *build* to listen, radio is the greatest of all entertainers."

A NEW FIELD for LISTENERS

An Interesting Article on Short Wave Reception.

THE average present day broadcast listener has become so familiar with the long and medium wave stations of Europe that he tends rather to take them for granted, and to sigh for fresh fields to conquer. For those who seek to regain the fascination of tuning and identifying new stations and of having a further selection of really excellent programmes, the enjoyment of which is enhanced by the knowledge that their source may be many thousand miles distant, the solution lies in the construction of an efficient short wave receiver.

By *short* waves is meant the region of wavelengths between approximately 10 and 100 metres in which it is generally considered that the future progress of Broadcasting lies, at least for long distance transmission. The present lower broadcast band of 200-550 metres should be referred to as "medium" waves in order to avoid confusion. There is a further band below 10 metres, usually termed "ultra-short," which is receiving the attention of experimenters, but with which we are not concerned in this article.

The main advantages of the short waves are twofold. In the first place, these waves have the property of travelling huge distances with much less falling off in strength than those with which we are familiar. Consequently it is possible to receive, say, Australia in this country (on the loudspeaker) with a simple 3-valve receiver. Secondly, owing to the much higher frequency, the "spread" of each station is very small indeed. The wave-band will, therefore, carry an enormous number of stations without interference troubles arising, or without necessitating special provision for obtaining selectivity in the design of the receiver.

The reception of short waves has been thought to be outside the province of the ordinary listener, who associates short waves with masses of experimental apparatus using long extension handles, large unwieldly coils and headphones—a phase of listening open only to the expert, and requiring the consumption of much midnight oil.

Whatever basis there has existed in the past for this conception is entirely removed by the advent of the Telsen Short Wave Coil Unit, which makes an efficient short wave set as simple to construct as the "Conqueror Three," and its success in operation as certain.

The theory and working of a simple short wave receiver are in all respects exactly similar to those of an ordinary broadcast receiver, but on account of the higher frequencies involved the design of the component., and in particular, the coils, condensers and H.F. chokes must be outstandingly good in order to achieve any degree of success. Due to the enormous range of frequency required to be covered, it is desirable, both for efficiency and to avoid super-critical tuning, to use two wave ranges, and this has been done in the past by the use of plug-in coils, a system which is open to many objections (losses in coil-holders, inconvenience, damage due to handling.)

Much research and experiment on this problem has resulted in the evolution of the Telsen Dual Range Short-Wave Coil Unit which comprises a complete set of high efficiency coils (aerial coil, tapped grid coil, reaction coil), wound on a common former. Its use in conjunction with the Telsen .00025 mfd. variable air condenser and .0003 mfd. variable reaction condenser gives reception on all wavelengths from 20 to 80 metres, a range which includes all

desirable present day transmissions. The binocular H.F. choke will be found very suitable for inclusion in short wave circuits, and those who have in the past known the advantages of using Telsen Matched Components may continue to do so in their explorations in the realm of short waves.

The delightful uncertainty of reception of the short waves makes it impossible to give a list of stations which can be received. Suffice it to say that there is no continent which does not provide programmes easily receivable on an efficient short wave receiver, and the enthusiast can switch on, sure in the knowledge that a careful scouring of the wave-band will provide something new and interesting. For him, America is a next-door neighbour and Australia just round the corner. A slight knowledge of morse will provide the additional thrill of identifying the multitude of commercial stations and amateurs. A list of the more popular short-wave stations is given on page 60.

The usual considerations regarding an efficient aerial apply with greater force in the case of short waves, as at these tremendous frequencies (30 metres is equivalent to 10 million cycles per second) H.F. losses are far greater. Care should therefore be taken that the aerial and its down lead are well isolated from masonry, roof gutters, trees, etc. The same aerial as used on broadcast reception will be quite suitable if attention is paid to these points. It should not be unduly long but need not be cut down below broadcast requirements. A good earth connection with as short a lead as possible will contribute to satisfactory results.

MAKE CERTAIN OF A GOOD EARTH

Unsatisfactory results from a set are very often due to a faulty earth connection. When using a buried plate or tube, the joint where the wire is attached to this should be inspected frequently, as corrosion is very likely to occur at that point.

THE IMPORTANCE OF A FUSE

However careful you may be in disconnecting your H.T. battery before making any adjustments in your set, at some time you are liable to have an accident in the form of a short circuit, probably by using a screwdriver without having taken this precaution, and probably at the cost of a set of valves. You might even burn out a choke or transformer as well, and damage the H.T. battery. It happens to all of us sooner or later, and the determination not to do it again is very little consolation to set against the possible outlay of several pounds to cover the damage.

By fitting a fuse holder in the set you can, for the cost of under a shilling, make such a contingency practically impossible. It is really one of the simplest and cheapest insurances that has ever been devised, and it has the advantage that if you are careful you will not have to pay another premium without the satisfaction of knowing that for a cost of four pence-halfpenny or so you have saved a pound or two.

The right way to fit a fuse is as follows. Disconnect the H.T. and G.B. terminals from the rest of the set and connect them together to one terminal of the fuse holder. The other terminal may then be connected to L.T. as before.

To do the job properly it is desirable to buy a spare fuse and holder and fix them in an odd corner of the set. The spare will then always be on hand when wanted.

An ordinary flash lamp bulb will afford no protection. A radio fuse or .06 type of bulb is needed.

The lamp will not light when in use unless there is an excessive drain on the H.T. battery, or a short circuit. If the set unaccountably goes dead, suspect a blown fuse, or one not properly screwed down on to its contact.

● Whichever set you decide to build, use Drydex batteries for H.T. and Grid Bias, as recommended by the designers. They know that Drydex batteries will give you every satisfaction, price for price and quality for quality.

FOR H·T· Drydex -AS Telsen ADVISE

Makers of world-famous Exide offer greatest Dry Battery value!

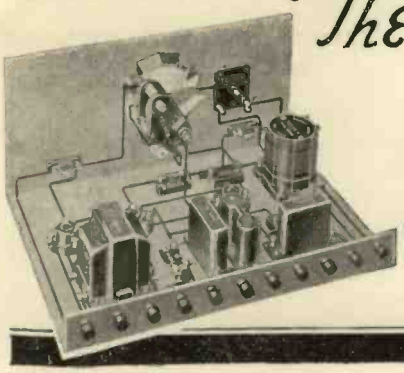
RED TRIANGLE	GREEN TRIANGLE	ORANGE TRIANGLE	BLUE TRIANGLE
60 volts 5/6 • 66 volts 6/-	60 volts 8/6 • 66 volts 9/6	Triple Capacity • 60 volts 12/-	For portable sets • 63 volts 7/6
99 volts 9/- • 120 volts 11/-	99 volts 14/- • 120 volts 16/9	105 volts 21/- • 120 volts 24/-	99 volts 11/6 • 108 volts 13/-

For Grid Bias: *Red Triangle.* 9 volts—1/-. 16.5 volts—1/9. *Green Triangle.* 9 volts—1/6. 16.5 volts—2/6.

Obtainable everywhere from all good dealers.

Exide Batteries, Exide Works, Clifton Junction, nr. Manchester. Branches: London, Manchester, Birmingham, Bristol, Glasgow, Dublin, Belfast

Dx. 61



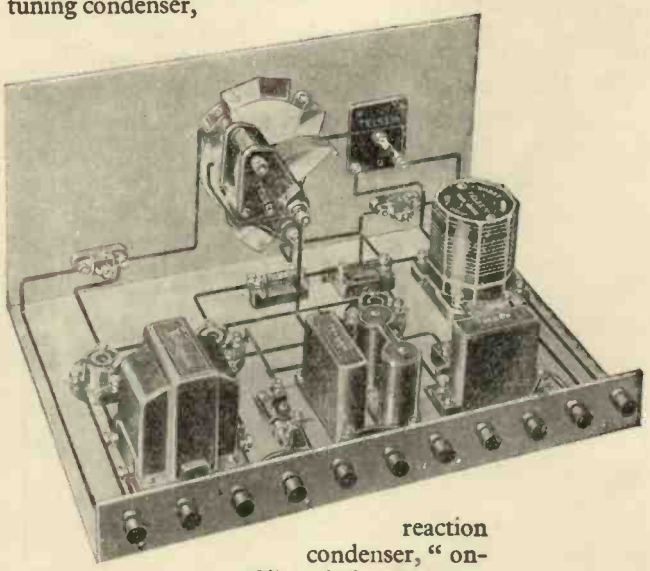
The TELSEN Short Wave THREE

A HIGHLY efficient Short Wave Receiver capable of world-wide reception and as simple to build and to operate as a conventional broadcast receiver, the Telsen Short Wave Three is made possible by the new Telsen short wave dual range coil Unit. The simplicity of the design will be evident from the illustration and blue print adjoining, and in fact, the circuit is straightforward, both to build and to operate. Constructors who have not previously ventured into the realms of short waves need have no hesitation in building the Telsen Short Wave Three with the assurance of a wealth of novel and interesting entertainment.

The circuit arrangement is a detector followed by one resistance coupled stage and one transformer. This is found to be best for short waves as it gives smoothest reaction control. The detector is decoupled in order to ensure against L.F. feed-back.

The procedure for building is exactly the same as in the case of an ordinary broadcast circuit, and in this connection the general constructional article on page 37 should be read. In this case it will be advisable to mount the panel components, including the illuminated disc-drive and logarithmic variable condenser, and to try the panel in position before screwing down the baseboard components in order to ensure that there will be adequate clearance for the valves when these are inserted. Having arranged the baseboard layout and screwed down the appropriate parts, the baseboard wiring should be carried out before attaching the panel and completing the wiring.

In building and operating the set, avoid the proximity of metallic objects such as screens or batteries, as this may cause losses and inefficiency. Metal panels and baseboards are not permissible. The controls on the set are identical with the "Conqueror" Three, *i.e.*, tuning condenser,



reaction condenser, "on-off" switch and wave change switch. The latter alters the tuning range from 20-40 metres (when closed) to 35-80 metres (when open). For this receiver, the valve arrangement is much the same as in the "Conqueror" Three. The output valve recommended is the P.220, as we are here concerned with maximum amplification, and we shall not expect to overload this valve. This has the

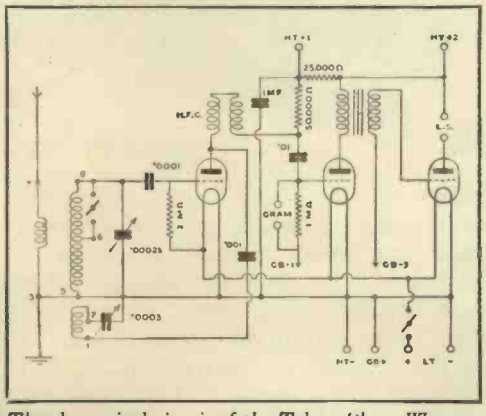
advantage of making the set economical to run, as the total consumption of H.T. will be about 7-8 milliamps. The H.L.2 is to be preferred for the detector, but the H.210 makes quite a good second choice.

For particulars of batteries, etc., see the article on page 51.

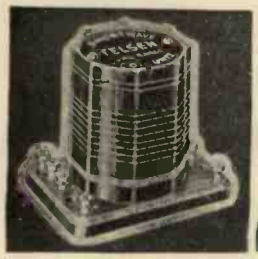
The operation of a short wave receiver calls for a little more care than its broadcast counterpart as the space on the tuning dial occupied by a station is a fraction of a degree, giving an impression of extreme selectivity. The use of a good slow motion dial is essential. Work with the receiver in its most sensitive condition, *i.e.*, just not oscillating, oscillation being indicated by a rushing noise in the loud-speaker and the usual heterodyne whistles as the tuning is varied. The reaction condenser should be adjusted simultaneously with the tuning control to maintain maximum sensitivity; increase of tuning wavelength will be found to require an increase of reaction condenser and vice versa.

In order to preclude the possibility of a gap between the two tuning ranges it is arranged for these to overlap slightly. In the case of a station receivable on both wave ranges it will be found preferable to use the lower end of the higher range.

It may be found that having tuned in a station, removal of the hand from the dial will cause reduction in volume or even disappearance of the station. In this case it will be found that by tuning slightly above the desired station, removal of the hand will bring the set into tune.



The theoretical circuit of the Telsen Short Wave 3.



TELSEN SHORT WAVE THREE.

List of Components.

Quantity.	*Description.*	*Cat. No.*	*Price.*
3	Valve Holders ..	W.105	1 6
1	.0001 Mica Condenser	W.91	6
1	.001 Mica Condenser ..	W.96	6
1	Grid Leak 2 meg. ..	W.101	9
1	Grid Leak 1 meg. ..	W.100	9
2	Grid Leak Holders ..	W.148	1 0
1	Short Wave Coil Unit..	W.174	4 6
1	.00025 Logarithmic Variable Condenser	W.130	4 6
1	.0003 Reaction Condenser	W.188	2 0
2	Two-Point Switches ..	W.107	2 0
1	"Radiogrand" Transformer	W.59	8 6
1	Binocular H.F. Choke	W.74	5 0
1	.01 Mansbridge Type Condenser	W.83	1 6
1	Illuminated Disc Drive	W.184	4 6
1	1 mfd. Mansbridge Type Condenser	W.78	2 3
1	50,000 ohm. Spaghetti Resistance	W.123	1 6
1	25,000 ohm. Spaghetti Resistance	W.121	1 0
	Panel 14in. × 7in.		42 3
	Baseboard 14in. × 9in.		

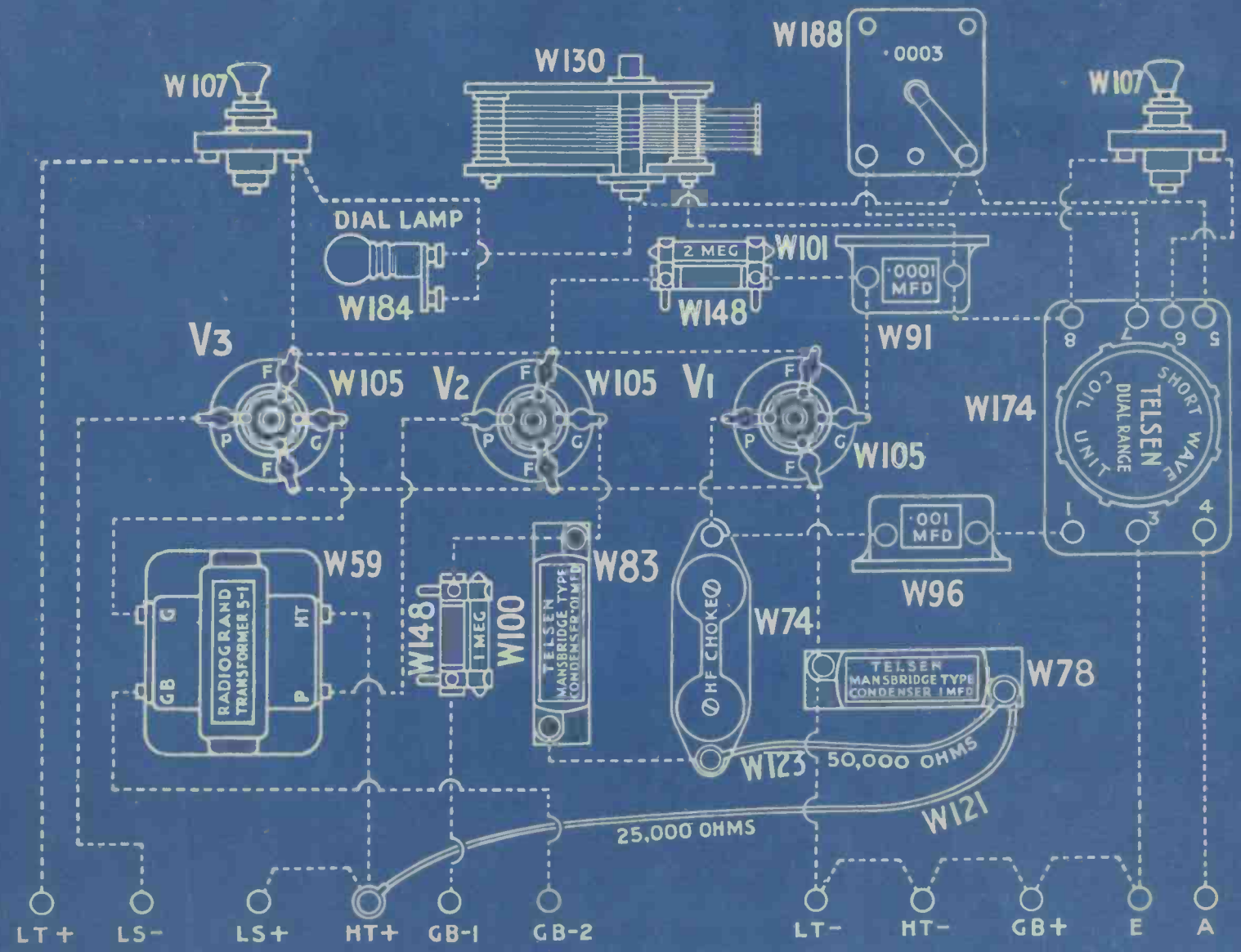
VALVES RECOMMENDED.

Detector	V1 MAZDA H.L.2 or H.210.
L.F.	V2 MAZDA L.2.
Output	V3 MAZDA P.220

Readers who have only just made acquaintance with the pleasure of building their own set will obtain a very much increased interest in their hobby by taking in regularly a weekly wireless journal such as *Popular Wireless*, published every Thursday at 3d.

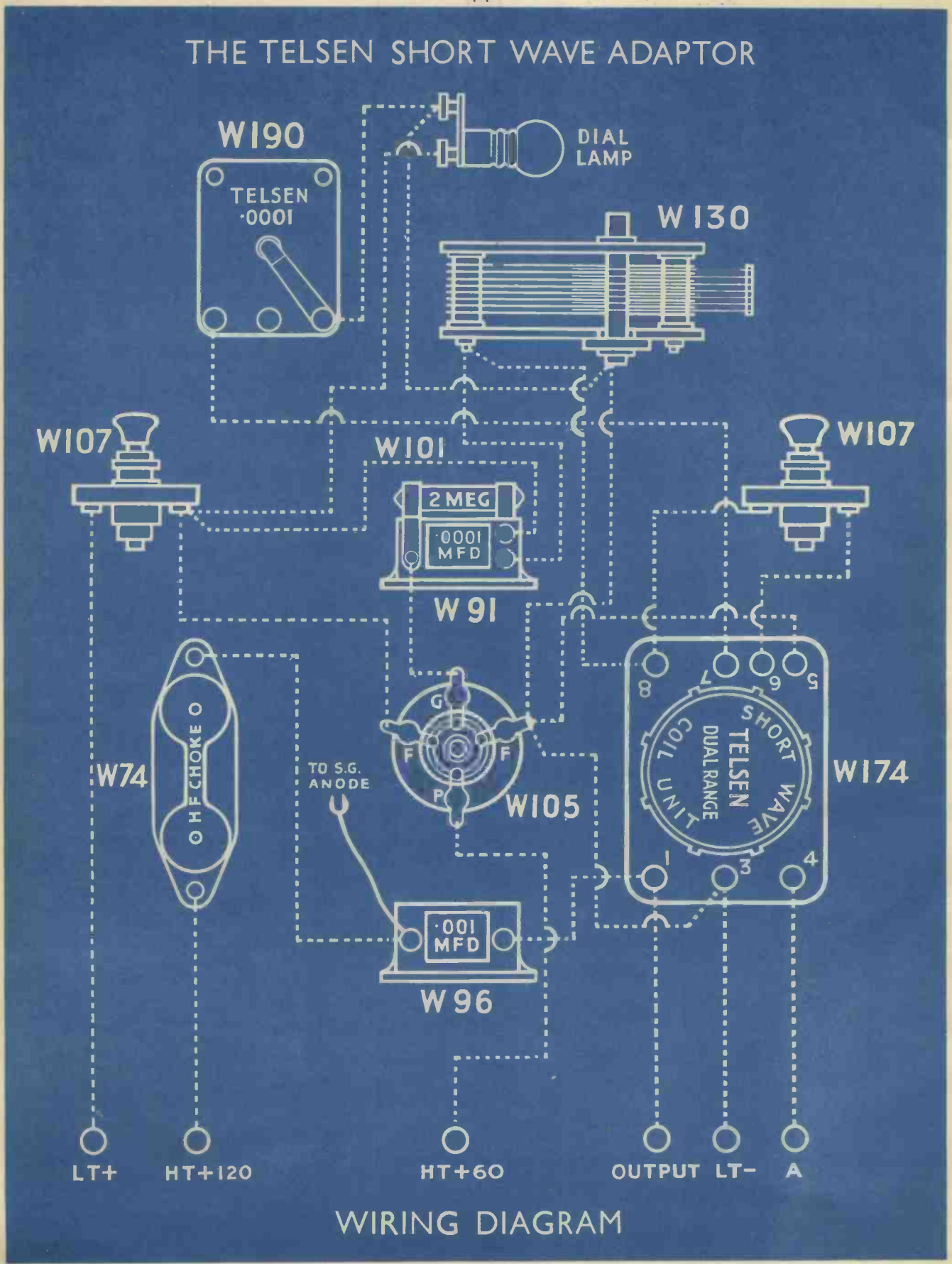
It is always advisable to switch off the set before making any adjustment in H.T. or grid bias values.

THE TELSEN SHORT WAVE 3



WIRING DIAGRAM

THE TELSEN SHORT WAVE ADAPTOR



WIRING DIAGRAM

TELSEN Short Wave ADAPTOR

THIS adaptor fulfils the need of those who have already a satisfactory broadcast receiver in use and do not wish to disturb it or go to the trouble of providing a separate receiver for the short waves only.

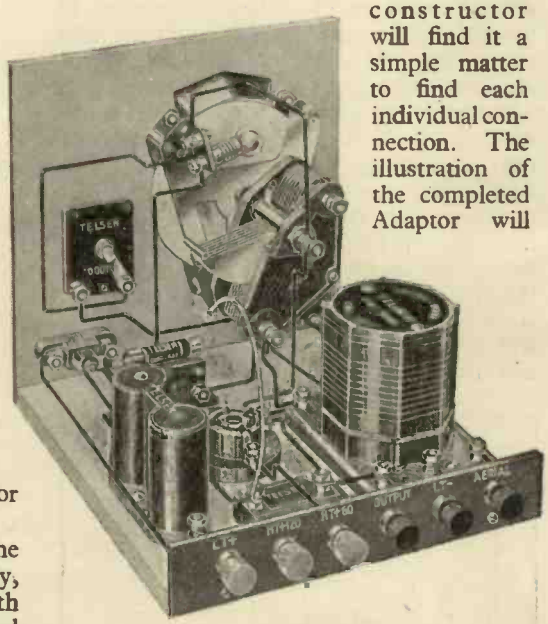
The use of a short wave adaptor enables a choice of short wave reception to be obtained with a minimum of expenditure and trouble. It is used by connecting it to the aerial end of any ordinary broadcast receiver, but best results will be obtained on one employing H.F. amplification as in the case of the " Commodore " Three or " Empire " Four.

When it is desired to disconnect it and use the set for ordinary broadcast reception, it is only necessary to transfer the aerial back to the main receiver, the work of a moment.

This adaptor operates on the super heterodyne principle, which may sound complicated, but actually the tuning of short wave stations with its use, is, if anything, simpler than with the Short Wave Three, although naturally one cannot expect quite the same efficiency as in the case of a circuit designed solely for short wave reception.

The Adaptor may be built up from the description given here, or alternatively, may be purchased in kit form complete with panel, baseboard, wire, terminals, etc., and full size blue print and numbered wiring chart.

Construction requires no lengthy explanation and follows the standard practice of the other circuits in this magazine. It is only necessary to ensure that the connections carrying H.F., *i.e.* all but the filament and H.T. wires, are well spaced from each other and from metal parts. It is advisable before screwing down the baseboard components to try the panel in position with the tuning condenser and disc drive mounted, to ensure that ample space has been allowed for the valve. A blue print of the wiring will be found facing this page and the constructor will find it a simple matter to find each individual connection. The illustration of the completed Adaptor will also act as a guide to the layout of the components on the panel and baseboard.



CONNECTING UP THE ADAPTOR.

The aerial should be removed from the broadcast receiver and attached to terminal " A " on the adaptor. A short direct

wire should then be taken from the terminal marked " Output " to the original terminal on the broadcast receiver, assuming that the filament voltage of the valves in the latter is the same as in the case of the valve it is intended to use in the adaptor. For instance, if it is proposed to use the S.215.A as recommended, it may only be fed from the same accumulator as the main receiver if that contains 2-volt valves. It is presumed that H.T.— and L.T.— are common and the terminals marked H.T. 60 and H.T.120 should be fed with approximately those voltages from the common H.T. battery.

If desired, an ordinary valve of the H or H.L. type, such as " Mazda " H.L.2 may be used instead of the screen grid valve, though signals will not be as strong. In this case do not use the H.T.+60 terminal, and connect the flexible " anode " lead to terminal P on the valve-holder.

Further, the voltage supply of the H.T.+120 terminal must now be reduced to 60.

Having connected the adaptor according to diagram and instructions, switch on and adjust the broadcast receiver to its most sensitive condition on about 2,000 metre wavelength (*i.e.*, near the top of the long-wave range, dials in tune and receiver just not oscillating). Turn adaptor reaction condenser until the short wave circuit oscillates, this condition being verified by momentarily increasing broadcast reaction until that oscillates, then rotating slowly the short wave tuning condenser, when, if all is well, a number of heterodyne whistles will be heard. To tune a station, pick up one of these heterodyne whistles and slack off broadcast reaction condenser until the whistle disappears. Then very carefully re-adjust the short wave tuning condenser, and slight adjustment of the broadcast tuning controls may be carried out. Having thus tuned the broadcast receiver, this needs no further attention, and other short wave stations can be tuned by merely rotating the short wave tuning dial with occasional adjustment of the adaptor reaction control.

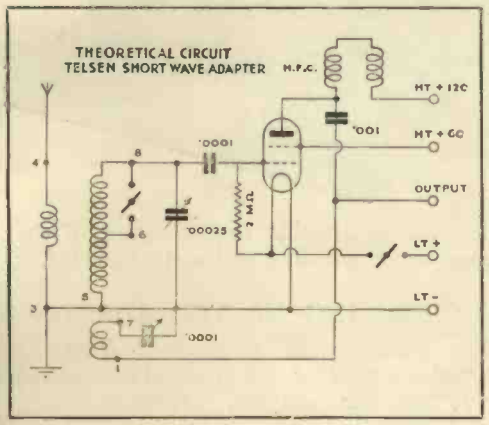
It should be emphasised that reception conditions on short waves vary widely from week to week, the amateur should not be discouraged if results are at times disappointing. It is quite likely that a day or two later he will be equally delighted. Again, the phenomenon of fading will be met with, much more than in the case of medium waves. Once a station is tuned in, if it fades out, do not alter the tuning in an attempt to bring it back, or it may be lost for the evening. It will probably come back strongly in a few moments, and may then be identified and " logged."

TELSEN SHORT WAVE ADAPTOR.

List of Components.

Quantity.	*Description.*	*Cat. No.*	*Price. s.*	*d.*
1	Valve Holder	W.105		6
1	.0001 Mica Condenser	W.91		6
1	.001 Mica Condenser ..	W.96		6
1	Grid Leak 2 meg. ..	W.101		9
1	Short Wave Coil Unit	W.174	4	6
1	.00025 Logarithmic Variable Condenser	W.130	4	6
1	.0001 Reaction Condenser	W.190	2	0
2	Two-point Switches ..	W.107	2	0
1	Binocular H.F. Choke	W.74	5	0
1	Illuminated Disc Drive	W.184	4	6
			24	9

Panel 7×7 ins.
Baseboard 7×7 ins.

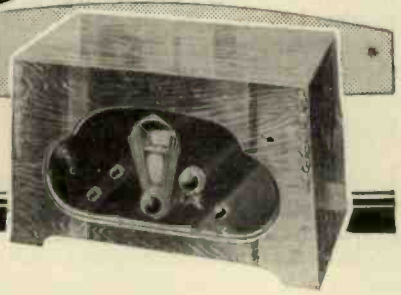


VALVES RECOMMENDED.

Mazda S.215.A. or H.L.2.

The first mentioned is preferable.

The TELSEN TRIPLE THREE

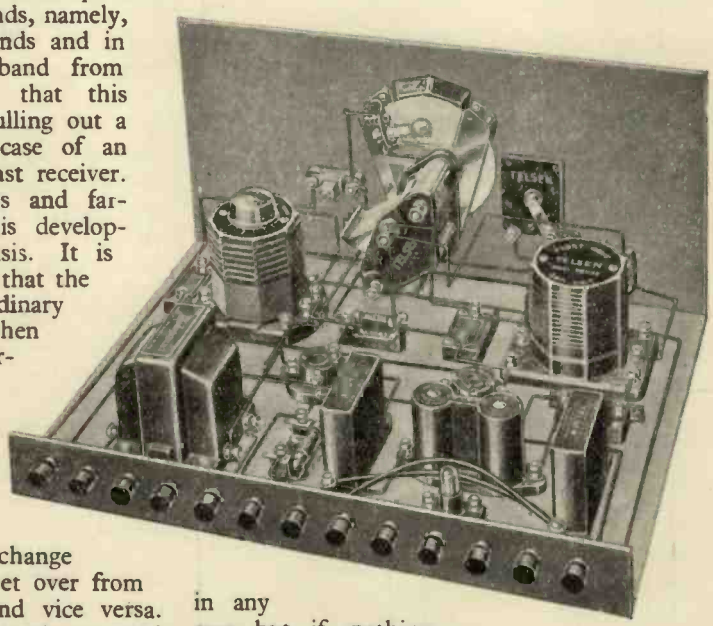


CONSTRUCTORS will find in the Telsen Triple Three a circuit of very novel, not to say revolutionary, properties. As its name implies it is designed to operate, without any change over except for switching, on three wave bands, namely, the usual two broadcast bands and in addition the short wave band from 20-50 metres. We repeat that this change over is made by pulling out a switch exactly as in the case of an ordinary dual range broadcast receiver. The outstanding advantages and far-reaching possibilities of this development will need no emphasis. It is only necessary to point out that the receiver may be used as an ordinary broadcast receiving set, and when it is desired to make an excursion into the realms of short wave this can be done in a moment without so much as changing a wire.

The only addition to the controls is one extra wave change switch which throws the set over from broadcast to short wave and vice versa. The tuning and reaction controls are used identically on all three wave bands.

Apart from this unique triple-band feature, the Telsen Triple Three is an excellent example of a three-valve broadcast receiver giving excellent quality reproduction and sufficient selectivity for modern requirements. Terminals are provided for attachment of a gramophone pick-up and further discussion of this point will be found in an article devoted to the subject.

It will be seen from the illustration that the addition of the short wave tuning coil and its corresponding switch does not complicate construction of the set

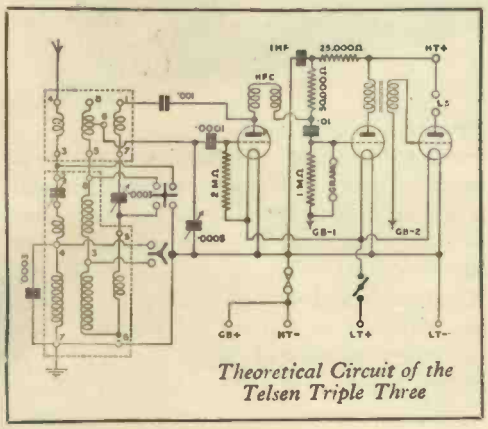


in any way, but, if anything, leads to a more symmetrical and well-balanced layout. The general constructional article on page 37 will give all the particulars necessary for building this advanced yet simple circuit. The layout shown in the photograph and on the blue print should be followed as closely as possible, and the wires associated with the coils and tuning condensers should be well spaced from each other.

The change to short waves is made by a 4-point switch which will require a simple alteration. It is necessary to bridge the two moving contacts which are at present insulated from each other. This is carried out by slacking off the two screws holding them to the centre block and connecting them together by a loop of wire as shown in the blue print. On tightening up it is important to note that the contact pieces have not been displaced. They should be central and pressed up against the raised portion. They are held in place by a square projection which fits the square hole in each, and to keep them in place it is advisable that the washer should be underneath the wire. This connection is easier to make than it possibly sounds from the description, but a little care should be taken in carrying it out, otherwise there is a possibility of not getting proper contact at the switch.

It will be found easier to attach the tuning condenser after most of the panel wiring has been completed. The disc drive may be fitted to the panel together with the other components before this is fixed to the baseboard, but the .0005 mfd. logarithmic condenser is best fitted afterwards.

A fuse is provided as an insurance against accidental short circuits, and if at any time the receiver seems unaccountably "dead" a spare one should be tried. A proper radio fuse must be used, not a flash lamp bulb, which affords no protection. A 2-volt flash lamp bulb will, however, be required for the dial lamp, which will indicate that the set is switched on.



Theoretical Circuit of the Telsen Triple Three

TELSEN TRIPLE THREE.

List of Components.

Quantity.	Description.	Cat. No.	Price. s.	d.
3	Valveholders	W.105	1	6
1	.0001 mfd. Mica Condenser	W.91		6
1	.0003 mfd. Mica Condenser	W.93		6
1	.001 mfd. Mica Condenser	W.96		6
1	Grid Leak 2 meg.	W.101		9
1	Grid Leak 1 meg.	W.100		9
2	Grid Leak Holders	W.148	1	0
1	Aerial Coil with Selectivity Adjustment	W.76	7	6
1	Dual Range S.W. Coil Unit	W.174	4	6
1	.0005 mfd. Logarithmic Variable Condenser	W.132	4	6
1	.0003 mfd. Reaction Condenser ...	W.188	2	0
1	2-Point Switch	W.107	1	0
1	3-Point Switch	W.108	1	3
1	4-Point Switch	W.153	1	6
1	Radiogrand Transformer	W.59	8	6
1	50,000 ohms Spaghetti Resistance ...	W.121	1	6
1	25,000 ohms Spaghetti Resistance ...	W.123	1	0
1	.01 mfd. Mansbridge Condenser ...	W.83	1	6
1	1 mfd. Mansbridge Condenser ...	W.78	2	3
1	Binocular H.F. Choke	W.74	5	0
1	Fuse Holder	W.146		6
1	Illuminated Disc Drive	W.184	4	6
	Panel 14in. × 7in. Baseboard 14in. × 9in.		52	6

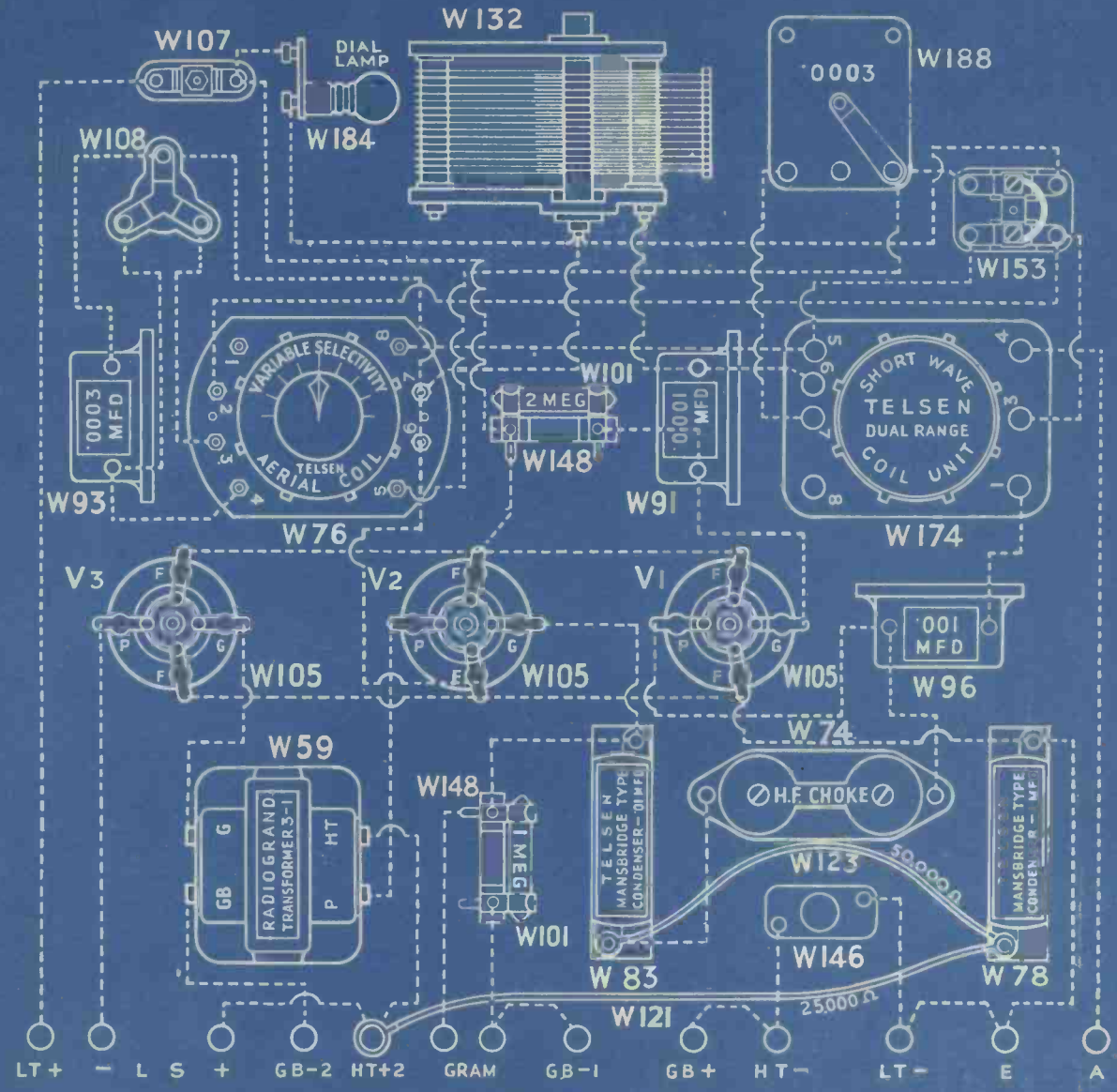
The constructor is referred to the article on page 51 for the types of battery recommended for this receiver.

Tuning is perfectly normal, except that on the short waves the set should be operated as nearly as possible to the oscillation point, and tuning should be carried out very slowly. The two-point switch closes the filament circuit on being pulled out. The other two are wave change switches, and their operation may be easily memorised as follows. For long waves, push in (open) both switches. For medium waves (220-550 metres) pull out the three-point switch (right hand facing panel). For short waves (20-50 metres) pull out the left-hand (four-point) switch. The dual range feature of the short wave coil is not employed in this circuit, as the .0005 mfd. tuning condenser on the single range covers a band of 20-50 metres, which includes most of the interesting programmes, and avoids the complication of an additional switch.

VALVES RECOMMENDED.

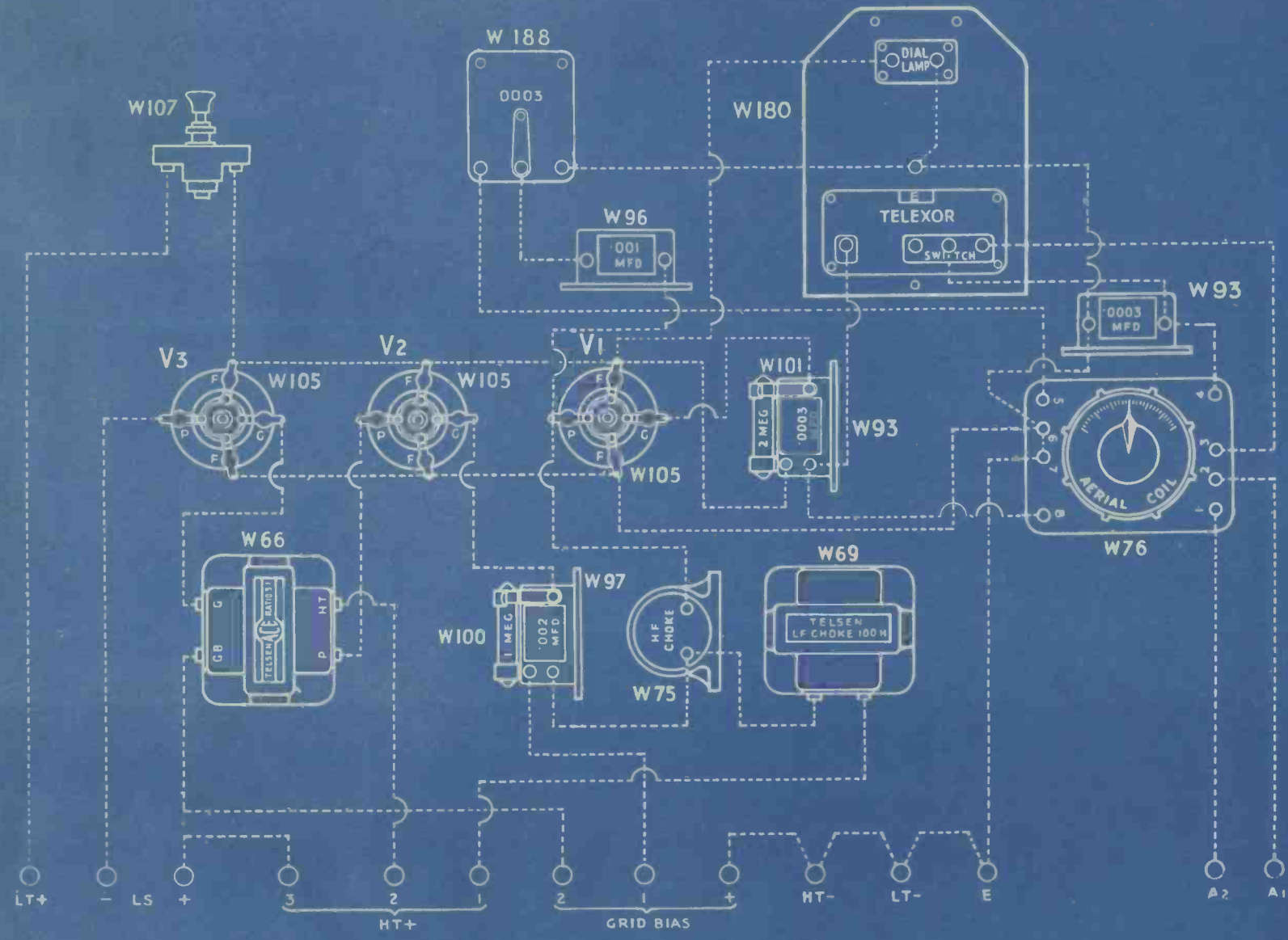
Detector .. V.1 Mazda H.L.2 or H.210.
L.F. .. .. V.2 Mazda L.2.
Output .. V.3 Mazda P.220 or P.220A.

THE TELSEN 'TRIPLE' 3



WIRING DIAGRAM

THE TELSEN TELEXORIZED 'CONQUEROR' 3

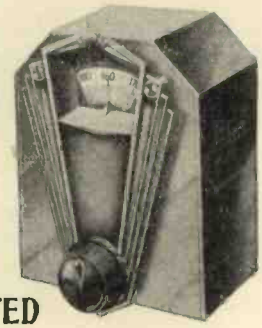


WIRING DIAGRAM

The "TELEXOR"

A NEW DEVELOPMENT

WAVE-CHANGE SWITCHING OBVIATED



IT is safe to predict that the word "Telexor" will take a prominent part in the discussions of radio enthusiasts in all parts of the country. It is also anticipated that the "Telexor" will be adopted as a standard tuning device for its simplicity and convenience are certain to make it popular. Simplicity is one of the greatest assets of a modern radio receiver, and every move to eliminate unnecessary controls is welcomed.

WHAT IS THE "TELEXOR"?

To allay the curiosity of the reader at the outset, it may be said at once that the "Telexor" is primarily a tuning device which does away with wave-change switching (plug-in coils, of course, are not even taken into consideration). Perhaps it would be more accurate to say that the "Telexor" *automatically* carries out the operation of wave-change switching, and, therefore, the listener has no further need to bother with it.

The "Telexor" also incorporates a tuning condenser of special design, such that it rotates round the whole circle instead of the usual half-circle. Half of this movement is available for one wave band and the remainder for another. For broadcast purposes, therefore, the medium wave stations will be received on various readings from 0 to 100, and the long wave on various readings from 101 to 200. There is, in fact, no need for the totally uninitiated to concern themselves whether they are long or short wave stations, as it is no longer necessary to remember to operate the wave change switch. The "Telexor" does all that is necessary automatically, and the list of stations which are habitually received can be "logged" on one set of readings with the greatest possible simplicity.

It may be thought that this involves a complicated piece of apparatus which the home constructor would do well to avoid. The exact contrary is the case. The construction of a receiver employing a "Telexor" becomes simpler than ever. In the first place, it is not necessary to buy and attach a separate slow motion dial. A special disc drive with the dial marked to read from 0 to 100 in one direction, and from 101 to 200 in the other, in accordance with the requirements of the "Telexor," is built into the instrument itself. A striking escutcheon plate of modern design, finished in oxydised silver, is likewise part of the component and in mounting the "Telexor," therefore, a very efficient and attractive disc drive is already fitted.

HOW TO "TELEXORISE" YOUR SET

The "Telexor" replaces, as will have been gathered from the foregoing remarks, the tuning condenser and wave change switch. It is recommended for use with the Telsen dual range coils, but it will work equally well with any dual range coil operated by

THE TELEXOR (cont'd).

shorting switches. Two terminals are provided representing the ordinary fixed and moving vane connections of the tuning condenser. The terminal marked G, should be connected to the grid circuit, *i.e.*, terminal No. 8 on the Telsen coil, and the earth terminal to terminal No. 6 on the coil. The other three terminals provided are available for switching purposes, and in the case of the Telsen coils, two of them will be connected to terminals 3 and 4 respectively, and as there is a spare one, this will be left free.

This completes all the necessary connections to the " Telexor " for any ordinary tuning circuit such as those in this magazine, and it will therefore be seen how simple it is to " Telexorise " an existing circuit. The complete circuit of the " Conqueror Three " adapted to employ a " Telexor " is illustrated on the blue print facing this article.

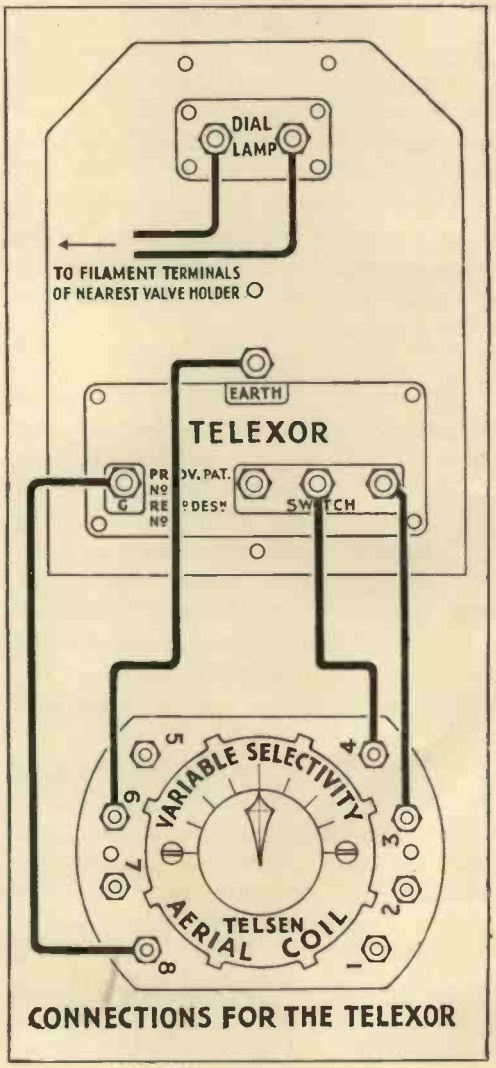
The two terminals marked " Dial Lamp " should be connected to the positive and negative filament leads of the valve-holders and a flash lamp bulb of suitable voltage may be inserted in the holder by removing the cover. This, of course, is to illuminate the dial, which not only facilitates reading the figures but adds greatly to the appearance of the set, and as the light indicates when the set is switched on, it is also a safeguard against run-down batteries.

FOR H.F. CIRCUITS.

Two " Telexors " may be used in sets containing two tuned circuits, such as the " Empire Four " and " Commodore Three " described elsewhere in this issue of the *Radiomag*. The connections will be exactly the same, each " Telexor " being connected to its appropriate coil in the manner described above and also clearly shown in the accompanying diagram. All wave-change switching is thereby removed and the number of operating controls reduced to a great extent.

Readers need have no hesitation whatever in replacing any tuning condenser and switching by a " Telexor," with the certainty of obtaining simplified operation and, undoubtedly an enhanced appearance and neatness in the home-built receiver.

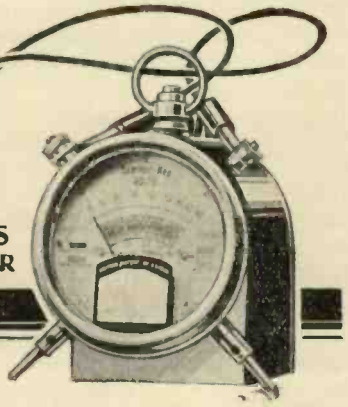
The " Telexor " is arranged so that it may be mounted either on panel or baseboard. Full instructions for either method are given in the leaflet which is packed with each instrument. Provision is also made for different thicknesses of panel.



CONNECTIONS FOR THE TELEXOR

TRACING Troubles

SOME USEFUL TIPS FOR THE AMATEUR



IF, after completing and connecting up the set, no signals are received, it is well to remember that the chances of it being due to a faulty component are less than one in a thousand. It cannot be too strongly emphasised that the time taken to find the trouble can be reduced to a matter of minutes if a methodical procedure is adopted. The value of a suitable meter in tracing circuit connections cannot be over estimated, and in this connection the "Pifco" Radiometer would be found invaluable provided its indications are properly interpreted. In the absence of a meter, continuity in a circuit can be tested by means of a flash lamp battery and pair of headphones, or in place of the headphones a suitable flash lamp bulb will indicate continuity where there is no high resistance in the circuit. Continuity tests should be made with the valves removed in order to ensure that an injurious voltage is not applied to the filaments.

On touching the grid terminal of the first valve holder with the moistened finger, a distinct sound should be heard in the loud speaker. If this is so, the whole of the circuit between that point and the loud speaker may be considered to be at least working, and lack of signals should be looked for in the aerial circuit and its connections. If there is no sound on touching the grid terminal of the first valve holder there is no need yet to investigate the aerial circuit, and the same test should be carried out with each of the successive valve holders, which will very quickly narrow down the field of search. The sound on the last valve holder will not be very distinct, but the H.T.— plug may be removed as a last resort and tapped on its socket, when there should be a loud click. Failing this the loud speaker adjustment should be inspected and the circuits traced through from the H.T.+ terminals through the appropriate components, including the loud speaker, to the various plate terminals on the valve holders. Similarly the L.T. connections should be checked, not by merely verifying that the right terminals are connected to the right battery, but by tracing each circuit through. It is here that a circuit test is very useful. If there is continuity between H.T.+ and each valve plate, these circuits may be considered in order. Similarly, there must be no continuity between H.T.+ and any grid or any filament terminal. The battery, of course, must be disconnected for these tests.

Continuity tests of this kind will quickly show up a fault in wiring which may not be apparent to any but the most careful visual search. For instance, incorrect assembly of the grid leak clips and connections will be sufficient to stop reception.

When a sound can be produced by touching one grid terminal and not the next, it is evident that the fault lies between the two, and if the valves are beyond suspicion and the anode feeds have been tested, the grid circuits should be carefully traced and checked.

When a sound has been obtained by touching the grid terminal of the first valve this test should now be applied to the No. 1 terminal of the aerial coil. If this does not occur, the connections in the aerial coil circuit should now be examined.

In sets employing S.G. valves the aerial may be connected to No. 1 terminal on the H.F. coil and if this circuit is in order and the detector and L.F. portions of the set are functioning, reception should be possible, using the right hand dial and reaction condenser. If reception can be obtained under these conditions the aerial should be transferred to the No. 1 terminal on the aerial coil, and if no reception is then possible the fault must lie in the aerial coil circuit or H.F. choke circuit.

In this manner search is very rapidly narrowed down, and the fault should be quickly traced, when hours of indiscriminate investigation might give no result.

If a milliameter is available a very quick test becomes possible. The meter should be connected between the H.T.— wander plug and the negative socket of the battery. On switching on, the meter should show the full H.T. consumption of the combined valves. The valves may now be removed one by one, when the current will drop by the amount taken by each valve. The output valve will usually take more current than all the others put together, and average currents will be :—

Detector valve ..	.. 1-2 mA.
L.F. valve ..	.. 3 mA.
Screen grid valve	.. 3 mA.

If current is flowing to each valve it indicates that the filament and anode circuits are almost certainly in order. Excessive current for any valve will indicate that its grid bias circuit is disconnected or wrongly connected. If all anode currents are in order the fault is probably confined to the grid circuits, and which of these is at fault can be found by the method described above.

An output filter is always desirable when using an eliminator as this keeps the H.T. voltage off the loudspeaker leads. Either an output transformer may be used, or a suitable output choke in combination with a condenser. A range of chokes covering all requirements will be found illustrated in the centre section of the "Radiomag." Full instructions for their use are given in a leaflet packed with each. An improvement in quality of reproduction usually follows.

Selectivity Control

THE proper use of the adjustment on top of the Telsen coil will enable a wide degree of adjustment to be obtained in the matter of selectivity and will compensate for any large divergences in the length of aerial, etc. When turned to the extreme left, maximum strength will be obtained, and although selectivity is adequate for many districts, it will not be so for listeners residing in a Regional area. On getting interference from one station while listening to another, this knob should be gradually turned to the right, at the same time slightly adjusting the tuning until the interference disappears. If strength is now insufficient, a little reaction may be used to make it good. Whenever reaction is altered, the tuning control should be tried to ensure that it is on the best point.

The selectivity control can also be used to reduce the local station to reasonable strength. This will reduce distortion due to overloading. This setting will usually be satisfactory for best all round results, and it should not be necessary to alter the adjustment continually.

Generally speaking, use as little reaction as is necessary to give the volume required.

For all general purposes, an aerial of about 60 feet long and as high as possible will give the greatest range. When close to a powerful broadcasting station it may be helpful to cut the length down to half, though the selectivity control on the Telsen aerial coil will compensate for all but extreme cases.

With a short aerial, or where the nearest broadcast station is some way off, best results may be obtained with the aerial attached to terminal No. 1 on the aerial coil. This puts the selectivity control out of action.

New listeners should be content with reception from their local stations, and should not indulge in hunting for distant stations until they are sufficiently familiar with the set to know instantly whether it is oscillating or not. Reception of distant stations is always much easier when the local station has shut down.

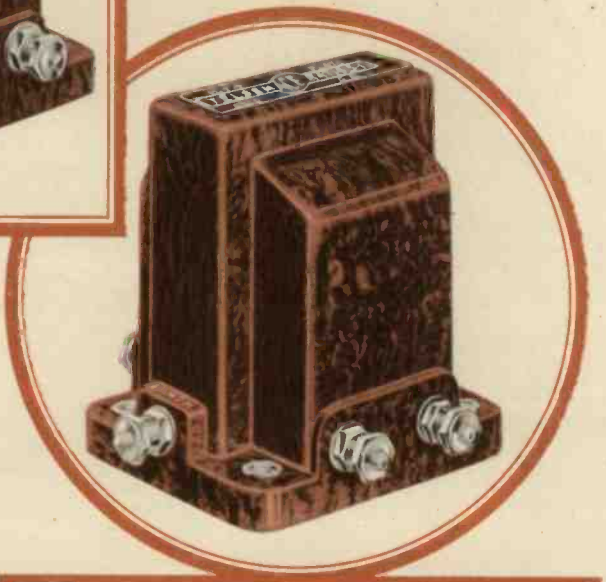
L.F. TRANSFORMERS

TELSEN "RADIOGRAND" L.F. TRANSFORMERS

Telsen "Radiogrand" Transformers have signified to expert designers and enthusiastic constructors all that is finest in British radio craftsmanship. Every "Radiogrand" Transformer is built on the soundest engineering principles and tested under broadcast conditions for immaculate performance and enduring efficiency.

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

Price 8/6



TELSEN "ACE" L.F. TRANSFORMERS

Similar to the famous "Radiogrand" Transformer in its life-like reproduction and capacity for reliable service, the Telsen "Ace" is eminently suitable for receivers where highest efficiency is required at a low cost and where space is limited.

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

Price 5/6

TELSEN "RADIOGRAND" RATIO 7-1 TRANSFORMER

This transformer is designed to give extra high amplification on receivers employing only one stage of L.F. amplification. Following the detector in the popular screened grid three arrangement it will give sufficient power to load fully the output valve. It is not recommended for use in receivers employing two L.F. stages as overloading is likely to occur.

No. W.60.

Price 12/6

TELSEN "RADIOGRAND" INTER-VALVE TRANSFORMER, RATIO 1.75-1

For use in receivers employing two stages of L.F. amplification, where exceptionally good quality is desired. The somewhat lower step-up ratio is amply offset by the extra power available under modern receiving conditions. When used following an L.F. stage employing choke coupling it will be found to give ample volume with remarkable reproduction.

No. W.61.

Price 12/6

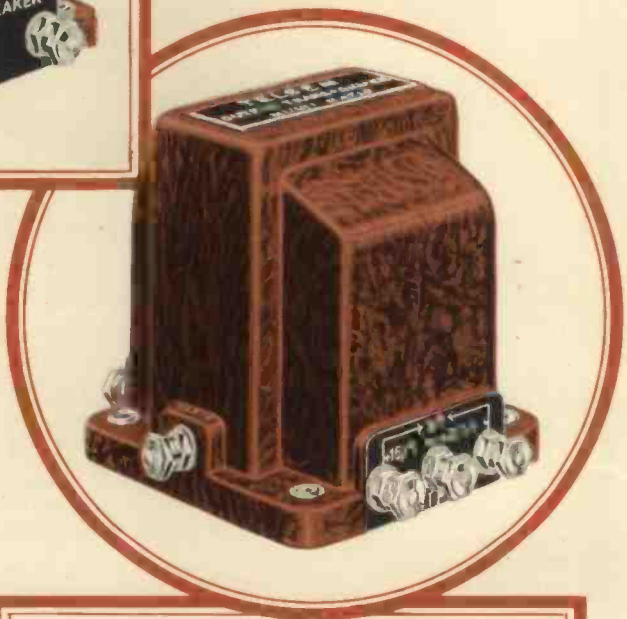
OUTPUT TRANSFORMERS

TELSEN OUTPUT TRANSFORMER, RATIO 1 - 1

This Transformer is intended for connecting the loudspeaker to the output stage of the receiver. Its object is to avoid saturation of the loudspeaker magnet system, by isolating the direct current from the speaker windings. This produces a remarkable improvement in the quality of reception. It also serves to keep H.T. voltage from the speaker and its leads, which is especially important when using a D.C. Eliminator. The primary terminals should be connected to the original loudspeaker terminals on the receiver, and the loudspeaker should then be connected across the secondary of the transformer, which may be mounted inside or outside the receiver. Suitable for anode current up to 40 m/A. D.C. Resistance of primary 280 ohms.

No. W.62.

PRICE 12/6



TELSEN MULTI RATIO OUTPUT TRANSFORMER

This is designed for use with moving coil loudspeakers having low impedance speech coil windings. It has three ratios—9-1, 15-1 and 22.5-1, which allows the correct matching of speakers of widely varying characteristics. The primary is connected in the anode circuit of the ouptut valve, and the loudspeaker is fed from two of the secondary terminals. Suitable for anode currents up to 40 m/A. D.C. Resistance of primary 180 ohms.

No. W.63.

Price 12/6

TELSEN POWER PENTODE OUTPUT CHOKE

The purpose of this Power Pentode Output Choke is to prevent direct current passing through the loudspeaker, and also to match the speaker to the pentode valve. By using this choke in conjunction with a condenser of 1 mfd. the quality obtained from a pentode becomes quite equal to that expected from a normal super power valve, and the volume is much increased. This model is suitable for mains power pentodes carrying currents up to 40 m/A and for correct matching gives a choice of three ratios, viz. :— 1-1, 1.3-1 and 1.7-1. Total D.C. Resistance, 490 ohms.

No. W.172.

Price 12/6

L.F. & OUTPUT CHOKES

TELSEN INTERVALVE L.F. COUPLING CHOKES

These popular L.F. Chokes are primarily intended for use as coupling chokes in the anode circuits of modern radio receivers, but may be used in any circuit not carrying more than the stipulated maximum current. The 100 H. type should be connected in the anode circuit of an H or HL type valve. The 40 H. type is designed for use with an L type valve. Either is highly suitable for power grid detection where the anode current does not exceed the specified limit.

Rating	Normal Current	Max. Current	No.
40 H. at	5 mA.	8 mA.	W.68
100 H. at	3 mA.	6 mA.	W.69

Price 5/-

TELSEN TAPPED PENTODE OUTPUT CHOKE

This choke is designed primarily for pentodes taking an anode current of not more than 20 m/A which includes the ordinary battery operated types. The single tapping provided gives (by reversing) ratios of 1-1, 1.6-1, and 2.5-1, which provide for matching under widely varying conditions. The choke is equally suitable for matching a low impedance speaker with an ordinary power valve. A coupling condenser of 1 mfd. is recommended. Total D.C. Resistance 490 ohms.

No. W.72.

Price 8/6

TELSEN OUTPUT CHOKE

Designed for use as Output Filter in conjunction with a condenser not less than 1 mfd. This choke has been modified to deal with any power or super power valve taking up to 40 m/A and the D.C. Resistance has been reduced to 242 ohms. The inductance is now 15 H at 5 m/A and 8 H at 40 m/A which values are adequate to give a practically level power response down to 50 cycles.

No. W.71.

Price 8/-

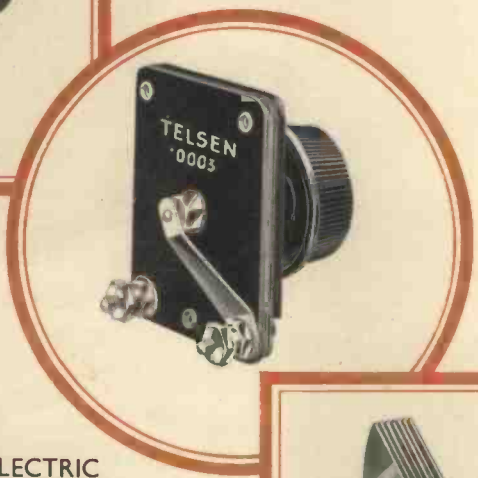
VARIABLE CONDENSERS

TELSEN DIFFERENTIAL CONDENSERS

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

Differential Condensers.

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



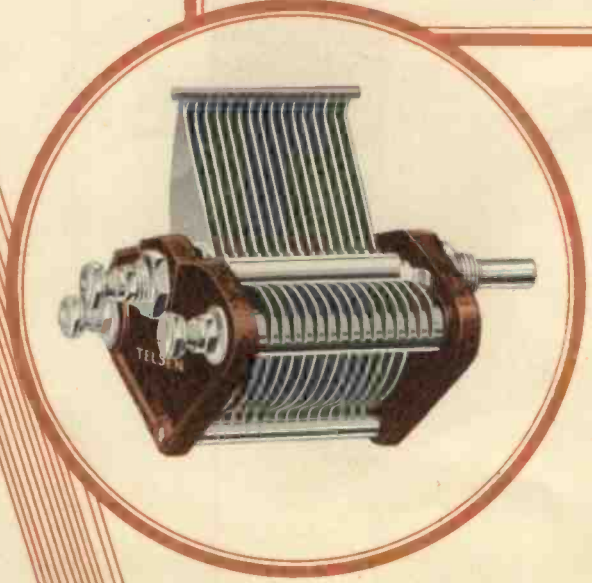
REACTION CONDENSERS.

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

TELSEN BAKELITE DIELECTRIC TUNING CONDENSER

Redesigned on an entirely new principle giving great rigidity with compactness and high efficiency, this condenser may be used with confidence where space is limited. The frame is of improved and rigid construction, and the spindle is so mounted as to make endplay impossible. The well braced vanes are interleaved with a minimum of highest quality solid dielectric, and complete accuracy of tuning is obtained. Supplied complete with knob.

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



TELSEN LOGARITHMIC VARIABLE CONDENSERS

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

Capacity .0005. No. W.132.
Capacity .00025. No. W.130.
Capacity .00035. No. W.131.

Price 4/6

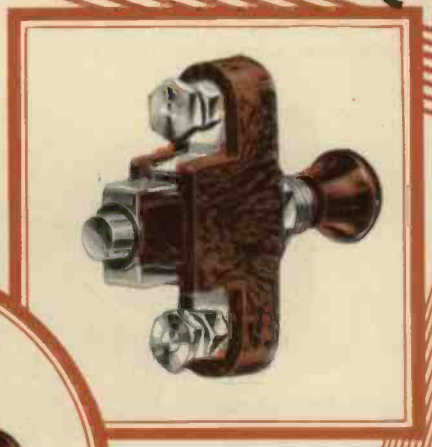
SWITCHES & DIALS

TELSEN PUSH-PULL SWITCHES

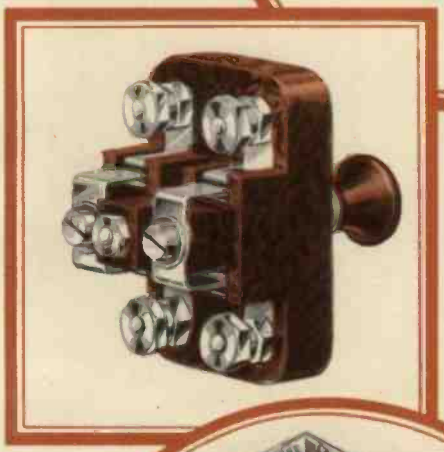
(*Prov. Pat. No.* 14125/31)

The Telsen Push-Pull Switches are designed on sound engineering principles. They employ the " knife " type of self-cleaning contact, as used in electrical power work, 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.

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



Three-point. No. W.108.
Price 1/3

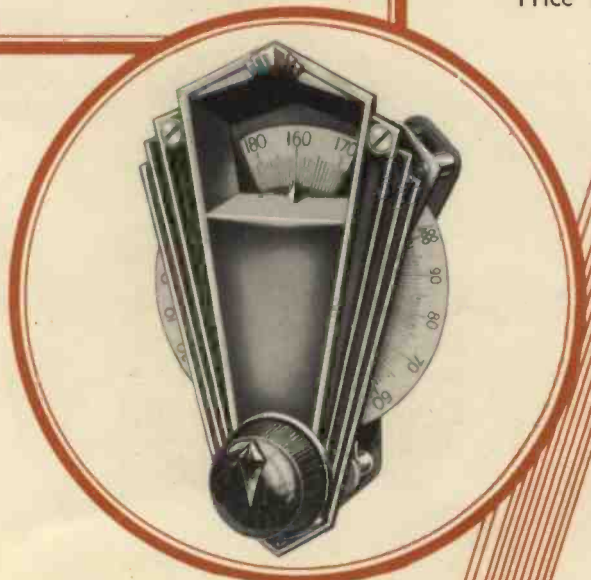


TELSEN FOUR-POINT " TWO-POLE " PUSH-PULL SWITCH

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

Designed on exactly the same principles as the Telsen two-point and three-point switches described above, this model is a two-pole switch highly suitable for use in wave changing on two coils or an H.F. Transformer.

No. W.153.
Price 1/6



TELSEN ILLUMINATED DISC DRIVE

Fitted with a handsome oxydised silver escutcheon of modern design, this drive incorporates an improved movement, which gives an exceptionally smooth action with no possibility of slip. The gear ratio of approximately 5-1 and the bold and well proportioned figures, make for delightfully easy tuning, and as the dial rotates over the full circle, all types of condensers are catered for. The dial may be illuminated by means of an ordinary flash lamp bulb. A double ended spanner to fit all TELSEN " one hole fixing " nuts, is supplied free with every Disc Drive.

No. W.184.

Price 4/6

H.F. CHOKES

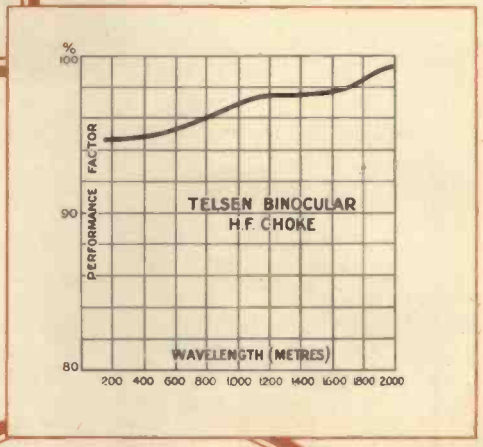
TELSEN BINOCULAR H.F. CHOKE

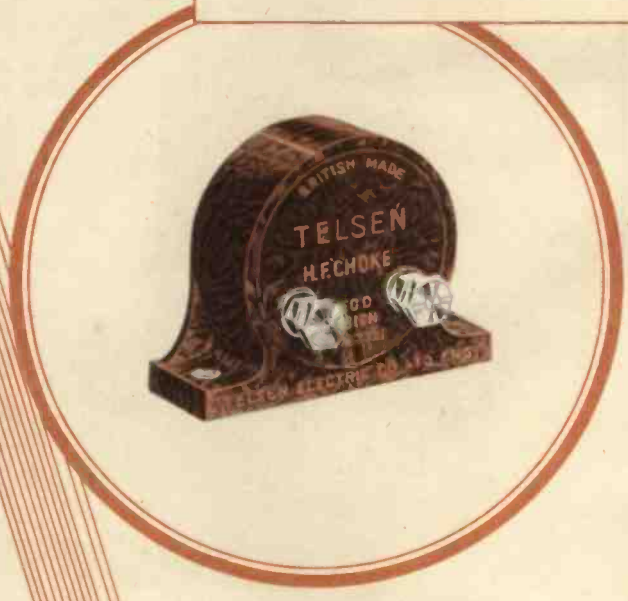
In H.F. amplification the performance of a choke is of supreme importance. The Telsen Binocular H.F. Choke is called for wherever the highest efficiency is required. Its high inductance (180,000 micro-henrys) and exceptionally low self-capacity (.000002 microfarad) ensure a very high impedance at all wavelengths, and its excellent efficiency curve proves that it is free from parasitic resonances. These qualities, together with the restricted field due to the binocular formation, make it the ideal choke for a high class circuit.

No. W.74.

Price 5/-

The curve below, published by courtesy of *Amateur Wireless*, represents the efficiency of the Telsen Binocular Choke over the broadcast band.





TELSEN STANDARD H.F. CHOKE

The Telsen Standard H.F. Choke, which utilises the minimum baseboard space, is designed to cover the whole broadcast band and has the very low self-capacity of .000008 microfarad. It is highly suitable for reaction circuits. The inductance is 150,000 micro-henrys and the resistance 400 ohms. It has proved very popular and has been incorporated by set designers in many of the leading circuits.

No. W.75.

Price 2/-

DUAL-RANGE TUNING COILS

TELSEN DUAL RANGE AERIAL COIL

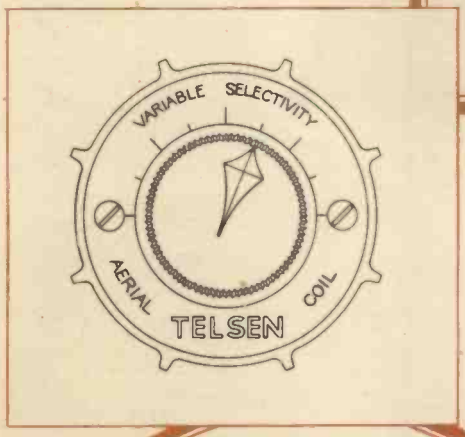
Incorporates a variable series condenser, which can be set up to give any degree of selectivity, making the coil suitable for widely varying reception conditions. This adjustment also acts as an excellent volume control, and is equally effective on long and short waves. The waveband change is effected by means of a 3-point switch and a reaction winding is included.

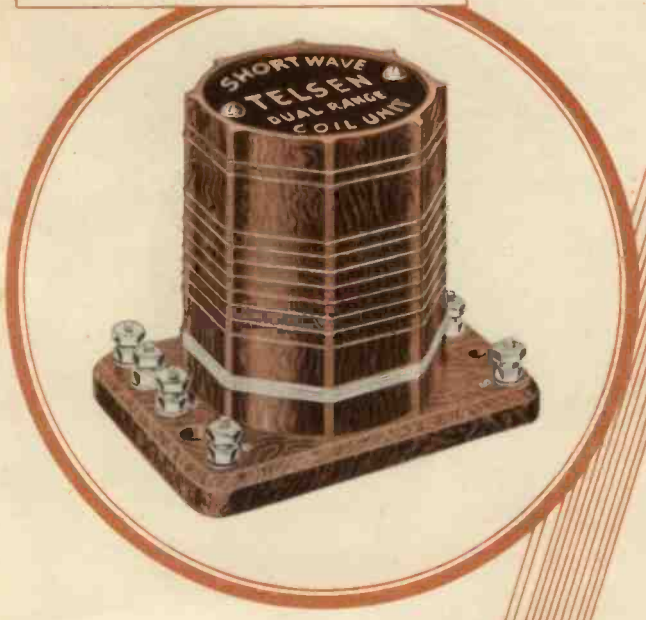
THE TELSEN H.F. COIL

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.

AERIAL COIL No. W.76 .. **Price 7/6**

H.F. COIL .. No. W.154 .. **Price 5/6**





TELSEN COMBINED DUAL RANGE SHORT WAVE COIL UNIT

This Unit for the first time brings the construction of short wave receivers into line with the simplicity of modern practice. When tuned by a .00025 condenser, a wave range of 20 to 80 metres can be covered by the operation of a switch as in ordinary broadcast practice. No coil changing is necessary and no other coils are required, as the unit incorporates windings for aerial, tuning and reaction circuits. The coil is also suitable for use with sets covering all wave bands with a .0005 tuning condenser. In this case the Dual Range feature is not employed.

No. W.174.

Price 4/6

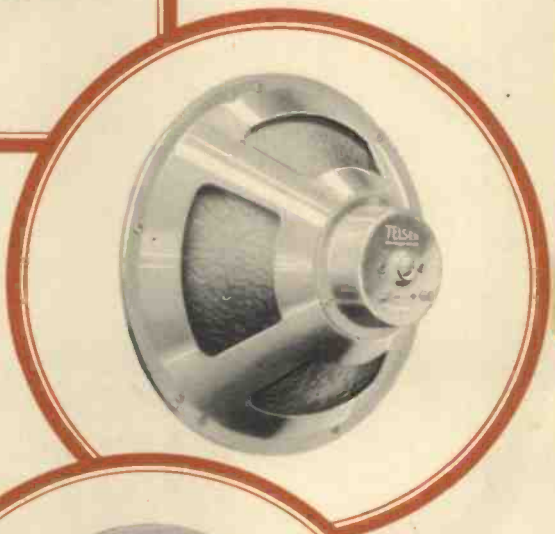
LOUDSPEAKERS

THE TELSEN CABINET SPEAKER

A thoroughly reliable Loudspeaker, giving a very fine performance, pleasing to the most sensitive ear. The natural resonances have been adjusted so that a good tone-balance is obtained. The artistic bakelite cabinet is finished in polished mottled walnut and will harmonise with any surroundings. Size, 11 in. high, 11¼ in. wide, 3½ in. deep.

No. W.53.

Price 25/-

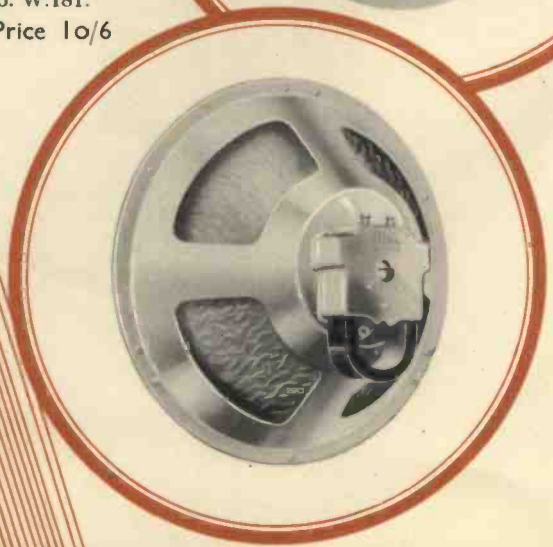


TELSEN W.181 LOUDSPEAKER

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

No. W.181.

Price 10/6



TELSEN W.182 LOUDSPEAKER

This complete Loudspeaker Chassis incorporates a powerful unit of the 4-pole type with a high degree of sensitivity and is capable of handling large power outputs. The tonal range is exceptionally fine, combining both depth and brilliance to a remarkable degree. The fully floating cone of special damp-resisting material is mounted in a rigid pressed frame. Telsen No. 183 Loudspeaker Chassis is fitted with a powerful 4-pole unit of similar design but the cone diameter is 14½ ins.

No. W.182
(Diam. 11 in.)
Price 17/6

No. W.183
(Diam. 14½ in.)
Price 22/6

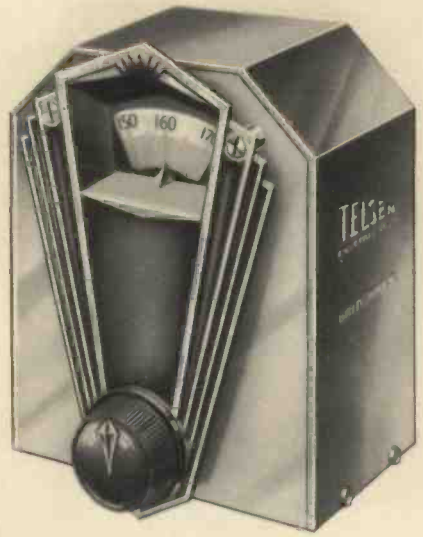
THE TELEXOR

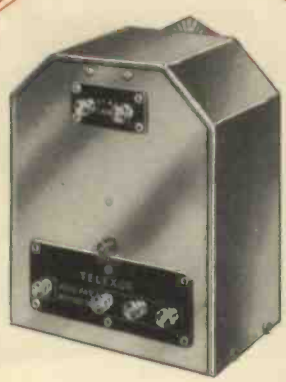
THE TELEXOR

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

No. W.180.

Price 12/6





MOUNTING INSTRUCTIONS

Full instructions are included with every Telexor for baseboard or panel mounting, together with the necessary screws. The approximate overall dimensions excluding the escutcheon plate are 5¼ in. high, 4¼ in. wide and 2¾ in. deep.

ALL THE WORLD ON ONE DIAL

The Telexor obviates the necessity of the wave change switch. The whole of the medium and long wave broadcast band is covered with one turn of the dial.

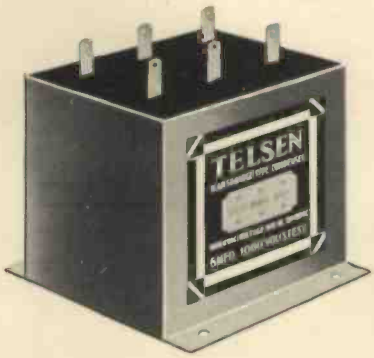
CONDENSERS

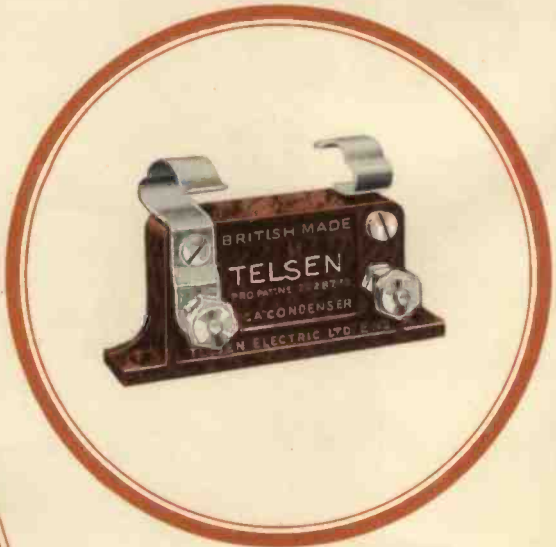
TELSEN MANSBRIDGE TYPE CONDENSERS

Cap. Mfd.	500 volt test. No.	Price.	1,000 volt test No.	Price.
.01	W.83 ..	1/6	W.90 ..	2/6
.04	W.81 ..	1/9	W.88 ..	2/9
.1	W.82 ..	1/9	W.89 ..	2/9
.25	W.80 ..	2/-	W.87 ..	3/-
.5	W.79 ..	2/3	W.86 ..	3/3
1	W.78 ..	2/3	W.85 ..	3/6
2	W.77 ..	3/-	W.84 ..	5/-
4	W.175..	5/6	W.178..	9/6
6	W.176..	8/-	W.179..	14/6
8	W.177..	10/6		

TELSEN MANSBRIDGE TYPE CONDENSERS

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





TELSEN FIXED MICA CONDENSERS

(Prov. Pat. No. 20287/30)

The Telsen Fixed Mica Condensers are made in capacities up to .002 mfd. Careful design and manufacture result in the H.F. losses being practically negligible. The .0003 Telsen fixed mica condenser is supplied complete with patent grid leak clips for series or parallel connection. All sizes may be mounted upright or flat.

Cap. Mfd.	No.		Cap. Mfd.	No.
.002	W.97	..	.0003	W.93
.001	W.96	..	.0002	W.92
.0005	W.95	..	.0001	W.91
.0004	W.94	..		

Price 6d.

VALVE HOLDERS ETC

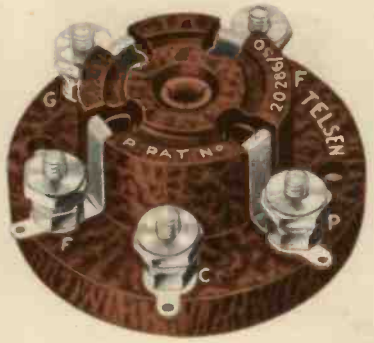
TELSEN VALVE HOLDERS

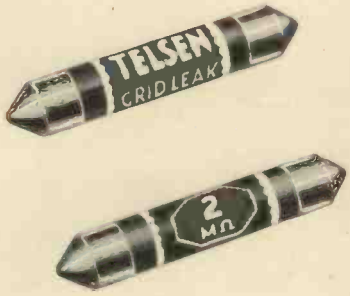
(*Prov. Pat. No.* 20286/30)

Telsen valve holders incorporate a new design embodying patent metal spring contacts, which provide the most efficient contact with split or non-split valve legs. The metal springs are extended in one piece to form soldering tags. Telsen valve holders have a very low capacity and are self-locating.

4-pin. No. W.105. 5-pin. No. W.106.

Price 6d. Price 8d.





TELSEN GRID LEAKS

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

Cap. Megohms.		No.
5	..	W.104
4	..	W.103
3	..	W.102
2	..	W.101
1	..	W.100
½	..	W. 99
¼	..	W. 98

Price 9d.

TELSEN PRE-SET CONDENSERS

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

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

Price 1/6

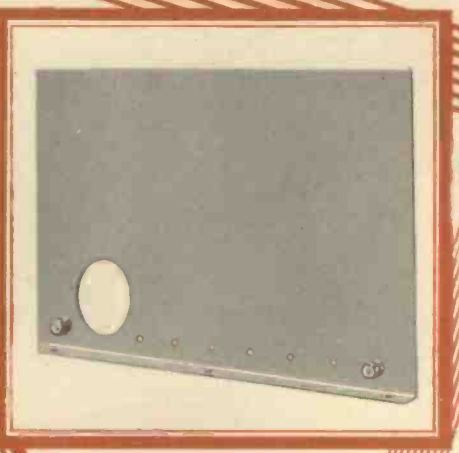
SCREENS ETC.

TELSEN SCREENS

These are beautifully finished, and a series of holes is provided for fixing in different positions the movable terminals which are supplied. Size 6″ deep × 9¾″ wide.
In model No. W.167 a hole is provided for mounting the screened grid valve in a horizontal position.

No. W.166. Price 2/-

No. W.167. Price 2/6



TELSEN FUSE HOLDER

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

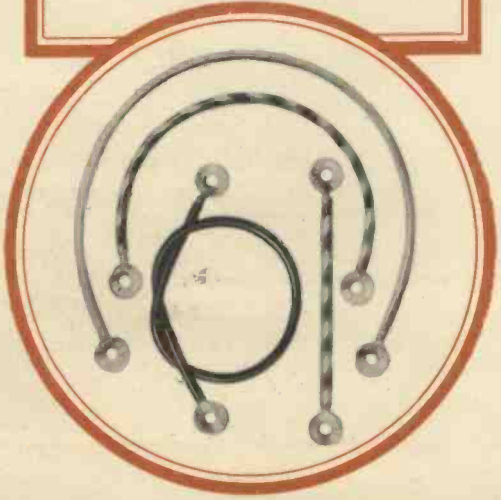
No. W.146.
Price 6d.

Note.–The illustration shows the Telsen fuse holder in use with the standard type fuse.

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 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. The tags are firmly clamped to the element and are clearly marked with the value after stringent test.

Made in the following values :—

Resistance Ohms.		Maximum Current	Price
300	600	42 mA.	6d.
750	1,000	42 mA.	
1,500	2,000	23 mA.	9d.
3,000	4,000	23 mA.	
5,000		23 mA.	
10,000	15,000	6 mA.	1/-
20,000	25,000	6 mA.	
30,000		6 mA.	
50,000	60,000	3 mA.	1/6
80,000	100,000	3 mA.	

TELSEN 1932 CIRCUITS

SONGSTER 2 · CONQUEROR 3
COMMODORE 3 · EMPIRE 4

SINCE the first issue of the " Radiomag " much appreciation has been expressed of the articles describing the construction and operation of the receivers embodied in the TELSEN 1932 Circuits. Many thousands of constructors were unable to obtain copies of the first issue, and it has, therefore, been considered necessary to present again the full particulars of these popular circuits.

Several months' experience in the use of the receivers has not shown any necessity for improvement or alteration. On comparing the blue prints, however, with the original issue, slight differences will be found in two respects. The drawings have been altered to show the improved bakelite Tuning and Reaction Condensers illustrated for the first time in the coloured supplement in this magazine, and the lists of components have been amended in price where any alteration applies. This accounts for the small differences in the prices given for the complete set of components in each case, but, of course, where the original types are available they are entirely satisfactory.

The other alteration to the blue prints refers to the method of indicating connections. It was originally intended that these should be to some extent diagrammatical, and not to indicate actual runs of wires. However, some constructors have found the " joins " not quite clear, and the blue prints have therefore been altered to show the actual point-to-point wiring.

Readers are reminded that the Telsen recommended circuits are not issued in kit form, but are intended for construction with standard Telsen components obtainable from any reputable radio dealer. For readers who require a complete kit set, the "Telsen Three" kit described elsewhere in this issue is strongly recommended. With this kit a full size blue print and numbered point-to-point wiring diagram is included, so that the veriest novice can be confident of obtaining satisfactory results.

As much latitude as possible has been allowed the individual constructor in the make-up of these circuits, and for this reason no attempt has been made to lay down exact positions and sizes to a fraction of an inch, or to issue full size blue prints. Nevertheless, if the recommended sizes for panels and baseboards are adopted, and the approximate layout as shown in the photographs and blue prints are adhered to, they will be found most convenient and the wiring will be easy and not cramped.

ACCESSORIES REQUIRED.

In addition to the list of components given for each receiver, a panel, baseboard and terminal strip will be needed, together with the necessary fixing screws, a few yards of

insulated connecting wire and the requisite number of terminals.

The baseboard should be of wood ⅜ or ½in. thick, and is included without extra charge in all cabinets supplied by Radiocabinets Ltd., of Walsall. The panel may be of plywood or ebonite, but not of metal, as the reaction condenser spindle must be insulated from earth. The terminal strip should be of ebonite, about 2in. wide, and may conveniently run the whole length of the baseboard.

DRILLING THE PANEL.

The panel will need drilling for the controls, the hole sizes for all Telsen variable condensers being ⅜in. full, and for Telsen switches 5/16in. full. Three or four small holes along the bottom edge of the panel will suffice for fixing to the baseboard. The terminal strip must be drilled for the desired number of terminals, and also for fixing to the baseboard. Arrangements have been made for home constructors to purchase from any reputable radio dealer, "Permcol" panels and terminal strips, ready cut to size and drilled for the Telsen receivers.

WIRING.

A neat job may be made of the wiring with any of the covered connecting wires on the market, or bare tinned copper wire may be used in conjunction with a suitable size of insulated sleeving.

The general procedure in construction is as follows:—Mount the terminals on the terminal strip in the correct order, and attach to baseboard. Belling-Lee terminals are to be recommended, and are obtainable with all requisite markings. Note the instructions given below for mounting grid leak clips. Lay out *all* the components in the position roughly indicated in the blue print, using the photograph as a guide to a balanced layout. Mark through the fixing holes of the components and proceed to screw them down. Suitable sizes of screws are No. 4, ¼, ⅜, ½, and ⅝ inches. The baseboard wiring should then be completed, careful reference being made to the blue print.

THE PANEL COMPONENTS.

The panel components should now be mounted and the panel screwed to the baseboard. The wiring connection between the baseboard and panel components can now be made, and the connections tightened up all round.

BATTERY CONNECTIONS.

The batteries should be connected by lengths of rubber-covered flex fitted with wander plugs for the dry batteries and spade tags for the accumulator. Special notes on the construction and operation of each individual circuit are given in the following pages, together with further general instructions with full notes on the subject of choice and use of accessories.

GRID LEAK CLIPS.

All Telsen fixed mica condensers of values .0001 mfd. to .0003 mfd. are now supplied with patent grid leak clips which may be mounted to give either series or parallel connection. A little care is necessary to see that these are mounted in the correct way, as otherwise they will almost certainly prevent the set from working, and may in some cases cause damage. In the circuits described in this magazine these clips are used in various positions, and in all cases with the series method. It is important to note that in none of these cases are both clips connected to the condenser terminals. One clip must be mounted facing the front of the condenser using one of the spare nuts, and the other facing the back, using the spare nut, screw and terminal. It does not actually matter which clip faces forward, but that is the one to be connected to the grid terminal of the valve holder.

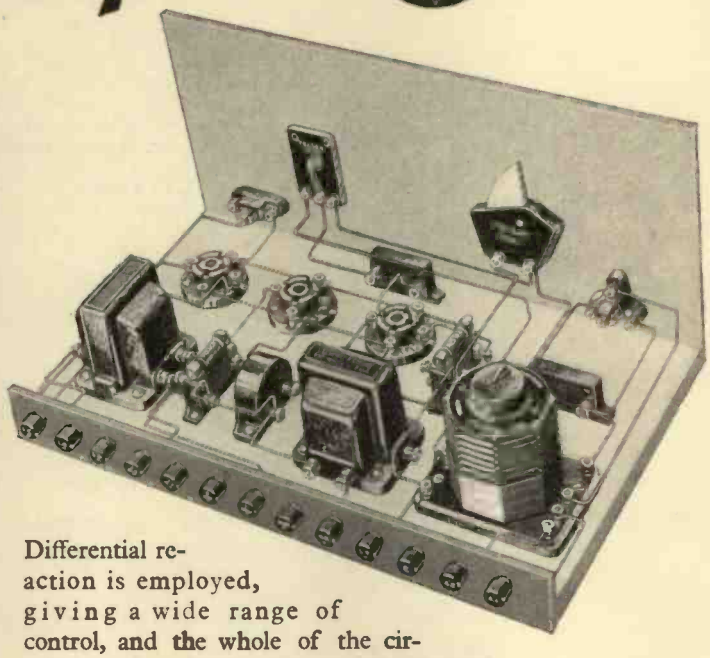
The TELSEN 'Conqueror' 3

THIS immensely popular circuit is here presented exactly in its original form with the minor exception that the latest type Telsen bakelite tuning and differential condensers are shown. The soundness of the original design is proved by the fact that no desirable improvement has suggested itself, and the three principal features of the circuit retain their outstanding interest.

The first is the selectivity adjustment of the Telsen aerial coil which gives this simple circuit arrangement a new field of usefulness, in enabling exactly the right degree of selectivity to be obtained to suit the locality and conditions in which it is used. Regional programmes can be definitely separated at any distance over five miles, and this without detracting from the essential simplicity of the arrangement. The amount of foreign reception available will naturally depend to some extent on the distance from the "local" but under all ordinary conditions the principal foreign stations come in strongly.

Coupled with the selectivity question will be noted the .0003 mfd. condenser connected across the terminals 4 and 7 of the aerial coil, which serves to remove any trace of interference on the long wave band from powerful medium wave stations.

Turning to the L.F. side of the circuit, the unusually good quality of reproduction is mainly due to the L.F. choke coupling which precedes the transformer coupled stage and renders the circuit worthy of a good super-power output valve and a loudspeaker which will do it justice.



Differential reaction is employed, giving a wide range of control, and the whole of the circuit remains simple and straight-forward. It is not desirable to vary the specification except as under, these alternatives being given to allow the constructor to use his individual preference wherever possible. A Telsen logarithmic variable condenser .0005 mfd. may be substituted for the bakelite tuning condenser shown, and the new Telsen illuminated disc drive will improve the ease of control and materially add to the appearance of the front panel. The "Ace" transformer may be substituted if desired by a Telsen 3-1 "Radiogrand," or better still, by a Telsen 1.75-1, which will give a further slight but definite improvement in quality, appreciable to the critical listener. A .01 mfd. Mansbridge Type Condenser in place of the .002 mica

condenser will give a slightly greater base response. In this case, a separate grid leak holder must be used, being connected from grid to G.B. —1. The exact arrangement may be seen in the blue print of the Telsen Short Wave 3. If desired, terminals H.T.+2 and H.T.+3 may be run into one, enabling the set to be worked from the two positive sockets of an eliminator.

The general notes on construction and operation given elsewhere should be carefully read and followed, and owing to the simplicity of this set there are no special precautions to be added.

The wiring diagram given on page 41 will assist the constructor in wiring up, and the illustration of the completed "Conqueror" 3 will act as a guide to the layout of the components on the panel and baseboard.

The valves recommended below have been selected after careful tests to give best results with this receiver. If economy in H.T. consumption is essential, the P.220.A may be substituted by a P.220, but the same volume of output cannot be expected without distortion.

Details of the batteries required and their proper use are given on another page and should be carefully studied for best results and for obtaining the proper life from the batteries themselves.

Suitable mains units are also specified.

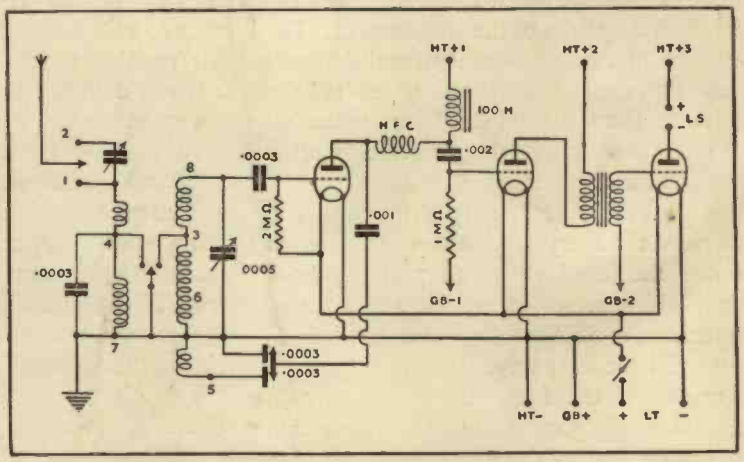
TELSEN "CONQUEROR" THREE.
List of Components.

Quantity	Description.	Cat. No.	Price.
3	Valve holders	W.105	1 6
2	.0003 Mica Condensers, with Clips	W.93	1 0
1	.002 Mica Condenser	W.97	6
1	Grid Leak, 2 meg.	W.101	9
1	Grid Leak, 1 meg.	W.100	9
1	Aerial Coil with Selectivity adjustment	W.76	7 6
1	.0005 Bakelite Tuning Condenser	W.193	2 6
1	.0003 Differential Reaction Condenser	W.185	2 6
1	Three-point Switch	W.108	1 3
1	Two-point Switch	W.107	1 0
1	"Ace" Transformer, ratio 3—1	W.66	5 6
1	L.F. Choke, 100 henrys	W.69	5 0
1	Standard H.F. Choke	W.75	2 0
1	.001 Mica Condenser	W.96	6
			£1 12 3

Panel 14×7 in.
Baseboard 14×9 in.

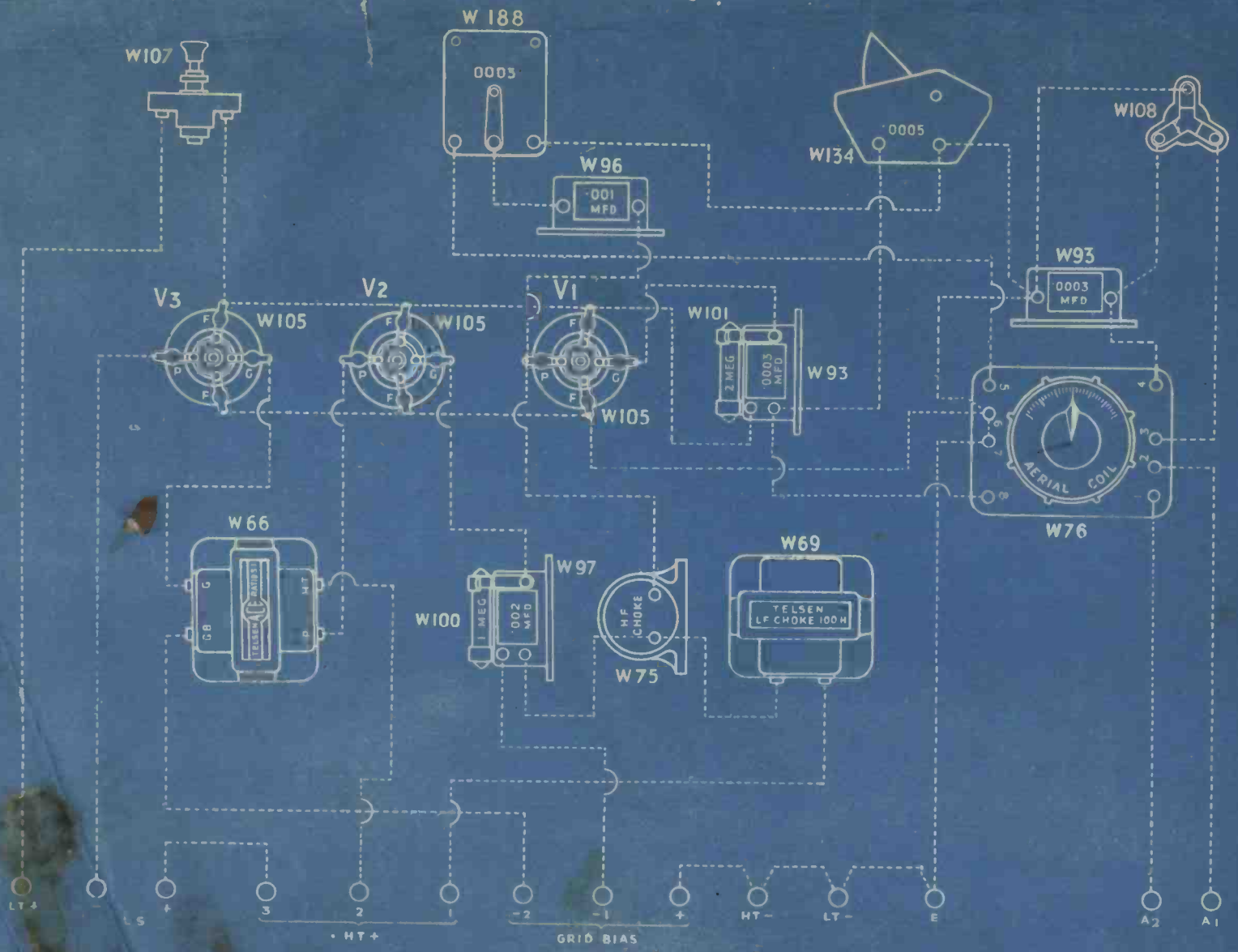
VALVES RECOMMENDED.

Detector	V.1. MAZDA H.210 or H.L.2.
L.F.	V.2. MAZDA L.2.
Output	V.3. MAZDA P.220.A. or P.220.



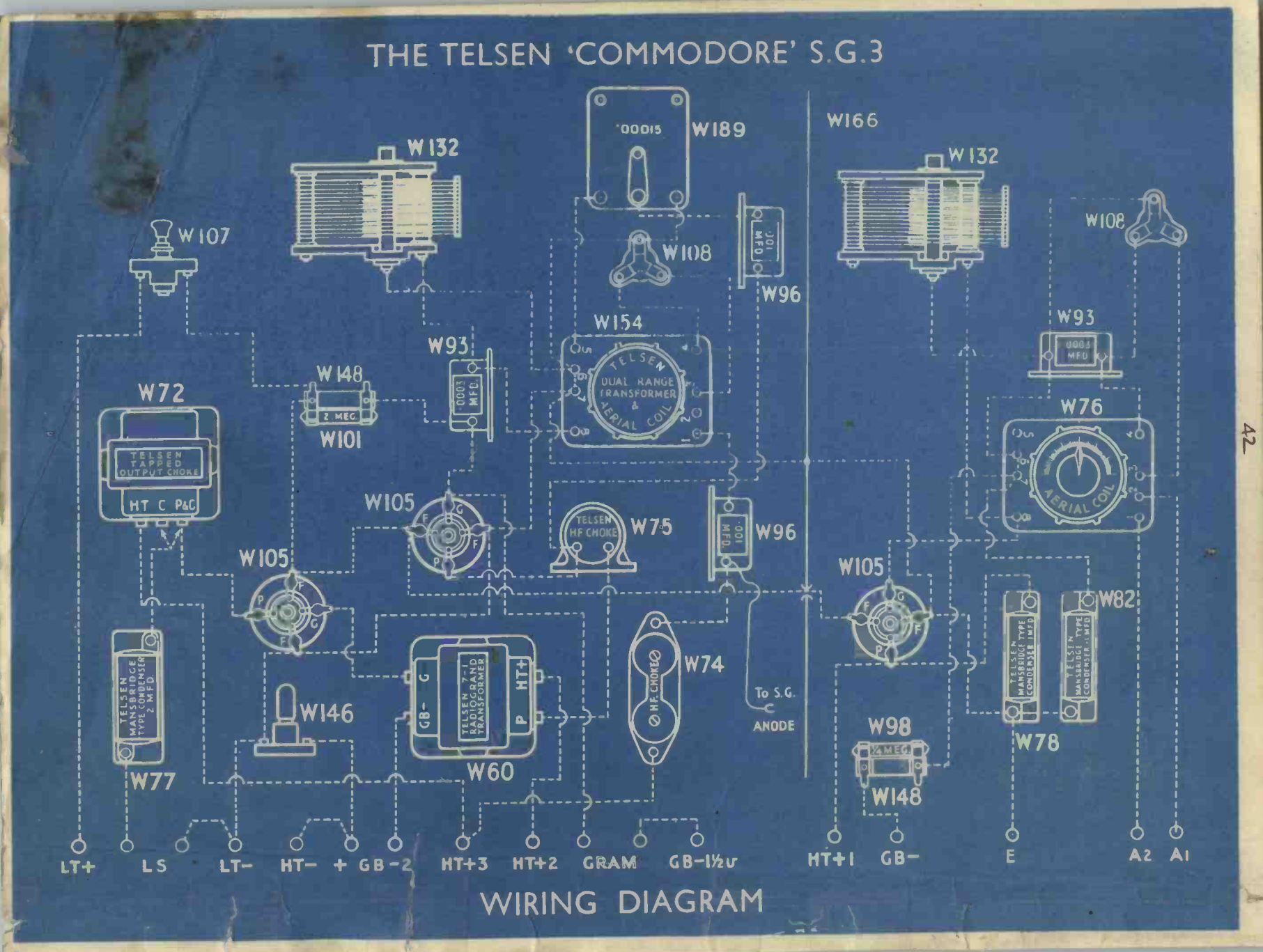
The theoretical circuit of the Telsen "Conqueror" 3.

THE TELSEN 'CONQUEROR' 3



WIRING DIAGRAM

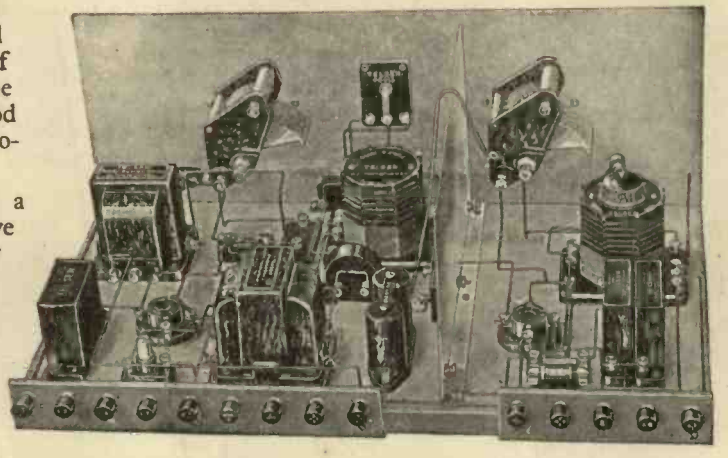
THE TELSEN 'COMMODORE' S.G.3



WIRING DIAGRAM

The TELSEN "Commodore" 3

FOR the constructor who requires the additional selectivity and range obtainable from a stage of screen grid amplification, the Telsen "Commodore" Three offers an admirable and well-balanced arrangement. The two separately tuned circuits ensure the highest amplification being obtained under all conditions, and in conjunction with the aerial coil adjustment will give a high degree of selectivity to suit different localities and aerials. A good range of continental stations can be relied upon with good volume and excellent reproduction.



Owing to the use of a metallised screen grid valve as recommended, only simple screening is required in the construction of the circuit itself. Arrangement is made for biasing the screen grid valve from the common bias battery, and to assist stability this connection is decoupled by means of a ¼ megohm grid leak and condenser.

The Telsen H.F. coil is used in the tuned grid method of amplification.

The single L.F. stage consists of a Telsen 7-1 transformer, followed by a tapped output choke filter which is arranged to accommodate a Pentode or ordinary Triode output valve.

The construction of the circuit is simple and straightforward provided that the baseboard is wired first with the screen and panel not in position. These may be added at a later stage after the components have been mounted on the panel. In this connection the new Telsen illuminated disc drive has been specified, though not shown in the illustration. Full instructions for mounting this handsome and efficient control are given in a leaflet enclosed with each disc drive. The latest type Telsen differential condenser is illustrated. The 1931 type may, of course, be used with complete satisfaction.

The general notes on construction and operation of these circuits given elsewhere should be carefully read before commencing to build.

Two terminals are brought out for the gramophone pick-up connection. Strictly, only one is necessary, as the other is connected directly to the 1½-volt tapping on the grid bias battery, and this connection may be made by means of a wander plug direct, instead of passing through the terminals shown. Further instructions on

the use of a gramophone pick-up are given in another article.

The output stage may be fitted with either the P.220.A. or a Pentode, Mazda Pen.220, which is probably the most suitable valve; it has the advantage of keeping the H.T. consumption of the set below 10 mA. and thereby effecting considerable economy in battery expenditure, whilst at the same time it gives excellent volume and amplification. The power valve P.220.A. is recommended to the set builder who, whilst requiring ample volume with high quality on the local transmissions and also on the main foreign stations, chooses a screen grid set for its selectivity rather than extreme range, and desires the utmost purity of reproduction. This valve is not so likely to be overloaded on the local stations, but it demands a higher H.T. current consumption and therefore a more substantial H.T. battery.

The Pen. 220.A. will have an extra connection, which may take the form of a terminal on the side of the base, or a fifth pin. In the latter case a five pin valve holder should be substituted for V.3. The extra connection in either case must be connected by means of a flexible wire to an additional H.T. wander plug. This plug should be connected to 100 to 105 volts. Further notes on the battery connections will be found in another article.

When using the Pentode the connection from the 2 mfd. condenser should be made to the centre tapping of the output choke, but when a P.220.A. is employed this connection should go to the same terminal as the connection from V.3.

TELSEN "COMMODORE" THREE

List of Components.

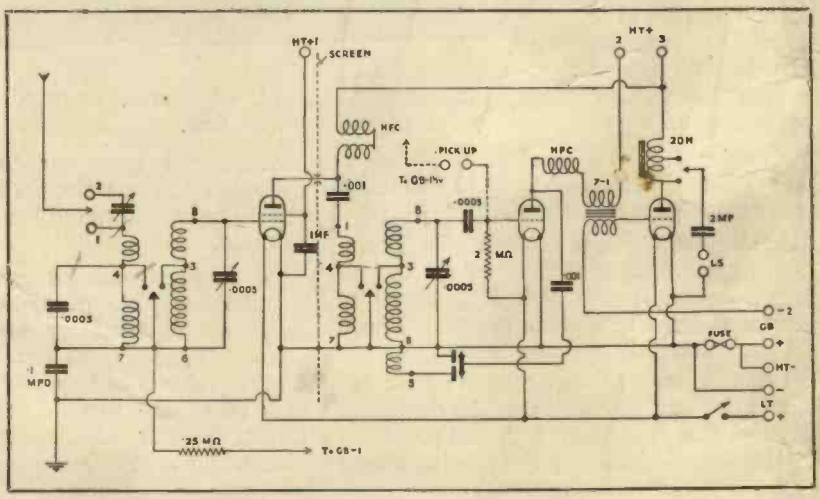
Quantity.	Description.	Cat. No.	Price
1	"Radiogrand" 7—1 Transformer	W.60	12 6
1	Tapped Output Choke	W.72	8 6
1	Binocular H.F. Choke	W.74	5 0
1	Standard H.F. Choke	W.75	2 0
1	Aerial Coil with Selectivity Adjustment	W.76	7 6
1	2 mfd. Mansbridge Type Condenser	W.77	3 0
1	1 mfd. Mansbridge Type Condenser	W.78	2 3
2	.0003 mfd. Mica Condensers ...	W.93	1 0
1	Grid Leak, 2 meg.	W.101	9
3	4-pin Valve Holders	W.105	1 6
1	Two-point Switch	W.107	1 0
2	Three-point Switches	W.108	2 6
2	.0005 mfd. Logarithmic Condensers	W.132	9 0
2	Illuminated Disc Drives	W.184	9 0
1	Fuse Holder	W.148	6
2	Grid Leak Holders	W.148	1 0
1	H.F. Coil	W.154	5 6
1	Screen	W.166	2 0
1	.1 mfd. Mansbridge Type Condenser	W.82	1 9
2	.001 mfd. Mica Condensers ...	W.96	1 0
1	½ meg. Grid Leak	W.98	9
1	.00015 mfd. Differential Re-action Condenser	W.186	2 6
			£4 0 6

Panel size 18×7 in.
Baseboard size 18×10 in.

VALVES RECOMMENDED.

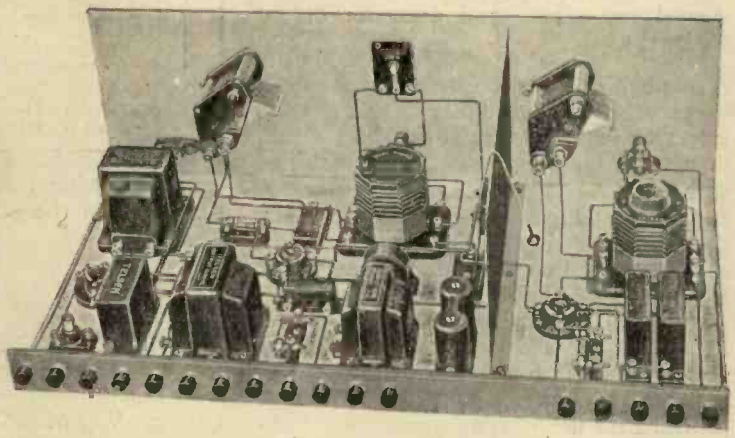
H.F. V.1. MAZDA S.G.215 or S.215.B.
Detector V.2. MAZDA L.2.
Output V.3. MAZDA Pen.220 or P.220.A.

The theoretical circuit of the Telsen "Commodore" 3



The TELSEN "Empire" 4

THIS is the circuit for the constructor who requires long range and a big reserve of power with really high quality reproduction. This powerful circuit employs a stage of screen grid H.F. amplification and two stages of L.F. There are two tuned circuits employing the new Telsen Dual Range Coils which are separately tuned to give the greatest efficiency and ease of control, at the same time relieving the constructor of any ganging troubles.



Additional selectivity is provided by the selectivity adjustment on the Aerial Coil, which not only contributes to eliminating interference, but also enables the excessive power of the local stations to be kept fully under control. The screen grid valve is biased by the common Grid Bias battery, and the biasing lead is decoupled to eliminate any possibility of feed-back at this point. The screening grid is decoupled by a 1 mfd. condenser, and a separate H.T. lead is provided for it to give a wider control of stability.

Passing to the other side of the screen, the H.F. valve is coupled to the detector by the tuned grid method. Reaction is applied through a differential condenser fed from the detector plate. The L.F. side is interesting by reason that it employs a stage of choke-coupled amplification followed by a Telsen 1.75-1 transformer. This arrangement, together with the choke output filter, combine to give complete L.F. stability without the necessity for decoupling, and exceptionally rich and natural reproduction.

In spite of the splendid results obtained from this powerful circuit it presents no difficulty whatever in construction. The general procedure outlined on page 37 can be followed with confidence. After attaching the terminal strip, the baseboard components should be laid out in the positions indicated by the blue print, but following the photograph as an indication. Space should be left for the screen, but it should not be put on at this stage, as the wiring of the baseboard will be easier with both the panel and screening absent. These may be added afterwards when the switches and variable condensers have been mounted. Where connections

are made to the screen it is advisable to scrape the surface to remove any trace of lacquer. The new Telsen disc drive as specified will add greatly to the appearance and ease of control of this set. Full mounting instructions are enclosed in the package containing this component. The rear view of the disc drive is not shown in the illustration, but it will be a simple matter to take two wires from the positive and negative filament on the nearest valve holder to the dial lamps which illuminate the scales.

It is not advisable to vary the specification; the L.F. side will *not* be improved by attempting to get a higher ratio of amplification. The arrangement shown is sufficient to load fully the super power valve under all normal conditions, and even on distant stations.

A fuse holder has been fitted as a refinement to prevent the possibility of damage to valves or batteries through a short circuit or wrong connection. This must be fitted with a proper radio fuse of the 60 or 100 milliampere type. A flash lamp bulb, though similar in appearance, is not suitable, as it will afford no protection to the valves. If at any time the set should appear completely dead, although everything else is in order, the fuse should be suspected and a spare one put in to determine whether that is the cause of the trouble. Terminals are provided for use with a Gramophone Pick-up, and further instructions on this point are given in the article on another page.

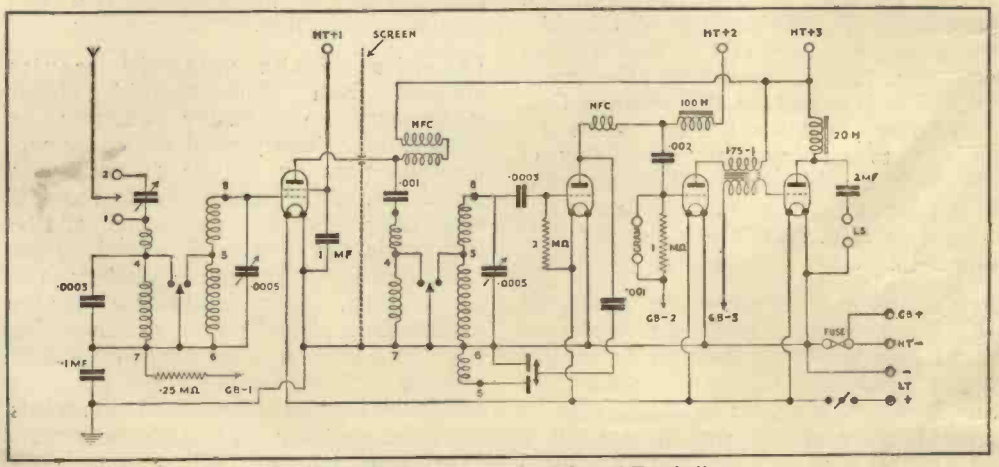
TELSEN "EMPIRE" S.G. FOUR.
List of Components.

Quantity.	Description.	Cat. No.	Price.
1	"Radiogrand" 1.75-1 Transformer	W.61	12 6
1	Output Choke	W.71	8 0
1	L.F. Choke, 100 henrys	W.69	5 0
1	Binocular H.F. Choke	W.74	5 0
1	Standard H.F. Choke	W.75	2 0
1	Aerial Coil with Selectivity adjustment	W.76	7 6
1	1 mfd. Mansbridge Type Condenser	W.78	2 3
1	.1 mfd. Mansbridge Type Condenser	W.82	1 9
2	.0003 mfd. Mica Condensers ...	W.93	1 0
1	.002 Mica Condenser	W.97	6
2	.001 Mica Condensers	W.96	1 0
1	Grid Leak, 1 meg.	W.100	9
1	Grid Leak, 2 meg.	W.101	9
1	Grid Leak, ½ meg.	W.98	9
4	4-pin Valve Holders	W.105	2 0
1	Two-point Switch	W.107	1 0
2	Three-point Switches	W.108	2 6
2	.0005 Logarithmic Condensers ...	W.132	9 0
1	.00015 Differential Reaction Condenser	W.186	2 6
2	Illuminated Disc Drives	W.184	9 0
1	Fuse Holder	W.146	6
3	Grid Leak Holders	W.148	1 6
1	H.F. Coil	W.154	5 6
1	Screen	W.166	2 0
1	2 mfd. Mansbridge Type Condenser	W.77	3 0
			£4 7 3

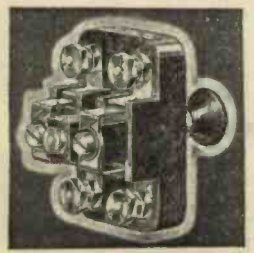
Panel size 21 × 7 in.
Baseboard 21 × 10½ in.

VALVES RECOMMENDED.

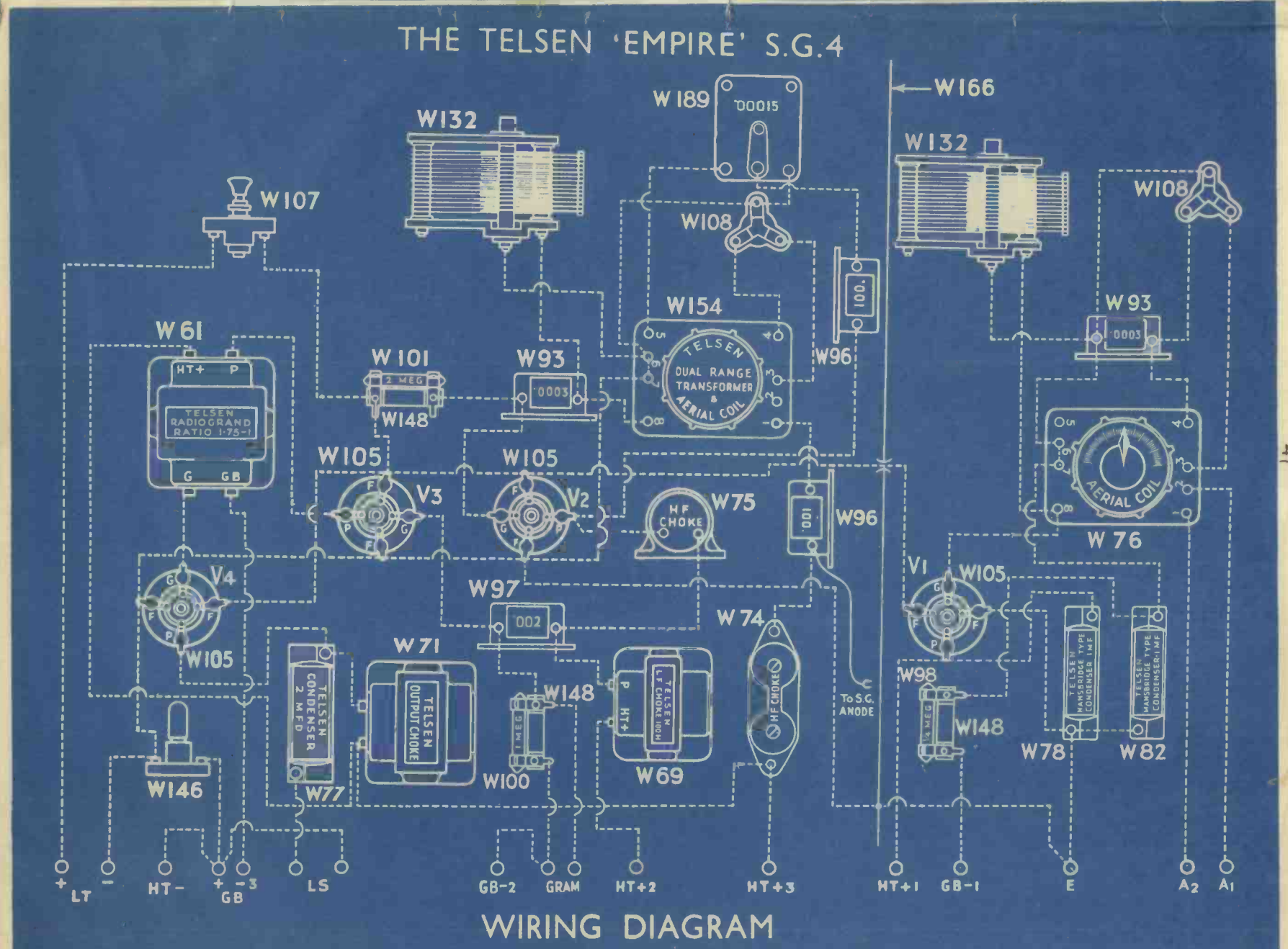
H.F. V.1. MAZDA S.G.215 or S.215.B.
Detector V.2. MAZDA H.C.2.
L.F. V.3. MAZDA L.2.
Output V.4. MAZDA P.220.A.



The theoretical circuit of the Telsen "Empire" 4.

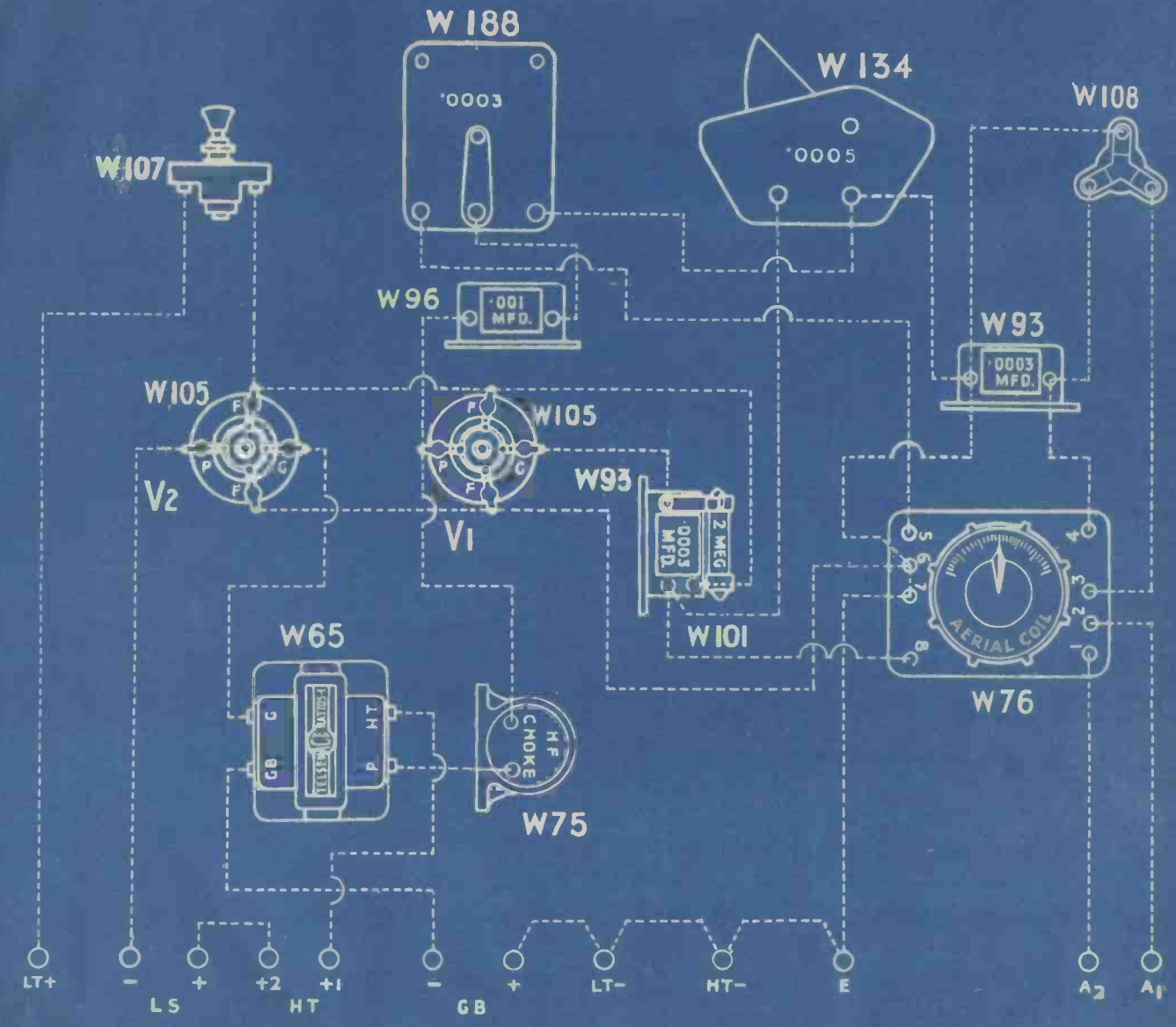


THE TELSEN 'EMPIRE' S.G.4



WIRING DIAGRAM

THE TELSEN 'SONGSTER' 2



WIRING DIAGRAM

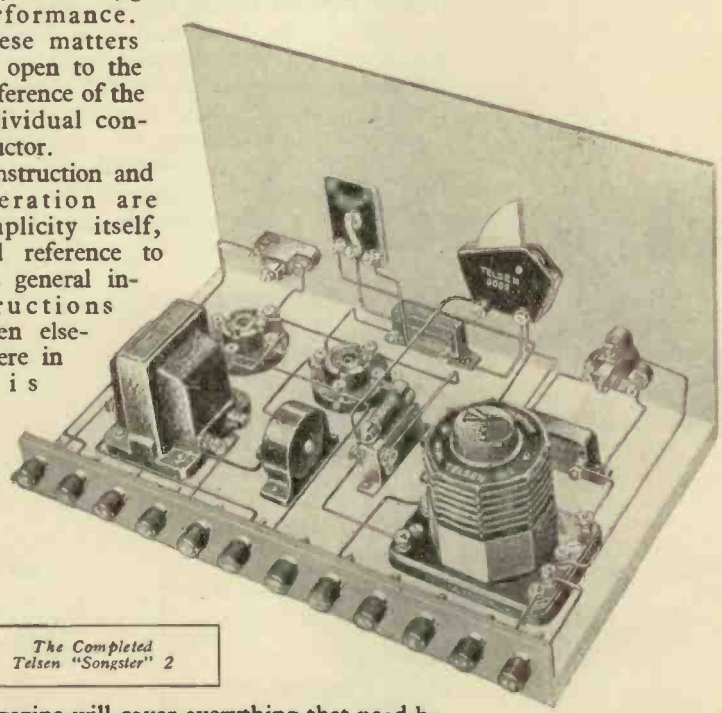
The TELSEN 'Songster' 2

THE straightforward two-valve circuit cannot be bettered for reception of the local station programmes provided that it is sufficiently selective to separate the Regional transmissions which now usually fill this category. When the circuit is soundly designed and the valves well chosen, quality of reproduction can be every bit as good as that from a more powerful set, and the two-valve receiver has a great advantage in low first cost and economy of upkeep.

In the case of the Telsen " Songster " Two, the first requirement is covered by the incorporation of the selectivity adjustment on the Telsen aerial coil. This will definitely enable Regional transmissions to be separated at any distance over five miles. Further, when it is operated not too close to the local station, foreign reception may certainly be expected with a good aerial.

The Telsen " Songster " Two is also perfectly suitable for reproducing gramophone records with the aid of a pick-up. Full instructions for this purpose will be found in another article. A volume control across the pick-up would be desirable. The quality of the reproduction, both on radio and gramophone is excellent and worthy of a good loudspeaker.

The illustration shows the latest type of Telsen bakelite variable condensers, but the 1931 type may, of course, be used with complete satisfaction. The tuning condenser may be replaced by the Telsen logarithmic variable condenser with some advantage if desired, and the new illuminated disc drive would materially enhance the appearance of the set and further increase the ease of tuning. A Telsen " Radiogrand" 5-1 transformer, or better still, a Telsen super ratio 7-1 " Radiogrand " may be fitted in place of the " Ace " specified, and will, of course, give an audible difference in performance. These matters are open to the preference of the individual constructor. Construction and operation are simplicity itself, and reference to the general instructions given elsewhere in this magazine will cover everything that need be said on this score.



The Completed Telsen "Songster" 2

A blue print of the wiring will be found facing this page and the constructor will find it a simple matter to follow each individual connection. The illustration of the completed set will also act as a guide to the layout of the components on the panel and baseboard.

Where the round type of Telsen Differential Condenser is used, it must be noted that the connection from the .001 fixed mica condenser (W.96) goes to the moving vane terminal, which is the one fitted with a pigtail connection. If this terminal is at the bottom, then facing the back of the set, the right-hand of the two remaining terminals is connected to No. 5 on the coil, and the other to moving vanes of the tuning condenser.

A matter worthy of attention is the choice of output valves offered together with the conditions required to get the best out of the set with each. The P.220 is suitable where local station reception at normal volume is the main requirement and where the nearest regional transmitter is within, say, 25 miles. The Pen. 220 is a Pentode which will give considerably more power for the same input, and will therefore increase range somewhat, as well as power available on local stations, but in order to get the best quality it is desirable to use a high impedance loudspeaker, or a tapped choke output filter, as in the Telsen "Commodore" Three.

The Pen. 220 has a fifth connection, which may be in the form of a fifth pin or a terminal on the side of the base. In the former case, a five-pin valve holder should be substituted for V.2. In either case, the extra contact must be connected by a piece of flex to an additional wander plug at 100-105 volts. Never adjust the bias or H.T. plugs without switching off the set, and especially when using a pentode.

Details of the recommended batteries or mains units, together with full instructions for their use and maintenance, will be found in an article devoted to this subject.

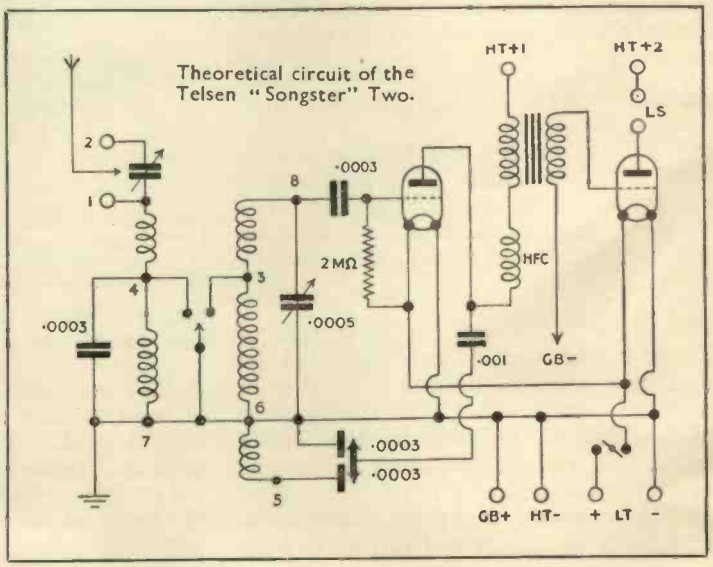
TELSEN "SONGSTER" TWO.
List of Components.

Quantity.	Description.	Cat. No.	Price.
2	Valve Holders	W.105	1 0
2	.0003 mfd. Mica Condensers	W.93	1 0
1	Grid Leak 2 megohm ..	W.101	9
1	Aerial Coil with Selectivity adjustment ..	W.76	7 6
1	.0005 Bakelite Tuning Condenser	W.193	2 6
1	.0003 Differential Reaction Condenser ..	W.185	2 6
1	3-point Push-Pull Switch	W.108	1 3
1	2-point Push-Pull Switch	W.107	1 0
1	"Ace" Transformer, ratio 5-1	W.65	5 6
1	H.F. Choke	W.75	2 0
1	.001 Mica Condenser ..	W.96	6
			£1 5 6

Panel size 12 × 7 in.
Baseboard size 12 × 7 in.

VALVES RECOMMENDED.

Detector V.1. MAZDA L.2.
Output V.2. MAZDA P.220 or Pen. 220



THE CHOICE AND CARE of BATTERIES

IN view of the fact that the batteries are the power supply of the radio receiver, the importance of choosing suitable types and maintaining them in proper condition cannot be too strongly emphasised if satisfactory performance is to be consistently obtained from the receiver. Probably the most prolific cause of distortion, to take one aspect alone, is insufficient H.T. voltage on the last valve, or incorrectly adjusted grid bias. Apart from this question, it is definitely wasteful to feed a set with inadequate or unsuitable battery power.

THE H.T. BATTERY.

The component on which this false economy is so often indulged is the H.T. battery. It is very tempting to purchase a cheaper battery when it is known that it will not, in any case, last for ever. Actually, if the battery is not up to its work, it will have a so much shorter working life that the ultimate cost throughout the year will be greater.

Drydex batteries are recommended with confidence for use with these Telsen circuits, and the types listed in the chart on page 52 may be taken to represent the most economical for use under the conditions shown. It will be appreciated that the current consumption of the sets will be greater when using a more powerful output valve, and the improvement in quality and volume is considered well worth the difference. In all cases, 120 volts is recommended.

GRID BIAS.

Maintenance of correct grid bias voltage is most important from two aspects. In the first place insufficient grid bias, which may be due either to too small a battery or to the fact that the grid bias battery has remained in use after it has lost its voltage, will cause a serious drain on the H.T. battery and may reduce its useful life to a fraction of what it should be. Incorrect grid bias is also usually accompanied by distortion.

The figures for correct grid bias under different conditions are given on a leaflet with each valve sold, and its recommendations should be carefully noted. Where alternative figures are given, as 9-10½ volts, it may be assumed that the higher figure is the best one for economy in H.T. current, and the lower for best volume and purity. This applies principally to the power valve. The first L.F. Valve must also be biased to exactly the right amount, but the economy question hardly arises. It is best to try both values given and use which sounds the better on a loud passage. For screen grid valves, 1½ volts is usually satisfactory.

When changing the H.T. battery for a new one it is desirable to have the grid bias battery tested, and if at all doubtful, renewed.

The table given on page 52 also shows the suitable H.T. and G.B. values for all the circuits described in this magazine.

ACCUMULATORS.

Less discrimination perhaps is necessary in the case of an accumulator, as this will only need replacing after a long period. It is as well to choose one which will not require too frequent charging, and which is large enough to supply comfortably the necessary filament current. The "mass-plate" type is recommended, as it will withstand longer periods without charging, and does not require as much careful

attention. Nevertheless, it is desirable to take the accumulator to a reliable charging station at regular intervals of two or three weeks, regardless of whether its charge is exhausted.

The Exide " D " type is recommended as being an excellent example of the " mass-plate " accumulator, and suitable types are listed in the accompanying table.

Where a mains unit with trickle charger is used, one size smaller accumulator may be selected.

In this case, periodical attention is necessary to keep the battery in proper condition. A good indication of the state of charge is the colour of the plates. When in good condition, the positive plate should be a deep chocolate, and the negative a light silvery grey. Completion of the charge is shown by bubbles rising freely from the plates. This should not be allowed to continue too long, as it will evaporate the liquid. When the level of acid falls below the correct mark it must be " topped-up " with distilled water only.

ELIMINATORS.

Where electric supply mains are available, it is highly desirable to use them for the H.T. supply, and if desired also for charging the accumulator. It is then possible to use a liberal size of power valve without worrying about H.T. consumption, which when taken from the electric mains is of negligible cost. Although the initial cost of an eliminator is greater than that of a H.T. battery, it very soon pays for itself in that it does not have to be replaced at intervals. Before purchasing an eliminator or mains unit it is necessary to find out the particulars of the electric mains supply, and then to choose a suitable type. Regentone mains units are thoroughly recommended for use with Telsen circuits, and suitable types are indicated below. The " combined " types in the right-hand two columns are fitted with a " trickle charger " for charging the accumulator at home, a simple operation which saves any trouble and expense in this connection.

BATTERIES AND ELIMINATORS RECOMMENDED

CIRCUIT.	BATTERIES.			ELIMINATORS.			
				H.T. only.		H.T. & Trickle Charger.	
	H.T. Drydex 120 volt.	G.B. Drydex Red Triangle.	L.T. Exide.	For A.C. Mains. Regentone.	For D.C. Mains. Regentone.	For A.C. Mains. Regentone.	For D.C. Mains. Regentone.
Songster 2	Red Triangle	9v.	D.F.G	W.1.F.	D.C.1.	A. C. Combined W.5B.	D. C. Combined No. 1.
Conqueror 3 with P.220 ..	Green Triangle	9v.	D.M.G	W.1.F.	D.C.1.	W.5B.	,,
S.W.3. Triple 3. with P.220.A.	Orange Triangle	16.5v.	D.M.G	W.1.D.	D.C.1.	W.5A.	,,
Commodore 3 with Pen. 220.	Green Triangle	9v.	D.M.G	W.1.C.	D.C.1.	W.5B.	,,
Commodore 3 with P.220.A.	Orange Triangle	16.5v.	D.M.G	W.1.C.	D.C.1.	W.5A.	,,
Empire 4	Orange Triangle	16.5v.	D.H.G	W.1.C.	D.C.1.	W.5A.	,,

Note: Where trickle charging is done at home, the next smaller size accumulator will suffice.

THE L.T. BATTERIES *specified for these fine* TELSEN *sets*

Exide "D" Type Battery.
The most economical battery for most of the Telsen sets because it need not be re-charged as frequently as the other types. It is almost impossible to over-sulphate it. Note its convenient construction :—

1. *Non-interchangeable terminals.* Different screw threads and differently shaped and coloured. Cannot let acid creep past.
2. *Name Slot.* For easy identification.
3. *Large screwed filler cap.*
4. *Improved lid.*
5. *Convenient carrier.*

DTG—2 volts, 20 amp. hrs., 4/6. DFG—2 volts, 45 amp. hrs., 8/6. DMG—2 volts, 70 amp. hrs., 11/- DHG—2 volts, 100 amp. hrs., 14/6.

Exide "C" Type Battery.
The best for larger sets taking a lot of current, where re-charging must be more frequent, CZ3—2 volts, 30 amp. hrs., 11/-. CZ4—2 volts, 40 amp. hrs., 13/-.

Exide Unspillable Batteries.
For portable sets or where special care must be taken against spilt acid. In two types—the Exide "Gel-Cel," the first really satisfactory jelly acid battery to be produced, and the Exide Unspillable Liquid Acid Battery. Sizes to suit every set. Prices from 9/-.

YOU cannot get more out of a set than you put in. So feed your set with the steady, generous power of an Exide Battery as Telsen recommend. Then you'll get steady, generous results and you'll never regret the battery you've bought.

Exide

THE LONG LIFE BATTERY

Obtainable from Exide Service Stations or any reputable dealer. *Exide Service Stations give service on* **EVERY** *make of battery.*

Exide Batteries, Exide Works, Clifton Junction, nr. Manchester. Branches at London, Manchester, Birmingham, Bristol, Glasgow, Dublin & Belfast.

N.75

The NEW WONDER

OF all the inventions of this twentieth century which have become commonplace in everyday life, there is perhaps none about which so little is generally known as the ordinary radio valve.

In homes and ships and aircraft throughout the civilised world, hair-like filaments glow steadily in gleaming bulbs of glass, beaming their messages of speech and music to those who would hear—the envoys of sound.

Yet wondrous as is the part played by the radio valve in the affairs of mankind, more inspiring still is the realisation of the way in which this part is played.

It is beyond the scope of this article to demonstrate the mathematical intricacies with which the radio engineer of to-day is faced. It is possible only to explain the broad principle of operation commonly employed in the ordinary broadcast receiving set.

The filament of the valve — a fine wire treated with some special substances—is heated by passing an electric current through it from an accumulator. Owing to the peculiar nature of the substances, the heat thus generated causes the filament to give off a strong stream of electrons (negative electrical charges) which are attracted to the anode—a metal sheath encircling the filament — by keeping it at a high electrical potential with a high tension battery or other similar form of supply. Thus, under these circumstances, there is a continuous flow of electrons from filament to anode.

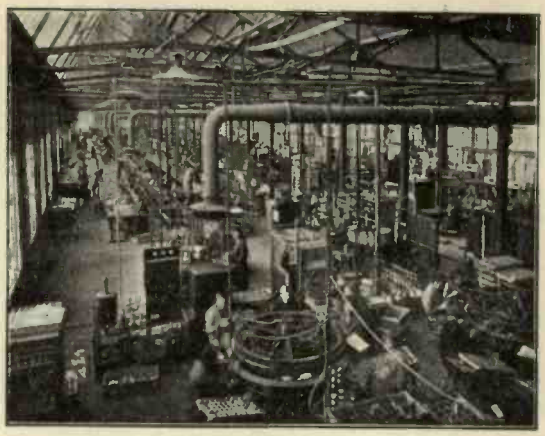
The broadcast signals picked up by the aerial are fed to a "tuning circuit"—a device which separates the wanted from the unwanted signals. The signal thus singled out is led to the grid of the valve—a sheath of wire mesh located between the filament and anode, and directly in the

Sealing, Exhausting and Capping Machines—Mazda Valves.

OF THE WORLD

path of the electron stream already described.

Broadcast signals are a series of electrical impulses and it is the imposition of these impulses on the grid of the valve in operation which causes variations of the electron flow corresponding to the signals to be received, and registered by a variation of current in the anode circuit. Some impulses retard the flow of electrons through the grid, others accelerate their flow and always the impulses are repeated in the anode circuit, but repeated more emphatically, *i.e.*, they are amplified. It is the loudspeakers job to translate these repetitions into sound and it is placed in the anode circuit for this purpose.



General View of Components Shop—Mazda Valves

An analogy will make this clearer.

Let us picture a dam across a great river. The tide flows fast against one side of the dam and emerges through the sluice-gates to where a boat strains at its moorings. A man turns a handle, closing the sluice-gates and the boat is at rest. If he opens the sluice gates once more, the force of the tide will cause the boat once again to toss at its anchorage. He can, within limits, control the motion of a large boat with his hand.

So in a valve : the tide of electrons is passing through a sluice-gate (the grid) to where the boat rocks in the stream (the anode) : the sluice-gate is opened and closed with great rapidity by the broadcast signals applied to it and the boat (in this case, the loudspeaker) responds faithfully, though in a greater degree, to these impulses.

This briefly is the way in which a radio valve works. Of the various methods employed to accentuate and increase this fundamental effect we have no space to talk. Here, outlined, is the original principle which has developed and culminated in that supremely efficient production—the modern Mazda radio valve.

Modern receivers have been specially designed to make the most of these valves amazing efficiency. In the Mazda valve of to-day is mirrored that incessant striving after improvement which has established them in the eyes of radio engineers as the valves which represent the zenith of modern research.

The TELSEN RADIOMAG

USING A Gramophone PICK UP

IT is generally known that any ordinary wireless receiver capable of operating a loudspeaker may be simply adapted for electrically reproducing gramophone records, and that the quality obtainable is usually better than that given by any but the highest class of mechanical gramophone. This latter, however, does not apply if an attempt is made to obtain excessive volume from the loudspeaker. Due regard must be had to the power handling capacity of the output valve. An ordinarily sensitive gramophone pick-up such as the B.T.H., which is generally accepted as one of the best on the market, will give sufficient output when followed by two stages of amplification to overload any ordinary power valve, and unless a volume control is used, distortion is bound to occur. Consequently, in the Telsen circuits described in this magazine, all of which may be used for gramophone reproduction, it is recommended that one stage of amplification be used, and the pick-up should be connected to the valve preceding the output valve. In those cases where gramophone connections are shown, this principle is adhered to, but if it is desired to attach a pick-up to any of the other circuits, the following general notes may be found useful.

Fig. 1

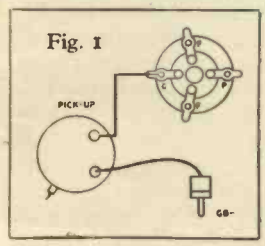
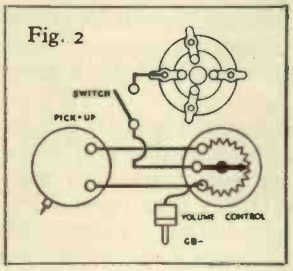


Figure 1 shows the pick-up connected in its simplest form. G is the grid connection to the valve selected, which in a receiver employing two stages of L.F. amplification should be the first L.F. valve, or in a circuit with only one L.F. stage, the pick-up will be connected to the detector. (It is permissible to connect the pick-up to the detector in any case provided a volume control is used). The use of a volume control is always an advantage and adds to the enjoyment obtainable.

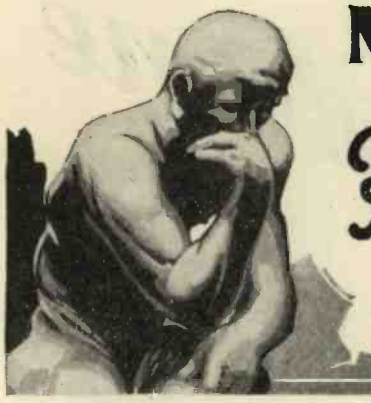
Fig. 2



The other terminal of the pick-up is connected to a suitable value of negative grid bias, usually 1½ volts in the case of the detector. Where the first L.F. valve is used, this is already biased negatively, and the pick-up should, therefore, be connected to the existing bias connection.

A simple two-point switch may be inserted in the grid circuit to avoid the necessity of disconnecting the pick-up when it is not in use. If the detector is the valve concerned, the wire from its grid to the switch or pick-up terminal must be as short as possible. Figure 2 shows how a volume control is connected, with a switch included as described above ; both may be conveniently mounted on the panel.

The leads from the pick-up to the set should not be unduly long, and should be kept away from the loudspeaker leads, otherwise amplifier instability may spoil reproduction. If needle scratch is very prominent it can be eliminated by fitting a scratch eliminator. This consists of a small fixed mica condenser in series with a spaghetti resistance connected across the pick-up. The values will vary according to the make of pick-up used, and should be given by the makers.



MORE Hints and Tips FOR THE HOME CONSTRUCTOR

Horizontal length does not add appreciably to strength of reception from an aerial. On the other hand, height is always advantageous.

In a screen grid set adjustment of the lead to the screening grid of the S.G. valve is a very good control of stability. This lead is H.T.+1 in the "Commodore" Three and "Empire" Four. If the set is unstable this voltage should be reduced until best results are obtained.

When searching for stations it is advisable to start at the bottom of the dial, i.e., the zero reading, and work upwards, keeping the dials in step if there is more than one. By this means you will not be constantly breaking into oscillation, but can bring up the reaction as much as is necessary from time to time.

By tuning slowly you will find a lot of stations which you would miss by turning the dial rapidly from end to end. This particularly applies to short waves.

When using a D.C. eliminator it is essential that a condenser be inserted between the earth terminal and earth. This is usually provided on the eliminator, but if not, it may be connected inside the set between the earth terminal and its appropriate connections. It is also advisable to have a condenser in the aerial circuit, but if the aerial is connected to terminal No. 2 on the Telsen variable selectivity coil no further condenser will be required.

The condenser for this purpose, either in the aerial or earth lead, must be capable of withstanding the full mains voltage and should be noninductive. In the earth lead 1 mfd. at least is desirable, but in the aerial lead .001 mfd. is sufficient.

The special construction of the Telsen aerial coil enables the insulation of the aerial circuit from the mains to be carried out in a still simpler manner. It is only necessary to disconnect terminal 7 from terminal 6 on the coil. The earth should then be connected to terminal 7 and none of the other components (with the exception of the .0003 mfd. condenser where this is fitted across terminals 4 and 7). The H.T. connections in the rest of the circuit will be connected to terminal 6. The 3-point switch must now be replaced by a Telsen 4-point switch No. W.153 and one pair of contacts connected so as to short circuit terminals 4 and 7, and the other pair across 3 and 6. This only applies to the aerial coil and any H.F. coil connections in the set will remain undisturbed.

Any but a precision voltmeter with a wide 2-volt scale is useless for testing the condition of an accumulator. A hydrometer is a much better indication.

A low resistance voltmeter is only useful for testing H.T. batteries, and gives no reliable indication of the actual voltage reading at a point in the circuit, especially where there is a resistance in the anode circuit. For general purposes, a meter of at least 200 ohms per volt is desirable. For use with eliminators, 1,000 ohms per volt is the minimum which can be used, and where resistance coupling or decoupling is employed, no voltage readings at the anodes can be taken as accurate.

On a multi-range meter the lowest current range will usually indicate the current consumed when used as a voltmeter.

A meter with a heavy current consumption should not be kept connected to the battery longer than is necessary to take its voltage.

SHORT WAVE STATIONS

Metres	Kc.	Station	Power in Kw.
14.55	20,618	Bandoeng (Java) P.M.B.	—
15.5	19,350	Nancy (France)	—
15.93	18,830	Bandoeng (Java) PLE	80
16.57	18,105	Chicago W9XAA	—
19.56	15,340	Schenectady W2XAD	20
19.68	15,234	Pontoise (Paris)	—
19.72	15,210	Pittsburg East W8XK	—
20.5	14,630	Chapultepec XDA	20
21.5	13,950	Bucharest	.3
23.8	12,605	Rabat (Radio Maroc)	6
24	12,500	Funchal (Madeira) CT3AQ	.05
25.2	11,905	Pontoise (Paris)	—
25.25	11,880	Pittsburg East W8XK	—
25.27	11,870	Calcutta (India) VUC	.5
25.34	11,840	Chicago W9XAA	—
25.4	11,810	Rome (Italy) 3RO	9
25.4	11,810	Bowmanville (Canada) VE9GW	—
25.5	11,763	Chapultepec XDA	20
25.53	11,750	Chelmsford G5SW	16
25.63	11,705	Pontoise (Paris)	—
28.2	10,635	Bandoeng (Java) PLR	—
28.98	10,350	Buenos Aires LSX	20
29.3	10,238	Heredia (Costa Rica) NRH	7.5 watts.
30	10,000	Belgrade	—
30.75	9,756	Agen	—
31.28	9,590	Eindhoven (Holland) PCJ	25
31.28	9,590	Melbourne (Australia) VK3ME	—
31.28	9,590	Sydney (Australia) VK2ME	20
31.3	9,582	Philadelphia (Pa.) W3XAU	.5
31.35	9,570	Springfield (Mass.) W1XAZ	—
31.35	9,570	Poznan (Poland) SR1	1
31.38	9,560	Zeesen (Germany)	8
31.48	9,530	Schenectady N.Y. W2XAF	10
31.51	9,520	Skamlebaek (Denmark) OXY	.5
31.55	9,510	Melbourne (Australia) VK3ME	5
31.75	9,450	Rio de Janeiro (Brazil)	—
31.86	9,143	Bandoeng PLE	80
32.26	9,300	Rabat (Radio Maroc)	6
32.5	9,230	Paris FLJ	—
33	9,090	Radio LL (France)	.5
34.68	8,650	Long Island W2XV	—
36.92	8,125	Bandoeng (Java) PLW	—
39.7	7,556	Bogotá (Colombia) HKF	—
40.7	7,370	Nuevo Laredo (Mexico) X26A	—
41	7,313	Bangkok HSP2	2.5
41.6	7,211	Tenerife Radio Club EAR58	.5
41.7	7,195	Singapore VS1AB	—
42.9	6,991	Lisbon CT1AA	2
43	6,976	Madrid EAR100	—
45	6,667	Constantine (Algeria) 8KR	.2
45.38	6,611	Moscow (Russia)	—
46.69	6,425	Bound Brook (N.J.) W3XL	—
48	6,250	Casablanca (N. Africa) CN8MC	—
48.35	6,205	Bogotá (Colombia) HKC	—
48.62	6,170	Tegucigalpa (Honduras) HRB	2.5
48.65	6,167	Mexico City X1F	—
48.8	6,147	Winnipeg (Canada) VE9CL	2
48.86	6,140	Pittsburg East W8XK	—
49.05	6,121	Saigon (French Indo-China) F3ICD	—
49.02	6,120	Richmond Hill, N.Y. W2XE	.5
49.18	6,100	Bound Brook (N.J.) W3XAL	12
49.22	6,095	Bowmanville (Canada) VE9GW	.028
49.34	6,080	Chicago W9XAA	.5
49.4	6,072	Johannesburg (S. Africa)	—
49.43	6,069	Vancouver (B.C.) VE9CS	—
49.5	6,060	Philadelphia (Pa.) W3XAU	.5
49.5	6,060	Nairobi (Kenya) 7LO	—
49.5	6,060	Cincinnati, W8XAL	10
49.67	6,040	New York W2XAL	.25
49.83	6,020	Chicago W9XF	5
50	6,000	Moscow (Russia)	—
50	6,000	Bucharest (Roumania)	.3
50	6,000	Barcelona Radio Club EAJ25	—
51.22	5,857	Chapultepec (Mexico) XDA	20
54.52	5,502	Brooklyn (N.Y.) W2XBH	—
58	5,172	Prague	—
61	4,918	Radio LL (France)	.5
62.5	4,800	Long Island W2XV	—
70.2	4,273	Khabarovsk (Russia)	20

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