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FIRST, from the list of words below choose any one, two, three or four to form an Example line. In order to give you greater scope, you may take any two which, joined together, form one—such as PASS and AGE—PASSAGE, or CAN and DID—CANDID. These would each be counted as one word.

After you have made your Example line you compose a phrase having an apt bearing on the Example. Your phrase must not consist of more than five words—any five words you like.

Here is a specimen of joined words to use in the formation of an Example. The word "AS" combined with the word "SET" gives "ASSET." Add the three words to THE FAMILY and "ASSET TO THE FAMILY" becomes an Example line. Compose a phrase such as "ERNEST" EARNING and you have a "Nap" that is bound to catch the judges' attention.

A good Example line, compiled of separate words from the list, would be "COLLEGE ACCENT" and a "Naps" phrase, such as "PUT ON"—"TAKEN OFF" would immediately attract the judges' eye.

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TO LET
TEN IN FAMILY
SOMETHING TO KISS
POLICE
SUITOR ALSO SCARLET
THE GAME OF COURTING
AGE OF MOTORS
AFTER THE PROPOSAL
THE CANDID FRIEND
A TENSE GAME
IN THE PASSAGE
ASSET TO THE FAMILY
HONEY
SMASH
COLLEGE ACCENT
LOOKING FOR HER
THE SUITOR TO GRAB
SET AT REST
LEFT A SCAR
THE THING TO DO
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Mr. GILBERT FRANKAU, the famous author, has agreed to examine and adjudicate upon the selection of attempts submitted to him by the Judges. He will select those attempts which appeal most to him and arrange them in order of merit.

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February 3rd, 1934

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Please send me free of charge, your 20-page Catalogue of Radio Receivers B.20.
SOLDERING TAGS OR TERMINALS?

Many Thanks!

CORDIAL thanks to the many readers who have written in congratulation concerning our new receiver, the 102 Fury Four Super, and thanking us for our moderation in the space devoted to it. Quite naturally we have the interests of every reader at heart, and excellent as the Fury Four Super is, it is a part of our policy not to cut down the amount of general reading matter in order to make room for descriptions of our receivers. In every case we prefer to enlarge the issue to carry the extra descriptive matter.

Antarctic Saturday Broadcasts

MOST of the American short-wave fans make an attempt every Saturday night to tune in direct the broadcasts of KJTY, from the Byrd Antarctic Expedition. They have already been picked up on and around 30 metres, a channel which would appear to have been recommended for DX work by the Marchese Marconi when he was interviewed by one of the members of the expedition. There is no reason for which owners of short-wave sets in the British Isles should not try for these signals: the time for a search is about G.M.T. 3 a.m. (Sundays).

The Modern Tower of Babel

BROADCASTING in some European countries is greatly complicated by the fact that more than one language may be necessary to give a service to the entire population of a State. Belgium, Switzerland, Czechoslovakia, and even France (in view of its reconquered areas) are compelled to transmit programmes in two to three tongues. In Norway the problem is not so acute, although the country uses two languages, Riksmal, somewhat similar to Danish, and Nynorsk (Neo-Norwegian) of more modern origin. In its programmes the Oslo studio makes every effort to reconcile the wishes of the supporters of both these tongues.

The Paris P.T.T. High-power Station

WORK on the new station at Villebon-sur-Yvette, destined to replace the Belfe Supérieure (P.T.T.) transmitter, is being hurried forward, as the authorities are anxious tolaunch it on the ether with a national programme on July 14th.

Sponsored Concerts

LISTENERS to European broadcasts will have noticed to what extent publicity has been directed to the British Isles having been developed during the past few months. Sponsored programmes, announced in the English language, are now regularly transmitted from Athlone, Fécamp, Poste Parisien, Juan-les-Pins, Ljubljana, Barcelona (EAIJ1), San Sebastian (EAIJ8), and through Madrid EAQ on 30 metres. In most instances, the broadcasts are carried out in the later evening hours.

FOLLOWING the example of Germany, where the authorities have designed and placed upon the market a cheap wireless receiver for general use, Poland, under the name Detyaphone, is also turning out a set from its national works. Contrary to the method adopted by Germany, where the instrument must be paid for on delivery, the Poles are giving facilities to buyers, inasmuch as listeners may purchase the instrument by twelve instalments, remitted to the Post Office with the monthly payments towards the annual listening licence. It is hoped that the new regime will result in an increase of registered listeners, which to date number roughly 315,000.

Radio Advertising Verboten!

RECENT regulations drawn up by the German Reichsfunk now forbid any private advertising to be broadcast from the State transmitters. The only publicity allowed is that organised by the Ministry of Propaganda for the benefit of the nation as a whole.

Radio Normandie’s Wavelength

IT is unfortunate that the French State should have compelled the Fécamp station to reduce its wavelength to the bottom of the band, as not only is the channel (200 m.) an unfavourable one, but it carries with it stringent restrictions regarding power. The station is complying with the request, but we believe that this is only a temporary measure, and that negotiations may result in a more suitable channel for this popular broadcaster.

Still Holding the Lead

DURING December, 1933, the Post Office authorities in Great Britain issued roughly 700,000 licences, bringing up the total to the end of the month to 5,783,709 registered listeners. Not very far from six millions, which puts us well on top of the list.

Where Is Istanbul?

SOME surprise has been expressed regarding the fact that the Constantinople broadcasting station should have disappeared from the list of long-wave stations. Turkey was given a long channel, which is being used for Angora. Constantinople (Istanbul) will not appear in our logs as the wavelength allocated is 201.1 metres, which it shares with London National.
ROUND the WORLD of WIRELESS (Continued)

High-power Station at Diinepropetrovsk

The new 100-kilowatt station in the U.S.S.R. at Diinepropetrovsk (Russia) has been brought into service, and now works on 329.8 metres, a channel shared with PTT Limoges. The power of this transmitter is such that its broadcasts can be heard in the British Isles.

German Plans for 1934

In addition to the alterations already made in the power of the Munich, Muelacker and Berlin transmitters, in August, 1934, we may expect to hear Breslau, Langenburg and Heilsberg broadcasting programmes of entertainment. Moreover, plans have already been passed for new relay transmitters at Dresden and Stettin, as well as for a station at Coblenz. Koenigs Wusterhausen on the "long waves" will also be increased to 150 kilowatts. Possibly the 1,634.9 metre wave-length may be retained if all stations working on channels above 1,000 metres do not take up their allotted positions.

Broadcasts from South Polar Regions

The Columbia broadcasting system now transmits every Saturday night at 10.00 p.m., Eastern Standard Time (3.00 a.m. G.M.T. on Sundays) over its network of fifty-nine stations a special programme given in support of the second Antarctic Expedition. Later, for the benefit of European listeners, a relay will also be carried out by W2XEX, Wayne (N.J.), on 49.02 metres. The signals, although sent direct from "Little America" in the polar regions, will be relayed through one of the powerful Buenos Aires short-wave transmitters, a direct broadcast to Europe being that of Dr. Johnson, whose birthplace at Lichfield is the second most famous literary shrine in the Midlands. The great Cham of Letters and his biographer, Boswell, will be represented on their Hebrides tour through the medium of Arne's "Omes" which are to be played by the Linz Philharmonic String Orchestra, conducted by Johan Hock; Arne's Sonata in A, given on the harpsichord by Michael Mullinar, and songs from The Beggar's Opera and The Mock Doctor by Alex Penney.

S U L V E Y H I T S

PROBLEM No. 72.

Arthus built up a mains four-valve, which gave splendid results when first put into commission. After an hour's use signals suddenly became distorted and dropped to less than half the original strength. The set was switched off and left until the next day, when the same thing occurred. Upon testing the various H.F. positive points, Arthus found that when the set was operating satisfactorily the voltage on the detector side was only about 25 volts, just as soon as the drop in volume occurred this voltage also dropped to 5 volts. What was wrong ? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL WIRELESS, George Newsam, Ltd., 6-11, Southampton Street, London, W.C.2, and post to reach here not later than February 5th. Envelopes must be marked Problem No. 72.

Central Hall, Coventry, open and close the bill. Edith Sudbury and the Holst Singers at Walsall; Bransby Williams will be heard in character sketches and Marjorie Astbury in violin solos from the Central Hall, Birmingham; and there will be a short play by Coventry Repertory Company, produced by A. Gardner Davies, at the Opera House there.

Solution to Problem No. 71.

When he purchased his new component Arrowsmith forgot that he required a low-frequency choke, not an H.F. choke. Therefore he had not provided an adequate load for the valve with the H.F. component. Two readers only successfully solved Problem No. 71, and books have accordingly been forwarded to them:

J. R. Ackroyd, 96 Woodside Road, Sidcup.
H. Wilson, 50 Lennard Road, Cirencester, Glos.

Thanks to an Amateur Transmitter in the U.S.A., where the number of amateur radio stations has been increased, many services have already been rendered by them in cases where no other assistance was available. Recently, when listening to Ed Stevens, of Seattle, who picked up an S0's call emanating from a lonely island off the coast of Alaska. It concerned the serious illness of a child for whom no medical attendance was forthcoming. Pasting the call on, Stevens was able to get in touch with one of the Northern military bases which flew to his appeal, promptly despatched an aeroplane and thus conveyed, without delay, the sick child to a hospital on the mainland.

A Period Feature Broadcast

A PERIOD feature is the chief attraction for Midland Region enthusiasts on February 5th, the age chosen being that of Dr. Johnson, whose birthplace at Lichfield is the second most famous literary shrine in the Midlands. The great Cham of Letters and his biographer, Boswell, will be represented on their Hebrides tour through the medium of Arne’s "Omes" which are to be played by the Linz Philharmonic String Orchestra, conducted by Johan Hock; Arne’s Sonata in A, given on the harpsichord by Michael Mullinar, and songs from The Beggar’s Opera and The Mock Doctor by Alex Penney.

Curiouser and Curiouser !

A CURIOUS report from Stockholm a Swedish engineer, Balsac von Platen, claims to have solved the problem of the wireless transmission of power. No details of the invention or apparatus used are given, but it is stated that a company has been formed to exploit this sensational discovery.

Radio to the Rescue

By contributing an amount said to be in the neighbourhood of three hundred thousand dollars, the National Broadcasting Company of America would appear to have assured the continuance of performances at the Metropolitan Opera House, New York. Relays of operas with some of the world’s greatest singers are regularly made over the N.B.C. Network.

Switch Over to Battersea

FEBRUARY 23 marks the date of an interesting experiment to be carried out by the B.B.C. in an attempt one of the most difficult of any outside broadcast yet undertaken—that of installing microphones to tour the Battersea station. As these generators have an output reaching as much as 100,000 kilowatts, special precautions must be taken to shield the broadcasting apparatus.
Some Circuits Worth Trying

By H. J. BARTON CHAPPLE, Wh.Sch., B.Sc.

There is No Substitute for Actual Experience, so to Become Thoroughly Acquainted with New Radio Developments, try a few Experiments Yourself. Here are Some Useful Circuits to Help You.

A LARGE number of listeners have, no doubt, already completed the building of their new season's set, and are looking about them for some fresh activity to occupy the winter evenings, and it will therefore be helpful to offer some suggestions for useful circuits which they may try in order to widen their general experience. In many cases most of the components can be taken from that valuable collection of spare apparatus which all real experimenters amass in the course of time, and for this reason only the main outline of the circuits and a few practical hints will be given, leaving the detailed design and layout to be developed by the individual experimenter.

First we will begin with a few circuits, each employing a single special feature or providing the material for a single experiment. The reader can then develop other circuits embodying such features and thus, perhaps, map out the main lines for his next complete receiver.

Power-grid Detection

Let us take the detector stage first. Have you ever tried anything more than the ordinary leaky-grid system? If not, try a real "power-grid" detector for your first experiment. You will want to rig up a circuit containing at least one high-frequency stage, for power-grid is mainly a device to rectify signals of considerable strength. Figs. 1 and 2 show typical circuits for both battery and A.C. mains operation.

The main points which require attention are the grid and anode circuits of the detector. Any good detector valve may be used, and matters must be so arranged that the maximum high-tension voltage for which the valve is rated is applied at the anode. For example, if a battery valve is employed, which can be used at "maximum anode volts 150," be sure and use 150 volts.

Instead of the usual .0003 mfd. condenser and 2-megohm grid leak, a grid condenser of about .0001 mfd. and a leak of 1/2 to the transformer core. Approximate values for the essential components are marked on the diagrams.

Remember that no greater amplification will be obtained with power-grid detection, but the quality of reproduction will be better, especially with strong input signals.

Two Interesting Circuits

Another interesting detector circuit is shown in Fig. 3 in which a screen-grid valve is employed as detector. By virtue of its high amplification factor such a valve makes a very sensitive detector. Best results are obtained from the "anode bend" method of rectification, which necessitates the use of a certain amount of negative grid bias; consult the instruction slip issued by the valve maker for the correct value. Because this type of valve has a very high impedance, resistance-capacity coupling is essential to obtain good results, and the anode resistance should be of the order of 1 to 1.5 megohm. A circuit with one high-frequency stage is (Continued overleaf)
is adequately decoupled. There is a single tuning condenser of the usual unscreened type, and it will be seen that a gramophone

indicated in the diagram, but it is well worth trying a screen-grid detector without a high-frequency amplifier.

For example, the circuit given in Fig. 4 is of a three-valve A.C. set, intended as a "local station" receiver in a situation where only an indoor aerial is available and the main requirements are really good quality on the two local stations, and for gramophone reproduction, simplicity in handling, and adequate selectivity.

The arrangement is that of a high-frequency pentode as anode-bend detector (a high-frequency pentode can be used exactly as a screen-grid valve for detection), low-frequency amplifier and large output triode. Resistance-capacity coupling is employed throughout and every circuit

Round the World of Wireless

(Continued from page 940)

New Greek Broadcasting Scheme

A FURTHER attempt is to be made by the Hellenic Government to establish a broadcasting system in Greece. Previous schemes have failed owing to the lack of the necessary finances, but it is now reported that the State may endeavour to float a national loan of fifty million drachmas, and with this capital will build a network of some fifteen small stations. Of this amount fifteen millions will be earmarked for the purchase of the necessary material.

Canned Music

A LITTLE it would appear to be the general impression that France is the country which makes the most use of gramophone records in its wireless pro-

Smooth Volume Control

Mention of volume control naturally raises the question of variable-mu valves.

It is extraordinary how many listeners have not even yet tried this type of high-frequency valve. The circuit is quite conventional—any ordinary three-valve having one high-frequency stage will serve, and the diagrams in Figs. 5 and 6 are merely typical. Note the simple alteration in the battery-operated version

50 Tested Wireless Circuits

By F. J. CAMM

This handbook contains every modern circuit, complete with instructions for assembling, component values and notes on operation. Obtainable at all Book-stores, or by post 2/6 from Stannett, Ely, B11, Newcastle upon Tyne, London, W.C. 2/6

5/6

Pick-up can be inserted in the grid circuit of the first low-frequency valve. The volume control arrangement is very interesting; the volume-control potentiometer operates for both gramophone and radio, and controls the input to the first low-frequency grid, also serving as grid leak for the first stage.

Fig. 5—Employing a variable-mu valve with a battery-operated set.
Superhets for SHORT WAVE Listening

The writer considers that the Superhet is ideal for Short-wave Listening, and in this article he gives a considerable amount of Practical Information in regard to this Type of Circuit.

By FRANK PRESTON.

It is rather unfortunate that more amateurs do not use a superheterodyne circuit arrangement for short-wave reception, because this would solve a large number of the difficulties which frequently arise. The detector-LF type of circuit is ideal for the experimenter, and takes some beating for the person who is expert at "twiddling the knobs," but for those who desire to go in for short-wave listening, as opposed to experimenting, the superhet is without a peer. A receiver of this kind can easily be tuned by means of a single knob and without the need for those delicate reaction adjustments which are always called for with a short-wave set of the "straight" type. It is often considered that a superhet must necessarily have a large number of valves, and therefore that it must be expensive. This is not the case, for a four-valve super for short-wave reception will easily give loud-speaker signals quite as good as those to be obtained with a three-valve "straight" arrangement.

In the hands of an inexperienced amateur, in fact, the volume to be obtained will be much greater, besides which far more stations will easily be receivable.

A Four-valve Short-wave Superhet

The circuit at Fig. 1 shows how extremely simple a four-valve short-wave superhet really is, and it should be stated that a set built around this circuit can be relied upon to give excellent results under practically any conditions. A standard dual-range short-wave tuner is employed in the aerial circuit, and this feeds into a combined detector-oscillator first valve. This is of the screen-grid type and operates on the anode-bend principle. Initial setting of the reaction is carried out on the .001 mfd. reaction condenser, and any further adjustment is made on the screen-grid potentiometer, which enables the exact degree of feed-back to be obtained under all conditions. Normally, it is only necessary to set the reaction controls to their optimum positions, after which stations on any part of the waveband in use can be tuned-in by the simple process of rotating the (slow-motion) dial of the .0001 mfd. tuning condenser.

The detector-oscillator feeds into the screen-grid intermediate frequency amplifier through an I.F. transformer of the type tuning to 150 kcs., this frequency being produced by the first valve operating on the autodyne principle. A second and similar I.F. transformer is used to couple the I.F. amplifier to the second detector, which works on the usual leaky-grid system. A standard form of L.F. coupling is then used between the second detector and the pentode output valve.

A receiver of this kind can be made up very easily, and if the aerial coil and I.F. transformers are screened, the layout is

![Fig. 1. The circuit of an excellent 4-valve S.W. Superheterodyne; this is referred to in the text.](image)

By no means critical. It is best to employ circuits on top, with the filament, high-tension, and L.F. components underneath. Standard valves are used throughout, and these may be those which have previously been employed in an ordinary broadcast receiver. In most cases it will be found best to apply a negative G.B. voltage of about 1.5 to the first valve, but alternative voltages up to 4.5 should be tried.

Initial Adjustments

The initial adjustments consist of setting the reaction controls until the first valve is oscillating freely (generally indicated by the cessation of a faint "hissing" sound heard in the speaker) and setting the trimmers on the I.F. transformers until maximum signal strength is obtained from a station which is not normally subject to fading. A suitable signal is generally provided by Zeesen on 31.38 metres, or Rome on 25.4 metres. After these adjustments have been made, any number of stations can be tuned in, and sometimes the signal strength can be increased by making a final slight adjustment of reaction. It should be mentioned that nothing will be heard if the first valve is not oscillating, so that in some cases reaction will have to be increased as the condenser is set for the higher wavelengths.

In any case reaction control is not critical and should present no difficulty whatever.

A Simple Converter

When it is not proposed to construct a complete receiver especially for short-wave use, it is still possible to use the superhet idea in the form of a converter which may be used in conjunction with the ordinary broadcast set. If the latter is provided with one or more H.F. stages, only a single valve will be required, and the circuit should be like that shown at Fig. 2. It will be seen that this is just the same as the first valve of the complete receiver used, having an H.F. amplifier. The circuit is almost identical with that used for the first valve in Fig. 1.
terminals on one of the valve-holders in the set so that both set and converter can be switched on simultaneously. Inter-

mediate-frequency amplification is carried out by the H.F. valves in the broadcast receiver, and coupling between the converter and first receiver valve will be on the tuned-grid system, the "broadcast" H.F. choke being used along with the .0002 mfd. fixed condenser for this purpose.

In use, the set is first tuned to about 2,000 metres, or the highest wavelength possible, and the reaction controls on the converter are operated exactly as described before. The screening-grid potentiometer and anode-circuit lead from the converter are shown as being joined together and taken to a tapping on the H.T. battery, but in practice it will sometimes be found that better results are to be obtained by inserting a 5,000 ohm decoupling resistance and 1 mfd. condenser as shown by broken lines.

A Converter for Det.-L.F. Seis

A converter of the type just described cannot be used in conjunction with a non-H.F. receiver, but it is a simple matter to add an I.F. amplifying stage to the converter as shown in Fig. 3. In this case the second valve is fed by a tuned-grid circuit, an ordinary broadcast coil being used in conjunction with a .0002 mfd. variable condenser. This latter may be of the bakelite-dielectric or pre-set pattern and can be mounted on a chassis, since it will not need to be altered after the preliminary adjustments have been made.

The converter is connected to the set as described before, and after the receiver has been tuned to its highest wavelength the pre-set tuning condenser in the converter should be adjusted until signal strength attains a maximum on some particular station. After that, nothing but the aerial tuning condenser and (occasionally) the reaction controls need be touched. It should be mentioned that the reaction control on the broadcast receiver should always be set to give maximum signal strength, but once it has been adjusted it will "hold" over the complete wavelength range of the converter.

For Mains Sets

The circuits given so far have been in relation to battery-operated converters, but all of them can readily be modified for mains working. A mains-operated converter using an indirectly-heated A.C. valve is given at Fig. 4, and this can be used very successfully in conjunction with almost any mains A.C. receiver having an-H.F. own mains supply equipment, and this might be considered superfluous. As a matter of fact, however, it is quite essential with most receivers, because the output of the mains equipment is generally just sufficient for the set itself. On the other hand, if the H.T. and L.T. supply circuits are not fully loaded, the converter could be fed from them. The converter will require 4 volts at 1 amp. for the heater of the valve and about 180 volts at 7 milliamps for high-tension purposes. When there is so much power to "spare" in the supply circuits of the receiver the heater of the new valve can be wired in parallel with those of the other receiving valves and the high-tension supply can be taken through a 5,000 ohm resistance connected to the positive side of the smoothing equipment. Ample decoupling must be provided, and, therefore, a 2 mfd. condenser must be joined between the "anode" side of the resistance and earth.

An Ideal All-Wave Receiver

I consider that a combination of a four-valve (two V.M.) broadcast receiver and a short-wave converter of the type represented by Fig. 4 is an ideal outfit for so-called all-wave reception. It is easier to design than a single receiver fitted with coils covering the several wavebands and, not being in the nature of a compromise, can generally be made to be much more efficient. It is a simple matter to arrange a switch to transfer the aerial lead-in from the converter to broadcast receiver, and vice versa, and it is best to arrange things so that the anode and cathode circuits of the converter are connected to the supply source irrespective of whether the set is being used for short-wave or broadcast reception. The load on the mains transformer is thus maintained at a constant level, and this is frequently more important than the fact that a small amount of current is wasted when the short-wave section is not in use. One disadvantage of the scheme just outlined is that the aerial leads have two tuning dials and an extra knob (for reaction) on the front of the set.

Fig. 3.—This circuit represents an excellent converter arrangement for use in conjunction with a non-H.F. broadcast receiver.

Fig. 4.—The circuit of an all-mains converter complete with its own power supply circuits.
HOW TO CHOOSE AND USE THE BEST VALVES

If there is one stage in a receiver in which it is difficult to go wrong in the choice of valves, it is the detector stage. This is very largely due to the fact that the range of choice is limited.

In this Series of Articles the Author Explains the Function of the Various Types of Valves Employed in Modern Receivers.

PART II.

The ordinary leaky-grid detector, on the other hand (see Fig. 1), in which negative half-waves of the incoming signal are fully amplified and positive half-waves almost entirely suppressed owing to grid current damping, is very sensitive to weak signals. It is, however, liable to distort very strong signals.

About two years ago the modification known as "power grid" detection was introduced. This system is basically identical with leaky-grid detection, but the valve is operated at a much higher anode voltage. The effect is greatly to extend the grid base of the valve, and hence its signal-handling capacity. In other words, a power grid detector, while retaining the sensitivity of the earlier leaky-grid detector, will amplify much stronger signals without distortion.

It must not be imagined that by increasing the anode voltage to any detector valve, ordinary leaky-grid is immediately converted to power-grid. Also, the grid must also be made to the grid circuit of the detector valve. And in the first place, to ensure the due discharge of the grid, a smaller resistance value of grid leak is usually necessary, one quarter to one half megohm being the normal value. Then it is usually advisable to reduce the size of the grid condenser from the standard 0.0003 microfarads to 0.0001 microfarads.

Valve Types Standardized

The ordinary leaky-grid detector is now practically universal, valve-makers having practically standardized on a comparatively small range of detector valve types. Generally speaking, a valve of the so-called "H.L." type is satisfactory for almost any set. The "H.L." valves have characteristics between the old "H." "E.F." or "R.C." types, and the "L." or "L.F." types, that is to say, their impedance and amplification factors are in general lower than those of the "R.C." type but substantially higher than those of the L.F. types. The "H.L." type, therefore, will give a good account of itself from the stage-gain point of view when used in conjunction with modern audio-frequency transformer coupling, yet is perfectly satisfactory for resistance-capacity coupling in those circuits which still employ this device, providing the anode resistance does not exceed about 100,000 ohms.

Another point in connection with power-grid detection in particular is that the increased anode voltage results in a considerably increased anode current. Few low-frequency transformers, except the most expensive modern types, will carry the full anode current of such a valve without introducing distortion due to magnetic saturation of the transformer core. It is highly desirable, therefore, to adopt the resistance-feed method of connection, when the direct current portion of the anode current passes through a high resistance in the anode circuit, only the audio-frequency component being passed through the transformer winding into a coupling condenser, as indicated in Fig. 2. The characteristics of the "H.L." type of valve are particularly suitable for this method of coupling.

Generally speaking, therefore, if it is desired to fit a new detector valve to a battery-operated set, it will suffice to employ one of the "H.L." class. It is, however, necessary to give special consideration to sets of old design employing R.C. coupling with a high value of anode resistance of the order of 250,000 ohms or more. For such a circuit, a valve of the "R.C." class is advisable. Such a valve will have an impedance of 40,000 ohms or

Detector Modification

About two years ago the modification known as "power grid" detection was introduced. This system is basically identical with leaky-grid detection, but the valve is operated at a much higher anode voltage. The effect is greatly to extend the grid base of the valve, and hence its signal-handling capacity. In other words, a power grid detector, while retaining the sensitivity of the earlier leaky-grid detector, will amplify much stronger signals without distortion.

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Soldered Joints More Permanent

Sir,—I prefer soldered joints, as they are efficient and do not oxidize or slack off. Terminals must be tightened occasionally, and while the connection is to some extent (as all connections are) liable to slack off when the set is removed from cabinet, due to the slight whip—if stillness is required—contact area in mains sets is seldom sufficient. Only advantage of terminals is for an experimental hook-up, of temporary nature.

—R. T. CRASHEY (Aylesbury).

Soldering Saves Time

Sir,—My preference is always soldered joints. Reasons? Well, in the first place, soldering, if done properly, is a good, sound job—never works loose (as do terminals in time), is quickly done and enables one to get at awkward places where spanners or pliers are difficult to operate. Short direct wiring (essential in short-wave work), cheaper! I say this because some components can be bought with just soldering tags on them, easier to dismantle, as in the case of the man who always tries something different, he doesn’t want to waste a lot of time fiddling about with terminals; and lastly, all of us who really profess to be constructors or experimenters will not let a terminal “slip” stop us from using it. Try! That’s our middle name, and once we’ve mastered this very simple (and it is simple) job, we shall never go back to terminals.—W. C. MEACHEM (Bletchley).

Manufacturers Use Soldered Connections!

Sir,—I prefer soldered connections. They are tidier, stronger, more efficient, more permanent, more easy to make. Terminal connections not infrequently slacken off; the surfaces in contact are not protected from oxidation, and they encourage careless workmanship. With soldered joints cleanliness is the first essential. Moreover, properly made, such connections exhibit no wild atmospheric action, are practically everlasting and their electrical resistance remains low. Set manufacturers invariably use soldered joints in their products—they would hardly do so were the terminal connection more efficient.—T. LESLIE SMITH (Oldham).

Non-standard Nut Sizes

Sir,—My vote goes to soldered joints. Not because I am enamoured of the process, but because the variation in diameters of nuts of different manufacture is great enough to render your gift spanners useless in many cases.

—R. T. CREASEY (Aylesbury).

Reasons?

1. Economy (less wire used or wasted).
2. Cleanliness (no filings—the result of war between pliers and terminal nuts, and no dirty finger marks on coloured insulation on wires).
3. Neatness (no kinks in wiring on account of faulty manoeuvres with pliers).
4. Efficiency (no cracked moudings and stripped threads).
5. Temper (normal, and nerves O.K.).

Soldering is Safer

Sir,—In my opinion soldering is by far superior to terminals. Not only is one assured of an electrical connection, but it is far quicker and easier once a few simple rules have been mastered.

When one realizes the vast amount of trouble and time taken to bare the wire, make a loop, take off the terminal and fit it on again, this soon becomes evident. And that is not all. A few days ago I was wiring up a receiver for a friend and using pull-back wiring wire, when I came across another instance where I have experienced trouble is with the terminals on air-cored coils. Many is the connection I have seen broken through scraping down the terminal too hard, thus tearing the insulation and twisting the coil wire attached to it. This all boils down to the obvious remedy “Solder Your Joints.”—R. W. HUGHES (Barmouth).
European Programmes
set out hour by hour
the simplest and most convenient
arrangement yet devised

AUTHORITATIVE
TECHNICAL FEATURES
EVERY WEEK

Ralph Stranger's
prize competition
Serial
'RADIO ISLAND'

COME TO THE RESCUE OF A CAST-
AWAY PARTY OF SCIENTISTS AND
HELP TO BUILD A WIRELESS RECEIVER
AND TRANSMITTER FROM RAW
MATERIALS FOUND ON A DESERTED
ISLAND IN MID-PACIFIC • JOIN IN THIS
FASCINATING COMPETITION AND WIN
A MONEY PRIZE • Free Entry for All.
The 1934 FURY FOUR

Tuning and Operating Notes of the Latest Practical Wireless Receiver, which is Covered by A.C. 1934 Fury Four Super will be Described Next Week.

By F. J. CAMM

JUST at the moment selected to pen this contribution my personal post has arrived, with an overwhelming proportion of envelopes from all districts, and of all shapes and sizes, bearing the superscription "FURY FOUR SUPER" in the top left-hand corner. Last year's Fury Four was the outstanding receiver for home constructors, and it was, I am given to understand by members of the radio trade, made in greater numbers than any other receiver described during the contemporary period.

I have received many hundreds of letters from readers who have built it—some laudatory, some asking for advice, and a few containing complaints that the receiver did not come up to expectations. My Personal Guarantee of Satisfaction

I want therefore to preface this article with a re-affirmation that, provided the parts I specified are used, every receiver designed by me does all that I claim for it. It has always been my policy to understate the case, and in the few cases of complaint which I have investigated I have found that the trouble has been due either to a faulty component or to the reader's mistake in wiring up.

So confident am I of the capabilities of the Fury Four Super that I enthusiastically recommend it to every reader who did not build up the previous edition; and to those who did I would adjure them to revise the old Fury Four and convert it into the receiver which is the subject of this present article. This the reader may do at trifling cost. All readers may build the Fury Four Super confident that it will do everything claimed for it. I have been connected with radio from the very start and I believe (I say it in all modesty) I was the very first radio journalist to appreciate the possibilities of broadcasting.

I edited a sixteen-page periodical devoted to wireless for amateurs nearly twenty years ago, and this journal made its regular appearance for a number of years. I have designed every type of radio receiver—crystal as well as valve, and there is scarcely a piece of wireless apparatus which I have not tested. Much of it I have designed. I think I can fairly claim that I have not fallen into a stage of laisser faire in radio design, by producing receivers which are merely regurgitated versions of old receivers with additional knobs, the virtues of which are extolled in voluptuous and almost poetic language with suitable excerpts from the classics; nor have I ever devoted a preponderance of space to descriptions of my receivers. I readily realize that every reader of PRACTICAL WIRELESS may not wish to make the Fury Four Super, and it would be unfair of me to allot space to a subject which the general reader feels should more properly be devoted to some general but practical topic. I could easily fill PRACTICAL WIRELESS with extended descriptions of the capabilities of my Fury Four Super, but I prefer the reader to judge for himself without any artificial urge in the form of a journalistic smoke-screen of irrelevant extravagancies or flights of fancy. Whenever it is my privilege to describe a receiver of my design the number of pages comprising "Practical Wireless" is increased to carry that description, so that space is not filched from the general reader.

And yet I could be almost poetical myself regarding the Fury Four Super. Notwithstanding the fact that it is not a superhet, it possesses selectivity in the extreme and in the best interpretation of that term. It will receive an abundance of British and foreign programmes; its quality of reproduction...
our FREE Advice Guarantee. The
Diagrams were Given Last Week

leaves nothing to be desired, its current
consumption is less than half of that of
the old Fury Four. This has been made
possible by the use
of the Graham
Farish Battery
Economiser, and
whereas last year's
Fury Four con-
sumed about 20
milliamps of H.T.
current, the Fury
Four Super con-
sumes just a little
more than 9 mil-
ami.
**LIST OF COMPONENTS FOR 1934 FURY FOUR SUPER.**

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Type/Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE SET OF FERROCASTER TYPE &quot;G&quot; COILS (G.10, G.14, G.13) with Switch—see notes in last week's issue (Colverm).</td>
<td></td>
</tr>
<tr>
<td>ONE &quot;NUGANG&quot; SINGLE VARIABLE CONDENSER, 0.0005 mfd. with Type A Drive (Jackson Bros.)</td>
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</tr>
<tr>
<td>ONE &quot;NUGANG&quot; 2-gang Variable Condenser, 0.0005 mfd. with Type A Drive (Jackson Bros.)</td>
<td></td>
</tr>
<tr>
<td>ONE DISC TYPE H.F. CHOKER (Lissen).</td>
<td></td>
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<tr>
<td>ONE 1 megohm resistance with wire ends (Lisren).</td>
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</tr>
<tr>
<td>ONE PRESET AERIAL CONDENSER, 0.0003 mfd. (Lisren).</td>
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<tr>
<td>ONE &quot;PENDITE&quot; NICHROME (Vetley).</td>
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<tr>
<td>ONE GRADUATED VOLUME CONTROL, TYPE C.P.158, (Varley).</td>
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<tr>
<td>ONE &quot;FERROCASTER&quot; H.F. CHOKER, TYPE H.F.4 (Bulgin).</td>
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<tr>
<td>ONE FUSE HOLDER, TYPE F.5 (Bulgin).</td>
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<tr>
<td>ONE 100 m.a. FUSE (Bulgin).</td>
<td></td>
</tr>
<tr>
<td>ONE G.B. BIAS CLIP, TYPE 2 (Bulgin).</td>
<td></td>
</tr>
<tr>
<td>THREE 10,000 ohm 1% with &quot;OHMITE&quot; RESISTANCES (Graham Farish).</td>
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</tr>
<tr>
<td>FIVE 1,000 ohm dito (Graham Farish).</td>
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</tr>
<tr>
<td>FIVE 25,000 ohm dito (Graham Farish).</td>
<td></td>
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<tr>
<td>ONE 500 ohm dito (Graham Farish).</td>
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</tr>
<tr>
<td>ONE 0.002 mfd. REACTION CONDENSER (Graham Farish).</td>
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<tr>
<td>ONE &quot;BOOSTER&quot; UNIT (Graham Farish).</td>
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</tbody>
</table>

**THE 1934 FURY FOUR SUPER.**

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Type/Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWO 1 mfd. Fixed Condensers, Type 9200 B.S. (Dubilier).</td>
<td></td>
</tr>
<tr>
<td>FOUR 4 mfd. dito (Dubilier).</td>
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<tr>
<td>TWO 2 mfd. dito (Dubilier).</td>
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</tr>
<tr>
<td>ONE 0.001 mfd. dito Type 670 (Dubilier).</td>
<td></td>
</tr>
<tr>
<td>TWO 0.002 mfd. dito, Type 670 (Dubilier).</td>
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</tr>
<tr>
<td>THREE 4-pint Chasis-Type Valveholders (Clix).</td>
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<tr>
<td>ONE 5-pin dito (Clix).</td>
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<tr>
<td>FOUR WANDER PLUGS marked G.B.1, G.B.2, G.B.3, G.B.4 (Clix).</td>
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<tr>
<td>ONE PASSFLEDA COUPLING UNIT (B.R.G.).</td>
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<tr>
<td>TWO LARGE COMPONENT BRACKETS (B.R.G.)</td>
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<tr>
<td>THREE TERMINAL MOUNTS (Belling-Lee).</td>
<td></td>
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<tr>
<td>SIX TYPE B TERMINALS (Aerial, Earth, L.S. + L.S.—Pick-up, Pick-up) (Belling-Lee).</td>
<td></td>
</tr>
<tr>
<td>ONE &quot;WESTECTOR&quot; TYPE W.E. (Westinghouse).</td>
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</tr>
<tr>
<td>ONE &quot;METAPLEX&quot; CHASSIS (Peto-Scott).</td>
<td></td>
</tr>
<tr>
<td>ONE &quot;FURY SUPER&quot; CABINET (Peto-Scott).</td>
<td></td>
</tr>
<tr>
<td>FOUR VALVES, TYPES P.M.12M., P.M.12M., P.M.2DX., P.M.22 (Mullard).</td>
<td></td>
</tr>
<tr>
<td>ONE MOVING COIL LOUD-SPEAKER, TYPE P.M.6. (W.B.).</td>
<td></td>
</tr>
<tr>
<td>ONE 120-volt H.T. BATTERY (Siemens).</td>
<td></td>
</tr>
<tr>
<td>ONE 10-volt G.B. BATTERY (Siemens).</td>
<td></td>
</tr>
<tr>
<td>ONE 2-volt L.T. BATTERY (Block Batteries).</td>
<td></td>
</tr>
<tr>
<td>CONNECTING WIRE, LENGTH METAL BRASSING, SCREWS, etc.</td>
<td></td>
</tr>
</tbody>
</table>

**PRACTICAL WIRELESS February 3rd, 1934**

In regard to the volume control, which, of course, functions by applying a variable biasing voltage to the grids of the two variable-mu valves, it was particularly pleasing to find that this gave a perfectly smooth control of volume over its entire range. When receiving the local, Daventry, and Radio-Paris, the volume control had to be slackened off considerably in order to prevent overloading, and to keep the volume down to a comfortable level for normal listening.

Quality of reproduction was found to be commendable, and not only when receiving the nearby stations, but also in the case of foreigners which are often worthless for entertainment purposes, due to the tremendous amount of distortion which takes place and the loud "back-ground" noises which accompany them.

This leads us to the point where special mention should be made of the real absence of "hisses" and other noises which are frequently so noticeable with a powerful set. No matter what position the volume control potentiometer was set to, there was a definite absence of unwanted noises or interference of any kind.

In a later test of the "1934 Fury Four Super," which was carried out during the evening and under more favourable conditions, it was literally possible to obtain good reception of stations at almost every setting of the tuning dials. At this stage the opportunity was taken to adjust the trimmers on the two-gang condenser. First of all the pre-set condenser was screwed about "half-in" and the star-wheel trimmer on the first condenser section was screwed in as far as it would go and then unscREWED D. LONDON NATIONAL, the Radio-Paris, Daventry, and the locals, had to be slackened off considerably.

The quality of reproduction was found to be a commendable feature, not only when receiving the nearby stations, but also in the case of foreigners which are often worthless for entertainment purposes, due to the tremendous amount of distortion which takes place and the loud "back-ground" noises which accompany them.

**INTERFERENCE—FREE RECEPTION.**

This series of tests was carried out soon after the new Laverne wavelength plan has come into operation, so there was some slight difficulty in identifying some of the stations whose wavelengths had been modified. Nevertheless, it was very noticeable that practically every transmission was received entirely free from interference, and could have been recognised had there been time to wait until the call signal or interval signals were given.

When using a gramophone pick-up reproduction was of the same high quality as on radio, and there was ample volume to fill even the largest room.
Grid-leak Connections

A USEFUL tip when connecting up a grid-leak for experimental purposes and dispensing with soldering, is to make a groove in the metal ends of the leak by means of the cutting edge of a pair of pliers or a file; then bind the ends of the wire around the groove and tighten with the pliers, as shown in the sketch. This will be found to be quite effective and enables the experimenter to try out different types of leaks.—C. Ross (Liverpool).

A method of making grid-leak connections.

Two Lighting Hints

MANY constructors possess a crystal detector, either loose or on an old set which is no longer used. This can easily be made into a handy light by replacing the crystal cup with a bulb-holder (flash-lamp type), and the arm carrying the cat’s whisker with a nut and bolt. One contact to the holder is made through one bracket to the centre screw, the body of the holder being connected to the other bracket and a thin wire passing through the glass tubing. This light will be found useful inside the set for inspection purposes, but it is particularly serviceable especially if the glass is of the half opaque type. The once popular valve window is now no longer used, but it can easily be turned into a handy gadget, i.e., an indicator light. The opening is usually covered with gauze or clear celluloid. This should be removed and replaced with a similar shaped piece of white (opaque) celluloid or equivalent material. On the back of this in black letters is printed the word ON, using India ink. It must be printed backwards, i.e., as if viewed in a mirror, and should preferably be inked twice to ensure a solid black. This is fitted with the window on any convenient place on the set, with a small bulb behind wired to the filament or heater circuit. When the set is switched off, all that will be seen is the white surface, but when the set is switched on the bulb will illuminate the celluloid, the word ON showing through as black lettering on a white background.—D. Cosquest (London, S.P.15).

A Simple Two-way Telephone

ANYONE possessing a set fitted with pick-up terminals and an extension speaker can easily make his own two-way telephone system by arranging a simple switching device as shown in the diagram. All that is required is a four-pole double-throw switch, although two double-pole double-throw switches will do, because they can be easily ganged together. If a rotary switch is available this should be used as it enables a more rapid change-over to be made. One pair of connections is taken to the loud-speaker terminals on the receiver and another pair to the pick-up terminals, whilst the moving arms of the switch are taken to the loud-speakers, one pair to each. When calling up the extension, the radio-gramophone switch must be over to gramophone and the switch turned over to the side A. It is not necessary to speak very close to the speaker (which, of course, is now used as a microphone); when the message is finished, say “Over” and turn the switch over to the side B so that the extension speaker is now used as a microphone, whilst the speaker resumes its legitimate duties. When the caller at the extension end has finished his message he calls “Over” and that is the signal to switch over to side A again and then speak.—R. H. Banner (Chesterfield).

Flexible testing prods for use in connection with a flashlamp bulb.

Wiring diagram for a simple two-way telephone.

A novel indicator light.

Flexible testing prods

### Grid-leak Connections

A method of making grid-leak connections. A groove is made in the metal ends of the leak by using the cutting edge of a pair of pliers. The ends of the wire are bent around the groove and tightened with the pliers. This method is effective and enables the experimenter to try out different types of leaks.

### Two Lighting Hints

**Crystal Detector Light**

A crystal detector, either loose or on an old set, can be easily made into a handy light. The crystal cup is replaced with a bulb-holder, and the cat’s whisker arm is replaced with a nut and bolt. One contact is made through one bracket to the centre screw, and the holder body is connected to the other bracket with a thin wire passing through the glass tubing. This light is useful inside the set for inspection purposes and is particularly serviceable if the glass is of the half opaque type.

**Valve Window Light**

A valve window, once popular, can be turned into a handy gadget by replacing the gauze or clear celluloid cover with a similar opaque piece of celluloid. This is fitted with a small bulb behind wired to the filament or heater circuit. The word “ON” is printed in black letters on the back of the window using India ink. It must be printed backwards and inked twice to ensure a solid black. When the set is switched off, nothing is visible except the white surface; when the set is switched on, the bulb illuminates the celluloid, and the word “ON” is visible through black lettering on a white background.

### A Simple Two-way Telephone

Any set fitted with pick-up terminals and an extension speaker can be easily converted into a two-way telephone system by using a simple switching device. A four-pole double-throw switch is required, although two double-pole double-throw switches can be used. The moving arms of the switch are connected to the loud-speaker terminals on the receiver and another pair to the pick-up terminals. The switch is used to select which loud-speaker or microphone is active.

### Flexible Testing Prods

Flexible testing prods are shown for use in connection with a flashlamp bulb. These prods are essential for testing and connecting various components in a radio system.
Inexregu Mains Tester—A Correction

On page 857 of our issue dated January 20th we illustrated a wrinkle for determining the character of the house mains supply. Owing to a misunderstanding the circuit arrangement was wrongly described, and it will be seen, if the original circuit is examined, that the mains supply is short-circuited when the switch is closed. The choke and its switch should, of course, be adjusted to provide a suitable distinction in the brilliancy.

Soldering Flexible Wander Leads

Having experienced considerable trouble through G.B. and similar leads breaking away at the point of soldering, I overcame the fault in the following manner.

When the mains supply is switched on, and the switch on the testing unit is opened, the lamp will show a certain brilliancy which will remain unchanged when the switch is closed if the supply is D.C., but which will vary in brilliancy as the switch is opened and closed if the supply is A.C. As originally mentioned, the impedance of the choke accounts for the difference on the alternating supply and the choke may be adjusted to provide a suitable distinction in the brilliancy.

![Diagram of mains tester](image)

Improvement Method

A simple method of soldering flexible wander leads.

Small L-shaped piece of wire as shown; the L-shaped piece is then soldered to the wiring, and a short piece of systoflex covered over the joint of flex and L-piece as shown in the accompanying sketch. The systoflex covering will be found to obviate sharp bends and kinks in the soldered end of the flex, which appears to be the source of trouble in exposed joints.

—L. E. SHELLEY (East Sheen).

Speedometer as Counter for Coil-Winding

An excellent counter for use in winding coils and transformers can be made from a second-hand speedometer, which may be bought very cheaply.

Remove the counting machine and fit to your coil winder. This will depend on the type of winder and counter. A portion of the flexible shaft taken from the driving cable of the speedometer can be fitted to the winder spindle by soldering or a set screwed sleeve.

Fit the winder and counter so that the lamp will show a certain brilliancy which is closed if the supply is D.C., but which will remain unchanged when the switch is closed if the supply is A.C. Owing to a misunderstanding the circuit arrangement was wrongly described, and it will be seen that the mains supply is short-circuited only when the iron is removed from the stand. Thus when soldering the iron receives the full load, but when the iron is placed down the resistance is brought into circuit, and thus prevents the iron from passing a high current during the time that wires are being put into place in a receiver, or some other operation is being carried out. Obviously the value of the resistance must be chosen so that sufficient current is passed to keep the iron at a working temperature. The sketches show the device quite clearly.

Simple High-voltage Supply

There are times when the experimenter requires a reliable source of H.T. in the region of 300/350 volts, but owing to the expense of a transformer and rectifier all he can do is to wish. It does not seem to be generally known that quite an effective power pack may be built for only a few shillings by using chemical rectifiers in a special voltage-doubling circuit.

![Diagram of high-voltage supply](image)

A Simple Battery of Chemical Rectifiers for Supplying H.T. Current

A simple battery of chemical rectifiers for supplying H.T. current.
DISTORTION IN TELEVISION RECEPTION

A Complete Explanation of all the Forms of Distortion which can Occur in Television Reception, and the Cures. By W. J. DELANEY.

ALTHOUGH the technique of receiving speech and music is practically the same as that required for the reception of televised images there is one vast difference. This lies in the fact that the eye and the ear are totally different in their reception of anything which is offered to them. This may seem a slightly difficult point to comprehend, but the following explanation may clear up any doubt which you may have regarding the truth of the remark. The ear, by interpretation, will put in or extract from a musical item in order to enable the brain to receive a clearer understanding of the item. This may be proved by any listener who visits a friend with a radio receiver. It may be found that the friend boasts of the bass response of his set, and yet when you visit him you form the opinion that your receiver is more productive of bass, a statement which form the opinion that your receiver

Fig. 1.—The received image should bear a close resemblance to this illustration, all half-tones being well represented.

Fig. 2.—A common fault experienced when first tuning-in to the transmission.

Fig. 3.—Another fault which occurs due to the lack of synchronism.

Fig. 4.—If the signals are too weak, or the lamp is too brightly illuminated from a separate source, the received image will appear as shown in Fig. 3, it will only be necessary to rotate the synchronizing gear round the motor shaft. The object, no matter whether synchronizing gear is fitted or not, is to obtain the picture squarely in the "frame," and it will soon be found that a variation in speed will quickly move the picture to the desired position, although the "framing" control must be adjusted where this is fitted.

Quality Response

Dealing with the disc apparatus, which is undoubtedly the simplest to understand, it will be fully appreciated that the range of tone which has to be obtained must vary from the brightest high-light to the deepest shadow, and this means that the neon lamp must, for the first mentioned detail, be at maximum brilliancy, and for the shadow must be extinguished. Therefore, the signal currents which are passed through the lamp must not only vary to that degree, but must also be adjusted in conjunction with the normal current passed by the lamp so that it may have those two extreme effects. Suppose, for example, that the receiver is capable of correctly handling the lowest as well as the highest frequency which is transmitted, but that the voltage which is applied from a separate source to the neon is too great. This will mean that the signal current will not be strong enough to extinguish the lamp, and the received image will appear as shown in Fig. 4, where the entire "field" will be brilliantly illuminated and the image will appear faintly. The same effect will, of course, be obtained if the signal strength is too low, and this may be remedied to a certain extent, when a separate source is employed for striking the neon, by reducing the current passed by the lamp. When the lamp is included in the anode circuit of the output valve, and the normal anode current is relied upon to provide the striking voltage, a weak signal will produce a similarly faint effect, although it may be found that the lamp will go right out at times, resulting in dark patches.

If the design of the radio side is not good and the low-frequency response is lacking, the received image will have an appearance somewhat similar to that shown in Fig. 6, although it must be appreciated that all of the illustrations accompanying this article are slightly emphasised in order to give in print an idea of the kind of image to be expected under the various conditions. It will be seen, therefore, that if the low-frequency response is

Fig. 5.—If the receiver has high-frequency response, the image will be accompanied by white patches surrounding the dark sections, somewhat after the manner shown in this illustration.

Fig. 6.—A poor low-frequency response will result in dark patches beneath the chin and loss of detail in the face, as shown here.

Fig. 7.—Interference such as may be caused by local oscillation or undue use of reaction will break up the image into squares or produce a chequered pattern as shown here. Some types of motor interference may produce a similar effect, although the white patches will predominate.

Fig. 8.—L.F. instability produces dark lines passing across the picture, as represented in this illustration. Motor interference sometimes causes a similar effect, as does the reaction control before the oscillation point is reached.

(Continued on next page)
Excess of High Frequencies

Should the receiver be so designed that the high frequencies are in excess, the effect will be similar to Fig. 5, where the image is accompanied by white patches surrounding any dark object, such as the hair and eyes. In other respects the picture may appear quite good, although movement of the image will render these white patches slightly confusing, but an examination of this illustration in conjunction with your received picture will enable you to decide whether the higher frequencies are in excess or not.

Oscillation

Where the receiving portion of the apparatus is fitted with a reaction control, this must be very sparingly employed, or the picture will be entirely spoilt. The effect of reaction on music is well known. As it is advanced towards the oscillation point the tone becomes deeper and muffled.

The effect on the television image will be similar to that shown in Fig. 7, where the contrast becomes very marked, and the picture breaks up into its component squares and is very contrasty. If the set is permitted to oscillate a chequered pattern will appear to pass across the screen, the exact pattern, the size of the lines, etc., varying according to the type of image. Instability in an H.F. stage will produce a similar effect, although in this case it may be found that the pattern is much smaller and remains more or less stationary. Low-frequency oscillation, or motor-boating, will probably produce dark lines running vertically down the picture, and these will travel across from one side of the picture to the other (Fig 8). A different effect is encountered if interference from the motor is experienced, and the usual two fixed condensers connected across the brushes, with the junction earthed, should always be included in this part of the apparatus.

MY REPLY TO "RADIOOPTIC"


I am sure that readers were interested to read "Radiooptic's" provocative article which appeared in last week's issue, but I strongly suspect that the writer gave rein to his own point of view with his tongue in his cheek. Criticism properly ministered is invaluable, but I feel sure that the engineer has followed the line of so many other television critics and passed judgment without a proper practical investigation, for he shows very frequently a lack of perspective while his "facts" are incorrect. Finally, although I appreciate that his attack on television investigators in general was quite impersonal, I took his comments very much to heart, for he criticised certain lines of recommendation which I have repeatedly suggested to readers of Practical Wireless myself. That being the case, I felt compelled to take up the cudgels and wage a counter-attack.

Transmitter Improvements

Taking the comments in turn, it is quite correct to say that very great improvements have been made on the transmitting side, but primarily this is more noticeable for the simple reason that initially the

Transmitting side was very much behind the state of the art at the receiving end. This is borne out very conclusively by an examination of two of the accompanying illustrations which show in Fig. 2 one of the original disc transmitters with a fixed electric cell stands correctly in front of a strong reflection, a better light spot and one which forms better output, and much better cell amplifiers.

Our "Radioptic" engineer would have appreciated these mechanical and electrical improvements much more if he had been associated with their development, or alternatively had made it his business to see the results of the early work and compared it with the vastly improved results accruing from the present type of apparatus. I am in no way trying to infer that present-day results are perfect; that would be ridiculous, but to make that an excuse for not evolving improvements much more if he had been associated with their development, or alternatively had made it his business to see the results of the early work and compared it with the vastly improved results accruing from the present type of apparatus. I am in no way trying to infer that present-day results are perfect; that would be ridiculous, but to make that an excuse for not evolving improvements much more if he had been associated with their development, or alternatively had made it his business to see the results of the early work and compared it with the vastly improved results accruing from the present type of apparatus.

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endeavours to justify his remarks by particularizing and dealing with certain sections of the apparatus which strike him as being amateurish (rather a slur on the many capable amateurs who have proved their worth in so many branches of radio, especially in short-wave transmitting, to mention only one example) and wholly lacking in engineering design.

First of all he takes the motor. Of course, there are some motors sold which are quite unsuitable for the work, but it is all a question of price. If the television constructor does not pay a good price for this product, of course the armatures and spindles are likely to be unbalanced. But cannot the same remarks apply to all classes of radio components? If a fair and reasonable price is not paid for coils, condensers, transformers, loud-speakers and so on, will they boast of a performance in any way comparable with their more expensive prototypes? Of course not, and if I wanted to give free publicity I would divide their prices by ten for similar components. The constructor does not pay a good price for the work, but it is all a question of price.

The next piece of “constructive” criticism is in connection with the brass spindle bush so often used for mounting the disc. While assembling his apparatus, treats it with a great deal of care, and yet the television constructor has reason to be thankful if the brass bush does not fail to fit. A coiled spring links the bush and the motor shaft (the bush is held gripped to the motor shaft by a spring which is adjusted by a screw) and while assembling his apparatus, treats it with a great deal of care, and yet the television constructor has reason to be thankful if the brass bush does not fail to fit. Moreover, if it is not a precise fit, it will render the motor inconveniently hot, and if I wanted to give free publicity I would divide their prices by ten for similar components. The constructor does not pay a good price for the work, but it is all a question of price.

Returning now to the last two points raised by "Radioptic," he complains of the relatively flimsy character of the scanning disc, and asserts that it lends itself readily to buckling. Surely he knows that when the apparatus is complete it is enclosed in its cabinets, and is therefore free from gross rough usage. The constructor is fully aware of this so-called fragility of his scanning device, and, in consequence, while assembling his apparatus, treats it with the respect it merits. If we handled loud-speaker cones, coil windings, glass valves and so on in a careless or rough manner, damage would soon occur, but we do not blame the designers for this, but regret our own lack of care.

The so-called television engineers (I quote this expression from the article of last week) with screw adjustment, the television constructor has reason to be thankful if the brass bush does not fail to fit. Moreover, if it is not a precise fit, it will render the motor inconveniently hot, and if I wanted to give free publicity I would divide their prices by ten for similar components. The constructor does not pay a good price for the work, but it is all a question of price.

Now for the real climax of the article which demanded an answer—hole-punching in disc. The mechanical television constructor should be most scientific in the methods he adopts for marking out and punching the disc. A tram of discs, with screw adjustment is suggested, a press to make the holes, or a clamp to grip the metal and prevent buckling! Does not "Radioptic" know that expensive machines have been installed by those manufacturers who make and supply accurate scanning discs? Yet the price of these products is something of the order of 10s. to 12s. 6d. To make "a trammer for the amateur" is all a question of price. Of course the armatures and spindles are likely to be unbalanced.

(The article continues.)
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**WHAT IS A RECTIFIER?**

A RECTIFIER is any device used for converting alternating current into direct current. In wireless the term is usually used to refer to the apparatus used for converting the alternating current supplied by the electric-light mains into direct current suitable for providing high-tension current for the receiver.

First of all let me explain the difference between alternating and direct current. The former, as its name suggests, alters backwards and forwards. It flows first, in one direction along the carrying wires and then in the opposite direction. At one instant, that is, at the change-over of direction, there is no current flowing at all. The next instant the current starts flowing, gradually increasing in magnitude until it reaches a maximum, after which it dies down again to zero. It then starts to move in the opposite direction, increasing to its maximum value, and again subsiding as before.

With the majority of electric-light mains, this process or cycle, as it is called, is repeated something like fifty times per second. It is usually represented graphically by the curved line in Fig. 1. At the instant of time represented by the point A there is no current flowing. In about 1/200th of a second, that is, from A to B, it rises to its maximum value. This is represented by the height that B is above the zero line. In another 1/200th of a second it has sunk to zero again, as shown by the drop in the curve to the point C. From C the current commences again, but in the opposite direction, and reaches its maximum at D. It then sinks once more to zero at E, and so the cycle is completed.

Now, current of this nature is entirely unsuitable for supplying the valves of a receiver. What is required is a current flowing steadily in one direction all the time—that is to say, a direct current. Such a current is shown graphically in Fig. 2. The line representing the current is straight, representing the condition of no change in value, and hence a steady flow. Such a current is shown graphically in Fig. 2. This is the straight line from A to B to C to D to E to F, to A. Herein lies the virtue of the apparatus, for if an alternating current (one which moves first in one direction and then in the other) is applied to the copper oxide-lead joint the latter will allow it to pass readily in one direction, but will practically stop it when it attempts to flow in the opposite direction. The result is a current which flows in one direction in a series of "jerks." It rises from zero to its maximum figure and then dies down. There is then a wait of about 1/100th of a second, during the time the current is attempting to flow in the wrong direction. During this interval another "jerk" of current is supplied, and the process is repeated until a steady direct current is obtained.

**Principle of the Metal Rectifier**

The metal rectifier is simply an assembly of alternate plates of oxidised copper and lead. Details of a single unit of this assembly are shown in Fig. 3. Actually the active elements are the film of copper oxide and the lead. The two plates are pressed firmly together so that the copper oxide and lead are in close contact. In practice a number of these units are used as in Fig. 4. They are connected in series or parallel according to the voltage and amperage of the current to be dealt with.

Now, if an electric current is passed through the unit from the lead to the copper it offers a comparatively low resistance; but a current in the opposite direction, from copper to lead, meets with considerable opposition. Herein lies the virtue of the apparatus, for if an alternating current (one which moves first in one direction and then in the other) is applied to the copper oxide-lead joint the latter will allow it to pass readily in one direction, but will practically stop it when it attempts to flow in the opposite direction. The result is a current which flows in one direction in a series of "jerks." It rises from zero to its maximum value and then dies down. There is then a wait of about 1/100th of a second, during the time the current is attempting to flow in the reverse direction. During this interval another "jerk" of current is supplied, and the process is repeated until a steady direct current is obtained.

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**Output: Alternating Current**

Of course, there are electric-light mains which supply direct current as well as those giving alternating current. Naturally, it is only with the latter that a rectifier is necessary. There are two types of rectifier in general use—one is the metal rectifier and the other is the tube rectifier. Each has its own particular merits.

**THE EASY ROAD TO RADIO**

**THE BEGINNER'S SUPPLEMENT**

**Fig. 1.** A graphic representation of an alternating electric current.

**Fig. 2.** Direct current is represented by the above graph.

**Fig. 3.** Details of one unit from a metal rectifier.

**Fig. 4.** A complete metal rectifier assembled from units such as the one in Fig. 3.

**Fig. 5.** This graph shows the result of half-wave rectification.

**Fig. 6.** This illustration shows the result of full-wave rectification.

**Fig. 7.** This illustration shows the result of full-wave rectification.

**Fig. 8.** The "bridge" method of using a metal rectifier.
the opposite direction, but cannot owing to the very high resistance of the rectifier, and then it again rises in the same direction as at first, and once more dies down and so on.

A graphical representation of this process, which is called half-wave rectification, is shown in Fig. 6. From A to B the current rises; from B to C it sinks to zero again; and then from C to E it practically ceases. A slight hump below the zero line shows that a very small current flows in the opposite direction during this period. This is, of course, due to the fact that the rectifier is not "perfect" in action. Although it offers a very high resistance when the polarity is reversed, it is not a complete insulator, and therefore a small current is bound to flow.

The circuit arrangement for a half-wave rectifier is given in Fig. 6. It is extremely simple, but has certain drawbacks. One is that the direct current pulses carry considerable smoothing before it is fit to supply the receiver.

Smoothing
A better arrangement is known as full-wave rectification, in which both halves of the alternating current are utilized. There are two circuits available—one is called the bridge circuit and the other the voltage-doubler circuit. They are shown respectively in Figs. 8 and 9. The choice of the one or the other depends on the output required. The former method gives an output voltage of about 70 or 80 per cent. of the input voltage, whereas the latter gives an increase in output voltage—not actually double the figure as theory demands, but something like 50 per cent.

In order to carry out the necessary smoothing a fixed condenser, called a reservoir condenser, is used in conjunction with an iron-cored choke. Fig. 10 shows this condenser and choke as connected in the voltage-doubler circuit. The effect of the condenser is like that of a large silencer or expansion chamber fitted to the exhaust pipe of a motor car. As you know, the exhaust gases enter the silencer in a series of spurts corresponding with each opening of the exhaust valves, but owing to the elasticity of the gases, the size of the expansion chamber, and the restricted outlet, the pressure of the gases when they leave is more or less constant. With the reservoir condenser each surge of current charges it up and then when the current drops between the surges it discharges itself and so tends to keep the output even.

The principle of the choke is exactly the opposite of that of the condenser, for whereas the condenser accepts each surge of current, the choke resists them. For this reason the choke is connected in series and the condenser in parallel with the rectifier. As the current through the choke rises, so a back E.M.F. (electro-motive force, or voltage) due to the inductance of the choke is created which opposes the flow of current. Then as the current falls the induced E.M.F. changes its direction and assists the passage of the current. Thus the effect of the choke is to maintain the current at a constant level—to make it less "jerky." You will notice that the choke comes first and then the reservoir condenser, thus the current is first partially smoothed by the choke and then the job is completed by the condenser.

Valve Rectifiers
Now let us have a look at the valve rectifier. This in its simplest form is similar to an ordinary receiving valve, but it has no grid—there is just the filament and the plate as in Fig. 11. It is connected up as shown in Fig. 12. This circuit is basically the same as the half-wave circuit of Fig. 6.

Since the current from the transformer is alternating, therefore, the plate becomes alternatively positive and negative. When it is positive it attracts the electrons which are being given off by the heated filament so that there is thus a stream of electrons from filament to plate, in other words an electric current flows through the valve. When the plate becomes negative the electron emission from the filament is repelled (electrons are, of course, negative particles of electricity). Like repels like, and no current flows through the valve. The resulting current is thus a uni-directional pulsating current similar to that represented in Fig. 5.

A more usual type of valve rectifier has two plates and gives full-wave rectification. The circuit is shown in Fig. 13. It is usual to supply the current from the mains. The transformer is therefore provided with another secondary winding specially for this purpose. This extra winding is clearly shown in Fig. 13.
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"UNIVERSAL" HIGH VOLTAGE MAINS VALVES EASILY CONVERT YOUR BATTERY SET TO ALL-MAINS, and enable anyone to build a splendid "UNIVERSAL" A.C., D.C. set. Highly efficient and most economical in every way. NO TRANSFORMERS, NO RESISTANCES. NO BARRETTES needed. Astounding results guaranteed by our technical staff. Free reprint of article "How to Convert a Battery Set to All-Mains" as described in "Practical Wireless" sent on request.

"UNIVERSAL" KITS also supplied. Blue Print with each kit. 3, 4, 5 and 7 Valve Receivers. 3 and 4 Valve Radiograms. 2 and 3 Valve Amplifiers. Complete List "N" and all details of the full range of Ostar-Ganz High Voltage Mains Valves free on request. Remember, too, that Ostar-Ganz "Universal" High Voltage Mains Valves work equally as well on either D.C. or A.C., so there's never any need to scrap them because your electric supply is changed.

Leaflets on Ostar-Ganz "Universal" sets and circuits as described in this and other radio papers sent free on request.


February 3rd, 1934

UNIVERSAL MODEL SETS

These are the most economical sets to buy and use. They also work off either A.C. or D.C. supply without alteration. These sets are remarkably free from mains hum. Reproduction is superb.

Post free mail order, including the "HORIHU " UNIVERSAL MODEL SET, employs a highly selective circuit with Pentagrid input triode tube, Helmholtz detector (D.I.C.), and qungull output. P.S.T. capable of an uninterfered output of 1.6 watts. Pedestal seated receiver, fitted with battery type volume control. Fitted with loudspeaker with horn-type firing. Priced withiostream type earphones and earphone lead: ready for use.

Price 25 Sh. 6d.

A postcard will bring you full details and prices. Unquestionably the greatest value obtainable in all-mains sets.

READ THIS QUALITY Produces EFFICIENCY

TESTED BEFORE DESPATCH

The original BECOL ebonite low loss formers are thoroughly reliable. They are used in all parts of the world. Look for the BECOL trade mark. Ask your dealer. If unable to supply write direct. SEND NOW, enclosing 6d. (post free) for third edition up-to-date handbook of tuning coils for DUAL RANGE, BAND-PASS, and SUPER-HET. circuits. Fully illustrated with data. A very interesting handbook.

RODS, SHEET, TUBES, PANELS


2 Free Blueprints!

THE REMARKABLE LINACORE

3-valve circuit equal to a Superhet

By sending this coupon NOW you will receive free a blueprint of an ideal battery or mains model "LINACORE" circuit which from 3 valves will give you results equal to a "Superhet." Enclose 2d. only for postage, and state which.

For battery receivers type BPB
For Mains receivers type BPM (as illustrated) 69/6

TO JACKSON BROS. (London) Ltd., 72, St Thomas' Street, London, S.E.1.

Please send free blueprint of Battery Model)

Mains Model ) Delete one not required

I enclose 2d. in stamps for postage.

NAME

ADDRESS

To P.W. 36/5
Television Kit Set

A new high-frequency speaker uses a piezo-electric crystal instead of the usual magnet and coil arrangement, and its function depends upon the principle that a torsion effect on the crystal can be produced by applying an E.M.F. between its faces. In use it is generally desirable to feed the two speakers (H.F. and moving-coil) through a selector device so that the lower frequencies are applied to one speaker and the higher ones to the other. So-called high- and low-pass filters are made specially for the purpose and are supplied along with the H.F. speaker.

New Tuning Dials

We have become so accustomed to the usual semi-circular or straight type of tuning scale, that any departure from this method arouses interest and creates not a little argument amongst the many devotees of the different forms. The latest novelty in dials has been produced by the makers of the well-known Ultra range of receivers, and takes the form of a clock.

The aperture in the cabinet front is square, and the wavelength markings of the medium and long-range band are arranged in the usual semi-circular form at the left-hand side of the "dial," and the medium band ranging right to left on the right-hand side. The markings are continuous, the lowest setting starting at a point midway between 6 and 7 o'clock, and the change from medium to long occurring at 12 o'clock. The indicating pointers take the form of clock hands, and the general appearance is very pleasing, giving the receiver an aspect which is a change from the usual "laboratory" arrangement of most receivers. Any change such as this, of course, will be welcomed, and will tend to still further popularize radio for the non-technical user.

H.F. Loud-speakers

A new type of loud-speaker has recently been developed in America and on the Continent which is intended to give particularly good response to the very high audio frequencies up to something like 12,000 cycles. This speaker gives practically no response to frequencies lower than 3,000 or so, and is therefore not intended for use by itself, but in conjunction with a moving-coil unit which, as is well known, gives maximum response to frequencies lower than about 4,000 cycles. By using the two together it is possible to obtain an almost perfectly uniform response to the complete range of audio frequencies, and thus reproduction of a hitherto unheard-of quality is to be obtained. The new high-frequency speaker uses a piezo-electric crystal instead of the usual magnet and coil arrangement, and its function depends upon the principle that a torsion effect on the crystal can be produced by applying an E.M.F. between its faces. In use it is generally desirable to feed the two speakers (H.F. and moving-coil) through a selector device so that the lower frequencies are applied to one speaker and the higher ones to the other. So-called high- and low-pass filters are made specially for the purpose and are supplied along with the H.F. speaker.

Artist Broadcasts While in Pain

None of the millions of listeners who heard the first broadcast in the "His Master's Voice" studios at St. John's Wood. He had been in bed for a fortnight, and at the last moment it was thought that the broadcast would have to be cancelled. His doctor forbade him to get up, but against his medical advice, he rose from his sick bed and, wrapped in rugs, left in a specially heated car for the studios. He took his place before the microphone, and listeners were switched over to the studios to hear him finishing the chorus of "The Glory of the Motherland.

Some Secrets of Record Making

Max Kester, the well-known personality of B.C.C. broadcasting, who is on the staff of "His Master's Voice," was hoping to broadcast in the "His Master's Voice" studios while in pain. The broadcast was arranged for a Saturday night feature of the famous gramophones and gramophone records. It had been arranged for a broadcast in the "His Master's Voice" studios at St. John's Wood. He had been in bed for a fortnight, and at the last moment it was thought that the broadcast would have to be cancelled. His doctor forbade him to get up, but against his medical advice, he rose from his sick bed and, wrapped in rugs, left in a specially heated car for the studios. He took his place before the microphone, and listeners were switched over to the studios to hear him finishing the chorus of "The Glory of the Motherland.

READERS' WRINKLES

(Continued from page 972)

The cells are easily made, either from pickle jars or test tubes. A most efficient arrangement is to make six cells from test tubes and mount them in a rack (Fig. 1). The cells may be made as shown in Fig. 2. When they have been assembled they may be put away in a dry place. Then, when it is necessary to "form" the electrodes, which is quite a simple operation. Connect up as shown in Fig. 3 and switch on the current, when, after a short time, the lamp will come dim and finally go out altogether. The electrodes are then formed, and after renewing the solution that they are ready for use. The smoothing condensers and choke complete the power pack, and the parts should be assembled as shown in Fig. 4 (S. Somers, Leeds 7).
TROUBLE-TRACKING IN SHORT-WAVE RECEIVERS

By B. M.

TROUBLE-TRACKING in short-wave receivers sometimes presents some curious difficulties which are not always easy to correct by the methods which are normally used for medium and long-wave receivers. As far as the home constructor is concerned, trouble may be encountered in a short-wave receiver in two different ways—either the receiver has been badly designed and/or badly built in the first place and refuses to work correctly from the first time of switching on, or else a fault develops after the receiver has been working satisfactorily for a while.

Ignoring short-wave superhet alone, we will give our attention to the type of receiver shown in the diagram. This is a straightforward arrangement consisting of an untuned screen-grid stage, detector, and two low-frequency amplifiers. This circuit, stage for stage, is the basis of the majority of short-wave receivers in use to-day. Some omit the screen-grid valve, whilst some omit the resistance-capacitance amplifier stage and, again, a number of receivers only use the two remaining valves for head-phone operation.

Failure to produce oscillations is generally the first short-wave trouble to be encountered, and this may be due to one or more of many causes. The first and obvious query is—are the coils correctly made and wired up in the correct sequence? If commercial coils are in use, it should only be necessary to check up the way in which they have been wired into the remainder of the circuit. If home-made coils have been used, the golden rule is to make them to some reliable specification and stick to that specification. The coil data has already been worked out and put into practice by an experienced designer, and any slight deviation from the original is bound to make some difference to the actual operation of the coil, in some cases making the coil quite useless. The size of the wire itself, the diameter, length, and material of the former, the number of turns, and the exact spacing between the coils are all important.

Assuming that the coils are correct and correctly wired up, further failure to produce oscillations may be due to a faulty detector valve, an incorrect size of reaction condenser, an inefficient H.F. choke, insufficient high tension on the detector valve, too tights coupling between aerial and tuning coils (in the case of receivers without an H.F. stage), wiring too long, etc.

Circuit for short-wave receiver, having an untuned S.G. stage, detector, and two L.F. amplifiers.

PRACTICAL WIRELESS
THREE TYPICAL USES FOR WESTECTORS

BATTERY ECONOMY

Used as a battery economiser, the Westector enables a large output to be obtained from a battery set without using special equipment, and is applicable to any type of receiver.

AUTOMATIC VOLUME CONTROL

Usually the introduction of Automatic Volume Control necessitates complicated alterations. But even delayed A.V.C. may be obtained in a simple manner with the Westector.

HIGH-QUALITY DETECTION

When used as the second detector in a Superheterodyne, the Westector gives straight line rectification with distortionless detection, and it is almost impossible to overload it.

You will want to know more about this useful component. It is incorporated in many commercial receivers, A.V.C. Units, etc. The coupon below and a 3d. stamp to Dept. PRA, will bring you full details—a copy of our booklet "The All Metal Way, 1934."

COUPON

The Westinghouse Brake & Saxby Signal Co., Ltd.,
82, York Road, King's Cross, London, N.1.

Please send me "The All Metal Way, 1934," for which I enclose 3d. in stamps.

Name

Address

PRA 3.2.34

Amazing Station Separation
Great Success of the WREN-EASTON MICRIONISED CLASS B RECEIVER

"The Easiest Set in the World to Build"

Thousands of "Practical Wireless" readers have built up the R.I. "Wren-Easton" Micrionised Class B Receiver. They are saying that it gives amazing station separation with the purest and most realistic tone that has ever been rendered by a battery-driven set.

Furthermore, it is so economical to run. Mr. Camm said: "The current consumption was measured and the average current for one hour's use was only four milliamps, thus providing very economical running" (Practical Wireless, Jan. 20th).

If you have not begun to build this receiver, do so now—if you have mislaid your copy of the circuit POST COUPON below at once for another.

The Great Selectivity of the R.I. "WREN-EASTON" Receiver is due to the MICRION IRON CORE COIL WITH ADJUSTABLE INDUCTANCE

"MICRION" was described in a test report by "Wireless World" as 30% to 40% better than other coils. It is the secret of the selectivity of the "Wren-Easton" and can also be used in practically any existing receiver to bring in station after station with clear-cut separation. It is easily fitted in a few seconds, no troublesome alterations to the circuit or re-calibration being involved. A turn of the micrometer adjusting screw enables it to be matched with existing coils and valves, or to suit varying aerial conditions.

Ask your dealer for the "Micrion" instructional leaflet which tells you how to fit the coil in your set.

12/6

Constructors are reminded that their radio dealer can supply all components for the "Wren-Easton." In the event of any difficulty please write to R.L. direct, who will tell you the nearest R.I. Wren-Easton Kit stockist.

WREN-EASTON CIRCUIT FREE!

Sign this Coupon and enclose 2d. in stamps for postage.

Name

Address

PRW

The Advt. of Radio Instruments, Ltd., Croydon, Surrey.
HERE IS A SELECTIVITY UNIT

that is NOT just a "gadget" to attach willy-nilly to any set and "hope for the best."

The "TONASTAT" has been carefully designed to meet the individual needs of practically every type of set in present-day use, be they 1924 or 1934 models.

NO OTHER SELECTIVITY UNIT COSTING SO LITTLE CAN DO SO MUCH AS THE "TONASTAT."

It offers a wide variety of combinations in connections to meet varying conditions of reception.

THE "TONASTAT"

GIVES HIGHER SELECTIVITY TO ALL TYPES OF SETS.

MAKES IT EASIER TO TUNE DOWN TO 200 METRES.

GREATLY REDUCES INTERFERENCE.

STOPS BREAKTHROUGH OF MEDIUM ON LONG WAVES.

COUNTERS NOISES FROM EARTH LEADS.

REDUCES MUSH AND SIDEBAND SPLASH.

BALANCES YOUR AERIAL WITH ANY SELECTED STATION.

CUTS DOWN WHISTLE INTERFERENCE.

INCREASES THE NUMBER OF STATIONS RECEIVED AND EASILY ADDS TO THE PLEASURE OF LISTENING.

With every "TONASTAT" there is supplied simple circuit wiring diagrams and a table of "TONASTAT" circuits recommended for use with 2 to 5 valve sets employing aerials from 40 to 100 feet long, for sets using indoor aerials, for sets using mains aerials, and for replacing the aerial by a "TONASTAT." Descriptive Folder "N." Free.

T.X. PRODUCTS Co.,
(Dept. "N") 32, QUEENSWAY, PONDERS END, MIDDLESEX

Telephone: Enfield 2823

50% reduction in H.T. and prolonged battery life

In addition to its other advantages just consider the resultant economy of the "Power Puncher." For example, in an average 3-valve set (1 S.G. Detector and Small Pentode) you save 50% of H.T. consumption. In other words you save at least one H.T. battery renewal per year and in some cases two. A complete unit in itself—requires no extra rectifier or resistances.

Write today for our new components' leaflet—it is free.

Varley

(Proprietor, Oliver Pell Control Ltd.)

Advertisement of Oliver Pell Control Ltd., Kingsway House, 103, Kingsway, London, W.C.2. Phone: Hol. 3593
ELECTRADIX MICROPHONES
Efficient, Cheap and Reliable Instruments for Home Broadcasting

For home broadcasting, and for many other experiments which have been described in these pages from time to time, a good microphone is indispensable. There are, of course, many different types of microphone available for the homenavigator, and the prices of these instruments vary considerably. The illustration on this page shows a range of microphones and special transformers which are supplied by Electradix Radios, and in this group will be seen no fewer than six different models, ranging from the small “button” type in the foreground, to the large pedestal type at the rear. The small button costs only 1s., and is of approximately the same diameter as this coin. Its overall length is only one inch, and although the sensitivity is not abnormal it can be productive of remarkable results. As an instance, it may be attached to a fairly large thin sheet of some substance to act as a sounding board, and then when connected to a two-stage amplifier good “phone” signals may be obtained from a person talking six feet from the microphone. The quality is not, of course, good enough to enable a musical instrument to be reproduced in another room, although the output may be modified by suitable condenser shunts. For experimental purposes, however, there will be found many interesting applications of the device and its price brings it within the reach of everybody.

On the right of this button may be seen a round model known as Type No. 11, which costs 7s. 6d. This consists of a moulded bakelite case inside which is mounted a microphone button of slightly larger dimensions than the 1s. model, and it is provided with a large mica diaphragm attached to the centre pole. Connections are brought out to two terminals on the rear, and the front is enclosed by a metal gauze with silk backing at the rear to prevent damage to the mica diaphragm. The sensitivity is naturally much higher than in the case of the Is. model, and quality is also better. There is naturally a slight background or rustling noise, but it is capable of fair quality musical reproduction and is very sensitive.

On the left of the front row is Model 11B, a more robust version of the previously described microphone, which costs 7s. 6d. This is finished in a neat blue cellulose enamel and is furnished with a two feet length of silk flex for connection purposes. The sensitivity is slightly better than Model No. 11 and quality is proportionately higher with a consequent reduction in background noises. This will prove a very good all-round instrument for the serious experimenter and is capable of really fine results when coupled to a suitable circuit. The flexible lead which is attached would render this particular model very useful for a sports meeting as it could be passed through a buttonhole and the various races, etc., could be announced without encumbrance.

This particular model is incorporated in the centre and right-hand stand models in the group, and these are, of course, much more convenient for public meetings, or occasions where the instrument is to be stood on a table for relaying a speech. The microphones are spring-suspended in the outer casing, ordinary rubber being used in the tall model, and helical springs in the model on the right. These prevent practically all of the background noises associated with the hand models, and also prevent the transmission of sounds other than those which are directed towards the microphone. Both models are finished with a neat bronze lacquer and a silk flexible lead. The super model on the extreme left is built on very substantial lines and the framework, as well as the microphone, is a most robust affair. It is capable of really high-class results, and is free from many of the objections usually found with low-priced microphones.

It is necessary with practically all microphones to employ some form of input transformer in order to correctly match the grid circuit of the valve with which it is employed, and three such transformers may be seen in the group. In the centre is an unshrouded model designed for microphones No. 11 and 11B, and this has a ratio of 90 to 1. It costs 3s. 6d. On the left is Model 2T, designed for the stand models and is provided with a ratio of 100 to 1. It costs 7s. 6d. For microphones No. 12 and 12S the transformer on the right should be used. With a ratio of 75 to 1 the cost of this transformer is 4s. 6d.

Each one conclusive proof of Dublier's outstanding Reliability

When building the ‘Fury Super’ insist upon Dublier Resistances for reliability.
T.W. THOMPSON SUPER-MICROPHONE

The illustration herewith shows a small microphone which retail at 8s. 6d., and which means in its moulded case the necessary coupling transformer. The coil is provided with a transformer which has at its upper end a small slot which enables the instrument to be hung on a nail or on a small button on the clothes if the microphone is required for use as a portable transmitting device. The front of the case is provided with a small copper gauze, and this is high and dense it is also possible to reduce various forms of interference. whilst by certain combinations of the coils and condenser it is also possible to reduce various forms of interference. When the terminals are brought out to form the coil and this is high and dense it is also possible to reduce various forms of interference. This is therefore a simple matter to bring the slot into use as required. Two stages of high amplification, battery-operated, proved adequate for really loud signals.

NEW HAMBLING TUNING COIL

A new tuning coil, especially designed for the new T.W. Thompson super-microphone, has been received for use with speakers which are designed to simplify the assembly of the complete assembly. The coil is provided with a transformer which has a ratio of 1 to 8, should be employed to connect the Tonastat to a receiver in various ways and in addition there are two small inductances wound in such a manner that they also act as capacitors. That is, one end of each winding is left disconnected, and the other coil is placed in the case, surrounded by the small lug. Thus the device may be joined in series with the coil, and this is high and dense it is also possible to reduce various forms of interference. It is obvious that the coil is totally enclosed and there is little risk of short-circuits.

The New Hambling tuning coil.

RADIO INSTRUMENTS Q.D.P. CHOKE

The range covered by the coil is 1,700 to 1,900 metres, and the price of the coil is 5s. 6d. from all well-known dealers, or 5s. 6d. by post from T.Y. Products Co., 32, Queenway, Fonder Idd, Middlesex.

The Radio Instruments Q.D.P. choke.
A NEW VALVE

IT is interesting to note that in the extensive range of Marconiphone receivers there are models which incorporate a form of quiescent push-pull amplification. As many of our readers will remember, this arrangement necessitates the use of two pentode valves arranged in a push-pull circuit, and the two valves are biased down to their bottom bend. This circuit arrangement did not find favour with the experimenters when it was first introduced, owing principally to the necessity of purchasing two separate pentode valves, and owing also to the rather difficult task of balancing the two valves.

In their own receivers they were able to make all the necessary adjustments to obtain best results, and with certain other modifications they renamed the circuit P.C.P. These letters stand for parallel conductance principle.

Experiments have been continued by the Marconiphone Company, and as a result a new valve has been introduced by them known as the Q.P.21. This is of the multiple-valve type, incorporating in one glass bulb the elements of two pentode valves. The two anodes and the two control grids are brought out to separate terminals, and the two filaments are in parallel. In order that the valve may be fitted with a standard 7-pin base the two priming grids are joined together and thus require only one pin. The characteristics of the valves have been arranged so that one of the original drawbacks of the Q.P.P. circuit have been overcome, and there is no necessity with this double valve of adjusting each priming grid to obtain equal anode currents in the two valves. Instead, the priming grid is adjusted, together with the grid-bias voltage, to produce a total anode current of approximately 2.6 mA at 150 volts H.T. or 3 mA at 120 volts H.T. The following figures give some idea of the working characteristics of a sample valve which we have tested.

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<tr>
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<td>3.5</td>
<td>12.5</td>
<td>9.5</td>
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</table>

It will be seen from the above table that there is a great deal to be gained by using a high value of high-tension voltage, although the total anode current consumption remains of a very low order. The quiescent current in, of course, the total value shown with no signal, and this rises according to the strength of signal received. Over a normal evening's listening the average current should work out at a figure of about 6 mA only with the maximum H.T., and this represents a very great improvement on the normal Class B arrangement. The input transformer should have a ratio of 1/10, and the anode-to-anode load should be approximately 24,000 ohms. In most cases it will be found desirable to use a filter circuit across the two anodes, and this should be made up with a .01 mfd. condenser and a 10,000-ohm resistance in series. The actual values will, of course, depend upon the actual speaker which is employed.

The price of the valve has not yet been fixed by the makers, but it must be remembered that with this method of amplification there is no necessity for a driver stage, and the Q.P.21 may follow a detector stage direct.

Mr. Camm's

‘FURY FOUR’
(W.B. Speaker solely specified)

Mr. Camm's

‘SUPersonic SIX’
(W.B. Speaker solely specified)

Mr. Camm's

‘1933 SUPERSET’
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AND NOW THE 1934

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February 3rd, 1934

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967
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PRACTICAL LETTERS FROM READERS

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

A Suggestion from S. Africa

Sir,—I have only recently started reading PRACTICAL WIRELESS, but am sorry that I did not commence sooner. After reading my first copy I was struck with the number of interesting and useful articles and simple explanations of difficult subjects.

On page 550 of the November 25th, 1933, issue of your magazine I noticed a letter from a South African reader, who suggested that you should publish an A.C. all-wave three. I have for some time been looking out for a diagram of a set of this type, as it seems to be the kind of set that satisfies our requirements (in South Africa) best. I, too, had thought of a circuit with S.O. (for H.F. pentode), detector, and pentode output.

Alternatively, a set of the type just mentioned, but without the escapade (which, I suppose, would make a fourth valve necessary), would be very welcome, as we are often without power.

I am sure that many South African readers would be very grateful if you were to publish a design for either of the above sets. —Y. S. Elson (Cape Province, S. Africa).

Reception on Ultra-S.W. Band

Sir,—I note with interest the queries of your correspondent " Mac."—H. O. Hendry (Barry).

From a Limehouse Reader

Sir,—I am sorry that I am a little late in acknowledging the tool kit, but I can assure you that it was not because the gift was unappreciated. I have PRACTICAL WIRELESS since No. 1, and look forward to every Wednesday morning. I thoroughly enjoy the articles therein I was very pleased with the gifts, especially the tool kit, and through showing them to friends I have gained you two more readers.—A. Hendry (Limehouse).

An Australian Reader's Thanks

Sir,—Thank you for the very useful formulae concerning choke—thair inductance, etc. It always to be very simple and straightforward. I must also take this opportunity of thanking you for your excellent magazine, which I have taken since the third issue. I learned more from it in three months than I learnt in a year and a half from two other publications. I am very interested in television, and am delighted to see any articles concerning it in PRACTICAL WIRELESS. Any articles explaining the more difficult, theoretical side of wireless are also greatly appreciated.—D. J. Cole (Footscray, Victoria, Australia).

A Welsh Reader's Comments

Sir,—I read the " PRACTICAL Letters from Readers " page with great interest each week, and notice that in the December 23rd issue Mr. G. W. Fortnam has written asking for a five-valve circuit to be published. The first thing an amateur wireless constructor considers before he builds a set is the cost. If it is too expensive he would probably turn it down, and if you did publish a five-valver as G. W. F. suggests, I'm afraid a great number of your readers would not be able to build it. This is the first time I have written to you and I wish you an excellent paper every success. I have taken it from about No. 9, and shall continue to do so, as it has helped me to understand a great deal about wireless. PRACTICAL WIRELESS is the best paper that ever appeared on a bookstall, and it certainly lives up to its title.—I. Jones (Barry).

Do you know

—THAT a primary winding on a mains transformer should be screened from the remaining windings to prevent hum and noise.—THAT a heater winding intertwined between primary and secondary windings will act as a screen for the above purpose.

—THAT a fixed condenser should hold a charge indefinitely, and that the nearer the surrounding air, the longer the well the charge be held.

—THAT the self-capacity of a tuning coil is of much greater importance on the short-wave band than on the long-wave band.

—THAT there is shortly to be a revival of the Quisscent Push-pull system of amplification owing to the introduction of a double pentode valve.

—THAT a vertical aerial is to be preferred for ultra-short-wave reception.

—THAT a hollow metal tube fixed about eighteen inches from the wall of the house will be found a very efficient arrangement for the above purpose.

NOTICE.
The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, Ducon Works, Victoria Rd., North Acton, London, W.3.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in PRACTICAL WIRELESS is as yet the subject of letters patent.
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special note.

we wish to draw attention to the fact that the queries service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, or on general wireless matters. we are not in a position to answer questions on (1) personal problems, (2) supply circuit diagrams of complete sets, (3) suggest alterations or modifications to the circuits described in our contemporary issues, (4) suggest alterations or modifications to commercial receivers, (5) answer queries over the telephone. please note also that all sketches and drawings which are sent to us should be the name and address of the sender.

mating the loud-speaker

"i am very keen on experimenting, and am con- tinually trying out different make of loud-speaker and output valve. although i have a tapped output choke, i cannot employ a low-resistance speaker and cannot get the transformer which the makers fit to the speakers is not always satisfactory. would you advise me to make up a tapped output transformer for various values? if so, could you give me any details concerning its construction?" g. t. (hampstead).

a tapped transformer would no doubt be of very great assistance to you if you do a lot of experimenting. we would suggest that you obtain 100 pairs of no. 30 stranded wire, and make a bobbin to fit these cores. for the primary use 10 lb. of no. 32 enamel wire, and wind this into one half of the bobbin. the approximate inductance of this winding will be 20 henries, and it will give sufficient output for experiments, although, if your experiment involves use, probably tapings at 50 per cent will prove most useful. the tapings will, at the above calculation, be wound with about 300 turns of no. 24 enamel, and it will carry 60 ma. comfortably. the secondary should be wound with about 300 turns of no. 24 enamel, and the approximate inductance of this winding at a turn ratio of 1:1 will be 20 henries. if you find that this brings results back to normal you may require, although, for general use, probably tappings at every 50 will be sufficient. if so, could you make a tap of the transformer which the makers fit to the speakers is not always satisfactory. would you advise me to make up a tapped output transformer for various values? if so, could you give me any details concerning its construction?" g. t. (hampstead).

data sheet no. 72

cut out each week and save it in a notebook.

resistance ratings

<table>
<thead>
<tr>
<th>resistance ohms</th>
<th>max. voltage</th>
<th>max. current</th>
<th>max. wattage</th>
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the formula for finding watts dissipation is 1/2 v 2 r. it must be remembered that certain types of resistance will stand up to a 50 per cent overload, and therefore the maximum wattage dissipation must be followed.

d.c. aerial circuits

"i am situated where the c.g. supply mains are very noisy, and, after testing the sets run by two or three of my neighbours, i am rather uncertain about having a set at all. the sets i have inspected are all home-made, and it appears that really all the noise is introduced via the earth lead, as one of my friends has tried various forms of interference eliminator on the mains side. can you give me any hints in choosing a set which will remove these troubles?" g. a. (finchley).

you will probably find that the mains will be removed when the earth lead is disconnected, and in this case we advise you to go ahead and build any particular type of set which you prefer, but be careful in the choice of aerial coil. this should be of the h.f. transformer type so that the aerial circuit is completed through the coil to earth with no direct electrical connection to the remainder of the circuit. the usual way is, of course, to employ a fixed condenser between the earth and the aerial. the h.f. transformer arrangement avoids this condenser and provides a separate aerial circuit. we think you will find that this will cure your trouble.

speaker field for bias

"i am using a mains set with a directly-heated output valve. i have now obtained a loud-speaker with an energized field and am uncertain how to use this to obtain grid-bias for the output valve. i already have a good chassis for smoothing the h.t. supply and would like to use this instead of a choke. could you give me a sketch showing the best arrangement?" t. g. (bolton).

the sketch hereunder shows the most likely arrangement for your particular case, but we would advise you to obtain a copy of practical wireless, dated march 19, 1933, in order to read the article with article c with the utilization of energized field windings in various parts of a mains circuit.

superhet tracking

"i have built up a superhetrodyne receiver somewhat on the lines of your premier but using parts which i had and which were chosen on account of their quality. i find the following fault, however, which is very hard to cure. when the receiver is subjected to a wavelength of about 250 metres i can adjust the frequency control to a correct station at really good strength, and the setting is fairly critical. as i tune up to a longer wave the receiver loses the station and it cannot get the midland regional without readjusting the tuning control. the same happens in the opposite direction. could you suggest what might be wrong?"

the sets in use.

we notice that a valve rectifier is employed in the mains portion of your receiver, and it is probable that this is the cause of trouble. if the same rectifier has been in use since the set was new it has probably lost its emission. the simplest test would be to replace the valve, and if it is not your dealer.

free advice bureau coupon

this coupon is available until february 10th, 1934, and must be attached to all letters containing queries.

practical wireless, 2/3/34
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T.C.C. Electrolytic Condensers, 400 volts working, 0.005, 2/6; 80 volts working, 0.005, 1/6; 160 volts working, 0.005, 2/6; 320 volts working, 1/3.

T.C. Block Condensers, 250v, working, 4 x 4 x 1 x 1 x 1 x 1 x 1 = 0.001, 3/6; the above condenser, but without the screen, 0.005, 1/3.

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DUBLINERS Condensers, 3 mfd., 1200v., working, 4/6; 6 mfd., 4/6; 12 mfd., 8/6. Indirectly-heated Condensers, working, 4 mfd., 6/6; with screens, 4 mfd., 8/6. Electrolytic Condensers, 80 volts working, 3/6; 160 volts working, 0.005, 1/6; 320 volts working, 0.005, 2/6.

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- PREMIER H.T.10 Transformer, 250v.

- PREMIER Mains Transformers, output 135v. 80m.a. for voltage doubling, 8/6;

- 4v. 3-4a., CT.,

- Rectified, with 4v. 3-5a. C.T., L.T., and screened primary, 60 m. a., 4v. 2-3a., 4v. 1-2a. (all CT.);

- Magnavox, 4/11

- Magnavox, 4/11.

- Indirectly-heated Condensers, working, 4 mfd., 6/6; with screens, 4 mfd., 8/6.

- Electrolytic Condensers, 80 volts working, 3/6; 160 volts working, 0.005, 1/6; 320 volts working, 0.005, 2/6.

- The above condenser, but without the screen, 0.005, 1/3.

- 1 mfd., 2/6.

- 6 mfd., 4/6; 12 mfd., 8/6.

- Indirectly-heated Condensers, working, 4 mfd., 6/6; with screens, 4 mfd., 8/6.

- Electrolytic Condensers, 80 volts working, 3/6; 160 volts working, 0.005, 1/6; 320 volts working, 0.005, 2/6.

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- 4v. 3-4a., CT.,

- Rectified, with 4v. 3-5a. C.T., L.T., and screened primary, 60 m. a., 4v. 2-3a., 4v. 1-2a. (all CT.);

- Magnavox, 4/11

- Magnavox, 4/11.

- Indirectly-heated Condensers, working, 4 mfd., 6/6; with screens, 4 mfd., 8/6.

- Electrolytic Condensers, 80 volts working, 3/6; 160 volts working, 0.005, 1/6; 320 volts working, 0.005, 2/6.

- The above condenser, but without the screen, 0.005, 1/3.

- 1 mfd., 2/6.

- 6 mfd., 4/6; 12 mfd., 8/6.

- Indirectly-heated Condensers, working, 4 mfd., 6/6; with screens, 4 mfd., 8/6.

- Electrolytic Condensers, 80 volts working, 3/6; 160 volts working, 0.005, 1/6; 320 volts working, 0.005, 2/6.

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- Magnavox, 4/11

- Magnavox, 4/11.
F. J. Camm, the "Practical Wireless" expert set designer, used and specifies Colvern Ferrocart coils for his "1934 Fury Super."

Ferrocart coils ensure unsurpassed selectivity and unfailing accuracy. Every coil is thoroughly tested and guaranteed to be identical with those employed in the designer's original receiver.

Follow Mr. Camm's specification—use Ferrocart for the 1934 Fury Super. One set Ferrocart coils, types G.10, G.14, G.13, at 37/6 per set, with on and off switch 1/6 extra.

Make certain of the best results—get a Colpak for your next set. The type illustrated on the left is "Colpak" Type H (Mains) at 57'6"

Made under license from the patentee, Hans Vast.

Ferrocart ...chosen for the new Fury Super