FREE INSIDE!
DATA SHEET
No. 6
"HIGH AND LOW FREQUENCY CHOKES"

SEND US YOUR "RADIO WRINKLE"

Whether it's bought or whether it's built, earth your receiver by fitting a FILT!

GRAHAM FARISH FILT
PERCOLATIVE CHEMICAL EARTH

Price 2/6 COMPLETE

If you cannot readily obtain a FILT from your radio dealer order direct, post free, from sole manufacturers:
GRAHAM FARISH LTD.
205, Mason's Hill, Bromley, Kent.
The wedding of William and June, the daughter of a rich business man, was to take place in a fortnight's time. But suddenly June sprang a bombshell on everybody by insisting that William must elope with her that very day.

William Gwynn was once more face to face with the large, wealthy father of June.

"Hello, Will. Sit down! This is something that has to be discussed at once, of course."

"What is it?"

"This business of your marrying June. You're expecting to do that a week from Friday? Well, you're not!"

"What?" gasped William.

"No. June has changed her mind," said Henry Stannard. "Fact is, June doesn't want to wait till next week. She is going to marry you to-day!"

"But—but we can't do that!" William stammered. "The invitations are all out for Friday and—"

"I know, Will."

"What for?" William asked. So many things were racing through his mind. Sheer joy, of course, that the only perfect girl so far produced by the human race was to be his own at once. And also a quantity of plain consternation as he realised that in his pocket reposed exactly six dollars and in his bank account—nothing!

"I don't know!" Stannard said irritably. "Seems she has some damned romantic notion of being carried off this evening at nine. So there you are, and you'll have to hustle, you haven't got much time."

"It's impossible," said William. "We can't let it go through. I'll have to talk to June. Where is she?"

"She's here, Will," said June, with a sigh, as she entered.

"She's here, Will," said June, with a sigh, as she entered. William rose to greet her.

"Sit down!"

"Yes, Will," said June, with a sigh, as she entered. William rose to greet her.

"You've something to say to me, Will?"

"You bet I have!" said Mr. Gwynn. "I think it's a lot more romantic and alluring."

William found himself caught up in a bewildering host of difficulties as a result of June Stannard's ultimatum. Read of his desperate attempts to obtain money for his honey-moon in the brightest and cheeriest serial story of the year.
FOR EVERY SET—there's a PILOT AUTHOR KIT
CASH—C.O.D.—or H.P.

EVERYTHING RADIO
CARRIAGE PAID TO YOUR DOOR


THREE TAPINGS:
W.B. with fully automatic electric starting and 12 -inch nickel motor plate. £6/15/0. C.O.D.

CABINET KIT "B" As KIT "A" but with valves, less cabinet. CASH or C.O.D. £5 - 10 - 9 or 12 monthly payments of £1/6/6.

KIT "G" As KIT "A" but with valves, less cabinet. CASH or C.O.D. £6 - 13 - 3 or 12 monthly payments of £1/6/6.

LISSEN "SKYSCRAPER" S.G.3 COMPLETE WITH VALVES


HEAYBIRD HOME BATTERY-CHARGER Model A.0.3. for A.C. Mains only. Charges 4, or 6, accumulators at 1 amp. Cash or C.O.D. Carriage Paid. £2/6/6. Balance in 6 monthly payments of £1/6/6.


SELECTONE Described this week

KIT "A" CASH OR C.O.D. £4-8-0 or 12 monthly payments of 8/-

Author's Kit of specified parts, including ready drilled panel, but less valves and cabinet.

KIT "B" CASH OR C.O.D. £5-2-0 or 12 monthly payments of 9/-

As KIT "A" but with valves, less cabinet. CASH or C.O.D.

KIT "G" CASH OR C.O.D. £6-13-3 or 12 monthly payments of 5/-

STOP PRESS OFFERS


AMPION PICK-UP with arm base and volume control. Cash or C.O.D. only. £10/6/0. Carriage Paid.


This is an honest-deedsmanship offer from a firm established in 1931—only for the purpose of building quality sets and equipment. Your Author's KIT gives you the best of results. Peto-Scott Author gives every owner of this kit a personal guarantee of satisfaction. We give you credit over

7 monthly payments, making an extra change for easy Terms. Cash Price £11/6/0. Complete with all Depression. Peto-Scott Author gives every owner of this kit a personal guarantee of satisfaction. We give you credit over

10 months payments of £1/6/6.

IMPORTANT.

Parts, Etc., Miscellaneoua Component. Finished Receivers or Accessories for B.P. or own set. Send 5/- on our own offer. Payment. Send a list of your wants — we will make you an offer. C.O.D. orders value over 10/- cost carriage and deal directly.

PETO-SCOTT CO. Ltd. 77, Gify Road, London, E.C.1.

FOR 1933 SECOND HAND KITS


1. UNTILITY STANDARD 2,005 rated. Condenser with UTILITY type W. 10 Microdial. £15 0.0. 1. GOLVERD "T.D." Coil... 8 6 1. BENJAMIN Transistors

1.9. VARILEY Recetor Transformer

3. Specified Valves

2.8. CANGRO Exclusor Oak Cabinet as specified.... 1 2 0

SOLO 3 KIT "A" specified parts, including ready drilled panel, and cabinet. Carriage paid.

KIT "B" CASH OR C.O.D. £3-0-0 or 12 monthly payments of 8/-

Specified Valves £1-2-9. Cabinet 15/-

THE PETO-SCOTT WALNUT CONSOLE (RADIO ONLY)

Recommended for the Selectone

Construed to fit Walnut with contrasting inlaid Walnut Veneers. Comes with you with valanced foud out, as illustrated. No skill or expensive tools are required to transform your radio into a beautiful boulouese instrument, preserving the professionalism gained experience of the most expert cabinet makers. Peto-Scott makes you own the best money can buy. Carriage and W. 2/- extra for easy Terms.

PETO-SCOTT S.G.3 SHIELDING PLUG. Ready for immediate use and sold with the professionally finished Walnut Concole Radio. £1/-

13/- specified parts, including ready drilled panel, but less valves.

CASH or C.O.D. or H.P.

11/- monthly payments of £1/6/6.

1933 KELSEY SHORT WAVE ADAPTOR

Tune -in the Short-Wave Tunes in the World's Stations on your present Short -Wave Set. This makes you own the best money can buy.

Send 45/- CASH or C.O.D. or £6/3/- 10 monthly payments of £1/6/6.


Dear Sirs, Please send me CASH/C.O.D./H.P., for which I enclose £1 6/-.

Name.......................... CASH/C.O.D./H.P.
Address..........................

Carriage and Post Charges Paid

Any item supplied separately—orders over 10/- sent C.O.D. Carriage and Post Charges Paid.
The Most Talked About Set of the Season

“SKYSCRAPER RADIO”

Its builders are its best salesmen

Never before was there such a set within the reach of the home constructor. Never before such power from a battery set. Never before so many enthusiastic letters from constructors or so much talk about any radio set as this Lissen “Skyscraper” Kit has elicited. 50—60—70 loudspeaker stations—everybody who builds a “Skyscraper” gets results like that!

THE ONLY KIT YOU CAN BUILD YOURSELF EMPLOYING METALLISED S.G. HIGH MU DETECTOR AND ECONOMY POWER PENTODE VALVES

This new Lissen “SKYSCRAPER” Kit Set is the only one on the market that you can build yourself employing a Metallised Screened Grid Valve, High Mu Detector and Economy Power Pentode. Around these three valves Lissen have designed a home constructor’s kit the equal of which has never been before. Why be satisfied with whispering foreign stations when you can BUILD WITH YOUR OWN HANDS this Lissen “SKYSCRAPER” that will bring in loudly and clearly distant stations in a profusion that will add largely to your enjoyment of radio?

Lissen have published a 1/- Constructional Chart, giving the most detailed instructions ever printed for the building of a wireless set. You can’t go wrong—every part, every wire, every terminal is identified by photographs. Everybody, without any technical knowledge or skill, can safely and with COMPLETE CERTAINTY OF SUCCESS undertake to build this most modern of radio receivers from the instructions given and the parts Lissen have supplied.

YOURS FOR ONLY 8/- DOWN

To-day you can buy the LISSEN “SKYSCRAPER” KIT on Gradual Payment Terms. “Skyscraper” Chassis Kit, complete with Valves. CASH PRICE 8/-6. Or 8/-6 down and twelve monthly payments of 7/-6.

“Skyscraper” Kit complete with Walnut Cabinet and in-built Loudspeaker, as illustrated, 86 Sts. Cash. Or 11/-6 down and twelve monthly payments of 10/-6.
Next Week’s Great Free Gifts!  

Readers have had plenty of evidence since the publication of No. 1 of PRACTICAL WIRELESS on Sept. 24th, that this paper exists earnestly to foster the interests of the home constructor. The Wire, a new wonder set—the Encyclopaedia, specially prepared and made exhaustively comprehensive, was made available. Our series of WIRELESS DATA SHEETS provides the reader with valuable facts and figures in easily consulted form.

Next week, however, we are giving TWO FREE GIFTS, for in addition to Data Sheet No. 7 (which is entitled "Condensers and Condenser Values") there will be presented Free with every copy, in an envelope, the Home Constructor’s Handy Gauge, made in a stout gauge of steel, which you see illustrated actual size in the centre of this page. This gauge is an almost indispensable tool, for it may be used as a screw gauge, as a tap drill gauge, as a valve leg gauge (for triodes and pentodes), as a wire loop former, as an insulation stripper, as a wood scraper, as a universal trammel for scribbling holes on panels, baseboards, etc. The exact uses to which the gauge may be put forms the subject of a special article, which will also appear next week. You cannot buy one of these gauges, for it has been specially made for PRACTICAL WIRELESS. Note that you have nothing to do in order to get it, except to buy next week’s issue. YOUR GAUGE will be secured to the cover of YOUR copy. There is always a great demand for gift issues, and it is necessary for you to order now. Note also that next week’s issue (on sale on Wednesday, January 25th) is the same price as the preceding issue.

The "Fury Four."  

On page 833 of this week’s issue you will find a preliminary announcement concerning set—the "Fury FOUR"—which is destined to make radio interesting. Fuller details of the "Fury FOUR" will be given in the January 28th issue! This receiver has engaged the designer, Mr. F. J. Camm (Editor of PRACTICAL WIRELESS), in exhaustive experiments over the past four months. It is entirely new in principle, and it has been designed so that even those with a limited purse can make it up. So remarkable is the set that we venture to think it will be made in its thousands. It will receive, on any evening, over 100 stations without jamming; it is extremely selective, simple to operate, easy to build, cheap, incorporates the very latest ideas (including two S.G. valves) and, what is more important, despatching the volumes with all speed.

If you have not yet done so, therefore, affix the gift stamp to your subscription voucher and forward the completed voucher in accordance with the instructions thereon to-day.

Wireless Set in a Walking Stick  

Another well-meaning experimenter has had the idea of cramming a wireless receiver into a hollow walking stick, the whole of the apparatus, apart from the headphones, being contained in the stick. Modern traffic conditions allow of no distractions for pedestrians, and when walking in the country I personally can think of no better programme to listen to than Nature’s own broadcasts.

Brussels Extends its Programmes  

The Brussels No. 1 and No. 2 stations are now giving a continuous broadcast on Sundays from 10.0 a.m. until 2.0 p.m. and from 5.0 p.m. until midnight; on Saturday evenings dance music is also transmitted until midnight.

New Long Wave Station at Droitwich  

While the next "big noise" to be heard in this country will be the new West Regional, I hear it is practically certain that the new long-wave station at Droitwich will follow closely on its heels. This will be a good thing for I do not think I would be a mile out if I said that the long-wave National has a greater following than any other British station. If you consider this you will see that it is not surprising because 5XX’S signal is always consistent, although not always excellent, and the ether around that wavelength has enjoyed a long run of comparative freedom from interference.

Sponsored Programmes by "Atlas"  

Messrs. Haddon, Clarke and Co., the makers of the famous "Atlas" series of receivers and components, have now arranged for sponsored programmes to be broadcast on behalf of "Atlas". If you have not yet sent in your coupon according to the conditions given in our December 24th issue, you should do so without further delay. We are, of course, anxious to hear your comments and suggestions on the set.
**ROUND the WORLD of WIRELESS (Continued)**

**Broadcasting Films in France**

Many Continental stations in the course of the year will offer new view of the entertainment relay performances from local cinemas. Radio Strasbourg (France) now makes a regular feature of this kind of broadcast. All necessary explanations are given by the announcer in a running commentary where the film is itself not sufficiently explicit.

**Penny-in-the-slot Wireless**

A radio engineer in Durham has patented an invention which he proposes to offer to manufacturers and dealers selling wireless instruments on hire-purchase terms. Unless regular instalments are paid by dropping coins into a special slot by means of a time switch, the instrument automatically "switches down." Arrangements can be made by which a set will work for a day, week or month according to the amount paid.

**Early-Morning Transmissions**

Although broadcasts may be heard in the early hours of the day from a number of Continental stations, up to the present most of the French studios do not work between breakfast time. In future, the Poste Parisien (Paris) will awaken its listeners with a fanfare of trumpets at 7.30 a.m., to be followed by a news bulletin, a course of physical exercises, and a concert of gramophone records.

The Luxembourg Giant

In view of the fact that official authority to operate has not yet been received from the Radio Luxembourg super-power station is not supposed to broadcast. It may be heard testing, however, daily between 11.0 a.m. and midday, and again between 6.15 and 8.30 p.m., G.M.T., on a wavelength in the neighbourhood of 1,190 metres. The opening signal was designed to be heard by the neighbours or by passers-by in the street.

The Luxembourg Giant

The Luxembourg Giant consists of a series of prolonged siren-like notes and buzzes. For an obvious reason, no call is given out during the broadcast, and no announcements are made between items of music, yet every listener in France knows that it is Radio Luxembourg. Owing to the delay in opening the station, the inhabitants of the Grand Duchy are not supposed to switch off their sets or take steps to ensure that wireless entertainments or gramophone music cannot be heard by their neighbours or by passers-by in the street.

**Solutions!**

**Problem No. 18.**

Smith corrected his three-wave receiver for use on the Short Waves. The conversion consisted of altering the value of the grid-leak and better wiring, with the addition of a 900 ohm potentiometer across the L.T. and L.T. + terminals. The set worked quite well for a time, but Smith found that, although the valves had not been altered, the accumulator required much more frequent charging. What was the cause of this? Three books will be awarded for the first three correct solutions opened, a Mark envelope Problem No. 18, and send to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 441, Southamptowm Street, London, W.C.2, to reach us not later than January 23rd.

**SOLUTION TO PROBLEM No. 17**

Reassembler forgot to insert the coupling condenser between tuner and transformer primary, and therefore the H.T. was short-circuited by the resistance and transformer primary in series.

Only two readers succeeded in giving a correct solution of Problem No. 16, and books have therefore been forwarded to:

D. W. Lemon, 32, Sunnert Park Road, Dinas-powdth-Halg, Manchester; Patrick J. Boyd, 22, Derby Road, Ribbleston, Preston, Lancs.

**Flying Radio Reporters**

As news bulletins form the major portion of the Moscow broadcast, in order to develop this feature the Soviet authorities have installed a fleet of six aeroplanes which will enable special reporters to make running commentaries on any event of general interest. Each aircraft is fitted with a short-wave telephony transmitter to permit it to keep in touch with the nearest broadcasting station. It is further intended to equip two of these planes with recording apparatus, and thus allow a re-broadcast of the talk at a future date.

**Free Listening Licences**

Following raids by the Belgian police with a view to the discovery and prosecution of radio pirates, the Labour Party in Belgium has requested the Government to issue free licences to the unemployed. This step was taken in the spring of some months ago, where, in addition, no tax is collected from the blind or from war invalids.

**Another Super Station for Romania?**

Experiments which have been carried out with a kilowatt transmitter relay of the Bucharest programmes have proved very satisfactory, it is reported that if financial conditions will permit a 150 kilowatt station is to be erected at Capiu. The most favourable choice for the broadcasts was found to be 1,890 metres.

**Hilversum and Huizen**

From January 1, listeners may have noticed that the A.V.R.G. and V.A.R.A. broadcasting associations are being transmitted on the higher wavelength. Although it is generally stated that the stations exchange wavelengths, this is incorrect, inasmuch as the transmitters continue to operate in the same channels. What actually does take place is that the studios exchange transmitters. During the period January-March, therefore, you will hear Hilversum announcements on 1,875 metres, and Huizen entertainments on 295.1 metres.

**D.X. Work**

Some time ago I mentioned in these notes that there was every indication that reception conditions during the present winter would be as good as they had ever been before during the past seven or eight years. My prophecy has been more than fulfilled already, and I can honestly say that conditions are better than I have ever known them. I have kept a more or less continuous reception log since the days when Blackpool was a "flying" (Dux, Endem Rock) and the Hague were the only sources of broadcast entertainment, but never have distant stations come in as well as they do at present. In saying this I make full allowance for increased transmitting power and receiver improvements.—JACQ.
AN IMPORTANT ANNOUNCEMENT -

MY “FURY FOUR”

Preliminary Statement by F. J. CAMM
Concerning his Remarkable New Receiver,
Details and Photographs of Which will be Given Next Week!

I t is with extreme pleasure that I announce to every reader of PRACTICAL WIRELESS directed my thoughts to the production of a new type of wireless receiver yielding such remarkable results that I confidently predict that it will be made in its thousands. As Editor of this paper, I am in a unique position to gauge from the hundreds of letters I receive every day the type of set which the home constructor requires, and which no designer of home receivers, so far as I am aware, has as yet supplied.

The difficulties readers have encountered form a valuable guide to the snags encountered in home-constructed sets, and the queries received by my Technical Staff accentuate the fact that the amateur has, so far as I am aware, incorporated in one excellent as so many home-constructed sets are, no designer of sets for the amateur has, as yet supplied. The requirements which those letters indicate to produce a receiver the drawbacks and the bugbears which the amateur must suffer.

The unassailable and unrivalled position now occupied by PRACTICAL WIRELESS could, by following the very complete constructive details to be given in following issues, duplicate immediately he had attached the last wire to the set, the remarkable results of which my set is capable.

With the object of providing my readers with a really outstanding receiver which would not readily go out of date, I have very carefully analyzed modern radio reception and difficulties so that I could anticipate the snags instead of, as is so often the case, leaving the reader to do so. The “Fury Four” is no ordinary set. I have built into it my sixteen years’ experience of radio design and construction, and having got the design right, I felt that time could not be delayed in placing before the readers of this paper an announcement of the utmost importance to every home constructor of wireless sets in the country.

To accelerate the tests necessary before the announcement could be made, not alone myself, but members of my staff and many other radio experts have been dispatched by aeroplane all over the country, and their reports agree in striking manner with mine. It is no chance set merely put out as a journalistic stunt, for wherever it has been put on test (and the testing zones have been far flung and specially selected because they set up wrong standards), it has responded in a remarkably uniform degree, and confirmed the results which I have sincerely set out to attain.

You will be afforded ample proof that these claims are not an over-statement of the capabilities of the set. Logging charts from various parts of the country will be placed before you. Every detail necessary to construct the “Fury Four” will be published in these pages and guarantee that, using the components I specify, you will immediately have a receiver which represents a marked advance on anything before published.

The “Fury Four” is, as its name implies, a four-valve receiver employing two S.G. valves and a pentode output stage. I believe, the practice in the electrical and radio industries for designers to name sets after themselves, a practice originated by the pioneers of electricity, who vied with one another in their efforts to produce a new electrical unit which could be named after them. The vanity of these pioneers, of course, be excused, for one can forgive geniuses like Galvani, Volta, Coulomb, Ampere, and others the vanity of naming their discoveries after themselves, so that their names might reverberate down the centuries. My aim has been to produce a set for such purposes, but to serve the constructors, and the “Fury Four,” you will agree, is an easily remembered and euphonious title.

Expert wireless designers frequently fail to achieve success because they set up wrong standards. Opticians, for example, set up impossible standards and proclaim that everyone needs glasses who falls short of them. The home constructor, therefore, is perhaps to-day excusably weary of the claims for particular sets, which fail to materialize. If the standards are wrong the design must be wrong; my standards are not impossible standards. Briefly, they are these: The set must be extremely selective, with absence of overlapping; it must provide ample volume on all stations received; it must be capable of receiving 100 stations; it must be simple to operate, it must be cheap to build, it should be free from background, it should be economical to run; it should operate equally well on medium and long wave-bands; it should be trouble-free, stable, easy to construct, and, most important of all, it should be backed by a guarantee of satisfaction by its designer. In other words, the constructor who fails to achieve what the designer claims should be entitled to free advice until it functions in the manner claimed.

This guarantee I readily give, for every builder of the “Fury Four” may avail himself of my personal advice, free of charge, for as little difficulty he may encounter, and I shall not be satisfied until every reader obtains the results I claim. If he follows the instructions I shall give later this he is bound to do.

One little feature I have incorporated in the “Fury Four” is the use of voltage dropping resistances so that the builder is relieved of the necessity of adjusting H.T. voltage. He merely places the negative plug into the negative socket of the H.T. battery and the positive wander plug into maximum H.T. voltage. The fixed resistances will ensure that the correct voltages are applied to the anodes of each valve. I have also made use of these resistances to act as decouplers, a purpose which they quite successfully serve, for a feature of the “Fury Four” is its entire absence of background noises.

A point which the home constructor will appreciate is that I have eliminated the need for accurately balancing the three tuned circuits necessary in a modern receiver by tuning the detector grid coil by a separate condenser and the remaining two coils by a double gang condenser. I shall have more to say later about this ingenious method of tuning. I do not think it possible to incorporate in one receiver arrangements for receiving short, medium and long waves, for short-wave reception is admittedly tricky, and to render it efficient the medium and the long waves must suffer. Having in mind the depth of the pocket of the average home constructor, I have purposely kept the cost extremely low, for it may be built for about Five Pounds. The “Fury Four” is a set which will make radio history. Next week I shall describe the set and its performance in great detail.—F. J. C.
A MATEUR constructed receivers have a number of possible advantages over commercially-constructed ones, but in one respect, many commercial receivers score. I speak of the calibration in wavelengths of the tuners.

At first sight, it might be thought that except when using one of the few wavelength-calibrated "packs" on the market, the difficulty of calibrating most prevent amateurs from competing in this field. However, this is far from the case. By the means I shall describe in this article, every amateur can calibrate his receiver in wavelengths, and provided he takes reasonable care he will be rewarded by an accuracy considerably greater than that found in most commercial receivers.

Making a Graph

To provide the wavelength settings for calibration, a graph has to be used. A considerable number of amateurs will have already made graphs, and in any case the necessary procedure of making a graph is pretty well known, so I do not propose to say more than a few words on the subject. If you do not understand what is meant or done as regards graphs, please study carefully Fig. 1, and I think you will soon realize what it is all about. The graph shown is a very diminutive affair; graph paper is usually sold in sheets of about 18 in. by 24 in., and a full sheet should be used for calibration. The dots on the graph represent stations, of course, and the position of each dot is obtained by tuning in a reliable station, noting its dial-reading and wavelength, and marking the point on the graph where a horizontal line from the dial-reading (as represented on the graph) would cross a vertical line.

Once this has been done, and the graph completed, it is very easy to read off any wavelength or dial-reading. Fig. 2 should make this quite clear.

Calibrating the Dials

The next thing that has to be done is to locate, on the blank disc, the positions of the degrees to which the fine inscriptions can be made with Indian ink. As somewhat of a novelty, a dial of commercial type is used, the dial can be fixed to the panel, and some mark on the dial can be used as a pointer.

When the blank disc has been made, a line should be drawn on it, starting from the equivalent to zero, to a position equivalent to the top of the scale. In the case of aperture dials, this line should coincide with the middle of the aperture. The line is the dividing line between the respective markings for long waves and medium waves.

(Continued on page 836.)
**HOLDING THE FOREIGNERS**

Various Methods of Ensuring Consistent Reception of Long-distance Stations.

**THE SECOND ARTICLE**

FROM the conclusions arrived at in the first part of this series, it would appear that by feeding back to the grid circuit of a multi-mu valve some negative voltage developed in a later stage of the receiver, and varying with the signal strength, a constant volume level could be maintained. The reason is, of course, that the increased voltage drop due to an increased signal would act as additional negative grid bias on the multi-mu valve, and thus reduce the effective degree of radio-frequency amplification.

Let us now see how such automatic control can be applied. There are a number of points in a radio circuit the potential of which varies with the signal strength. Most of them, however, are not admissible for automatic volume control purposes. In some instances the use of a certain voltage drop in this way would result in raising the potential of the multi-mu grids to that of the high-tension supply, involving considerable practical difficulties. In other cases the snag is that the available voltage drop is also modulated at radio or audio frequency. It will be shown later how these difficulties can be overcome.

**Using the Grid Leak**

Perhaps the most successful method of applying automatic volume control to a multi-mu valve or valves is by making use of the difference of potential between the grid circuit of the ordinary leaky grid detector.

Fig. 1 shows the conventional diagram for such a detector. If the "grid" end of the grid leak is connected back to the grid coil of the multi-mu valve, any increase in the signal as reaching the detector grid would impress a corresponding increase in negative potential on the multi-mu valve's grid, and thus tend to restore the signal to normal strength. A theoretical diagram of this arrangement is given in Fig. 2. Note that this is not a practical circuit as many essential and incidental components have been omitted for the sake of clarity. The heavy line A-B represents the connection between the grid of the detector valve and the grid coil of the multi-mu valve. It is through this connection that the negative potential at A is transferred to B. The condenser C.3, which is of fairly large capacity compared with the aerial tuning condenser, serves, of course, to complete the resonant circuit L.1, C.1.

**Modifications**

The scheme thus outlined forms the basis of an entirely satisfactory method of automatic volume control. However, there are probably many listeners who may like to carry out a little private experiments. For the same reason only conventional tuning arrangements are indicated in the diagram. In a practical circuit the constants of the normal receiving network must be taken into account and each receiver dealt with on its merits. Here again it is necessary to point out that the actual arrangement is not given quite so precisely as could be wished, as they depend largely upon the characteristics of the valves employed and upon general circuit conditions.

**Analyzing the Circuit**

V.1 is the multi-mu screened grid valve, and V.2 the detector valve, both of the indirectly heated A.C. mains type. A simple tuning system, L.1, C.1, is shown for the aerial tuning and a similar arrangement for the tuning coil for resonance connecting the grid leak bears a radio frequency modulation. It is therefore necessary to provide rather complete filter and decoupling arrangements in order to avoid radio frequency voltage variations being fed back to the grids of the multi-mu valves, where, of course, they would produce a reaction effect leading to instability.

The circuit depicted in Fig. 3 includes a radio frequency choke L.3, and a bypass condenser C.5 for this purpose, while further smoothing is obtained by the decoupling resistance R.4. Here again it is necessary to point out that the actual values of the various components cannot be given quite so precisely as could be wished, as they depend largely upon the characteristics of the valves employed and upon general circuit conditions.
Fig. A.—Theoretical circuit for A. V. C. using an auxiliary control valve.

A Defect

Although technically correct, the method of automatic volume control described above, and the several variants of it, suffer from one defect, namely, that the varying negative potential available at the grid of the average detector is comparatively small, so that the control it offers is not of great magnitude.

Fuller Details Next Week

The Most Remarkable Receiver Since Broadcasting Began.

How to Calibrate Your Receiver

(continued from page 834.)

When the preliminary marking, which should in pencil, is finished, the lines and numbers should be neatly filled in with a mapping pen. See Fig. 3. Further filling in can next be done. On an average dial, there is only room for a tick for every two metres on medium waves, which is quite satisfactory. On long waves, a tick at every twenty or twenty-five metres is convenient.

Fixing the Disc in Position

When marking the new disc is complete, the disc has to be attached in position. With drum and disc rotators, the new calibrated scale can either be attached over the original scale or substituted for it. The material of the new disc, and the method of fixing of the old one, have to be taken into account, so choice in the matter must be left to the reader.
January 21st, 1933

PRACTICAL WIRELESS

837

This illustration shows the de luxe edition of the Wireless Constructor's Encyclopaedia.

SOME READERS' OPINIONS

"I thank you for your Practical Encyclopedia, which I think is an admirable and comprehensive book."—R. O. K., Oxford.

"I have received my Wireless Constructor's Encyclopedia and must say I am very pleased to have such a book."—J. W., New Malden.

"I must say that the book you have sent me is far beyond my expectations, and I am thoroughly satisfied with the same. I feel justly proud to be the owner."—V. F., Earl Shilton.

"I thank you for your Encyclopedia. It is a good addition to the book."—F. W., Sheffield.

"I have received my presentation book and just had to write you a line to say how much I enjoyed the book. It is a magnificent volume, of which I shall feel justly proud to be the owner."—F. W., Brighton.

"I thank you very much for the copy of the Wireless Encyclopedia. I cannot explain what pleasure the book has given me in reading through it."—F. W. S., Sheffield.

"I have received my presentation volume. It is a fine work, and is just the thing for the constructor."—J. M., Barkston.

"I would like to thank you very much for the Wireless Encyclopedia. It is compiled in a very neat volume and well explained in every detail. It is a pleasure to be able to read such a book."—A. W., W. E.

"I have received the Encyclopedia. Many thanks for such a valuable volume."—H. M. Beaton.

"I am sure it will prove invaluable to keen amateurs."—J. H., Bristol.

If you have not yet claimed your presentation copy of the Wireless Constructor's Encyclopaedia you should do so without delay!

We are despatching the presentation volumes of the WIRELESS CONSTRUCTOR'S ENCYCLOPAEDIA with all speed. Gift stamps which appeared on the back covers of PRACTICAL WIRELESS from our first issue (dated September 24th, 1932) to December 24th, 1932, should be attached to the subscription voucher sent to all readers who reserved copies, and the completed voucher should be sent in accordance with the instructions thereon without delay.

If you have lost or mislaid your subscription voucher and have been unable to claim your volume for this reason, you will be glad to know that you can still obtain your copy of the WIRELESS CONSTRUCTOR'S ENCYCLOPAEDIA if you send at once the thirteen Gift Stamps, attaching them to the label below, together with a postal order for 2s. 4d. for the Standard Edition, or 3s. 6d., if you desire the de Luxe Edition, to "Practical Wireless" Presentation Department, 39, King Street, Covent Garden, W.C.2. If you have mislaid some of your Gift Coupons enclose 2d. extra for each coupon which is missing.

BOOKS WITH CARE

Name

Full Address

If undelivered please return to—

"PRACTICAL WIRELESS" Presentation Dept., 39, King Street, Covent Garden, London, W.C.2.
During the course of some of the previous articles I have been forced to gloss over the exact interpretation of the expression "synchronism," but in view of its extreme importance in relation to successful television reception I propose to devote this instalment to a consideration of the problems involved and describe how they are solved.

First of all let us tackle the subject by clearing the air as to the true meaning of synchronism, for I find so often that this simple term has an application in divers directions other than television, and it may help to make matters plain if I give two simple everyday analogies.

Analogies

In Fig. 1A is shown a pair of pendulums, identical in length and weight, suspended from a beam and set swinging. The time executed for each swing by each pendulum is the same, but they are not in "phase," that is to say, when one is reaching the top of its motion in one direction, the other is reaching the top of its motion in another direction. In consequence, at no time are they "in step" and the condition fulfilled is known as isochronism, a term indicating identity of speed or time movements, but an absence of "phase." We have to turn to the condition shown in Fig. 1B before we have true synchronism. Here the same pair of pendulums not only execute exactly timed swings, but both their motions at any instant are identical, and it is this double condition which must be satisfied for synchronism to be fully established.

For a second example suppose we take the case of two electrically driven clocks used in the same house, that is to say, they are working off the same mains. The angular movements of the minute and hour hands will be the same, but unless they have both been set to the same Greenwich time they will register different times at the same instant. Under these circumstances they will be only isochronized and synchronism will not take effect until the hands of both clocks are set to register the same time at the same instant.

It is thus seen that while we can achieve isochronism without bringing about synchronism, it is impossible to establish synchronism without having first satisfied the condition of isochronism. In any television system isochronism is first of all achieved through the agency of the mechanism incorporated in the apparatus and generally this is done automatically, but the question of "phasing" has to be undertaken by each individual operator and is quite simple, as we shall see later.

The Simplest Scheme

Having appreciated what synchronism demands, the next point to consider is how it can be achieved for the purpose of successfully establishing proper television reception at any point. The simplest of schemes will no doubt occur to the reader, namely, that of driving the transmitter and receiver motors from the same alternating current mains network. Synchronous motors worked under these conditions are admirable and in the U.S.A. quite wide areas are linked up covering large areas, and this in itself solves what is admitted to be television's most acute problem. In this country, however, it will be necessary to await until the ambitious "Grid" system is well advanced before advantage can be taken of linked electricity mains over large areas. For the benefit of readers who happen to reside in the localities, however, it is as well to mention that the same electrical supply company which feeds the motors of the television transmitter at Broadcasting House covers the Marylebone area and sections of Hampstead.

Several Suggestions

Many and varied have been the suggestions put forward to maintain identical speeds between the transmitter and receiver mechanisms, but the majority have had to be discarded on the grounds of complication, expense, additional channels of communication, and so on. What is required is a simple and inexpensive method whereby the rotating mechanism of the television transmitter can produce regular signals which in some way can control the revolution of the scanning disc or mirror drum at the receiving end.

One suggestion put forward was to arrange to short-circuit the photo-electric cells six times per revolution...
For less than ever before you can now own an up-to-date Screened Grid Receiver — the Cossor Melody Maker—equipped with every modern refinement and having the performance and appearance of an expensive factory-built set. The remarkable efficiency of the Cossor Melody Maker—its selectivity, its range, its high all-round performance—has resulted in an extraordinary degree of popularity. So great has been the demand that even the vast resources of the great Cossor works have been severely taxed to meet it. The enormous production of Melody Makers has permitted wholesale reduction in manufacturing costs. This reduction is passed on to you. Send the coupon for full details.

**BATTERY MODEL 335**

Kit of Parts includes 3 Cossor Valves (220 V.S.G Variable-Meta, Metalled Screened Grid, 220 H.L. Metalled Detector and 220 P. Output). Individually Shielded Cords. All metal Chassis and all parts for constructing the Receiver as illustrated: handsome cabinet 18 in. x 13 in. x 10 in., wide. Balanced-Armature Loud Speaker, Provision inside for fitting Gramophone Pick-up and Fix. Price £6.17.6

**BATTERY MODEL 334**

Kit of Parts, similar to Model 335 except that no loud speaker is supplied. Hand- some cabinet 18 in. x 13 in. x 10 in., wide. Price £5.15.0

**BATTERY MODEL 333**

Kit of Parts, complete with valves for building Cossor Melody Maker Chassis for fitting to your own cabinet. Specification as Model 335 but without loud-speaker or cabinet. Price £4.19.6

**ALL-ELECTRIC MODEL 337**

Kit of Parts for All-Electric Melody Maker Model 337 similar to Model 335 (as illustrated) but for all-electric operation, including Cossor Valves, hand-made finished Cabinet, Win. x 15 in. x 5 in., Loud Speaker and all parts. For A.C. Mains only 200-250 volts (adjustable), 40-100 cycles. Price £10.17.6

**ALL-ELECTRIC MODEL 336**

Kit of Parts similar to All-Electric Model 337 except that no loud speaker is supplied. Handsome cabinet 18 in. x 13 in. x 10 in., wide. Price £9.15.0

**ALL-ELECTRIC MODEL 338**

Kit of Parts for All-Electric Melody Maker Model 338 Chassis. Identical with Model 336 except that no cabinet is supplied. Escutcheon and template for drilling your own cabinet is included. Price £8.15.0

**ALL-ELECTRIC MODEL 339**

Kit of Parts similar to All-Electric Model 338 except that no loud speaker is supplied. Handsome cabinet 18 in. x 13 in. x 10 in., wide. Price £7.15.0

**FUNCTIONAL MODEL 331**

Kit of Parts similar to Functional Model 335 except that no loud speaker is supplied. Handsome cabinet 9 in. x 11 in. x 10 in., wide. Price £5.15.0

**FUNCTIONAL MODEL 332**

Kit of Parts, similar to Functional Model 335 except that no loud speaker is supplied. Handsome cabinet 9 in. x 11 in. x 10 in., wide. Price £5.15.0

**FUNCTIONAL MODEL 333**

Kit of Parts, complete with valves for building Cossor Melody Maker Chassis for fitting to your own cabinet. Specification as Model 335 but without loud-speaker or cabinet. Price £4.19.6
A method of repairing broken terminal screws on an accumulator.

Repairing Accumulator Terminal Screws
Doubtless many wireless enthusiasts have experienced the trouble of terminal screws on an accumulator breaking off through corrosion. Such terminal screws can be made good by the following method. On referring to the sketch, which is practically self-explanatory, it will be noted that the lugs which are attached to the plates have two screws soldered to them. The tops of the lugs were filed flat and two cheese-head brass screws, the same diameter and pitch as the thread in the terminal nuts, were obtained. A large blob of solder was then placed on each lug with a soldering iron and the heads of the screws were then tinned and held in position with a pair of pincers, a collar of solder being worked around the heads with a hot soldering iron. The top parts of the collars were afterwards filed flat to give a good bearing surface for the terminal tags. The method was only adopted as a temporary repair, but it has stood up to its work for several months without failing and appears to be as strong as the original screws. It also has the combined advantage of being easy to repair in the event of breaking again, and the cost of the repair is practically nil.—G. F. Barnett (Ravenscourt Park).

Mounting a Metal Panel
A Lithium metal panels are not very often used in the ordinary type of broadcasting receiver, they nevertheless have a distinct advantage in preventing hand capacity effects when using a short-wave receiver. The following method of arranging the metal panel without the aid of angle supports is simple, and has an exceptionally neat appearance, completely screwing from view any jagged edges which might otherwise be visible. Obtain two (or more according to the size of the panel)

PRACTICAL WIRELESS

January 21st, 1933

Jan. 21

Simple automatic switching for aerial series condenser.

An efficient earthing switch.

A Simple Earthing Switch
An ordinary house lighting switch of the tumbler type makes a very efficient earth switch. The switch should be fitted outside the house, enclosed in a small box with hinged front, the box, of course, serving to exclude rain and dirt. The connections need little explanation. The lead in should not be cut at the switch, but the wire bared, doubled, and twisted and inserted into one point of the switch, the free end of lead being taken to lead-in tube. The earth lead is treated likewise and connected to the other point of switch, and the free end to earth on set. To operate, switch on for earthing aerial, and switch off to use set.—E. P. Frost (Colechester).

Automatic Switching for Aerial Condenser
Most owners of inexpensive sets, such as a Det., and 2 L.F., have found that much volume is lost on long waves through the aerial condenser being in circuit, although it is indispensable on medium waves. The majority have some method of shorting it, with a piece of wire or other wire, but this leaves inside the set when it is desired to change the waveband. Here is illustrated a device which automatically shorts the series condenser on long waves only. The device consists of two pieces of springy metal bent as shown, the rear piece being bent over at the top and cut to a point. The length of these pieces is determined by the height of the switch spindle above the baseboard. When the switch is at the top for the medium waves, the contacts should come apart, the front one clearing the spindle of the switch. The terminals A B are, of course, connected to the terminals on the aerial condenser.—Reader (Walker-on-Tyne).
Connecting Up, and Using the Selectone

By FRANK PRESTON, F.R.A.

NOW that you have finished the construction of your Selectone you will naturally be very anxious to give it a test and see what it will do.

First, fit the G.B. battery in its clip, and put in the wander plugs. Plug "G.B.+" goes into the "+" socket, but the positions of the other plugs will depend to a certain extent on the voltage of the H.T. battery employed. Assuming it to be of 108 volts, "G.B.-" should be put in the 11-volt socket, "G.B.-1" in the 3-volt socket, and "G.B.-2" in the 6-volt socket. If a 120-volt battery is to be used, plugs "G.B.-" and "G.B.-1" should be taken to the 3 volt and 41-volt sockets respectively, whilst plug "G.B.-2" should be put in the 9-volt socket. Now insert the valves into their respective holders as indicated in Fig. 3. Connect the H.T. and L.T. batteries by means of suitable lengths of flex (when I say "suitable" I mean that the lengths must be such that the wires will reach to the batteries, wherever you propose to store them). Attach the aerial and earth leads to terminals "A" and "E," and then connect two speaker wires to terminals "L.S.+", and "L.S.-"—it doesn't matter which way round the latter wires are connected. The speaker is fitted with an output transformer, having ratios suitable for either ordinary or pentode output valves; in this case the wires should be connected to those terminals provided for "ordinary" valves.

The First Trial

And now we are ready for giving the Selectone a "trial run." Do not put it in the cabinet until you have tried it and so verified everything. Do not forget to pull out the radio-gram switch knob to put the set into the "radio" position, and to put the wave-change switch into the position required—for long waves, push in, and for medium, pull out, the knob.

For a start, put the coil plug into socket No. 1, which provides maximum sensitivity and minimum selectivity. Set the reaction condenser to its minimum (fully anti-clockwise) position, turn the tuning dial to zero and commence to rotate it by means of the slow-motion knob. Continue this until a station is heard and then increase strength by carefully adjusting the reaction condenser. If the condenser is turned too far, the set will oscillate (whistle), so care must be taken not to turn it past the point at which distortion begins. Incidentally, it should be added that oscillation can cause interference to neighbouring receivers, but it is not of a very serious nature, due to the loose coupling between the aerial and grid coils of the tuner.
Having brought the signal up to full strength you can adjust the tone control; when set to the maximum clockwise position the resistance is entirely out of circuit, and consequently, reproduction is low pitched and rather boomy, but by turning the knob in the other direction reproduction is gradually raised in pitch until it becomes "thin" and "screechy." Somewhere between the two extremes you should be able to obtain just the tone you require.

Do not be misled by the fact that as the control is turned towards the "shril" position there is a certain reduction in overall volume; this is quite normal.

**Overloading**

Due to the high amplification properties of the Selectone it is possible to overload the second and last valves when listening to local stations. Overloading is indicated when good reproduction cannot be obtained with any setting of the tone control and can be obviated in two ways. The first is to turn back the reaction condenser, and the second is to transfer the coil plug to a lower tapping (sockets 2, 4 and 5). In one or two cases, when a return is made to the main aerial within a powerful station, it might be necessary to connect a .0001 mfd. pre-condenser in series with the aerial. The latter has not been included in the set itself because it will only be necessary in very few instances. Overloading could be avoided by replacing the 210 H.L. and 220 F. valves by type 210 P. and 230 X.P., respectively, but the latter would give less amplification on distant stations besides consuming considerably more high-tension current.

**Getting Distant Stations**

After having tuned in the first stations, others can be received in a similar manner. Remember, that the set is in its most sensitive condition when it is just off the point of oscillation—indicated by a faint "breathing" sound—and so when searching for very distant or low-power stations, it should be kept in this condition by advancing the slow-motion knob of the tuning dial only. When two stations can be heard together, selectivity must be sharpened by advancing the reaction condenser and/or by putting the coil plug into a socket of a higher number. The optimum setting of the tone control will be dependent upon the degree of selectivity employed, and will vary for different stations. Of course, it is not essential that the tone control should be altered from, say, its midway position, but by making suitable adjustments, distant stations can be brought in as clearly as the locals. As you are well aware, the latter is quite impossible with ordinary receivers, and explains why distant stations are not usually so clear as the nearer ones.

If you make a note of the dial settings for stations in the same general area, the optimum setting of the tone control will be brought in as clearly as the nearer ones.

The capacity of measurement should be found from the calibration of the oscillator; or if necessary, it can be determined by connection of a high resistance in parallel with the coil and condenser C1, the latter will then give a lower effective resistance, or possibly even a negative resistance.

**LIST OF COMPONENTS FOR THE SELECTONE**

- **Vibrant plywood panel 14in. by 9in.**
- **Utility Science .0005 mfd. condenser.**
- **Utility type W.181 micro-dial.**
- **Lumen .00011 mfd. differential condenser.**
- **Colvina type "T.D." coil.**
- **Green 3-pole exchange switch.**
- **Triton on-off battery switch.**
- **Warrant type "G.C.O." radio-gram switch.**
- **Lumen 5,000 ohm potentiometer.**
- **Edsman chassis mounting valve-holders.**
- **T.C.C. .0002 mfd. fixed condenser.**
- **Dubller 3 megohm grid leak.**
- **Dubller grid leak holder.**
- **Triton Standard H.F. choke.**
- **Belled finger-tight terminal.**
- **V.T.C. 2 mfd. condenser.**
- **Vartey Reactance transformer.**
- **Belling Lee baseboard fuseholder with 60 m.a. fuse.**
- **10 Belling Lee "Junior" terminals; 1 each marked A, F, L.T., L.T., H.T., H.T.-, L.S.- and 2 marked Pick-Up.**
- **6 Belling Lee wander plugs; marked G.B.-1, G.B.-2, H.T.-, H.T.-.**
- **1 Strip Bendol ebonite, 14in. by 11in.**
- **1 Bulgin G.B. battery clip.**
- **1 Cell Gaede connecting wire.**
- **1 short length flex.**
- **1 5-ply bushingboard, 14in. by 8in.**
- **2 pieces hard wood, 7/in by 3in.**
- **1 place 2-ply, 14in. by 2in.**
- **Approximate total cost: £4 10s. 0d.**

---

**ACCESSORIES.**
- **Canoe "Excellity" or "Aston Senior" cabinet.**
- **Cosor valves; 1 type 210 Det. (metallized).**
- **1 Camco "Excelsior" or "Aston Senior" cabinet.**
- **1 Dubller grid leak holder.**
- **1 3-ply baseboard, 14in. by 8in.**
- **1 3-ply, 14in. by 2in.**
- **2 pieces hard wood, 7/in by 3in.**
- **1 place 2-ply, 14in. by 2in.**
- **Approximate total cost: £4 10s. 0d.**

---

**THE FOLLOWING is a method by which the H.F. resistance measurement of tuning coils can be accurately obtained.** In the diagram, L1 is the coupling coil to oscillator, L2, L3 any coil and condenser to tune, R the H.F. resistor, Lr, the coil under test, and C1 a good condenser to tune Lr.

Firstly, with switch in R position, tune L1, L2 to resonance with oscillator. Now, whilst observing the meter, switch to R position and adjust R until the meter shows the effective resistance Lr C1 at the frequency of measurement. It is advisable on obtaining an approximate value for R, to retune L1, L2 to eliminate any effect of tuning due to any large variation of R, and also to check tuning of Lr, C1. The resistance thus obtained is the effective resistance of the coil for most purposes, and if C1 is extremely good, the resistance can be taken as the resistance of the coil for most purposes. This error could give a lower effective resistance, or possibly even a negative resistance.
A definite advance...

This well-known radio and television authority pays striking tribute to the new W.B. "Mansfield" Speaker Magnetic System.

... The ultimate result is a really astonishingly high flux density for the size of the magnet used... fidelity of tone of outstanding merit... sensitivity very noteworthy, comparable in many respects with externally energised types without the necessity for mains or batteries. The Speaker will handle an input more than sufficient for quite a large room and yet can be worked satisfactorily from a small two-valve set.

"My conclusions... this new P.M.4 speaker is a definite advance in the permanent magnet class."

Write for copy of Mr. Barton Chapple's full report. The "Mansfield" (patent) Magnetic System is a revolutionary development. It makes possible a magnet 30% more efficient than a good cobalt steel magnet of same weight and 10% more efficient than a chrome steel magnet of three times the weight. It enables a steel chassis to be used without magnetic loss. It eliminates the bugbear of loss of magnetism. Ask your dealer for a demonstration; you will be AMAZED.

In 1933 super selectivity will be more than ever necessary. Start the New Year by constructing the "Selectone," the last word in selectivity in straight detector L.F. receivers.

The "Selectone" incorporates the Colvern TD Coil, which is completely screened and incorporates tapped aerial coupling and reaction.

Four alternative aerial tappings are arranged as sockets with a wander plug. The first two tappings give aerial couplings similar to those normally employed, but with greatly increased selectivity.

Numbers 4 and 5 give a high degree of selectivity with weak aerial coupling suitable for use in a swamp area. There is no break through on the long wave-band from B.B.C. stations.

Price 8/6

Send for the Colvern Booklet, Radio List No. 10.

COLVERN LIMITED,
MAWNEYS ROAD, ROMFORD
The Wiring

After the general layout has been decided upon, all the components should be mounted loosely by single screws, and the panel fixed in position; any slight alteration can then be made quickly before finally putting in the remaining screws and making everything quite secure.

The wiring must be done next. In a simple set, where very few wires are required, bare 16 gauge tinned copper wire is most convenient. If the wiring is at all involved, or if the set is mains operated, it is best to use insulated connections. The bare wire can be insulated by passing it through suitable lengths of systoflex sleeving; or insulated material, such as Glazite, can be employed. In any case the wire will be coiled when bought, so it should be straightened by holding one end in a pair of pliers and pulling it through a duster held in the hand. Another way is to grip the end of the wire in a vise and pull steadily until it stretches slightly. There is an old and fairly well-known rule to the effect that wires in the grid and plate circuits of valves operating at high frequency should be kept as far apart as possible, and that they should not run parallel to each other. This rule is still as important as ever, and many cases of H.F. instability and uncontrollable oscillations can be traced to its neglect.

Shielded wires are often useful if employed judiciously, but, generally speaking, they should not be used for grid-circuit connections, because the screening might have some effect on tuning. Wires of this kind are particularly useful for making connection to the anode terminal of a metallized S.G. valve, or for connecting the anode terminal of the detector valve holder to the reaction condenser; in either case they tend to improve H.F. stability. When building a portable set it is very desirable to use shielded wire for making loud-speaker connections, since it prevents them from "picking up" H.F. currents from the near-by frame aerial. In all cases the braided metal forming the screen should be effectively connected to earth, for otherwise it will not serve its intended purpose. The simplest way to make the earth connection is by means of a length of thin wire bound round and soldered to the braid as shown in Fig. 7.

Another practical point in wiring up a receiver concerns the cores of L.P. transformers and chokes; where possible they should be connected to earth. Some makers provide an earth terminal specially for this purpose, whilst others connect one of the holding-down screw eyeslets to the core so that an earth connection can be made to the holding-down screw. Where neither of these provisions is made a wire can often be attached to a core-clamping bolt.

Choosing Components

Although it is not intended in this article to deal with the question of choosing components, it might be as well to refer to a few of the more important ones which can have a very marked effect on the set's performance. Among these latter must be classed the fixed condensers used to bypass the H.T. supply to the screening grids of S.G. valves, and also that used for coupling a pair of band-pass coils; in each case the components must definitely be of the non-inductive type. Ordinary condensers might cause various kinds of instability which would probably be difficult to trace. Resistances used to provide automatic grid bias to S.G. valves or for by-passing the band-pass coupling condenser should also be non-inductive to ensure that they shall not be the cause of parasitic oscillation or similar trouble. Ordinary push-pull switches should on no account be employed for connecting the mains supply; their contacts would quickly burn away due to sparking, and the danger of receiving a shock would be very great. Mention of this matter might appear superfluous, but I recently saw the result of a mistake in choosing a mains switch. Luckily the constructor concerned escaped without injury, but his set caught fire from sparks caused by bad contact at the switch.

Of course, it should be borne in mind that manufacturers are, in general, well aware of some of the points which have been raised in this article, and in many cases have made some attempt at removing the difficulties encountered by the home-constructor. Quite a number of these are, however, of the home-constructor's own making, and can be obviated by careful thought when planning a receiver or adhering strictly to the instructions laid down by the designer of the receiver which is being built.
BRITAIN wants dry cell BATTERIES

6,000,000 British Homes are without ELECTRIC POWER of any sort. Each Home with Wireless needs Batteries!

Millions of British homes are in regular need of Wireless Batteries! Millions more are in need of other sorts of dry cell batteries. Just think of all the numbers of people in your district who need them!

Now—just imagine the golden opportunity you would have of MAKING MONEY if you could supply these people with BETTER Batteries—at a LOWER Price than they can obtain anywhere else! It is a proposition which pays. This is the opportunity we offer you TO-DAY!

Making Batteries according to our Patented method and formula is easy. Any intelligent man or woman can do it.

One Man Earned £960 in Spare Time

The Wonderful part of it is that you need not have the slightest experience or technical knowledge. You need no expensive plant—only a few simple tools and hand presses, most of which you can make yourself at trifling cost. It is so simple that you can start on your kitchen table and even the children can help you!

And you can make up to £300 per year licence!

Profits Guaranteed!

And we will purchase sufficient of your output to guarantee you a weekly Profit provided your work comes up to the required standard, which is easily attainable! And we will continue your training FREE until you reach that standard.

Our Licensees Will Have a PROSPEROUS NEW YEAR.

Wireless will be more popular than ever in 1933. Wireless Batteries more than ever in demand. It means a PROSPEROUS YEAR for our Licensees—become one yourself NOW!

You CAN MAKE MONEY MAKING BATTERIES

This Way—A Guaranteed Genuine Home SPARE-TIME BUSINESS!

Profits Guaranteed!

Why hesitate? Why delay? Here is your OPPORTUNITY to earn a comfortable spare-time income in a business which is increasing by leaps and bounds!

SEND THIS COUPON

TO MR. V. ENGLAND-RICHARDS,
The England-Richards Co., Ltd.,
244, Kings' Lynn, Norfolk.

Sir,—Please send me at once, and FREE, full details as to how I can Make Money at Home in my spare time, and also Testimony from those already making money and profit that one man earned £900 in spare time. I enclose 2d. in stamps for postage. I endorse my name and address boldly in capital letters on a plain sheet of paper and pin this coupon to it.

“Practical Wireless” 21/1/33.
CHOOSING AND USING YOUR LOUD-SPEAKER

In this Article FRANK PRESTON, F.R.A., Deals with the Various Types of Loud-speakers and Examines Them from the Point of View of the User.

**Fig. 1.—Moving iron speaker.**

**Fig. 2.—Moving iron dynamic speaker.**

**Fig. 3.—Cones giving the effect of combining two matched units to form a sphere.**

**Fig. 4.—Energized moving-coil speaker.**

**Fig. 5.—Diagram showing the effect of combining two matched units to form a circle.**

**Fig. 6.—Using the field winding of a moving-coil speaker as something else in an R.C. receiver.**

**Fig. 7.—Cassette showing the effect of combining two matched units to form a sphere.**

**Fig. 8.—Connection for connecting different output speakers.**

**Fig. 9.—Diagram showing the effect of combining two matched units to form a sphere.**

Imagine a room, somewhere in the world, where ideas are born and dreams are realized. A quiet corner, perhaps, with a desk and a chair, a place where thoughts can wander freely. A room where the words of the past and the currents of the present collide, creating a symphony of intellectual curiosity. This is the setting in which Frank Preston, a man of many talents, finds himself as he explores the world of loudspeakers. Preston, a member of the Royal Astronomical Society, is not just any speaker enthusiast; he is a man who understands the science behind the sound, the physics that governs the vibrations of the air, and the art of turning those vibrations into music that fills a room. He is a man who appreciates the beauty of the moving coil and the elegance of the balanced armature, knowing full well that each has its place in the grand scheme of things. 

But why would one choose a moving coil over a balanced armature, or vice versa? It's all about personal preference and the type of performance one desires. Moving coils are ideal for those who seek a precise and detailed reproduction of sound, with a focus on the lower frequencies. They are the choice for audiophiles who want to hear the finest nuances of a classical concert, or the delicate whispering of voices in a recording. Balanced armatures, on the other hand, are better suited for those who value clarity and a broad frequency response. They are the choice for those who want to hear every note, every beat, and every breath in a performance, ensuring that the music is not just heard but felt. 

Preston also discusses the economics of loudspeakers, recognizing that not all of us can afford to indulge in the most expensive equipment. He points out that a small permanent magnet moving coil can be a good temporary substitute, especially for those on a tighter budget. But even here, he cautions, the performance will be limited, and it's important to choose wisely. 

And so, as we listen to the music, we are reminded of the importance of technology and science in our lives. It is the interplay between the two that allows us to experience the beauty of sound, to feel the pulse of the music, and to connect with the world in a way that words alone cannot convey. This is the true power of loudspeakers, and it is a power that Frank Preston, with his wisdom and insight, helps us to understand and appreciate.
CHOOSING AND USING YOUR LOUD-SPEAKER

In this article FRANK PRESTON, F.R.A., Deals with the Various Types of Loud-speakers and Examines Them from the Point of View of the User.

I shall recommend you to bear a few different types in your mind and then select the one you will like. This is possible, however, only if you are familiar with the various types and their features. And besides, you might be prepared to spend five pounds, or more, on a reasonably good speaker.

Balanced armatures... have an advantage over moving coils and are available in various types. Among them, balanced armatures are the most sensitive, and they are capable of giving good reproduction, even at low frequencies.

Another type of speaker, known as a moving iron, is not as sensitive as the balanced armature, but it is cheaper and more reliable.

The inductor has 'em all... every set will say, "Really, old boy, you can't mend it, especially for a not very powerful amplifier..."

But that is not the point... in a loudspeaker... which a certain amount of "jarring" or "grating"... An inductor has... a good specimen will provide a noticeably greater volume than will an inefficient moving coil for a given input of sound energy... and nowhere near as good a frequency response...
THE PRACTICAL WIRELESS
SELF-BINDER
for our
FREE-GIFT
DATA SHEETS
CLAIM YOURS TO-DAY!

The loose binders for preserving in permanently consultable form the Data Sheets which are being given every week in PRACTICAL WIRELESS are NOW READY; and all readers who sent in reservation forms as published in our Dec. 24th issue should claim their binders in accordance with the conditions therein printed, without delay.

The PRACTICAL WIRELESS DATA SHEETS LOOSE LEAF Binder as illustrated here has a stout linen-covered stiff-board cover specially made to stand hard wear, having a special flap with cloth hinges and enamelled press-button fitting for speedy insertion and removal of the Data Sheets which, as will be noticed from the sheet in this week's issue, are specially "holed" to fit. There is an extremely useful manilla gusset pocket on the inside back cover for holding loose sheets, newspaper clippings, notes, and other odds and ends.

If you require one of these binders you should fill in the label below, enclosing a postal order for 1s. 6d., to include cost of registration, postage, packing, insurance, etc., and send to PRACTICAL WIRELESS, Presentation Department, 39, King St., Covent Garden, London, W.C.2. Immediately on receipt of this your binder will be despatched.

FILL IN THIS LABEL AND POST TO-DAY

BOOKS WITH CARE

Name:

Full Address:

If undelivered please return to:
PRACTICAL WIRELESS Presentation Dept.,
39, King Street, Covent Garden, London, W.C.2.

Fill in this label, in Block Letters, and send, with postal order for 1s. 6d., to: "PRACTICAL WIRELESS" Presentation Dept., 39, King Street, Covent Garden, London, W.C.2.

THE FOLLOWING DATA SHEETS HAVE ALREADY BEEN ISSUED:

Data Sheet No. 1—Accumulator Charging—Dec. 17th, 1932
Data Sheet No. 2—Coils & Coil Winding—Dec. 24th, 1932
Data Sheet No. 3—Resistances—Dec. 31st, 1932
Data Sheet No. 4—Mains Transformers—Jan. 7th, 1933
Data Sheet No. 5—Wire and Wire Gauge—Jan. 14th, 1933

Those new readers—who are desirous of completing their files of these Data Sheets—may have those already issued for 2d. each from the address given above.
Television Broadcasts from New York

There is no doubt that this feature of being able to ahead of the times, coupled with the fact that many pet ideas may be incorporated in one set, form the main attraction of home construction as we know it. I further believe, too, that the British pride of workmanship is a further contributory cause of the way in which wireless receiving-set making captured the imagination of the intelligent young and not-so-young men in this country. It is certain that no other country in the world—like Britain, and sets, moreover, that for the few more alternative British times to turn to would be welcomed at Britain's Large Proportion of Home Constructors.

There is no doubt that this feature of being able to ahead of the times, coupled with the fact that many pet ideas may be incorporated in one set, form the main attraction of home construction as we know it. I further believe, too, that the British pride of workmanship is a further contributory cause of the way in which wireless receiving-set making captured the imagination of the intelligent young and not-so-young men in this country. It is certain that no other country in the world—even America—possesses so many home-built sets in proportion to the population as Britain, and sets, moreover, that for the most part are of a quality seriously to challenge some commercial receivers. Then, again, those of us who started in radio at the commencement of broadcasting are now ten years older—but have we stopped building sets? We certainly have not, and I am beginning to think that once a radio fan, always a radio fan!

The Garden is not desecrated with an ugly pole.

All the expense of erection and its inconvenience when touching window frame or wall is now superceded in the modern home by a modern aerial.

The modern home has no unsightly wires!

The old-fashioned outside aerial that was always causing trouble, corroding and rusting, losing its efficiency when touching window frame or wall is now superceded in the modern home by a modern aerial.

In a Glass alone.

There is no doubt about your switching if you fit a Bulgin Signal Lamp on your set. The warm, red glow adds a real touch of life to your panel, and enhances its appearance.

List No. FLUSH MOUNTING TYPE. Price
D.9 Slight projection only. Bulb instantly removable from the front. One hole fixing. Highly nickel-plated finish. 2/6
D.7 BRACKET TYPE.
For console or Radio-gramp receivers. Large Ruby lens. 1/6
D.11 TUBULAR DIALITE.
A highly nickel-plated fitting for dial illumination. Takes all standard bulbs. 3/6
D.17 PANEL ILLUMINATOR.
With automatic switch and ruby lens. 3/9
MES8 CLIP-ON LAMPHOLDER.
Small bulb holder with spring-on clip. Low consumption bulbs. All ratings. Each 6d.

Send for 80-page Catalogue “N.” Enclose 2d. postage.

BULGIN

KEEP THE HOME TIDY... NO.3

FUSES and FUSE-HOLDERS

PIX INVISIBLE AERIAL.

30 ft. 2/-

IDEAL FOR USE IN FLATS.

PRACTICAL WIRELESS

The Carden

DEALERS will fit other ratings in any of these holders at the time of purchase.

BELLING-LEE FOR EVERY RADIO-CONNECTION

A. F. BULGIN & Co., Ltd., ABBEY RD., BARKING, ESSEX.
Take a leaf—

out of the HEAYBERD HANDBOOK!

Constructors! Build your own Mains Units, Battery Chargers, etc. Seventeen different circuits are given in the Heayberd 36-paged Handbook showing how you can do so at negligible cost. Mains Units to suit practically any Radio set. Technical Tips. Service Hints. Details of Mains Transformers, Chokes, Condensers, etc., together with specifications of complete Mains Units and Assembled Kits. At least one leaf from the Heayberd Handbook will give you just the Unit you require. Send for it NOW!

POST COUPON

Please send me the new Handbook "Mains Power for Radio." Packed with useful information, diagrams, etc., compiled by Mains Specialists. I enclose 3d. stamps.

Mr. __________________________________________
Address _______________________________________

Prac. 10, FINSBURY STREET, LONDON, E.C.2

THERE IS A "GOLTONE" COMPONENT FOR EVERY "PRACTICAL WIRELESS" RECEIVER

"GOLTONE" SCREENED DUAL-RANGE COILS

For modern receiver designs, these "Goltone" units will meet all requirements. Made in 5 types to suit every modern circuit. FULL-TONE is a registered trade mark. Maximum permissible variation is +1% per cent. although the average is rarely more than 0.8 per cent.

ALL UNITS DUAL-RANGE.
Type GEIR—Tuned grid with separate reaction and aerial taps. A popular multi-tap for all purposes.
Type GC10—Tuned grid with reaction and alternative aerial taps.
Type GGC—Special Aerial coil with three tappings, allowing various degrees of selectivity. No reaction.
Type GBA—Band-pass aerial coil with coupling winding.
Type GBS—Band-pass secondary coil with separate coupling winding.

Price for ALL TYPES 5/9 each.

FREE TWO FIVE-PAGE FOLDERS with accompanying excellent descriptions of the various Goltone Screened Dual Range Coils, with large illustrated Radio QUEST FREE ON REQUEST.

For this very selective three valve receiver it is imperative that the best available condenser and slow motion dial is used to obtain the closest possible tuning.

The designer has therefore specified a Utility Standard .0005 Condenser and Utility Slow Motion Dial, the finest pair known. Ensure your own results by insisting on being supplied with these components.

W185 Condenser 8/6 W181 S.M. Dial 7/6 or the two complete 15/-

from your dealer or post free from the makers

WILKINS & WRIGHT LTD.
UTILITY WORKS, HOLYHEAD RD., B'HAM.

London Agents:
E. R. Morton, Ltd., 22, Bartlett's Buildings, Holborn Circus, E.C.4
**A Trickle Charger for 7s. 6d.**

By F. W. CHAMPION

Two refinements may be made, which although not essential, tend to improve the working of the rectifier, and prevent sparking and spluttering. One is to add a small quantity of iron filings or a small nail to the acid before using the charger. The filings will dissolve in the acid and form iron sulphate, which will improve the conductivity of the electrolyte. The rectifier then runs much cooler than it otherwise would.

After connecting up the rectifier and inserting the adapter in the lighting socket, immerse the two output leads in salt water, when it will be found that the wire from the lead electrode gases furiously while the other wire remains normal, the wire which gases is, of course, the negative connection, and must be connected to the negative terminal of the accumulator. The average 2 volt 10 amp. accumulator should be put on charge all night once or twice a week and will be kept in tip-top condition without any visits to the charging station.

As regards running costs, the consumption of current from the mains is about 3 watts, which, of course, is negligible. Finally, tantalum is obtainable from any scientific supply store and is quite inexpensive, as only a very small quantity is needed.

The cost of the complete charger need not exceed 7s. 6d., which amount is made up as follows:—

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell transformer</td>
<td>s. d.</td>
</tr>
<tr>
<td>Tantalum strip</td>
<td>1</td>
</tr>
<tr>
<td>Acid</td>
<td>0</td>
</tr>
<tr>
<td>Strip of lead</td>
<td>0</td>
</tr>
<tr>
<td>3yd. flex</td>
<td>1</td>
</tr>
<tr>
<td>Bayonet plug</td>
<td>1</td>
</tr>
<tr>
<td>2-terminal spades</td>
<td>4</td>
</tr>
</tbody>
</table>

Total: 7s. 6d.

**WHAT IS TELEVISION?** *(Continued from page 839.)*

Tips are of opposite polarity, and there are several methods of joining this section of the apparatus to the wireless receiver, which are all in series, a fixed condenser being connected in parallel with the pair of coils.

Electrical Brake

In action the current passing through the small field coil makes them of opposite polarity, and if the speed of the disc at the receiving end is identical with that at the transmitting end the resultant magnetic pull on the teeth of the cogged wheel introduced by the synchronizing impulse at a frequency of 375 times per second will balance out in each cycle of changes. If the disc tends to run fast, however, the impulse occurs at a different part of the cycle, and produces a magnetic pull on the cogged wheel teeth tending to drag them back. This retarding impulse acts as a brake and the disc is forced to drop back to its normal isochromatic speed.

The method works very well in practice when set up correctly and fed with sufficient current, but there is always a tendency for a slight vertical "hunting" motion. On the other hand, since there are no wearing parts needing replacement the scheme has found favour, and in a fourth illustration will be seen an amateur making adjustments on his home-made vision apparatus which includes the cogged-wheel synchronizer plainly visible in the centre of the picture. In the last instalment of this series I shall deal with all the important points arising from the actual procedure of watching a television image received by wireless.
Receivers and their Records

WITH the progress made on the transmission side of broadcasting, coupled with the vast improvement in the quality of signals, and the daily increasing number of wireless entertainments available from both near and distant foreign countries, the listener to-day demands radio receivers which are in keeping with the present conditions. He is no longer satisfied to hear mere musical sounds backed by the information that they emanate from some hundreds of miles from his station. To-day he requires from manufacturers receivers which will permit him to reach the highest degree of foreign transmissions with the certainty that he will hear programmes of such quality that they may be considered of entertainment value. Moreover, with the continued increase in the number of transmitters squeezed into the wavebands allotted to the broadcasting services, both on this side of the Channel and in Europe generally, tuning the average set has become more difficult, and the separation of stations from others operating on near-by channels has compelled makers to design receivers which will answer more exacting requirements. Fortunately, the solution of the problem has been facilitated by the revival of the superheterodyne circuit, and of those at present launched on the market the R.I. Six-valve A.C. mains table model under review is a successful example.

The receiver has been housed in a walnut cabinet of a striking design; it is a handsome piece of furniture which, without doubt, will meet with the approval of the female members of the household. The lower part of the front, below the loudspeaker fret, has only three knobs—namely, the tuner, that operating the combined wave-change, gramophone and " on " and " off " switch, and the volume control.

Tuning is remarkably easy as there is only one knob to operate. The volume control has a smooth action, but must be used with judgment. Excessive amplification of loud signals causing valve overload will result in poor quality of production, and somewhat less strength is obtained in this case than if the volume control is carefully handled. Moreover, excessive amplification produces the effect of double hump tuning—i.e., the signal will be received at two positions of the dial at maximum strengths with a relatively weak region between the two readings. The range of wavelengths covered is from 210-560 metres and from 850-2,000 metres. It is a particularly liberal allowance which permits the reception of a number of stations below, say, Radio-Normandie, and yet will readily tune in broadcasts from Budapest.

A novel feature adopted in the R.I. Superhet consists of a shutter which, operated by the wave-change switch, automatically reveals the " short " and " long " wave scale of the illuminated dial, whichever happens to be in use. This well-thought-out contrivance will be found of great practical assistance when tuning in stations as, by limiting the area of degrees seen, it is possible to secure greater exactitude in the condenser readings. The illuminated scale itself is calibrated in wavelengths. The shutter also serves a multiple purpose, as not only does it show the actual wave range which is being tuned, but it also indicates when the receiver is used for gramophone reproduction; a special label appears when the set has been switched off. The simplicity of its working would enable a mere child to operate this superhet, which, in reality, for the local stations, merely needs plugging into a power or light socket in any room where electric mains current is available.

The circuit has been well designed to cope with to-day's conditions as well as, so far as can be anticipated, with those of the near future; it complies well with the requirements of listeners who demand good quality reproduction with the highest degree of selectivity. To ensure this latter

R.I. SIX-VALVE SUPERHETERODYNE (A.C. MAINS)

Tested by JACE

QUALIFICATION CHART OF SET DIAL SETTINGS

The R.I. six-valve Superheterodyne Receiver, A.C. mains model.

We shall be pleased to advise readers regarding purchase of complete sets.
supported in order to obviate any risk of cabinet vibration. Bass is well reproduced and speech is crisp and clear providing the volume is not pushed to extremes. The tone quality, however, may also be regulated by the knob at the rear of the cabinet; according to its adjustment bass or treble may be increased as desired, and it can be suited to the actual broadcast tuned in. The control is also useful for suppressing “atmospherics,” and in many instances heterodyne whistles, etc., which frequently mar a transmission. The R.I. Superhet possesses the advantage, when used for the electrical reproduction of gramophone records, of not requiring any extra external potentiometer volume control. The leads from the pick-up are merely plugged into their respective sockets at the back of the set, the switch is turned to the position showing the word “Gram,” and both volume of sound and tone of reproduction can be regulated in the same way as when the receiver is set for the reception of broadcast transmissions. Moreover, when reverting to radio, the pick-up leads may remain connected. The reproduction of gramophone records was found to be very satisfactory, the volume of sound being ample for a large-sized room.

As regards sensitivity and selectivity the set put up an excellent performance. The slightest movement of the condenser tuned in transmissions, and a large log was rapidly compiled. Clear reception was secured of “atmospherics,” and in many instances loud signals from Stavanger and Belfast could he distinctly heard, although not at a useful volume, but for the purpose of identification and calibration they were clearly readable. On the evening on which the test was made the B.B.C. carried out relays of European transmissions, and for the sake of experiment the self-same broadcasts were directly tuned in. Greatly to the credit of the Superhet, the programmes, through this medium, were better heard. In some instances, as in the case of Warsaw, Vienna, Hilversum, Milan, louder signals were obtained, and, if anything, a purer quality. No difficulty was experienced in the course of the evening in separating Breslau from Wilno were heard working, in addition to Oslo, Kalundborg, Motala, Warsaw, Eiffel Tower, Daventry, Radio Paris, and Huizen. Königs-wusterhausen, although clear of its neighbours, did not appear to work at its usual power.

To wander from station to station with this receiver afforded considerable pleasure. As the condenser knob was twirled it was found that the programmes, with but few exceptions, could be received with the minimum degree of interference. Tuning, as already stated, was remarkably easy, and even in the hands of a novice the R.I. Superhet will furnish a large number of broadcasts at ample volume for even a legalized living-room.

The receiver is made by Radio Instruments, Ltd., Purley Way, Croydon; its price is £5 guineas. A successor of this calibre, which combines razor-edge selectivity with good reproduction, should satisfy the requirements of every purchaser.
NEW WIRELESS INSTRUCTION

The I.C.S. Wireless Courses cover every phase of wireless work, from the requirements of the youth who wishes to make wireless engineering his career to the man who wants to construct a broadcasting set for his home, and, at the same time, to know how and why it operates and how to locate any faults that may develop.

The branch of industry has ever progressed as rapidly as wireless and the rate of progress is increasing. Only by knowing thoroughly the basic principles can pace be kept with it. Our Instruction includes American broadcasting as well as British wireless practice. It is a modern education, covering every department of the industry.

OUR COURSES

Included in the I.C.S. range are Courses dealing with the installing of radio sets and, in particular, with their Serviceing, which to-day intimately concerns every wireless dealer and his employees. The Operating Course is vital to mastery of operating and transmitting.

There is also a Course for the wireless salesman. This, in addition to inculcating the art of salesmanship, provides that knowledge which enables the salesman to hold his own with the most technical of his clients.

We will be pleased to send you details of any or all of these subjects. Just fill in and post the coupon, or write in any other way, stating which branch of Wireless interests you—the information you require will be forwarded at once.

---YOU MAY USE THIS COUPON---

International Correspondence Schools, Ltd.,
Dept. 14, International Buildings,

Without cost, or obligation, please send me full information about the Courses I have marked X

X THE I.C.S. WIRELESS COURSES
X THE I.C.S. RADIO COURSES

Name: ___________________________ Age: __________

Address: __________________________

---END OF COUPON---

A word may be said about the output transformers used in the modern moving-coil speakers. Instructions are given with the speaker regarding the connecting up of the transformer, in some of which there are generally four or more. The lowest ratio tapping is intended for super-power valves of low impedance, and the tappings are spaced in such a manner as to cover the range of valve impedances up to that of the pentode, this being the last tapping provided. Do not, however, be guided by the instructions too rigorously. Try the tappings on either side of the one suggested by the makers if you are using a power output valve and determine for yourself which gives the best results. With a pentode valve you are practically limited to the one tapping provided, although you may ring the changes still further if your set is already fitted with an output transformer.

Again, if your set has a choke output-filter incorporated the moving-coil speaker may be attached to the output terminals without difficulty, and in this case the best results would often be obtained from a different tapping to that advised by the instructions. A choke output considerably improves the quality by checking any tendency to motor-boating that your receiver may possess and the absence of high-tension current in the output-transformer windings is an added protection both to the speaker and to the transformer. A warning must be given with regard to the alteration of the connections to the tappings of the transformer.

Interaction Troubles

Distortion and poor quality troubles can be grouped into two main categories as a rule, those that are directly caused through inherent defects in the circuit or design of the set; and those that are caused through defects in the components used, or in the valves or current supply. If you carefully follow the designs for sets published in PRACTICAL WIRELESS, you should not be troubled with any of the first, but you will realise the importance of using the components and valves specified and of strictly adhering to the layout suggested. Component and wiring badly spaced are a frequent source of poor quality difficulties, and the cure is too obvious to require further comment.

---THE I.C.S. WIRELESS COURSES---

Are You Getting MOVING COIL QUALITY?—2

(Concluded from page 813, Jan. 14th issue)

Never alter these connections while the set is switched on, as the danger of peak voltages is acute with sudden changes in load. This is particularly the case with pentode valves as the current surge on open circuit is often of sufficient magnitude to seriously damage the emission of the valve or the fixed condensers in the set or eliminator.

---END OF ARTICLE---

HAYE YOU CLAIMED YOUR WIRELESS CONSTRUCTOR'S ENCYCLOPAEDIA? SEE PAGE 837
January 21st, 1933

The Decoupling of the H.F. Circuit

The advantages of decoupling from the point of view of stabilizing the set, and preventing reactions on the aerial circuit have already been discussed. It was not specifically pointed out that it is the aerial and aerial-circuit that have to be protected from reaction or feed back. Obviously when there are two or more stages of H.F., it may be a question of any later stage reacting on an earlier stage or on the aerial.

But there is an entirely different reason why the H.F. stage or any H.F. stage should be effectively decoupled. The modern S.G. valve, and especially the variable-mu type has a graph or characteristic that may be described as all made up of anode bend, there is little or no straight. Now the amplitude due to the incoming signal is in the aerial tuned circuit (whatever it may be) is still of very small amplitude, of the order of 0.05 volt (vector), and this being so, the curvature of the characteristic does not give rise to distortion. But when an audio-frequency surge from the H.T. battery is applied, it is as inevitable if the precaution of decoupling is omitted, the H.F. oscil lation finds itself riding on a wave of low frequency sometimes high up on the valve characteristic, and sometimes down. This is indicated in the accompanying diagram. Now, although the low frequency wave cannot itself come through to the detector, owing to the constants of the circuit being only adapted to pass H.F., this does not end the matter, for the amplification of the H.F. depends upon the position in which it finds itself on the valve characteristic and so, as it varies its position, due to the superposed low-frequency wave its amplification varies in like manner. This constitutes, in fact, a disturbance of the signal, and when this is received by the detector, the low-frequency wave is reconstructed just as though the impossible had happened, and had come through direct (see diagram).

It would, therefore, seem that it is just as necessary to avoid low-frequency (acoustic frequency) feedback as to prevent a feed back from the power stage to a previous I.F. stage, and the consequence of neglect may give rise to similar forms of instability such as "motor boating." How far this is to be feared in practice, it is difficult to say, the whole subject of "motor boating" is of such complexity, that the greatest authorities on Radio seem to give it the widest possible berth. Morecroft in his large tome "Principles of Radio Communication," does not mention any more, on the subject than would be expected from the veriest tyro amongst amateur receiving sets. In Turner's "Wireless" there appears to be nothing either. The only thing that the author of the present note can from his own experiences assert, is that if each stage is fed by separate and independent batteries and if what may be termed "into the aerial" one end of the other plenty of room and particularly length in the set, it is safe to say that motor boating will not take place. Few people can go much further or say much more with certainty.

The " impedance" of a valve, however, is varied principally by the voltage applied to the grid. While, therefore, it is not subject to the same laws as a pure resistance it is not a true impedance. "Anode resistance" is probably the most suitable term coined so far. Some radio engineers use the term "differential resistance" which sounds very learned, but is not very clear as to its actual meaning. Valves are often compared on the basis of their "mutual conductances," the mutual being the change in anode current occasioned by a one-volt change in grid voltage, and expressed in "milliamperes per volt." Now, whether this fact is given in a specification is in the reciprocal of its resistance, and a little juggling with Ohm's Law will reveal that the reciprocal of the resistance is the so-called mutual differential. The unit of conductance is the "mho." and the conductance in mhos is varied principally by the voltage. The unit of conductance is the "mho" and the conductance in mhos is equal to the current in amperes divided by the pressure in volts. The mutual conductance of a valve, in milliamperes per volt, therefore, is, if anything, a number of milli-mhos. But in a true conductance, these factors are constant and the voltage and resistance are constant and the same characteristics in the same anode curve; and this is, in fact, a measure of the mutual conductance.

"Reactor." Many receivers employ "reaction" in the detector stage—a very vague and misleading term. In this device, part of the energy in the anode circuit of the valve is passed back to the grid circuit and is re-amplified by the valve. "Re-amplification" is a far better term than reaction. Some of the alleged misnomers we have just discussed might become the subject of a highly technical discussion for which these pages are not the right place, so let us examine a few of the simpler radio terms. The "high tension" and "low tension" supplied will do to begin with. "High" and "low," for example, are only relative terms. The 150 volts "high" tension of the average receiver distinguishes low, compared with the 132,000 volts, of the "grid" electric power scheme. So why not call the "high tension" the "anode supply" and the "low tension" the "heater current"? Again, "low" frequency is high compared with normal electric supply frequencies, and "high" frequency is low compared with, say, light or X-rays. Please let them be "audio-frequency" and "radio-frequency" in future. The last stage valve of a receiver is not a "power amplifier." It is, in fact, a power release valve, and output valve, a well-known and very satisfactory term. This valve operates a "loud-speaker," I feel a little sorry for the poor instrument which is only credited with the power of speech when it can also sing, and play the saxophone and a half a hundred different instruments! I do think we might promote him to the title of "sound reproducer" from now on.

"Battery." When I meet the term "battery" it rather annoys me. The dictionary states that "battery" is the set of batteries, or a collective name for a number of cannon (things that can "batter"). Of course, the "electric battery" is the collective name for a number of electric cells—but surely a more apt collective noun could be found. An accumulator, again, does not accumulate in the correct sense of the word. It merely stores energy. It never possesses more energy than has been put into it, so that "chargeable" or "charging" term is somewhat like putting money into a box and taking it out as required. It is certainly not analogous to investing it or placing it on deposit at interest so that a profit "accumulates." There are dozens of other radio terms I would like to pick to pieces, but my space is nearly exhausted. I must, however, have one final thrust—this time at the "set-makers" and the "sets" they make. "Sets" of what, if you please? The term has been in common use since the inception of broadcasting and I cannot make out how it originated. It cannot mean a set of parts—for the first "sets" were complete instruments. If any reader can enlighten me, I shall be very grateful—or meanwhile I shall continue to refer to my box of tricks as my "receiver" on every possible occasion.

Self Binders for Data Sheets are now ready. (See Page 859.)
Topping Accumulators

Sir,—Your efforts to substitute practical instruction in the art of wireless for the "mumbo-jumbo" one is accustomed to come across from time to time are deserving of commendation. The tendency to foist a species of technical mysticism on the wireless public generally is not only useless but at times positively harmful.

Simple apparatus is vested with an unmerited reputation of being difficult to maintain or instal, and your efforts in countering this attitude are all to the good. In connection with this I would take the opportunity of referring to Mr. W. Burchell (Westcliff) for his letter on "Topping Accumulators." The elaboration of the really simple job of topping-up is not only unnecessary but disadvantageous, in that it suggests that an accumulator is a difficult and indeed a dangerous thing to maintain. It is true that water should not be added to sulphuric acid, but this, like many other statements, requires qualification:—water should not be added to concentrated acid or of great heat may be generated.

Before Topping-

Temperature Rise.

<table>
<thead>
<tr>
<th>Sp. Gr. of Acid</th>
<th>Temperature Rise Before Topping</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.140</td>
<td>0.25°C</td>
</tr>
<tr>
<td>1.200</td>
<td>0.5°C</td>
</tr>
<tr>
<td>1.250</td>
<td>0.95°C</td>
</tr>
</tbody>
</table>

In conclusion may I assure your readers that any good battery is not likely to become at all "hot under the collar" if topped-up in the ordinary way, but is, in fact, eager to reciprocate in good service.

A number of Exide accumulators in various states of charge and discharge were topped-up with an amount of distilled water equal to 10 per cent. of the total quantity of electrolyte, both the electrolyte and the topping-up water being at ambient temperature. The experiment was repeated and the amount of topping-up water increased to 20 per cent. The results of these tests are given below and the figures speak for themselves:—

Sp. Gr. of Acid | Temperature Rise Before Topping |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.140</td>
<td>0.25°C</td>
</tr>
<tr>
<td>1.200</td>
<td>0.5°C</td>
</tr>
<tr>
<td>1.250</td>
<td>0.95°C</td>
</tr>
</tbody>
</table>

DO YOU KNOW?

1. Top-up an accumulator with an amount of distilled water equal to what per cent. of the total quantity of electrolyte?
2. Is it true that water should not be added to sulphuric acid?
3. What is the temperature rise before topping with 10% and 20% dilution?

CUT THIS OUT EACH WEEK

Diagrams illustrating Mr. P. Edgell's letter.

A Scottish Reader's Satisfaction

Sir,—F. M. B.'s request for a Det 2LF set interested me. About six years ago I purchased an American "Fada" 3-valve Neutrodine. Despite its origin it gave first-class service up to last autumn. After definitely refusing to perform further, I decided it was time I knew more about its working parts than that of the switch. I then made my first purchase of a wireless journal and it turned out to be Practical Wireless, No. 3. Issue after issue I searched in vain for someone seeking knowledge about a similar set. Being Scotch and thus timorous by nature, I didn't like to consult your wireless doctor, so I felt that something like 4,999,999 wireless fans would, on seeing my letter, say, "Here goes Aberdeen." To-night I feel considerably bucked up, for evidently it is not only hard-hit Scottish glen farmers extremely economical method of mounting. I thought it may interest some other readers.—F. W. WESTLEY (Leyton.)

Auto-Grid Bias.

Sir,—Following your article on Auto-Grid Bias, I note that you have omitted that which may be a very important illustration, namely, the application of Auto-G.B. on the detector valve when used as the first amplifier on a gramophone. You will observe by the accompanying diagram that no G.B. is applied to the valve when used as a detector on radio.

I find that decoupling resistance is best left out altogether.—P. EDGELL (Hanwell).

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, No. 11, Southampton Street, Shoreditch, W.C.2.

Due to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers informed with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.
who still have to be putting up with ancient circuits. P. F. M., who dwells in London, and should know, says thousands of pioneers in "listening-in" love and retain their first loves. From knowledge gained by reading your paper I tested my set and disconnected transformers. These I replaced with two Ayrmer RI LF. Nothing but the best for an old and faithful servant. Through further praise in your journal notes I decide that the three Yankees were a bit hefty on current consumption. I next purchased three English type valve holders, split the 3 volt accumulator in three, found one section dud, and purchased a 2 volts P.M. 2 DX for detector, a PMH for 1st stage and a PM 202 for 2nd and output stage. After reading the instructions enclosed in the valve containers I found my PM 202 would develop inward troubles if not worked in conjunction with a grid-bias battery. My next purchase was a 17 volt grid bias and a bit of flex. The earth required another bit of flex which was plugged into — 10. Into the positive I plugged a bit of flex and connected it to LT—. Results were entrancing with an unannealed old Brown V hanging from a peg in the ceiling. All the big cats and Asia Minor. These in with a slight touch of the dials. No crowding, and volume enough to make the ham which hangs on the other peg along with a bit of dance.—William Wallace (Aberdeen).

MUCH BETTER EVEN THAN EXPECTED

Sir,—I was very pleased to receive my "Wireless Encyclopedia," and write to the editor to say that it is the first book I have seen that has the size and number of pages. It is much better even than I expected, and full of useful information. The first object inward that if not worked charging, will be of great assistance to me as I am hoping to get into the wireless business and a bit of flex. I commenced for the splendid encyclopedia.—R. Brand (Loughton).

Another Appreciation

Sir,—I feel I must thank you for the safe reception of the Wireless Encyclopedia and should like to add my appreciation, both of it and also Practical Wireless, the former being as practical as our weekly. I should like to get into the wireless reception of the Wireless Encyclopaedia and will do so as I am hoping to get into the wireless business. I have admired your paper for years and if I may I should say that the three Yankees were a bit hefty on current consumption. I next purchased three English type valve holders, split the 3 volt accumulator in three, found one section dud, and purchased a 2 volts P.M. 2 DX for detector, a PMH for 1st stage and a PM 202 for 2nd and output stage. After reading the instructions enclosed in the valve containers I found my PM 202 would develop inward troubles if not worked in conjunction with a grid-bias battery. My next purchase was a 17 volt grid bias and a bit of flex. The earth required another bit of flex which was plugged into — 10. Into the positive I plugged a bit of flex and connected it to LT—. Results were entrancing with an unannealed old Brown V hanging from a peg in the ceiling. All the big cats and Asia Minor. These in with a slight touch of the dials. No crowding, and volume enough to make the ham which hangs on the other peg along with a bit of dance.—WILLIAM WALLACE (Aberdeen).

SLADE RADIO

There was a lantern lecture on Rotary Converters, etc., by Mr. E. R. Allred, Rotax Ltd., at the meeting of the above Society held last week. In this he explained the developments which have taken place and also described the various types now available.

Among those dealt with was a hand type which can be made at the class of emergency, and which would be particularly useful in some of the isolated parts of the world and could be used to common help, etc. A demonstration was given using an Eddystone All-Wave FOUR, B.T. and L.T. being supplied by a 6-10v. converter.

The results were good, and it was noticed that the machine was entirely along in operation. It was stated that using this machine it is possible to get down to 8-10 metres without interference.

Full details of the Society may be obtained on application to the Hon. Sec., 115 Hilary Road, Gravelly Hill, Birmingham.

INTERNATIONAL SHORT WAVE CLUB

I should like to bring the London Section of this organisation to the notice of readers of Practical Wireless.

We are holding regular meetings at the B.A.C.S. Hall, Wandsworth Road, S.W. The object of these meetings is to help the short-wave listener get better reception. We arrange demonstrations and lectures which are very much appreciated. Also listeners can meet and exchange their ideas and between meetings.

I should be pleased to give future dates of meetings, also full particulars of the I.S.W.C., together with specimen magazine if your readers will enclose 1d. stamp. A. R. and L. 10, St. Mary's Place, Rothesay, London, S.10.

FUTURE WEEK'S GREAT FREE GIFT!

Turn to page 831 for details of our WIRELESS CONDUCTOR'S GAUGE (Made in Steel), to be Given Free with Every Copy of Next Week's Issue!

Order Next Week's Copy Now! Same Price!
MORLEY SHORT-WAVE COILS

This Morley is a very interesting model of short-wave coil, designed to cover the wave-band from 12.5 to 70 metres with a .00025 mfd. tuning-condenser. An eight-ribbed former is used for the coil, and this is slotted and wound with heavy gauze wire, widely spaced. The winding comprises an Aerial Coil, Grid Coil, and Reaction coil, and the grid coil is tapped and connections taken inside to a silver-contact, self-clothing switch, operated by the red and control knob on the panel. Terminals are provided on the ebonite base for connection, so that the complete coil may be conveniently fitted into an existing set. The two wave-bands covered by the coil are from 12.5 to 30 metres and from 25 to 70 metres, and the site and position of the aerial coil has been so chosen that it gives a satisfactory matching on both bands. The price of this coil is 6d., at which it represents very good value. This firm also manufactures a series of ganged and screened coils, which differ from others on the market in that the screening-can has a domed top. The most interesting of this range is a pair of Three Range (Ultra-Short, Medium, and Long-Wave) Coil, consisting of the short-wave coil above mentioned. The Morley short-wave coil.

LOTUS 3-GANG CONDENSER

This is a splendid example of a completely screened condenser, and is very suitable for tuning three circuits. This is supplied complete with disc drive and spacers and is G.A.M.T.-marked. A similar disc drive is available for the smallest wireless set to get really first-class results. To enable this to be employed with any type of valve, a multi-ratio output transformer is also fitted to this model. The chassis is built up of aluminium, and the price varies from 1s. 6d. to 5s. for the smallest. The power handling capacity is given as 3,750 milli-watts, and it will therefore, deal comfortably with the output of practically every home receiver. On test, speech was found remarkably faithful, no hint of brilliance being noticed, and no boominess. On musical items the overall response seemed particularly good, with a remarkable degree of fidelity and good balance of the whole range of the scale. This explains why the sales of the Electron Aerials have kept pace with the growth of the broadcasting audience.

GRAMPIAN SPEAKERS

A New Permanent Magnet Moving-Coil Speaker has recently been placed on the market, and is illustrated below. This is the Grampian speaker manufactured by Grampian Electrical Ltd., and selling at 5£s. 6d. This has an overall diameter of 7½in., and weighs 9lbs. The magnet is built up of aluminium-nickel, and the magnet is very substantial. The strength of the field is 3,000 lines, and the speech coil is wound with a resistance of 1.7 ohms. To enable this to be employed with any type of valve, the output transformer is also fitted to the chassis and six different ratios are obtainable from the front, this being fixed to the transformer. The lowest ratio is 15 to 1, and the highest is 1 to 1. The power handling capacity is thus given as 3,750 milli-watts, and it will, of course, deal comfortably with the output of practically every home receiver. On test, speech was found remarkably faithful, no hint of brilliance being noticed, and no boominess. On musical items the overall response seemed particularly good, with a remarkable degree of fidelity and good balance of the whole range of the scale. This explains why the sales of the Electron Aerials have kept pace with the growth of the broadcasting audience.

WHITFORD P.M. SPEAKERS

With our recent interest in innovation to our pages to bring a fairly large output of multiskilled items to the attention of the manufacturer, we have drawn attention to the fact that their PM speaker will work comfortably on an output of only 40 milli-watts. This, of course, is a very low value, and it enables the user of even the smallest wireless set to get really first-class results from the moving-coil type of speaker. The illustration herewith shows the new cabinet which has been designed to house the Whitford PM speaker, and the chassis is obtainable for 30s., complete. It is known as the Mansfield Junior Cabinet.

Melbourne Short-Wave Coils

The Melbourne short-wave coils are an interesting device, having air-spaced windings, spaced and held rigid by small results strips insulated at three points round the circumference. The wire employed is of heavy gauze and stranded, and a flat two-pin plug is fitted to the base for connection purposes. These are obtainable with 3, 5, 8, 10, and 20 turns, and the price varies from 8s. 6d. for the smallest to 5£s. for the largest. These provide a simple method of employing a set for all wave-lengths, as standard broadcast coils may be plugged-in in place of the short-wave coils and thereby cover a complete range. The makers are the Melbourne Radio Supply Co.
The trouble started when a few of us clubbed together, bought a cine camera and decided to produce a picture to be shown at the firm's annual dinner. Everyone was enthusiastic, and a hastily-thought-out plot left us with only the cast to be arranged.

Comedy was to be the keynote. After all, our efforts might be mistaken if we attempted to be serious, and if we did happen to be funny—well, we were supposed to be, weren't we? So we chose the hackneyed theme of the heiress who must marry by a certain hour—introducing the villain "determined to marry the girl, by gad!"—and all that.

A Veritable Adonis

For the hero we chose a veritable Adonis—black marcelled locks, a "neat-line" moustache and the most charming "Colgate" smile. Had he a girl? He vaguely murmured that he had. —rather too vaguely, I thought.

It was finally decided to have one big day out and get all the outdoor shots done in the fine weather and leave the interior scenes until the late autumn. We selected a spot in the wilds of Hertfordshire (yes, there are wilds even in Herts), and started off bright and early one morning with a lorry full of props and three private cars conveying the cast—on location.

The villain

I had been informed the situation was a most serious—one we had not been the number of motoring fans who had themselves right on the nearest camera! I rang them up in the hope. I pressed the picture." Hollywood directing (sic) and cameras most obtained without it was unwanted.

Just then... Our opening scene was a close-up of the bride-to-be. Soon we had spotted "just the..."

The detective's office was certainly a work of art!

This interesting article appears in the January

HOME MOVIES

SEND POSTCARD TODAY FOR SPECimen COPY

"Home Movies" is obtainable at all Newspapers, Bookshelves and Dealers, or by post (subscription rates: Inland and Abroad 7/- per annum, Canada 7/- per annum), from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.
THE STANDARD IS RISING...

To keep up with Radio Progress only the best components are good enough. Write for free leaflets indispensable to constructors who are satisfied only with the finest results.

1. The Potentiometer. Price 3' to 8'.

Every type of component is made by "Lewcos" and stocked by all reputable dealers.

Lewcos
REGD.
RADIO COMPONENTS

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS, LIMITED, CHURCH ROAD, LEYTON, LONDON, E.10

P.W. Gift Stamp No. 17