

53. Collier

FREE INSIDE! DATA SHEET No. 15—“EUROPEAN BROADCASTING STATIONS”

Practical Wireless

3^p

Published every Wednesday by
GEORGE NEWNES LTD.

Vol. 2. — No. 28.

APRIL 1st, 1933.

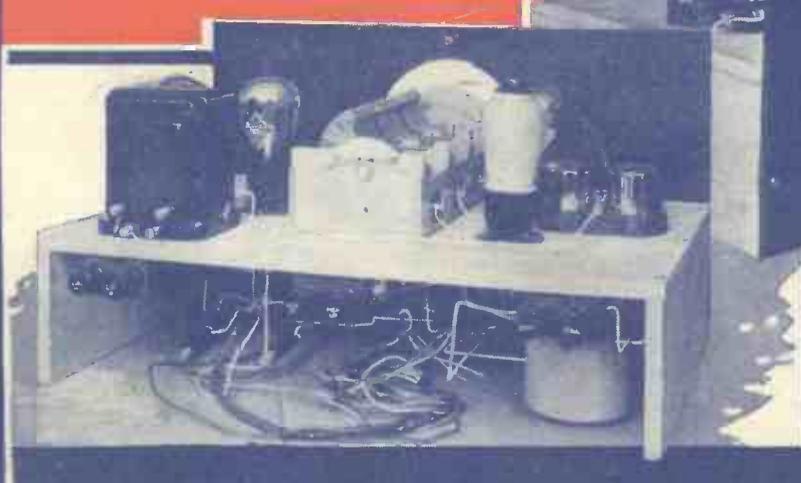
Registered at the G.P.O. as a Newspaper.

BUILDING THE

FERROCART

Q.P.P.

HI-MAG THREE



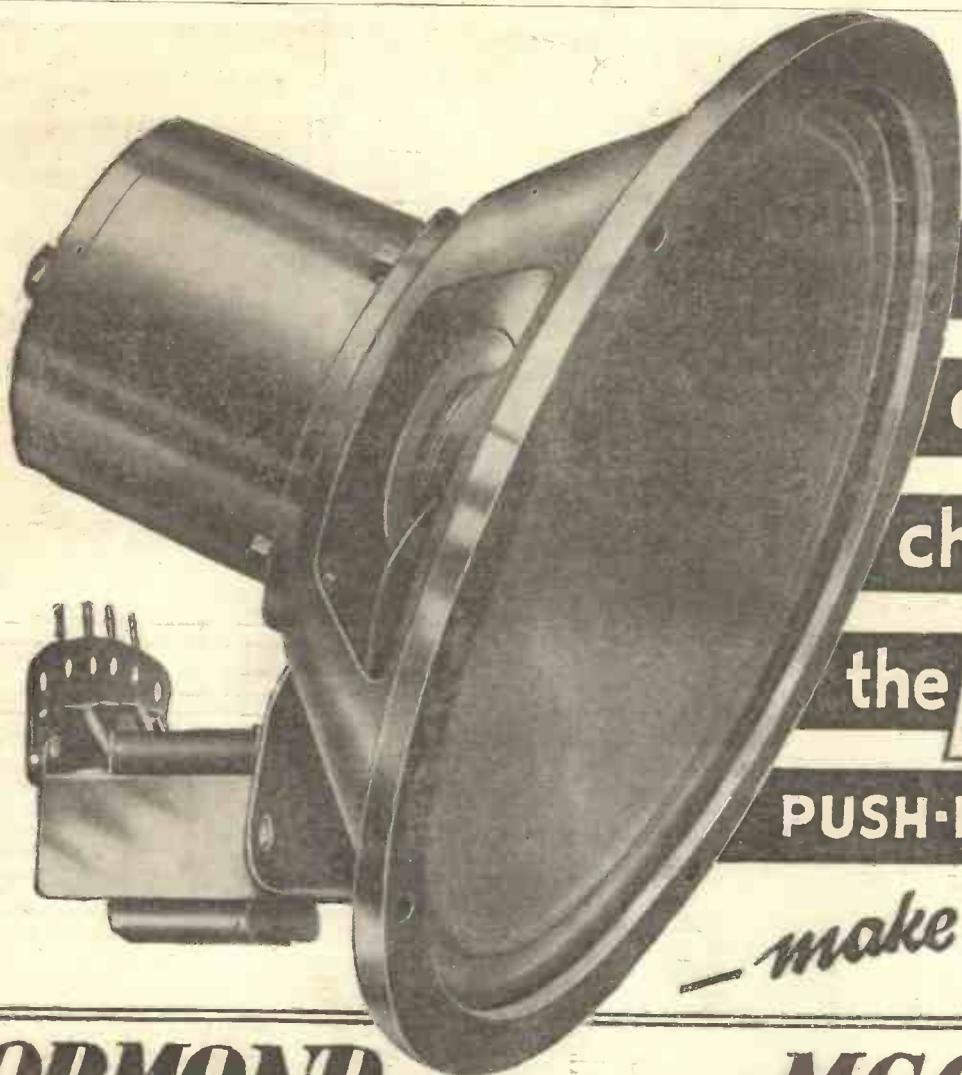
ALSO INSIDE:

- THE SUPERSONIC SIX
- CIRCUIT DIAGRAMS SIMPLIFIED
- A B C OF SELECTIVITY
- CLASS B AMPLIFICATION
- SPECIAL BEGINNER'S SUPPLEMENT, Etc., Etc.

Send for Free 1/4 Constructional Chart and Full Size Blueprint
NEW REVOLUTIONARY Q.P.P. KIT SET

SEE INSIDE—PAGES 71 & 74.

Write **PETO-SCOTT CO. Ltd., 77, CITY ROAD, LONDON, E.C.1.**



.....The
 designer's
 choice for
 the **ALPHA**
 PUSH-PULL THREE

— make it yours!

ORMOND PERMANENT MAGNET **M.C. CHASSIS**

IT met the exacting demands of the designer himself. Naturally it will serve YOU best, too. And for you it has an additional appeal. The expert chose it for superlative performance—regardless of cost. You, to whom cost is a consideration, will be pleased and gratified by its low price. It's another of those amazing Ormond "Value" products—such value as only Ormond's vast manufacturing resources make possible.

This speaker has an excellent frequency response, giving natural reproduction with the maximum sensitivity.

It is fitted with a pressed steel chassis and moulded cone, with large permanent magnet to give reliability with long life. Complete with special Q.P.P. output transformer. Overall size: Diameter, 8 in.; depth, 5½ in. Cat. No. R/494CT.

26'

Ormond components particularly suitable for this receiver include:—

- Q.P.P. TRANSFORMER. (Nickel Iron) Cat. No. R/531 C.T. Price 7/6.
- FIXED CONDENSER. Cat. No. R/444. Cap. .01 mfd. Price 1/9.
- REACTION CONDENSER. Cat. No. R/505. Cap. .0003. Price 2/.
- AERIAL CONDENSER. Cat. No. R/502. Cap. .0003. Price 2/3.
- GRID BIAS BATTERY CLIP. Cat. No. R/341. Price 6d.
- ON-OFF SWITCH. Cat. No. R/323. Price 1/3.

THE ORMOND ENGINEERING CO., LTD.,
 Ormond House, Rosebery Avenue, London, E.C.1.
 Telephone: Clerkenwell 5334-5-6 & 9344-5-6. Telegrams: "Ormondengi, Isling."



FOR PUNCH, POWER AND PURITY

For Hire Purchase Terms see Page 45.

Specified exclusively for the FERROCART Q.P.P. HI-MAG THREE

..... a receiver that combines the two most revolutionary improvements in radio reception. The designer naturally turned to the pioneers in L.F. Transformer design for his Q.P.P. Components. He knew that Varley would do credit to the capabilities of this outstanding circuit—that there were no better input or output Q.P.P. components than Varley DP 36 and DP 38.



DP36 Q.P.P. INPUT TRANSFORMER ratio 9/1. Primary inductance 30 henries with no D.C., 27 henries with 2 M.A. D.C. Price 17/6 (Including royalty)

Q.P.P.

DP38 Q.P.P. OUTPUT TRANSCHOKE ratios 3/1 and 50/1. Primary inductance (each half) 8 henries with 26 M.A. D.C. Price 16/6 (Including royalty)



POST THIS
COUPON
TO-DAY

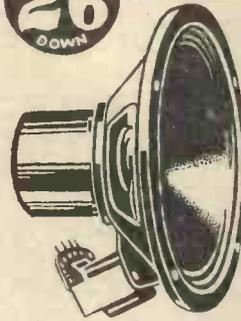
To Messrs. **VARLEY,** Kingsway House, 103, Kingsway, W.C.2.

Please send me, post free, your new brochure on Q.P.P. (with diagrams for converting existing sets), "THE BATTERY SET COMES INTO ITS OWN."

NAME
ADDRESS

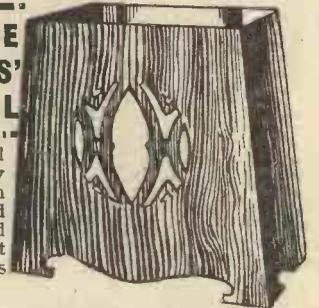
PR.W.2.

ONLY 2/6 DOWN For the NEW ORMOND P.M. MOVING COIL LOUDSPEAKER



As Specified for the "ALPHA" PUSH-PULL THREE

HAVE 7 DAYS' TRIAL



The NEW ORMOND Moving-Coil Speaker has an excellent frequency response, giving natural reproduction with maximum sensitivity. It is fitted with a pressed steel chassis and moulded cone, with large permanent magnet giving reliability with long life, and is complete with output transformer.

The British-made **WATES UNIVERSAL METER** is the only popular-priced instrument testing resistances as well as batteries, valves, circuit, and all components; 4 readings on one dial. **SEND ONLY 1/6** for 7 days' trial. If satisfied, complete purchase by 5 monthly payments of 2/6 (cash 12/6).



For the **CHASSIS**, overall size, 8in. diameter, 5 1/2in. deep, send only 2s. 6d. for 7 days' trial, if satisfied, pay further 2s. 6d. at once, and complete purchase by 5 monthly payments of 5s. (Cash in 7 days, 26s.).
For the **CABINET** model—the moving-coil chassis described above, fitted into an exceedingly handsome figured Walnut Cabinet of modern style, height 14 1/2in., depth 8in., width at base 15 1/2in., send only 2s. 6d. for 7 days' trial, if satisfied, pay further 2s. 6d. at once, then 8 monthly payments of 5s. (Cash in 7 days, 40s.).
See also the Ormond advertisement on inside of front cover.

E. J. HERAUD, Ltd., Dept. P.19, NUMBER ONE, EDMONTON, LONDON, N.18.
Branches: 78-82, Fore St., Edmonton; 77, West Green Rd., Tottenham; 34, St. James St., Walthamstow; and 139, Hertford Rd., Enfield Wash.

NO! Not a New Set- NEW VALVES -ETA VALVES

You may pay more but you won't get better. ETA valves are equal to the best—or even better. Why pay more?

FREE Ask for the ETA "Comparative Table" No. 13b showing which ETA valves to use in place of your old ones. Technical advice gladly given. Write to

THE ELECTRICAL TRADING ASSOCIATION, Aldwych House, Aldwych, W.C.2.
Scottish Agents: **RADIOVISION LTD.**, 233, St. Vincent Street, Glasgow, C.2.

AMERICAN SETS. There are ETA valves for all types of American sets.

PRICES FROM
5/6



As low in price as a really good valve can be

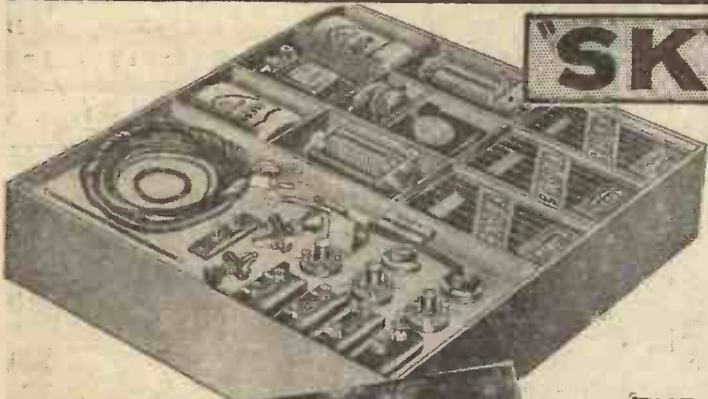
THIS COMPLETE KIT OF THE FAMOUS

"SKYSCRAPER"

YOURS for ONLY **8'6** DOWN

**MOST SENSITIVE
SELECTIVE & POWERFUL
BATTERY SET
YOU CAN BUILD
YOURSELF**

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



GREAT FREE CHART

TELLS EXACTLY WHAT TO DO WITH
EVERY SINGLE NUT AND SCREW

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 loud-speaker stations—everybody who builds a "Skyscraper" gets results like that! 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. 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 there 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?

COMPLETE IN CABINET WITH LOUDSPEAKER **£6'5** or 11'6 down & twelve monthly payments of 10'6

To-day you can buy the LISSEN "SKYSCRAPER" KIT on Gradual Payment Terms.
"Skyscraper" Chassis Kit complete with Valves, CASH PRICE, 89'6. Or 8'6 down and twelve monthly payments of 7'6.

"Skyscraper" Kit complete with Walnut Cabinet and in-built Loud-speaker, as illustrated, £6 5s. cash. Or 11'6 down and twelve monthly payments of 10'6. You can get the Lissen "Skyscraper" Chart FREE from any radio dealer, or by posting the COUPON below direct to factory.

YOURS FOR **8'6** DOWN

LISSEN "SKYSCRAPER" KIT 3



INCLUDING VALVES **89'6**

To Lissen, Ltd., Publicity Dept., Isleworth, Middlesex.
Please send me FREE copy of your 1/- Skyscraper Chart.
Name
Address
P.R.43

ASK YOUR DEALER - OR POST COUPON ABOVE

ALL ABOUT CLASS B AMPLIFICATION

Practical Wireless

EDITOR:
 Vol. II. No. 28 || F. J. CAMM || April 1st, 1933
 Technical Staff:
 H. J. Barton Chapple, Wh. Sch., B.Sc., (Hons.), A.M.I.E.E.
 W. J. Delaney, Frank Preston, F.R.A., W. B. Richardson.

ROUND *the* WORLD of WIRELESS

Rumania's Two Stations

IN addition to the transmitter, which has been operating for some time at Baneasu, near Bucharest, on 394.2 metres (12 kW.) for experimental purposes, a second station—but in this case a mobile one—has been installed on four railway trucks at Blaj (Blasendorf). Its power is 750 watts, and broadcasts of the capital programme are now carried out on 1,920 metres. As Romania is anxious that its wireless entertainments should be heard by listeners beyond its frontiers, it is proposed to erect a 120-kilowatt transmitter on some site not too distant from Bucharest during 1933-34. The wavelength has not yet been definitely fixed, but it is hoped to secure, if at all possible, a channel between 1,200 and 1,800 metres. In view, however, of prior claims to such favourable positions in the long waveband it is hardly likely that authority will be forthcoming from the International Broadcasting Union at Geneva.

Sponsored Wireless Entertainments in Italy

BY arrangement with an American Petroleum concern, the E.I.A.R. will be paid a subsidy for the broadcast of a series of sponsored orchestral and vocal concerts through the Rome, Milan, Trieste and Genoa stations. The income derived from this source will permit the studios to include in these special programmes some of their most famous orchestras, as well as singers and instrumentalists of international repute. The concerts will be given every Monday evening for a period of twelve weeks.

Alternative Programmes for Czecho-Slovakia

UP to the present the Czechs have only used one of the two channels which were originally allotted to them. They have now started tests with a new transmitter on 540 metres. If favourable results are obtained, the present Prague station may use this channel for a National programme, an alternative entertainment to be given on 488.6 metres.

Deutschland Uber Alles!

TAKING as a plea the critical financial situation of artists and musicians throughout the country, the German Reichs-

funk commissioner has instructed all studios in his organization to restrict engagements to persons of German nationality. In addition, in order that listeners may know that this is being done, all artists appearing before the microphone, under stage-names or other *noms-de-guerre* must be given their true name in the published programmes.

Galsworthy's "Escape" as Radio Play

AS a tribute to the memory of the author, the B.B.C. will broadcast on April 11th, a microphone version of John Galsworthy's successful play, *Escape*. It was

Ltd. This action will act as a test case for all the gramophone record manufacturers to define their rights under the Copyright Act of 1911. The case will be heard at the High Court of Justice in London in due course.

New H.M.V. Record Catalogue

FEW people know that it is still possible to hear a bombardment of the Great War. A gramophone record is still available of the fighting by the Royal Garrison Artillery, near Lille, in 1918. A glance at the new edition of the "His Master's Voice" 400-page record catalogue will reveal even stranger facts. This book has been called "The Musical Debreit," so full of nobility are its pages, for, besides listing over 5,000 records of over 8,000 titles, it is practically a history book of the last decade. The voices of practically all the members of the English Royal family are represented. Their Majesties The King and Queen can be heard speaking on the importance of Empire Day, H.R.H. The Prince of Wales on Sportsmanship, and H.R.H. The Duke of York can be heard explaining the purpose of his annual camp for public schoolboys and working lads. Musicians will be interested to know that Grieg and Saint-Saëns made records of their own compositions. Great explorations of the past are recalled when it is found that Sir Ernest Shackleton and Commander Peary recorded accounts of their exploits. The new 1933 H.M.V. Catalogue is also packed with interesting details, giving biographies and portraits of the world's most famous artists.

Chief Contents:

- THE FERROCART Q.P.-P.
- HI-MAG THREE
- THE SUPERSONIC SIX
- A DUAL-WAVE ADAPTOR
- ABC OF SELECTIVITY
- CIRCUIT DIAGRAMS SIMPLIFIED
- FACTS ABOUT COLD VALVES
- BEGINNER'S SUPPLEMENT

originally projected for transmission at the time of the Dartmoor revolt, but was cancelled at the eleventh hour as being inopportune in view of that unfortunate event.

Gramophone Record Test Case

A WRIT has been issued by The Gramophone Company, Ltd., against Messrs. Stephen Carwardine and Co., Ltd., the well-known caterers of London and Bristol, for performing in public, without authorization at their restaurant in Bristol, an "His Master's Voice" record, of which the copyright is vested in The Gramophone Company,

Shocking the Ether

IF rumours are to be believed, the super-power, 500 kilowatt transmitter, which the Soviet Government has erected at Moscow Noghinsk, will not operate on a "long" channel as previously reported. Tests have been recently carried out in the middle of the broadcasting band, and there would appear to be a likelihood that the wavelength chosen is one in the immediate vicinity of 350 metres. If so, the advent of a station of this power is likely to cause considerable trouble, and will greatly add to the problems to be solved by the International Broadcasting Union at Lucerne.

ROUND *the* WORLD of WIRELESS (Continued)

The Radio Fan's Dream Aerial!

FOR the International Exhibition which Paris proposes to open in 1937, the French authorities propose to build a giant tower, 2,200 feet high, as a special attraction. Paris wireless journals suggest that if the scheme matures it should be used as a mast for the aerial of *Radio France*, the giant broadcasting transmitter which on various occasions has been promised to listeners by the State. The existing Eiffel Tower built for the 1889 Exhibition is 984 feet high, and since it was taken over by the military authorities as a wireless station has been equipped with both long and short aeriels. The new tower, however, which it is suggested should be called *Le Phare du Monde* (The World's Beacon) would easily hold the record for the height of any building on this earth. Undoubtedly as an aerial mast it would be the radio fan's ideal!

Carillons as Opening Signals

BOTH Madrid EAJ7 and Barcelona regularly relay chimes as an overture to their broadcast programmes. The carillon heard through EAJ7 at midday, 2.0, 9.30 p.m. and midnight G.M.T. is taken from the Home Office buildings at Madrid; Barcelona EAJ1, at 11.0 a.m. and 9.0 p.m. G.M.T. precedes its transmissions by a chime of bells relayed from the Cathedral.

Stand By For New Swiss Station

THE new 20 kilowatt Tessin broadcasting station on Monte Ceneri, has started its initial tests on 678.8 m. (442 kc/s) thus taking over the channel previously used by Lausanne. All announcements are made in the Italian language; the studio is situated on the borders of Lake Lugano in the Italian speaking district of Switzerland.

Memories of Zeebrugge Mole

WHEN the B.B.C. relays from Dover the annual Memorial Service to the men of the patrol who fell at the attack of Zeebrugge fifteen years ago listeners will hear the tolling of the bell which the Germans used during the War to warn the inhabitants on the arrival of British aircraft. The Bell was presented by the King of the Belgians and usually hangs in the belfry of Dover Town Hall.

Another Trans-Atlantic Debate

REGIONAL listeners on April 8 will hear a debate between Oxford Union and Columbia College, New York. The subject being "That Democracy has Failed." On this occasion shortwave fans will be given the opportunity of tuning in this broadcast direct from the American transmitters taking the Columbia System programmes.

Barcelona New Call

THE Spanish station of which broadcasts are heard on 252 m. with the call *Barcelona-Catalunya* is not the better known Radio Barcelona but its competitor EAJ15.

INTERESTING and TOPICAL PARAGRAPHS.

The official call letters are frequently given during the evening's programme, namely (phonetic) *Eh-Ah-rhota-Keen-say*. It is owned and operated by the *Radio Associacio de Catalunya*.

Advertising the French Riviera

THE station of Nice Juan-les-Pins, on 250 m., in order to attract tourists and visitors to the French watering places on the Mediterranean coast, broadcasts both German and English publicity programmes at the end of the day's scheduled

STARTING YOUNG.



A class in an L.C.C. school listening to a lesson in music by wireless given by Sir Walford Davies. "Practical Wireless" is the refresher course for the expert and the road to easy radio for the beginner.

SOLVE THIS!

Problem No. 28

Jackson built the battery version of the *Fury Four*, and installed it in a radio-gramophone cabinet. When perfectly satisfied with the radio reproduction, he purchased a pick-up and connected it as shown in the theoretical circuit of this receiver. The correct bias was applied, and a record played through. The result was perfectly satisfactory, and when he had played sufficient records he attempted to tune in the broadcast programme. Nothing could, however, be heard until the pick-up was disconnected. What was the reason for this, and what was the remedy? Three books will be awarded for the first three correct solutions opened. Address your solution to the Editor, *PRACTICAL WIRELESS*, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2, and mark your envelope Problem No. 28. No other correspondence should be included with this solution.

SOLUTION TO PROBLEM No. 27

Owing to the fact that the anode current from two valves in Q.P.P. varies whilst the signals are being received, the H.T. also varied on Brown's mains unit, and this resulted in the distortion and poor signals. The following three readers received books in connection with Problem No. 26:—
R. P. Bishop, The Grammar School, Farnham;
F. G. Bird, Bury House, Town Green, Wymondham, Norfolk; P. English, 35, Livingstone Road, W. Southbourne, Bournemouth.

transmissions. An entertainment with German announcements may be heard every Thursday at midnight.

Where Neighbours Differ

CONTRARY to the policy adopted by the German broadcasting system, the Dutch government has given permission to all political parties to make use of the Hilversum and Huizen microphones to express their views almost nightly between March 27 and April 25, when the General Elections are to take place in Holland. It is stated that on these occasions full liberty of speech will be allowed and the addresses made by members of the political parties will not be subject to censorship.

Their Views On National Anthems

MOST European countries nowadays close down the day's broadcasts by playing their National Anthem; if there is no orchestra at the time in the studio, a gramophone record is used. In Austria the authorities have decided that the Federal Anthem (The Hymn to the Emperor) shall only be played on Sundays and holidays, notwithstanding the request made by listeners that it should be broadcast nightly. Italian stations play not only the Royal Anthem (Marcia Reale) but also the *Giovinetta* or Fascist Hymn, daily; they are never omitted. The Czech broadcasting authorities, on the other hand, have decreed that their hymn is only to be used on special occasions. They are of opinion that it should be treated as a solemn rite and therefore should not be played indiscriminately at the end of the ordinary radio programmes. Which of them is right?

Agreement Between Studio and Stage

THE Vienna Studio has concluded an agreement with the Burgtheater in that city by which the broadcasting authorities, in consideration of an annual subsidy destined to assist in defraying costs of dramatic performances, will be entitled to secure the free services of dramatic artists twice weekly for the production of radio plays at the studio. The arrangement is an outcome of complaints made by the theatres to the effect that the transmission of dramatic performances by wireless was affecting the box-office takings.

Loud-speaker versus Telephone Earpiece

FOLLOWING a series of tests, the German Posts and Telegraphs administration is proposing to replace telephone earpieces by specially-designed loud-speakers. At the outset these will be supplied to business concerns, public institutions, and other establishments where there is no great necessity for privacy in communications. One great advantage claimed for this innovation is the assistance it affords when messages need transcription, as with the new instrument both hands remain free. The apparatus reproduces at ordinary loud-speaker volume. Similar instruments have been used in the United States for some months.

(Continued on page 50.)

A DUAL WAVE ADAPTOR

SHORT-WAVE listening is a thrilling pastime, but, thrilling though it undoubtedly is, it can be made more so by the use of a two-detector receiver, or adaptor. To demonstrate this I will outline but two advantages such an arrange-

By **LESLIE W. ORTON**

as few listeners wish to "eavcsdrop," this is no disadvantage.

this way no wires will be overlooked and, consequently, the preliminary tests are likely to be satisfactory.

In the diagram the coil shown is a home-made coil, and although any short-wave coil (of reliable make) may be employed, the reader may save expense by constructing his own coils. To do this he should procure a ribbed former, of about three inches diameter, and (commencing with the aerial coil) should wind twelve turns (with No. 18 S.W.G. wire), taking care that they are firmly wound, with about a quarter of an inch between turns. The ends of the coil should be taken to terminals mounted upon the former (Fig. 3.) So as to avoid the necessity of changing coils or employing switches, a clip is so arranged that the coil may be shorted out turn by turn, thus covering a wide waveband.

The reaction coil should consist of about six turns of No. 20 S.W.G. wire. However, as the size of the coil will differ in accordance with the valve employed, etc., I suggest the reader winds on twelve turns and, when the receiver is in operation, take off a turn at a time until the most suitable size of coil is found.

When the adaptor is constructed it can be plugged into any straight receiver. To do this the detector valve of the existing receiver should be taken out and

Details of Construction

The construction of the adaptor is simplicity itself. Fig. 1 shows the pictorial layout of one of the two detector stages. Both should be wired similarly, but, although they should be mounted upon the same baseboard, they should not be "crammed" together. Fig. 2 shows the circuit of the adaptor. The reader should wire with this in front of him, and so as to avoid errors, pass a blue or other pencil through each connection as he makes it. In

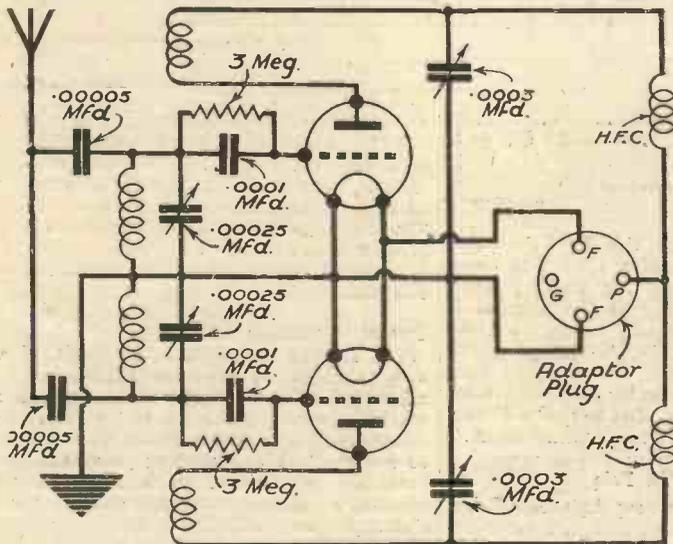


Fig. 2.—The theoretical circuit of the two-detector receiver.

ment has over the normal adaptors and receivers of the present day.

Firstly, fading may be greatly reduced by receiving the same programme from two different stations, the strength of reception being kept comparatively constant, it being highly improbable that both stations will fade at the same time.

Upon perusing a short-wave list the reader may conclude that there are very few instances where the same programme is "put over" two stations at once. As a matter of fact, there are quite a number of instances where this is done. The Empire stations, VE9DR, Drummondville, W8XK, Pittsburg, and W2XAD and W2XAF at Schenectady give three, of many, such instances.

Another advantage of the two-detector adaptor is in the case of stations testing (when the technical operators speak to each other, as if over a telephone or in conversation in the same room), it being possible to receive both ends of the conversation and not merely one as in the normal arrangements. In the case of trans-Atlantic and other radio-telephone stations, this is not possible, as the British end is inaudible, or nearly so, owing to beam and skip effects. However,

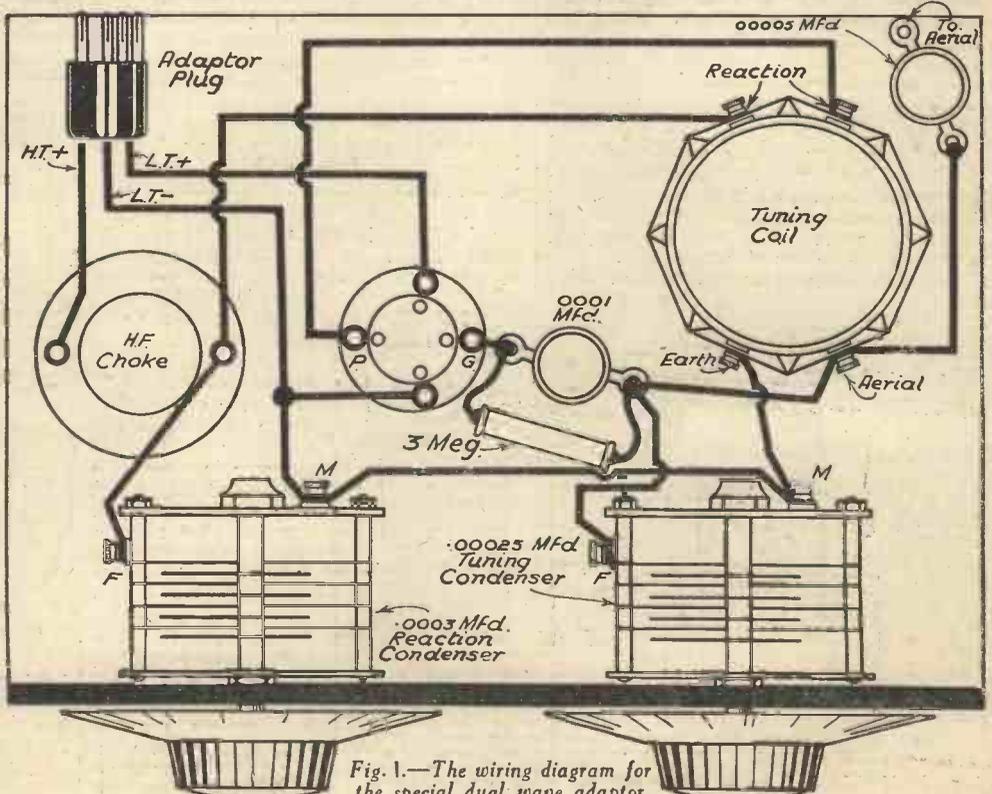
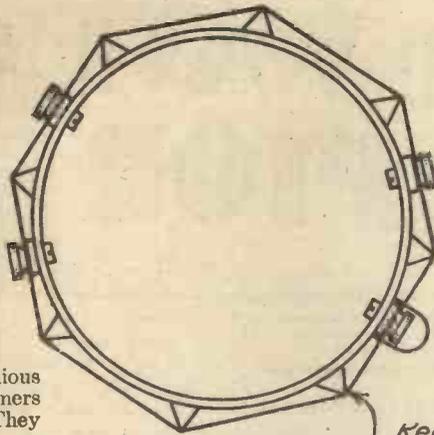


Fig. 1.—The wiring diagram for the special dual wave adaptor.

the plug inserted in the detector socket. Then the aerial and earth should be connected to the adaptor, and the valves inserted in the sockets, when, assuming you have everything correct, you will be ready for a tour around the stations with something entirely new in adaptors.

By the way, for the coil the ingenious Ewebec Coil Formers serve splendidly. They have eleven slots, so that you will have to pile two of the windings or, alternatively, you may use one of the British Ebonite Co.'s solid formers.



Turns Wound On Ribs Of Former

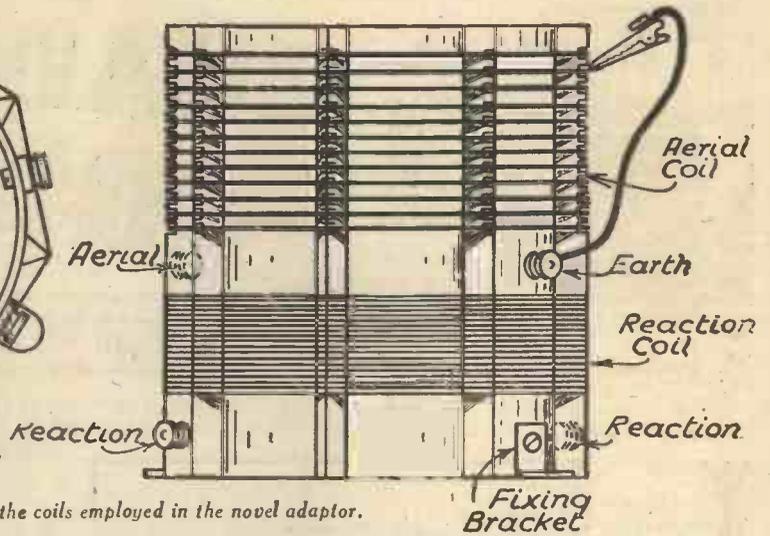


Fig. 3.—Details of the coils employed in the novel adaptor.

Radio Crisis in Jugoslavia

AUSTRIAN papers report that the Jugoslavian Government has cancelled the concessions granted to the Belgrade and Ljubljana broadcasting stations, and that these transmitters are shortly to be taken over by the State. The reason given is that developments of the system as provided by the agreement have not been carried out by the concessionaires.

German Ministry of Propaganda

UNDER the direction of Dr. Goebbels, an active member of the Hitler Government, German opinion through the Press, radio, theatre, and "movies" is to be moulded into a solid support of the present political administration. In future all official speeches, State ceremonies, or events of topical interest are to be broadcast by all German stations, but so far as possible efforts will be made not to interfere too much with the settled programmes. That the altered character of the German wireless entertainments does not suit all listeners

ROUND THE WORLD OF WIRELESS

(Continued from page 48.)

is already proved by the fact that the Berlin studio has been compelled to open a special department for dealing with complaints. The duty of the appointed officials is to answer all telephone calls and messages in respect of the programmes. During the past week the work in this department has so greatly increased that the staff is to be augmented to deal with the calls received during broadcasting hours.

Wireless and the South Pole

IN connection with a new Antarctic Polar Expedition which will be leaving England this summer, it is reported that special arrangements will be made to equip it with specially-designed short-wave transmitting and receiving apparatus in order that communication may be continuously

maintained with the Mother Country. For the final stage of the journey a small portable set will be carried on one of the sledges, thus enabling the advance party to keep in constant touch with the base. The latter will possess a transmitter of greater power which will enable messages from the Polar seas to be flashed direct to England.

Twentieth Century Miracle

AT Nantes (France), as a result of a prosecution a man was condemned to a heavy fine for treating patients by quack methods involving the use of "mysterious electro-magnetic waves hitherto unknown to science." When passing judgment the presiding magistrate, in a reference to broadcast entertainments, stated that although the accused was not authorized to practise, it was a curious fact that the means adopted had actually benefited the invalids. It would be interesting to know the kind of programme recommended by the quack doctor.

WHERE a set is frequently in use it often happens that the H.T. battery runs down at a time when funds are rather low. The simple coin-operated switch shown in the accompanying illustrations helps to solve the problem by making it necessary to insert a penny in a slot each time the switch is used.

The device consists of a small tin box which

PENNY-IN-THE-SLOT RADIO

can be fitted in any convenient position either inside or outside the cabinet. In one side of the box, near the top,

a slot is cut to just allow a penny to pass through. A strip of thin springy brass is soldered on each side of the slot, inside the tin, to act as guides and to hold the coin in place. To the top of tin, inside, a plunger switch is fixed so that when a penny is inserted in the slot it presses between the switch blades and completes the L.T. circuit. The L.T. negative lead is broken and the ends attached to the terminal screws on the switch, as shown in Fig. 1. A coil spring is fitted below the switch

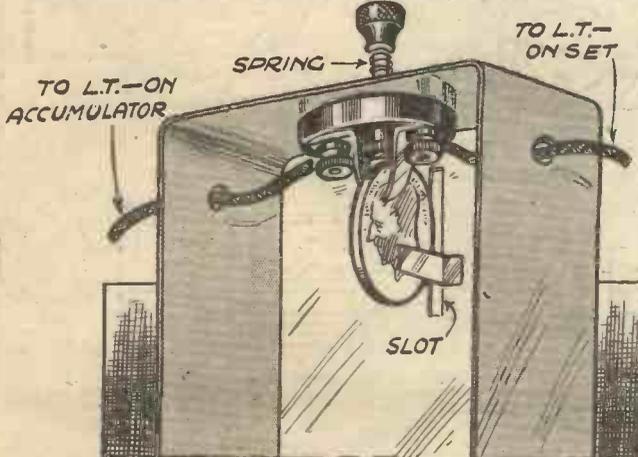


Fig. 1.—A simple coin-operated radio switch showing how a penny completes the circuit.

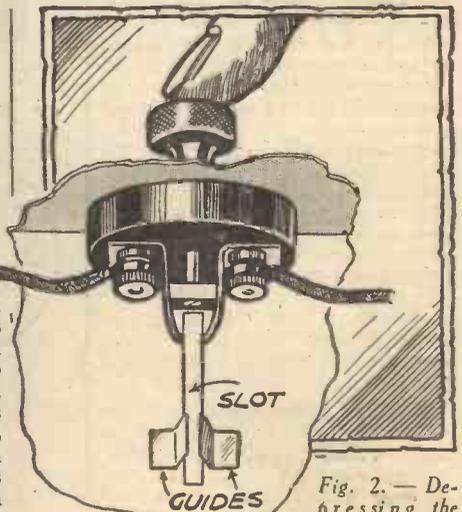


Fig. 2.—Depressing the plunger to release coin and break the circuit.

knob, and a new end piece, consisting of a small square block of ebonite, is screwed to the end of the plunger. To switch off the set the plunger is pressed, as indicated in Fig. 2, until the coin drops, thus breaking the circuit.—A. STEVENS (Rosherville).

CLASS B AMPLIFICATION— AND ALL ABOUT IT

Continuing Our Policy of Being First in Dealing with the Latest Radio Developments, Some Further Notes on the Latest Development in Battery Receiver Design are Here Given.
By W. J. DELANEY.

IN PRACTICAL WIRELESS dated February 4th was given an explanation of Push-pull Amplification, together with the modifications known as Quiescent Push-pull and Class B Amplification. The valve manufacturers have been hard at work on this latter method, and preliminary details are now available concerning the practice of this method of supplying the loud-speaker with an output from a battery-operated receiver which is comparable to that normally obtained with a powerful mains-driven receiver. If you refer back to the article above mentioned, you will read how the action of two valves working on the push-pull principle was modified when Quiescent or Class B amplification was employed. With push-pull correctly applied, the two valves work exactly opposite in phase, that is to say, if the grid of one valve receives a certain negative half-cycle of a given signal, the anode current of that valve will fall by a certain amount. The other valve in the push-pull stage will, however, at the same moment receive a positive half-cycle, and the anode current of that valve will accordingly increase by the same amount as the other valve decreased. The effect of this, you will remember, is that the total anode current of the two valves in push-pull remains at a perfectly steady value, and this is roughly double that of each individual valve. A milliammeter in the common H.T. lead should show a perfectly steady needle with this form of amplification, and kicking of the needle will indicate distortion due to overloading or other reasons.

Push-push

In the quiescent (or push-push) method of using the push-pull stage, each valve receives a biasing voltage which reduces the normal anode current to a very low value, and therefore the negative half-cycles of the signal voltage do not have a very marked effect on the anode current. On the other hand, the positive half-cycles cause large increases in anode current, and therefore when the signal is being received the anode current of one valve rises, but the decrease in the partner valve does not balance out and therefore a meter in the common H.T. lead will show the effect of the received signal in the form of a varying upward swing. As an instance, the Q.P.-P. Three-Four which was recently described in these pages gave a steady reading on a meter in the anode circuit of just over 2 mA. when no signal was received, and on very loud passages of music this rose to very nearly 10 mA. The aim of push-push

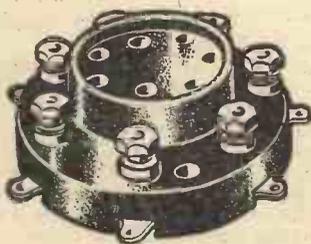


Fig. 4.—The W.B. baseboard mounting 7-pin valve-holder.

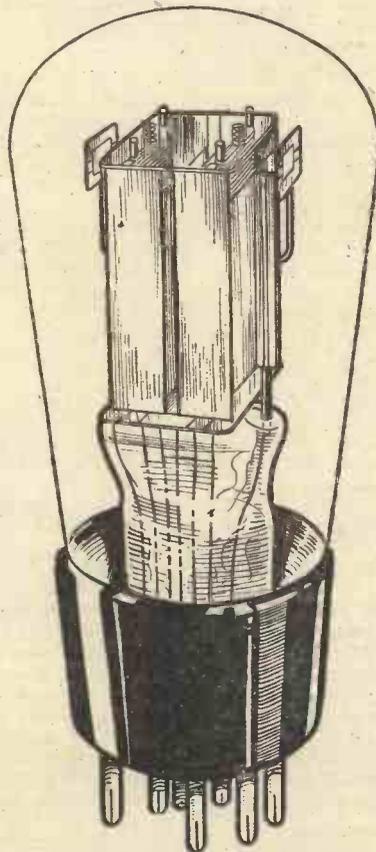
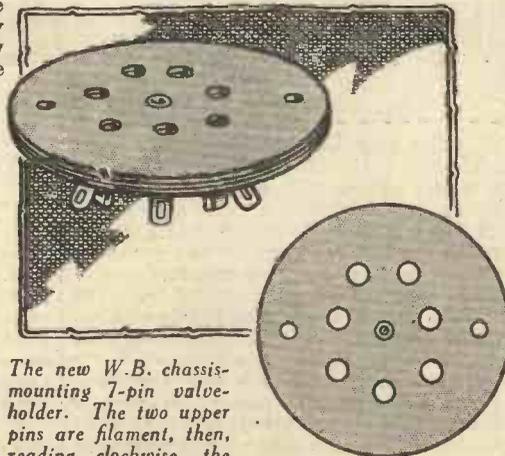


Fig. 3.—The new Cossor 240 B valve with 7-pin base for Class B amplification.



The new W.B. chassis-mounting 7-pin valve-holder. The two upper pins are filament, then, reading clockwise, the others are the anode, grid, grid, anode, and a blank.

(as quiescent push-pull is commonly called) is, therefore, to obtain the lowest reading possible in the output stage without actually introducing distortion, and this results in a saving of H.T. current and an increased output signal strength. However, the following facts must be borne in mind:—

1. Two valves are required.
2. To preserve a balance, the biasing battery must be discharged at the same rate as the H.T. battery.
3. Two pentode valves are needed to give the best from this form of amplification.

There are other considerations, but these three points are the most important.

Class B

The method of amplification which is now known as Class B amplification, employs the same fundamental principle as quiescent push-pull, but owing to certain factors it does away with *all* the drawbacks. Before I can fully explain the method it would, perhaps, be as well to just go over once again the method in which an amplifying valve works. Fig. 1 shows the normal anode-current grid-volts curve of an amplifying valve, and the correct biasing point is just under 6 volts. As the signal voltage varies between 3.5 volts and 7.5 volts, the anode current varies from just under 1.5 mA. to just under 4.5 mA. In other words, a decrease of 1 volt in grid volts results in an increase of nearly 2 mA. in anode current, whilst the increase of 1 volt on the grid decreases the anode current nearly 2 mA. This is the essential of true amplification, and if the signal applied to the grid is so large that the changes in anode current are not equal on both positive and negative half-cycles, then distortion is taking place. In Fig. 2 the signal, shown as a wavy line at the bottom of the graph, runs, on the right, beyond the zero line, and the result of this is to cause what is known as "grid current" to flow. As you probably know, the glowing filament gives off a stream of electrons, and these pass across from the filament to the anode, across the grid. When the signal consists of negative impulses the electron flow from the filament is repelled, but when a positive variation is applied to the grid the electron flow is not only augmented, but the following thing happens. With a weak positive impulse the effect will be simply that the normal filament emission will pass across to the plate. If the positive impulse is

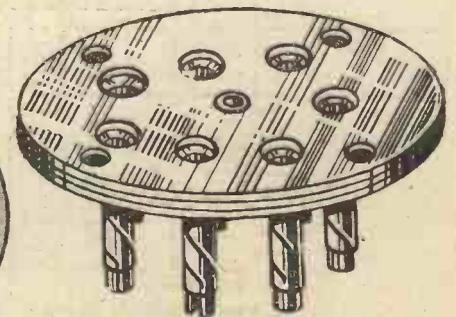
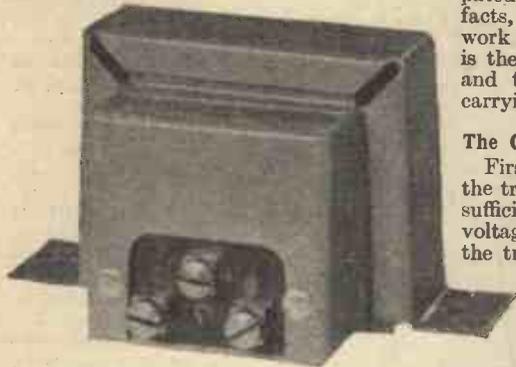


Fig. 5.—The Clix chassis-mounting 7-pin valve-holder.

above a certain value, however, the flow will be so great that many electrons will accumulate on the grid. When this state of affairs comes about the accumulation on the grid must be disposed of in some way, and in a valve arranged as a grid leak detector this accumulation leaks away to earth through the grid leak. In an L.F. valve arranged in the output stage, however, this current (which is known as "grid current," and is extremely small) must not on any account be permitted, owing to the distortion which it introduces. This grid current commences to flow when the valve becomes very slightly positive,



The Benjamin driver transformer.

and as the grid gets more positive the current increases at a much greater rate than the change in "positiveness" of the grid. The effect, therefore, is that the tops of the positive peaks are cut off, as shown in Fig. 2.

It is usual to include a transformer secondary winding between the grid of the output valve and earth, and the passage of even a small current through this winding results in a voltage difference across the ends of the winding. The ordinary L.F. transformer has a step-up ratio, which means that the primary winding (which is included in the anode circuit of the preceding valve) is smaller than the secondary winding, and this step-up ratio is usually about 4 to 1. The primary winding has to

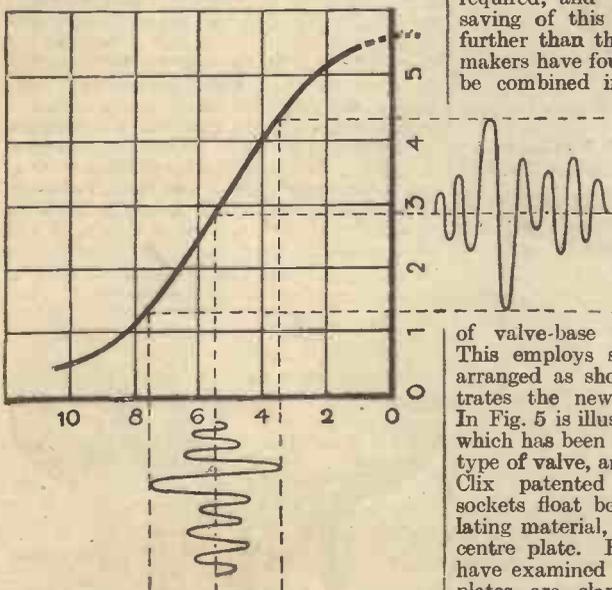


Fig. 1—The curve of a valve biased to give even amplification. The lower line gives grid volts, and the right-hand line gives anode current.

be sufficiently large to offer the requisite impedance to the valve with which it is used, and consequently the secondary winding will be of such a size that the resistance will probably be round about 10,000 ohms. From Ohms Law we know that a current flowing through such a winding will produce a voltage drop, which means that there will be a certain dissipation of energy which is not turned to any account. (A resistance, in ohms, multiplied by a current in amps., gives voltage drop. Voltage dropped multiplied by current passed, in amps., gives wattage dissipated.) Now, in view of the above facts, how can a valve be employed to work with grid current flowing? That is the feature of Class B amplification and the following is the method of carrying it out.

The Class B L.F. Stage

First of all, the secondary winding of the transformer must be wound with a sufficiently low resistance to avoid the voltage drop across it, or in other words, the transformer must supply sufficient energy to overcome the useless dissipation. This means that a step-up transformer cannot be used. Instead, the transformer must be designed to operate in the reverse direction, and therefore must have a step-down ratio—actually a ratio of 2 to 1 is found suitable. In addition, the secondary winding must have a resistance not exceeding about 500 ohms. This secondary winding must be centre-tapped as in normal push-pull work, but the energy supplied to the secondary must be of a high order, and therefore this transformer must be a substantial component, wound with thick wire, and the valve feeding this transformer must be of the small power type. The anode currents of the two Class B valves must be combined in the usual push-pull manner, and therefore a centre-tapped output transformer is also required. By the way, the input transformer for this method of amplification is called the "driver" transformer, and the valve feeding is known as the "driver." No grid bias is, of course, required, and we therefore can effect a saving of this component. Class B goes further than this, however, and the valve makers have found that the two valves may be combined in one glass envelope, and this greatly simplifies manufacture and naturally results in a saving to the purchaser. The actual valve is illustrated in Fig. 3, and it will be seen to consist of two complete sets of valve elements arranged side by side, and to enable connection to be made to these, a new type of valve-base has had to be designed. This employs seven pins, and these are arranged as shown in Fig. 4, which illustrates the new W/B 7-pin valveholders. In Fig. 5 is illustrated the new Clix socket, which has been produced for this particular type of valve, and this incorporates the new Clix patented floating principle. The sockets float between two panels of insulating material, and are keyed into a third centre plate. From the sample which we have examined we notice that the three plates are clamped together in such a manner that the sockets are able to move to such an extent that they are able to receive accurately the valve-base which is plugged

into the holder. It will be noticed that there are only two filament pins—this is because the filament connections inside the valve are common to both filaments. With a steady anode current of about 10 mA., an undistorted output of about 2,000 milli-watts should be obtained. The points to remember are that the driver valve must be of the small power type so as to deliver sufficient energy to the transformer; and the output transformer feeding the loud-speaker should be designed to offer the correct load for the double Class B valve. The advantages of Class B over Quiescent Push-pull are, firstly, saving in cost, as only one valve is required in place of the two Pentodes used for Q.P.-P.

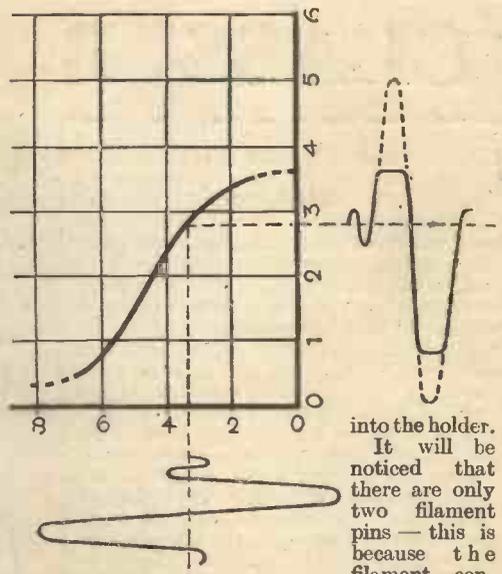
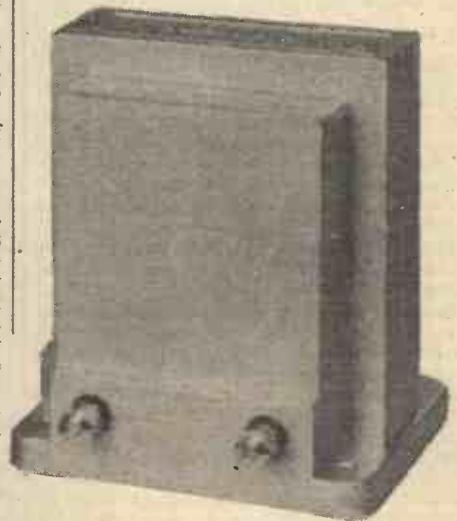


Fig. 2—The effect of grid current shown in diagrammatic form.



The Lotus driver transformer.

Secondly, no grid bias battery is needed. Thirdly, no matching has to be done. And, lastly, the output is increased.

The Lotus and the Benjamin

Above is shown two of the new Driver transformers. The Lotus transformer has a primary inductance of 30 henries, and the secondary resistance is only 100 ohms for each half (200 ohms in all). This has been specially designed to work with the Cossor valve, using a Cossor 215 P. valve as the driver. The price of this transformer is 11s. 6d. The Benjamin component costs 10s. 6d., and the secondary has a resistance of approximately 150 ohms per section.

THE ABC OF SELECTIVITY-2

In this Article the Author gives more Useful Information about the Design and Construction of Selective Tuners. Also Details of a Home-made Band-pass Filter

By W. B. RICHARDSON

STATED in the last article that, from the point of view of selectivity, the single tuned circuit had its limitations, and that when these were reached the only recourse was to employ more tuned circuits. In fact, other things being equal, the selectivity of a receiver is roughly proportional to the number of tuned circuits it contains.

Now comes the question of how these circuits are to be arranged—what type of coupling to use, how tight it shall be and so on. Last week I opened up the subject by giving an example of how an extra tuned circuit might be added to a three-valver of the det. and 2 L.F. type, and mentioned that the coupling should be loose. The reason for this can best be seen by reference to Fig. 1. Here are reproduced a number of response curves obtained from an actual tuner in which the coupling between the two coils was varied from tight to very loose.

Effects of Varying the Coupling

The outstanding thing which this graph reveals is that an increase in coupling beyond a certain point does not give an increase in signal strength. It does not increase the height of the curve, but merely alters its shape. From a pointed peak it first becomes a squarish one, then it develops a dip in the middle and finally it resolves itself into two distinct humps which get wider apart as the coupling nears its maximum.

Now what does this mean in practice? Well, it simply means that if you place the two coils close together or closely couple them in some other way, you will be able to receive any station at two different settings of the tuning condensers. Naturally, from the broadcast listener's point of view, this is highly undesirable. However, as the coils are moved farther apart so the two different settings will gradually draw nearer until they merge into one. The signal strength will remain the same. Moving the coils still farther apart will give very sharp tuning, and beyond this the signal strength will begin to fall off.

The degree of coupling for maximum selectivity combined

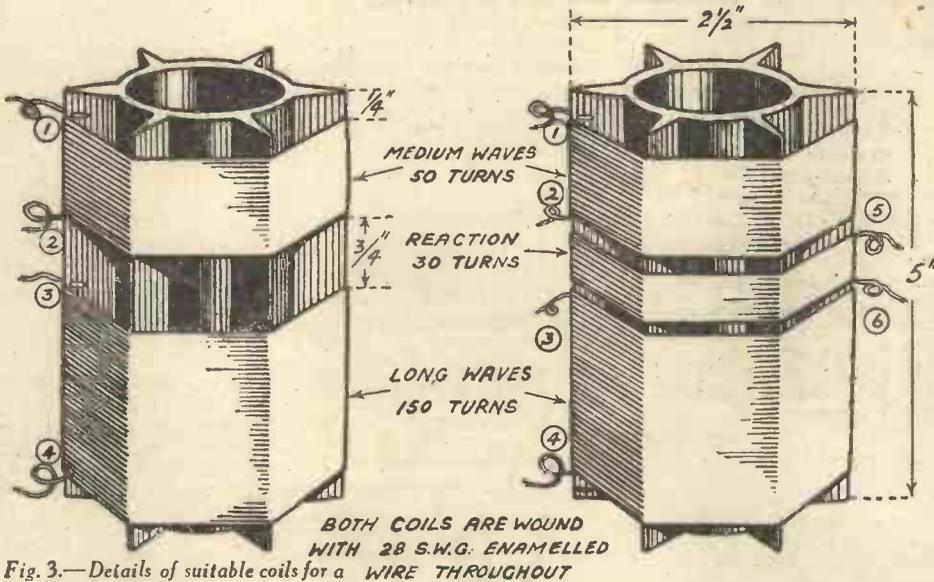


Fig. 3.—Details of suitable coils for a home-made band-pass tuner.

with sensitivity is that which gives a curve like (e) (Fig. 1.) Quite often tuners are designed to give such a curve, and under favourable conditions, especially if a modicum of reaction is used, they will give the proverbial "knife-edge" selectivity.



Fig. 2.—Ideal "curve" for a band-pass tuner.

Selectivity versus Quality

Unfortunately, very sharp tuning introduces another problem—that of

selective, otherwise some of the sidebands will be lost. The absence of the sidebands results in the characteristic attenuation of the high notes just mentioned.

There are two methods of overcoming this difficulty. One is to retain the super-selective circuit and to compensate for the loss in the higher part of the musical scale by amplifying the high notes more than the low, and the other is to use tuned circuits giving a square peaked resonance curve.

With the former method the compensation is carried out in the low-frequency stages by means of a tone control. Sometimes this is arranged to give a fixed degree of compensation such as is provided by the Varley intervalve transformer D.P. 35, or, better still, a variable control is fitted. If much use is made of reaction then a variable control is very desirable. You will readily appreciate that since the degree of selectivity varies according to the amount of reaction employed, so the degree of compensation should also be variable. Then whatever the reaction setting happens to be, whether at zero when receiving the local station or at maximum when tuned to a distant foreigner, a movement of the tone control will enable the best overall response to be obtained. Of course, the second method of obtaining quality with selectivity is dependent on the use of the well-known band-pass type of tuner.

Why Band-Pass Filters are Used

Let me say right away that there is nothing mysterious about a band-pass filter. It is not even a new idea, for

(Continued on page 54.)

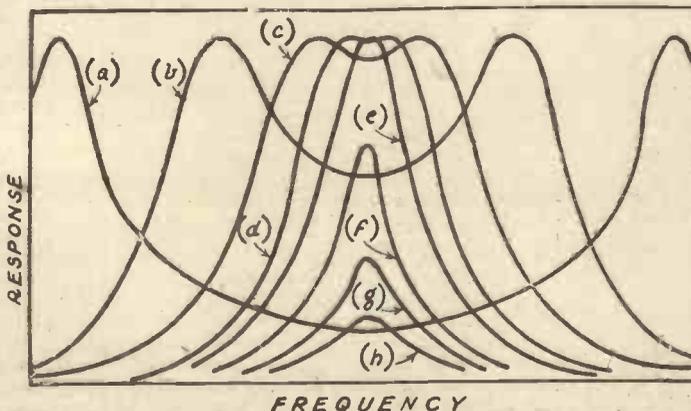


Fig. 1.—Resonance curves of a coupled circuit with various degrees of coupling.

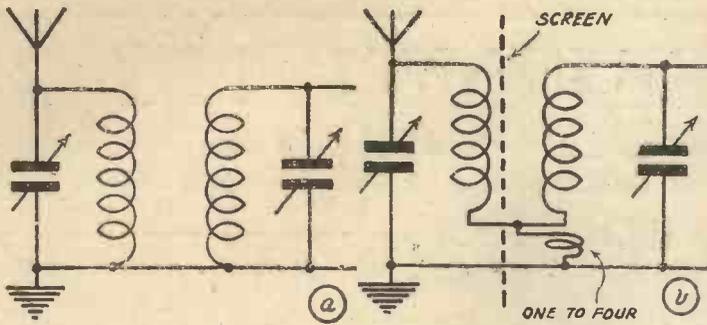


Fig. 4.—Two methods of inductively coupling two circuits.

(Continued from page 53.)

band-pass and band-stop filters, etc., have been known for years. A band-pass filter as used for broadcast reception is simply two tuned circuits with the coupling between them so arranged as to give a square top to the resonance curve like curve (d) in Fig. 1. The object is to secure a response over a small band of frequencies just sufficiently wide to include the sidebands of the transmitted wave, but no wider. The curve in Fig. 2 shows the ideal to be aimed at. It gives a maximum response for ten consecutive kilocycles and no response outside this band. With such an arrangement stations more than five kilocycles on either side of the one to which the receiver is tuned would give absolutely no response and therefore cause no interference. Naturally, such a curve is unattainable in practice, but one very nearly approaching it, such as that of (d) (Fig. 1) is quite easily secured.

Methods of Coupling

Now for the practical details. Obviously, two tuning coils are required. These should be as near identical as possible. Absolute matching, however, is not essential if separate tuning condensers are used, and in this connection the home constructor

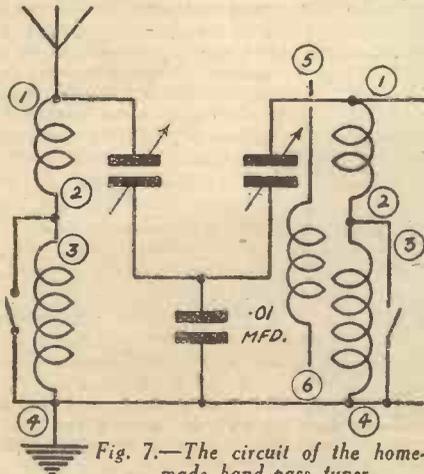


Fig. 7.—The circuit of the home-made band-pass tuner.

Firstly, there is the inductive method, two different versions of which are shown in Fig. 4. With circuit (a) the two coils are placed a certain distance apart so that their fields

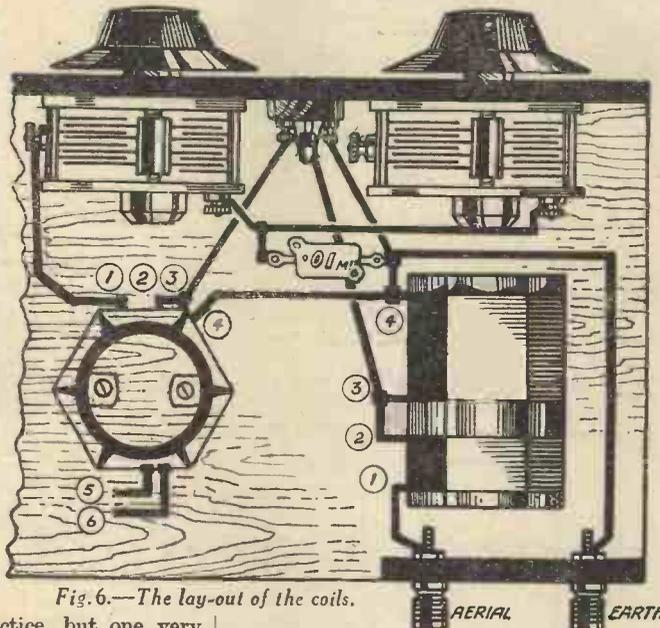


Fig. 6.—The lay-out of the coils.

interact, the degree of coupling depending on how far this distance is and the angle they are placed in respect to one another. With circuit (b) the two coils are either placed at right angles some distance apart or else completely screened one from the other, the object of both methods being to entirely eliminate all interaction. A pre-determined amount of coupling is then introduced by winding a few extra turns (one to four is usually sufficient) round the end of one of the formers. One end of this small inductance is joined to the bottom ends of the two coils and the other goes to earth. It will be seen that these few turns are common to both coils, and this is how the necessary coupling is obtained. Varying the number of turns varies the coupling. With one or two turns the tuning is very selective and of the sharp peaked variety, but as the turns are increased it begins to assume the true band-pass character with a squarish peak.

Coupling With a Condenser

The second method of coupling is the capacitive, that is to say, a condenser is used. Here, again, there are a number of different circuits to choose from. Fig. 5 shows three of them, (a) and (b) being the most common. Here the coils are arranged so that there is no magnetic coupling between them, but there is, however, a con-

will be pleased to learn that it is quite easy to make a good band-pass tuner with home-made coils. Particulars of a pair of suitable coils for such are given in Fig. 3. I shall refer to these again later.

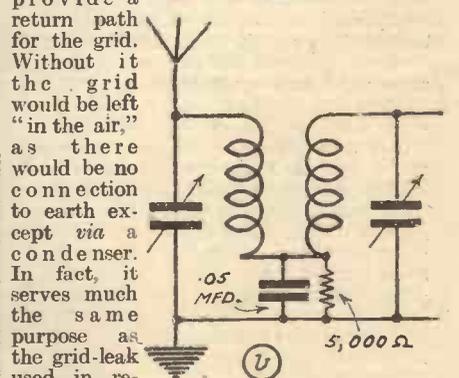
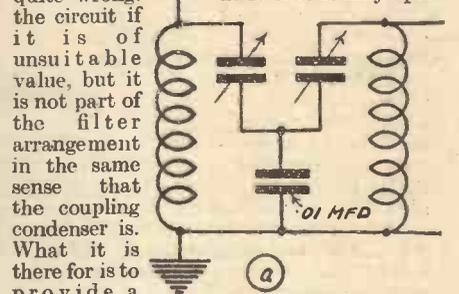
The next question is what kind of coupling to use. There are a variety of ways of arranging this.

denser in series with the two tuning condensers and, therefore, common to the two circuits. This provides the necessary transference of energy from one circuit to the other. The value of .01 mfd. shown is about right for a "square" peak. A larger value will reduce the coupling and so make the tuning peak sharper, while a smaller value will increase the coupling.

Circuit (a) is the simpler arrangement, but suffers from the drawback that the rotors of the tuning condensers are not at earth potential. This does not matter in a simple pre-detector filter in which two separate tuning condensers are used, but where there are other tuned circuits to follow, all of them to be ganged, it cannot very well be used. Circuit (b) is then adopted. This overcomes the difficulty by interchanging the positions of the condensers and coils so that the condenser spindles are now earthed. With this arrangement, however, a resistance R has to be included, otherwise there is no means of biasing the grid of the following valve.

The Mysterious Resistance

The presence of this resistance is a puzzle to a large number of people. They think it has some connected properties of quite wrong. The circuit if it is of unsuitable value, but it is not part of the filter arrangement in the same sense that the coupling condenser is. What it is there for is to provide a return path for the grid. Without it the grid would be left "in the air," as there would be no connection to earth except via a condenser. In fact, it serves much the same purpose as the grid-leak used in resistance-capacity coupling or in detection.



The value of R is not really critical. The only essential condition is that it should not be so low as to virtually short-circuit the coupling condenser. Any resistance from 1,000 ohms to 2 megohms will do, but as higher values

(Continued on page 82.)

CIRCUIT DIAGRAMS SIMPLIFIED for the BEGINNER

This Short Article Explains How Circuit Diagrams Can Easily be Understood.

By FRANK PRESTON, F.R.A.

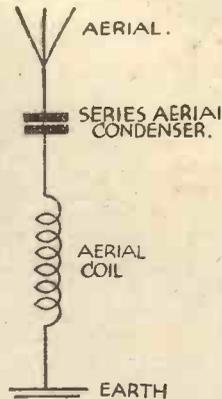


Fig. 2.—The aerial-earth circuit.

are precisely the same as those flowing through the aerial circuit, and the same as we should get if the aerial and earth leads were joined to the tuning coil itself. It is the purpose of the tuning circuit to select the oscillating currents forming the signal we require to receive and to reject all others. This it is able to do if the variable condenser is suitably adjusted by altering the amount of

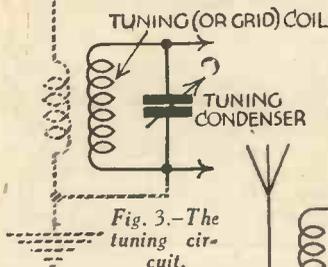


Fig. 3.—The tuning circuit.

THE word "circuit" is frequently employed in wireless work and, being used in so many forms, is very often misunderstood by the beginner. We generally refer to a collection of signs and symbols such as that shown in Fig. 1 as a circuit diagram—in this particular instance the diagram represents a two-valve receiver—but it really

consists of several subsidiary circuits all inter-connected to form the whole. In electrical and radio practice the general simple definition of a circuit is "the path of an electrical current," and if we were to analyze the diagram of Fig. 1 we should find at least half a dozen paths through which electrical currents travel. It is by studying all these separate circuits that the more experienced radio man can form accurate conclusions in regard to the capabilities of the set represented. To the beginner, however, the diagram conveys absolutely nothing and he probably looks upon it as being "Greek," "double-Dutch," or something worse. But once an idea of the general "make-up" of a circuit diagram has been grasped, the whole thing takes on a different light and becomes not only instructive but extremely interesting. That we might quickly learn to appreciate the value of the many diagrams which we meet let us pull to pieces the complete circuit of Fig. 1 so as to isolate the various complementary ones.

The Aerial-earth Circuit

First of all we have the aerial-earth circuit shown in Fig. 2, which in this case consists of the aerial, a small fixed condenser, a coil of wire and the earth lead. Oscillating currents forming the signals being received pass backward and forward thousands, or even millions, of times a second through this circuit and cause a "magnetic field" to be built up around the coil. It might at first appear that the condenser would prevent the passage of current—and so it would if the current were constantly flowing in one direction, as does that from a battery, but in this case it is of such a nature that it is able to "jump" across the plates

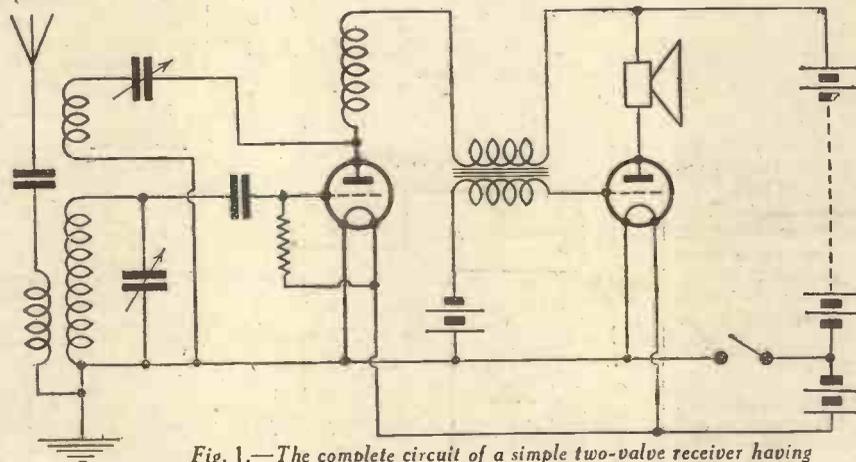


Fig. 1.—The complete circuit of a simple two-valve receiver having detector and low-frequency valves.

of a condenser just as easily as it flows through a length of wire. Without stopping to consider the theory surrounding the functioning of the aerial circuit we will pass straight on to the second, or tuning, circuit.

Tuning Circuit

This is shown in heavy lines in Fig. 3, and is seen to consist of a

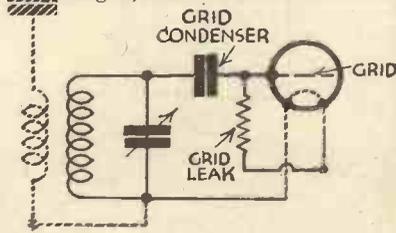


Fig. 4.—This diagram shows the complete grid circuit of the first valve.

coil and variable condenser. The coil is situated near to that in the aerial circuit and therefore comes within its magnetic field. In consequence the oscillating currents passing through the aerial coil are "induced" into the second one. For our present purposes we can consider that the induced currents

overlap between the fixed and moving vanes.

The tuning circuit forms a part of the complete grid circuit which embraces all those components and wires between the filament and grid of the first (detector) valve, and shown in dark lines in Fig. 4. The additional parts included in this circuit are the grid condenser, grid leak and the grid of the valve itself.

Filament Circuit

The next "path of an electrical current" is that known as the filament circuit and comprising the filaments of both valves, a battery switch and the low tension battery or accumulator; it has been added to the parts of the set previously considered, in Fig. 5. This filament circuit is somewhat easier to understand than the others since it carries direct current only. When the switch contacts are closed current flows from the negative accumulator terminal through both valve filaments (which are connected in parallel, by the way) and back to the positive terminal. The action of the current is to heat the thin wire filaments and so make them able to give off a stream of electrons, as we shall see later, when the high tension circuit is completed.

H.T. and Anode Circuits

There are really two high tension circuits—one to each valve—and that of the detector valve is shown in Fig. 6. This includes the high tension battery, valve, high frequency choke and transformer primary winding. Current passes round the circuit from the high tension negative terminal to the valve filament; from there to the plate, or anode, of the valve (in the form of an electron stream), passing through the grid; from the anode back to high tension

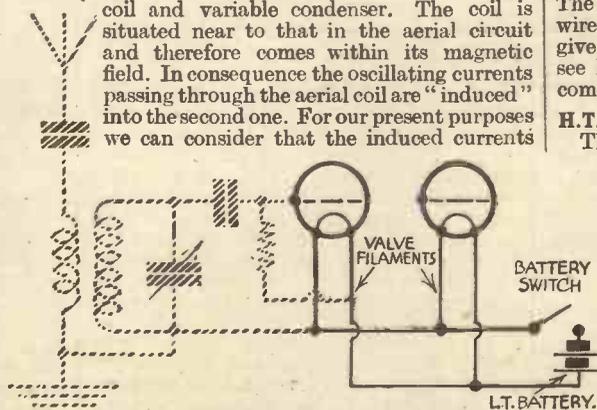


Fig. 5.—The filament circuit.

(Continued overleaf)

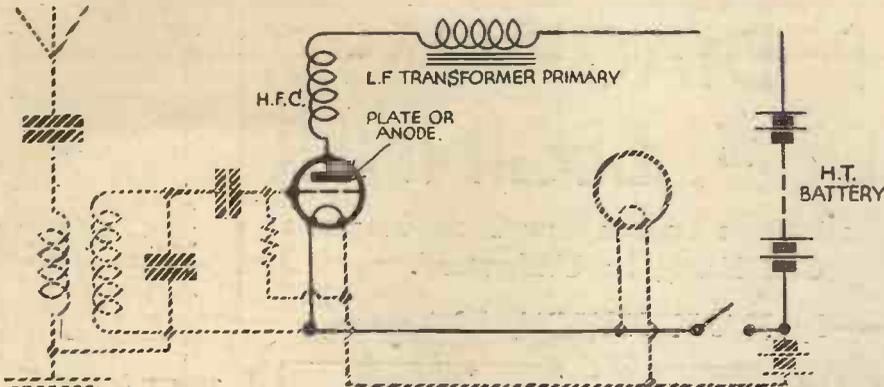


Fig. 6.—The anode and H.F. circuits of the detector valve; notice that the H.T. circuit "overlaps" the filament circuit.

(Continued from page 55.)

positive through the H.F. choke and L.F. transformer. It will be noticed that the high tension and filament circuits overlap to a certain extent, since one pole of both H.T. and L.T. batteries are connected together and to one side of the valve filament. The complete high tension circuit is often still further divided and we speak of the components and wiring between the anode of the valve and high tension positive as the anode circuit.

The Reaction Circuit

Next we can consider the reaction circuit, shown in Figure 7, which includes a coil of wire and a variable condenser. It is the object of applying reaction to feed back from the anode to the grid circuit some of the high frequency currents which have been amplified by the valve. By so doing the currents are again amplified and the final signal strength is thus made greater. The reaction coil is situated

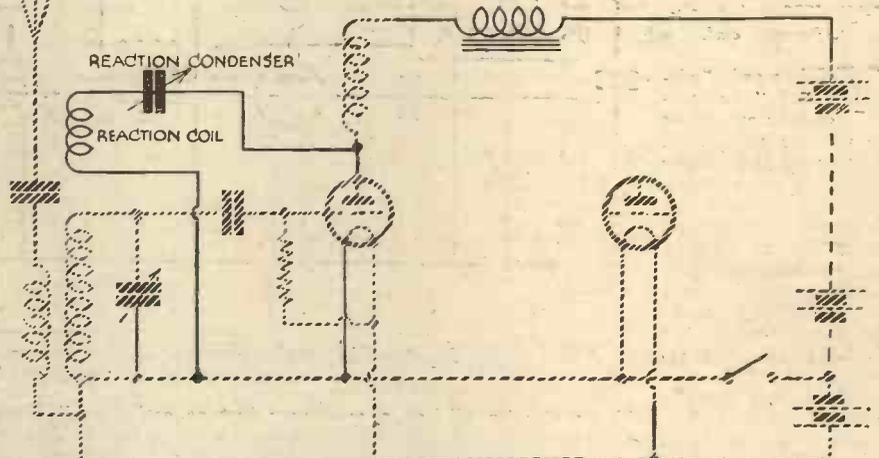


Fig. 7.—Here we see the path of the high-frequency currents which provide reaction.

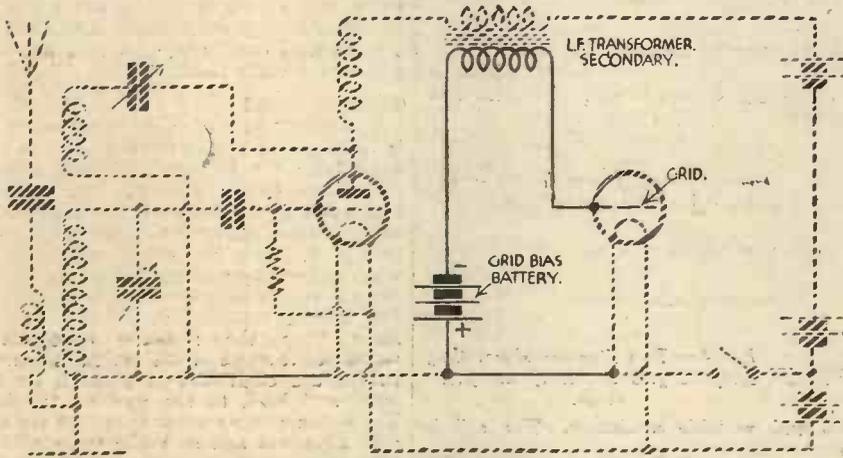


Fig. 8.—The grid circuit of the second valve.

close to that in the grid circuit and so the magnetic fields of both "overlap." As a result high frequency current flows from one to the other just as it passes from the aerial to the grid coil. The amount of current which may pass back from the anode to the grid circuit is governed by the capacity of the reaction condenser and, therefore, by varying this the degree of feed-back (or reaction) can be controlled by the operator.

The L.-F. Grid Circuit

We have now examined all the various circuits of the detector valve and may pass on to the grid circuit of the low frequency amplifier. This is shown in the diagram of

Fig. 8, and is seen to contain the secondary winding of the L.F. transformer, a grid bias battery and the grid of the second valve. Alternating signal currents passing through the primary winding of the transformer are "induced" into the secondary. Since the secondary contains a greater number of turns than the primary the voltages between its ends are greater than those across the primary, and the transformer is said to amplify, or step-up, the signals.

Output Circuit

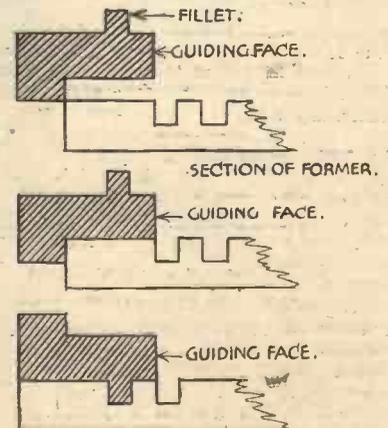
The last circuit in the series, generally referred to as the output circuit, contains the anode of the second valve, the loud-

speaker windings and the wires connecting these together and to the high tension supply. It is here that the low frequency oscillating currents are made to actuate the loud-speaker and so to produce sound vibrations of similar frequency to themselves.

In this short article we have dealt with our subject very briefly, but it is hoped that sufficient has been said to enable the beginner to view the many circuit diagrams he may encounter in rather a new light. We also hope that he may acquire the habit of "disentangling" diagrams which at first appear complicated, and studying each portion separately, for it is only by doing this that their value can fully be appreciated. Remember that any circuit, no matter how complicated or advanced, can always be sub-divided into the portions we have mentioned.

SIMPLE SLOTTING GAUGE

HERE is a dodge which is very useful when slotting ribbed formers. The gauge or template is chipped and filed (to suit the slots and spacing decided on) out of a piece of 1/8 in. brass or sheet iron. Place it against the end of the former, and saw or file the first slot, treat each rib in the former the same way. Then turn the template upside down, place the fillet in



the slot cut, and you have a second guiding face which will keep the pitch of the slots constant. Another idea is to use two or three hacksaw blades in the frame at once. —W. ROWLANDS (Dalton-in-Furness).

Mains volume from Battery Sets

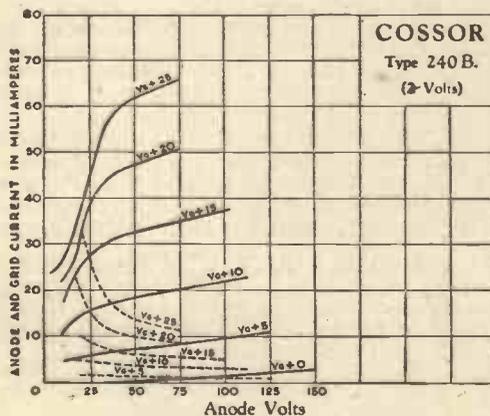
COSSOR 240 B

—the new valve for CLASS "B" AMPLIFICATION

An output Valve of remarkably increased efficiency is now introduced by A. C. Cossor Ltd., under the type number 240 B.

The Cossor 240 B is actually a dual valve having two complete sets of valve elements embodied in one bulb, the connections being brought out to a 7-pin base.

Full instructions for the use of this remarkable new valve, including circuit diagrams will be supplied on application to our Technical Service Department.

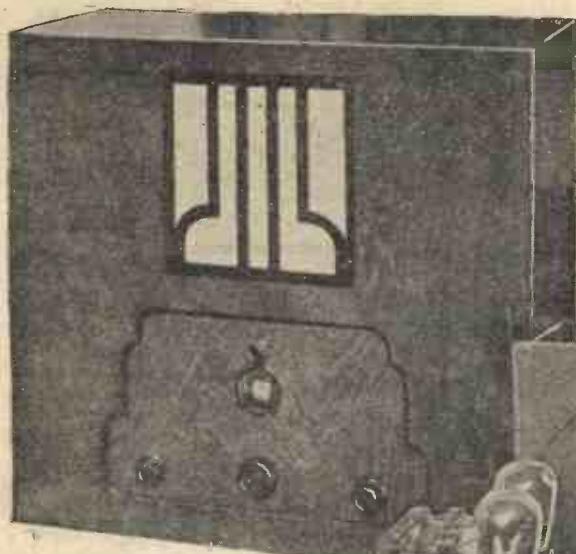


Anode and Grid Current/
Anode volts curves of
Cossor Class "B" Valve
Type 240 B.

Filament volts 2.0; amps. 0.4; Anode volts 150 max.; Max. Anode Current Swing 50 mA.; Max. Peak Applied Signal (Grid to Grid) 40 volts; Static Anode Current at $V_a=100$, $V_g=0$ (each half) 1.5 mA. Price **14/-**

OPERATING & ADJUSTING the ALPHA Q.P.-P. THREE

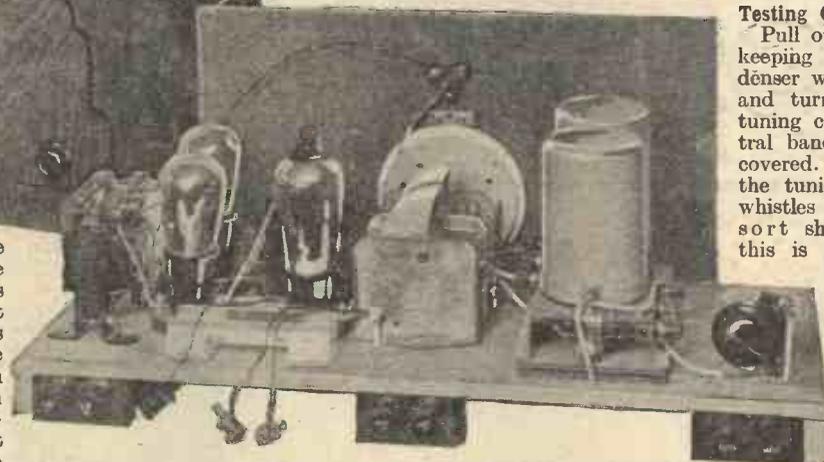
How to Obtain the Very Best from the Receiver Which Was Described in These Pages Last Week.



If you carefully examined the theoretical circuit of the Alpha receiver which was published on page 15 of last week's issue, and compared this with the circuits which we have already published dealing with Quiescent Push-Pull, a certain point probably made itself apparent. We refer to the fact that no separate tappings are provided for the priming grids of the two Output Pentode valves. There is, however, a reason for this. In the previous articles on this form of L.F. amplification you will have read how the grid bias is applied to the valves, and then the voltage applied to the priming grids is adjusted so that the minimum of anode current is passed. After this, the valves are said to be matched, and all that has to be done is to reduce the grid bias, or instal some form of resistance across the biasing battery so that the discharge of this battery is at approximately the same rate as the H.T. battery. This preserves the balance of the Pentode valves and provides the most economical method of maintaining the set. However, many readers do not like the idea of having to make these preliminary adjustments, added to which is the difficulty, with many readers, of obtaining the necessary meter for ascertaining the current passed by the valves. This trouble has, however, been removed in the Alpha, by the simple expedient of connecting the priming grids direct to the H.T.2 tapping. In this way the H.T. applied to the anodes of the Pentode valves is the same as that which is applied to the priming grids, and although this results in a slightly greater current consumption, there is no adjustment of any sort to be carried out.

Setting Up the Receiver

In view of this point, therefore, the



installation of the receiver is no more difficult than that which accompanies an ordinary two or three valve receiver. Into the clip at the rear edge of the baseboard, insert the 16-volt grid bias battery. The positive end of the battery should be on the right, that is to say, nearest the tuning condenser. The grid bias plug, which is joined to the metal casing of the variable condenser, and which is marked G.B.+, should be inserted in the end of the battery. The plug marked G.B.P.U. should be inserted in the 3-volt tapping, and the remaining plug should be inserted in the end of the battery nearest the L.S. terminals. That is, the 16-volt negative tapping. The 120-volt H.T. battery and the L.T. accumulator should be stood on the upper shelf, and the leads from the loud-speaker taken down to the L.S. terminals on the rear of the lower baseboard. There are only three plugs to be inserted in the H.T. battery, one being inserted in the socket marked H.T.—, the plug marked H.T.2 being inserted in the opposite end of the battery at the socket marked 120. The plug which bears the mark H.T.1 should be inserted in the socket marked 60 volts for the time being, and this may be adjusted at a later point in the installation. The two spade terminals are next joined to the correct accumulator terminals, aerial and earth leads are connected up, and the receiver is ready for its preliminary test.

Testing Out.

Pull out the on-off switch, keeping the reaction condenser with the vanes open, and turn the knob on the tuning coil so that the central band of wavelengths is covered. Carefully rotate the tuning condenser. No whistles or shrieks of any sort should be heard, as this is turned from its

minimum to its maximum position. If a whistle or shriek or any similar sound is heard, there is some fault with the receiver, and it should be switched off and the wiring carefully checked over. The small condenser mounted against the aerial and earth terminals should, of course, for the time being be adjusted so that the moving vanes are completely in mesh with the fixed vanes. If the tuning condenser may be rotated over its full scale with no objectionable noises, you may proceed to the next part of the operation in the knowledge that there is nothing serious wrong with the wiring. Advance the reaction condenser until a rustling is heard from the loud-speaker. With the other hand carefully turn the tuning condenser. When a loud chirp is heard, reduce the reaction and carefully tune backwards and forwards over a distance of about two degrees in the spot where the chirp was heard. Reduce the reaction until speech or music is heard at this point, and if it is a local station it should be quite loud. If possible, get a weak station, and try to obtain it about the centre of the tuning dial. Now rotate the small knob and see if the strength of the station can be increased. If you find that this knob has to be turned to its maximum position in one direction or the other, without being able to bring the signal up to its maximum, rotate the star wheel which is situated on the right-hand side of the condenser near the baseboard. When the best position has been found, the receiver is correctly adjusted and is in its most sensitive position.

LIST OF COMPONENTS FOR THE "ALPHA" Q.P.-P. THREE

- 1 2-gang .0005 mfd. Variable Condenser with escutcheon. (Polar.)
- 2 .0003 mfd. Precision Condensers. (Lissen.)
- 1 .01 mfd. Fixed Condenser. (T.C.C. Type S.)
- 1 1 mfd. Condenser. (T.C.C. Type 50.)
- 1 2 mfd. Condenser. (T.C.C. Type 50.)
- 1 .02 mfd. Condenser. (T.C.C. Type M.)
- 1 1,000 ohms 1 watt resistance. (Erie.)
- 1 20,000 ohms 1 watt resistance. (Erie.)
- 1 80,000 ohms 1 watt resistance. (Erie.)
- 1 50,000 ohms 1 watt resistance. (Erie.)
- 1 100,000 ohms 1 watt resistance. (Erie.)

- 1 Q.P.-P. Transformer. (R.I.)
- 1 Q.P.-P. Output choke. (R.I.)
- 2 5-pin valve holders. (Clix.)
- 1 4-pin valve holder. (Clix.)
- 1 Coil Unit. (Hambling.)
- 1 On-off Switch. (Busco.)
- 6 Terminals, marked E, A, L.S., L.S., Pick-up, Pick-up. (Belling Lee.)
- 6 Wander Plugs, marked G.B.+, G.B.1, G.B.2, H.T., H.T.+1, H.T.+2. (Clix.)
- 1 7-way Battery Cord. (Bulgin.)
- 2 L.T. Spade Terminals. (Clix.)
- 1 Grid Bias Clip. (Bulgin.)

- 2 Belling-Lee Terminal Blocks.
- 2 Coils Glazite.
- 2 Valves Pen 220A. (Mazda.)
- 1 Valve 215 S.G. (Mazda.)
- 1 Alpha Cabinet. (Hambling.)
- 1 Panel 14in. x 8in. (Becol.)
- 1 Plywood Baseboard 19in. x 7in.
- 1 120-volt H.T. Battery. (Lissen.)
- 1 16 volt. G.B. Battery. (Lissen.)
- 1 L.T. 2-volt Accumulator. (Lissen.)
- 1 Q.P.-P. Moving Coil Speaker. (Ormond No. R/494 C.T.)

THE HALF-GUINEA PAGE

Radio Wrinkles FROM READERS

Producing a Burred-finished Effect on Metal Sheets

THIS burred effect can easily be produced on a metal panel or chassis in the following manner. A hardwood plug, shaped as in sketch, in the grip of an ordinary chuck, is all that is required, beyond the making of an abrasive. I have found that finely-powdered glass from an ordinary electric bulb answers as well as any carborundum or emery powders.



HARDWOOD PLUG GRIPPED FIRMLY IN JAWS

Method of producing a burred finish on metal panel.

use the work to be treated is coated with a film of oil and the abrasive mixture then finely sprinkled on. The brace is then used as if drilling several holes but requiring a few twists only for each operation. A drilling stand is very convenient for the work as the metal to be treated need only be slid along, ensuring uniformity in producing the burred effect. If an ordinary hand brace is used, it can be gripped in a vice by the fixed handle.—H. J. NICHOLSON (Liverpool).

A Dual-unit Speaker

THE accompanying sketches show a novel form of loud-speaker which I constructed some time ago, and which has given very pleasing results. The speaker consists of two units fitted in one cabinet, and connected in parallel, this arrangement covering a much wider range of frequencies than either would do if used separately. The extent to which the upper frequencies are increased by this arrangement is strikingly brought out if the horn unit is temporarily disconnected. Many people, who have heard this speaker, remark on its clearness and purity of tone. It will be seen from Fig. 2, that one unit operates a cone and the other a wooden horn. Fig. 1 is a general view of the speaker, and Fig. 3 is a rear view with the back of casing removed.—H. C. LOADER (Oldham).



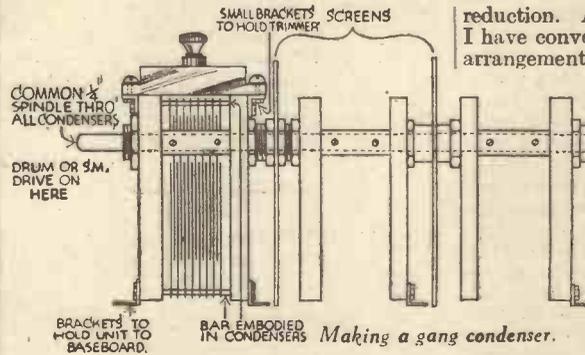
Fig. 1.—General view of a dual-unit speaker.

THAT DODGE OF YOURS!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us, addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

Gang Condensers

HERE is a cheap but efficient way to make your own gang condensers. There is a condenser on the market in which the rotor spindle is removable without upsetting the rotor. This spindle is held by two grub screws in the hollow centre piece to which the moving vanes are fixed. Thus, by removing the spindle and securing a piece of 1/4 in. steel of suitable length, 2, 3 or 4 condensers may be mounted on one common spindle. Trimmers may be mounted on top of each condenser, as shown, and should be of the



Making a gang condenser.

pre-set type of .00001 to .000005 mfd. capacity. I have made a number of these units and the maximum error between any two condensers has never exceeded two degrees on the tuning scale. The trimmers have always proved quite ample to give excellent matching with all rotors set in line. Screws are easily inserted as shown in sketch.—C. J. R. (Birmingham).

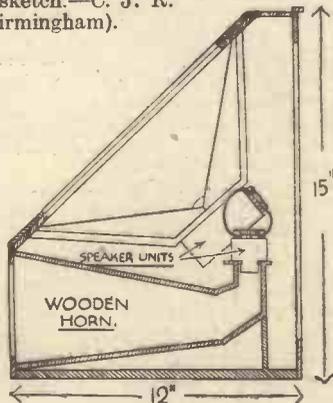
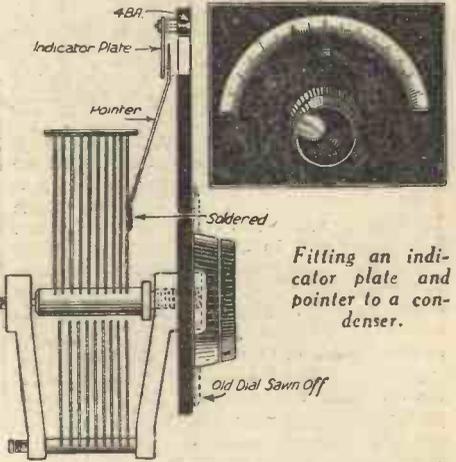


Fig. 2.—Sectional view of speaker.

Converting a Condenser Dial

THERE must be a number of constructors who have single-tuned sets utilizing slow motion tuning condensers of the hollow spindle type with the ebonite dial mounted on the face of the panel, the centre spindle being used for the gear



Fitting an indicator plate and pointer to a condenser.

reduction. As these dials look out of date I have converted my set to a more modern arrangement, as shown in the sketch.

First, take a piece of bare 18 gauge copper wire to make the pointer and bend it into shape to come near the panel at the indicator end. Flatten the end to be soldered to give increased surface for soldering, and then flatten the indicator end to give a "hair line" reading—this end can finally be blacked with lacquer. A semi-circular strip is cut from the panel and the indicator plate is spaced from the panel with washers. Sizes, of course, depend on the space available. The "solder" can be obtained in tube form from most ironmonger's shops.—G. H. DRIVER (Manchester).

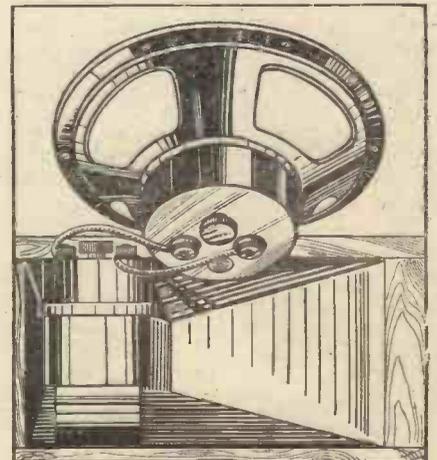
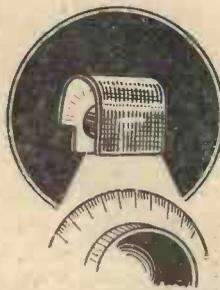
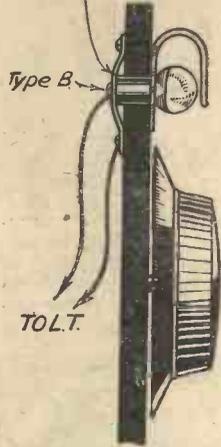


Fig. 3.—Rear view with back of casing removed.

Type Of Holder for Bulb



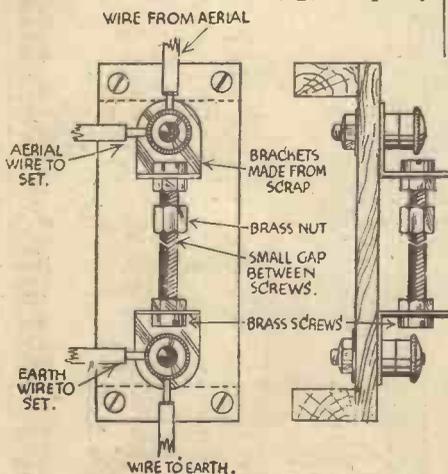
A novel method of fitting a dial light.

A Neat Dial Light

HERE is a little gadget for use as a pilot light on sets that have no aperture, and cannot be illuminated from behind the panel. A hole is bored in the panel large enough to take a B-type holder. The shade can be made from a thin piece of tin secured to panel by inserting the bulb, the hole being just the size to take the screw on bulb. If current consumption is to be considered a slight twist of the bulb in one direction or another will extinguish or light the lamp.—F. G. PRICE (Birmingham).

Simple Earthing Device

A NEAT and efficient earthing device can be made quite simply from scrap material. Two brackets are made from strip brass and a hole is drilled in both sides of them, one to take a brass screw and the other to secure it to an ebonite strip by means of a terminal. The brass screws are fitted in the brackets by lock nuts, which allows the gap between the two points to be finely adjusted. The ends of the screws are filed to a point, or one can have a point, and the other a V-groove filed into it, as shown in the illustration. Before these points are adjusted, another nut, the same pitch thread as the screws, is run on one of them. The screws are adjusted until a thin piece of paper can be just passed between them. This small gap lessens the chance of damage being done to the set when accidentally left unearthed during a thunderstorm. To earth the aerial in the usual manner, run the nut down the screw until it is across the gap, and partly



An aerial earthing device made from odds and ends.

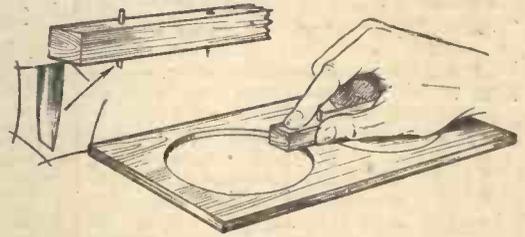
screwed on the other screw, thus making a mechanical and electrical earth connection.—A. WHEELER (Bristol).

Cutting Device for Circular Holes

THIS simple tool which is easily made is very handy for cutting holes up to any diameter in panels or baffle boards. The parts required are a piece of wood about 1/2 in. square and of convenient length; one round nail and one flat joiner's nail. To make the tool, drive the round nail in the middle of the bar of wood, and drive in the flat nail at a distance equal to the hole to be cut. For a 7 in. hole this distance would, of course, be 3 1/2 in. Now take your plain baffle board and place flat on a bench, and bore a true hole as vertical as possible in the centre of the board. Needless to say, the flat nail should be driven into the cutter bar, across the length, and not with it. The end of this nail must be sharpened with a fine file on both sides, and kept sharp or it will not cut properly. With the cutter just showing its point, drive the round nail into the hole in the baffle board, and describe a circle. With slight pressure

cause the intensity of the field varies directly as C. The movement is recorded on the scale by a pointer soldered to the top of the iron. It is necessary to calibrate the instrument by comparing with a standard ammeter. The scale is not regular but depends on the permeability of the iron, etc. Range may be varied by strengths of the springs.

Fig. 2 shows another form in which the compression spring is replaced by two of

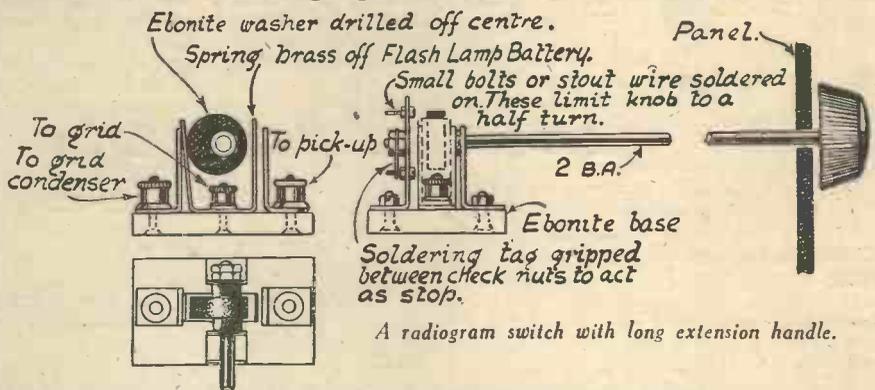


Cutting large circular holes in a baffle board.

the expansion type.—J. P. SAVAGE (Liverpool).

A Radiogram Switch

TO obviate the use of long grid leads, which are necessary with ordinary radiogram switches, I made the switch shown in the accompanying sketches.

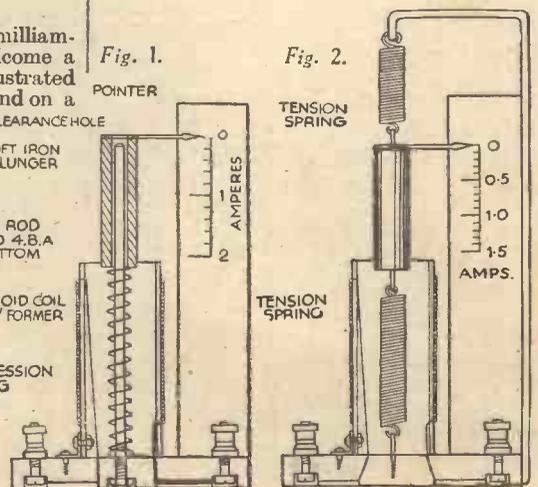


only, this will make a comparatively clean cut. Now repeat the process, after driving the cutter a little deeper, and so on, until the cutter has cut half way through the board. Take out the tool, turn over the board, and repeat the process, and in a short time the centre disc will come away clean, and will not require much sand-papery.—T. PILKINGTON (Wigan).

With this switch short leads can be used, as it can be screwed down to the baseboard close to the grid terminal of the valve-holder. There is no hand-capacity effect, as the operating knob is on the end of a long spindle which passes through the panel. Details of construction are clearly shown in the sketches.—P. T. BURN—(Wallsend-on-Tyne).

A Novel Ammeter

MANY amateurs who possess a milliammeter would, no doubt, welcome a higher reading ammeter. The one illustrated in Fig. 1, consists of a solenoid wound on a 1 in. cardboard former. Down the centre of the coil passes a 4BA brass rod tapped at one end and fastened to an ebonite or wooden base to which the coil is fastened by an angle bracket. The moving portion is a piece of soft iron, with centre hole to clear the 4BA rod, on which it slides. The iron is held in place by a weak compression spring. When a current is passed round the coil the iron moves to the field of maximum intensity, but is counterbalanced by the spring. The movement depends on the current be-



Two home-made high-reading ammeters.



1805 A.D.

"England expects every man this day...!"

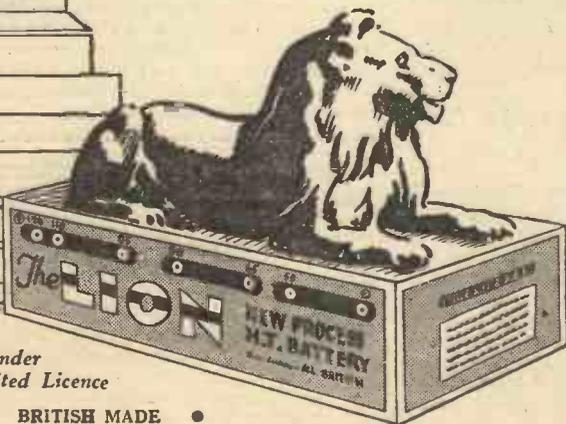
1933

You can expect
The **LION**
H.T. BATTERY
to do its duty
every day

... and besides giving you efficient service and giving your Set greater and more lasting power, the Lion H.T. Battery COSTS LESS ! It is made in one of the largest factories in Great Britain devoted exclusively to battery manufacture. It is made by men who know what you want and who know how to produce it at the price you want to pay. It is the battery with the lowest internal resistance.

● **LOOK AT THE PRICES!**

- 60v. H.T. 4/6 ● 100v. H.T. 7/-
- 120v. H.T. 9/- ● 9v. G.B. 10^d.
- 4½v. Pocket Lamp Battery 4½^d.



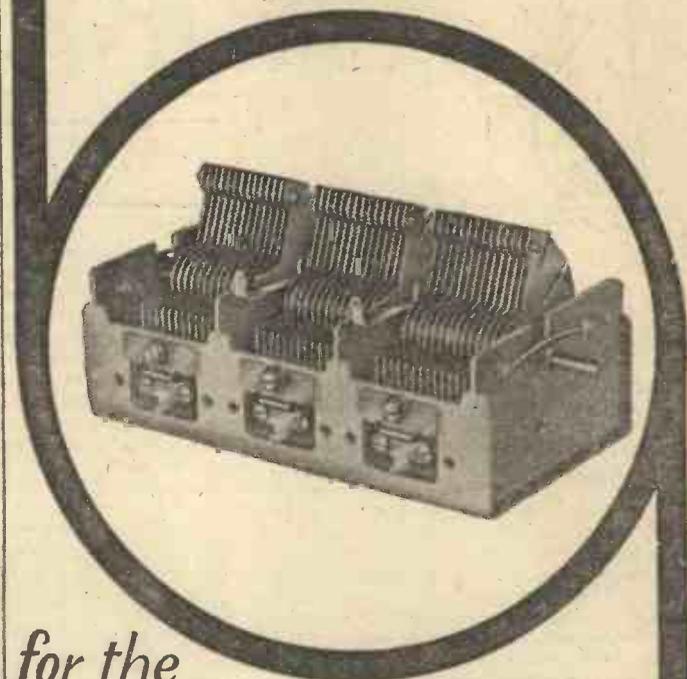
Sold under Limited Licence

● BRITISH MADE ●

YOUR DEALER CAN SUPPLY

Adv. of VINCES DRY BATTERIES LTD., LION WORKS, GARFORD STREET, LONDON, E.14. Telephone EAST: 1902.

SPECIFIED EXCLUSIVELY



for the
FERROCART Q.P.P. HI-MAG. THREE

On account of their great efficiency only ganged Condensers matched with the highest possible degree of accuracy can be successfully used with Ferrocart Coils.

That is why British Radiophone Ganged Condensers have been chosen WITHOUT ALTERNATIVE for the above receiver, which is one of the first to be designed.

British Radiophone Ganged Condensers are built with such precision that accuracy is guaranteed between any two sections to within 1 m.mfd. or ½ per cent. whichever is the greater. Furthermore, this accuracy is rendered lasting by virtue of sound mechanical construction which maintains the electrical characteristics at a fixed value under the most exacting conditions.

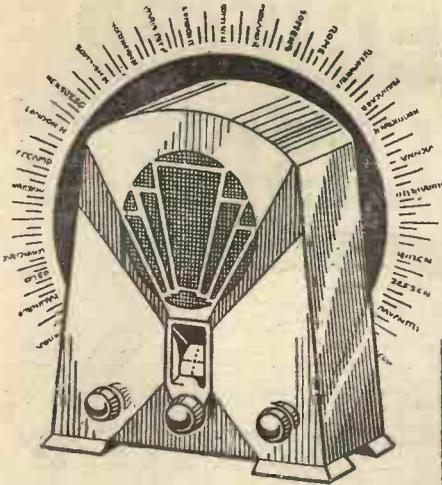
FOR THE FERROCART Q.P.P. HI-MAG. THREE

- Type 344J 3-gang condenser complete with cover - - - - - PRICE **28/-**
- Disc Drive Assembly with Pilot Lamp attachment - - - - - **5/-**

RADIOPHONE GANGED CONDENSERS

BRITISH RADIOPHONE LTD., Aldwych House, London W.C.2

OUR VIEWS ON RECEIVERS



THE latest entry to the cheap battery set market is the three-valve receiver produced by Messrs. H. Clarke & Co. (Manchester), Ltd. This is a remarkable little receiver, having the appearance of a really expensive set, as will be seen from the photograph reproduced on this page. The cabinet work is of a high standard and is not of the usual three-ply which is usually associated with a cheap set. The actual cabinet is seven-ply wood, which not only gives a substantial article which will stand mishandling, but will not warp and fall to pieces through extremes of temperature, to which it might be subjected in some situations. The receiver portion of the set is enclosed in a metal chassis housed in the lower portion of the cabinet, whilst the loud-speaker, which is of the permanent-magnet moving-coil type, is fitted to the upper part of the cabinet. A small shelf maintains the chassis in position and also serves as a support for the batteries. Clearly identified battery cords are fitted to the receiver, and the terminals are mounted on ebonite plates bearing bold white letterings. So much for the actual appearance of the receiver.

The Circuit

The circuit employed in this receiver is of the screen grid, detector and small power type, and is made up in the following manner. Small inductances are wound on paxolin tubes, and these are spaced away from the metal chassis by means of brass distance pieces. The long-wave section of the inductances is of the honeycomb type of coil, and this is affixed on the coil former at some distance from the medium-wave coil. A series aerial condenser is included, and the control for this projects from the rear of the chassis in the form of a 2in. ebonite rod. For connection to the anode of the S.G. valve a heavily-armoured flexible lead is used, and this is anchored to the metal chassis and passes right across to the opposite side of the receiver, where it makes connection with the secondary coil. This is arranged on the chassis in the same manner as the aerial coil, and is naturally well separated from it. In between the two sets of coils is disposed the two-gang condenser, and this is of the totally enclosed

THE ATLAS LAMBDA RECEIVER

type, and being earthed serves as an effective screen between the inductances. The two-gang condenser is of the type having a separate concentric knob for trimming purposes, and this enables the two halves of the condenser to be correctly matched at any part of the scale, independent of the reaction or setting of the pre-set aerial condenser. The detector valve is transformer-coupled to the output valve, and the loud-speaker is connected direct in the anode circuit of this valve. Gramo-



The Atlas Lambda Three-valve Battery Model.

phone pick-up terminals are fitted to the rear of the chassis, and a small on-off switch is mounted directly by the side of these so that there are no long grid leads to produce hum, instability or other faults. To facilitate connection to the various points in the receiver, small fibre strips are fitted to various parts of the chassis, and soldering tags are eyeleted to these so that the connections may be made after the chassis is bolted up. This is a very good point, as it ensures that really sound connections are made, and that the chassis may be easily assembled before the final connections are made. There is thus little likelihood of a fault arising after wiring has been completed. The loud-speaker is provided with a matching transformer,

and this is ready wired to the L.S. terminals on the chassis.

Results Obtained

The valves employed are of Marconi manufacture, the H.F. stage being occupied by a V.S.2, the detector valve is an H.L.2, whilst the power stage is taken by an L.P.2. The maintenance of the set is therefore very cheap, the total H.T. consumption being under 6 milliamps. For grid bias purposes only a 4.5 volt battery is required, whilst the output from the L.P.2 valve, correctly matched to the loud-speaker is ample for normal purposes. Tested on a small outdoor aerial in the heart of London, the two local stations were received at really good volume. The selectivity was very good, and there was a good clear section between the National and the Regional. The Northern Regional and the Midland Regional also offered good signals, which were greatly improved upon when used in conjunction with a good aerial and earth system. On the long waves, Daventry and Radio-Paris provided the best signals, although four other stations were clearly audible on the loud-speaker. With an indoor aerial the results were naturally not so good, but there were sufficient stations available to provide entertainment value on any evening, although naturally with such a modest arrangement one could not expect volume sufficient for dancing, for instance. When used as a gramophone record amplifier, by means of a good pick-up connected to the appropriate terminals, the results were excellent. The volume was sufficient for all ordinary purposes, and on some records, the volume control attached to the pick-up had to be called into use. The quality, on both records and radio, was extremely good. When it is borne in mind that this is a cheap receiver, produced for a cheap market, and which is cheap to keep in order and to operate, the results are certainly excellent, and we have no hesitation in recommending this receiver to those to whom such an outfit appeals.

NAME: Lambda 3-VALVE RECEIVER.
MAKERS: H. Clarke & Co. (Manchester), Ltd.

CIRCUIT: Screen Grid, Detector, Small Power. Two-gang tuning condenser, with dial calibrated in wavelengths.

CONTROLS: Three—Tuning condenser, Reaction condenser and wave-change switch (combined with on-off switch).

REMARKS: Very good all-round results, giving a number of stations at good strength on the permanent-magnet moving-coil loud-speaker which is incorporated in the cabinet.

PRICE: £9-15-0.

If you are collecting our Free Gift Data Sheets you require our Self-Binder. See page 64.

PROGRESS!

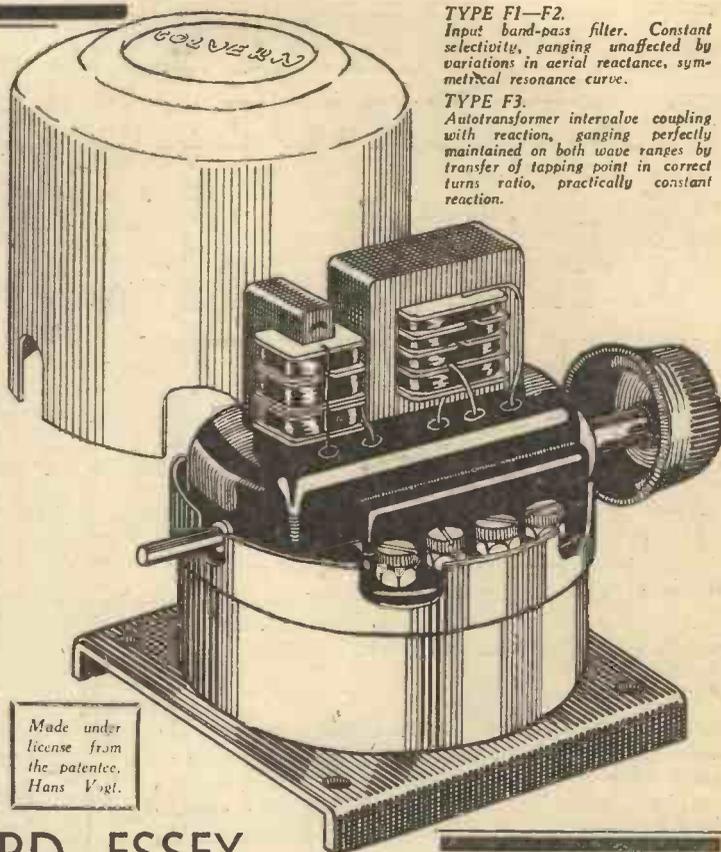
COLVERN FERROCART COILS open a new era in radio reception

It has long been recognised that tuning coils are of paramount importance in the attainment of selectivity and sensitivity. Colvern Ferrocart coils, though of considerably smaller dimensions than the relatively inefficient screened air-cored coils to which we have become accustomed, are actually more efficient than the unscreened Litz wound large diameter coils which have always been regarded as the last word in efficiency, but which could never be put to practical use owing to their bulk and the impossibility of screening without very serious loss of efficiency.

SPECIFIED FOR THE FERROCART-Q.P.-P. HIGH MAG THREE

One set F1, F2, F3 Coils ganged on sub base plate with wave change switch Set **50/-**

Made under license from the patentee, Hans Vogt.



TYPE F1—F2.
Input band-pass filter. Constant selectivity, ganging unaffected by variations in aerial reactance, symmetrical resonance curve.

TYPE F3.
Autotransformer intervalve coupling with reaction, ganging perfectly maintained on both wave ranges by transfer of tapping point in correct turns ratio, practically constant reaction.

COLVERN LTD., ROMFORD, ESSEX

Purchase your **KIT** for The **"ALPHA" Q.P.P. Three** from the Officially Approved Suppliers:

A. W. HAMBLING LTD.

15, ALFRED PLACE, LONDON, W.C.1.

Complete Kit of Parts - £5. 6.0

Complete Kit of Parts (including valves) - - £7.17.6

Complete Kit—Valves, Batteries, Speaker and Cabinet - - - £11.17.3

(Any component supplied separately if desired.)

A. W. HAMBLING LTD., 15, ALFRED PLACE, LONDON, W.C.1

FREE!
A beautiful Walnut Cabinet given **FREE** to "Practical Wireless" readers.
WRITE FOR DETAILS
Enclose stamped, addressed envelope.

THE PRACTICAL WIRELESS SELF-BINDER

for our

FREE GIFT DATA SHEETS

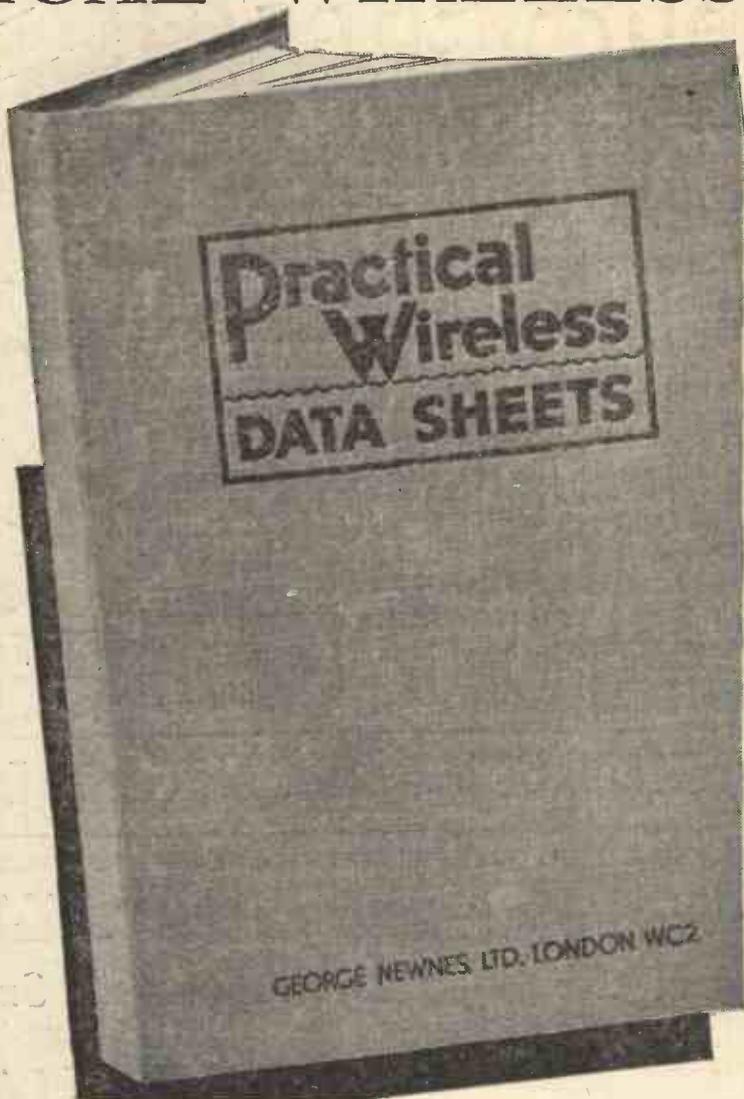
THIS OFFER IS SPECIALLY REPEATED FOR THE BENEFIT OF NEW READERS

CLAIM YOURS TO-DAY!

The loose-leaf binders for preserving in permanently consultable form the Data Sheets which are given in PRACTICAL WIRELESS are expressly made for the purpose.

The PRACTICAL WIRELESS DATA SHEETS LOOSE-LEAF Binder as illustrated here measures 11in. by 8in. and 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 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 dispatched.



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

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 Gauges	Jan. 14th, 1933
Data Sheet No. 6—	Chokes, H.F. & L.F.	Jan. 21st, 1933
Data Sheet No. 7—	Condensers	Jan. 28th, 1933
Data Sheet No. 8—	Battery Eliminators	Feb. 4th, 1933
Data Sheet No. 9—	Screws & Screw Threads	Feb. 18th, 1933
Data Sheet No. 10—	Battery-Operated Valves	Feb. 25th, 1933
Data Sheet No. 11—	Mains Valves	Mar. 4th, 1933
Data Sheet No. 12—	Handy Formulae	Mar. 11th, 1933
Data Sheet No. 13—	Terminals, Plugs & Fuses	Mar. 18th, 1933
Data Sheet No. 14—	Loud-speakers	Mar. 25th, 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.

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

Notes on COLD VALVES

IN the issue of PRACTICAL WIRELESS, dated March 18th, I discussed briefly some of the principles involved in the Westector or "cold valve," the component which has been developed for use in high and intermediate frequency circuits, so that when desired, it can replace the detector function of a grid detector, or that of a diode detector. In effect, at least as far as its use in high-frequency circuits is concerned, the Westector performs a similar function to the crystal detector of early radio days, two examples of which are shown in Fig. 1. With a crystal detector, however, there was a very marked limit to the magnitude of the signal input it would handle efficiently, coupled with the necessity of "catwhisker fiddling" or alternatively adjusting the operating point by means of a battery-fed potentiometer, although both these nuisances were overcome with the permanent type detector shown in Fig. 1.

Straight Line Detector

With the new component we have the advantages of the crystal detector, namely neither heater current nor anode current is required—this latter fact removing the need for smoothing the anode supply normally required for a valve detector, but in addition, it behaves as a true straight line detector with high input voltage values, namely 24 or 36 volts, according to the type employed. Of course, there is no form of amplification, but there are many cases where that is not of material consequence. Naturally, care must be taken to ensure that the "Westector" cannot be connected to any form of battery or eliminator supply, as the resulting current may bring about its destruction and necessitate replacement, and in addition the user must see that

Further Notes on This Interesting Development

By H. J. BARTON CHAPPLE, Wb.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

the component is joined round the right way in the circuit. A plainly marked red moulding indicates which is the positive end of the component, and it is essential that a D.C. conducting path be provided on the input side.

A reference to Fig. 2, will

show exactly what is meant. Here we see the "Westector" arranged for a radio or high-frequency input with a transformer coupled low-frequency output. This is somewhat similar to Fig. 5 of the March 18th issue, a tuned grid circuit providing the D.C. conducting path, while the connection for automatic volume control is also indicated. Bear in mind that when used as a radio frequency detector, the unit should be preceded

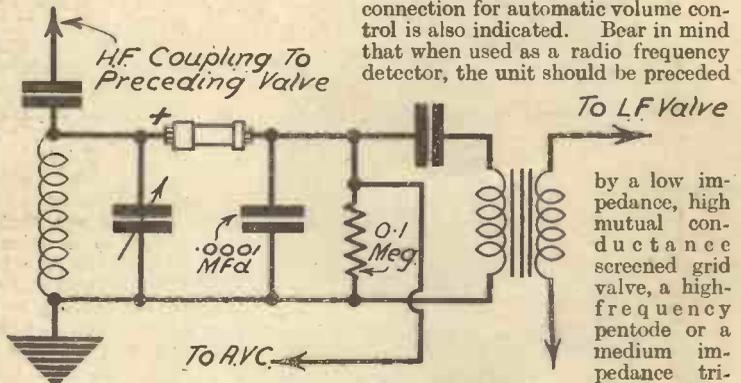


Fig. 2.—A Westector arranged as an R.F. detector.



Fig. 1.—A piece of crystal used for detection, and a permanent crystal detector employing this material.

by a low impedance, high mutual conductance screened grid valve, a high-frequency pentode or a medium impedance triode. When acting as the detector in superhet receivers, however, that is, working at intermediate frequencies, then an ordinary screened grid valve is quite satisfactory. The same remarks, of course, apply when full wave detection is used as shown in Fig. 3.

Delayed A.V. Control

Now an additional note dealing with automatic volume control. In Figs. 2 and 3, this is effected by feeding back the rectified carrier (arranged negative with respect to earth) to the grids of the preceding valves in the conventional manner. In many cases, however, a "delayed" automatic volume control is to be preferred and this is shown in Fig. 4. Here an auxiliary rectifier renders the control inoperative on signals whose strength is below a certain pre-set value. This pre-set value, corresponding in practice to weak and moderately weak signal strengths, is set up on a potentiometer situated in the H.T. negative return lead.

(Continued on page 79.)

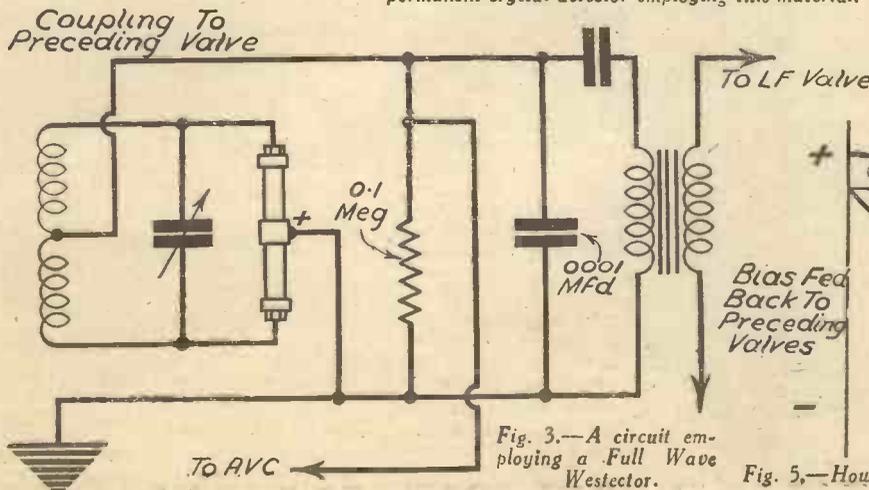


Fig. 3.—A circuit employing a Full Wave Westector.

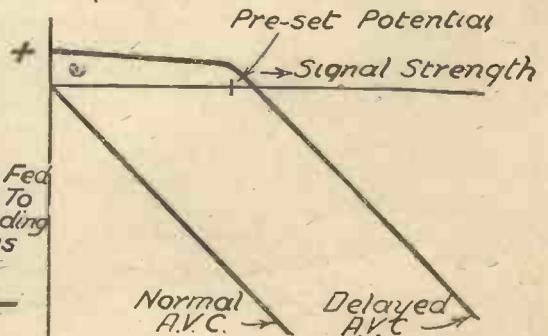


Fig. 5.—How the delayed automatic volume control differs from normal A.V.C.

IN last week's issue of PRACTICAL WIRELESS the preliminary notes of this receiver were given, and the complete instructions for wiring up and operating were given in brief form for those who wished to go ahead with the complete receiver. In order, however, that those who cannot wire a receiver from a theoretical circuit may be assisted, the following notes are written, and these should be followed in conjunction with the practical wiring diagrams given on page 68. It would, perhaps, be as well to point out here one or two apparent discrepancies in the wiring diagram, theoretical circuit and list of components. First of all, the coupling condenser between the anode of the screen grid valve and the detector grid coil, is shown on the theoretical dia-

gram (published last week) as a .001 mfd. condenser, whilst in the wiring diagram on page 68 this is shown as .0003 mfd. These two values are the limits between which the correct value should be selected. For general results .001 will be found best, but in some particular cases the smaller value will be found to be just as effective. In the view of the underside of the baseboard, a fixed condenser with a capacity of .002 mfd. is shown joined from the H.F. choke direct to the earth terminal. This will not be found in the list of components, and it need not be included unless reaction is found to be erratic in its adjustment.

Soldered Joints

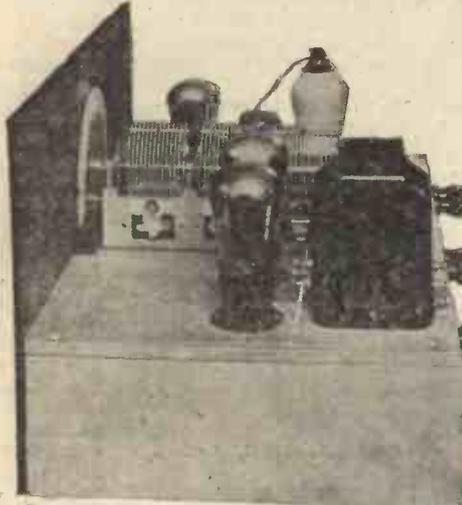
If you examine the underside view of the baseboard wiring on page 68 you will see that two leads are joined to terminal No. 7 on the coil nearest the panel. Terminal 5 on the next coil also receives two wires, as does terminal 1 on the same coil. If you prefer it, only one wire need be joined to these terminals, and the second wire should be soldered to a bared portion of the wire a little way from the coil screen. This is the preferable method, as there is then no risk of one of the wires squeezing out

when the fixing screw is tightened, as might happen when two loops are clamped under the screw head. The Luxus potentiometer requires soldered connections, as no screws are mounted on this component for the purpose, and as some soldering must be done, it is just as well to carry out the junction of wires by the same means. - If you examine the wiring you will find one or two points where the wiring may be simplified by means of soldered joints, and the construction is also easier to carry out by this means. For instance, the choke on the underside of the baseboard has three wires joined to the right-hand terminal. One wire may be taken straight from the moving vanes of the reaction condenser to the fixed .002 mfd. condenser, and the

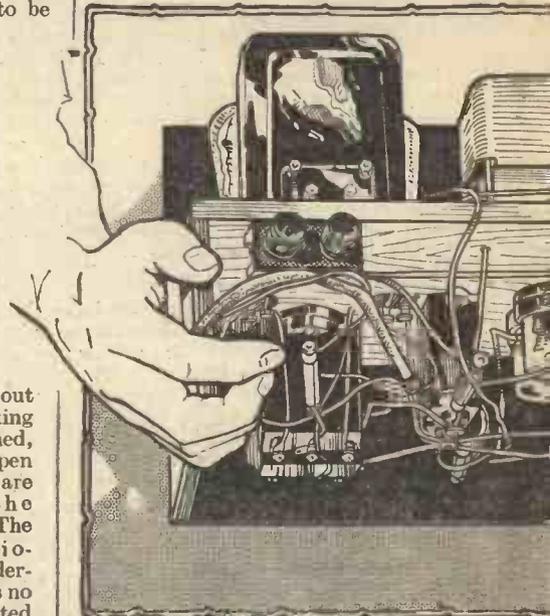


CONSTRUCTIONAL DETAILS OF THE NEW SUPER-SEL

lead to the choke soldered to this lead, with the lead from the anode terminal of the detector valve soldered to a point a little

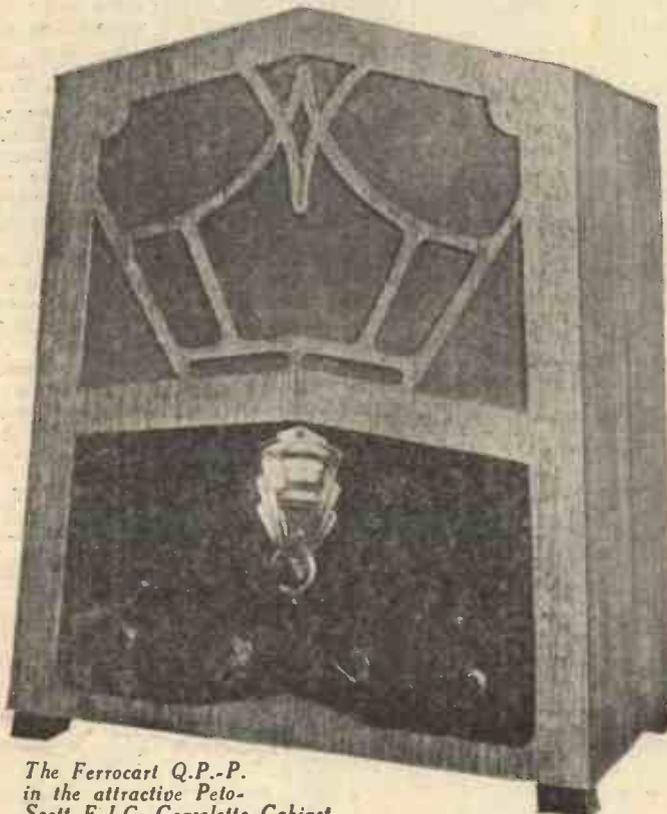


Side view of the new receiver.

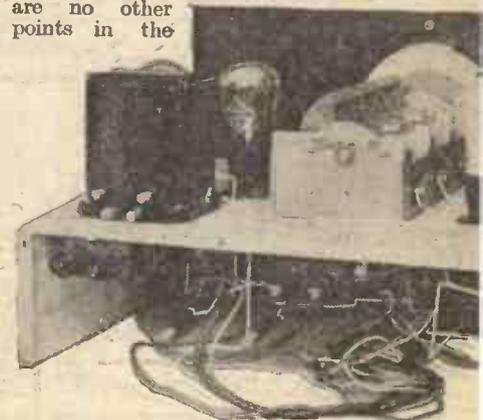


lower down the wire. This method is, of course, just as efficient, and provided you can really solder well, is to be preferred. There are no other points in the

FOR LIST OF
AND WIRING
See Page



The Ferrocart Q.P.-P. in the attractive Peto-Scott F.J.C. Console table Cabinet.

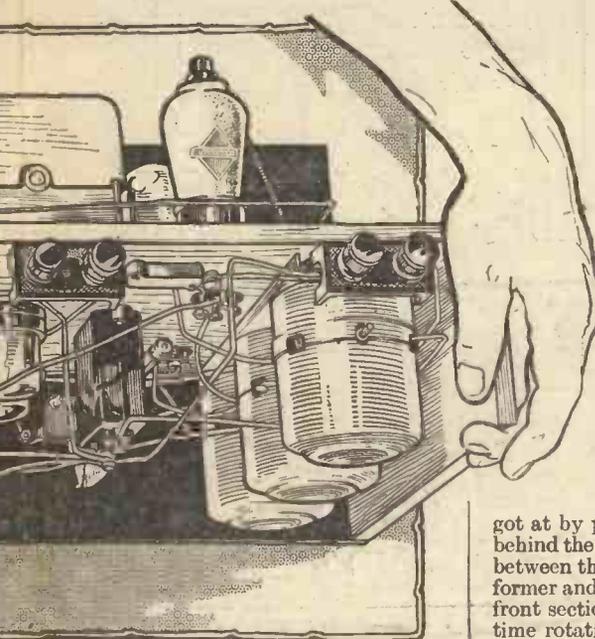


Rear view of the new "Practical Wireless" receiver Ferrocart coils.

Procarl Q.P.P. Tag Three

OUR NEW RECEIVER EMPLOYING
EFFECTIVE TUNING COILS

actual construction which need be mentioned, and therefore the following notes regarding the adjustment of the receiver

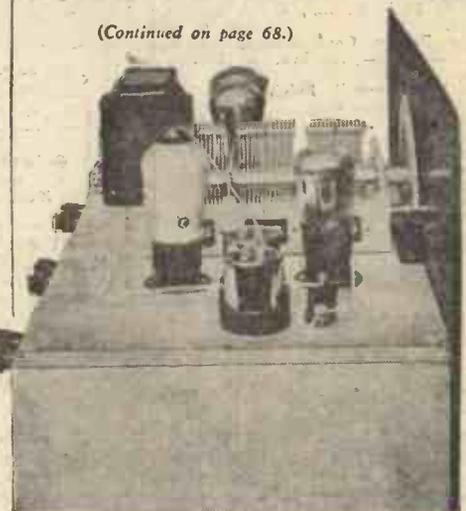


the tuning control until you get a whistle or shriek. At once slacken off the reaction and endeavour to tune in the station. It might be found that this can be done fairly easily, especially if it happens to be your local station working only a few miles away. If it should be a far distant station, however, it may be found impossible to resolve the signal, and therefore the procedure should be carried out at some other part of the dial. When a station is finally obtained, so that speech or music is intelligible, the three sections of the condenser should be trimmed, and for this purpose you should obtain a wooden screwdriver, or a similar strip of thin wood. Looking down on the set from the front there will be found three small screws disposed along the side of the gang condenser nearest the two output valves. These two valves have been arranged on the baseboard so that the first and second adjusting screw may be easily

got at by passing the screwdriver in front or behind the valves. Insert the screwdriver in between the two valves and the output transformer and carefully turn the trimmer on the front section of the condenser, at the same time rotating the tuning knob over two or

three degrees on each side of the point where the station was originally tuned in. If it is found that the strength of the station can be increased, obtain the maximum position on this trimmer, and then proceed to the next one. Carry out this procedure with each trimmer, but do not screw all the trimmers right in. If you do, the minimum wavelength which can be received on the set will be raised and this will restrict the tuning range. The operation is not difficult, but should be carefully carried out, as the reception of weak, or distant, stations will depend upon the accuracy with which the three circuits are balanced. When you think you have carried out the operation carefully, tune in a station at the very bottom of the medium waveband and see if any adjustment of the trimmers will increase the strength. Then do the same at the top of the medium waveband, and finally carry out the procedure on the long waves at two points on the scale. A point should be found where at all these places the adjustment of the trimmers either backwards or forwards results in a falling off in strength. The receiver is now trimmed

(Continued on page 68.)



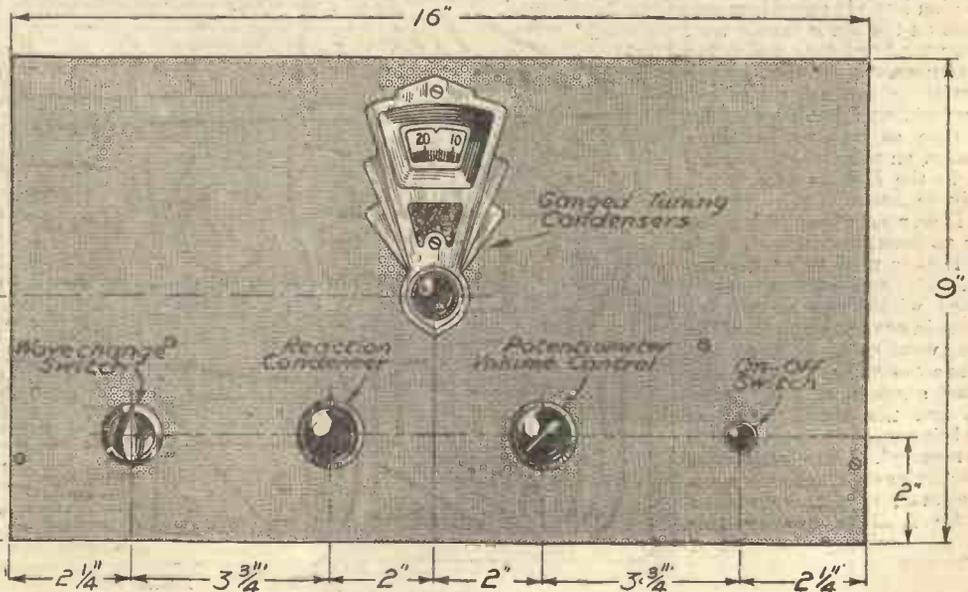
Remote side view of this new receiver.

COMPONENTS
DIAGRAMS
e 68.



should be studied.

Trimming
When first brought into use it is highly probable that nothing will be heard as the dial is rotated from one end of the scale to the other. The reason for this is as follows. The three circuits employed in the receiver are very sharply tuned. Each coil is accurately matched to its neighbour, and each section of the condenser is accurately matched. The connecting wires between the coils and condenser, together with the other wires which are joined to these,



The panel layout.

The BEGINNER'S SUPPLEMENT

Conducted by JACE



HAVING studied the working of our typical three-valve set stage by stage it now remains for us to make a final examination of the receiver as a whole. For this purpose I want you to look at the three diagrams given here. Fig. 1 is the theoretical or "circuit" diagram, Fig. 2 is a pictorial representation of Fig. 1, but showing the actual parts instead of using symbols, while Fig. 3 is a perspective view of the set as it would ordinarily appear.

This last diagram is included to remind

HOW YOUR SET WORKS

Part 6—Conclusion.

connections which are normally partially concealed by the chassis; I shall therefore confine my explanations to these two diagrams.

A Résumé
Let me say right away that we are

of the sake of clarity, I omitted to deal with previously.

You will remember that, in referring to Figs. 1 and 2 in part 4 of this series, I pointed out that there were one or two little modifications shown there which had not appeared in previous diagrams. These I promised to explain later on. Well, I propose to do that now. You need not consult your back copies, since Figs. 1 and 2 shown here include the part of the circuit I referred to.

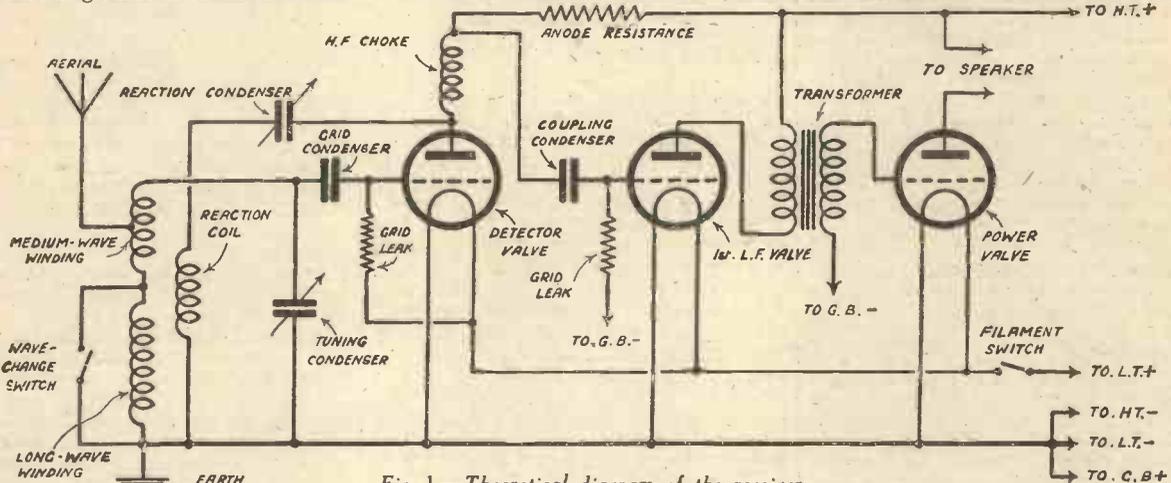


Fig. 1.—Theoretical diagram of the receiver.

you what the set looks like in its assembled form and to show the disposition of the various parts, otherwise it does not help much towards understanding how it works. Figs. 1 and 2 are provided for that purpose, as they show clearly all the

not going to wade slowly through the whole of the various processes again, but rather are we going to make a quick résumé of the functions of the different parts and at the same time clear up for those one or two little points which, for

Obtaining Selectivity
First of all look at the top left-hand corner of either Fig. 1 or Fig. 2. Here you will see the aerial connected to the aerial coil. You will notice it is not connected to the end of the coil as it was

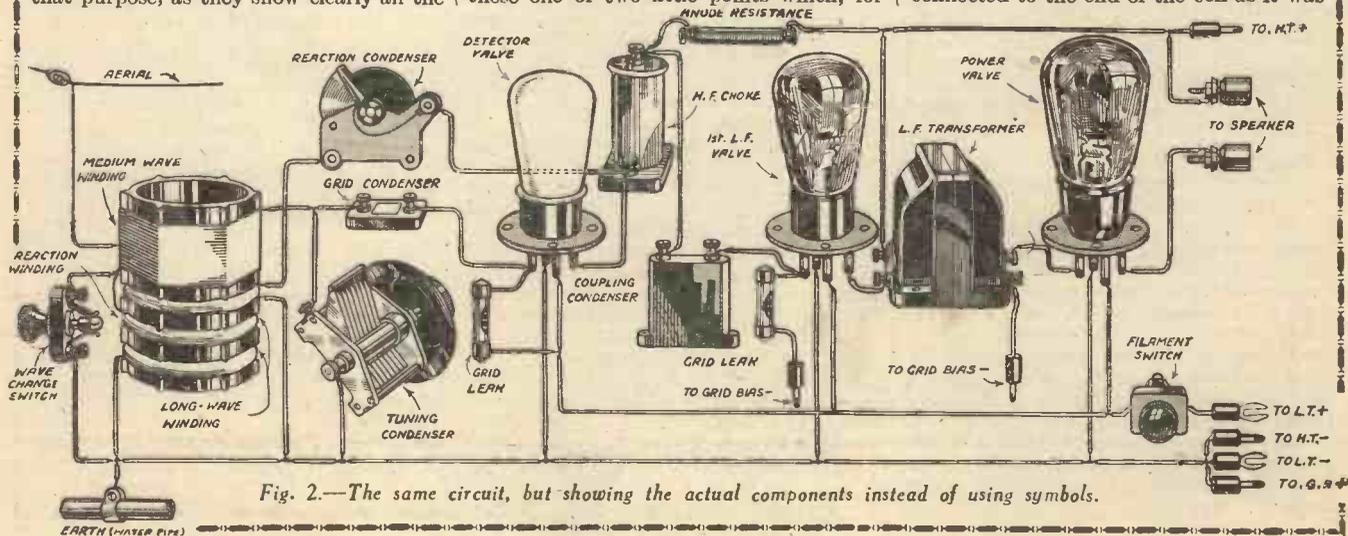


Fig. 2.—The same circuit, but showing the actual components instead of using symbols.

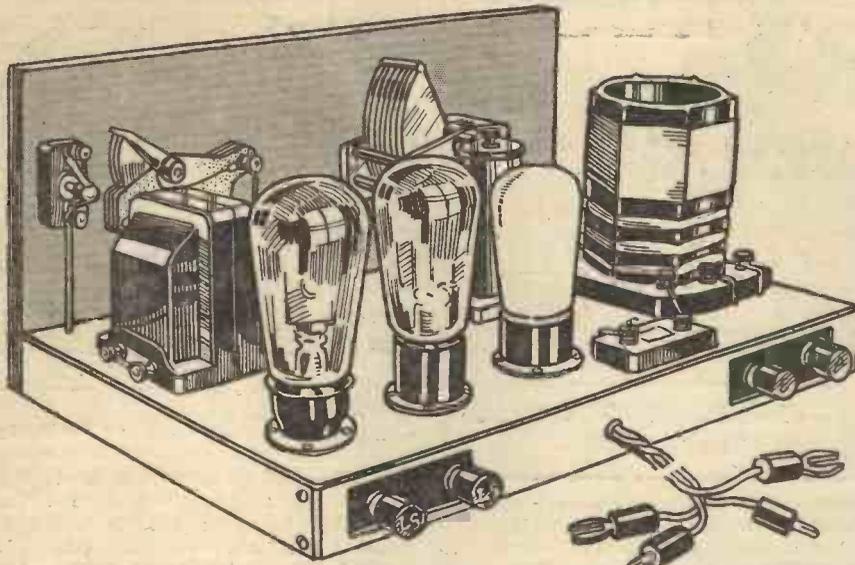


Fig. 3.—How the various parts are mounted on the "chassis" to form the complete receiver.

shown to be in Fig. 10 of the first article of this series, but is joined to one of the turns about half-way down the coil. This is done in order to obtain what is known as *selectivity*.

If the aerial were joined direct on to one end of the coil and the earth on to the other we should get *flat* or *non-selective* tuning. This means that if we tuned-in a station the setting of the tuning condenser would not be at all critical. Of course, there would be one particular position of the condenser at which signals would be loudest, but if we turned the knob several degrees either one way or the other we should still hear the station slightly. In other words our aerial circuit would still resonate slightly.

Naturally this would not matter in the least if we only wanted to receive one station, but if we wanted to tune in to another one which was sending out waves of nearly the same length as the first station there would be trouble. Imagine what would happen! On turning the knob or dial of the tuning condenser from the position where the first station was in tune, the sound would not suddenly cease but would still be audible, although gradually diminishing in strength, as we moved the dial farther and farther. As the second station would be transmitting on a near-by wavelength we should not have to move the dial through many degrees before we were in tune with that station. But the first station would still be audible.

Stations Overlapping

You may have experienced this sort of thing with your own set, especially when listening to a distant or weak station separated from a powerful local transmitter by only a few degrees on the dial of your tuning condenser. The powerful station could be heard on either side of its proper tuning point and so interfered with your reception of the weaker station. Well, one very popular method of overcoming, or at any rate partially overcoming, this deficiency, is to connect the aerial not to the "top" end of the tuning coil, but to one of the turns somewhere between the two ends

—hence the arrangement shown in Figs. 1 and 2.

Three Coils in One

Another point you will notice is that the aerial coil is wound in two sections. It is a *dual-range coil* as mentioned in part 3. The upper section will tune to the medium waves (above 200 to 500 metres) and the lower to the long waves (say, 1,000 to 2,000 metres). Incidentally this lower section is again split up by being wound in two parts. Actually it is really one coil, but half of it is wound in one set of grooves and half in another. When we wish to tune to the long waves the switch marked "wave-change switch" is left open so that the medium and long-wave coils act virtually as one large coil. For reception on the medium waves this switch is closed and so cuts the lower coil out of action, leaving only the medium-wave coil in use. Between the medium and long-wave coils is the reaction coil.

While on the subject of the coil (the term "coil" is often used to indicate the whole unit, comprising the medium-wave, the long-wave and the reaction coils) I must explain that in Fig. 2 the connections from other parts of the set are shown going straight to the windings. This is done to make the connections quite clear, but in practice they are usually taken to terminals on the flange or base of the coil as in Fig. 3.

Purpose of a "Choke"

Following on from left to right in Figs. 1 and 2, we come to the tuning condenser. The arrow drawn through it in Fig. 1 indicates that it is a variable condenser. Then comes the grid condenser, the grid-leak and the detector valve. We have already studied the working of these so we will pass on to the *H.F. choke*. This component, which you will see is connected between the plate of the valve and the anode resistance, has not been shown before, so I will explain what it is and why it is there. It is really a small coil something like a tuning coil, but smaller and containing many turns of fine wire. Its purpose is to direct some of the current from the plate of the detector

valve through the reaction condenser and reaction coil, instead of allowing it to pass through the anode circuit. This is the simplest explanation of its function, but it is really not quite so straightforward as this, as the current it is dealing with is of rather a complex nature. I will endeavour to explain it a little more fully, but if the next two paragraphs look a bit too technical you can easily skip them. In advance I warn you I am going to talk about high-frequency and low-frequency currents.

The current from the plate fluctuates at both high and low-frequencies. I know this sounds horribly technical, but I will try and explain what it means. You will remember that under the influence of the incoming wireless waves, currents are set up in the aerial circuit. These move backwards and forwards very quickly, from which comes the term *high-frequency*. However, when speech or music is being broadcast, these currents vary in strength. Sometimes a large current flows first in one direction and then in the other, then perhaps the next moment only a *small* current will flow. This variation in strength occurs at a comparatively slow rate compared with the actual oscillations backwards and forwards, hence the term *low-frequency*.

By means of the grid in the detector valve the plate current is made to vary, in a similar way. As we saw when studying the action of the valve earlier on, the plate current rises and falls with each individual surge of the aerial circuit current in one direction, although it is unaffected when it moves in the reverse direction. This rise and fall is, of course, at a high-frequency like the movements of the aerial circuit current which induced it. Also, like the aerial current, the amount of each individual rise and fall varies, this variation being at *low-frequency*. There are, therefore, both high-frequency and low-frequency variations in the plate current. Of course, it is still only one current flowing in one direction, but due to the two distinct rates of fluctuation it is often spoken of as though it consisted of *two* currents—high-frequency currents and low-frequency currents. From many points of view this is a convenient way of looking at it.

"Well, what has all this got to do with the H. F. Choke?" you may ask. The answer is that the choke allows the low-frequency currents to pass unhindered but "chokes" back the high-frequency currents. The low-frequency currents pass on through the anode resistance while the H.F. currents not being able to get through the choke, have to go *via* the reaction condenser and coil. They are there used to boost up the incoming signals as we saw in part 3.

A Double Function

Incidentally the high-frequency choke serves a double purpose. Not only does it direct the H.F. currents to the reaction circuit where they are wanted, but it also keeps them from the grid of the next valve where they are not wanted. It is the low-frequency variations, or as they are sometimes called the "speech" frequency variations which we want to amplify, and which we

(Continued on page 88.)

EVERYTHING RADIO

TELSEN SUPER "SELECTIVE" 4. Complete Kit of Telsen Parts in Sealed Carton. Cash or C.O.D. Carriage Paid **£4/18/6**. Balance in 11 monthly payments of 9/-. (Set of valves add 5/3 to each of 12 payments.) **9/- only**

TELSEN "SUPER" 6. Complete Kit of Telsen Parts in Sealed Carton. Cash or C.O.D. Carriage Paid, **£5/18/6**. Balance in 11 monthly payments of 10/10. (Set of valves add 7/5 to each of 12 payments.) **10/10 only**

TELSEN "ALL-MAINS" 3. Complete Kit of Telsen Parts in Sealed Carton. For A.C. Mains only. Cash or C.O.D. Carriage Paid **£6/18/6**. Balance in 11 monthly payments of 12/8. (Set of valves add 5/7 to each of 12 payments.) **12/8 only**



NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 29 P.M. With input transformer. Cash or C.O.D. Carriage Paid, **£1/12/6**. Balance in 6 monthly payments of 5/2. **5/2 only**

BLUE SPOT UNIT AND CHASSIS. Type 99 P.M. Including matched transformer. Cash Price, **£2/19/6**. Balance in 11 monthly payments of 5/6. **5/6 only**

SPECIFIED FOR THE FERROCART Q.P.P. HI-MAG THREE R & A "CHALLENGER" PERMANENT MAGNET MOVING-COIL SPEAKER. With special Ferranti multi-ratio input transformer. Cash Price, **£1/15/0**. Balance in 5 monthly payments of 6/6. **6/6 only**

ROLA PERMANENT MAGNET MOVING-COIL SPEAKER F.6. With Universal tapped input transformer. Cash Price, **£2/9/6**. Carriage Paid. Balance in 11 monthly payments of 4/8. **4/6 only**

ATLAS ELIMINATOR. Type A.C.244. Three tappings, S.G., Detector and Power. Outfit 120 volts at 20 m/A. Cash Price, **£2/19/6**. Carriage Paid. Balance in 11 monthly payments of 5/6. **5/6 only**

GARRARD INDUCTION GRAMOPHONE MOTOR. For A.C. Mains. Model 202. Mounted on 12-inch nickel motor plate with fully automatic electric starting and stopping switch. Cash Price, **£2/10/0**. Carriage Paid. Balance in 11 monthly payments of 4/7. **4/7 only**

W. B. PM4 Q.P.P. MOVING-COIL SPEAKER. Send With input transformer. Cash or C.O.D. Carriage Paid, **£2/2/-**. Balance in 7 monthly payments of 5/9. **5/9 only**

GARRARD AUTOMATIC RECORD CHANGER for A.C. Mains. Mounted on unit plate complete ready for fitting in position, including Garrard pick-up and tone-arm. Cash Price **£10/0/0**. Carriage Paid. Balance in 11 monthly payments of 18/6. **18/6 only**

Q.P.P. PILOT CONVERSION KIT

Mains Results on any Battery Set. Contains 1 Q.P.P. Transformer, 1 Q.P.P. Output Choke, 4 Non-Inductive Resistances, 1 Potentiometer, 2 Mansbridge Condensers, 2 Valve Holders, 1 Tone-Compensating Condenser, 1 H.F. Choke, G.B. Plugs, Wires, Screws, Flex, etc.

Delivered Carriage Paid on first payment of **6/-**

Balance in 7 monthly payments of 6/-. Cash or C.O.D. Carriage Paid **42/6**.

WITH FULL SIZE diagrams and constructional notes SEE PAGE 1075 PRACTICAL WIRELESS, FEB. 25th ISSUE.

From PETO-SCOTT—Pioneers in Radio since 1919
CASH, C.O.D. or EASIWAY

★ ★ ★ ★ ★ ★ ★ ★
NEW REVOLUTIONARY PILOT GUARDIAN Q.P.P. 4-VALVE KIT



DOUBLE OUTPUT—SAVES 50% H.T.

NEVER before has it been possible for the Home Constructor to build such an efficient receiver as cheaply as this Peto-Scott Guardian Q.P.P. 4-valve Kit. It incorporates the most sensational development in Battery Set Design, QUIESCENT PUSH-PULL, giving you mains volume and quality with a saving of 50 per cent. H.T., yet using only low-priced small H.T. Batteries. The finest S.G., Detector, Q.P.P. Kit Set money can buy. Send for FREE "How to Build" Constructional Chart and full-size diagrams. SEE PAGE 74 THIS ISSUE.

KIT "A" Complete Kit of Parts including ready-drilled panel, Valves, cabinet and meter. CASH or C.O.D. Carriage Paid, **£3/19/6**. 7/6 Deposit and 11 monthly payments of 7/3. **7/6**

KIT "B" As Kit "A" but with Valves, less cabinet and meter. CASH or C.O.D., Carriage Paid, **£6/18/0**. Delivered, Carriage Paid, on **12/6**. First Payment of 12/6. Balance in 11 monthly payments of 12/6.

KIT "C" As Kit "A" but with Valves and Table Cabinet less meter. CASH or C.O.D., Carriage Paid, **£7/13/0**. Delivered, Carriage Paid, on **14/-**. First Payment of 14/-. Balance in 11 monthly payments of 14/-.

KIT "D" As Kit "C," but with Consolelette cabinet less meter and speaker. CASH or C.O.D., Carriage Paid, **£9/3/0**. Delivered, Carriage Paid, on First Payment of **15/-**. Balance in 11 monthly payments of 15/-.

GUARDIAN Q.P.P. METER 10/- Extra. Add 11d. to each monthly payment.

FERROCART Q.P.P. HI-MAG THREE KIT "A" Author's Kit of First Specified Components including ready drilled panel and assembled and drilled plywood chassis, less valves, speaker and Cabinet. CASH or C.O.D. Carriage Paid, **£3/7/6**. Delivered, Carriage Paid, on First Payment of **15/4**. Balance in 11 monthly payments of 15/4.

KIT "B" as Kit "A," but with Valves. Delivered, Carriage Paid, on First Payment of **19/-**. Balance in 11 monthly payments of 19/-. Cash or C.O.D. Carriage Paid, **£10/8/6**.

KIT "C" As Kit "A." Complete with valves and cabinet, but less speaker. Delivered, Carriage Paid, on First Payment of **21/-**. Balance in 11 monthly payments of 21/-. Cash or C.O.D. Carriage Paid, **£11/8/0**.

Battery Shelf and Speaker Baffle 3/6 extra, or add 4d. to each payment.

EXCLUSIVELY SPECIFIED PETO-SCOTT OAK CONSOLETTA CABINET (Type F.J.C.), 19/6.

KIT-BITS Selected C.O.D. Items. You pay the postman. We pay post charges over 10/-.

1 PETO SCOTT Red Triangle Panel 16 x 9" ready drilled	2 0 0
1 COLVERN Set Ferrocart Coils	8 0
1 BRITISH RADIOPHONE Three-Gang Condenser Assembly, type 343, with Dust Cover & Disc Drive	2 10 0
1 VARLEY Q.P.P. Input Transformer, type D.P.36	17 6
1 VARLEY Q.P.P. Tramechoka, type D.P.35	18 6
1 Plywood Chassis 16 x 10 x 3 1/2" assembled and ready drilled for valve holders	3 6
Set of Specified Valves, £2/1/0.	

FURY FOUR

Battery Model.
KIT "A" Author's Kit of specified parts, including ready drilled panel, but less valves and cabinet. Delivered, Carriage Paid, on First Payment of **12/-**. Balance in 11 monthly payments of 12/-. CASH or C.O.D. Carriage Paid, **£6/10/0**.

KIT "B" As Kit "A" but with valves, less cabinet. Delivered, Carriage Paid, on First Payment of **17/3**. Balance in 11 monthly payments of 17/3. CASH or C.O.D., Carriage Paid, **£9/7/6**.

KIT "C" As Kit "A" but with valves and Peto-Scott American Type Cabinet with lift-up lid. Delivered, Carriage Paid, on First Payment of **18/6**. Balance in 11 monthly payments of 18/6. Cash or C.O.D., Carriage Paid, **£10/2/6**.

PETO-SCOTT CO., Ltd., 77, City Road., London E.C.1.
Telephone: Clerkenwell 9406/7, Telephone: Holborn 3248.

West End Showrooms: 62, High Holborn, London, W.C.2. Telephone: Holborn 3248.

Dear Sirs, Please send me CASH/C.O.D./H.P. for which I enclose £.....s.....d. CASH/H.P. Deposit.

NAME

ADDRESS

Pr. W. 1/4/33

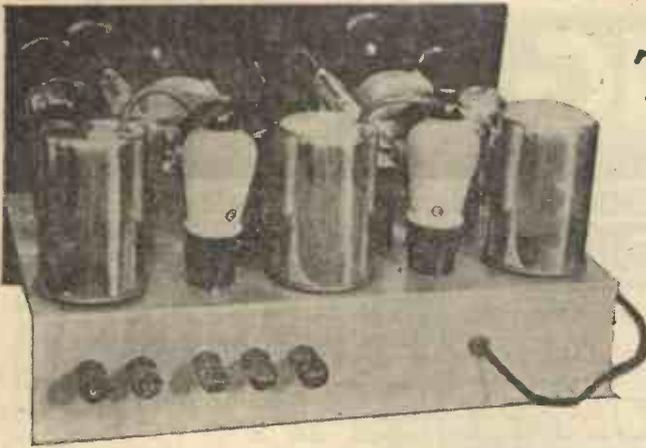
STRICT PRIVACY GUARANTEED—WE DEAL WITH YOU DIRECT

INTRODUCING— THE SUPERSONIC SIX

OUR FIRST SUPER-HET

A Six-valve Super-heterodyne, Wiring Diagrams and Constructional Details of which will be Given Next Week

By F. J. CAMM

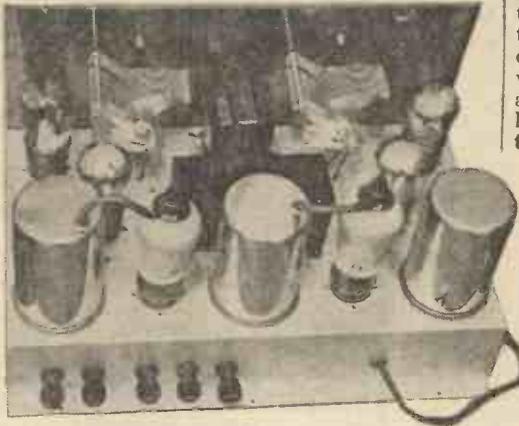


Rear view of our first superhet—the Supersonic Six.

THE selectivity problem almost daily grows more acute. Those readers situated well outside the swamp areas cannot realize how difficult it is for listeners situated beneath the aerial of some high-powered transmitter to receive and separate programmes. The only solution from their point of view is either a one-station receiver or a superhet. Hundreds of readers wrote to me just after I published details of my Fury Four asking whether it would be selective within five miles of their local station. Quite frankly, it would not. I promised those readers, however, that I would shortly publish details of a cheap yet highly efficient superheterodyne which would cure their troubles. I have been too busy with the Fury Four to publish this information before, but in order to satisfy those demands this week I give preliminary details of it. Its salient features are high sensitivity, high selectivity, only two tuning controls, low battery consumption (12 to 15 milliamps), distortionless volume control, automatic grid bias, and it functions extremely well with a frame aerial. As with the Fury Four, I am not over-stating the case when I say that this, the first superheterodyne receiver to be published in PRACTICAL WIRELESS, is a star performer.

The first detector functions on the anode bend principle of rectification, and the signal input is derived from the frame aerial. Local oscillation from the oscillator valve (incorporated into a new type of circuit evolved to keep the oscillator current down to a very low figure) is introduced into the frame aerial circuit via the centre tapping on the aerial itself. The beat frequency of 126 kilocycles obtained by heterodyning the incoming signal with the oscillator is transferred to the grid circuit of the first intermediate frequency amplifier by means of the special

band-pass transformer. A further stage of intermediate frequency amplification is given by the fourth valve and the second transformer. The signal is passed to the second detector by means of another transformer, and finally transferred to the pentode output valve by means of the low-frequency transformer. Automatic bias for the oscillator valve and the pentode is obtained by means of the voltage



Another view of the Supersonic Six.

dropping resistances. Volume control is obtained by varying the bias applied to the variable- μ intermediate frequency valve by means of the potentiometer.

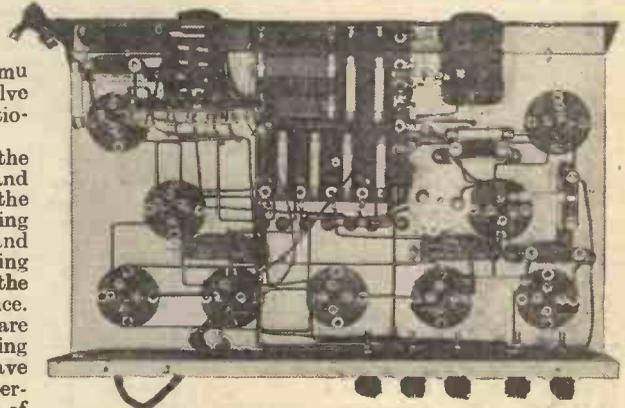
A strong feature of the receiver is the clean and symmetrical panel layout, the right hand dial is for tuning the frame aerial circuit, and left-hand dial is for tuning the oscillator circuit to the correct frequency difference. The remaining controls are the knob for controlling volume, and the on-off wave change switch, which performs the three functions of switching the set off when in

a centre position to the medium wave when turned anti-clockwise, and to the long waves when turned clockwise. This switch and the oscillator coil form a single unit. Note that this set is erected on an aluminium chassis which can be obtained with valve-holders already mounted in position from Messrs. Wright and Weaire.

The high degree of selectivity that can be obtained from this set is due primarily to the use of the special I.F. transformers. These are designed to operate on the band-pass principle, and have a tuning curve 9 kilocycles in width. It should be noted that these transformers are made in two types; with pigtail lead for connection direct to the anode of the variable- μ valves—List No. O.T.2 (for positions T_2 and T_3 in the circuit), and without the lead—List No. O.T.1 (for position T_1 in the circuit). The use of a frame aerial gives the user a great advantage from the selectivity point of view.

The H.F. choke in the second detector anode circuit is important and forms, in conjunction with the .001 by-pass condenser, a filter circuit to eliminate the H.F. component from the L.F. output of the detector.

Automatic grid-bias is an innovation somewhat new to battery sets and possesses one great advantage over the convenience of not having a grid-bias battery to worry about; as the H.T. battery runs down, the grid-bias to the oscillator and output valve falls in sympathy.

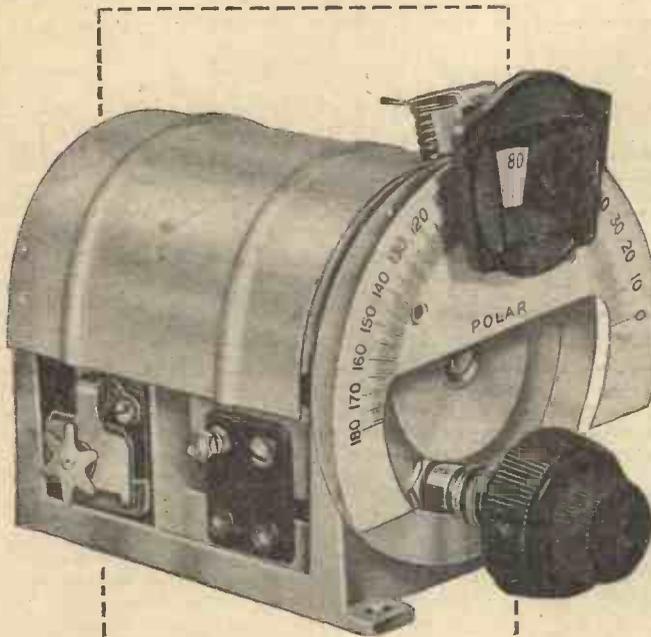


Sub-baseboard view of the Supersonic Six. Note the clean lay-out.

LIST OF COMPONENTS

- | | | |
|--|--|---|
| 1 Paxolin Panel drilled 14 in. by 8 in. ; (Peto-Scott) | 1 0.002 mfd. condenser, type 34. (T.C.C.) | 5 Terminals (2 L.S. and Aerial 1, 2 and 3) (Belling Lee) |
| 1 Aluminium Chassis ; drilled 14in. by 8in. (Peto-Scott) | 1 0.01 mfd. condenser, type 34. (T.C.C.) | 1 Centre tapped frame aerial. (Elex) |
| 1 Oscillator Coil and Switch unit with window dial and knob. (Wearite) | 1 Special Resistance Unit. (T.C.C.) | 8 4-Pin sub-baseboard valve-holders. (Clix) |
| 1 I.F. Transformer. (Wearite type O.T.1) | 1 1 meg. Grid Leak. (T.C.C.) | 1 5-Pin sub-baseboard valve-holder. (Clix) |
| 1 I.F. Transformer. (Wearite type O.T.2) | 1 500 ohms Grid Leak. (Bulgin) | 1 4-way Battery Cord (H.T.+, H.T.—, L.T.+., L.T.—). (Belling Lee) |
| 1 H.F. 10 Choke. (Bulgin) | 1 20,000 ohms 1 watt Resistance. (T.C.C.) | 1 P.M. 4 Mansfield Moving Coil Speaker. (W. B.) |
| 1 Special 8 mfd. condenser block. (T.C.C.) | 2 40,000 ohms 1 watt Resistance. (T.C.C.) | 6 Cossor Valves, 210 H.F., 210 L.F., 220 V.S.G. (2) |
| 2 0.1 mfd. condensers, type 65. (T.C.C.) | 1 1 amp fuse. (T.C.C.) | 210 DET., 220 P.T. (Lissen) |
| 1 0.0002 mfd. condenser, type 34. (T.C.C.) | 1 25,000 ohms volume control. (T.C.C.) | 1 Lion 120-volt H.T. Battery. |
| 1 0.0003 mfd. condenser, type 34. (T.C.C.) | 1 Hypernik L.F., 3-1, Transformer. (T.C.C.) | 1 Ediswan 2-volt 40-ampere hour Accumulator. (Polar) |
| | 2 0.0005 variable condensers with slow motion dial, type No. 2 S.M. (T.C.C.) | |

for the "ALPHA" PUSH-PULL THREE



POLAR
TWO GANG CONDENSER
(2 x .0005)

19'6

... the Specification says

POLAR!

Again the unquestioned reliability of Polar has prompted the designer's choice. The Specification of the "Alpha" Push-Pull Three says Polar. Follow that specification in the knowledge that you use a condenser which, with its rigid die-cast frame, ensures accurate tuning—for all time.

Write for Polar Leaflet.

POLAR

CONDENSERS

WINGROVE & ROGERS LTD.,
188-9 Strand, W.C.2. Works: Old Swan, Liverpool
Telephone: Temple Bar 2244

72649

"NEW RADIOS FOR OLD!"

READ WHAT THIS DELIGHTED CLIENT SAYS

ANY MAKE OF SET, KIT OR RADIOGRAM SUPPLIED.

You will never realise the pleasure of radio until your set is right up to date.

Hundreds of testimonials from satisfied Clients!

VISIT OUR SHOWROOMS FOR WONDERFUL BARGAINS.

FREE WIRELESS SET TO INTRODUCE THE RADIALADDIN CLUB!

17.12.32

"... I wish to say that I appreciate the businesslike manner in which you dealt with my enquiry and the fact that your offer, in all circumstances, was a reasonable one—this in contrast to the evidently absurd offers made by other firms who frequently advertise a similar business..."

L.G., Rochdale, Lancs. Ref. No. 8164.

IT WILL PAY YOU TO CHANGE YOUR SET EVERY FEW MONTHS BECAUSE WE CAN GIVE MORE WHEN YOU SELL AND CHARGE LESS WHEN YOU BUY YOUR UP-TO-DATE MODEL—BALANCE PAYABLE BY CASH OR HIRE PURCHASE.

Write for particulars of our amazing exchange offer, enclosing 1d. stamp, naming your old set and the new model you fancy.

A FREE QUOTATION WILL FOLLOW.

RADIALADDIN, LIMITED THE LARGEST RADIO EXCHANGE FIRM IN THE UNITED KINGDOM

DEPT. PR., 46, BREWER STREET, LONDON, W.1.

PHONE: GERRARD 4055



Read this
QUALITY
Produces
EFFICIENCY

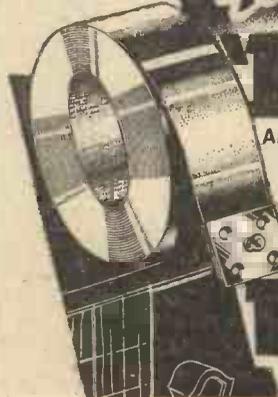
TESTED BEFORE DESPATCH

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

RODS. SHEET. TUBES. PANELS

The **BRITISH EBONITE Co., Ltd.**,
Hanwell, London, W.7.

BRITISH MADE



Get a HET for your set!
HET
AMALGAMATED METAL
INDOOR AERIAL

Get more stations, more volume and greater selectivity with this efficient and convenient indoor aerial fixed neatly round the room.

No unsightly wires. The "Het" adhesive aerial gives a finishing touch to the walls, and improves reception. In gold or silver finish, with special brass terminal plate. It looks as good as it is—better than any other aerial.

From all radio dealers or direct from
UNIVOLT ELECTRIC, LTD.,
Balfour House, Finsbury Pavement, E.C.2.

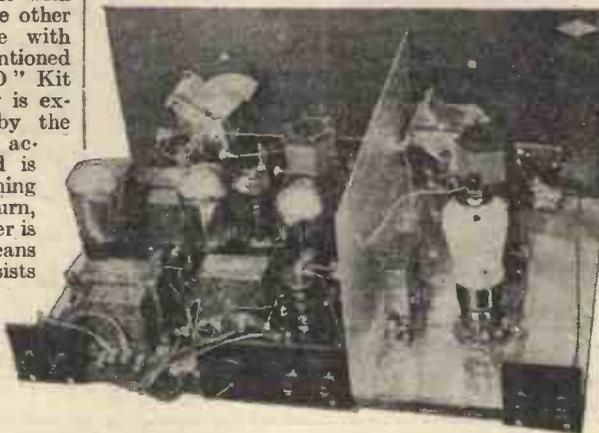
REVIEWS of LATEST KITS

THE Peto-Scott Company have just submitted to us one of their new kits bearing the above title. As this explains, it is a four-valve set employing quiescent push-pull in the output stage, and the claims are: treble output, mains quality and volume with batteries. The kit is most attractively marketed in a carton containing all the separate parts in various divisions, and is made up in four different types. Kit "A," for instance, is the complete set of parts for the receiver, including a ready-drilled panel, but with no valves, cabinet or meter. At the other extreme, Kit "D" is complete with cabinet, valves, etc. The first-mentioned kit costs £3 19s. 6d., whilst the "D" Kit costs £8 3s. The actual assembly is extremely simple, and is assisted by the large sheet of instructions which accompanies the kit. The baseboard is covered with foil to assist in screening and provide a common earth return, whilst the H.F. stage of the receiver is separated from the remainder by means of a vertical screen. The circuit consists of a screen grid valve, detector valve, and two pentodes in the output stage. The coupling between S.G. and detector valves is of the normal parallel-fed tuned anode arrangement, with coils wound on small diameter, air-spaced formers. The two wavebands are provided in the usual way by short-circuit, one section of the winding for use on short (or medium) waves. The detector valve has the primary of the Q.P.-P. transformer connected direct in the anode circuit, and is provided with a resistance across the primary for reasons which have already been pointed out in these pages in the articles on Q.P.-P. The anodes of the output valves are coupled by means of an output choke which is provided with four separate output tapplings, so that the impedance may be correctly matched to the particular loud-speaker, which is employed with the receiver. The remainder of the circuit is quite straightforward, except, perhaps, for the introduction of a potentiometer across the grid-bias battery to ensure that this is discharged at the same rate as the H.T. battery and so maintain the balance between the Q.P.-P. valves

THE PILOT GUARDIAN 4-VALVE Q.P.-P. KIT

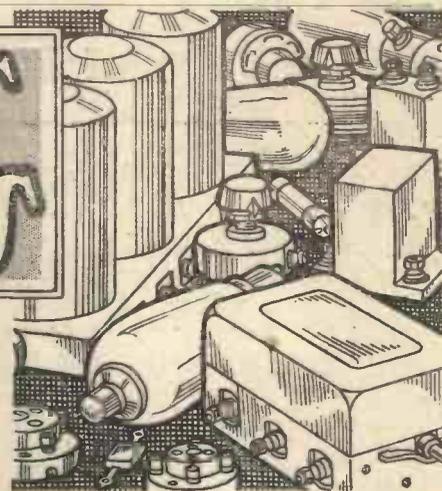
Assembly

The assembly of the receiver is extremely simple, and according to the instructions, the panel should first be assembled, a task which can be completed in less than half an hour. The baseboard components



Rear view of the Peto-Scott Guardian 4-Valve Q.P.-P. kit assembled.

are next screwed down, and the screen is left until last. The complete assembly, ready for wiring, may be carried out within an hour, so that there is nothing tedious or difficult about the work. All screws are provided, and a penknife, screwdriver and pliers are the only tools required. Wiring, as with any receiver, is a job which must be carried out intelligently, and the large sheet accompanying the kit explains the wiring, in stages. For instance, the first point to be wired is explained thus: "1. 'E' terminal to F—of Valveholder V.1." This detailed method of explaining the wiring is carried out right through the set and therefore no wireless knowledge of any sort is required to enable it to be completed. The balancing of the pentodes is also very clearly explained, and although a meter is suggested to enable the current readings to be obtained, this may no doubt be easily obtained for the purpose of adjustment. Messrs. Peto-Scott supply two meters for the purpose,



one at 10s. and one at 7s. The details given for matching are very complete, and, of course, once carried out there is no further need to touch them.

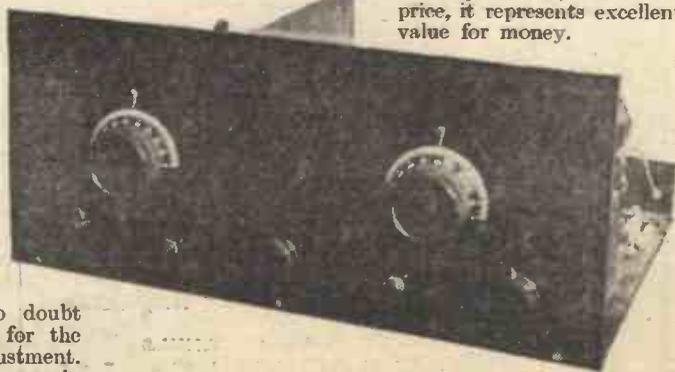
The wavebands covered by the receiver are 200 to 600 and 1,000 to 2,000 metres. The provision of a small adjustable condenser in the aerial lead enables the selectivity to be adjusted.

The panel also contains a reaction condenser, an adjustable anode coupling condenser, in addition to the two tuning condensers. With the left-hand condenser fully in mesh, the selectivity is poor, and signal strength is greatest. The central knob also varies the selectivity, and the combination of these two knobs will enable the receiver to be adjusted for practically any locality. Tested in the centre of London, in a bad district, quite a number of stations could be tuned in on the loud-speaker, and on the London stations the volume was fully up to what is expected

of pentodes in quiescent push-pull. A moving-coil loud-speaker was fully loaded, and gave more than sufficient volume for the home. The adjustment of the two condensers, already referred to, enabled a very complete control of selectivity to be obtained.

Gramophone pick-up terminals are provided on the rear of the baseboard, and, as there is no switch, the pick-up must be fitted with a switch at a convenient point on the motor-board.

The kit is certainly a very good proposition for those who wish to build up a set of this description without any trouble, and at the price, it represents excellent value for money.



Panel view of the Peto-Scott Guardian 4-valve Q.P.-P. kit.

LATEST KITS TESTED

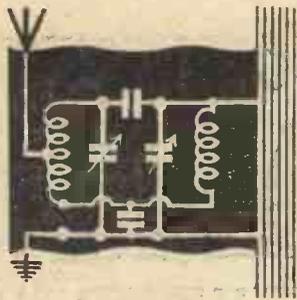
KIT—Pilot Guardian 4-valve Q.P.-P.

MAKERS—Peto-Scott Co., Ltd.

PRICE—Kit "A," £3 19s. 6d.; Kit "B," £6 18s.; Kit "C," £7 13s.; and Kit "D," £8 3s.

CIRCUIT—Screen grid H.F., detector, two pentodes in quiescent push-pull. Provision for gramophone reproduction.

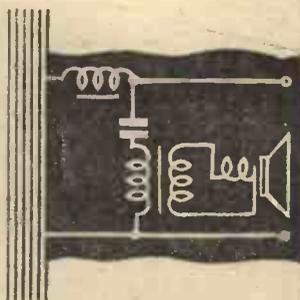
REMARKS—Splendid results at full-room strength from many stations. Quality of reproduction very high. Economical to maintain. The kit may be purchased on hire purchase terms if desired.



RADIO RAMBLINGS

By JACE

Gettings from my Notebook



"Cheap" Receivers

A FRIEND of mine recently "fell" for one of those cheap receivers frequently advertised by some of the large Departmental Stores in the daily Press. He thought he had secured a wonderful bargain in obtaining a four-valve all-mains set for ten guineas, and was most annoyed when I told him that he had made a foolish purchase. Anyhow, the set duly arrived, and on connecting up it worked—but oh! what quality (?), and what mains hum! Distant stations could be brought in, but only very few of them were free from interference by the "local" about fifteen miles away. I do not say that this set is typical of all the cheap sets advertised, but very few are worth buying. Most of them are nasty, jerry-built affairs, entirely without a guarantee of any value, and when anything goes wrong it is practically impossible to have repairs done, partly because the components are inaccessible and partly because the average dealer and repairer has no knowledge of the receivers. Even if he had, it is scarcely likely that he would care to associate himself with an instrument he knew to be "shoddy."

Half or Full-Wave?

I AM often asked whether it is better to employ full-wave or half-wave rectification in an A.C. mains set or eliminator. Theoretically, a full-wave rectifier is more efficient, but the difference between the two systems in this respect is not very great in practice. A more important consideration is that of mains hum, and when the supply is at a frequency of 50 cycles, hum is often less pronounced when rectification is on the full-wave principle. The reason is that the D.C. "ripple" is then at 100 cycles, and the smoothing circuit is rather more effective in consequence. It might appear that the same argument would apply in the case of 50-cycle mains, but there is another little point to consider. A 25-cycle hum (such as would be produced by half-wave rectification) is not so easily detected by the ear, nor so well reproduced by the loud-speaker, whereas a 50 cycle note is much more conspicuous. The main objection to half-wave rectification is that a more efficient smoothing circuit is required and thus either larger chokes or more condensers are necessary.

Short-wave "Transmitters"

I RECENTLY ran up against a rather peculiar form of interference that might be new to some readers. A very sensitive short-wave super-heterodyne was in use, and whilst listening to Schenectady (W2XAD) on 19.56 metres, we were nearly deafened by a horrible mixture of "crackling and fizzling" noises. This went on for a minute or so, and then suddenly disappeared without any alteration having been made to the set. Having had similar experiences before, I at once suspected that the noises had been caused by the

ignition system of a motor-car, and inquiry revealed that a neighbour had just arrived home in his Morris Minor. Incidentally, every type of car has its own "wave-length," and can be tuned in fairly accurately. For instance, the "wavelength" of an Austin Seven is about 18 metres, of a Morris Cowley, 22 metres, and of motor-buses and lorries, generally in the region of 40 metres. The larger vehicles can often be heard even on the broadcast bands, as many readers who live near a main road will know only too well.

Non-corrosive Flux for Soldering

IF you have ever attempted making your own transformers or coils, using very fine wire, you will have found sooner or later that it is often desirable, if not necessary, to solder the hair-like wire to a terminal or to some other wire. When doing this you must be careful not to use a flux that has any corrosive action, for the smallest amount of corrosion will quickly eat through the very small cross section of the wire. A good non-corrosive flux can be easily made by dissolving powdered resin in ether. Ether can be generally obtained from any good chemist, but you must take good care not to bring it near a naked light as it is highly inflammable. Use as little flux as possible in all soldering operations and see that the soldering iron is well tinned before you start.

Variable Mu Valves

IT is astonishing the number of people who overlook the advantages of the variable Mu valves when replacing an ordinary screened grid H.F. valve in their set. It is not possible to find a better form of volume control and still retain all the old characteristics of the old valve. The introduction of this type of valve calls for only a slight change in the circuit. The grid return is taken to a potentiometer having a resistance value of about 30,000 ohms. This component is connected across a grid bias battery of the nine-volt type. In order to get a perfectly equal reduction of volume a potentiometer of the Lewcos or Colvern

graduated type should be chosen. It will be noticed, in districts where strong signals from a local high-power station have to be dealt with, that there is no falling off of quality when the volume is reduced to the merest whisper. One of the greatest troubles with H.F. valves is the introduction of cross modulation, and it will be noticed when using this new type that this is reduced to a minimum if not entirely cut out, as it should be if the right type of circuit is used. I should mention a special switch is required in the L.T. circuit to break the circuit when this new addition is made. The connections are shown on the characteristic curve sheets.

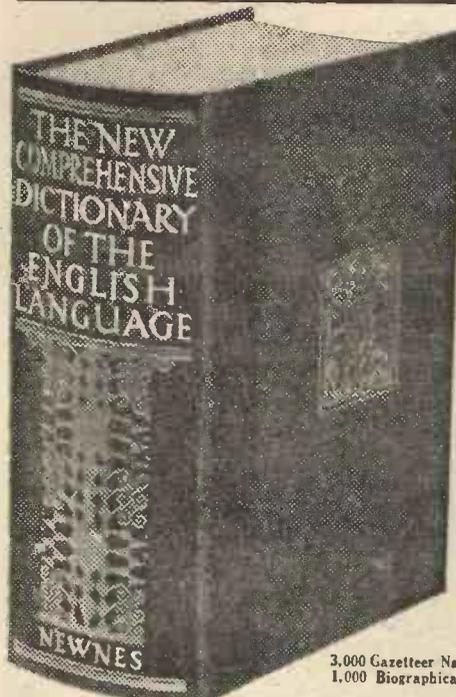
Empire Broadcasting

THOSE of my readers who are living overseas, perhaps in one of the great Dominions or Crown Colonies, are now looking forward with a great amount of interest to the time when they will be able to hear News and Concerts from the heart of the Empire. The new station at Daventry is now ready for testing purposes, and before many days are past it may be taken for granted this station will be giving a twenty-four hour service which will enable every part of the world to receive a programme during their evening hours, and in many cases all day long. Doubtless a great number of people are in a quandary of how, and in what way, the best advantage can be taken of this new service. They may wish to know which is the best set, or circuit, to use, or what kind of an aerial is most suited to their particular needs. Well, we folks at home are ready to do our bit by way of helping you, and anyone who cares to write Jace, enclosing a stamped addressed envelope, or post office stamp coupon, to PRACTICAL WIRELESS, Southampton Street, Strand, London, W.C.2, will receive advice in this direction. We people in the Mother Country are hoping that the innovation will bring happiness to all who are lonely, and longing to be in touch with home though separated by thousands of miles of sea or land.

The Mount Everest Expedition



The Westland Wallace machine used for the Mount Everest flight.



THOUSANDS OF POUNDS IN PRIZES

are to be won every week in

CROSSWORD COMPETITIONS

There will be many happy winners. Why not be one of them?

For success in solving Crosswords a good Dictionary is indispensable.

THE NEW Comprehensive DICTIONARY

Is the book you want. It has helped others to win. It will help you.

Contents include :

150,000 Definitions
10,000 Synonyms and Antonyms
3,000 Gazetteer Names. 2,000 Foreign Phrases.
1,000 Biographical Entries. 16 Maps in Full Colours

THE HOME LIBRARY BOOK CO.,
23-24, TAVISTOCK ST., LONDON, W.G.2.

Please send me on FIVE DAYS' FREE APPROVAL the NEW COMPREHENSIVE DICTIONARY. I will either return it to you on the sixth day or send you 2/6 and follow up with seven monthly payments of 4/- each and a final payment of 2/-. (Cash price on sixth day, 31/-.)

Name

Address

Pract. Wire., 1433

Geo. Newnes, Ltd.

FIVE DAYS' FREE TRIAL

Fill in the Free Examination Form and post to-day. No charge or obligation is involved.

In the April
STRAND
MAGAZINE

- P. G. WODEHOUSE**
G. B. STERN
SAPPER
A. P. HERBERT
E. TEMPLE THURSTON

In the April
STRAND
MAGAZINE
ONE SHILLING

THE NEW METHOD of DETECTION



The advent of the Westector brings the ideal detector a step nearer. This development of the Westinghouse Metal Rectifier enables the rectification of radi-frequency currents to be obtained by the use of a copper-oxide detector, which requires no anode or filament current and which is no bigger than a grid leak.

The Westector will handle large inputs and will give best results in the I.F. stages of a Superheterodyne Receiver, or in a straight set when preceded by at least two stages of H.F. amplification. It should not be used in a set without H.F. amplification.

Full particulars are now available, and a copy of the descriptive leaflet will be sent on receipt of the attached coupon.

WESTECTOR

HIGH FREQUENCY METAL DETECTOR

THE WESTINGHOUSE BRAKE & SAXBY SIGNAL Co., Ltd.
82, YORK ROAD, KING'S CROSS, LONDON, N.W.1

COUPON

Please send me full details of the Westector.

Name

Address

Pract. 14.

Geo. Newnes, Ltd.

PIONEERS OF RADIO-1

A. F. BULGIN & CO., LTD.

In the belief that readers will be interested in the development of those firms who have done pioneer work in Radio, we shall from time to time, under this title, give details of those early firms whose enterprise and vision are largely responsible for the development of Wireless.

WIRELESS firms come and wireless firms go. Fortunately the basis of a successful industry is not created by the birds of passage who do no pioneering but live, limpet-like, upon the work of others. In almost every case these parasitic appendages to the radio trade (all industries have them) have a short life and not often a gay one, which is, after all, fortunate for those firms such as A. F. Bulgin and Co., Ltd., of Abbey Road, Barking, whose works I recently visited. There is not a wireless constructor who does not know the name. There can scarcely be a constructor who has not used a Bulgin component. They have been in the wireless component industry from the very start of broadcasting, and only a firm with the ideals and outlook of A. F. Bulgin and Co., Ltd., could have successfully survived the vicissitudes through which the radio trade has passed.

A sound reputation for quality and reliability gradually acquired is a far better thing than the forced and somewhat spurious, if short, reputations enjoyed by what I may call the radio jumpers. For the firm of Bulgin knows not the name of junk. There is no need for any radio constructor to use junk when components of the Bulgin calibre are available for the same price, and in many cases below. You cannot all do as I did and visit the works. Fortunately, this famous firm has an excellent shop window in its splendid catalogue, one of the best (and it always has been) issued by the radio trade. It is a text-book, and I recommend all readers of this paper to send the 2d. necessary for a copy. PRACTICAL WIRELESS specifies



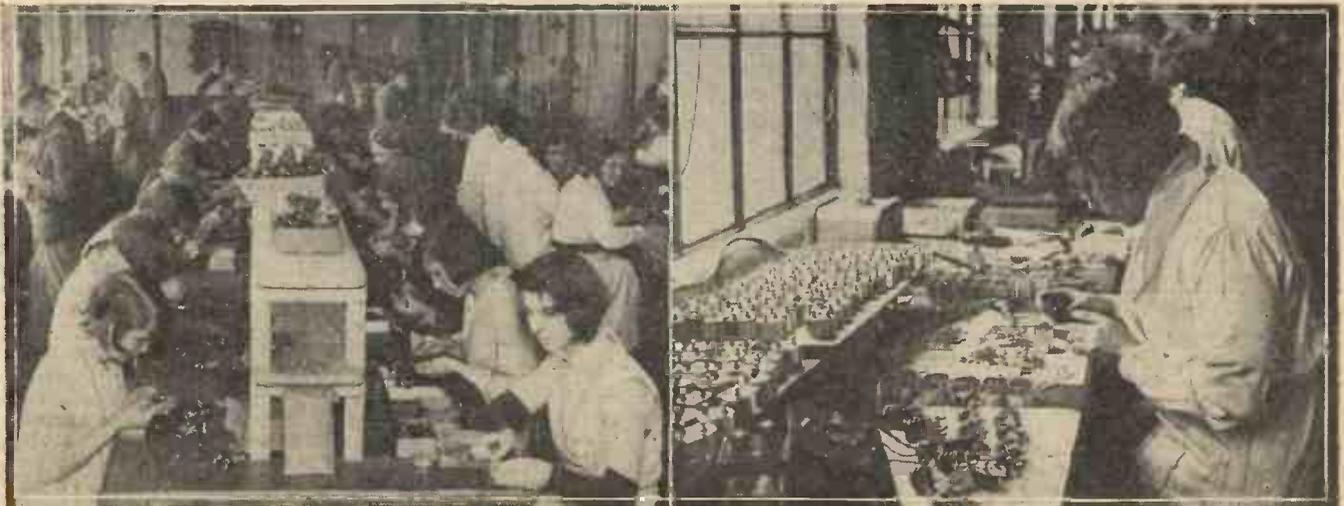
The works of A. F. Bulgin & Co., Ltd.

Bulgin components because in our laboratories we know that they are trouble-free and of impeccable quality. My visit, therefore, to Abbey Road, Barking, was not to satisfy any misgivings on that score, but I must say I was extremely surprised at the extent of the factory, the methodical layout of the plant, the meticulous testing and re-testing, the careful inspection which characterizes this firm's products. Enthusiasm is notoriously infectious, and the human catalyst in the case is Mr. A. F. Bulgin himself, who radiates enthusiasm and exudes energy.

I was not surprised to find that practically everything is made on the premises, and that special machinery has been created inside the firm to produce its components. Their tool-making department is a revelation in ingenuity, and there is little wonder that when the completed products leave the factory they are one hundred per cent. perfect. It is seldom that a Bulgin component has to be returned because of some defect in material or workmanship. I watched the manufacture of chokes, switches, jacks, indicators, resistances, valve-holders, spaghetti resistances (electrically spot welded at the ends)—there

is scarcely a radio component which is not manufactured in the factory. Their catalogue indicates ten years' intensive effort in the production of high-class components. You can examine any Bulgin component and find some little improvement which places it in the first class.

The testing laboratory, under the able direction of a wireless authority, assisted by a band of skilled enthusiasts, is there to test, to guide, and to design. They watch every development and have a lively ear and eye for the requirements of the home constructor. My visit revealed that this is a factory where satisfied customers mean far more than fat dividends. Piloted round the factory by Mr. A. F. Bulgin, I was so interested that we even forgot to stop for lunch, and I shall seek another opportunity of re-visiting and making even closer acquaintance with a firm which bids fair to be in existence as long as radio lasts. A little point: you will notice that an identification slip is in the box containing a Bulgin component. That is proof that the component has passed the rigid tests to which I have referred, and it is also your safeguard. I would repeat, an illuminating visit.—F. J. C.



These illustrations show merely a part of the assembling and testing benches.

THE radio enthusiast usually is fairly well versed in many of the most important principles of design and construction. He realizes, for example, the necessity of making good joints and connections within his set, of carefully screening high-frequency circuits and of spacing out components and wires. And then, as likely as not, he breaks all these rules when making the final connections to aerial and to earth, and to batteries or mains unit. By so doing he loses many of the advantages he would otherwise gain from his good design and careful workmanship. This is not the most serious part of the business, however, for loss of efficiency is the just punishment for his carelessness. The main trouble is that his poorly made connections usually are extremely untidy and unsightly into the bargain, they upset the lady members of the family and bring radio into disrepute with housewives in general.

Mend Your Ways

If, therefore, you are one of the number who, either by ignorance or casual untidiness, are doing untold harm to our hobby as well as curtailing your own enjoyment, it is your plain duty to mend your ways. What usually happens is that a new set is designed carefully and built up, and is completed one evening about ten minutes before the local station is due to close down. In his anxiety to run at least a preliminary test, a set of jury connections is rigged up by the excited constructor, such as we have shown in Fig. 1. Rough adjustments to the set are made, the receiver is tested out, found O.K. and put into service forthwith. It is fully intended that the "temporary" connections shall be replaced, squared up and made presentable, but somehow or other the job is put off and a disreputable garland of odd wiring remains to disfigure the sitting room.

Apart from the distressing appearance of untidy wiring, which is quite obvious and needs no further emphasis, very serious losses and technical troubles may arise due to shoddy connections. These may be divided into a number of classes, each of which is worthy of consideration. The first class comprises losses of efficiency due to bad metallic connections and high resistance generally. We have often seen temporary aerial and earth connections made with a number of short lengths of flexible cable or other wires twisted together. Possibly, as a jury expedient for an urgent test, such connections proved fairly satisfactory, but after a period, especially if subjected to movement and handling—to which trailing wires and festoons of connections are liable during the routine cleaning of a room—connections become loose and of high resistance. There will be losses in signal strength possibly voltages will be set up, across poor joints by which, if there is any coupling between the wires and some external source of interference, such as electric light wiring, hum, low-frequency oscillation and other parasitic noises will be multiplied.

A Case in Point

As a case in point arising from haste, let me cite the occasion when a friend of mine called me in to help him ascertain why his wireless reception was so poor. He possessed a three valve receiver which had given good service prior to moving into his new house. In the new situation the only station he could receive was the "local" one, and these signals were far from being up to

'WARE WIRELESS WIRES

Bad Reception is Sometimes Due to Bad Wiring. By "CYNIC"

anticipated strength. Added to this the tuning position for the station was quite different from what it should have been.

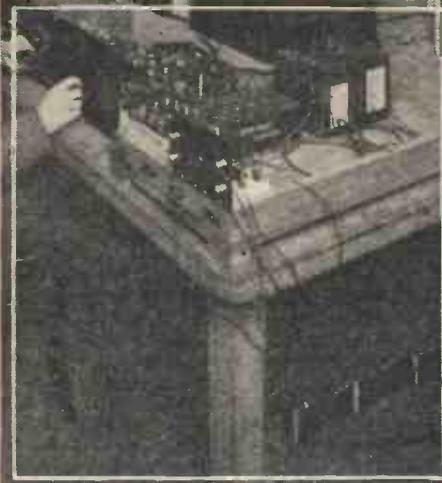


Fig. 1.—A set of jury connections usually is rigged up by the constructor in his haste to make the initial test.

Naturally, a very thorough overhaul of the set and auxiliary equipment was made, but here a blank was drawn as everything

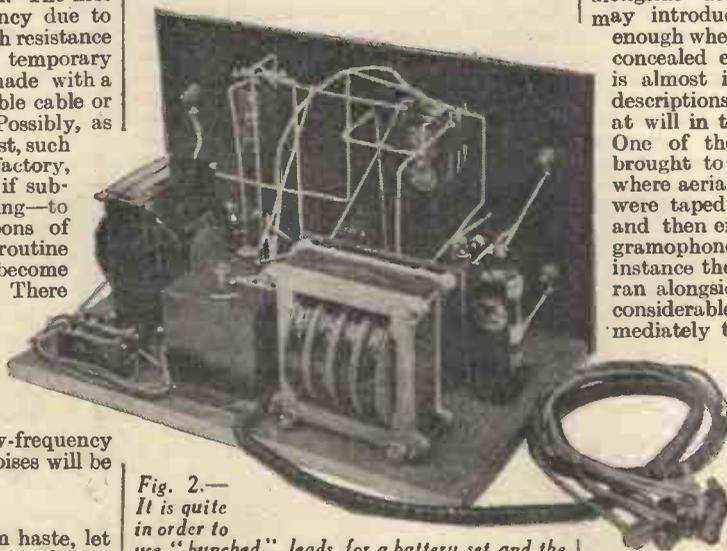


Fig. 2.—It is quite in order to use "bunched" leads for a battery set and the neat effect is shown here.

was quite in order. During the course of conversation, however, I learned that the new aerial had been erected with 7-22 enamelled copper wire. This had been well insulated with the usual porcelain insulators,

while the earth consisted of a buried copper plate. In spite of the assurance that this side of the installation was beyond reproach, I took steps to examine the aerial and earth switch, and the respective earth and aerial wires were removed from the switch terminals.

The trouble at once became apparent. In his haste to get the set working at the earliest possible moment my friend had to admit that the aerial had been erected hurriedly, and he had omitted to remove the enamel insulation from each of the seven individual wires forming the continuous aerial and down lead. This had effectively insulated his aerial from the switch terminal, but it was only the work of a few moments with a piece of sandpaper to remove the offending enamel, reconnect and all was well again.

The First Rule

Poor connections and joints in battery leads will result in cutting down the filament or heater current leading to low emission from the valves and poor performance both by way of volume and quality. Odd bits of thin wire or flex led to accumulators speedily corrode and ultimately contact is broken.

The first rule for the external connections to your set, therefore, is—use good quality insulated wire of ample section, and let each lead be one continuous length without joints. If, for economy's sake, you must join up two shorter lengths, make a good long twisted joint, and then solder it if at all possible, afterwards insulating the joint with good tape.

Another series of troubles is due to "bunched" leads. If several cables carrying the different currents employed in a radio receiver are arranged close together side by side, especially over a considerable distance, mutual induction between the circuits will take place, and the current in one circuit will be modulated by the changes in current in another circuit. Thus, a wire carrying A.C. mains current, either as the supply to an eliminator or low tension A.C. heating current, if run alongside aerial, earth or H.T. leads, may introduce serious hum. It is bad enough when such induction occurs due to concealed electric light wiring, but hum is almost inevitable when leads of all descriptions are allowed to trail or hang at will in the neighbourhood of the set. One of the worst instances that was brought to my notice the other day was where aerial, earth and A.C. mains wires were taped together for over three feet and then entered the cabinet of a radio gramophone through one hole. In another instance the flexible lead for a table lamp ran alongside the earth wire and caused considerable hum, which was cured immediately the lamp wire was moved.

Annoyance and Danger

There are, of course, many wires which it is perfectly safe to bunch. In a battery-operated set there is no harm in running both high tension and low tension leads (and G.B. leads, if this battery happens to be external to the set) in one composite cable such as is shown in Fig. 2, which illustrates an output stage unit. Do not adopt this practice, however, in a mains set. The heater wires must be kept away from all other wires, and should be of thick twisted flexible, preferably metal screened.

(Continued on next page.)

WARE WIRELESS WIRES
(Continued from page 78.)

So much for the technical disadvantages of badly-arranged wiring. There are, in addition, other points calling for equal consideration. Trailing wires are a source of considerable annoyance and even danger. They are apt to catch in people's feet, either tripping them up or pulling the receiver, batteries or speaker down on to the floor and resulting in considerable damage either to the apparatus itself or to carpets due to spilled acid. Then again, a long supply lead from a distant plug or lamp holder, used for an A.C. mains set or an eliminator, is not only inconvenient because it necessitates a journey to the opposite side of the room when it is required to switch the set on or off, but should it become disconnected or broken may cause a short circuit, blowing the house fuses and possibly causing other damage.

When installing a mains set it costs very little extra to have a plug fitted in a convenient position near the receiver so that a short and neat flexible wire is all that is necessary for connecting the set to the mains. At the same time, it is best to have an independent switch fitted at the plug point if no switch is incorporated in the set, as it is highly inconvenient as well as somewhat dangerous, to manipulate a live plug in an obscure and inaccessible corner every time it is required to switch the set on or off.

Out of Sight

We now come to the problem of neatening the external wiring to the set. It should be a golden rule that all wires must be, so far as is practicable, out of sight as well as short, and of ample section. Such wires as earth lead, loud-speaker extensions and so forth, can be fastened to picture rails or skirting boards with insulating staples, and will then be inconspicuous and safely tucked away. Battery leads, however, present something of a problem which is, moreover, bound up with another, namely that of where the batteries are to be located. No stretch of imagination

can make an accumulator and a high tension battery objects of beauty, yet they are essential and must be accommodated fairly close to the receiver.

If the set is a radiogram, or is housed in a capacious cabinet, there will probably be room for the batteries inside. If not, there are several alternatives. It is sometimes possible to have a small pedestal cupboard specially for "the wireless" when the set and loud-speaker can stand on the top and the batteries may go inside. In other cases, the receiver may be located within a few feet of an existing cupboard wherein room may be found for the batteries. Many sitting rooms, however, are without such convenient features and some attempt must therefore be made to camouflage or conceal the unsightly if necessary batteries.

One scheme is to make a battery box big enough to hold all the batteries and to place this in the most inconspicuous position available near the set. Possibly it may be hidden behind some other piece of furniture. In such a case it should be possible to run the connections from the set to a point a few inches from the battery box, neatly fastening the wires to the wall or skirting and leaving just sufficient slack for the connections. Or the box may be fitted with terminals and plug connections inside to permit run down or exhausted batteries to be removed without disconnecting the main wires.

Failing any method of concealing batteries, they should be placed adjacent to the wall, and as out of the way as possible, with the wires run to them from the set in the neatest manner. A wooden block with suitable plugs and sockets fitted close to the batteries may terminate the permanent wiring, the actual connections to the batteries being made by plugs and flexible leads.

A HANDY BOOK FOR HOME CONSTRUCTORS.

24 Tested Wireless Circuits. 96 pages fully illustrated, 1/-, or 1/2 by post from GEO. NEWNES, LTD., 8/11, Southampton Street, Strand, W.C.2.

THE COLD VALVE

(Continued from page 65.)

Then at greater signal strengths than that corresponding to the pre-set potential of the potentiometer, the control becomes

fully operative and reduces the signal to the proper level.

This effect is shown in simple diagrammatic form in Fig. 5, where it is possible to make a comparison between the two methods. In passing, it should be noted that the resistance value of the potentiometer shown in Fig. 4, should be such that the total voltage drop across it, due to the total anode current, is about 10 volts.

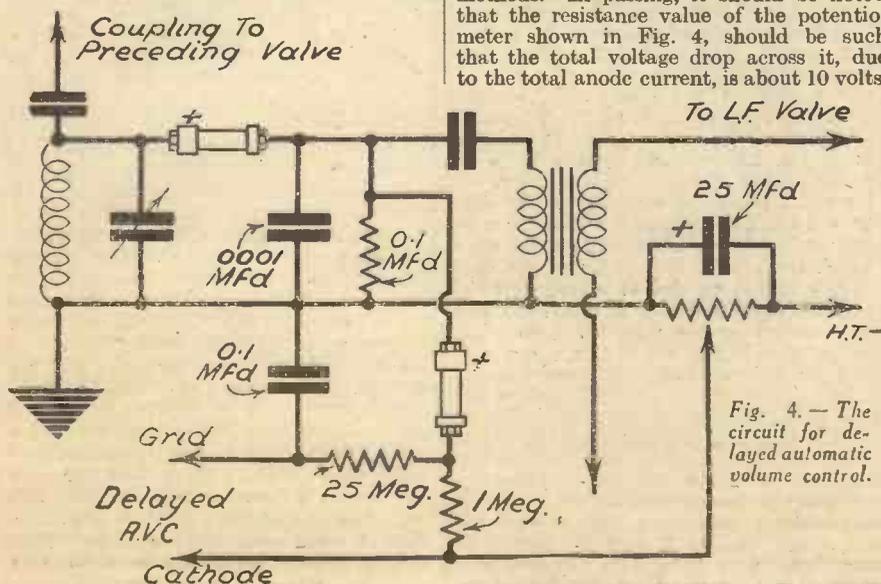


Fig. 4.—The circuit for delayed automatic volume control.

EXPRESS EASY PAYMENT SERVICE

We specialise in the supply of all radio goods on convenient easy payment terms. We have supplied many thousands of listeners in the past 8 years and every effort is made to give customers complete satisfaction.

Prompt Delivery Guaranteed.

NEW LISSÉN "SKYSCRAPER" With order
KIT, including Valves, Cash Price £4/9/6. **5/-**
And 11 monthly payments of 8/6.

Q.P.P.

Everything for the new Q.P.P. circuits supplied promptly, Cash, C.O.D. or Easy Terms. We shall be pleased to advise customers on all Q.P.P. matters.

R.I. PUSH-PULL INPUT TRANS-FORMER AND R.I. P.P. OUTPUT CHOKE. With two Mazda, Cossor or Mullard Pentode Valves. **5/10**
Cash Price: £3/4/-
And 11 monthly payments of 5/10.

Same as above, but with two Super Power Valves instead of Pentodes. **5/4**
Cash Price £2/13/-
And 10 monthly payments of 5/4.

VARLEY P.P. INPUT TRANSFORMER AND VARLEY P.P. OUTPUT CHOKE. Complete with two Mazda, Cossor or Mullard Pentode Valves. **6/4**
Cash Price £3/9/-
And 11 monthly payments of 6/4.

Same as above, but with two Super Power Valves instead of Pentodes. **5/4**
Cash Price £2/18/-
And 11 monthly payments of 5/4.

ACCESSORIES

BLUE SPOT 99 P.M. MOVING-COIL UNIT. With order **5/-**
Cash Price £2/19/6.
And 11 monthly payments of 5/6.

R. & A. "VICTOR" PERMANENT MAGNET MOVING-COIL REPRODUCER DE LUXE. With 6-ratio transformer and cadmium-plated grille. **6/5**
Cash Price £3/10/-
And 11 monthly payments of 8/5.

EXIDE W.H. HIGH-TENSION ACCUMULATORS (120 volts, 5,000 M/A). The cheapest and best high-tension supply where mains are not available. **7/-**
Cash Price £3/15/-
And 11 monthly payments of 7/-.

ATLAS ELIMINATOR A.C.244. Three H.T.appings. 20 M/A output. **5/-**
Cash Price £2/19/6.
And 11 monthly payments of 5/6.

SET OF THREE NEW VALVES. With Mazda, Cossor, or Mullard. 1 S.G., order 1 detector, and 1 power. **5/2**
Cash Price £1/12/3.
And 6 monthly payments of 5/2.

We shall be pleased to send you a quotation for any radio goods you may require. Price List free.

All above Carriage Paid. To avoid delay, will customers kindly send first payment with order. (Dept. P)

The **LONDON RADIO SUPPLY COMPANY** ESTD 1925
11, Oat Lane, Noble St., LONDON E.C.2
Phone NATIONAL 1977

Tune in on this 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.

No 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 Servicing, 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. 94, International Buildings,
Kingsway, London, W.C.2.

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

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

Name..... Age.....

Address

SHORT-WAVE SECTION

THE EELEX CONVERTER



The Eelex short-wave 8-pin reversible coil and base.

WE have several times drawn attention to the fact that a short-wave adaptor and a short-wave converter are totally different pieces of apparatus, and it would perhaps not be out of place to once again point out just what this difference is. Both pieces of apparatus employ a single valve, together with a coil. In the adaptor, however, a grid leak and condenser are also included, so that the circuit of an adaptor is simply that of an ordinary single valve detector, with the coils so chosen that it tunes to the short-waves only. The output circuit of this adaptor is supplied by means of a four-pin plug, and this is fitted with pins of the same size, and with the same displacement as a normal valve base. To use the adaptor, the detector valve is removed from a normal broadcast receiver and the plug of the adaptor is inserted in the valveholder in place of the detector valve. The latter is inserted in the holder in the adaptor, and the effect of this is that the adaptor becomes the tuning side of the normal broadcast receiver, with amplification carried out by the L.F. stages of this receiver. Obviously, if the broadcast receiver employs one or more H.F. stages, these are not brought into operation with the adaptor, and the complete arrangement therefore consists of a detector valve plus L.F. stages. The converter, however, is a much more elaborate piece of work. It still employs a valve and coils, together with the four-pin output plug arrangement. The method of connection employed in the converter, however, makes the valve act as a detector *plus* an oscillator valve, and the effect of this is that a signal received by the aerial and passed into the converter has its frequency changed to some value which is fixed by the design of the coils. If now this is coupled to a receiver which employs high-frequency stages, these may be adjusted to the wavelength to which the original signal was changed, and they may be employed to carry out amplification of this new signal frequency before passing the signal on to the detector valve for rectification and subsequent L.F. amplification. Such an arrangement is obviously much more efficient than a single detector and L.F. arrangement.

The Converter Chassis

The Eelex Converter, manufactured by Messrs. J. J. Eastick and Sons, employs

SHORT-WAVE

this arrangement, and this is a most efficient piece of apparatus, being entirely self-contained. There are many readers, however, who do not wish to add another cabinet by the side of their existing receiver, and yet who would like to take advantage of this method of obtaining long-distance short-wave signals. The converter chassis illustrated on this page is the solution to their problem, and Messrs. Eastick are to



The Eelex short-wave converter chassis.

be congratulated in putting this useful accessory on the market. It consists, as can be seen, of a bakelite base, fitted with valve-holder sockets, coil sockets, a change-over switch and terminals. Inside the base are the other necessary components, and all the wiring, a cover being fitted to prevent damage or the accumulation of dust. The chassis may be screwed to the baseboard, or on the inside of a cabinet, of the normal broadcast receiver, and connected up to provide the superheterodyne short-waver, with the added advantage that the small change-over switch shown on the left of the chassis may be brought into operation to convert the apparatus, when desired, into the normal broadcast receiver. An additional single-pole change-over switch, a small variable condenser, and a reaction condenser are also needed to complete the converter circuit, but as the chassis only costs £1 15s. the conversion is not an expensive proposition.

Special Coil

Attention must also be drawn to the novel form of tuning coil which is used with this chassis. It is shown separately, with its base, and it will be seen that eight pins are used on this coil. The arrangement of the pins, however, permits of the coil being placed on the base in two different positions. The coil, which is the same as that used in the converter, covers two separate wave-bands, one from 15 to 30 metres, and the other from 28 to 60 metres. To change the range, the coil is simply removed from the base, given a turn and replaced in the alternative position. This removes one of the great defects of short-wave work, and enables the losses introduced by switches to be done away with. The coil, with base, costs 7s. 6d., and a .0002 mfd. tuning condenser is required to cover the two wave bands mentioned.

MY OPINION!

By the Editor

"Practical Wireless,"
8-11, Southampton Street,
Strand, W.C.2.

My Corner

THE vast amount of correspondence I receive each day often raises questions which are the better for being aired. Hence this new weekly corner. The title is not meant to be provocative—and if you disagree with my opinions, you may rely upon equal prominence being given to the opposite point of view. Our policy is a simple one—service to the reader, and the leading position now occupied by PRACTICAL WIRELESS indicates that the policy is not only right, but that it was wanted. Our contents are practical, free from guff and unhampered by trade interests. I merely mention this in case you are a new reader and have missed earlier announcements.

Knobs

MILLIONS of words have been indited about knobs, and the problem of whether a wireless set should have one or many is still unsolved. I can sympathise with the nonplussed reader. He has been accustomed to advertisements which tell him to drink more milk, drink less milk, eat more fruit, eat less fruit, eat less meat, eat more meat, to spend more, to save more (truth in advertising, eh?), and now wireless adds to the confusion. At one moment experts tell him that the future radio set will only have one knob, and then they produce designs with half a dozen or more! Take my word for it—only a very few sets in the future will have "one-knob control" unless the public is prepared to have one-station receivers. Almost every listener has a different viewpoint; some are nomads, others are complacent stay-at-homes—ethereally speaking. Hence—the knobs!

Summer-time Radio

WIRELESS constructors in the past have been encouraged to make their hobby seasonal. A certain section of the Press has spoon-fed them with designs for a few months, and left the summer season alone, save for a few sparkling literary diapasos from alleged journalistic wags. PRACTICAL WIRELESS is going to show you how to enjoy radio the whole year round. Open-air radio will form a strong platform in our policy, and real outdoor radio at that!

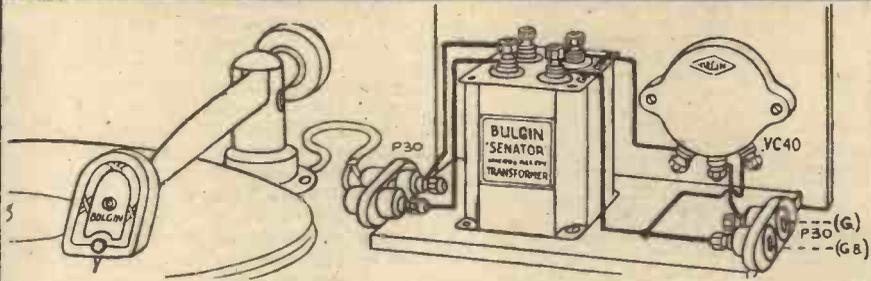
Our Specifications

A READER who evidently has become accustomed to the parenthetical catalogue of the entire component industry which nowadays goes under the name of specification, recently sent me a letter complaining of a "whistle" in the "Fury Four" he had constructed. He applied to me, under my personal guarantee, to help him. Investigation showed that he had not used one single component specified. I went to enormous trouble to get the "Fury Four" right, and this reader (I hope there are not others) wastes a lot of money and time getting it wrong!

Another reader adhered to the specification and then added to it, thus upsetting the balance of the whole circuit.

F. J. C.

TREBLE YOUR AMPLIFICATION



If, when using a Pick-up, you are not getting sufficient amplification, here is a way to overcome the difficulty without fitting another valve. Connected as shown, the "Senator" will treble the input from any Pick-up. This illustration shows a made-up unit, but the Transformer can be accommodated inside the cabinet and the Volume Control omitted, although advisable in most cases. The response curve being straight from 50 to 6,000 Cycles per second, the output from the Pick-up is not distorted. The "Senator" is also ideal for parallel feed coupling.

LIST No. L.F.11.

6/9

Send for 80 p.
Catalogue "N."
Enclose 2d.
Postage.

A. F. BULGIN & CO., LTD.

ABBAY ROAD, BARKING, ESSEX.

Telephone: Grangewood 3266-7



Send for 80 page Catalogue & Manual
200 Illustrations. 60 Diagrams. Enclose 2d Postage

FAR BETTER H.T. COSTS MUCH LESS

Further Amazing Testimony of Standard Battery Users WRITE FOR FREE BOOKLET

"It makes my set twice as good," says F. M. (Whitworth). And you may be sure of similar satisfaction wherever you live. Then, how cheap it is to run! For as the Technical Editor of 'Popular Wireless' says: "in a sense it NEVER WEARS OUT." Here is the only solution to your H. T. problem. Better reception and a great saving in hard cash. The Standard RECHARGES ITSELF and so will never let you down at inconvenient moments. When, at long last, it needs replacement you just change the cartridges yourself at 3½d. each.

EVENTUALLY you will tire of wasting money. Why not now! We sell direct to GUARANTEE your satisfaction, so take the first step now by writing for the STANDARD FREE BOOKLET. A postcard will do.

Model H5

126 VOLT STANDARD BATTERY
No. 3 size. 84 cells, 12,500 milliamp capacity.

Cash 37/8 Easy deferred terms available
Price 37/8 in England, Scotland and Wales
STANDARD BATTERY Co. (Department N.W.)
184-188, Shaftesbury Avenue, London, W.C.2

SPECIFIED for the

ALPHA PUSH PULL 3

and also for the

FERROCART Q.P.P. HI-MAG. 3

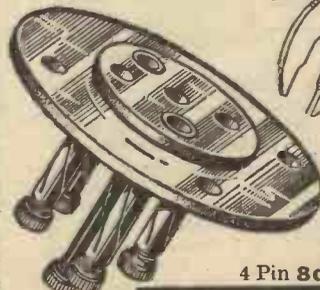
Experience has proved to the designer the wisdom of specifying only CLIX where perfect contact is essential.

CLIX "MASTER" PLUG

Firm grip and full contact with ANY battery socket. Curved ends for easy insertion 1½d.

CLIX NEW SPADE TERMINALS

Specially designed collar definitely prevents corrosion. Positive metal-to-metal wiring. Large type as specified 2d. Small type (Nickel-Plated only) 1½d.



CHASSIS MOUNTING VALVEHOLDER. Sturdily built. Perfect contact with any type of valve pin

4 Pin 8d. 5 Pin 9d.

CLIX Leaflet N/25 free on request.



LECTRO LINX LTD., 79a, ROCHESTER ROW, S.W.1

SOUTHERN RADIO'S SET MANUFACTURERS' GUARANTEED SURPLUS

MAINS TRANSFORMERS. 250-250-60 m.a. 4-volt 3 amp., 4-volt 1 amp., 10/3 each. All capacities in stock and specials made to order. Mains Transformers to suit Westinghouse-Rectifiers H.P. 4, 5, 6, 7, 8 or 9, 13/- each. **ALL TRANSFORMERS GUARANTEED 12 months.** **READY RADIO "303"** Three Valve Battery Kits less Valves, 21/-, with three specified Mullard Valves, 39/- each (List, £3/10/0) Ready Radio Meteor Screen Grid 3-valve Kit less valves, 27/6, with three specified Mullard Valves, £2/10/6 each (List, £3/7/6); Ready Radio Meteor Screen Grid 3-valve "A" Kit, including Cabinet and Celestion Moving Coil P.M. Speaker less Valves, £3/7/6; with three specified Mullard Valves, £4/12/6 each. **MULLARD RADIO FOR MILLION THREE-VALVE A.C. KIT,** complete with Three Specified Mullard Valves, £3 12/6 each (List £5/10/0). **ALL ABOVE KITS ARE BRAND NEW AND PACKED IN ORIGINAL SEALED CARTRONS.** Screened Chokes (H.M.V.), 1/- each, 9/- doz. Genuine Amplion Loud Speaker Units, 2/9 each (Listed, 12/6); Radiophone Volume Controls and Switch combined, 3/9 each (Listed, 10/6); Dual Gang Condensers 0.0003 (H.M.V.), 6/- each (Listed, 29/6); **CYLDON THREE GANG CONDENSERS,** .0005 with Trimmers and fully screened, 8/9 each (Listed, 32/-). **S.G. BROWNS A.C. MOVING COIL Speakers,** incorporating Igranic Elcon Rectifier, 12in. cone, 35/- (Listed, £3/10/0); Condensers 4 mfd., 2/6, 2mfd. 1/8, 1mfd. 1/- each. (All 750-volt Test.) **EVERY ARTICLE SOLD BY US IS GUARANTEED and Carriage Paid.**

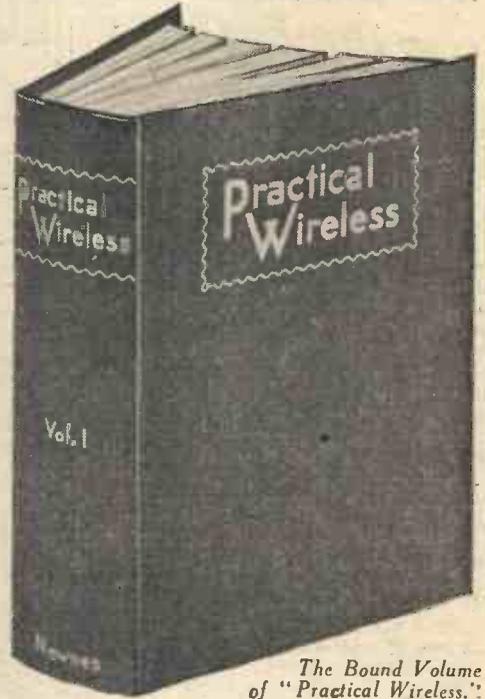
SOUTHERN RADIO,
323, Euston Road, London, N.W.1
(Near Warren St. Tube). Phone: Museum 6324

BINDING CASES AND INDEX FOR VOL. 1 OF "PRACTICAL WIRELESS."

Regular readers of PRACTICAL WIRELESS who are anxious to keep their copies in a permanently consultable form, will be interested to know that binding cases, title page and fully cross-referenced index will be available shortly at the nominal price of 2s. 6d. (by post 2s. 10d.). The index separately will cost 4d., post free. Volume I of PRACTICAL WIRELESS comprises twenty-six issues, commencing with No. 1 (dated September 24th, 1932) to No. 26 (dated March 18th, 1933). The illustration shows the really attractive style of binding case supplied. It is of rich royal blue art book cloth, boldly lettered on the shelf and front side with Peerless Silver Leaf. These binding cases and semi-annual indexes have been produced for the convenience of the reader so that he can readily turn up the particular article to which he wishes to refer. Postal orders should be addressed to:

The Publisher,
George Newnes, Ltd.,
8-11, Southampton Street,
Strand,
London, W.C.2.

Back issues to complete your volume may be obtained for 4d. each, post free, from the Back No. Dept., Exeter Street, Strand, W.C.2.



The Bound Volume of "Practical Wireless."

WHAT IS "ENGINEERING OPPORTUNITIES"?

"ENGINEERING OPPORTUNITIES" is a 250-Page Hand-book that has been prepared after years of patient search into the possibilities of various Engineering Careers. It shows clearly and definitely the way in which you may carve out a successful career in your chosen branch of Engineering, irrespective of your age, education or experience.

Among a host of other things, it outlines Home-Study Courses in all branches of Civil, Mech., Elec., Motor, Aero., Wireless and "Talkie" Engineering and shows the easiest way to pass A.M.I.C.E., A.M.I. Mech. E., I.E.E., A.M.I.A.E., M.I.M.T., G.P.O., Matriculation, Civil Service and other Examinations.

"ENGINEERING OPPORTUNITIES" is a unique Hand-book that you should most certainly read. Send for your copy to-day—FREE of any cost.

British Institute of Engineering Technology,
399, Shakespear House, 29/31, Oxford Street, London.

250 PAGES FREE

Write for Illustrated Catalogue of RADIO-GRAMOPHONE CABINETS

of exclusive modern design, made by craftsmen, in highly figured Oak, Walnut or Mahogany, post free **REMARKABLE VALUES.**

Cabinets made to order a speciality. *Maker, under license, of the HOWE BOX BAFFLE.* Recommended by the B.B.C. Full details on request.

GILBERT,
Cabinet Maker, - SWINDON
Estimates Free. Est. 1866



10,000 GRAMO-MOTORS FROM STOCK

BIG CASH DISCOUNT ALLOWED! Make a Gramophone or Radiogram. Order loose kits or sets and assemble them at home. Get for 3d. our new 64-page Catalogue with instructions how to make them. We sell motors from 7/6, pick-ups, big volume horns, loudspeakers, radio kits, complete Wireless Sets, gramophones, radiograms. Buy your Radio Set through us, 1933 all brands list free. Established 1903. Trade supplied.



The REGENT FITTINGS Co., D.285, 120, Old Street, London, E.C.1.

SERADEX FILTER CHOKES

- C.B.S. 30H carry 30Mc., 800 ohms, in metal case. **3: 11**
- (See "Wireless World" review of C.B.S.)
- C.B. As C.B.S. but unshrouded. **3: 6**
- C.Q. Special Quiescent P.-P. model. Ratios 1:1, 1.4:1, and 2.8:1 **10: 0**

Full lists for stamp from:
T. PEPPER, 48, WAKE GREEN ROAD, BIRMINGHAM, 13.

APOLOGY
Owing to exceptional and unexpected demand for P.W. 7/6 Battery Charger, we regret slight delay in delivery; this is now overcome, all parts being obtainable from stock. Complete Parts, 7/6.

FROST RADIO Co., 21, Red Lion St., London, E.C.1.

THE ABC OF SELECTIVITY

(Continued from page 54).

sometimes cause a slight hissing background to reception it is usual to use from 1,000 to 5,000 ohms.

The circuit (Fig. 5 (c), is not very much used, but I have included it in case you would like to try it. As the coupling condenser is across the "top" end of the coils it must be very small indeed, otherwise the coupling will be too great. About 2 micro-microfarads will be required. By using a neutralizing or trimming condenser of about .00004 mfd., and with a very low minimum capacity, you can vary the coupling until a suitable value is arrived at.

Pros and Cons

Now let us see what are the comparative merits of inductive and capacitive coupling. Well, first of all they each have opposite characteristics. For instance, with inductive coupling the tuning is more selective but less efficient on the long-wave end of the tuning range, while with capacitive coupling the tuning is sharper and the signals somewhat weaker on the lower end of the tuning scale. On the face of things, therefore, it would appear that the ideal arrangement would be a combination of the two systems and, indeed, many commercial designs do actually use a mixed coupling. However, there are certain cases where either purely capacitive or purely inductive coupling is most suitable. To give but one example: Where other tuned circuits follow which are more selective on the long-wave end the use of capacity coupling, which is more selective on the short-wave end, would be the best, as it would then compensate for the deficiency in the other circuits.

Still another method, which I ought to mention before leaving the subject of couplings, is that in which a resistance is used. It is of the order of 100,000 ohms and is connected between the top end of the two coils in the same way as the condenser in

Fig. 5 (c). This arrangement is employed in a certain patented tuner, and as regards the maintenance of a constant degree of selectivity and sensitivity over the whole tuning scale it is ideal, since with a resistance the degree of coupling is constant for all frequencies.

How to Make a Band-pass Tuner

Those readers who would like to try out the advantages of band-pass tuning with an ordinary det. and 2 L.F. type of set, but who do not wish to go to the expense of a bought unit, might care to construct the two coils shown in Fig. 3. The coils should be mounted with their axes at right angles, and should be at least 3in. apart, as in Fig. 6, so as to ensure negligible inductive coupling. Coupling is then provided by means of the .01 mfd. condenser shown. The circuit is given in Fig. 7. A .0003 mfd. series aerial condenser is used, and by careful adjustment of this the two tuning condensers, which, of course, should be of the same make and type, can be made to track together over practically the whole scale.

Those of an experimental turn of mind will no doubt want to try the effects of slightly different coupling-condenser values, and also the production of a mixed filter by altering the angle of the coils and so introducing a certain amount of magnetic interaction. In the case of a mixed filter a larger condenser, say, about .05 mfd., will be necessary.

Before concluding I must say a word or two about reaction with band-pass filters. To screw up the reaction to the limit in a set employing this type of tuning is to defeat the whole object of the design! This is because too much reaction tends to destroy the true, square-peak character of the response curve and to make it pointed. Of course, it will increase selectivity and sensitivity (providing the circuits are properly tuned), but will introduce sideband cut-off—the very thing the B.P. filters are intended to prevent.

PRACTICAL WIRELESS POSTAL RADIO BARGAINS

**SAVE MONEY...ORDER DIRECT
ORDER WITH CONFIDENCE.**

EASY TERMS PROMPT DELIVERY

Any Amplion, Blue Spot, Baker, Celestion, Epoch, R. & A. Rola, Sonochorde, or W.B. Moving Coil Speaker supplied.

Send 5/- only

and pay the balance by monthly instalments. No references. Entirely private and confidential.

KITS, PARTS, SETS, ELECTRIC CLOCKS ON EASY TERMS.

Write for Catalogue and details to:
TURNADGE & PARTNERS, LTD.
Ludgate House, Fleet Street, London, E.C.4.
Telephone: Central 1903.

The "WHITEHALL" range



Whatever the size of your set there's a reasonably priced and handsome "Whitehall" cabinet to suit it.

WHITEHALL DE LUXE STANDARD, 16" wide, 11" deep, 17 1/2" high. Choice Figured Oak, 30/- Cash.

WHITEHALL DE LUXE JUNIOR, 14" wide, 8" deep, 14" high. Choice Figured Oak, 21/- Cash.

Prices for above cabinets Walnut or Mahogany on request.

WHITEHALL GEM, 14" wide, 8" deep, 10" high. Choice Figured Oak, 16/6 Cash.

Interior measurements are quoted for all cabinets. All cabinets sent carriage paid or C.O.D.

MYERS-HUNT CABINET CO.
7, AUSTIN ST., SHOREDITCH, LONDON, E.2.

AMPLION

LOUD SPEAKERS AT BARGAIN PRICES

A.C.6.	25/- Oak Cabinet Speaker	12/11
A.B.4.	59/6 Walnut Cabinet Speaker	17/6
A.B.6	90/- Walnut Cabinet Speaker	25/-

DO IT AT HOME and SAVE £ £ £



Boot repairing with Rhino-Sole is simplicity itself: a plastic compound easily spread on with a knife. It can be moulded to any desired shape of thickness and hardens ready for wear in a few hours. "Rhino-Sole" repairs rubber as well as leather footwear and is ideal for worn tennis shoes, gum boots, galoshes, crepe and uskhide. Every tube is guaranteed and contains enough Rhino-Sole for 2 good soles and dozens of patches. Send P.O. for ls. 9d. to

STEVENS' (Dept. P.), 144, Greenway Avenue, WALTHAMSTOW, LONDON, E.17.

Trade Enquiries to 172, Fleet Street, E.C.4.

32 GNS.

MARGONIPHONE RADIOGRAM, MODEL 330

OUR PRICE **£1** For A.C. Mains. 200-250 volts.

OR **19 GNS.**

Down, and balance in 23 monthly payments of 18/7 CASH or C.O.D.

★ ★ ★ ★ ★ ★ ★

Just pay a further 2/6 on delivery and balance in 5 monthly payments of 5/6 for

**PETO - SCOTT
GUARDIAN Q. P. P.
MOVING-COIL SPEAKER**

specialy designed for Q.P.P. output. Extremely sensitive, and gives perfect quality. Cash or C.O.D., Carriage Paid, 29/6.

PETO-SCOTT CO. LTD.
77, CITY ROAD, LONDON, E.C.1.
Telephone: Clerkenwell 9408/7.
West End Showrooms: 62, High Holborn, London, W.C.1.

MORE SPEAKER BARGAINS

For "Practical Wireless" Readers

Blue Spot 32/6	100U Speaker	17/6
G.E.C. 50/-	"STORK" Cabinet Speaker	19/6
LAMPLUGH 34/-	D.C. Moving Coil Speaker	15/-
LAMPLUGH 42/-	Silver Ghost Permanent Magnet Moving Coil	29/6

**CASH OR C.O.D.
CARRIAGE PAID.**

These bargains can only be obtained from the address at the bottom of this column.

REGD. "EWEBEC" TRADE MARK WONDER COIL FORMER



Enables anyone to wind coils for any circuit or wavelength with ease and certainty. Make your own coils for the published circuits at half the cost and double the efficiency. Of all good wireless dealers or direct, post free.

Terminals 1d. each. Fixing brackets 1/3 with instructions & winding diagrams.

Pat. No. 369735 TRADE ENQUIRIES SOLICITED with screw 1d. each. 28 D8C wire 2oz. 1s.

1/3

Send 1/4d. stamp for full particulars.

Evington Electrical Manufg. Co., BECKINGHAM ROAD, LEICESTER.

SEND 2/6 ONLY

PETO-SCOTT CO. LTD.
77, CITY ROAD, LONDON, E.C.1.
Telephone: Clerkenwell 9408/7.
West End Showrooms: 62, High Holborn, London, W.C.1.

GUARANTEED COMPONENT AND RECEIVER BARGAINS

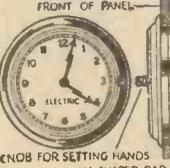
CAMCO-PEARL	70/- Radiogram Cabinet	42/-
"BROWNIE"	2-valve Battery Receiver complete with Valves and Batteries	45/-
IGRANIC	37/6 Universal Mains Transformer	12/6
PYE 12/6	L.F. CHOKES	4/11
PYE 16MFD	Condenser Blocks, 250 volt. working 4 x 4 x 4 x 2 x 2	7/6
PYE .25	Condensers.	6d.
Fixed Condensers,	12 Assorted Dubilier and Edison Bell	2/-
SUPREMUS D.C.	ELIMINATORS	16/6
UTILITY 22/6	2-gang .0005 Condensers with Trimmers	7/6
TELSEN,	10/6 Universal Core Chassis	3/11
DAPTACON (BRITISH)	Pick-up and Arm	6/11

CASH OR C.O.D. CARRIAGE PAID.

PEARL & PEARL,

190, Bishopsgate, London, E.C.2

FIT THIS ELECTRIC CLOCK TO YOUR SET!



NO MAINS NEEDED! KEEPS CORRECT TIME! NO WINDING!

Works off small battery lasting 12 months, or can be plugged into G.B. battery without affecting reception. Uses practically no current. Fits into hole 5 1/2 in. dia. in any panel up to 1/4 in. thick. Easy to fit—no screws required. Only 1/4 in. from front of panel to back of case. Swiss movement. Hands set from front. Nickel-plated bezel. Useful addition to any set.

2/6

COMPLETE WITH BATTERY

POSTAGE 6D

RIVERSIDE MFG. Co., Ltd.
Dept. 21, Crisp Road, Hammersmith, W.6.
Telephone: Riverside 6392.

SET CRACKLING IS ANNOYING! IF IT'S YOUR SWITCH FIT THE "BUSCO" SWITCH

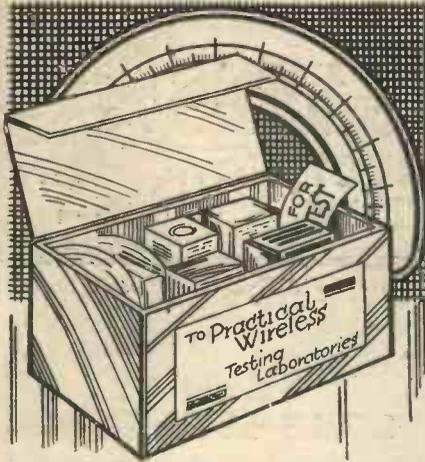


each 1/3 Post. Free. Patents Pending.

and ensure perfect switch contact! There is no contact point to turn round, and when you "switch on" you have contact like a power switch. They are as cheap as the inferior type but far superior in operation.

From your local dealer or

BUSBY & CO., LTD. (Patentees)
Dept. P.W., PRICE ST., BIRMINGHAM



Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

BULGIN DUAL CONTROL

THE illustration below shows the new ganged volume control manufactured by Messrs. Bulgin. These controls are rated at 3 watts, are wire-wound, and a novel feature is the inclusion of a metal back plate, which is not connected to any part of the apparatus. It may thus be earthed to provide a shield. The shafts of these controls are of the standard 1/16 in. thickness, so that any standard knob will fit. The units are obtainable in any values, and the prices of the individual resistances, from 500 to 100,000 ohms, vary from 3s. 6d. to 4s. 6d. A further model is made which is fitted at the end with a quick-make-and-break switch, and this will find a number of applications in the normal receiver.



Bulgin ganged volume controls.

TELSEN BAND-PASS COILS

THE illustration gives a good idea of the new Telsen band-pass coil units which are now obtainable in several forms. That which is illustrated is the standard input band-pass unit suitable for use in the aerial circuit. The medium wave-coil is wound at the upper portion of the air-spaced former, whilst the long-wave coil is pile wound in the slots at the lower end. No actual connections are made in the coils, and, as a small separate inductance is included, it is possible to use these coils for any form of band-pass coupling. The inductance of the medium-wave winding is approximately 160 microhenries, whilst for the long waves a value of 2,170 microhenries is provided. The wavelengths covered are from 200 to 560 metres and from 740 to 2,100 metres, assuming the use of .0005 mfd. tuning condensers. The



The new Telsen band-pass coils.

units are complete with base plate and switch rod, and, in addition, a neat escutcheon, fixing screws, etc., are provided.

RIVERSIDE ELECTRIC CLOCKS

MANY listeners already possess clocks of the synchronous type, operated from the electric-light mains. There are many others, however, whose houses are not fitted with the electric supply, and who would like a clock which requires no winding or other attention. The Riverside clock operates by means of a small grid-bias battery which will last for months. It is a very accurate time-keeper, and the current consumption is extremely small. The front of the clock is provided with a flange, so that a small hole may be cut in the front of a wireless or loud-speaker cabinet, and the clock held secure by means of the clamping bolt supplied with it. The front is nickel plated, and a small screw in the centre of the glass enables the hands to be adjusted when desired. The price is only 12s. 6d.

ELEX TEST PRODS

IN our issue dated March 18th we commented on the Elex test prods, and mentioned that the price was 2s. We now understand that this was an error, and that the price should be 1s. 9d. each. Will readers kindly note this?

GRELCO LAMP ADAPTORS

IN the article on a Radio workshop which recently appeared in our pages, one or two ingenious methods of obtaining more than one electric light supply from a single socket were shown. We are now informed that Mr. E. J. Clarke, of 70A, Norton Road, Wembley, Middlesex, has obtained a number of these adaptors in a commercial form. Samples which have been submitted to us prove very interesting. One form, in brown bakelite, consists of a "V" shaped moulding having two pins at the lower point of the "V" and two sockets on each end of the opposite side. It may, therefore, be plugged into a normal 5-amp point and two separate leads taken from the opposite side. This would allow, for instance, a lamp and a soldering iron, or any other combination desired. Another adaptor is shaped something like a letter "M," and is provided with three sets of sockets and one set of pins, so that three different articles may be used from the one point. Owing to the angle of these pieces, normal round top plugs may be used without any risk of one adaptor fouling another. Naturally, where a large number of items are required on the same point, one adaptor may be inserted in the other. The price is only 1s. 6d. Another form of adaptor has an ordinary bayonet lamp-holder at one end, whilst the opposite end is finished to enable it to plug into a normal lamp-socket. At either side of the moulding are two sets of sockets which take the normal 5-amp two-pin plug. This also will be found very useful in the workshop.

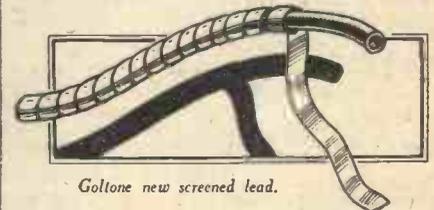
FOTOS VALVES

WE have received samples of the Fotos valves for test, and these are now manufactured in this country. The valve chosen for test was Type BD 9, which is a power valve. The impedance is 3,600 ohms, and the amplification factor is 9. The valve is rated to take up to 200 volts H.T., and the filament consumption is .32 amps. at 2 volts. With a slope of 2.5 mA/v., this is a very good valve, and tested in a normal three-valve receiver gave very good results both from the point of view of quality and volume. The price is only 6s. 6d. H.F. valves are obtainable from 5s., and detector valves from 5s. 6d.

GOLTONE ARMoured SLEEVING

THE new type of screening lead now produced by Messrs. Ward & Goldstone is shown on this page. Instead of the usual plaited wire sleeving, this new material consists of a thin strip of tinned copper wrapped in spiral form round ordinary varnished tube of the systoflex type. The adjacent turns of the copper are allowed to touch, so that the effect is a perfectly continuous metallic surface. The

advantages claimed for this particular idea are: greater flexibility; easy baring of the end for connection purposes; no wire ends to pierce the inner tube and cause short-circuiting; and, finally, it is much simpler to complete the earth connection. All that has to be done for the purpose is to unwrap the end few inches as shown in the sketch, and take the copper to the nearest earthing terminal. We understand that the material will be available in yard lengths in sizes from 2 mm. upwards. We also understand that Messrs.



Goltone new screened lead.

Ward & Goldstone have now introduced a department to deal with the question of interference elimination. We have already commented upon their interference chokes, screened aerial leads, etc., and in view of the number of individual cases which arise, in which the listener is in doubt as to what course to pursue to remove some form of interference, the department referred to has now been introduced. A further component which has just been produced is the screened H.F. choke shown in the lower right-hand corner of this page. This is the type S.H.F., costing 4s., and is intended for use in the anode circuit of H.F. valves. It has an inductance of 250,000 microhenries, a D.C. resistance of 550 ohms, and has many applications in H.F. stages. The current-carrying capacity is approximately 50 mA.

MAGNUM SHORT-WAVE ADAPTOR

WE have received details of a new Magnum product from Messrs. Burne-Jones & Co., Ltd. This is actually a super-het converter, although it bears the name usually associated with ordinary short-wave adaptors. As such it must be employed, of course, with receivers which already employ an H.F. stage. The converter is complete with two coils covering the wavebands of 18-30 and 40 to 80 metres and battery cord, at which the price is £2 5s. If purchased complete with valve, H.T. and L.T. batteries, the cost is £3 3s. As the Converter employs its own separate H.T. and L.T. supply, it is entirely self-contained and may, therefore, be used with any receiver possessing an H.F. stage, and it may be either battery operated or mains operated, English or foreign. Two leads are provided for connection to the aerial and earth terminals of your present receiver and the latter has to be adjusted to the long waves, whilst the adaptor is used to tune in and heterodyne the desired signals. In view of the fact that the existing receiver is employed as an intermediate frequency amplifier, it must be remembered that the unit will not function with receivers which are designed to cover only the medium wave-band.



Goltone screened H.F. choke.



Practical Letters

from

Readers.



The Editor does not necessarily agree with opinions expressed by his correspondents.

"Doing a Great Service"

SIR,—After taking your fine paper, PRACTICAL WIRELESS, since its commencement, I feel I should be doing an injustice to the fine Editorial and Technical staff behind it by not at least showing a little appreciation. I have been an experimenter this last ten years, and have had brought to mind a number of successes and failures in the past by reading twelve years of Radio Progress. I have not to refer very far back to the time when the majority of commercial components were entirely out of the reach of my pocket, and one had to resort to making their own. We had no PRACTICAL WIRELESS, and no Data Sheets in those days, and most information I derived from pamphlets issued as adverts by Radio Manufacturers. How PRACTICAL WIRELESS would have been appreciated in those days, with its fine constructional articles. But to-day, it is doing a far greater service to the ever-growing number of enthusiasts, by dealing with most advanced radio in an elementary way. I have read with great interest the article, Is Reaction Necessary? by Mr. H. J. Barton Chapple. It is a fine example of the practical value of the contents of your fine paper. Wishing PRACTICAL WIRELESS, and Staff every Success.—H. B. PEGRAM (Bootle).

The Development of Tuning Coils

SIR,—May I prefix my remarks by saying that I believe your staff to be really first-class men in Radio and that no comment of mine is made in any disparaging sense, but just an adverse criticism by an onlooker. H. J. Barton Chapple has taken up many valuable pages during the past few weeks ruminating on coils, etc., that have been consigned many moons ago to the museum. May I humbly suggest that he uses his very facile pen and extensive knowledge in getting down to brass tacks on present-day problems in concrete form. Take the issue for February 25th, two pages are used on the (sic) New Development in Coils that was in principle used to my knowledge over a dozen years ago. See Dr. J. A. Fleming's book, "The Thermionic Valve in Radio Telegraphy and Telephony," page 231, paragraph 2. His suggested method of tuning I saw used at GED thirteen years ago. Now for Constructive criticism. When you publish details for constructing your really efficient coils, etc., why do you not at the same time include the figures you have had under consideration in order to give us the finished product?

For example:—

What governs your choice of a particular former, wire, and number of turns.

How do you arrive at the L.C. required, and what correction factors do you use when taking into account distributed or self capacity and the mutual induction present when aerial coil and reaction coil are used? What is the dynamic resistance—in short, sir, tell us all about it. Or do you only use abacs?

H.F. Chokes that are efficient on 20 to 2,000 metres, what per cent. H.F. energy will be "passed over" on the 15 m.c. band due to the Capacity from Terminal to terminal plus the winding? I have seen but little information published. You have got almost a corner in Radio brains—please don't hoard them.—ALBERT L. BEEDLE (Balham, London, S.W.).

[Mr. Albert L. Beedle has rather misread the article on coil development to which he refers. Of course, the principle is old, we all know that, in fact, I gave readers due credit by stating in passing "the use of iron or magnetic cores for coils is by no means new." What is new, however, is the commercial application of this principle in a form which can be used by the radio man so that its advantages are not outweighed by its disadvantages. That this has been a difficult task is borne out by the fact that so many years have passed since the idea was first mooted before a really practicable product has become possible. The same remarks apply to the method of tuning to which I referred—old in principle, yes, but new inasmuch as it has only now become really possible, hence the justification for being new.—H. J. Barton Chapple.]

A Reader's Thanks

SIR,—Many thanks for the very useful and handsome binder, which I duly received under your very generous gift scheme. It is just the thing for the amateur who wishes to keep his data sheets handy yet compact. The pocket which is provided is a very useful asset. I for one hope you will continue with further gift schemes as far as possible, also with handy gadgets and useful tips, as such are always appreciated by the average reader and enthusiast. Wishing you every success in the future with such an excellent paper.—JAMES D. MENZIES (Merton Abbey).

A Satisfied Reader

SIR,—Although only a new recruit in the intricacies of wireless, I hope you will allow me to thank you and your staff for the weekly budget of information published in the valuable and well-edited paper, PRACTICAL WIRELESS. I have taken the paper from No. 1 and shall have them bound at the end of the volume. I would also like to convey my great delight and amazement at your wonderful book of knowledge, the "Wireless Encyclopædia." Its clear and precise way of explaining the terms of all the subjects dealt with should make it invaluable to all beginners and amateurs.—F. G. WEBSTER (Worksop).

"Many Hours of Interesting Reading"

SIR,—Please accept my thanks for the Wireless Constructor's Encyclopædia, which I have just received. I am surprised at the quality and quantity of its contents, and am looking forward to many hours of interesting and useful reading. It makes a good companion to your estimable periodical PRACTICAL WIRELESS, with which I have spent many pleasant hours at sea. Wishing you every success.—THOS. H. LUMSDEN, Chief Engineer, s.s. Teakwood (West Mersea).

(Continued on page 86.)

CUT THIS OUT EACH WEEK

DO YOU KNOW?

—THAT a new type of valve base is being developed, and that it will be provided with seven pins, in place of the customary four.

—THAT for Class B amplification no grid-bias of any sort is required.

—THAT apparatus is obtainable which enables gramophone records to be broadcast from one room to another, and picked up by your receiver in the same manner as wireless.

—THAT such apparatus is termed a Modulated Oscillator, and employs only one valve.

—THAT the resistance for a variable-mu type of valve should preferably be of the "graded track" type so as to provide more even control of volume.

—THAT the voltage across a grid-biasing resistance should not be measured, but should be calculated from the current flowing through it.

—THAT when the coupling components of a band-pass filter are short-circuited, no signals should be obtained.

—THAT if signals are obtained under the above conditions, it points to the fact that stray couplings exist.

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 addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, Geo. Neunes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

FIX A PIX AND BRING IN THOSE FOREIGN STATIONS

—and cut out local and powerful stations that spoil reception of foreign concerts. A PIX increases the selectivity of any set and is better than an extra screened grid valve—no costly wave-traps. No alteration to sets needed, over 1,000,000 satisfied users testify to the efficiency of the PIX. Fix a PIX now and bring in loud and clear those elusive foreign-ers.

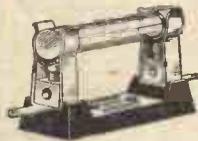


FROM ALL RADIO SHOPS OR SEND POSTAL ORDER DIRECT TO THE BRITISH PIX CO., LTD., (Dept. 489), 118/28, SOUTHWARK STREET, LONDON, S.E.1

**FIX A
P / X
TO YOUR
AERIAL
TO-DAY**

FUSES AND FUSE-HOLDERS

An exceptionally neat and compact Fuse-holder to take 1½-in. Fuses. Heavy gauge phosphor bronze clips, soldering tags and terminals. Complete with 1-amp. fuse.



Price 9d. each.

Spare Fuses, all ratings and sizes, 6d. each.

Write for complete list.

BELLING-LEE
FOR EVERY RADIO CONNECTION

Cambridge Arterial Road, Enfield, Md.

LOUD SPEAKERS REPAIRED 4/-
(Blue Spot a Speciality, 5/-)
Transformers 4/-, all repairs magnetised free. Eliminator Repairs quoted for. 24 Hours Service. Discount for Trade. Clerkenwell 9069.
E. G. MASON, 44, EAST ROAD, LONDON, N.1.

THE IMPROVED "TONIC"
self-generating trickle-charger kit keeps 2-volt accumulators fully charged. Electric mains and charging stations unnecessary. Ideal for remote places. 7/- each, postage 9d. Particulars, testimonials, with pleasure.
WILLIAMS, Netherend, Cradley, Birmingham.

Genuine **AMPLION** Units, Limited number. Over 75 per cent. reduction. Guaranteed. To clear, 2/3 each, carr. paid.—G.B. Pioneer Radio, Coptic St., W.C.1.

PRACTICAL LETTERS

(Continued from page 85)

The "Fury Four"—Excellent Results

SIR,—It may interest you to know that we have built the "Fury Four" from the circuit diagram first published together with the two photographs shown. We think that the set will evoke much interest, the layout and the results being excellent. We have demonstrated all the sets designed in your periodical, and intend to continue doing so.

We must certainly compliment Mr. Camm for his unprecedented action in personally guaranteeing his own circuit, which others have never attempted to do. With every good wish.—R. DANEBY, OLYMPIA RADIO LTD. (Bolton).

RADIO CLUBS & SOCIETIES

BEC RADIO SOCIETY

On Thursday, March 2nd. Mr. S. Stevens, B.Sc., gave a lecture on the "Westector" to members of the Bec Radio Society at Bec School, Boethcroft Road, S.W.17. Commencing his lecture, Mr. Stevens briefly outlined the principles of rectification at power frequencies, and then dealt with the application of metal rectifiers in connection with measuring instruments. Following this, members were treated to a lucid explanation on the subject of leaky grid rectification, during the course of which a series of entirely new lantern slides dealing with the chief points were displayed. The merits of Diode detection and the advantages following the inclusion of a "Westector" unit in such circuits, and in superheterodyne circuits, and as a means of providing automatic volume control, were each considered separately. The meeting concluded with the Westinghouse film on "Metal Rectifiers" being shown. Hon. Sec., Mr. A. L. Odell, 9, Westway, Grand Drive, Raynes Park, S.W.20.

THE CROYDON RADIO SOCIETY

The Society enjoyed an informal debate on "Are Short Waves Worth While?" at a recent meeting. It was soon realized that, although some did and others did not like short waves, the young members showed their approval of them in no uncertain manner. For instance, Mr. F. Betteridge spoke as an expert, for he had recently achieved fame by the demonstration of his unique short-wave set to the Society. He considered that short-wave reception was comparable to that of the medium waves ten years ago, and wondered if in ten years time reception on twenty metres would be as universal as on the medium wave band to-day. Certainly, its apparatus would be simpler, he maintained. The meeting ended with a lively discussion on the pros and cons of short waves. Hon. Sec., E. L. Cumbers, 14, Campden Road, South Croydon.

BURTON-UPON-TRENT AMATEUR RADIO SOCIETY

A very interesting evening was spent by the members of the Burton-upon-Trent Amateur Radio Society on March 7th, when Mr. P. W. S. Valentine gave a lecture on L.F. amplification. The lecture was illustrated by means of a twin two-stage amplifier with interchangeable components, so that by means of frequency records it was easy to judge the difference in response in different forms of L.F. coupling by means of quick switching from one amplifier to the other. The Society would welcome new members, and all applications should be sent to the Hon. Sec., W. A. Mead (G5YY), "Addiscombe," Burton Road, Brantson, Burton-on-Trent.

PROPOSED CLUB FOR BLACKPOOL

It is proposed to form a Radio Club in Blackpool, and any interested readers residing in this town are invited to write to Mr. G. F. Howard, 43, Cumberland Avenue, Blackpool.

THE SIDCUP AND DISTRICT RADIO AND TELEVISION CLUB

At a meeting held on March 8th, the President, Mr. E. W. Higgs, M.Inst.B.E., presided whilst a talk on "Television" was given by Mr. E. G. H. Mobsby. The following week, Mr. T. W. E. Towers lectured on "Elementary Principles of Magnetism and Electricity," and demonstrated several effects with the aid of an electroscopes, induction coils, and magnets. This was followed by a lecture on "Quiescent Push-Pull" by Mr. B. T. Wednure, who explained the system very

A Reader's Appreciation

SIR,—I am writing to express my appreciation of your paper in general, and in particular the article on Making a Dual Cone Loud-Speaker, by T. Stevens, in the No. 9 issue. I made up this loud-speaker, not expecting much, as I have read such articles before, but I was astonished at the results on the first test and heartily endorse all the author said about it. The results are all that could be desired, the depth of tone is excellent, and the bass is there without the attendant boom attached to most moving-coil speakers. I am using a balanced armature unit which is several years old, but, nevertheless, the results more than justify the trouble in making it up.

Wishing PRACTICAL WIRELESS every success.—HERBERT H. TOOTH (Salop).

thoroughly. Intending members are cordially invited to communicate with the Hon. Sec., T. W. E. Towers, 22, Crombie Road, Sidecup, Kent.

SLADE RADIO

A lecture on "Dual Speaker Equipment" was given by Mr. G. T. Peek at a meeting of the above Society held last month. He first of all described the set which had been designed for his own particular requirements, and which was capable of receiving any one of six stations at will, all of them free from interference and giving a reasonably good output. This comprised H.F., Det. and L.F. with battery valves, remote control of station selector being incorporated. Details were given of the special selector switch, which dealt with four circuits each six times, and also how the effects of the switch are cut out from the output. A full description was also given of the separate amplifier, which included two separate rectifiers, after which the two speakers were dealt with. A demonstration showed that these gave excellent reproduction of both gramophone and radio. Full details of the Society may be obtained from the Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

KETTERING RADIO AND PHYSICAL SOCIETY

Fifty members of the Society assembled on March 6th to hear an excellent lecture on "Empire Broadcasting," by Mr. F. X. J. Abraham, A.M.I.E.E., A.M.R.E., a B.B.C. engineer. Details of the establishing of the Chelmsford Station (G5SW) was given, followed by a description of the new Daventry transmitters and their aerial systems. Details of the methods employed by the B.B.C. to relay American programmes proved highly interesting. "By using three aerials spaced two miles apart," said the lecturer, "we have found it possible to obtain 90 per cent. intelligibility of the American signals with very little fading. On March 13th, Mr. Alan Hutchen, chairman of the Society, delivered a highly interesting address on "Electric Clocks," with references to the various uses of Broadcast Time Signals. Hon. Secs.: Mr. R. J. Pankhurst (G5YF), 9, Shakespeare Road, Kettering, and Mr. Thomas H. Hall (BR51018), 59, Tresham Street, Kettering.

THE SOUTHALL RADIO SOCIETY

On Tuesday, March 14th, an interesting lecture on "Television" was given by Mr. L. Swan. He explained (Continued on page 88)

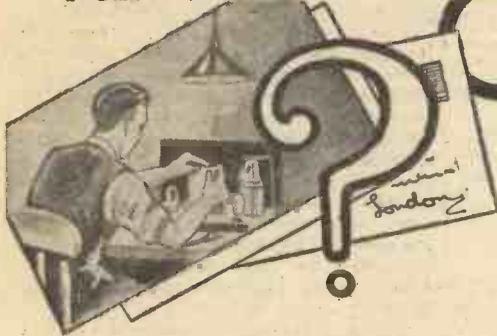
WIRELESS TERMS TRAVESTIED—3



Faulty Spaghetti.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO



If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to The Editor, PRACTICAL WIRELESS, Geo. Neuwens, Ltd., 8-11 Southampton St., Strand, London, W.C.2'

QUERIES and ENQUIRIES by Our Technical Staff

The coupon on this page must be attached to every query.

SPECIAL NOTE.

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.

Please note also, that all sketches and drawings which are sent to us, should bear the name and address of the sender.

THE A.C. "FURY FOUR"

"I have been examining the diagram of the A.C. version of the 'Fury,' and there are one or two points which are not clear to me. First of all, how is the Pentode valve biased? I see that this is of the directly heated type, and there is thus no cathode lead into which to insert the bias resistance. Secondly, where is the radio-gram. switch inserted. It does not appear on the panel."—(S. K. L., Leigh-on-Sea.)

The biasing resistance for the Pentode valve is inserted in the centre tap of the heater winding. It forms the connection from the heater winding to H.T.—. The loud-speaker return lead is joined direct to the centre-tap, and, therefore, the circuit of the last valve is made up by the anode components, the bias resistance, and back to the filaments. Obviously, therefore, the anode current of the last valve flows through the resistance, providing a suitable voltage drop. This is the only method of biasing an output valve of the directly-heated type, in view of the absence of a cathode. The radio-gram. switch is fitted on the motor-board, at the side of the turntable, and it is inserted, as shown on the theoretical circuit, in one lead of the pick-up.

BATTERY "FURY FOUR"

"I have made up the 'Fury Four,' and the volume and quality are all that can be desired. I get dozens of stations with ease, and the quality is better than I have ever heard with a battery set. I have completed a gramophone section for this, but I find that the following difficulty arises. When I first joined up the pick-up as shown on the diagram, I had, of course, to apply grid bias to the valve. I adjusted this until the signals from the record were practically as good as the radio signals, and I was highly delighted with the gramophone side. This was early in the day. When evening came I tried to get the wireless signals, but nothing would come through. After trying one or two wires, I suddenly thought of the grid bias, and when I removed this pick-up bias, in came the wireless. Is this right? I should like to know whether it denotes a fault."—(W. J., Bromley.)

The pick-up is joined to the detector valve, and, naturally, this must not have any negative bias in order to operate as a grid rectifier. Therefore, if you wish to leave the pick-up permanently connected, you must insert an ordinary on-off switch in one of the leads, in order that the bias may be disconnected when using the receiver on radio.

HOUSE LIGHTING SWITCHES

"I am suffering from a rather peculiar trouble, and I should like to hear what you suggest is the cause. Whenever a light in my house is switched on there is a peculiar scratching noise from the loud-speaker. This goes on all the time the light is on. Whilst trying to find the cause the other night, I went round the house switching on all the lights one after another. I found, to my surprise, that when every switch was on, the noise ceased. What can this be? Is there any cure?"—(R. H., Broxbourne.)

The usual cause of scratching noises from lighting switches is poor and dirty contacts. The fact that the noises ceased when all the lights were on probably is due to the fact that the total load on the mains reduced slightly the voltage and so acted as a sort of ballast across the mains and caused the arcing at the switch contacts to stop. Switch off the mains and remove the covers of all switches, and carefully clean the small contact points. If necessary bend them so that they make better contact. After some use these contacts do open slightly, and this is especially the case with cheap switches. When all cleaning has been done, switch on the mains, and watch each switch contact point (with the cover removed) and if you see any trace of blue sparks when the switch is operated, switch off at the mains again, and look to the point where the sparking occurs. You should soon be able to remove your trouble by this means, but remember not to touch the switch until the mains switch is in the off position.

TESTING AN ELIMINATOR

"I have a D.C. eliminator which I tested with a Meter, and to my surprise each tapping shows a drop of approximately 30 volts. Can I take the readings of this voltmeter as being correct, or should they be tested with a moving coil instrument. If tested with a moving coil instrument would the voltage

DATA SHEET No. 28.

Cut this out Each Week and Paste it in a Notebook

METRIC CONVERSION TABLE

	Multiply by
Centimetres to ins.	3.94
Metres to feet	3.281
Metres to yards	1.093
Sq. centimetres to sq. ins.	0.155
Sq. metres to sq. yds.	1.196
Cub. cm. to cub. in.	0.061
Cub. metres to cub. ft.	35.315
Grammes to grains	15.4
Grammes to ounces	0.035
Grammes to lbs.	0.002
Kilogrammes to tons	0.00098
Cub. cm. to fl. ozs.	0.0035
Litres to pints	1.76
Litres to cub. ft.	0.035

drop be as great as 30 volts? I am anxious to increase the power of my set and I do not want to damage the valves in any way through running too much H.T."—(E. C. D., Clapton, E.5.)

The meter which you are using is of the moving iron type and consumes far too great a current to enable it to be used for testing the output from a small mains unit. The voltage tappings are provided by means of resistances inside the unit, and according to the current flowing through these resistances, so the voltage is reduced from the total output of the smoothing section of the unit. As the average valves, used on these tappings, will only be taking two or three milliamps, the drop will be small. As, however, your meter probably consumes 30 milliamps or so, the drop is very much greater. You must, therefore, to get accurate readings, use a voltmeter with a resistance of about 1,000 ohms per volt.

D.C. RADIO-GRAM. TROUBLES

"I have a three-valve radio-gram, working from D.C. mains, and I occasionally get a pip when signals fade and then another pip and signals return to full strength. Also I wish to deepen the tone of my moving coil speaker. On the transformer there are five wires, do I have to connect a condenser to these. If so, which ones? My pick-up is earthed to the same earth as the set. Should this be so? I fancy it makes the pick-up live, as I have had several shocks from it."—(E. W. G. J., Christchurch.)

The fading of signals accompanied by a pop suggests that one of the grid connections in the receiver is faulty. Therefore, examine all grid connections, grid leaks, etc., and make quite certain that the grid pin of the valves is making good connection in the sockets. If a grid battery is employed, make certain that this has not run down. The tone of the speaker should be good enough, if it is correctly matched. You can connect a fixed condenser across the leads which go to the output valve of the set, and the value should be chosen to give you the tone you desire. The pick-up should be earthed to prevent hum, but if you find that you are getting shocks from it, we would suggest that you have not got a fixed condenser in the earth lead. Examine the wiring of the set, and you should find, between the common negative lead of the set and the earth terminal, a large condenser of 2 mfd. or so. If this is not the case, obtain such a condenser and attach it to your cabinet. Take a wire from the earth terminal to one side of the condenser, and attach the earth lead to the other side of the condenser. This is a precaution which should always be taken in receivers operated from D.C. mains.

INSUFFICIENT POWER

"I have a splendid little two-valve set, employing a detector valve followed by a power valve. I get London stations through beautifully, and can just hear the Midland. When I want to get the Northern and some foreign stations, I can hear them faintly on the speaker, but when I turn the reaction, before the signals are really loud enough to hear, the set goes pop and the signals are gone. What is wrong with it? I should like to bring in these stations a bit better as they are too weak to listen to as it is."—(R. D., Highgate.)

We think your trouble is due to the fact that you are trying to receive stations which are beyond the range of your receiver. If you have a moderate aerial, and the receiver is reasonably efficient, you should just hear the Northern Regional station in your district, but naturally, with only a detector valve and one stage of amplification you cannot expect to get really good loud-speaker reproduction from that station. The reaction control should build up gradually and distortion should be present before the pop. If this is not the case, and the set pops before distortion is audible, you have either too much H.T. on the detector valve or too large a condenser for reaction control. This should be adjusted accordingly. If you wish to get these other stations at entertainment value, you must certainly add a good H.F. stage and not rely upon reaction to bring the signals up to loud-speaker strength.

SCREENING A CHOKE

"I have just finished building a receiver to my own design and have come across a rather peculiar trouble. The set oscillated, no matter where I put the condensers. After being worried for some time I tried to find the cause, and after reading through some back numbers of 'Practical Wireless,' I decided to try the effect of moving about the coils and H.F. choke. The latter seems to be the cause of my trouble. It is home-made, on a one-inch former, and when I put my hand round it the oscillation stops. Does this mean that it wants screening? If so, what is the best material to use?"—(S. J. K., York.)

The fault may be due to interaction between the choke and one of the other components in the set, and therefore before going to the trouble of screening remove the screws which hold the choke in position and try the effect of turning the choke about so that it rests in different positions. You may find a position in which stability is restored, and the choke should then be fixed in that position. If you are unable to stop the instability by turning the choke about, fit a small tube covered with tin-foil or aluminium foil over the choke, but allow a space of about half-an-inch between the screen and the windings of the choke. The screening material should, of course, be joined to earth.

FREE ADVICE BUREAU COUPON

This coupon is available until April 8th, 1933, and must be attached to all letters containing queries.

PRACTICAL WIRELESS 1/4/33.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8/11, Southampton St., Strand, London, W.O.2. Where advertisers make a charge, or require postage, this should be enclosed. No other correspondence whatsoever should be enclosed with applications for catalogues.

PILOT Q.P.-P. KIT

WE have just received from Peto-Scott Co., Ltd., 77, City Road, London, E.C.1, a constructional chart of their new Pilot Guardian Q.P.-P. 4-valve Kit. A full size wiring diagram is given, together with detailed instructions for building the set which is claimed to give all-electric volume and screened-grid selectivity with small capacity. The price of the kit of parts, including ready-drilled panel but less valves, is £3 19s. 6d. Readers can obtain a copy of the chart for 1s. from the above address.

"ATLAS Q.P." MAINS UNITS

THE latest folder issued by H. Clarke and Co., Ltd., Atlas Works, Patricroft, Manchester, gives particulars of their new mains units, which have specially designed smoothing and voltage regulation for all sets using quiescent pull-pull or "Class B" amplification. There are three models, the "Q.P. 24" suitable for A.C. mains; the "Q.P. 26," also for A.C. mains, but incorporating a trickle charger, and the "D.Q.P.," which is designed for D.C. mains.

BELLING-LEE CLIP-ON UNIT PICK-UP

ANY possessor of a radio receiver and a portable gramophone can enjoy radio-gram results by fitting the new Belling-Lee clip-on unit. This consists of a standard type pick-up, tone arm and volume control on a special mount which can be clipped instantly on and off the side of any portable gramophone. Full particulars, and price of the unit, are given in a booklet, a copy of which can be obtained from Belling and Lee, Ltd., Cambridge Arterial Road, Enfield, Middlesex.

SMITHCRAFT RADIO CABINETS

A WELL-DESIGNED and built receiver deserves a well-designed cabinet to house it, and the most discriminating constructor will find a suitable cabinet for his set in a folder issued by Smith's Cabinets, Ltd., 18-20, Hertford Road, London, N.1. The models available include speaker cabinets and table radiogram models. The cabinets, which are obtainable in either oak, mahogany or walnut, are hand polished to a piano finish, and grilles are backed with gold silk gauze. Loose base and baffleboards are supplied with each cabinet. All readers who are interested in high-class cabinets at moderate cost should make a point of getting one of these folders from the address given.

GRAHAM FARISH COMPONENTS

OVERSEAS readers will welcome the new Graham Farish catalogue, which is printed in either English, French, German or Spanish. Amongst the components listed are the Filtr Percolative Earth, Lit-Los Condenser, Ohmite Resistances, Fixed Condensers, and a new twin-screen H.F. choke. A copy of either of these catalogues can be obtained from Graham Farish, Ltd., Masons Hill, Bromley, Kent.

FORMO PRODUCTS

THE new range of components shown in the latest Formo list should appeal to all discerning constructors. Amongst the components listed are dual-range aerial and band-pass coils, L.F. transformers, multicouplers, and dual and triple gang condensers. The ganged condensers can also be obtained mounted on a common base-plate with either two or three matched ganged coils with coupled switches. In the triple gang condenser each assembly is provided with an ordinary trimmer. The list also includes a range of Formo "Hymeg" fixed condensers of various capacities up to 14 mfd.

CLUBS AND SOCIETIES

(Continued from page 86.)

the fundamental principles underlying the transmission and reception of television, and described the construction of receivers using the scanning disc and neon tube and also the Kerr cell mirror drum. He showed his new receiver of the mirror drum type, which aroused considerable interest among the members present. The beginners' lecture on loud-speakers was given by Mr. Tyler.

Replies to Broadcast Queries

All inquiries should be addressed to *The Editor*, PRACTICAL WIRELESS, 8-11, Southampton Street, Strand, London, W.C.2, and the envelope marked *Broadcast Query Service*, in top left-hand corner. Stamped addressed envelope should not be enclosed, as replies cannot be sent by post, but will be published in due course in each issue of PRACTICAL WIRELESS.

F. W. CLARKE (Maidenhead): VWZ, Kirkee (Poona), also on 17.24 m. (17,400 kc/s). PIP (St. Leonards-on-Sea): W0BHT, W. P. Ingersall, 251, E. Chestnut St., Canton, Ill.; W80K, E. L. Murrill, 3rd Avenue, Huntington, W. (VA); W8GIY, Jim E. Correll, Camp Skeel, Oscoda, Mich.; W8GR, G. H. Norris, 8410, Brush St., Detroit, Mich.; KGA, regret, cannot trace. ONE VALVE (Farington): G6BJ, G. Brown, 62, The Ring, South Yardley, Birmingham; G20P, Captain G. C. Price, 2, St. Annes Villas, Hewlett Road, Cheltenham, Glos.; G2BS, Marconi Co., Ltd., Chelmsford; G2XS, H. W. Sadler, "St. Raphael," Anston Ave., Worksop, Notts.; G6ZS, C. Grundy, 234, Rishton Lane, Bolton, Lancs.; G6HK, J. H. Harker, "Dunelm," Church Lane, Lincoln; G2VR, H. B. Old, "The Shack," Spring Lane, Lambley, Notts.; G2GG, A. H. Kidd, Malborough House, Newbury, Berks; G2XV, G. A. Geaps, 2, Salisbury Villas, Station Road, Cambridge; G6CD, D. N. Corfield, 10, Holders Hill Gardens, Hendon, N.W.4, London; G6LM, R. A. Hiscocks, "Sylvandelle," Malmesbury Road, Chippenham, Wilts.; GBC, Rugby calling GLIZ, a ship and TFO, a station in Iceland; G6FY, R. A. Fereday, 37, Walwood Road, Leytonstone, London, E.11; G600, T. Woodcock, 8, George St., Bridlington, Yorks.; G6JJ, Dr. J. O. Pender Smith, 30, Wellesley Road, Colchester, Essex; G2LZ, F. A. Mayer, "Stilemane," Wickford, Essex; PAOKK, Louis de Groot, 38, Delistraat, The Hague, Holland; PAOASD, W. F. Jacot, 73, Buterper Straat, Amsterdam, Holland, PAORS, P. Van der Meer, 174 Lange Geer, Rotterdam; XID, Dr. James M. B. Hard, (130 Apartado, Mexico, D.F.); G6CB, G6ZM, G6ZI, PAPOE, Regret, cannot trace. T. E. L. (Cadishead): If call sign is correct, namely, with three letters, only amateur experimenter with artificial aerial; possibly in your immediate neighbourhood; write to Radio Society of Great Britain, 53, Victoria Street, S.W.1. BARTY (Leigh): Apparently amateur transmitter in your immediate neighbourhood; cannot trace it in published lists. T. DAVIES (Leigh): (1) PAONC is not given in published lists; if sure of call letters write to N.V.I.R., Post Box 400, Rotterdam (Holland); (2) G5TZ, W. G. Sherratt, 11, Both Road, Coves (I. of W.). TWO VALVE (Jedburgh): W20E, E. A. Smith, 102, Montee Street, Brooklyn, New York; W0BAC, Richard Laplander, Dollar Bay, Mich.; G5AW, A. E. Wood, 247, Leigham Court Road, Streatham, S.W.16; W2EUV, G2AB, G6AI, G6YJ, cannot trace; VWZ, Kirkee near Poona (India) on 17.24 m.).

HOW YOUR SET WORKS

(Continued from page 70.)

pass on to the following valves and so to the loud-speaker.

Connecting Up the Batteries

There is no need to go into the subject of the action of the two amplifying valves again, but I would draw your attention to the connections to the various batteries. The low-tension (L.T.) battery

or accumulator is connected by wires to the filaments of each valve (separate batteries are not necessary), and is switched on or off by means of the push-pull switch marked "Filament switch."

The high-tension (H.T.) battery has its positive (+) end connected by a wire, which branches into three. (One goes to the anode resistance of the first valve, one to the primary of the transformer, and one to the speaker. The negative (-) end is joined to the negative side of the low-tension battery. No switch is necessary here as no current flows when the filaments of the valves are switched off, therefore, the one switch connected in the low-tension battery circuit is all that is required to start the set going or to stop it.

The grid bias battery has its positive end joined to the negative side of the L.T. battery, while the connections from the valves are plugged in to separate points on the battery. For this purpose several sockets are provided so that just the right voltage to suit the valve may be obtained. You will notice that all the batteries have one end or the other connected to the "earthed" end of the tuning coil. The wire from the batteries to this point thus forms a sort of common lead to which all circuits have their return.

I think I have now dealt with all the points I intended to in the working and construction of our three-valver. Needless to say I have not gone into the matter anything like deeply, but that was not possible, or, indeed necessary, in a short series of articles of this type. What I have endeavoured to do is to give you some idea of the kind of thing that goes on inside your set. It is for this reason I chose a simple type. Even a partial understanding of the working of this will, however, make the operation of your own set more interesting, and will provide a starting point for the study of more advanced circuits.

CORRECTION

In the article entitled "Improvements and Refinements" which appeared in our issue dated March 11th, a draughtsman's error occurred in Fig. 6, page 1,176. To correct this illustration delete the line running from the anode of the valve to the resistance which is joined to the G terminal of the L.F. transformer.

RUN YOUR RADIO FROM THE MAINS AT 1/- PER YEAR



D.C. MODEL
21/- or 31/- Monthly.

A.C. MODEL
39/6 or 57/- Monthly.

FITTED WESTINGHOUSE RECTIFIERS

For particulars
MAINS POWER RADIO ROMFORD ESSEX

ADVERTISEMENT INDEX

	Page		Page
Bargain Page	83	Hambling, A. W., Ltd.	63
Belling & Lee, Ltd.	86	Heraud, E. J., Ltd.	45
British Ebonite Co., Ltd.	73	International Correspondence Schools	80
Brit. Inst. of Engineering Technology	82	Lectro Linx, Ltd.	81
British Pix Co., Ltd.	86	Lissen, Ltd.	46
British Radiophone, Ltd.	81	London Radio Supply Co.	79
Bulgin, A. F., & Co., Ltd.	61	Mains Power Radio	88
Busby & Co.	83	Mason, E. C.	86
Colvern, Ltd.	63	Myers-Hunt Cabinet Co.	83
Cossor, A. C., Ltd.	57	Newnes' "New Comprehensive Dictionary"	76
Edison Swan Electric Co., Ltd.	Back Cover	Newnes' "Practical Wireless" Data Sheet	64
Electrical Trading Association	45	Newnes' "Strand Magazine"	76
Ervington Electrical Mfg. Co.	83	Newnes' "Popular Wireless Books"	Inside Back Cover
Frost, Radio Co.	82	Ormond Engineering Co., Ltd.	Inside Front Cover
Gilbert, J. C.	82	Pearl & Pearl, Ltd.	83
		Peto-Scott, Ltd.	Front Strip, 71 and 83
		Pioneer Radio	86
		Radialaddin, Ltd.	73
		Regent Fittings, Ltd.	82
		Riverside Mfg. Co., Ltd.	83
		Seradex Products	82
		Southern Radio Supply Co.	82
		Standard Battery Co.	81
		Stevenson's Rhino-Sole	83
		Turnadge & Partners, Ltd.	83
		Univolt Electric, Ltd.	73
		Varley, Ltd.	45
		Vinces Dry Batteries, Ltd.	61
		Westinghouse Brake & Saxby Signal Co., Ltd.	76
		Williams	86
		Wingrove & Rogers, Ltd.	73

NEWNES' POPULAR WIRELESS BOOKS

The Wireless "Omnibus" Book

THE OUTLINE OF WIRELESS

by RALPH STRANGER
Third Edition

THIS book has been prepared for the non-technical listener. Written in simple language, it explains everything about wireless from A to Z as it has never been explained before. After reading "The Outline of Wireless," your set, which a few days ago was a sealed book to you, will now be yours to do with as you will. 840 pages. Fully Illustrated.

8/6, post free 9/-

Some Press Opinions:

"Mr. Stranger . . . gives a simple, yet authentic, introduction to all the 'mysteries,' and explains them away in an exceedingly interesting and readable way. . . . A book which should go on every listener's book-shelf."—*The Star*.

"A good book simply written."—*The Daily Mirror*.

FINDING FOREIGN STATIONS

by R. W. HALLOWS

This book will be welcomed by all wireless enthusiasts. The number of people who possess wireless sets of requisite power and who fail to get foreign stations satisfactorily, is legion. This book will enable you to obtain the best possible results of which your set is capable.

3/6, post free 3/9

WIRELESS STEP BY STEP

by "DICTRON"
Tenth Edition

A book which shows the wireless enthusiast how to obtain the maximum enjoyment from his wireless set. A practical book, expert in range, yet clear and concise in presentation. It explains in simple language the principles of radio communication. Its delightful simplicity and thoroughness will interest all, whether beginners or experts.

2/6, post free 2/9

Some Invaluable Practical Handbooks

This series covers a wide field and will prove of the greatest value to everyone interested in models and how to make them; woodwork and other crafts. Each book is clearly written and fully illustrated.

Accumulators

An up-to-date handbook dealing with every type of accumulator, methods of charging them at home, care and maintenance.

Motor Car Upkeep and Overhaul

Contains information on the engine, decarbonising, valve grinding, lighting system, carburetter, cooling system, lubrication, springs and shock absorbers, steering gear, brakes, wheels, axles, tracing noises, etc., etc.

Toy Making for Amateurs

How to make clockwork toys, model aeroplanes, model locomotives, model boats, ingenious toys operated by sand, wooden models and toys, electrical toys, steam toys, guns, etc.

Twenty-five Tested Wireless Circuits

All the sets described have been designed to meet modern needs. They range from simple crystal receivers to a seven-valve super-heterodyne.

Simple Electrical Apparatus

An excellent little book for those who wish to make simple and useful electrical appliances, such as galvanometers, electric motors, dynamos and Leyden jars.

Model Boat Building

Designs for battleship, speed boat, paddle steamer and yachts. Excellent models can be built with the simple directions and diagrams given.

The Home Woodworker

A fascinating book for the handyman. Clear instructions on how to make a large variety of articles in wood. Many useful hints on wood-working.

Model Aeroplanes and Airships

Contains full descriptions of easy-to-make models of every description that will fly.

The Handyman's Enquire Within

Hundreds of practical ideas and hints of value to the man who is clever with his hands.

25 Simple Working Models

Ingenious and practical designs for electric, steam and clock-work models.

NEWNES' HOME MECHANIC BOOKS

1/- each, post free 1/2 each

THE MATHEMATICS OF WIRELESS

by RALPH STRANGER

A book specially written to sweep away the greatest obstacle to the understanding of wireless—the mathematics of the subject. Original and lucid explanations of all branches of mathematics as applied to radio. Indispensable to all who would understand technical books and articles. Differential and Integral Calculus are explained at some length and the use of Logarithms and the Slide Rule clearly shown. Fully illustrated.

5/-, post free 5/3

WIRELESS THE MODERN MAGIC CARPET

by RALPH STRANGER

Fourth Edition

If you know nothing about wireless this book will show you how to provide yourself with an interesting and absorbing hobby. If you are a listener, but rather weak on the technical side, it will save you much unnecessary worry and expense. If you wish to experiment, this volume will provide you with valuable experimental data. If you are an expert and have to lecture, it will give you some useful lecture material.

3/6, post free 3/9

RADIO PLAYS

by L. du GARDE PEACH

Millions of wireless listeners who have been thrilled by such wireless plays as "The Path of Glory" and "The Marie Celeste" can now have these and other plays in book form. An indispensable guide for all who would write plays for the microphone. No library is complete without these thrilling plays.

2/6, post free 2/9

Obtainable from all Newsagents, Booksellers and Bookstalls or at post free rates from

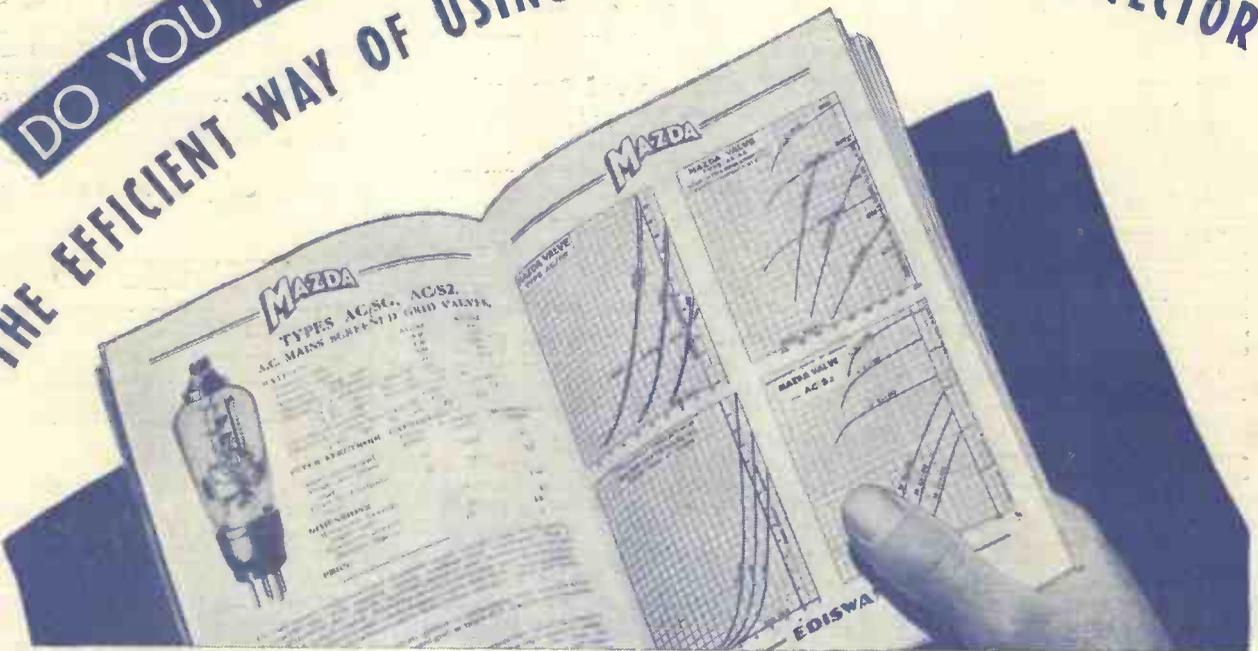
GEORGE NEWNES LTD., 8-11, SOUTHAMPTON ST., STRAND, LONDON, W.C.2



EDISWAN

The name that means 'EXCELLENCE'

**DO YOU KNOW
THE EFFICIENT WAY OF USING AN S.G. VALVE AS DETECTOR?**



A few years ago, you probably remember, designing a set was a much simpler business than it is now. Then, a valve was a valve, not a multi-mu or an S.G. or a metallised detector. You plugged it in, hoped for the best and usually realised it. There's still a lot of hoping, but much less realisation. This is the reason. The user of a modern

valve needs more information about it than just bare characteristics. That is the object of this book—to provide every man who wants to use Mazda valves, with all the information he needs. You save unnecessary trouble and expense that way. You get the results you want—first time and all the time.



THIS BOOK TELLS YOU HOW

"The Book of the Mazda Valve," No. R.782, is a mine of useful information about valves in general and Mazda Valves in particular. It contains facts and figures, circuit diagrams, component values, characteristic curves—in fact, all the valve user wants to know about valves. Send for your **FREE** copy to-day—or ask your dealer for one.

MAZDA

THE
BRITISH
VALVES



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

Mazda Radio Valves are manufactured in Great Britain for The British Thomson-Houston Co. Ltd., London and Rugby.

RECOMMENDED BY ALL GOOD RADIO DEALERS

v198

P. W. Gift Stamp No. 27

Printed by NEWNES & PEARSON PRINTING Co., LTD., Exmoor Street, Ladbroke Grove, W.10, and published by GEORGE NEWNES, LTD., 8-11, Southampton Street, Strand, W.C.2. Sole Agents for Australia and New Zealand: GORDON & GORCH LTD. South Africa: CENTRAL NEWS AGENCY, LTD. *Practical Wireless* can be sent to any part of the world, post free, for 17/4 per annum; six months, 8/8. Registered at the General Post Office for Transmission by Canadian Magazine Post.

THE LEADING WIRELESS WEEKLY!

Practical Wireless

3^d

Published every Wednesday by

**GEORGE
NEWNES
LTD.**

Vol. 2. No. 29.

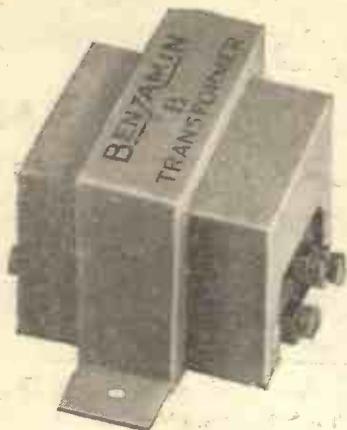
APRIL 8th, 1933.

Registered at the G.P.O. as a Newspaper.



GREAT SEASONAL SALE OF RADIO SETS AND COMPONENTS. All goods fully guaranteed
DIRECT RADIO LTD., 159, BORO' HIGH ST., LONDON BRIDGE

Specified exclusively
for the **BETA UNIVERSAL 4**



Regd. Design.

The Benjamin Driver Transformer specially designed for Class B amplification is essential to the success of your BETA UNIVERSAL 4

- Ratio 1 to 1 (overall).
- Secondary D.C. Resistance 160 ohms. each half.
- Size, in Grey Finished Metal Screening Case, 3 1/2" x 2 1/2" x 2" approx.
- Catalogue No. 8690.

Send for leaflet P.R.1319 for circuits.

PRICE 10/6

BENJAMIN "B" TRANSFORMER

THE BENJAMIN ELECTRIC LTD.,
TARIFF ROAD, TOTTENHAM, N.17

THE NEW AND REVOLUTIONARY **CLASS B** AMPLIFICATION VALVE



One popular radio journal describes the CLASS B Valve as "a revolutionary valve development." INCREASED POWER OUTPUT at relatively SMALL CURRENT DRAIN from the H.T. battery is obtained by using the marvellous BRITISH 362 "CLASS B" Valve. Send for one now on our Money Back Guarantee. If you also require a "driver" valve we recommend the BRITISH 362 "P.2," price 4/- post free, see our advt. on page 105.

IMMEDIATE DELIVERY POST FREE **8/**

with full instructions

Be one of the first to benefit by this great advance. Post your order and remittance today. Cheques and P.O.'s must be crossed and made payable to

The 362 RADIO VALVE Co. Ltd., (Dept.W3),
415, MARE STREET, HACKNEY, London, E.8.

A Man's Magazine

If you are tired of "ordinary" magazines, with their eternal man-and-girl fiction, you will find the *Wide World* refreshingly different.

It is a real man's magazine—the only one of its kind—a magazine of action and the open air. Our contributors are men who have actually undergone the experiences they describe, which fact gives their narratives the vivid actuality that is so characteristic of the magazine.

THE . . .

WIDE WORLD Magazine

EVERY MONTH.

ONE SHILLING.

Obtainable at all Newsagents and Bookstalls, or post free 1/3, from George Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2

Listeners All!

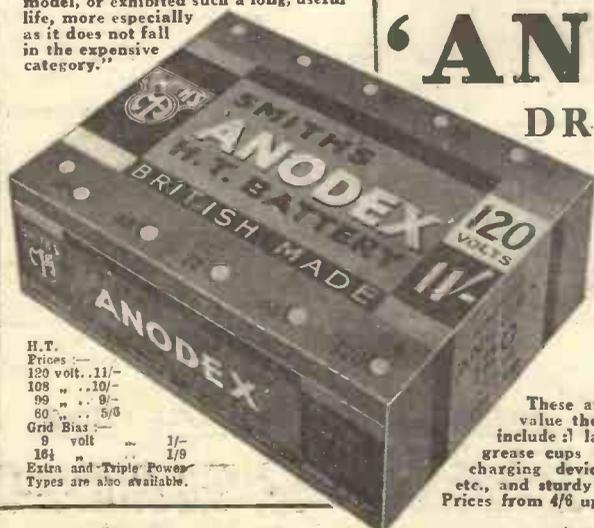
enjoy Better Radio with

'ANODEX'
DRY BATTERIES

&
SMITH'S
ACCUMULATORS



Extract from "Wireless World" Test Report, February 24th, 1933:—
" . . . Few batteries tested have maintained their voltage at such a high level for so long as this 'Anodex' model, or exhibited such a long, useful life, more especially as it does not fall in the expensive category."

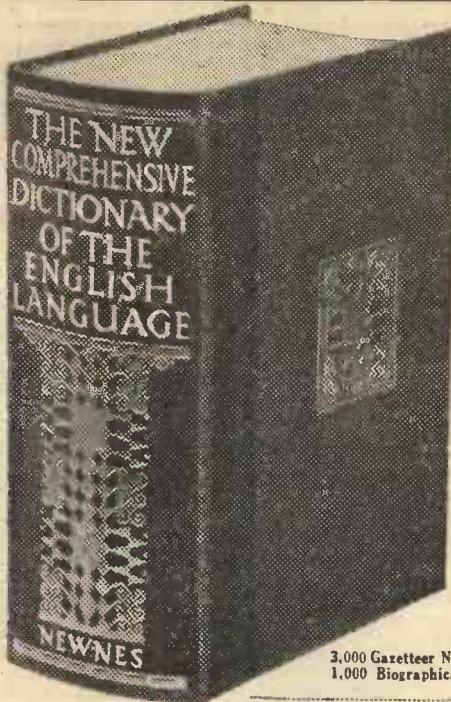


H.T. Prices:—
120 volt. 11/-
108 " . 10/-
88 " . 9/-
60 " . 5/6
Grid Bias:—
0 volt . 1/-
16 1/2 " 1/8
Extra and Triple Power Types are also available.

These are an entirely new range, giving the finest value the battery world can offer. Special features include: 1) large non-interchangeable coloured terminals, grease cups which prevent corrosion, ebonite separators, charging device, panel for owner's name, charge dates, etc., and sturdy metal carrier which cannot slip. Prices from 4/6 upwards.

Agents throughout the country.

S. SMITH & SONS, (Motor Accessories) LTD., Cricklewood, London, N.W.2.



THOUSANDS OF POUNDS IN PRIZES

are to be won every week in

CROSSWORD COMPETITIONS

There will be many happy winners. Why not be one of them?

For success in solving Crosswords a good Dictionary is indispensable.

THE NEW Comprehensive DICTIONARY

is the book you want. It has helped others to win. It will help you.

Contents include :
150,000 Definitions
10,000 Synonyms and Antonyms
3,000 Gazetteer Names. 2,000 Foreign Phrases.
1,000 Biographical Entries. 16 Maps in Full Colours

FIVE DAYS' FREE TRIAL

Fill in the Free Examination Form and post to-day. No charge or obligation is involved.

THE HOME LIBRARY BOOK CO.,
23-24, TAVISTOCK ST., LONDON, W.C.2.
Please send me on FIVE DAYS' FREE APPROVAL the NEW COMPREHENSIVE DICTIONARY. I will either return it to you on the sixth day or send you 2/6 and follow up with seven monthly payments of 4/- each and a final payment of 2/-. (Cash price on sixth day, 31/-)

Name

Address

Pract. Wire., 8433

Geo. Newnes, Ltd.

ROLA

the World's Finest Reproducers

ROLA MODEL F6-PM-01-Class B (PRICE 49/6)

is Used and Specified Exclusively for the

"PRACTICAL WIRELESS" BETA UNIVERSAL FOUR

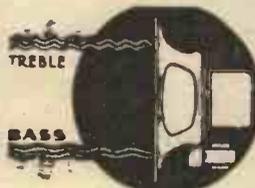
Because of their brilliant tonal realism Rola Speakers are used and recommended by the large majority of British Radio manufacturers and by nearly all "Constructor Set" designers. Use Rola and obtain the best results. Write to-day for the Rola folder.

EXTENSION SPEAKERS

There is a correct Rola Extension speaker for practically all British Radio Receivers. Write for list.

THE BRITISH ROLA CO., LTD.,
Brondesbury Works,
179, High Road, Kilburn,
N.W.6.
Telephone :
Maida Vale 5017-8-9.

ROLA SPEAKERS
for better Radio Reception



STUDY AT HOME **U** **IN YOUR SPARE TIME**

CAN HAVE A COLLEGE TRAINING IN ALMOST ANY CAREER FOR A FEW SHILLINGS MONTHLY

MATRICULATION
There are many ways of commencing a career, but Matriculation is the jumping-off board for all the best ones.

CIVIL SERVICE
Suitable to both sexes. Ages 15½ to 24.

G.P.O. ENG. DEPT. CUSTOMS AND EXCISE; INSP. OF TAXES, Etc. NO EXPERIENCE REQUIRED. OPEN EXAMS.
We prepare candidates for all

INSTITUTE EXAMS.
TECHNICAL, INSURANCE, COMMERCIAL, GENERAL, POLICE, Etc., Etc.

ENGINEERS ALL BRANCHES
There are examinations which are open and suitable to you, others which are not. Get our advice before deciding.

Let me give you that fatherly advice which is FREE to you, but which may mean so much to you in the future.



DO NOT DELAY — There may be chances for you to-day for which you may be too late to-morrow. Every day counts in a man's career.

W. Bennett

LET ME BE YOUR FATHER

Accountancy Examinations Advertising and Sales Management A.M.I. Fire E. Examination Applied Mechanics Army Certificates Auctioneers and Estate Agents Aviation Engineering Banking Boilers Bookkeeping, Accountancy and Modern Business Methods B.Sc. (Eng.) B.Sc. (Estate Management) Building, Architecture and Clerk of Works Chemistry Civil Engineering Civil Service All Commercial Subjects Commercial Art Concrete and Structural Engineering Draughtsmanship, all branches Engineering, all branches, subjects and examinations General Education G.P.O. Eng. Dept. Heating and Ventilating Insurance	Mathematics Matriculation Metallurgy Mining, all subjects Mining Electrical Engineering Motor Engineering Municipal and County Engineers Naval Architecture Pattern Making Police. Special course Preceptors, College of Pumps and Pumping Machinery Radio Reception Road Making and Maintenance Salesmanship Sanitation Secretarial Exams. Ship-building Shorthand (Pitman's) Structural Engineering Surveying Teachers of Handicrafts Telephony and Telegraphy Transport Inst. Exams. Weights and Measures "Insp." Wireless Telegraphy and Telephone Works Managers
---	--

If you do not see your own requirements above, write to us on any subject.

IT COSTS NOTHING TO ENQUIRE
WE TEACH BY POST IN ALL PARTS OF THE WORLD
Also ask for Our New Book (FREE OF CHARGE)
THE HUMAN MACHINE
SECRETS OF SUCCESS.

Note Address carefully:
THE BENNETT COLLEGE, Ltd.
(Dept. 192), SHEFFIELD.



ESTAB. 1900 SHEFFIELD
Dept. 192



AND BUILD YOUR OWN NOW! ALL-ELECTRIC SKYSCRAPER

**MOST
POWERFUL
RADIO EVER
PUT INTO
THE HANDS
OF HOME
CONSTRUCTORS
— AND
SAFE!**

Now at last you can equip your home with ALL-ELECTRIC RADIO, SELF-CONSTRUCTED. Here for the first time is a complete All-Mains Kit for the Home Constructor which is at once completely practical and completely safe. You build the "All Electric Skyscraper" yourself and so you know that there are no mysteries in it—you have no fear of letting the family handle it, and you can "tinker" with it yourself if you want to adjust it at all. The "All-Electric Skyscraper" works from A.C. Mains. It is a self-contained receiver, with provision for Mains Aerial. You simply plug in and switch on. Unique to this A.C. "Skyscraper" is the special Safety Fuse Plug—which is the fullest possible protection ever provided in a Mains Receiver, and makes this the first really SAFE A.C. Constructors' Kit, AS SAFE TO HANDLE AS A BATTERY SET!

CHART OF THE A.C. SAFETY "SKYSCRAPER" **FREE**

Lissen have published a beautiful and practical coloured Chart which gives you plans and photographs and exhaustive descriptions of every single point in the construction, operation and enjoyment of this receiver. Matched Valves. Pentode Output. Variable Mu Screened Grid H.F. stage. Drives Moving Coil Speaker at full volume. Metal Chassis. One dial tuning. Ganged Reaction and Volume Control. Walnut Console cabinet which you assemble yourself and so save money. Power Pack an integral part of the chassis. Heavily insulated Mains Lead. Every refinement of the most expensive All Mains Receiver is incorporated in the "All Electric Skyscraper"—and **SUCCESS IS CERTAIN WHEN YOU FOLLOW THE GREAT LISSEN CHART.**

**IN WALNUT CABINET WITH
MOVING COIL SPEAKER £10.12.6**

Obtainable from all Lissen dealers at the following prices:—

"All-Electric A.C. Skyscraper" Chassis Kit complete with Power Unit, 4 Matched Valves and Mains Lead with special Safety Fuse Plug. **£7.19.6**
Price

"All-Electric A.C. Skyscraper" Kit, as above, including valves, with Table Model Walnut Cabinet. Price **£8 15s. 0d.**

"All - Electric A.C. Skyscraper" Kit as above, including Valves and with Walnut Console Cabinet as illustrated and full power MOVING COIL LOUDSPEAKER. Price **£10 12s. 6d.**

Ask your dealer or post coupon below for FREE CHART.

**PRICE
COMPLETE WITH
FOUR VALVES
£7.19.6**



**LISSEN
AC
SAFETY**

**"SKYSCRAPER"
KIT**

**POST
COUPON
TO-DAY**

To Lissen Limited, Publicity Dept., Isleworth, Middlesex.

Please send me FREE copy of the CHART OF THE A.C. SAFETY SKYSCRAPER.

Name.....
Address.....
.....PRAC. I



EDITOR:
 Vol. II. No. 29 || F. J. GAMM || April 8th, 1933
 Technical Staff:
 H. J. Barton Chapple, Wh. Sch., B.Sc., (Hons.), A.M.I.E.E.
 W. J. Delaney, Frank Preston, F.R.A., W. B. Richardson.

ROUND *the* WORLD of WIRELESS

Royal Command Variety Broadcast

AS in previous years, the B.B.C. will be given an opportunity of relaying the Royal Command Variety Performance which has been fixed to take place on May 22nd. For this occasion the G.T.C. has lifted the ban on music-hall artists taking part in the show.

Vienna's Super Power Transmitter

THE giant Bisamberg station which is to take over the broadcasting of the Vienna programmes is rapidly nearing completion, and it is expected to come on the air for its initial tests early in April. In order to avoid interference with the Rosenhügel transmitter now in operation, the experimental broadcasts will be carried out in the earlier hours of the day and at the end of the advertised programmes. So stand by for a much heftier Radio-Wien!

Summer Time

BOTH France and Belgium changed over to Summer Time on March 26th and consequently until we adopt B.S.T. on April 9th, these countries will be *one hour ahead* of us. Holland will alter her clocks on May 15th. From the April date our time in Great Britain will coincide not only with France and Belgium but with all those continental countries working to Central European Time, namely, Germany, Austria, Italy, Switzerland, Scandinavia, etc. As Spain, Portugal, Algeria, Morocco, remain on Greenwich Mean Time all the year round, during the B.S.T. period we shall be *one hour* in front of them, and *two hours* ahead of Iceland. The difference between British Summer Time and Eastern European Time will be cut down to one hour; Moscow's local time will only be two hours ahead of us.

Snowed Up!

DURING the recent blizzard, one of the most northerly of the Norwegian broadcasting stations, Bødø was snowed up for three days, and was compelled to send out an SOS to obtain food and outside assistance. During that period the announcer carried on by giving the local listeners a transmission of gramophone records interspersed with a "news" bulletin in which he described the living conditions of the imprisoned staff.

Radio Luxembourg on the Air

ON 1,191 metres the new 150 kilowatt transmitter now transmits a regular programme daily. A News Bulletin is broadcast every evening at 7 p.m. G.M.T. in German and French as well as in the Luxembourg dialect. The station would appear to work from 7 p.m. to about 10 p.m. G.M.T., during which period, on some days, gramophone records alternate with a concert given by a studio orchestra. At present the Monday and Thursday transmissions are dedicated to Germany, those on Tuesday and Saturday to France and

these dates will be postponed until later in the year.

Extension of Jazz Veto on Germany

FOLLOWING a government decree to stop the playing of "Hot" music in the Berlin studio, the veto has been extended to the entire country and now includes not only broadcasts but all dance bands in public places and houses of entertainment. The Germans must now declare themselves satisfied with the waltz and the tango.

PTT Radio-Paris

THE French State has officially declared its intention of taking over the new Radio-Paris transmitter. According to a French report the station will no longer be permitted to broadcast foreign publicity concerts.

The New B.B.C. Long-wave Station

THE B.B.C. has concluded the purchase of the site at Wychbold, near Droitwich, for the new transmitter to replace Daventry 5XX, and preliminary work has already started. The new station, which will radiate the National programme, will work on a power of 100 kW. In addition to this transmitter, a high power medium-wave Regional station will also be erected on the same site, and when completed will replace Midland 5GB, which was experimentally built in 1927. Although no date can yet be fixed, it is anticipated that the Droitwich 100 kilowatt may be able to take over the Daventry service by the summer of 1934.

In This Issue:

- BETA UNIVERSAL
(Class B) FOUR
- ELECTRIC INTERFERENCE
- "FURY FOUR" EXPERIENCES
- CLASS B UNIT
- UNDERSTANDING
YOUR AERIAL
- A B C OF SELECTIVITY
- ALL ABOUT H.F. PENTODES
- IMPORTANCE OF LAY-OUT

Belgium, Wednesday to local listeners, Fridays to Holland and Sundays to the British Isles. The studio employs both men and women announcers.

An Edgar Wallace Broadcast

ON April 19th the B.B.C. will produce a microphone version of the late Edgar Wallace's thriller, *The Ringer*, for which, in the leading part, they have succeeded in securing the services of Constance Cummings the American film star. There will be two performances of this play, namely, April 19th for Regional and April 21st for National listeners.

The first broadcast of Horace Annesley Vachell's comedy, *Quinneys*, arranged for

The Sincerest Form of Flattery

THE example set by Radio Luxembourg, namely, a transmitter for the purposes of widespread publicity, is arousing considerable interest on the continent. It is now reported that Rumania is inclined to follow this lead and that negotiations are already proceeding with a foreign group of financiers to secure capital for the installation of a super-power transmitter at Temesvar near the Hungarian border. Will more imitators come along?

The Nice-Monaco - Corsica High-power Station

WORK on this new P.T.T. station is to be started this month. Although nominally of a power of 60 kilowatts, the transmitter is planned to permit of an

ROUND *the* WORLD of WIRELESS (Continued)

increased energy in the near future, as the French authorities are anxious that the programmes should be available to all inhabitants of the Riviera. It is probable that a 286-metre wavelength will be adopted, namely, the channel at present used by PTT Montpellier, which, on completion of the new transmitter, will be closed down. Studios are to be erected at Nice, Cannes and at Monte Carlo.

Listen to Milan-Vigentino

IN order to provide an alternative programme for Milan listeners, the EIAR has again brought into operation the Vigentino 7 kilowatt station, which acted as a standby when the 50 kilowatt transmitter at Sizzano was formally opened. The second Milan station is now working experimentally on 453.8 metres; it relays wireless entertainments from Rome, Naples and other Italian studios.

New Valves

I SHOULD think that the research staffs of the various valve-manufacturing firms must be having a very hectic and busy time just now, for new types of valves seem to be emerging every day. The introduction of automatic volume control brought the double-diode and then the double-diode triode and single-diode tetrode—what names! Whilst these were still “hot from the oven” the new “Class B” amplifier came into being, and now we have the high-frequency pentode. One can be excused for asking “What next?” The peculiar thing is that although these valves seem to have come upon us all at once, there has been a job of useful work awaiting each one, and no sooner has a valve been “released” than it has been put to good use. Perhaps the only unfortunate part of the business from the average constructor’s point of view is that most of the newcomers are only suitable for mains-operated receivers. At the same time, he can take comfort in the knowledge that the “Class B” valve, at any rate, is essentially a battery valve, and a most economical one at that.

H.F. Pentodes

THE H.F. pentode is not too well known as yet, but there is no doubt that it is going to be extremely popular. It is really a development of the S.G. and V.-M. valves, and not of the low-frequency pentode, as its name might suggest. This valve is already obtainable in both “ordinary” and variable- μ form and from my own experiments I can vouchsafe for its extraordinary abilities. It has all the advantages of the best V.-M. valves but is not so critical in regard to its screening grid voltage requirements and actually gives more amplification. The new valve has a very high impedance and thus can only give of its best when followed by an ultra-efficient, or high-dynamic, tuning circuit; this condition can readily be complied with by making use of Ferrocart coils. So far as I am aware, the H.F. pentode is not yet made as a battery valve, but I for one sincerely hope it will be before summer comes,

INTERESTING and TOPICAL PARAGRAPHS

because in that form it should be perfectly ideal for use in portables, where stability and high amplification are the principal requirements.

Q.P.-P. Transformers

QUIESCENT push-pull amplification is still increasing in popularity and many readers will, no doubt, be trying it. I am often asked why a special input transformer is advised and if an ordinary push-pull transformer cannot be used instead. Actually the latter kind of transformer can be used, but as it is of lower ratio than the proper Q.P.-P component

it will not provide as much amplification, and therefore one of the chief benefits of the new system will be lost. The new quiescent push-pull input transformers have a step-up ratio of 9 to 10 to 1, as compared with about 3 to 1 for ordinary P.-P. ones.

Q.P.-P. Eliminators

IT is interesting to notice how one radio development paves the way for another. For instance Q.P.-P. amplification led to the introduction of special H.T. batteries havingappings every 1.5 volts over the last 20 volts or so. And now it seems that different types of eliminators will be required for Q.P.-P. and “Class B.” The difficulty with ordinary eliminators is that the voltage they give from any tapping is proportional to the current load; as the current is increased the voltage goes down, and vice versa. Of course, the whole idea of the new amplification systems is that the anode current consumption is proportional to the amplitude of the signal voltages being handled and thus the current is less on soft, than on loud, passages of music. But with an ordinary eliminator the voltage rises as the current falls and the higher voltage tends to increase the current, with a net result that there is a tendency for the current to remain more or less constant. This means that the amplifier will not do justice to “light” and “shade” and that reproduction will suffer in consequence. What is required, then, is an eliminator whose voltage will remain constant over a change in load of 10 milliamperes or so. I have not gone fully into the question, but it seems that the only way to make a suitable eliminator will be by using a smooth-

ing choke of low resistance and a rectifier with an ample current reserve. Or perhaps the same result could be achieved by employing an eliminator of rather higher current rating than is actually required, and shunting a resistance of about 20,000 ohms across its positive and negative terminals; the resistance should hold the voltage reasonably steady. Anyhow, here is a little problem that is worth thinking about.

Output or Input?

A GOOD deal of misunderstanding often arises in connection with the name applied to that transformer used between the set and loud-speaker. When it is built into the set we refer to it as an output transformer, and yet when it is attached to the loud-speaker it gets the very opposite name of input transformer. Which is right? As a matter of fact both are, but they are derived in different ways. The transformer certainly deals with the output from the set and the input to the speaker, so the name is purely a relative term. Nevertheless, I think it would be a good thing if we could decide to call this component by one name no matter what its position may be—and “input transformer” is certainly not a good one because that is what we call the transformer which feeds two valves in push-pull. **JACE.**



A new chapter in the history of wireless was opened recently when Cape Town addressed the British Commonwealth of Nations from the top of Table Mountain, Cape Town.

SOLVE THIS!

Problem No. 29.

Jefferies had a simple two-valve set employing a detector valve working on the normal grid-leak principle, transformer-coupled to a small power valve taking a current of 5 mA. at 150 volts. A relative gave him a small mains unit for a birthday present, but this delivered 60 mA. at 250 volts maximum, and was provided with noappings. How could Jefferies use this unit with his small set without introducing any alterations to the unit and without damaging his valves? Three books will be awarded for the first three correct solutions opened. Address your solutions to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 9-11, Southampton Street, Strand, London, W.C.2, marking your envelopes Problem No. 29, and post to reach us not later than April 10th.

SOLUTION TO PROBLEM No. 28.

When used as a radio-gram, the detector valve becomes an L.F. valve with appropriate negative grid bias. Therefore, to enable radio to be received this bias must be removed, and Jackson should have inserted a simple switch in the pick-up leads to disconnect the pick-up on radio.

The following three readers received books in connection with Problem No. 27:—

W. Sanders, 16, Pollard Street, S. Shields, Co. Durham; W. G. Walker, “Kinver,” Etruria Road, Basford, Stoke-on-Trent; F. Brayne, 13, Wood Street, Tunbridge Wells.

ELECTRICAL INTERFERENCE

I SUPPOSE one of the greatest difficulties encountered by the writer of articles is that of choosing his subjects. No matter how enthusiastic and interested he is in regard to some particular topic it is no use writing about it unless his readers are also going to be interested. I must confess that I have met with this difficulty on numerous occasions, but it does not apply in the present case. A few weeks ago, under the heading of "Radio Ramblings", the subject of electrical interference was briefly introduced; and I can judge from the letters since received that the matter is generally considered to be of great importance. Two simple methods of reducing interference caused by electrical apparatus were described and concluded by asking readers to try them and to kindly advise us of the results obtained. Many have done so and their letters have been very much appreciated.

A Good Idea

One method suggested, and which I had found very useful, was to join together the aerial and earth leads and to connect both of them to the aerial terminal. It was pointed out that this method was only likely to be of value on the shorter wavelengths and if the earth lead was fairly long. It was also mentioned that the reason for the success of this scheme could not be explained satisfactorily by existing theories and that my results were perhaps in the nature of a "fluke."

However, I am delighted to learn that others have now found the suggestion of value. For instance, H.L.P. (Perth) writes "I am a mere novice in anything to do with wireless, but on reading an article in PRACTICAL WIRELESS I thought I would try the idea about joining the earth lead to the aerial terminal. My set is a S.G.3 and on joining the wires I found it was just as you said—hardly any interference. The only difference I noticed was that Scottish Regional seemed to be one point further up on the dial, but volume was almost as good as usual. My earth lead is rubber covered, but only 10 feet long."

Another reader, E.H., of Cashel, Tipperary, I.F.S. says: "In response to the request in PRACTICAL WIRELESS for March 11th, in reference to connecting the earth lead to the aerial terminal; I have tried this and strange to say it made absolutely no difference to normal reception on medium-waves, but on long-waves the set is unstable. May I point out that my earth lead is only six feet long?"

It Does not Always Work

These two are typical of a number of letters received and although they prove that the idea

Causes and Remedies Discussed by FRANK PRESTON, F.R.A.

is good they also show that I was wrong in assuming that the earth lead must be a long one for the method to be effective. But in support of my suggestion that the method would not always prove

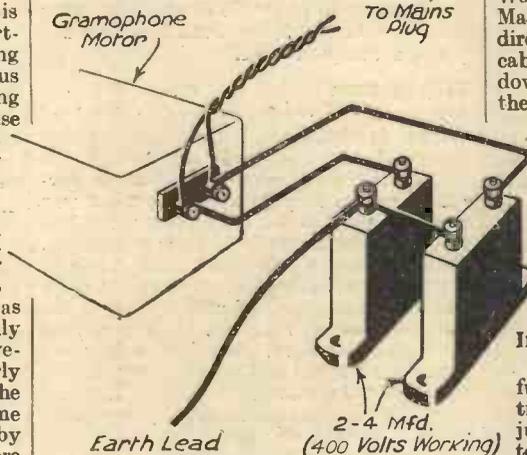


Fig. 1.—A simple method of curing interference caused by an electric motor or similar device.

successful, there is a letter from H. S. (South Shields) in which the writer says—"Regarding your method of connecting together the aerial and earth, I am afraid this experiment was not satisfactory. I think in my case the signals were going straight to earth. I could get stations (presumably free from interference) but much below usual strength."

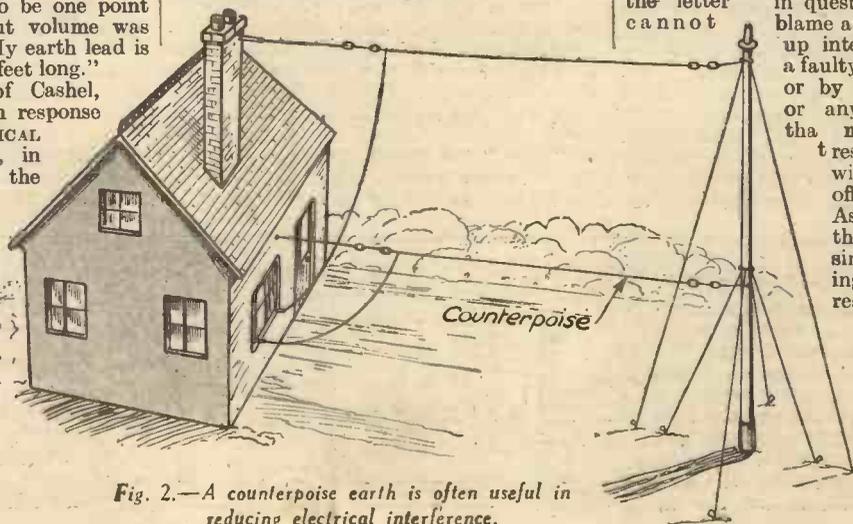


Fig. 2.—A counterpoise earth is often useful in reducing electrical interference.

Shielded Down-Lead

Another suggestion I made for reducing electrical interference, was to replace the aerial lead-in by a length of the special shielded cable which has just come on to the market. I am afraid that I was somewhat premature in recommending this method because a number of readers have written to say that they have as yet been unable to obtain the new material from their local dealers. It will thus be helpful to know that the cable is made by Messrs. Ward and Goldstone of Pendleton, Manchester, from whom it can be obtained direct, in 20 foot lengths. The screened cable simply replaces the normal aerial down-lead and connection is made from the outer metal braiding to earth. Although it is primarily intended for the aerial lead, I have found it helpful even for the earth lead when the latter is fairly long; the braiding is then connected along with the inner wire to the earthing plate or tube. I should be very pleased to hear from readers who try the screened lead-in, if they will write to me c/o The Editor.

In Reply to a Complaint

And now I would like to offer some further suggestions for eliminating electrical interference, but before doing so just allow me to make passing reference to a letter reproduced in PRACTICAL WIRELESS No. 26 under the title of "All-mains Receivers and Interference." The writer said he considered it "rather unfair on the part of manufacturers to expect a purchaser who has paid a high price for a set to go to outside sources for a cure of this household type of (electrical) interference." Of course one can see some justification for these remarks, but I am afraid the writer has not weighed up all the facts of the case, and I have no doubt that more than one manufacturer will already have replied to the letter in question. After all, one cannot blame a receiver for picking up interference caused by a faulty electric light switch or by an electric motor, or any other device for the matter; surely the responsibility rests with the owner of the offending apparatus. As a matter of fact there is not always a simple way of modifying a set to prevent its responding to local electrical disturbances. The methods referred to above might do the trick, but they cannot be guaranteed. Moreover, the particular interference likely to be experienced

(Continued overleaf.)

ELECTRICAL INTERFERENCE

(Continued from page 93.)

may take one of many forms, each of which demands its own special remedy. Obviously, then, it would be an utter impossibility to design any receiver which would be immune from all kinds of electrical interference. In addition to this, there is the question of cost. Even if some revolutionary device could be fitted to a set, it must necessarily add to the price of the outfit and consequently every purchaser would have to pay more for his set whether he required the "anti-interference" unit or not.

Tracing the Source of Interference

I have pointed out that different kinds of interference require different methods of prevention, so let us examine the question more closely. In case of difficulty, the first thing is to discover whether the stray noises are being picked up by the aerial or are coming into the set through the mains leads (when a mains receiver or eliminator is employed). This can be done by comparing results with and without the aerial and earth connected. If interference is just as bad in either case, it is obviously being transmitted through the supply leads or is being picked up by the receiver itself. On the other hand, if it is found that the aerial is responsible, one of the remedies already referred to can be tried. But if you know the cause of the interference, it is much better to tackle it at its source wherever possible. For instance, if it is noticed that interference is only experienced when a particular switch is "on" you can be pretty sure that either the switch or the apparatus it feeds is at fault. Bad contact in a lamp holder or a damaged switch can be a great nuisance, but the cost of repair or replacement is small. When the trouble is due to an electric motor (perhaps a gramophone motor, hair drier or other domestic appliance) you can generally effect a cure by joining two large capacity (2 to 4 mfd.) condensers in series across the motor terminals and connecting an earth lead to the centre point of the two condensers. The method is illustrated in Figure 1. It is important that the condensers should have a working voltage of at least 400 for otherwise the insulation might break down.

If the interference starts regularly at a certain time of day, you can generally trace it quite easily to some flashing electric sign or generator in the vicinity. There is only a narrow field to "search" because electrical disturbances rarely travel over distances greater than 100 yards or so. Having found the origin of the trouble you can do little more than request the owner of the apparatus to attend to the

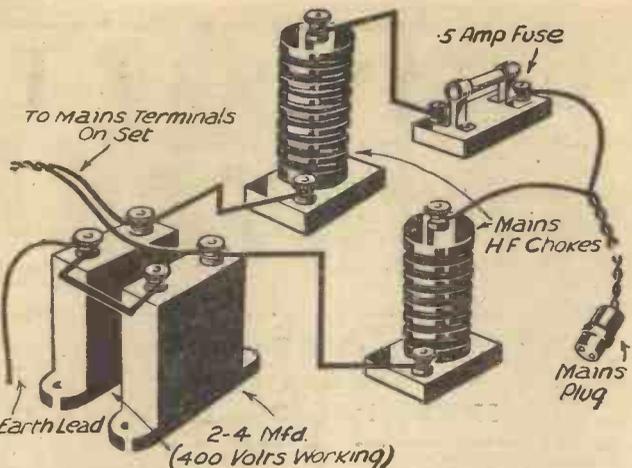


Fig. 3.—A rather elaborate filter circuit which is useful in cases of serious electrical interference of the kind introduced by the mains leads.

matter. In the case of a motor or generator you might suggest the condenser arrangement of Figure 1; it will almost invariably give some improvement even if it does not prove a complete cure.

Difficult Cases

Probably the most annoying kind of trouble is that caused by tramways and electric buses. There is no difficulty in tracing the interference, but local authorities are not easy to approach when you want to suggest that they should spend money in the interests of their ratepayers. Rather than waste time and postage, you will probably find it better to try one of the suggestions referred to at the beginning of this article. When neither of them is effective, you might reduce the size of your aerial and employ the screened cable for the whole of its length. Another idea which is often useful, though frequently difficult to put into practice, is to dispense with the normal earth connection and use a counterpoise earth as shown in Figure 2. The counterpoise is in effect a second "aerial" consisting of a single wire running parallel to the aerial proper; it must be thoroughly insulated and is connected to the earth terminal of the receiver. In mild cases of interference, some relief can be obtained by connecting a 2 or 4 mfd. fixed condenser in series with the earth lead; this system is worth a trial.

Should you come to the conclusion that interference is coming to the set via the mains supply leads your mode of procedure will be rather different. Incidentally, mains leads do very often act as an effective aerial and pick up all kinds of H.T. impulses. (You know, of course, that they can be employed instead of an outside aerial). The object, then, must be to "filter" the mains supply by inserting an H.F. choke in one or both leads. Ordinary chokes are useless for this purpose since

they will not carry the necessary current, but special components are made by Messrs. Bulgin and also by Messrs. Wearite. Start by connecting a choke in one lead first of all and if this proves insufficient put one in the other lead as well. As an alternative to the H.F. chokes a split-condenser filter of the type shown in Figure 1 might be connected across the mains leads at their point of contact with the set. Sometimes it is found that neither of these latter methods is sufficient completely to cure the trouble and in that case a more complicated filter circuit like that shown in Figure 3 must be resorted to. Here we have a special mains H.F. choke connected in each supply lead and also a pair of large-capacity (2 to 4 mfd.) condensers wired in series across the supply. The

earth wire is removed from its normal terminal on the set and joined to the junction of the two condensers. It is also a wise precaution to include a .5 amp. fuse on the "mains" side of the filter to prevent damage in case of a short-circuit or the breakdown of a condenser. All the filter components should be placed in some kind of box so that there will be no danger of getting a shock by accidentally touching any of the terminals.

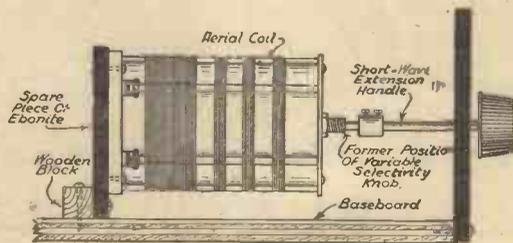
Voltage Fluctuations

There is yet one further prevalent source of trouble which we have not considered and which is due to fluctuations in the mains voltage. Although supply companies are legally supposed to maintain the mains voltage within 4 per cent. of its rated figure one often finds a variation of as much as 15 per cent. Such voltage surges naturally make themselves known by various forms of "noise" or by variations in volume level. There is no real cure in the hands of the listener, but often a certain amount of relief can be obtained by connecting a lamp across the mains terminals of the set. The lamp will absorb a good deal of the surge voltages and help to maintain a silent "background."

I have not mentioned all the possible causes and cures of electrical interference, but I think sufficient has been said to show what steps should be taken and to make it quite clear that every individual case must be treated on its own merits. I would just add that the Technical Staff of PRACTICAL WIRELESS will be pleased to render assistance, through its Advice Bureau, to all readers who are in difficulty. But remember that for them to be of real assistance you must supply the fullest possible details of your trouble, since it is not easy to suggest remedies when given such vague descriptions as "intermittent crackles," "buzzing sounds" and so on.

Extension Handle for Tuning Coil.

MANY readers no doubt have in use an aerial coil with a small variable condenser enclosed in the top, for selectivity purposes. When the set using this coil is enclosed in a cabinet, it often proves awkward to get at the condenser, but I eliminated this difficulty by making the following changes. First, I mounted the coil horizontally, as shown in the sketch,



and removed the bakelite knob from the top. Then by boring a hole in the front panel and attaching a short-wave extension handle to the condenser spindle, I was able to re-attach the knob on to the extension handle, so that the selectivity could be controlled from the panel. This arrangement also helps to eliminate hand-capacity, when tuning in some of the weaker foreigners. —R. G. RENTON (Harlesden).

THE IMPORTANCE OF LAY-OUT

With Some Ideas Which Will Help You to Make a Clean and Efficient Job When Designing a New Set.

By ALBERT E. OAKLEY

I SUPPOSE the most thrilling moment about the construction of a set comes when it is finished. The wiring has been checked over, nuts finally tightened, batteries and power connected and the set is switched on. What will be the result? So many things may happen. Oscillation, growls, hum, reception of the local station all round the dial—silence. The constructor of, say, a PRACTICAL WIRELESS set has only to work carefully, methodically and unhurriedly, and, above all, to stick to the design, components, and the precise lay-out instructed and all will be well.

Building to Your Own Design

But the man who really gets the craze for construction—and most of us do—will want to build sets of his own design in addition to the published ones. Commencing with a standard circuit, he will add his own refinements, try out some pet idea and use up certain components he has on hand. Possibly the set is going into an existing piece of furniture, and must be designed to fit. The work of designing a set falls into three heads, viz., planning the circuit, selecting suitable components and designing the lay-out. It is the latter I propose now to discuss.

The first thing the amateur designer will do, very naturally, will be to set out all his components on the baseboard, if this already exists, or on the board from which it will be cut. Having compactness and neatness prominently in mind he will arrange and rearrange till he gets everything into the smallest space. He will then probably settle the size and cut out the baseboard, screw down the components and make ready to start wiring. Unless, however, the wiring detail was fully planned at the same time it is almost certain that this method will result in a bad tangle, with wires crossing and recrossing. Many

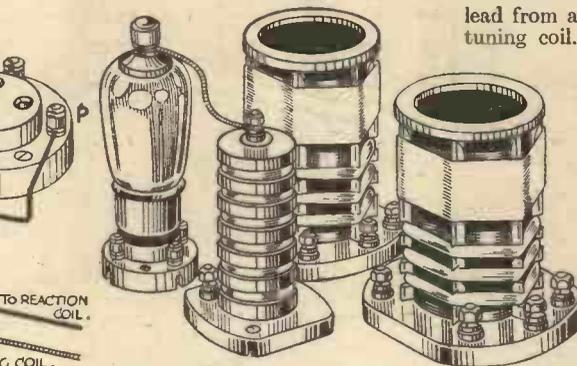


Fig. 1.—Do not run H.F. wires close together.
 Fig. 2.—Unshielded coils and chokes should not be mounted near one another.

will be of unnecessary length, grid and anode wires will exert undesired magnetic and capacitive effects, and the result will be at best a set which does not yield the maximum of efficiency, and at worst a real dud. Let me explain what to do, what to avoid and why.

lead from anode alongside the grid lead to tuning coil. If any two such wires must run in the same direction they should be well separated; one, say, on the baseboard, the other in the air. The low-tension or filament leads are of minor importance as to length, but must not run close to H.F. leads. This would cause loss, and often affect the matching of coils, while in the case of ganged condensers the adjustment might be affected. Coils tuning successive stages must not be mounted close together unless they are of the canned type. Fig. 2 shows an arrangement which might appear neat and

tidy, but as the coils and choke would react powerfully, the effect would be disastrous. If screening partitions are used to separate the H.F. stages the coils should be mounted, as far away from them as is practicable, for the effect of a close up screen is to reduce the inductance of the L.S. coil, so altering its wavelength range, and probably introducing ganging difficulties. In addition, the screen absorbs power from any H.F. conductors which may be near to it. The loss from a wire passing through the screen at right angles, as, for example, the lead from the choke to anode of the screened grid valve will not be material, but wires parallel to screens should be avoided.

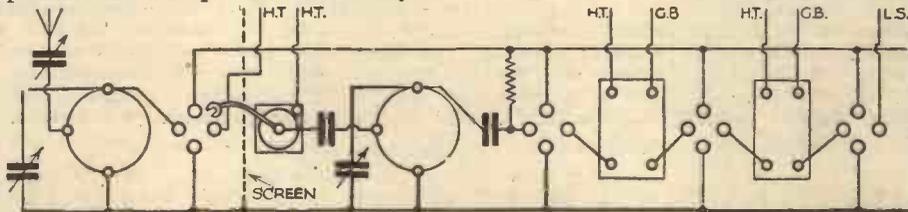


Fig. 3.—Shows the chain of essential components in a 4-valve S.G. receiver, arranged and connected in the simplest possible manner.

What to Avoid

Long leads are bad. Those carrying high-frequency currents, that is the grid and anode wires, and the coil connections to grid or anode, should be as short as it is possible to make them. Why? Because these wires are radiating energy, and every inch of length increases the radiation. Grid and plate wires in close proximity mean, therefore, a transfer of energy from plate to grid—virtually an increase in grid-anode capacity. This results in a tendency to instability or, perhaps, damping and weakening of signals according to the directional relation of the conductors. Fig. 1 shows how such a mistake might easily be made by running the reaction

The L.F. Side

The conductors carrying L.F. currents are less important than the H.F. ones, but it is still best to stick to the rule of "short, direct and well apart." Care must be taken in the arrangement of transformers and chokes, as these are surrounded by an alternating magnetic field. Interaction between these L.F. components is one of the frequent causes of low-frequency oscillation, particularly in that irritating form called "motor boating." Mount these items, therefore, with their magnetic

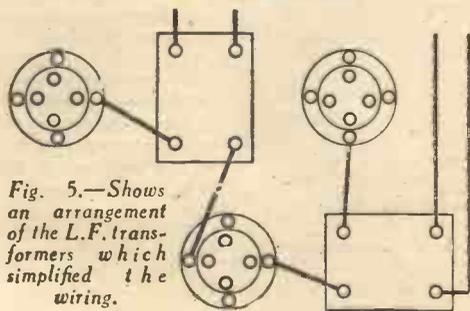


Fig. 5.—Shows an arrangement of the L.F. transformers which simplified the wiring.

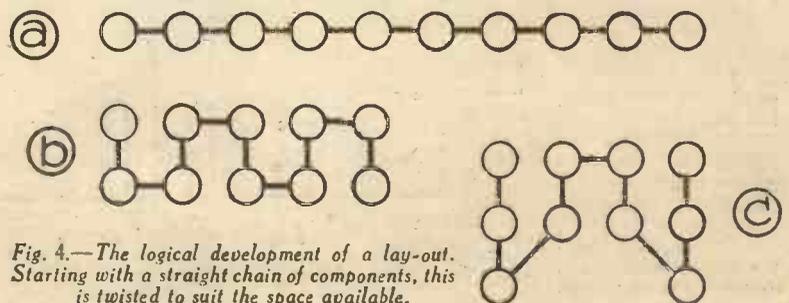


Fig. 4.—The logical development of a lay-out. Starting with a straight chain of components, this is twisted to suit the space available.

axes at right angles one to the other, and don't have them closer together than is necessary. This will generally obviate serious interaction. Fig. 5 shows a suitable arrangement.

Go as You Please Wiring

The reader has probably seen sets where the wires, generally flexes, are taken from point to point without any pretence at orderly arrangement. This system, or, more properly, lack of system, had a certain vogue for a while, but it is, in the writer's opinion, thoroughly bad, for its appearance is slovenly and amateurish, one is taking chances, and probably spoiling the job for the sake of a few minutes more time spent in wiring.

Arranging the Components

Let us consider how the components of a straight four are connected. If we lay them out in a sort of chain, single file as it were, it is easy to follow the connections, and a glance at Fig. 3 will show that the necessary wires can be made short and direct. Unfortunately this would involve a long and inconvenient cabinet, so we must find a more compact way of packing them in without violating the rules which have been enumerated. But in whatever positions on the board we place our components, they will still form a chain as shown in Fig. 4, where (a) represents ten main components in the ideal, but impracticable single line, (b) a double line, and (c), an arrangement which conforms to the usual shape of baseboard, and leaves a central space for the projection of the tuning condensers. It will be understood, of course, that these diagrams are merely

symbolic of the broad idea of a chain. The components will rarely be so geometrically positioned because of their various shapes and sizes, the necessities of different circuits, etc.

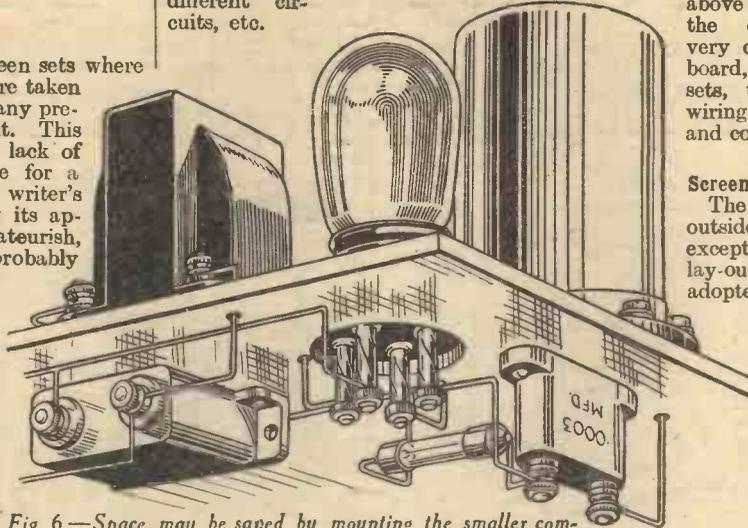


Fig. 6.—Space may be saved by mounting the smaller components "below deck."

are conveniently mounted on the panel below the chassis line. Valve holders of the disc or "wafer" type should be used, and the wiring may be all below deck, or partly above and partly below. Although the concealed method gives a very clean appearance to the baseboard, yet, for most home built sets, the mixed arrangement of wiring is generally the more efficient and convenient.

Screening

The problems of screening are outside the scope of this article except so far as they concern the lay-out. If band-pass tuning is adopted, or any circuit involving more than two tuning coils, then canned coils are necessary. If using a single S.G. valve with the usual tuned aerial and intervalve circuits, open coils may be used with due precautions. One coil is preferably mounted at right angles to the other, and as far apart as possible unless a screen is interposed between the stages, in which case the coil positions present less difficulty. If a partitioning screen is not used, then the H.F. choke in the anode feed should be of the screened variety, while in all cases the valve should be metallized. Certainly the full use of screened components makes the lay-out problem simpler, for the valves, coils, etc., can be packed closely together without fear of interaction, and one has little more than the wiring problem to consider. All screens, whether partitions, chassis, coil cans, condenser covers, etc., should be connected to L.T. negative and earth.

Saving Space

The tendency of design is towards compactness and still greater compactness. Considering their great power the best sets to-day are strikingly small compared with the apparatus of but a few years ago. Adoption of the chassis method of construction will help materially towards space saving and tidy wiring. Many of the smaller items can be fixed beneath the chassis, reserving the "deck" for the main components. The decoupling condensers, resistors, grid condensers and leaks can with advantage be placed below. Switches for "on-off" and wave change

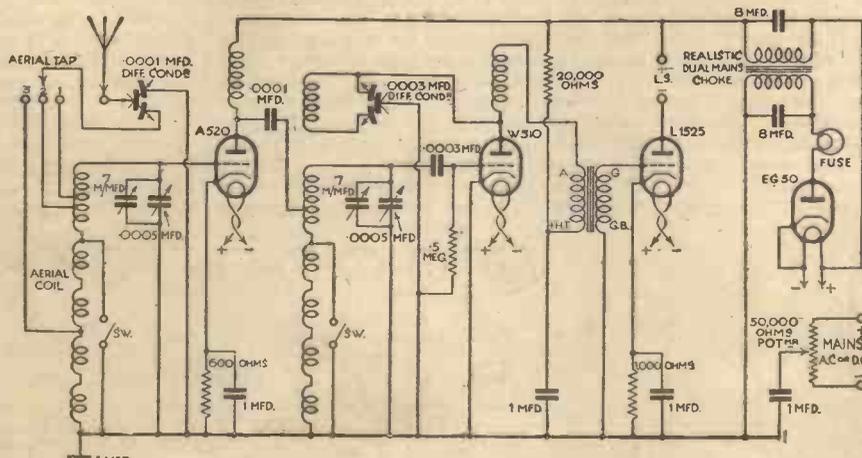
An Ingenious Universal Three-Valve Set

WHEN you wish to make up a receiver for a relative or friend, and that friend lives in a house fitted with D.C. whilst you are on A.C., or when you build a set for use on A.C. mains and move to a district where D.C. is supplied, the difficulties appear almost insurmountable. The circuit shown on this page, however, is of a three-valve receiver, employing special valves, which may be used indiscriminately on any type of electric supply. As will be seen from the diagram, in place of the customary transformer used on A.C. mains sets, a potentiometer is joined across the mains input terminals. This feeds the receiver through a special type of valve, the EG.50, which acts as a rectifier if the supply should be alternative, but purely as a ballast resistance when the supply is D.C. The heater connections for the valves are omitted from the

A Three-valve Receiver which may be Plugged Direct into either D.C. or A.C. Mains

diagram to avoid complications. The remainder of the circuit is straightforward,

and employs an S.G. valve in the first stage, and a power detector in the second stage. The output is delivered by a Power Valve of similar construction. These valves are all of the Ostar-Ganz type, handled in this country by Eugen Forbat, of 1, Rosebery Avenue, E.C.1.



Circuit diagram of the Universal All-Mains (A.C. or D.C.) Three referred to here.

In PRACTICAL WIRELESS dated October 15th last, a description was given of how a two valve battery receiver was converted to all mains working by means of these valves, and many readers asked for details of a three-valve set using the same types of valve. The circuit illustrates the arrangement which we recommend. It will be noticed that no heater transformer is required with these valves, which operate with the full mains voltage on the heaters, and may be used with mains voltages between 110 and 250 volts. The consumption is very low.

STILL LEADING!

OUR "CLASS B" UNIT

A Simple Easy-to-make Unit Employing a Class B Valve, and the Necessary Accessories for Addition to Any Existing Receiver. A Cheap Method of Testing Out Class B Amplification Without Building a New Receiver.

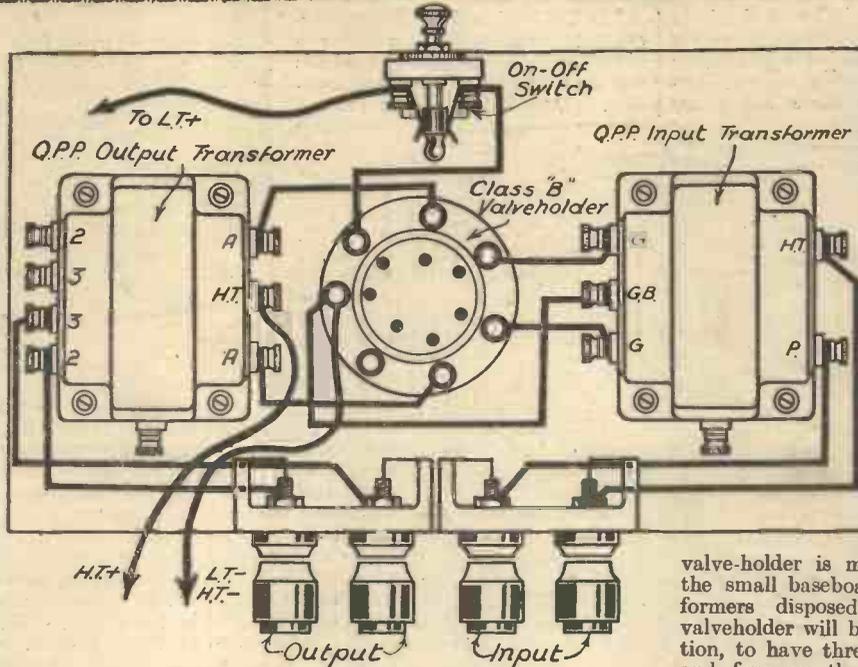
At the time of writing this article, Saturday, March 25th, the first 7-pin valves to be released to the Press have just been received, and in accordance with the PRACTICAL WIRELESS policy of being first, we give in this issue details of a receiver and a unit employing this, the very latest development in wireless valves.

Undoubtedly, the majority of readers like to try out the various new developments which are introduced into the radio world, and this is sometimes a matter of difficulty, owing to the fact that there is not always a desire to dismantle a receiver which is giving good service. Sometimes, too, the present receiver employs very expensive parts, and these naturally are not of the kind which may be put in the junk-box whilst new parts are purchased to build up a new set.

"Class B" is a new development, and as you will have read last week, it gives a phenomenally large output from a battery-operated receiver, and requires no grid-bias. In order, therefore, that readers may try out the scheme, the unit described in this article has been made up and may be adapted for use with practically any broadcast receiver. There is just one point which must be stressed, and that is, that the input transformer used in this unit will only give of the best when used direct in the anode circuit of a small power valve. This is not due to the particular make of transformer used, as this point applies to every driver transformer used with Class B valves, and the reason will be apparent if you refer back to last week's article on the Class B valve.

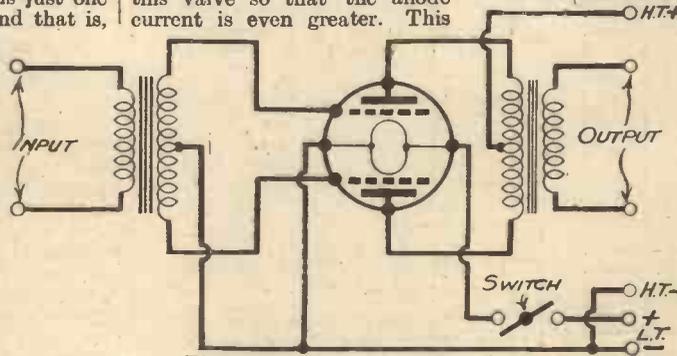
Power Necessary

As you will see, the flow of grid current in the transformer secondary necessitates the supply of power to that secondary, and the method of obtaining this is to use a step-down transformer, and to supply the primary with a really good current. Therefore, if the receiver with which you intend to use this unit employs a choke output circuit, the best results will be



Wiring diagram of the Class B Unit

obtained if you cut out the choke which is included in the anode circuit of the valve you are using. Another point which must be emphasized is that the valve feeding the input of this unit should be a Cossor P. 215, or at least a valve of exactly similar characteristics. This valve takes an anode current of 10 mA. with 7.5 volts grid-bias, and an anode voltage of 150, although for best results with Class B it will be found preferable to slightly under-bias this valve so that the anode current is even greater. This



Theoretical Circuit of the Class B Unit

need not cause any doubt regarding the life of the H.T. battery as the Class B valve takes such a small current that it compensates for the increased current of the driver valve whilst at the same time delivering such a large speech signal.

The Unit

A glance at the wiring diagram and theoretical circuit will show that there are only four components employed, two Class B transformers, an on-off switch, and a valve. The construction of the unit is, therefore, simplicity itself. The

valve-holder is mounted in the centre of the small baseboard, with the two transformers disposed on either side. The valveholder will be found, on close inspection, to have three terminals on one side, and four on the other (that is with an imaginary line drawn across the diameter). If you examine the wiring diagram you will see how to stand this holder, unless, of course, you obtain a holder with the marking on the terminals. The two terminal blocks are screwed to the rear edge, with the input terminals connected to the input or driver transformer, and the output terminals joined to a pair of terminals on the output transformer. The on-off switch is centred on the panel, and wired in the filament lead as shown. When connecting the output terminals to the transformer use ordinary flex to begin with, and try the effect of using different combinations of the four terminals to see which best suits your particular loud-speaker. The remainder of the wiring is carried out with Glazite, and is extremely simple.

Obtaining Best Results

As already mentioned, to obtain the best results from the unit it must be joined direct in the anode circuit of a small power valve. Connect the two input terminals to the anode circuit of the output valve of your present receiver, and switch on the two units. The maximum H.T. voltage should be applied to the unit, and if instability is introduced through using the direct anode connection in your receiver output circuit, you will have to introduce a low value decoupling resistance and

"PRACTICAL WIRELESS" "CLASS B" UNIT

- | | | | |
|---------------------------------------|-------------|--------------------------|-------------|
| 1 SS/B Driver Transformer | Sound Sales | 4 Terminals, Input— | Belling Lee |
| 1 SS/BC Output Choke | | Input+, Output. | |
| 1 On-Off Switch S.38 | Bulgian | 2 Terminal Mounts | Belling Lee |
| 1 7-pin Valve Holder (baseboard type) | Whiteley | 1 Battery Cord—H.T.+ | Belling Lee |
| 1 Cossor 240 B. Valve | | H.T.—, L.T.+ L.T. | |
| | | 1 Baseboard 9in. by 5in. | |
| | | 1 Panel 9in. by 5in. | |

(Continued on page 132.)

THE WIRELESS HOUSING PROBLEM

A Practical Article on the Construction of a Serviceable Radio Cabinet of Modern Design.

By "CABINET CRAFT"

There are many wireless enthusiasts who construct their own receiving sets and are sadly at a loss when it comes to making up a suitable cabinet to house them. Also, there are many who purchase their sets ready-made, usually in a somewhat plain case, and who would like to make for the set a cabinet really worthy of it. They can easily do this and house the speaker and set in one cabinet. This article should make an especial appeal to these workers, as it describes how a cabinet was actually made to contain a Cossor All-Mains set and a double-cone speaker. For a battery driven set, there is plenty of room behind the speaker for all batteries.

The illustration, Fig. 1, shows the cabinet as completed, while the diagrams give the necessary details and measurements for the construction. The set itself, over all, measured

18 1/4 in. long by 12 1/2 in. wide and 8 3/4 in. deep, while the cone speaker was 18 in. square. The depth of the speaker need not be taken into consideration. The aerial condenser control is on the left side of the set, and the terminals on both sides must be allowed for in the width, and also suitable-size holes must be made in the sides of the cabinet to give access to these fittings. So the over-all width of the cabinet and projecting con-



Fig. 1.—The completed cabinet.

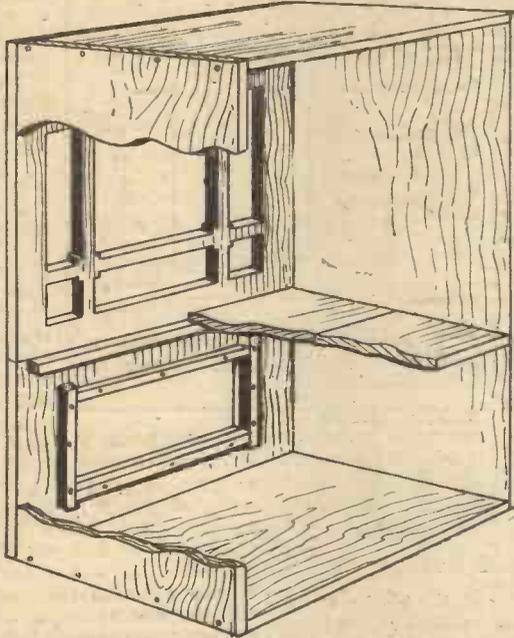


Fig. 3.—Showing the inside construction of the cabinet.

trols determines the width of the cabinet inside. The height of the cabinet is determined by the size of the speaker, which is in the upper compartment. From these general dimensions, an idea of the amount of wood required for the cabinet can be judged.

Constructional Details

The sides, top, and bottom consisted, in the actual cabinet, of 3/4 in. thick birch plywood (7-ply), while the front was 3/4 in. thick solid Spanish chestnut made up in two pieces, as indicated in Fig. 2. The floor of the speaker compartment consists of 1/2 in. deal in two widths, and cut 18 3/4 in. long. It was screwed through the sides, the holes for the screws being countersunk and afterwards covered with 3/4 in. by 3/4 in. strips. To accommodate the overhanging lip on the top of the set, and also to add to the appearance, the panel of the set was recessed an extra 1/2 in., and this was done by gluing and screwing four 1/2 in. square strips of oak round inside the lower half panel opening, as shown in Fig. 3. The method of building the cabinet was as follows. After the sections were cut and squared up, the positions of the screw holes were set out 3/8 in. from the ends of the sides and 9 3/4 in. up from the bottom edge for the floor screws. The bottom and top of the cabinet measured 18 3/4 in. long by 12 1/2 in. wide, and to these the sides were screwed and the floor added. The top fretted front, 1 ft. 7 1/4 in. long by 1 ft. 7 1/4 in. wide, was next added, and a 1/2 in. square fillet glued to the underside of the deal floor and flush with its front edge, this fillet taking the top edge of the lower front, the joint between the two pieces being later covered with strips, as also were the screws holding the fronts to the sides and top and bottom. There is no baffle-board to the type of speaker used, it consisting only of a frame 18 in. square, of 1 in. square wood, to which the linen is attached. Another frame, 12 in. square behind and held away from the first at a distance of about 4 in. The small frame is held by two square uprights having a 5 in. board nailed across the middle to take the unit. The speaker was fixed in the cabinet by screws through the top and one side, and was held away from the floor entirely, as shown in Fig. 4.

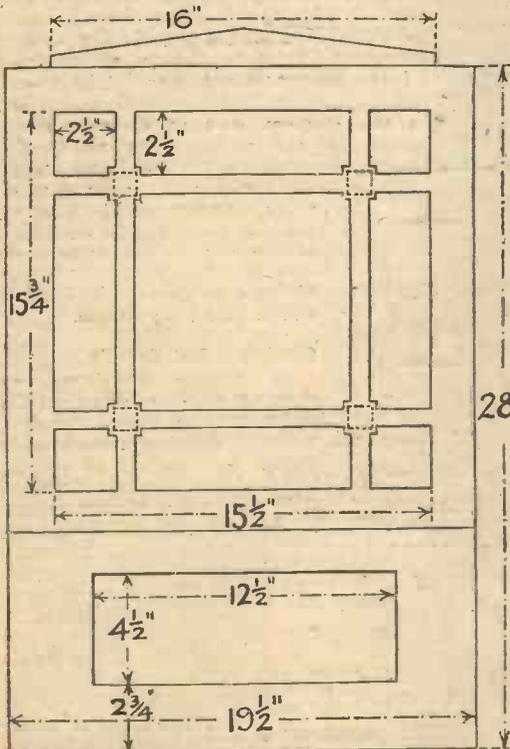


Fig. 2.—Front of cabinet with all necessary dimensions for making up.

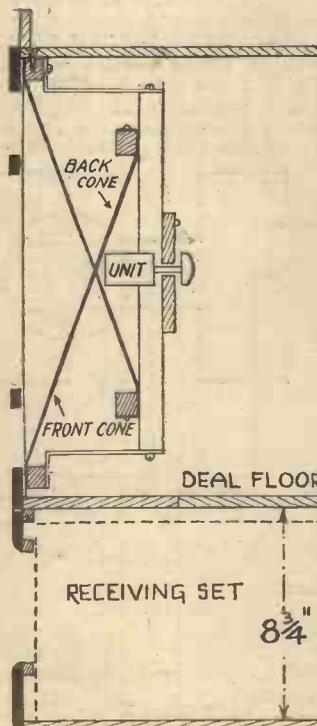


Fig. 4.—Section through set and speaker.

THE ABC OF SELECTIVITY

PART III

A Practical Article
Explaining Methods of
Obtaining It

By W. B.
RICHARDSON

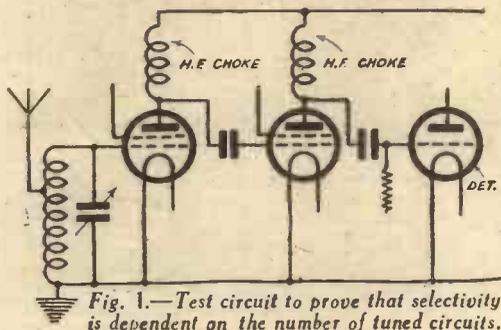


Fig. 1.—Test circuit to prove that selectivity is dependent on the number of tuned circuits.

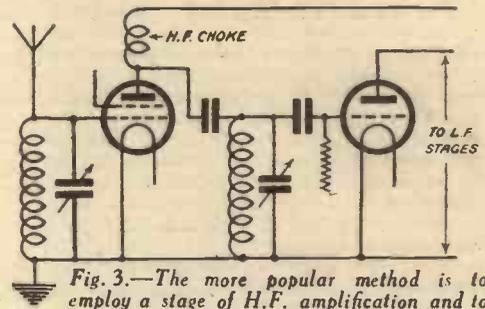


Fig. 3.—The more popular method is to employ a stage of H.F. amplification and to use the second circuit as the coupling between the S.G. valve and the detector.

WHEN we think of a really selective set we naturally imagine one with one or more stages of H.F. amplification. Indeed, we have become so used to associating H.F. amplification with long range and selectivity that we are inclined to take it for granted. I wonder how many of us if we were suddenly confronted with the question: "Why should a 3-valve set with two screen-grid stages be more selective than one with 2 L.F. stages?" would be able to find an answer. And yet it seems to me that unless we have some idea of the "reason why" we must of necessity be groping in the dark when it comes to designing or choosing the design for a selective receiver.

That H.F. amplification does give selectivity there is no doubt whatever, but the question is—How does it do it? The best way to arrive at the answer is to compare it with L.F. amplification. As you know, L.F. amplification does not increase selectivity. Wherein then lies the difference? Is there some fundamental dissimilarity between the two systems which would account for the difference in their behaviour? Of course there is. H.F. stages which are used before the detector are tuned whereas the L.F. stages which follow after are untuned. It is the tuned circuits which make the difference.

Selectivity Dependent on Number of Tuned Circuits.

I have already stated that, other things being equal, an increase in the number of tuned circuits gives an increase in selectivity. The action of a number of tuned circuits in cascade might be compared with a rack of sieves, the top sieve being of coarse mesh and the others of increasing fineness. The top sieve makes a very rough selection of the material being sifted, while each succeeding one narrows down the selection until with the last one only the wanted particles are passed. With several tuned circuits in a receiver each one increases the selectivity until the last one passes only a prescribed narrow band of frequencies.

The fact that the increase in selectivity is due solely to the tuned circuits can be demonstrated by fitting up a receiver with several stages of *untuned* H.F. amplification. By this I mean that instead of having a tuning coil and condenser between each H.F. stage the coupling is carried out by means of a resistance (as with R.C.C. coupling used in the L.F. stages) or by means of an H.F. choke as in Fig. 1. Apart from the fact that there is not quite so much amplification as with tuned stages

the most noticeable difference is that selectivity is of a very low order. In fact the apparent selectivity owing to the amplification of wanted and unwanted stations alike is worse than if no H.F. valves were used at all.

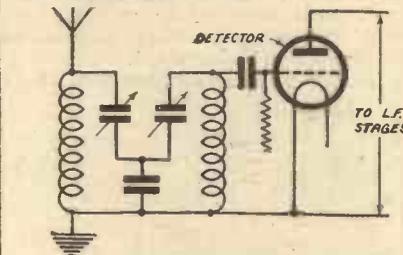


Fig. 2.—One way to employ two tuned circuits is to place them both before the detector.

The Object of H.F. Valves.

When two tuned circuits are coupled together there is always some loss in signal strength. This depends, of course, on the tightness of the coupling. It may be that only 70% of the available energy is trans-

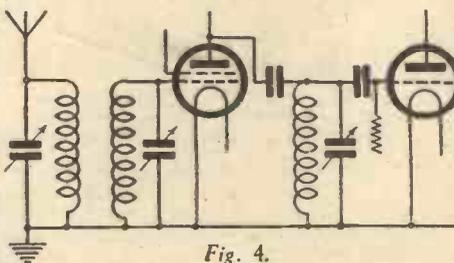
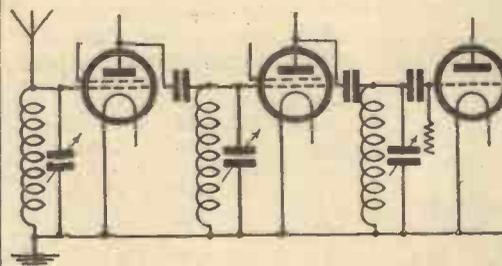


Fig. 4.

ferred to the second circuit. However, the gain in selectivity is such as to make it worth while. In this respect two coupled circuits differ from a single circuit, for as we have already seen none of the expedients which are normally used will



Figs. 4 and 5.—Optional arrangements for three tuned circuits.

increase the selectivity of the single circuit without introducing a disproportionate loss in signal strength.

However, although from the point of view of selectivity two tuned circuits are better than one we cannot go on increasing the number indefinitely without taking into account the loss in sensitivity which each additional circuit entails. This is where the H.F. valves come in. They make up for the loss between each circuit. Of course, modern valves do more than just make up the loss; they give a decided increase.

In this connection it may be easier to understand the function of the H.F. stages of a set if we consider the valves as the means of coupling the tuned circuits rather than the more usual way of looking upon the tuned circuits as the means of coupling the valves.

Alternative Arrangement of Tuned Circuits

Let us now have a look at the various methods of coupling several circuits when we have one or more H.F. valves available. Firstly, let us take the case of just two circuits. Here there are two alternatives. The first one, which we have already seen, is to place both circuits before the detector as in Fig. 2. The various methods of coupling we have already studied so that there is no need to go into that again here. The second method, which is the more popular, is to employ a screen-grid valve and use the second tuned circuit between the S.G. valve and the detector as in Fig. 3. What are the pros and cons of the two arrangements?

Range or Quality?

From the point of view of selectivity alone there is not much to choose between them, but when it comes to the questions of range and quality there is some difference. Circuit Fig. 3 gives greater range because the signal impulses are amplified by the S.G. valve before detection. As you know, the perfect detector has yet to be discovered, and with the popular leaky-grid arrangement the rectifying effect drops off rapidly below a certain input. This means that *very weak* signals are to all intents and purposes not rectified at all. Of course it's no use adding more L.F. stages to bring them in because *you cannot amplify what is not there!* If the detector has not rectified them then they are lost. This is where the H.F. valve comes in. It amplifies the H.F. impulses from weak stations so that they are strong enough to make the detector

(Continued on page 100.)

(Continued from page 99.)

function. From this you will see how the circuit of Fig. 3 has the advantage over that of Fig. 2. Fig. 3 employs pre-detector amplification but Fig. 2 does not.

The advantages of Fig. 2 circuit are chiefly those of quality and cheapness. If the coupling between the two coils is arranged to give a band-pass effect then the quality will be good and no tone compensation will be required in the L.F. stages; also the somewhat expensive screen-grid valve is not required. With Fig. 3 circuit, on the other hand, band-passing is not possible: therefore if the circuits are made very selective some loss of high notes is bound to result.

With three tuned circuits there are again two possible arrangements. The first is to use one H.F. stage with band-pass input and a single intervalve circuit as in Fig. 4, and the other is to use two H.F. stages with a tuned circuit between each. This is shown in Fig. 5. Here again the choice will depend on other considerations than that of selectivity alone, from which point there is not much to choose between them. The number of tuned circuits being the same so the selectivity will be about the same.

Low-loss Circuits Essential

A fact which is not always realised is that to obtain the full selectivity from a number of tuned circuits each must be designed on efficient lines—lines similar to those laid down in Part I of this series. It is not sufficient to have a low-loss aerial coil followed by indifferent intervalve coils and still less so to have all of them of small inefficient design with the idea that the enormous magnification of modern valves will make up for the losses. Certainly the valves will make up for the loss in sensitivity but they cannot restore lost selectivity. They can increase the height of the response curve of the detector grid circuit, but they cannot alter its shape! No, each circuit, if it is to pull its full weight, must be designed on low-loss lines. If you need practical proof of this statement you have only to take the example set by the new Ferrocart coils. These are essentially low-loss coils and give remarkable selectivity. The great feature about them is that they are not only highly efficient but also extremely compact. On the other hand, the ordinary type of coil is either efficient or compact—but not both!

Selective Tuners must be Carefully Matched

Another point is that the more selective the circuits are the more accurately must they be tuned. This fact will often explain

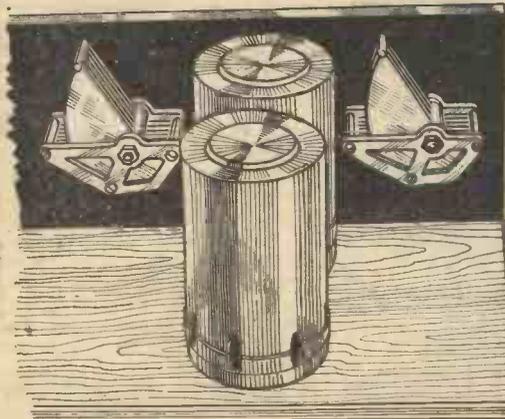


Fig. 7.—An arrangement which allows of a more compact lay-out but is not so efficient as that shown in Fig. 6.

why a receiver employing two circuits tuned with separate condensers will give better range than one using three circuits tuned with a three-gang condenser. Owing to inaccurate ganging the second set is not properly tuned and is therefore not giving of its best.

I have often read descriptions of receivers in which the designers have made a virtue of flat tuning in the intervalve circuits. They stated that ganging was "easier." Surely a most naive admission of the shortcomings of the ganging! Had the ganging been accurate there would have been no need for flat tuning. In this connection it will be noticed that indifferent ganging and flattish tuning go hand in hand. It is no use providing selective coils if they cannot be tuned. On the other hand, if the coils are unselective it does not matter so much about the condensers being dead accurate. Of course if full advantage is to be taken of really selective coils used with ganged condensers then both the coils and the condensers must be carefully matched and all the stray capacities and inductances due to the wiring balanced out. Regarding this last point endeavour should be made

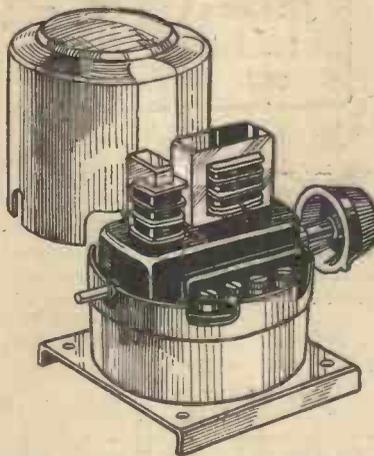


Fig. 8.—A Ferrocart coil which gives remarkable selectivity and has small dimensions.

to obtain some symmetry of lay-out, by which I mean that the connecting wires to each coil should be as near the same length and shape as the corresponding wires to the other coils. In this way the added inductances and capacities will be approximately the same for each circuit, and thus ganging will remain more accurate over the whole scale than would be the case if the trimmers were relied upon to make up the differences.

Compactness versus Efficiency

With the increase of tuned circuits there are always two important questions to be considered. One is the means of tuning them and the other is the question of space. With one H.F. stage only (two tuned circuits) it is possible to get a high degree of efficiency by using fairly large coils spaced well away from a single metal dividing screen as in Fig. 6. This arrangement is very popular, but if still greater selectivity is wanted then another circuit must be added.

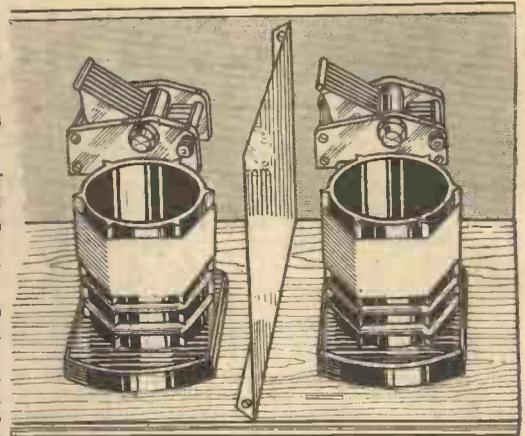


Fig. 6.—Good selectivity can be obtained from two tuned circuits arranged as above.

To repeat the same arrangement again by using a third similar coil, condenser and screen would make the whole thing unnecessarily bulky and the three condensers would be exceedingly difficult to tune. The usual thing to do, therefore, is to employ three comparatively inefficient screened coils and a three-gang condenser. The resulting arrangement is even more compact than with the single H.F. stage but it naturally does not give the same increase in selectivity that three low-loss coils and three separate condensers would. An alternative arrangement is to use a two-gang condenser and a single condenser instead of the three-gang one as a sort of compromise. Of course the Ferrocart coils already mentioned are a distinct step towards a solution. They provide in a small space coils of an efficiency equal to very large coils of the ordinary type.

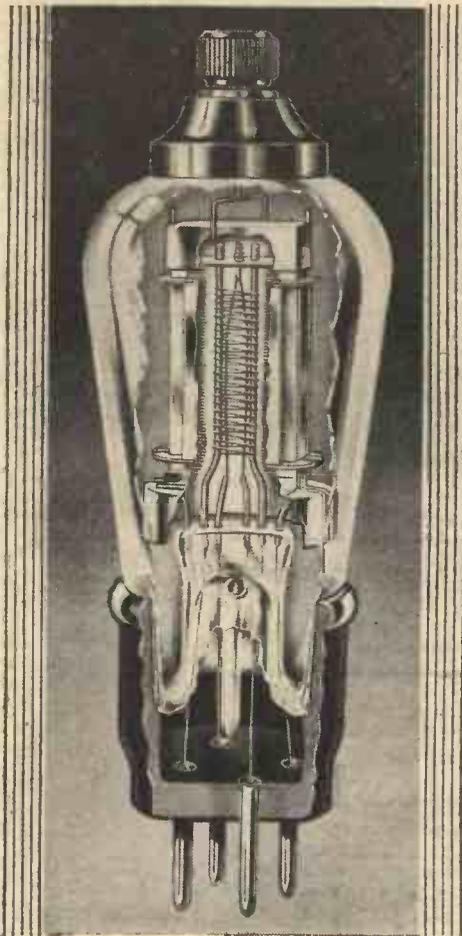
Effect of the Detector on Selectivity

There is one point in connection with selectivity which must not be overlooked. I refer to the damping effect of the detector valve on the circuit immediately preceding it. With leaky grid detection this is often considerable and results in reduction of selectivity and general alteration of the tuning. It is not so apparent with a single tuned circuit because there is no other similar circuit with which to compare it, but with two or more the last circuit is noticed to be flatter in tuning than the others and also to be difficult to gang with them. Anode-bend detection is often suggested as a solution, but it is usually found that under working conditions the "Miller effect" due to the inter-electrode capacity of the valve nullifies the advantage gained by the absence of the grid leak and condenser.

Screened-grid Valve as Detector

Probably the most practical solution of the problem is the use of a screen-grid valve as detector. Due to its internal screening it is free from the Miller effect and so throws less damping on the previous circuit even when used as a leaky grid detector.

Returning to the question of intervalve circuits I find I have not made any reference to the various systems of connection. As regards selectivity there is not much to choose between tuned-grid, tuned-anode or transformer coupling. Each employs its own individual method of sharpening the tuning, such as reducing the size of the coupling condenser, taking a tapping or reducing the number of turns on the primary.



Send for a free copy of the 40-page Cossor Valve and Wireless Book which contains a wealth of interesting and useful information including Radio Definitions—Useful Circuits—List of Stations, etc., etc. Please use the Coupon.

UNIFORMITY—
EFFICIENCY—
LONG LIFE—

BETTER RADIO RECEPTION



KINGS OF THE AIR

Far too many people put up with indifferent wireless when they could easily improve it out of all recognition. Will your set bring in the stations it used to? Is its tone as good as it was? And what about its volume? Or, if you are building a new Receiver, are you sure it will give the results you expect?

Restore the youth of your Receiver—get maximum performance from your new Set—fit the correct types of Cossor Valves (your dealer will tell you which you need)—they'll give you a pleasant surprise.

COSSOR VALVES

2-VOLT TYPES

Type	Filament Amps.	Anode Volts	Imped.	Amp. Factor	Mutual Conductance m.a.v.	Price
*215 S.G.	.15	120-150	300,000	330	1.10	16/6
*220 S.G.	.2	120-150	200,000	320	1.60	16/6
*220 V.S.G.	.2	120-150	110,000	—	1.6	16/6
210 R.C.	.1	75-150	50,000	40	0.8	7/-
*210 H.L.	.1	75-150	22,000	24	1.10	7/-
*210 H.F.	.1	75-150	15,800	24	1.5	7/-
*210 DET.	.1	75-150	13,000	15	1.15	7/-
210 L.F.	.1	75-150	10,000	14	1.4	7/-
215 P.	.15	75-150	4,000	9	2.25	8/9
220 P.	.2	75-150	4,000	9	2.25	8/9
220 P.A.	.2	100-150	4,000	16	4.00	8/9
230 X.P.	.3	100-150	1,500	4.5	3.00	12/-
230 P.T.	.3	100-150	—	—	2.0	17/6
220 H.P.T.	.2	100-150	—	—	2.5	17/6
220 P.T.	.2	100-150	—	—	2.5	17/6
210 D.G.	.1	75-100	27,000	5.1	0.19	20/-
240 B.	.4	120-150	—	—	—	14/-

* These Valves available with or without Metallised Bulbs.

To A. C. COSSOR LTD.
Melody Dept.
Highbury Grove,
London, N.5.

Name

Please send me free of charge, a copy of the 40-page Cossor Valve and Wireless Book B.17.

Address

PRAC. 8/4/33.

A. C. Cossor Ltd., Highbury Grove, London, N.5. Depots at Birmingham, Bristol, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Sheffield, Belfast, Cardiff and Dublin.

"FURY FOUR" EXPERIENCES

The Most Successful 1933 Receiver which Carries the Personal Guarantee of the Designer

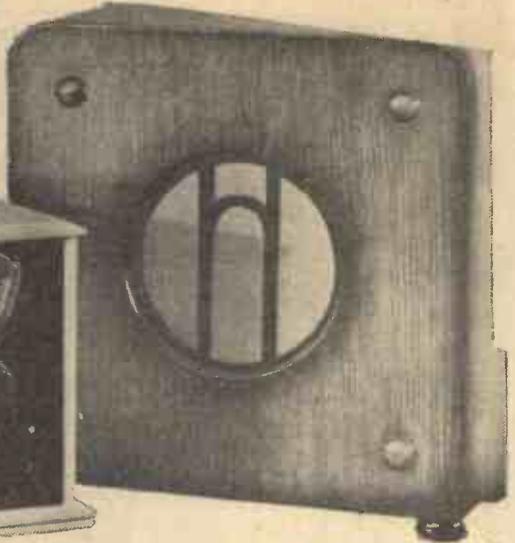
JUDGING from the vast correspondence which has been dealt with regarding my "Fury Four," there are very few real difficulties which have arisen. As was to be expected, this circuit was so carefully worked out that there was very little that could go wrong, and the majority of the queries which have been received were relating to quite simple points. In order, therefore, to anticipate any questions which may be asked by builders of this receiver in the future, I will give details of the points which have been raised. Just a friendly hint: Please do not ask your queries over the telephone.

The Fixed Condensers

Quite a number of readers wrote to enquire about the two fixed condensers which are used in the H.F. decoupling circuits. In the specification these are referred to as Dubilier Type BE.31 with a value of .1+.1. On the case of the condenser appears the marking .2 CT. Some readers thought that the condenser which they had bought was of the wrong type. Actually the condenser consists of two .1 condensers joined in series inside one case. The junction of the two condensers is provided with one lead, whilst a lead is brought out from the remaining terminal on each condenser. Therefore the condenser has a total capacity of .2 and is centre-



The "Fury Four" ready for a test.



Some General Queries Answered and Anticipated! By F. J. CAMM

tapped. If, therefore, you buy the condenser specified you will understand the meaning of its marking.

The Reaction

Another point which has cropped up in some cases is the reaction control. This does not seem to function in some receivers when the knob is rotated clockwise. If your receiver suffers from this peculiarity, try the following idea. On the coil furthest from the panel, terminal 2 is joined to the screw on the coil chassis. On the blue-print terminal 5 is also joined to terminal 2, whilst the reaction condenser is joined to terminal 6. Leave terminal 2 joined to the metal chassis, but change over the two wires which are joined to terminals 5 and 6. That is to say, terminals 2 and 6 are joined to earth, and terminal 5 to the reaction condenser. In some cases this will be found an improvement so far as the reaction is concerned.

Selectivity

Complaints of lack of selectivity are nearly always found to be due to lack of skill (if I may call it such) in handling the receiver. As I pointed out in the notes on tuning the receiver, if the potentiometer is left turned nearly fully on, the sensitivity is

greatest, but as has been pointed out in many articles in these pages, sensitivity and selectivity work together. That is to say, if the set is made sensitive, it becomes unselective, and conversely when made selective the sensitivity falls off. Therefore remember that when you are in need of selectivity you must reduce sensitivity by turning down the potentiometer. In order to get back the strength of the station you desire to receive, recourse must be had to the reaction control, and there is a certain amount of "skill" in being able to balance these two controls so that the weak station which is transmitting on a wavelength close to that of a high-powered one may be received clear of interference.

Balanced Circuits

The three tuning coils are matched, and the single and the double-gang condenser are also matched. Therefore, the tuning points on the two dials should be practically identical. If one dial is more than 10 degrees out, then the circuits are not wired up correctly, or undue stray capacities have crept in due to bad wiring or bad spacing of wiring. This will give you something to work on, therefore, if your circuits are well out of tune. The small pre-set condenser must be correctly adjusted for your local conditions, and there is no need to touch this once the preliminary adjustment has been carried out. The small slotted nut on the side of the ganged condensers should be adjusted with a long thin strip of wood to avoid hand-capacity effects, and there will be found to be a critical spot on this, although it is not very easy to find. The best thing is to tune in a very weak station on the bottom of the medium wave-band (preferably when London is not working) and to set it by that. This setting should hold right up to the top of the long-wave band.

Quality

Not one single complaint has been received concerning the quality of the reproduction, and this appears to have fulfilled my wish to please everybody, so far as tone is concerned.

This completes the points which have been raised concerning the actual receiver, but I should like to point out the following things. Two London readers phoned me up (although it is stated on the Queries and Enquiries page that queries cannot be

(Continued on page 121.)

UNDERSTANDING YOUR AERIAL

By GILBERT E. TWINING

An efficient aerial can be said to be an elevated wire placed at the necessary height, insulated and isolated as far as possible from all earthed objects, such as walls, high buildings, iron guttering, etc. It is the means whereby electrical vibrations originating from the transmitting stations are received and conducted to the receiving set. It must be understood that the aerial is constantly having set up in it a large number of minute pulsating electric currents of different frequencies, for each broadcasting station has been allotted its own frequency or wavelength. In other words, the violent electrical vibrations in a transmitting station's aerial will produce electric waves in space and these waves coming into contact with the receiving aerial will set up in it electrical vibrations of exactly the same frequency as those of

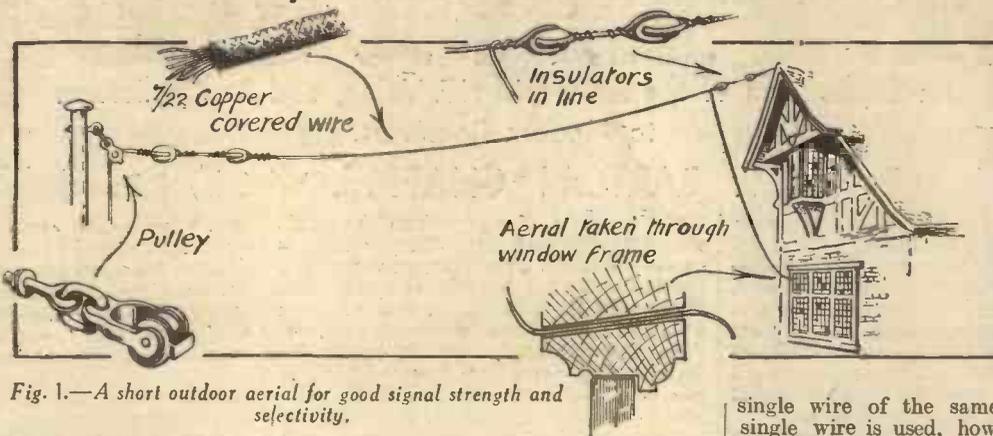


Fig. 1.—A short outdoor aerial for good signal strength and selectivity.

This Article Describes in a Simple Way the Functioning of the Aerial together with the Comparative Merits of the Different Types.

district in which it is situated is arrived at, to be entirely controlled by the set's own tuning circuit.

Frequency of Vibration

The minute currents which the aerial collects surge up and down the wire; the coil to which it is connected adds a certain amount of length to the aerial, the bigger the coil, (that is to say, the greater its length or number of turns it has upon it), then the greater the time taken for the surges. Frequency means the time that the currents take to flow in the aerial, backwards and forwards, causing it to vibrate at a definite frequency. Therefore if the length of the aerial is altered, so also must the frequency of the vibrations be affected and the set will then be said to be tuned to another station, either of a shorter or a longer frequency, depending upon whether more wire was wound around the coil or some taken away. This is

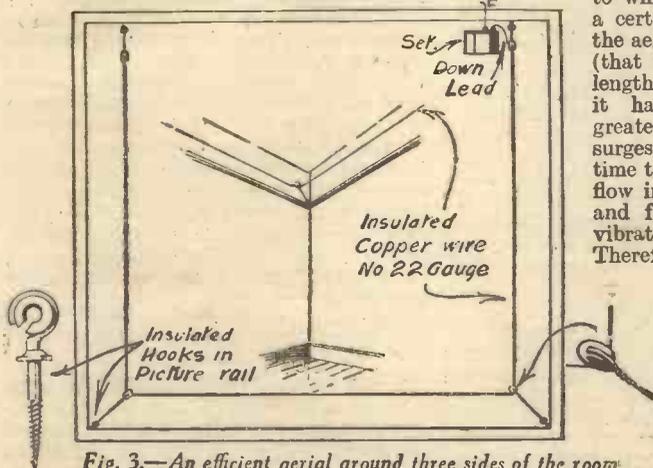


Fig. 3.—An efficient aerial around three sides of the room hung from its picture rail at a distance of 1 foot.

the transmitter. An aerial, however, has its own natural wavelength; this is the wavelength to which the inductance of the wire is tuned by its own capacity, therefore the nearer the natural wavelength of the aerial is to the station being received the stronger will be the signals from that station. It must follow, then, that the inductance of the aerial tuning coil and the capacity of the variable condenser in the set to which the aerial is connected, will have little effect in overcoming or cutting out the signals from the station which the aerial naturally tunes in to. But, however, if the aerial is shortened, then its natural wavelength will be reduced and so remove it farther away from the station received. The aerial will then have less control over the tuning of the set, and so allow the aerial, when the correct length or rather the best length for the

said to be altering the inductance of the coil, but it is easier in actual practice to alter the capacity of a variable condenser which is connected across the coil. It is only when wavelengths of widely different frequencies are needed that complete new coils, or at least separate windings, are necessary, such as medium and long wave coils of the dual-range type and, of course, short wave coils.

The coil and condenser are so adjusted, enabling the aerial to be in "tune" with a certain transmitter of a given frequency. This really means the resonance or building-up effect of one frequency only, so that the strength of the current received from one station to which the set is tuned will be very much greater than

that of the adjacent stations to which it is not in tune. The high-frequency currents mentioned above mostly travel on the outside of an aerial and it is for this reason that stranded wire is preferred, as the area of a number of strands must be greater than that of one single wire of the same diameter. If a single wire is used, however, do not let it be too fine, for whatever the thickness used it must offer some resistance to the H.F. currents picked up, therefore the larger the gauge of wire the easier will be the passage for the flow of current.

The Outdoor Aerial

An aerial which is erected out of doors still remains one of the most efficient types that can be obtained, for if care is taken in choosing the spot where it is to be placed, special note being taken, as before mentioned, from the point of view of isolation, it should be selective and very efficient for long distance reception. Many people already having an aerial outside in the garden have discarded it for one placed round the picture rail or elsewhere in the house. If the garden aerial had been shortened and a little more attention paid to it the trouble of

(Continued on page 121.)



Fig. 2.—A vertical aerial held well away from the wall approximately 20 ft. high, will give very good results.

H.F. PENTODES

An Explanation of the Multi-grid H.F. Valve, and its Application to Modern Receivers.

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

IT is an open secret that the coming season will almost certainly see the general use of high-frequency pentodes as radio-frequency amplifiers. Although, at first, they may only make their appearance in sets of the most advanced design, there is no doubt that in due course valves of this type will, to a very large extent, replace the familiar four electrode or screened-grid valve in the high-frequency stages.

For this reason, it is not too early for listeners to learn something of the new method of amplification, and the reasons for its adoption. In the first place, it must be stated right away, that actually high-frequency pentodes have been available for some little time, although so far they have not been used very widely. Now, however, their appearance in commercial form, for the use of the average listener, is imminent.

Where is the Difference ?

In external appearance, and in general design, high-frequency pentodes do not differ greatly from screened-grid valves, the only addition being the third grid which, like the low-frequency pentode third grid, is connected to the cathode of the valve. In application, also, the high-frequency pentode and the screened-grid valve are identical, so that the user will have no difficulty whatever in accustoming himself to the new valves.

What, then, will be the difference between the two types of amplifier? Briefly, the main difference will lie in the much greater sensitivity of the pentode, giving a much larger overall gain per valve stage, but in addition, the pentode allows a considerably wider degree of latitude as regards operating conditions, as will be explained. First of all, however, because the high-frequency pentode must be considered as a development of the screened-grid valve, it is necessary to consider briefly the facts which led up to the introduction of the screened-grid valve itself.

Up till about five years ago, the only type of valve available for use as a high-frequency amplifier was the ordinary three electrode valve. Theoretically, such a valve should be quite a good amplifier of radio-frequency signals, but in practice its possibilities could not be fully realized. You see, owing to the physical design of the valve (the position and closeness of the electrodes and the leads coming from them) the metal parts of the valve acted as the plates of a very small condenser. For low-frequency work, this condenser effect, or "inter-electrode capacity" as it is called, was not very serious, but on radio frequencies this small condenser allowed a considerable part of the amplified high-frequency energy in the anode circuit to pass back to the grid circuit *within the valve*.

Feed Back Difficulties

You will scarcely need to be reminded

that the return of energy from the anode circuit to the grid circuit in any valve is equivalent to the process known as reaction, the energy so fed back being re-amplified in the valve. At first sight, this may seem a very efficient and useful arrangement, but the difficulty was that owing to this re-amplification, more high-frequency energy was built up than could be utilized, or, to put the matter in technical language, the valve generated free oscillations. This excess energy produced an unstable condition of the circuit, and was manifest by howling and other distressing symptoms.

The screened-grid valve was the final and best solution to the difficulty. In addition to the usual control grid, this valve has a second grid which is kept at a positive potential of approximately half the high tension voltage applied to the anode. Two effects follow. In the first place, the second grid, being arranged between the true grid and the anode, and being connected to earth *via* the high-tension battery, acts as an electrostatic screen between the grid and anode, and thus prevents high-frequency energy from passing back from the anode to the grid. The circuit thus remains stable, especially if care is taken to screen effectively all other components in the high-frequency circuits. The second point is that the amplification factor of the screened-grid valve is very much greater than that of the triodes it replaced, and because of the stable condition of the circuit, this high amplification factor can be utilized to good advantage.

S.G. Valve not Perfect

Why, then, is it now found necessary to introduce a further type of high-frequency valve? Well, in spite of the high efficiency of the screened-grid valve, it is not perfect in certain respects. I do not want to go too deeply into technicalities, so it must suffice to say that in order to obtain stable working with a screened-grid valve, a certain rough proportion between the screen voltage and anode voltage must be maintained. The respective values are not very critical, as anyone who has used a screened-grid valve will know, but the fact remains that the value of the anode current is not absolutely and at all times governed by the voltage applied to the grid of the valve. In certain circumstances, an interaction takes place between the screen and the anode, and the anode current variations do not follow the variations of grid voltage. Not only does this mean distortion, but also an unstable condition of the circuit.

In the high-frequency pentode, a third grid is situated between the screen grid and the anode, and is connected to the cathode or filament, as the case may be. It thus acts as an electrostatic screen and shields the anode from the screen grid, preventing the flow of electrons from the anode to the

screen grid—the cause of the unstable condition referred to above.

Thus, we have the screen grid used to prevent high-frequency energy passing from the anode to the control grid, and the third or "earth grid" employed to prevent secondary emission from the anode to the screen grid. As a result, the high-frequency pentode can be relied upon to give efficient and stable amplification because the anode current is governed almost entirely by the signal applied to the control grid, and is not effected by the relation between the screen voltage and anode voltage to the same extent as in the screened-grid valve.

High Impedance Necessary

In addition to this, the characteristics of the high-frequency pentode are much higher than those of a screened-grid valve. That is to say, we may expect higher values of amplification factor and of mutual conductance. Other things being equal, therefore, a high-frequency pentode should give a greater degree of amplification than a screened-grid valve. There is, however, one little snag. On account of its special construction, the high-frequency pentode has a considerably higher impedance than a screened-grid valve. Now the overall amplification obtained from a valve, while it depends to a large extent upon the amplification factor of the valve, is also governed by the impedance of the valve and of the apparatus connected in its anode circuit. Actually, the overall amplification, or "stage gain" as it is termed, is given by the formula:—

$$\text{Stage gain} = \frac{\text{Amplification factor} \times \text{load impedance}}{\text{Valve impedance} + \text{load impedance}}$$

It will be seen, therefore, that the stage gain can never be as great as the amplification factor of the valve, but that, subject to certain practical limitations, the higher the impedance of the load in the anode circuit, the larger the proportion of the amplification factor which can be utilized.

In order to make full use of the high amplification factor of the high-frequency pentode therefore, it will be necessary to use tuned high-frequency couplings of the highest possible efficiency as a high-efficiency tuned circuit forms a load of high impedance. The introduction of the high-frequency pentode, therefore, will stimulate manufacturers to produce coils of higher and higher efficiency, for without these the advantages of the new valves cannot be exploited to the fullest possible extent. At the same time, even when using what are now termed high-efficiency coils, such as are employed in the best home constructed and commercial sets of to-day, the high-frequency pentode will give better amplification than the screened-grid valve.

(Continued on page 126.)

**BE SURE
OF THE
RIGHT
SPEAKER
for
CLASS "B"
CIRCUITS**



The Amplion Class "B" permanent magnet speaker is being specified by designers of Class "B" circuits all over the country. Chosen because of its natural reproduction it will give you every satisfaction—sparkling treble, clear bass—and those foreign stations will be just a little clearer because of your AMPLION.

AMPLION

AMPLION (1932) LTD., 82-84, ROSOMAN STREET, CLERKENWELL.

**WHY PAY
EXORBITANT
PRICES FOR
VALVES?**



For many years we have made Radio Valves, which we have supplied on contract to leading Set manufacturers. Now we are supplying these same tried and tested Valves direct to the public at "direct to the public" prices.

**BRITISH
362
VALVES**

Every 362 Valve is GUARANTEED to be the EQUAL of any other valve (British or foreign) of similar characteristics, and is NON-MICROPHONIC. Any 362 Valve failing to give entire satisfaction within a period of 6 months from date of sale, will be replaced FREE (provided it has not been mis-handled).

R.C., H.F., L.F. POWER SUPER-POWER SCREENED-GRID

3'6 4' 4'6 7'6

all in 2v., 4v. or 6v. (Metallised 3d. extra)

For details of our "CLASS B" Valves, see our advt. on inside front cover.

If valves of a certain make have been specified for your Set, send the name and type with your order and we will send you 362 Valves of similar characteristics. Cash with order. Cheques and P.O.'s must be crossed and made payable to:—The 362 RADIO VALVE Co., Ltd., (Dept. W.2.), 415, Mare St., Hackney, London, E.8



EDISWAN

The name that means 'EXCELLENCE'

**THE GREATEST BATTERY VALUE
- at any price!**



GUARANTEE
The Edison Swan Electric Co. Ltd. guarantees that Ediswan Batteries are of full voltage and capacity. Should any Ediswan Battery fail to give satisfactory service, we undertake to deal with customer's complaint within 24 hours of receipt of defective battery.

**60 VOLTS
5'6
STANDARD CAPACITY**

When you buy an Ediswan battery you don't have to take it on trust. It has run the gauntlet of the most exacting tests. It has been passed as fit to bear the Ediswan Guarantee. It's ready for a long life of good service.

Standard Capacity - 10 M/a
99 volts 9/- 108 volts 10/- 120 volts 11/-
150 volts (new type) - - - 14/6
Also tapped for Q.P.P.
Super Capacity types - - - 20 M/a

Write for your FREE Copy of "How to get the most out of your H.T. Battery." Full of useful data.

EDISWAN

**Guaranteed RADIO
H.T. BATTERIES**

The Edison Swan Electric Co. Ltd.  Ponders End, Middlesex

EDISWAN—the Better Service Batteries

FIRST AGAIN!

THE BETA UNIVERSAL FOUR

A "luxury" receiver, employing variable-mu valve, tone-controlled L.F. stage, and a Class B output stage.

By the
Practical Wireless Technical Staff.

It is, as every reader knows, impossible to please everyone the whole of the time. Nowhere is this more obvious than in wireless journalism. A receiver is described in one journal which appeals perhaps to the listener who craves for the reception of stations in the very remote parts of the globe; this has no appeal to the older folk who require only the quieter forms of music broadcast from our home stations. Another article describes a receiver which is guaranteed to "lift the roof" so far as volume is concerned; again, the older or more sedate listener abhors loud volume. Or it may be that a receiver is described which is guaranteed to reproduce the very lowest note that the B.B.C. transmits, and complaints will be received that the piccolo is not reproduced with the screech that a piccolo player likes to hear. So it goes on, and it is thought perhaps, that there is not the slightest possibility of building a receiver which can appeal to all. After carrying out a few experiments in the PRACTICAL WIRELESS laboratories, and in view of the latest arrival in the wireless world (the Class B valve), we hit upon the circuit which is given on this page. A study of this will show that it is almost possible to arrive at a circuit which will go a long way to pleasing everyone. Before passing on to a description of the circuit, let us examine it and see wherein the novelty lies.



The new Cossor 240 B 7-pin base valve.

valve is fed into the tuned-grid circuit of the detector valve, working on the usual leaky-grid principle. Sensitivity is thus good, whilst the provision of a reaction winding on the coil enables the strength of weaker stations to be boosted. Furthermore, owing to the fact that the coil used is matched with the two band-pass coils, a three-gang condenser may be employed, and by choosing components here which are all of the same make it has been found possible to introduce a dial on the condenser which is calibrated direct in wavelengths. The position of any station is therefore easily found and no "searching" is necessary.

The coupling from the detector valve to the first L.F. valve is carried out by means of a special tone-control transformer. This is a component made by the Multitone Electric Company, and is used in conjunction with a special graded potentiometer. By adjustment of this potentiometer it is possible to vary the reproduction from normal to "all bass" or "all treble." In other words, the high notes or the low notes may be eliminated. The value of this is felt most in the removal of heterodyne whistles, or in adding depth to organ music, etc. The tone of the reproduction may therefore be adjusted by each individual listener to suit personal likes. The output from this transformer feeds a small power valve, which is next coupled to the latest Class B valve. The result, therefore, is that the loud-speaker receives a signal which is free from interference, is controlled as to tone, and is of a volume which will suit either the listener who wishes to join the family circle in a dance, or who desires to hear really high-class music in an atmosphere of "refined" tone.

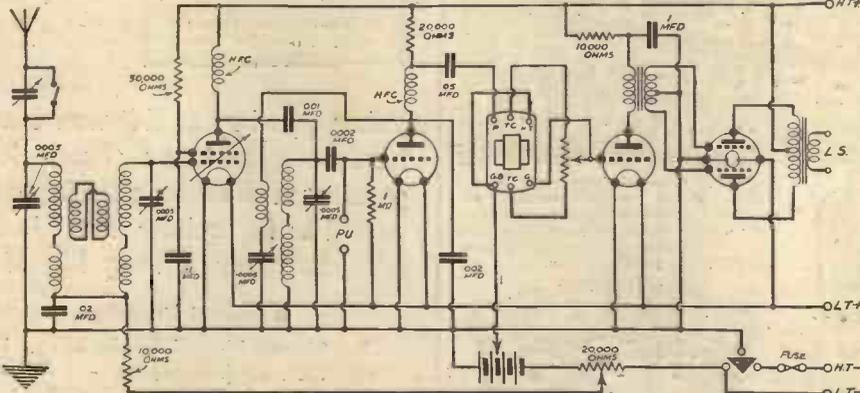
The actual receiver is very simple to build, and although there may appear to be rather a formidable array of knobs on the

panel, the handling of the receiver is not difficult. There is the main tuning control, the volume control, the reaction control, and the tone control. The on-off switch cannot, of course, be classed as a control. Reaction will only be needed at infrequent intervals when it is desired to bring up the strength of the very weak stations.

Next week we shall give the preliminary constructional notes regarding this receiver.

The Circuit

Commencing at the input end of the circuit, we find that a band-pass tuner is employed. Obviously, therefore, the listener under the shade of one of the B.B.C. main station aeri-als is catered for here. This form of aerial input circuit is the most selective which can be employed to-day, and it provides a separation which is employed by the actual transmitting stations, so that there can be no jamming; and, furthermore, the method of obtaining this selectivity results in the reproduction of all the high notes so that the range-of frequencies passed on is the total which is used by the transmitter. No one can find anything to complain of in this part of the circuit, therefore. The first valve is of the variable-mu type, giving range, and a really simple method of reducing volume. The seeker after long-distance stations can therefore reach out, by employing this valve at its most sensitive position, whilst when the home stations are required, the volume may be reduced to a whisper without introducing distortion. The manner in which the variable-mu does this has already been explained on numerous occasions in these pages. The output from this



Circuit diagram of the Beta Universal Four.

LIST OF COMPONENTS FOR THE BETA UNIVERSAL FOUR

- One Pair Telsen Band Pass Coils (Type W. 290).
- One Telsen single Matched Coil (Type W. 216).
- One Telsen Three-gang Condenser with Disc Drive.
- One Telsen Aerial Condenser with shorting switch.
- Three 4-pin chassis-type valveholders. Clix.
- One 7-pin chassis-type valveholder. Clix.
- One .02 Dubilier fixed condenser, type 9200
- One .001 ditto " 670
- One .05 ditto " 9200
- One 1 mfd. ditto " BB
- One .0005 mfd. ditto " 670
- One .1 mfd. ditto " 9200
- One 10,000 ohm spaghetti resistance. Lissen.
- One 20,000 ohm ditto Lissen.
- One 30,000 ohm ditto Lissen.
- One Bulgin H.F. Choke Type H.F.9.
- One Lissen standard H.F. Choke.
- One .0005 mfd. reaction condenser. Lissen.
- One Multitone Toco 1.4 L.F. Transformer.
- One Multitone Graded Potentiometer.
- One Benjamin Class B Driver Transformer.
- One Busco three-point switch with fuse-holder.
- One Lewcos 20,000 ohm Potentiometer.
- One Becol Ebonite Panel, 15in. by 7in.
- One 2 megohm Lissen Grid Leak with wire ends.
- One Lissen 16-volt Grid Bias Battery.
- One Lissen 120-volt H.T. Battery.
- One Lissen 2-volt Accumulator.
- One Rola Loud-Speaker, Type F.6/PM/O1/Class B.
- One 5-ply Baseboard, 15in. by 10in.
- One Cabinet. Peto-Scott.
- One Cossor 220 VSG valve (metallized).
- One Cossor 210 Det. valve (metallized).
- One Cossor 215 P. valve.
- One Cossor 240 B. valve.
- Three Belling-Lee Terminal Mounts.
- Six Belling-Lee Type B Terminals (Aerial, Earth, Pick-up, Pick-up, Loud-Speaker, Loud-Speaker).
- One Belling-Lee Four-Way Battery Cord.
- Three Wander Plugs, G.B.+, G.B.1 and G.B.2.
- Sundry Screws, Fuse Bulb, Coil of Glazite, Flex, etc.

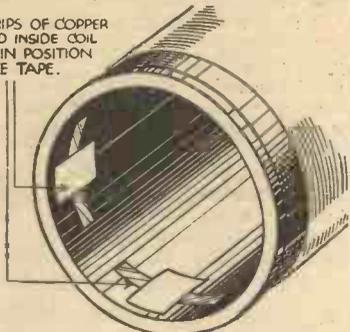
THE
HALF-
GUINEA
PAGE

Radio Wrinkles FROM READERS

A Ganging Device

THE presence of metal in the field of any coil will have the effect of lowering the inductance of that coil if the metal in question is non-magnetic. This effect is often responsible for making it impossible

SMALL STRIPS OF COPPER FOIL PLACED INSIDE COIL AND HELD IN POSITION BY ADHESIVE TAPE.

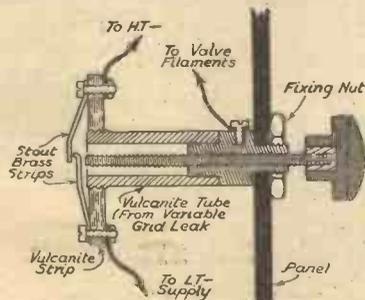


Varying the inductance of a coil.

to tune two circuits with a ganged condenser throughout the wave range covered by the coils, since this system requires the inductance of the coils to be practically identical, and if unscreened coils are employed and not mounted similarly on a metal chassis, the varying proximity of the metal may result in a difference of inductance which cannot be allowed for by use of the condenser trimmers. Such a case was cured easily by the use of a very simple dodge, and perfect ganging obtained over the whole scale. By noticing which condenser was set at the smaller value I located the coil of higher inductance. Small strips of copper foil were then inserted in this coil, thus reducing its inductance, until perfect ganging was obtained. The foil was then retained in position by a few strips of adhesive tape. A very wide range of adjustment is possible by this method, and an astonishing reduction in inductance may be obtained by inserting one complete turn of wire, though this is seldom necessary.—M. L. HASEL GROVE (North Harrow).

Handy Switch

THE accompanying sketch shows a switch made from one of the "one hole fixing" variable grid leaks or anode resistances, which were popular a few years ago, with the addition of a few odds and ends from the junk box. It has the advantage of switching on the valve filaments before the H.T. supply, and switching off the latter before the L.T. to valve filaments.



A combined switch.

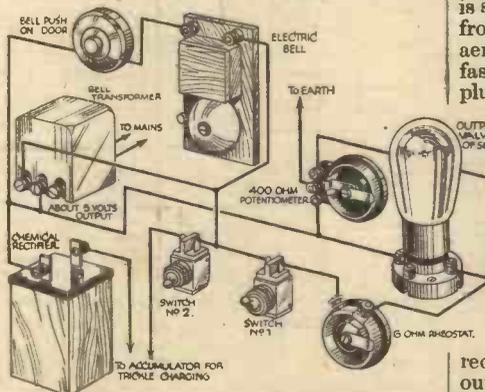
THAT DODGE OF YOURS!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us, addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

It may also be used to prevent unauthorized interference with the set, as it is easy to entirely remove the switch spindle by simply unscrewing same right out. I have used this gadget on a four-valve set for several years with entire success.—E. C. MIDWINTER (Southfields).

Making Good Use of a Bell Transformer

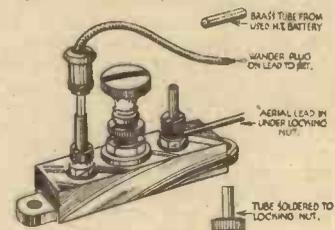
I HAVE recently purchased a bell transformer costing about 4s., and have put it to three very good uses. Firstly, to work a front door bell. Secondly, to heat the filament of the power valve in my wireless set. Thirdly (in conjunction with



A novel way of using a bell transformer.

the excellent chemical rectifier described in PRACTICAL WIRELESS of January 21st), to charge the accumulators which feed the remaining valves in my set. As I am deriving H.T. from an eliminator my set is now virtually "all-electric." The appended illustration will indicate all the connections. The bell transformer I mounted in the hall next to the door bell, as it gives a slight hum in circuit. The wires from the 5-volt output of the transformer to the bell were tapped, and a length of flex run under the carpet to the set, which is in an adjoining room. The wires were then taken to a switch and then to a rheostat. An ordinary 4-volt power valve is used and the rheostat arm was slowly moved round until the set gave forth its normal output. Care must be taken not to pass more voltage than the valve is rated for. A 2-volt valve can be used with the rheostat arm adjusted accordingly. A potentiometer is necessary, and the slider is kept in the half-way position. With switch No. 1 closed, and No. 2 open,

the bell transformer supplies the filament of the power valve. With switch No. 1 open and No. 2 closed, the accumulator is on charge. The wiring was done throughout with twin flex, and the whole arrangement works admirably. It should be quite possible to run extra low frequency valves from the transformer output, but not, of course, H.F. or detector valves, because of mains ripple. During any of the foregoing operations the front door bell rings merrily whenever called upon.—K. W. FRASER (Bexley).



Using a plug and socket to cut out a condenser.

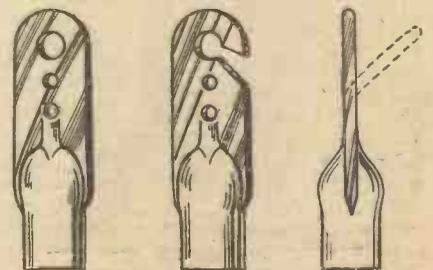
Cutting-out a Condenser

I HAVE adopted the following idea for cutting out or tuning in, on a pre-set condenser. To each screw terminal nut is soldered a short piece of brass tube taken from an old H.T. battery. The end of the aerial lead-in is fixed under one nut and fastened down. On the lead to set, a wander plug is fixed. All that is then necessary is to "plug in" to whichever terminal you wish to use. This method dispenses with all switching and wiring, as will easily be seen by reference to sketch.—R. B. POYNTER (Caversham).

A Handy Terminal

THIS terminal can be attached quickly by one hand, and is useful for the aerial and earth leads to a receiver which is often placed close to a wall. This means that the receiver terminals are usually nearly out of sight, and to use both hands is inconvenient. The terminal is of the type used for a car ignition lead, and is readily obtained from a garage for a penny. A few seconds with a file or chisel will alter the terminal to the required shape, as suggested by the diagram. The wire may be soldered in or slipped through the hole and hammered tight. The blade of the terminal may also be easily bent to an angle, which is a further convenience in many instances.—H. COMBES (Bolton).

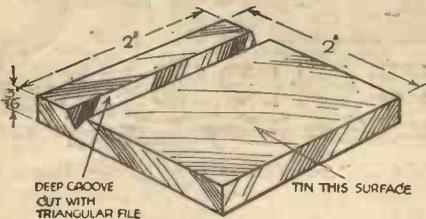
(Continued on page 108.)



A handy terminal.

RADIO WRINKLES

(Continued from page 107)



A handy tinning block.

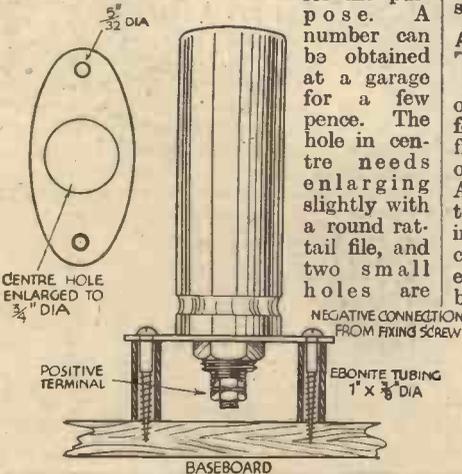
A Tinning Block

A **TINNING** block for tinning connecting wires, soldering tags, etc., is a most valuable accessory for a wireless workshop, and one which can save a lot of time and trouble. You will need a thick piece of copper or brass for the block. Suitable dimensions are 2ins. square, and 1/8 in. thick. Clean up one surface, and make a deep V-shaped groove across it with a triangular file. Now put the block on a gas ring, heat it up, apply flux to the groove and the flat surface and coat them well with solder. You will find that you can nearly fill the groove with solder, without any running away at the ends. To tin the ends of your connecting wires, whether solid wire or stranded flex, put a trace of flux on each wire, rest it for a moment in the groove of the block, and the job is done cleanly and well. You can tin tags and other small flat articles by applying them to the flat surface of the block.—A. V. HORT (Wembley).

Mounting an Electrolytic Condenser

SEVERAL manufacturing firms have recently placed on the market a new type of cylindrical electrolytic condenser which is primarily designed for mounting on a metal chassis with 1/2 in. hole. When the condenser is screwed home the outer case comes into contact with the metal chassis, automatically earthing same and forming the negative pole of the condenser. The question arises as to how these condensers are to be mounted on a wooden baseboard, for they must be kept upright.

I mounted mine as shown in the accompanying sketch. On hunting through my scrap box I came across an old motor-car inner tube valve plate. This is elliptical in shape and made of stout brass, with a fairly large hole in the centre. Just the very thing for the purpose. A number can be obtained at a garage for a few pence. The hole in centre needs enlarging slightly with a round rat-tail file, and two small holes are

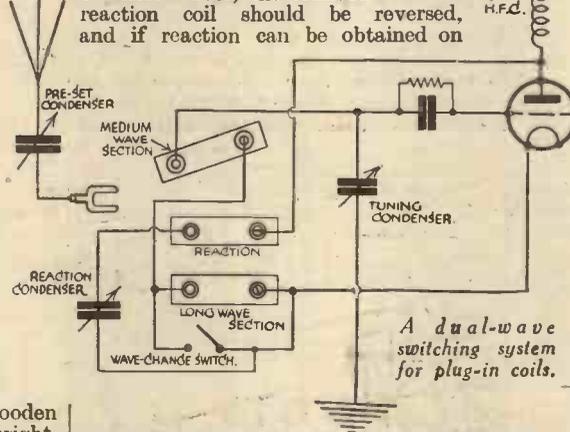


A neat mounting device for electrolytic condensers.

drilled through at each end. For supporting the plate, two pieces of ebonite tubing 1in. long and about 1/4 in. diameter are used, the fixing screws passing through them, as indicated in the accompanying sketch.—A. A. LAMBERT (West Hartlepool).

A Practical Dual-wave Switching System

THE arrangement described here enables experimenters to have the advantages of dual-range switching with the use of plug-in coils. As will be seen from the diagram, three coil bases are mounted on the baseboard, two close together, in order to obtain a tight coupling, whilst the third is arranged to swivel to obtain a variable coupling. The centre coil base is for the reaction coil and is wired in the usual manner; the coil base which is in close proximity to the reaction coil is for the long-wave section, and this is wired in series with the other coil (for the short-wave section) and can be shorted by a push-pull switch. In operation a coil of 200 turns is placed in the long-wave socket, a 75-turn in the reaction, and a 60-turn—preferably of the X-coil or centre-tapped type—in the short-wave socket. The aerial is connected through a pre-set condenser of low minimum capacity to the end of the short-wave coil which goes to the grid condenser, or to the tapping in the case of the X or centre-tapped coils. Should it not be possible to obtain oscillation on either the long or short waves, the connection to the reaction coil should be reversed, and if reaction can be obtained on



A dual-wave switching system for plug-in coils.

one wave but not on the other, reverse the connections to the coil which fails to oscillate. It might be noted that a very efficient arrangement can be set up as described, as the better makes of plug-in coils are good by modern standards, being wound with thick wire and have little solid dielectric.—P. TAYLOR (Penzance).

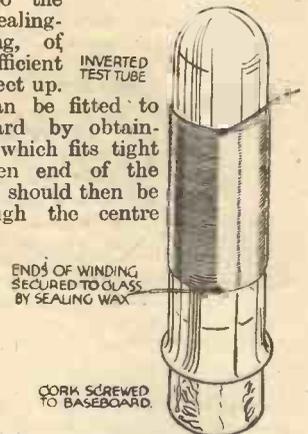
A Useful Slow-motion Device

THE accompanying sketches show how an existing slow-motion of a ratio of 4 to 1 can be converted to about 20 to 1, for keener tuning. A is a bracket made from 1/4 in. by 1/8 in. brass strip in any of the forms shown in Figs. 1, 2 and 3. As the on-off switch is usually beneath the tuning condenser the arrangement shown in Fig. 1 may be used, the bracket tail being clamped under the existing bush under of each, as shown. No holes need therefore be drilled in panel. If it is desired to have the dial closer than 1/4 in. to the panel, then the arrangement in Fig. 2 or 3 may be used, where the clamping nut of the on-off switch and one countersunk screw through panel is required to hold the bracket. B is a rubber washer (Fig. 1), 1/4 in. diameter, with a 1/4 in. hole (as used for a gramophone motor seat). C is a spindle

pushed into B and revolving in two bearings D. If there is any tendency to slip (and there will not be if correctly fitted), a piece of adhesive tape wound round B will make an effective adjustment. A coat of black enamel or thin pitch makes it hardly noticeable.—J. MOORE (Glasgow).

A Simple Short-wave Choke

WHILE experimenting with short-wave receivers and adaptors I have found that a very efficient short-wave choke can be made by obtaining an ordinary test-tube, such as can be bought at any chemist's, and winding same to within an inch of each end with a thin gauge cotton-covered wire. The ends can then be finished off by sticking them to the glass with sealing-wax, leaving, of course, sufficient inverted test tube wire to connect up. The tube can be fitted to the baseboard by obtaining a cork which fits tight into the open end of the tube, a hole should then be bored through the centre



Method of mounting a simple short-wave choke.

of the cork and a screw inserted long enough to reach the baseboard. The cork can then be firmly screwed down and the open end of the tube fitted over it.—D. B. COOKE (Hereford).

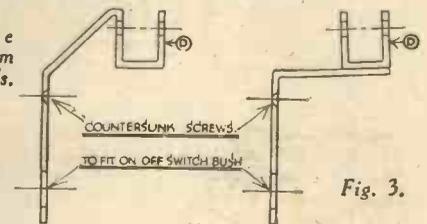


Fig. 2.

Fig. 3.

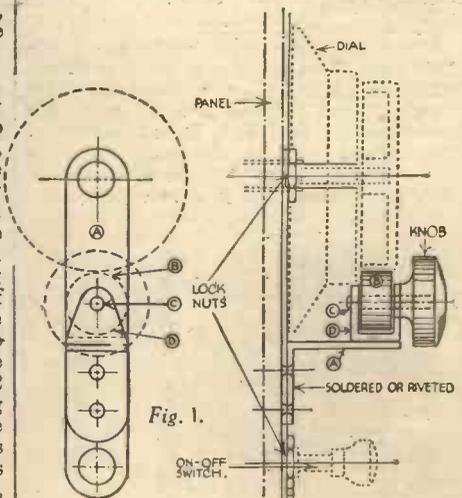
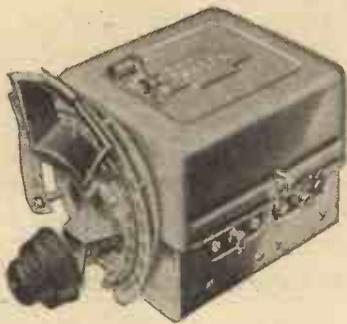


Fig. 1.

Fitting an additional slow-motion device.

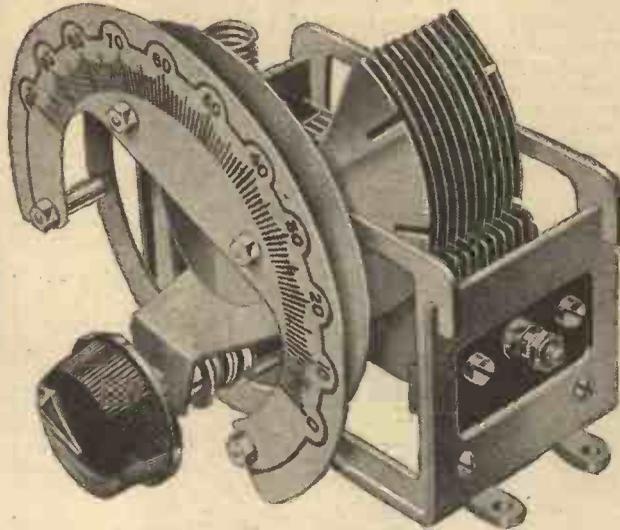
TELSEN PRECISION COMPONENTS



TELSEN TWIN GANGED CONDENSER

Comprises two perfectly matched units, giving accurate and simultaneous tuning of two circuits by rotating a single dial. A knob concentric with the main tuning control operates a variable trimmer. Complete with disc drive, dust cover, escutcheon plate, pilot light holder, degree and wavelength scales,

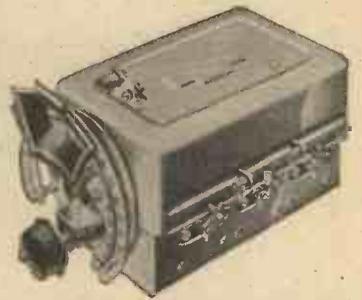
Price **16'6**



TELSEN SINGLE CONDENSER UNIT

Designed for use in modern receiver circuits where accuracy of tuning is essential. A pressed steel frame of great rigidity completely obviates distortion, the rotor and stator vanes being let into high pressure die-castings to ensure permanent accuracy of spacing and eliminate the possibility of the vanes working loose. In attractive stove aluminium finish, complete with disc drive, escutcheon plate, pilot light holder, knob, degree and wavelength scales.

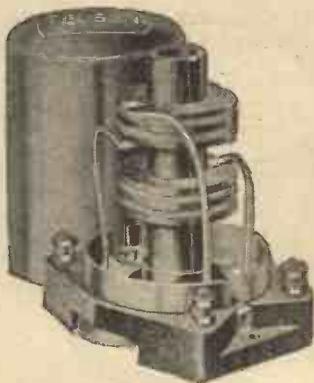
Price **9'6**



TELSEN TRIPLE GANGED CONDENSER

Comprises three perfectly matched units, giving accurate and simultaneous tuning of three circuits by rotating a single dial. Trimmers are provided across each section. Complete with disc drive, dust cover, escutcheon plate, pilot light holder, degree and wavelength scales,

Price **22'6**

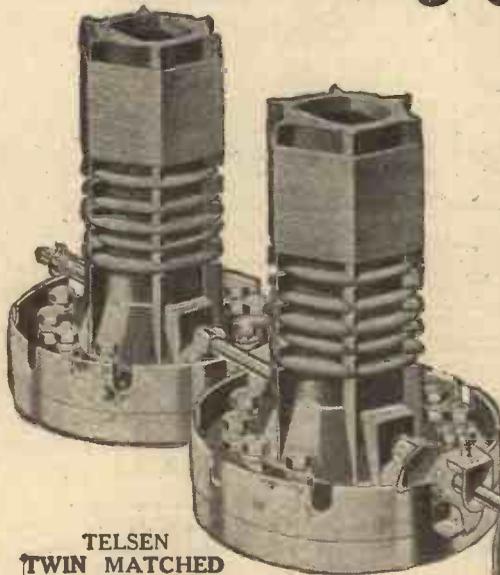


TELSEN

Intermediate Frequency TRANSFORMER COILS

Consists of two tuned circuits adjustable for different values of stray capacities, with variable filter coupling so that optimum conditions for both quality and selectivity may be obtained. Totally screened.

Price **12'6**

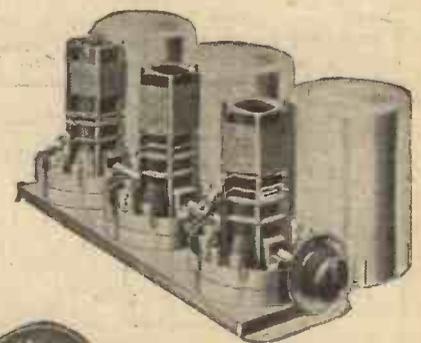


TELSEN TWIN MATCHED SCREENED COILS

Embody the ultimate efficiency attainable in a perfectly shielded inductance of moderate dimensions. Provided with separate coupling coils for medium and long waves, and fitted with cam-operated rotary switches. Complete with aluminium screening cans.

Price **17'-**

Also Triple Matched Screened Coils ... 25/6
Single Screened Coil ... 8/6



TELSEN BAND-PASS AND OSCILLATOR COIL UNIT

The ideal coils for any super-heterodyne circuit.

Comprises the Telsen Band-Pass Coils and Oscillator Coils mounted as a single compact unit on a rigid metal plinth base. All wave-change switches ganged with single knob control.

Price **25'6**

Also Superhet Coils, Type No. S.330 ... 25/6

TELSEN RADIO COMPONENTS FOR LASTING EFFICIENCY
ANNOUNCEMENT OF THE TELSEN ELECTRIC COMPANY LIMITED, ASTON, BIRMINGHAM

OUR REPLY TO THE—

LAST week I gave preliminary details and explanations of the circuit of our latest receiver, the "Supersonic Six." It is the first superheterodyne of which we have given constructional details, and, as is the case with all our sets, the design has not been rushed through. We had in mind first of all the production of a superheterodyne which would be cheap to build and yet provide the quality of reproduction the super-selective capabilities and the station-getting properties which are the cardinal features of the superhet. circuit. Superheterodyne receivers in the past have been costly, and for that reason I have hesitated to devote much space to them, but I have

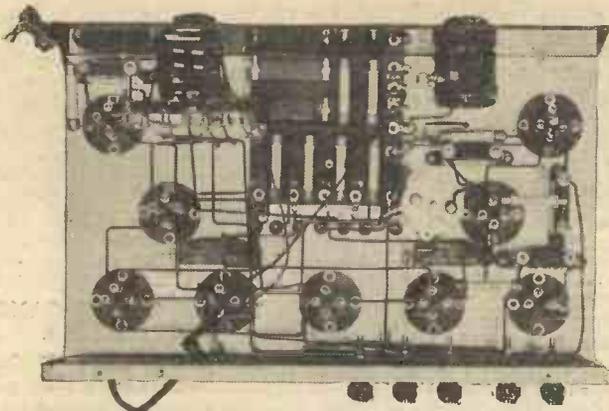
principle of rectification. The signal input is derived from a frame aerial and local oscillation from the oscillator valve is introduced into the frame-aerial circuit via the centre tapping. The beat frequency of 120 kilocycles obtained by heterodyning incoming signals with the oscillator is transferred to the grid circuit of the first intermediate frequency amplifier by means of the special band-pass transformer. A further stage of intermediate frequency amplification is given by the fourth valve and the second transformer. The signal is next passed to the second detector through another transformer and finally passed to the pentode-output valve by the low-frequency transformer.

Voltage-dropping resistances are used to obtain automatic bias for the oscillator valve and the pentode. Potentiometer volume control is used to vary the bias applied to the variable- μ intermediate frequency valve.

A glance at the photographs will show the clean and symmetrical lay-out of the panel and the components. The right-hand dial is for tuning the frame-aerial circuit, and the left-hand dial is for tuning the oscillator circuit to the correct frequency difference. The remaining controls are for volume and wave changing. This latter switch performs the triple function of switching the set off (centre position) to the medium waves (anti-clockwise), and the long waves (clockwise). The aluminium chassis, complete with Clix valve-holders, can be obtained already drilled from Messrs. Wright and



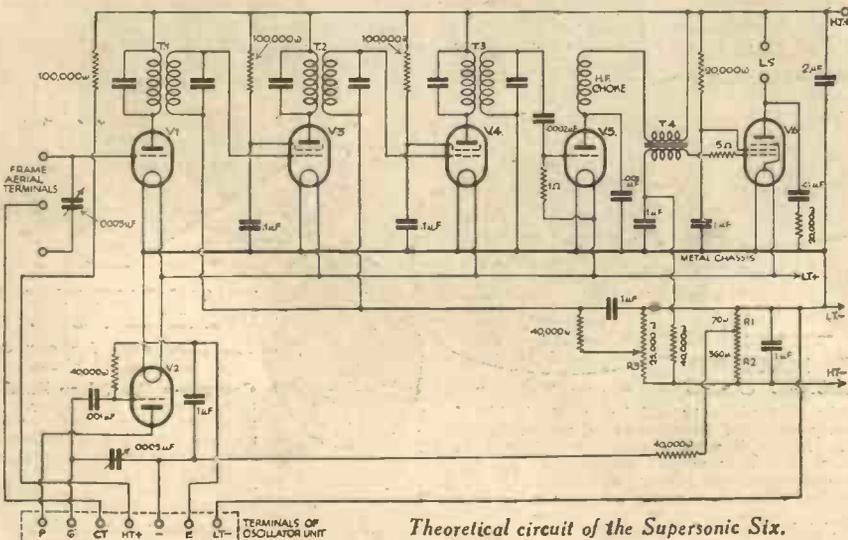
Weaire. The special intermediate frequency transformers are designed on the band-pass principle, and they are responsible in no small degree for the extreme selectivity of the receiver. Automatic grid-bias is adopted and possesses the great advantage that there is no



Sub-baseboard view of the Supersonic Six. Note the clean lay-out.

received many letters from readers living in swamp areas, and even from those who live in districts where interference should be non-existent, asking PRACTICAL WIRELESS to produce a set which would satisfy their special needs. The Supersonic Six is that set, and, as with the Fury Four, I give my personal guarantee of free advice to every reader who builds it. It will easily receive a century of stations, and what is more important, it will separate them.

I will briefly go over the circuit again. An examination of it will show that the detector functions on the anode-bend prin-



Theoretical circuit of the Supersonic Six.



Pictorial view of the Supersonic Six.

A "Practical Wireless" Guarantee BACKED BY REAL READER TESTIMONY

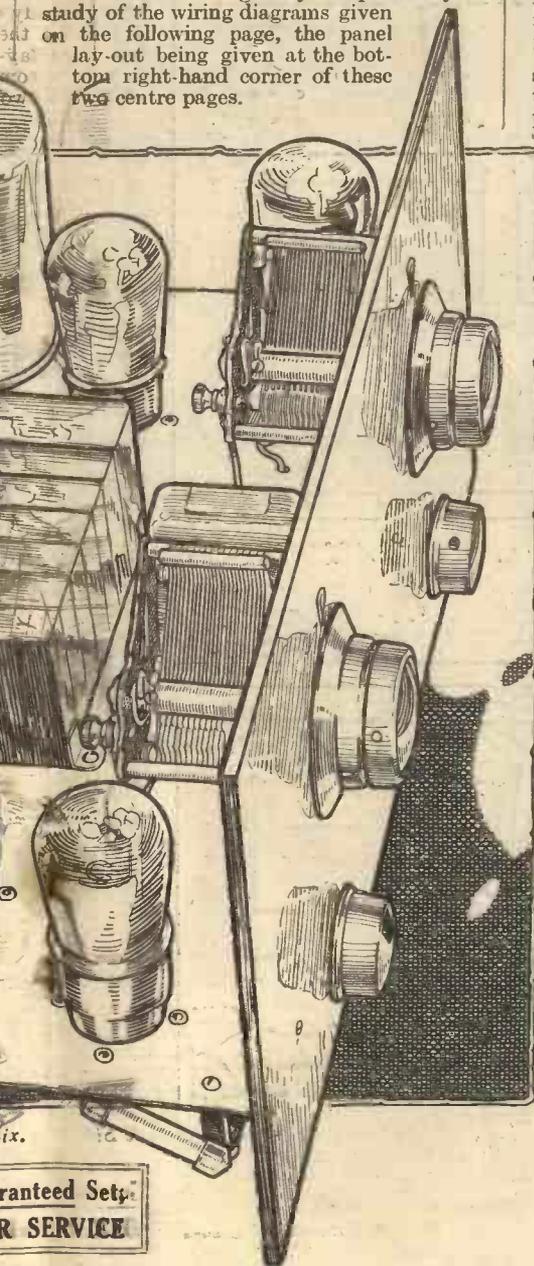
Supersonic Six

A highly efficient Super-Heterodyne Receiver which Carries My Personal Guarantee of Free Advice and that it Performs in the manner claimed. Operating instructions will be given next week

By F. J. CAMM

grid-bias battery to worry about, for as the H.T. battery runs down the grid-bias to the oscillator and output valve falls in sympathy.

Construction is greatly simplified by a study of the wiring diagrams given on the following page, the panel lay-out being given at the bottom right-hand corner of these two centre pages.



Guaranteed Set
SERVICE

—SELECTIVITY PROBLEM

It will be seen that the wiring is straightforward and, in conjunction with the photographs, should present no difficulty. Take care before connecting the batteries to note that the transformers and valves are in their correct sockets.

The constructor who has had no previous experience with superhet. receivers of this type may like to have these advance details of operation.

After switching on, locate the local station by swinging the oscillator condenser only.

Having tuned in the "local" on this dial swinging the aerial-tuning condenser will produce what will appear to be a startling result—the local will be heard all over the dial! This is quite in order, however, and it will be found that shifting the oscillator-dial reading by one degree and bringing the aerial-tuning condenser to approximately the same dial reading (its exact position will be indicated by a marked increase in "noise") results in the complete removal of the local station.

Having found the dial readings corresponding to the two circuits being in step, the dials should be carefully moved together when stations should be found at almost every degree on the dial.

It should be noted, by anyone not familiar with the high degree of selectivity obtainable with this type of circuit, that stations that can be obtained at full loud-speaker volume are in and out of tune in about one degree, and are quite easily missed unless great care is exercised in tuning.

It will soon be discovered that the most sharply tuned circuit is the oscillator, and, after becoming familiar with the "feel" of the controls, the oscillator-tuning dial should be calibrated in terms of stations or wavelengths. This assists in removing a certain amount of troublesome "sorting out" when it is desired to receive a particular station at a later date.

It will be found that drastic use of the volume control will be necessary on a large number of stations in addition to the locals.

To obtain best results, it is necessary to use a loud-speaker suitably matched to the pentode used in the output stage.

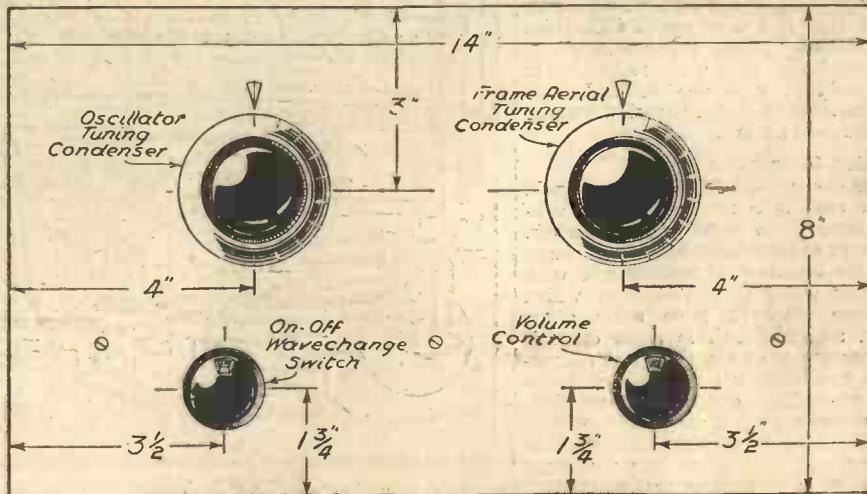
Next week I will deal with the operation



Rear view of our first superhet—The Supersonic Six.

of the Supersonic Six in greater detail. Meantime, I cordially invite any reader to write to me on any point not made clear in this or the preceding article. I can thoroughly recommend this superhet., and would add that it lends itself admirably to the use of the Westector Cold Valve. As has been already pointed out in the articles on this new development, it forms an admirable detector unit and, consequently, may be used in place of the second detector (V5). The circuit showing this modification, together with the necessary alterations which have to be made, will be given next

(Continued on page 112.)



Panel lay-out for the Supersonic Six.

LIST OF COMPONENTS FOR THE SUPERSONIC SIX

- 1 Paxolin Panel drilled 14 in. by 8 in. : (Peto-Scott)
- 1 Aluminium Chassis ; drilled 14 in. by 8 in. (Peto-Scott)
- 1 Oscillator Coil and Switch unit with window, dial and knob. (Wearite)
- 1 I.F. Transformer. (Wearite type O.T.1)
- 2 I.F. Transformers. (Wearite type O.T.2)
- 1 H.F. 10 Choke. (Bulgin)
- 1 Special 8 mfd. condenser block. (T.C.C.)
- 2 0.1 mfd. condensers, type 65. (T.C.C.)
- 1 0.0002 mfd. condenser, type 34. (T.C.C.)
- 2 0.001 mfd. condensers, type 34. (T.C.C.)
- 1 0.01 mfd. condenser, type 34. (T.C.C.)
- 1 Special Resistance Unit. (Dubilier)
- 1 1 meg. Grid Leak. (Dubilier)
- 1 500,000 ohms Grid Leak. (Dubilier)
- 1 20,000 ohms 1 watt Resistance. (Dubilier)
- 2 40,000 ohms 1 watt Resistance. (Dubilier)
- 1 1 amp fuse. (Microfuse)
- 1 25,000 ohms volume control. (Watmel)
- 1 Hypernik L.F., 3-1, Transformer. (Lissen)
- 2 0.0005 variable condensers with slow motion dial, type No. 2 S.M. (Polar)
- 5 Terminals (2 L.S. and Aerial 1, 2 and 3) (Belling Lee)
- 1 Centre-tapped frame aerial. (Ealex)
- 8 4-Pin sub-baseboard valve-holders. (Clix)
- 1 5-Pin sub-baseboard valve-holder. (Clix)
- 1 4-way Battery Cord (H.T.+, H.T., L.T.+, L.T.-). (Belling Lee)
- 1 P.M. 4 Mansfield Moving-coil Speaker. (W.B.)
- 6 Cossor Valves, 210H.F., 210 L.F., 220 V.S.G. (2) 210 DET., 220 P.T.
- 1 Lion 120-volt H.T. Battery.
- 1 Ediswan 2-volt 40-ampere hour Accumulator.

(Continued from page 111.)

week. Of course, no amplification is provided by the detector when this particular arrangement is used, but in view of the high amplification given by the receiver as a whole the volume of even the most distant stations will be sufficient for normal requirements. Instructions regarding the modifications will be given next week.

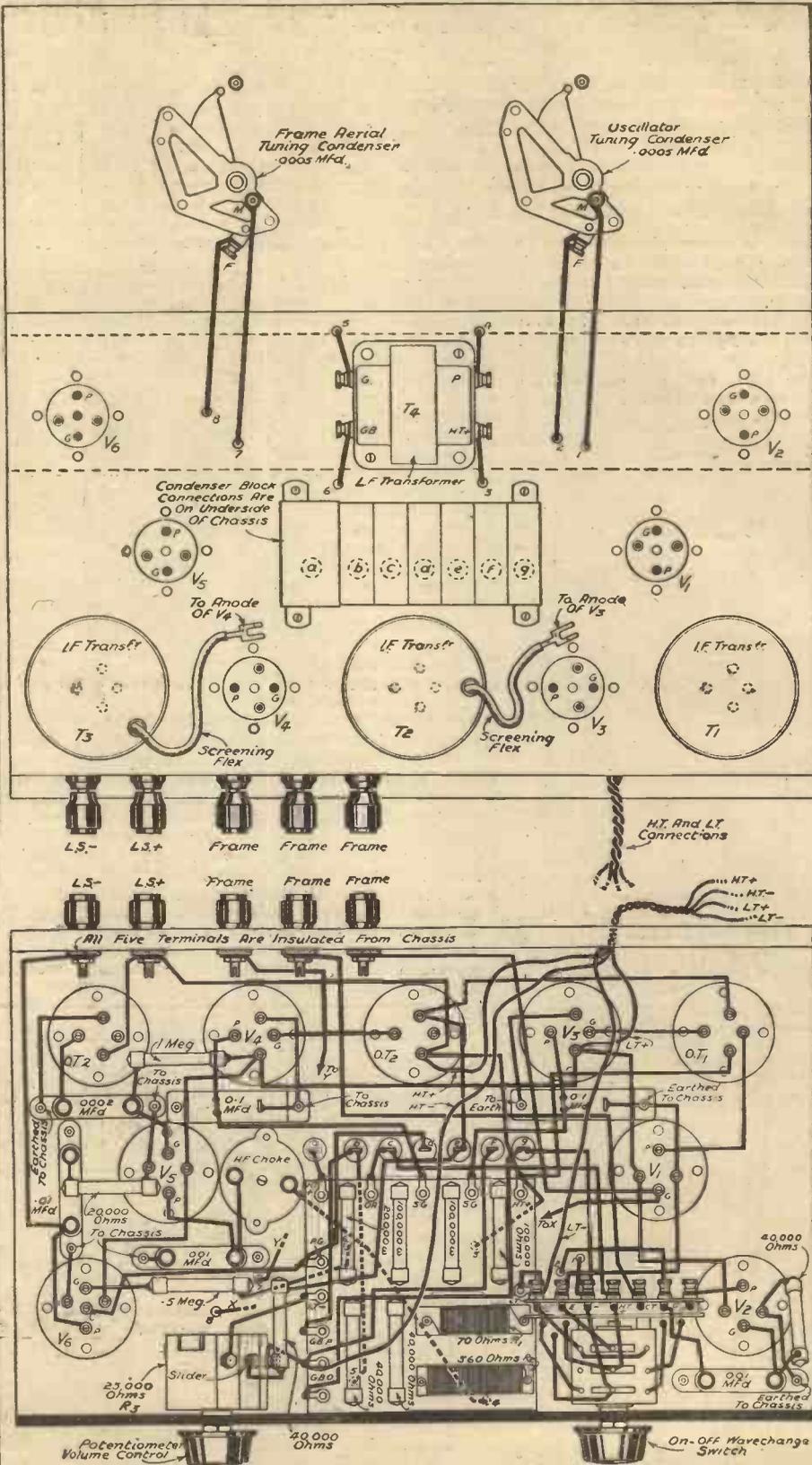
I have just received a query from a reader who asks whether it is possible to employ this receiver without a frame aerial, and he wishes to use it with an ordinary outdoor aerial. There are two very good reasons why this is not possible. Firstly, the input circuit must be provided with a centre-tap, and this cannot be arranged on a normal outdoor aerial and earth system. Secondly, and perhaps this is the more important reason, the over-all amplification provided by a receiver of this type is so great that the energy which is picked up by a small frame aerial in the normal house is ample for the production of loud-speaker signals from all the worth-while stations of Europe. If an arrangement such as an outdoor aerial is joined to the receiver, the energy fed into the receiver would be so great that not only would difficulties be experienced from overloading, but there would also be a great reduction in the selectivity, and one of the most important features of the superheterodyne receiver would be lost.

Alternative Components

Before closing this article I must again mention that it is not possible to substitute component parts of the receiver. After every set is published in these pages we receive letters from readers who wish to employ some particular item which they have removed from some other receiver, and although in some cases it might happen that the electrical characteristics are identical, the risk of introducing some fault owing to interaction, wrong voltage, etc., is so great that it is preferable to inform you that no substitutions can be made. For the same reasons, it is definitely inadvisable to endeavour to make up the intermediate frequency transformers, even though you are

able to obtain from a catalogue or similar source details of the windings. It might seem to many to be a waste of time to mention these two points, but it is surprising how many readers write in each week with queries on these lines. Undoubtedly some of these readers possess sound mechanical and electrical knowledge, and are able to carry out

the work in a workmanlike manner, but the question of matching, and other details, are generally so critical that the time spent on the work would be wasted. Please, therefore, do not write to me with questions on the lines I have just mentioned, and if you wish to build the receiver, do not depart from the specification in the slightest detail.



Above- and sub-baseboard wiring diagrams of the Supersonic Six.

The BEGINNER'S SUPPLEMENT

Conducted by F.J. CAMM

THE EASY ROAD TO RADIO



Condenser

A CONDENSER consists essentially of two or more metal plates separated by a non-conducting substance such as air, mica, ebonite, bakelite, oil, etc. Although one of the simplest components used in wireless, its action is not easy to explain. Sometimes a condenser is said to be a piece of apparatus designed to store electricity. This is quite correct, but to the man who does not know very much about electricity

THE BEGINNER'S A B C OF WIRELESS TERMS

(Continued from March 25th issue, page 26.)

one of the road springs on a motor-car. Applying a force to the spring, such as when the car goes over a bump, will bend it. In other words, it stores up the energy which might otherwise bounce the car in the air. As soon as the bump is

passed, however, the road spring unbends and so sends the wheel downward to fill up the drop on the other side. The car body remains steady the whole time it is going along, while the spring moves up and down, first storing and then releasing energy as the wheel mounts the bumps and drops into the pot-holes. The same sort of thing happens when a condenser is in use. When a voltage is applied to the terminals of the condenser current flows into it, but as soon as the voltage is lowered then the "springiness" of the condenser causes the current to flow out again.

Although condensers are used for many different purposes, full details of which

we cannot give in the space available, it is interesting to note that one of them is that of "smoothing" a current in much the same way as the springs of a car "smooth out" the road. If a direct current fluctuates slightly in value and it is desired to get rid of this, a condenser is connected between the wires carrying the current. The action is as follows: If the current rises slightly above normal, then the extra current flows into the condenser. Should it decrease slightly, then the deficiency is made up from the current stored in the condenser. This, you will see, is exactly analogous to the action of the springs of a car racing along a bumpy road. The condenser smooths out the irregularities in the flow of current in the same way as the springs of the car smooth out the irregularities in the road surface.

Different Types

Condensers are of two main types—fixed and moving. Fixed condensers are used where the size of the condenser has to be the same all the time. They are usually made of thin sheets of copper or tin foil separated by sheets of mica, waxed paper, or bakelite. Details of the construction of a typical fixed condenser are given in Figs. 1 and 2. Fig. 1 shows how the alternate layers of foil and mica are arranged. You will notice that the sheets of foil protrude alternately from one end and then the other end of the "sandwich," but that the ones sticking

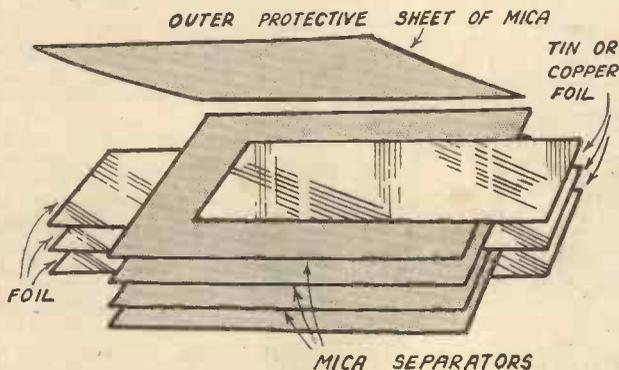


Fig. 1.—How a fixed condenser is built up.

such a statement seems to need amplifying. When he discovers, for instance, that his own wireless set is bristling with condensers of various sorts and sizes he naturally wonders why they are all necessary. If they store electricity, he argues, then his set must be a veritable electrical storhouse! Anyway, the idea of storing anything rather suggests that the thing stored is doing no useful work.

Well, actually the storing action is not used in quite that way. It is not like putting so much furniture in a depository and leaving it idle for a number of years. No, a condenser is used to receive and re-deliver the electricity at a very high speed. A condenser is always associated with pulsating or alternating currents. As the pressure or voltage of the current rises so electricity will flow into the condenser, and as it falls again so the condenser gives up the stored electricity. In fact condensers in high-frequency circuits have often to deal with currents which fluctuate at the rate of a million or more times per second! This means that they fill up with and discharge electricity at the same enormous rate. They could hardly be compared to sleepy storhouses!

The Action of a Condenser

One way to explain the action of a condenser is to compare it with that of

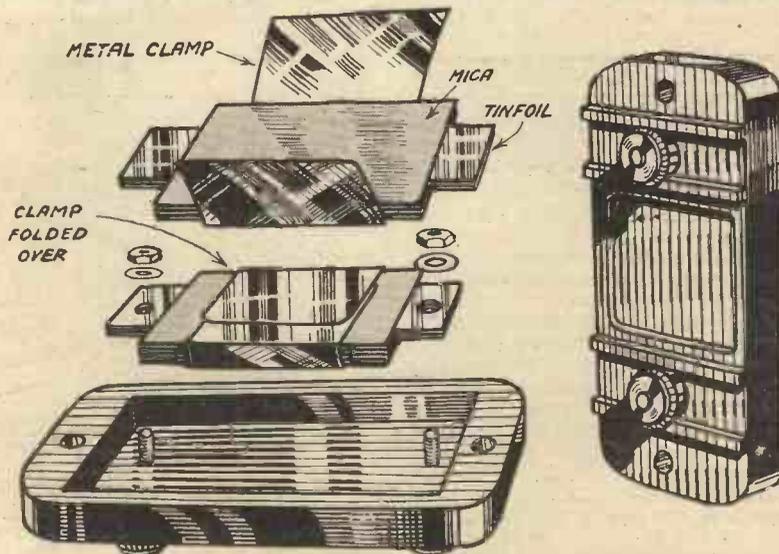


Fig. 2.—Three stages in the construction of a mica condenser.

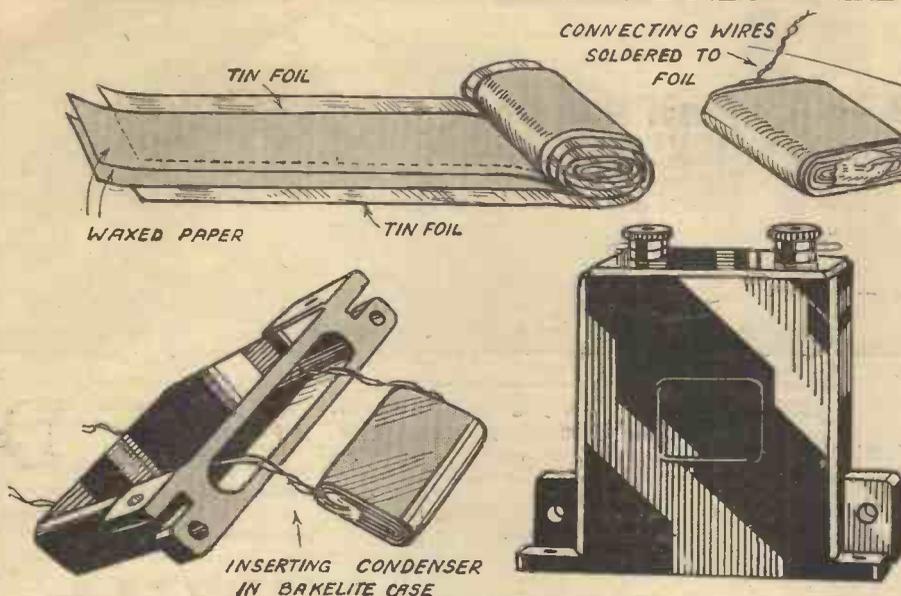


Fig. 3.—How a paper condenser is made.

out at one end do not in any way connect with those which protrude from the other end. They are insulated by the sheets of mica. Fig. 2 shows the various stages in the making of the complete component. The pile of mica and foil is clamped together with a metal band, then it is placed in a small shallow bakelite case, and connection made by means of soldering or with nuts and washers to the two terminals. The whole is then sealed up by pouring in a wax-like composition which, on cooling, sets hard. This is done from the back of the case. The front, showing the finished appearance, is illustrated on the right.

The reason for using a pile of plates instead of just two separated by one sheet of insulating material is because in the larger sizes the sheets would have to be so big as to be cumbersome, therefore a large number of small ones is used instead. The alternate plates are joined together so that it comes to the same thing as using two large plates.

Another way of producing a compact condenser is to use two long plates and to roll them up into a small bundle. For this type of condenser the plates are made of two strips of tinfoil separated by lengths of waxed paper. The sheets of tinfoil are offset so that on rolling up the "bundle" the edge of one sheet protrudes beyond the edge of the paper on one side, while the edge of the other sheet likewise shows all along the other side of the paper. This is shown in the top illustration in Fig. 3. When the whole thing is rolled up, connection can be made to the two sheets of tinfoil by flattening down the foil sticking from each end of the roll and soldering a wire to each. You will notice that after the

condenser is rolled up it is pressed flat before going into the case.

When the size, or the capacity, as it is called, of a condenser has to be varied while it is in use, as in tuning a wireless set, then a variable condenser is used.

This again may take various forms, but it usually consists of a number of stiff metal plates or vanes mounted on a

spindle. By rotating the spindle these plates are made to interleave with another set of plates whose position is fixed. In this way the amount of overlap of the two sets of plates can be varied, thus varying their effective area. Three typical examples are shown in Figs. 4 and 5. The one in Fig. 5 is really three condensers mounted on one spindle. It has the advantage that the three condensers can be varied by the same amount at the same time by turning one knob only. This is very useful in some circuits and saves having three knobs to "twiddle" on the front of the set, when one will do the job.

Efficiency of Condensers

The efficiency of a condenser depends on its ability to return all the electricity which it stores. That is to say, it must be able to give back as much energy as goes into it. The extent to which it is able to do this determines whether it is a good or bad component. Where loss of efficiency is most likely to occur is in the insulating medium which separates the plates. This is called the dielectric, and if it allows some of the charge on the plates to leak from one to the other, then that much will be wasted and will not be returned by the condenser. In such a case the condenser would not be 100 per cent. efficient.

Great care has to be taken to see that the dielectric is as near a perfect insulator as possible. In variable condensers air is usually used; that is to say, there is no

(Continued on page 126.)

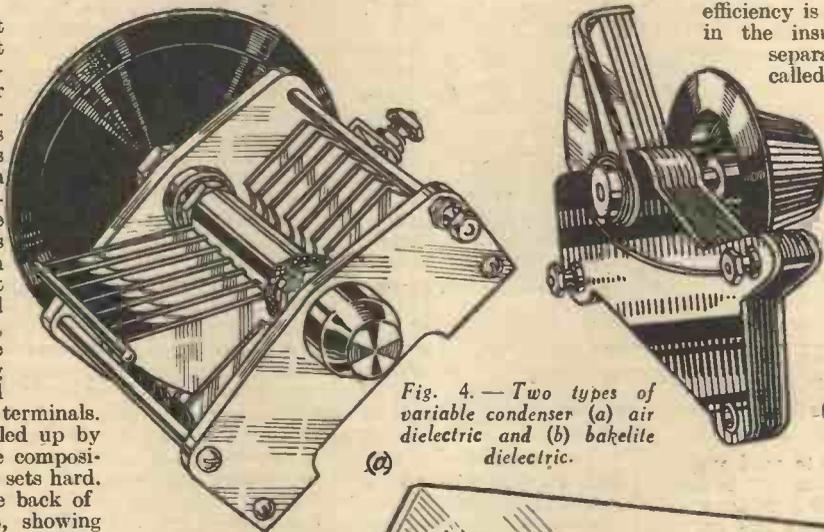


Fig. 4.—Two types of variable condenser (a) air dielectric and (b) bakelite dielectric.

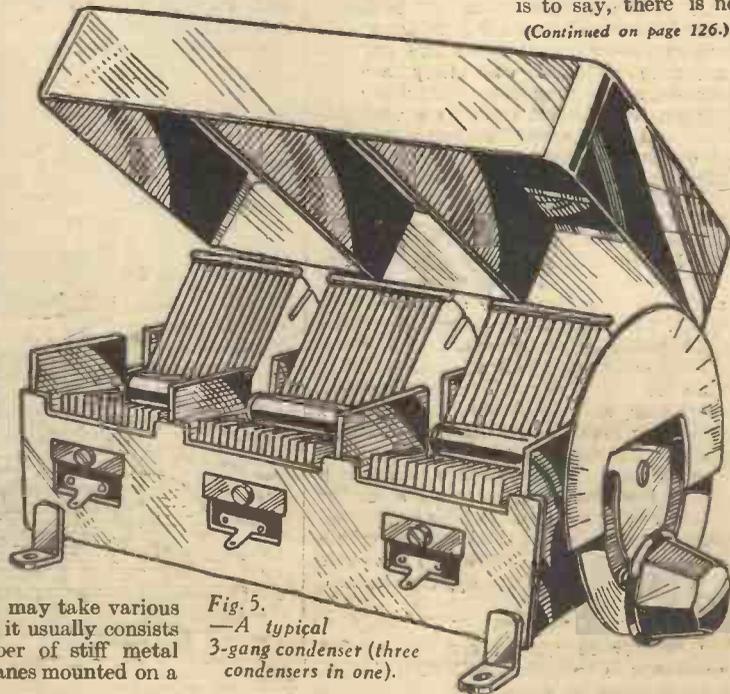


Fig. 5.—A typical 3-gang condenser (three condensers in one).

WEARITE

REGD. TRADE MARK

COILS are SPECIFIED for the "SUPERSONIC SIX"

The name of "Wearite" has become almost synonymous with Superheterodyne. Again and again Wearite features as exclusive specification for Oscillator and I.F. Transformers. The "Supersonic Six," a receiver that embodies the latest principles in Superhet. design, uses Wearite. Remember, that only by following the designer implicitly can you obtain the results he intended—and the coils are the most important components. Send for special Super Het. Coil Leaflet.



THE WEARITE
CENTRE - TAPPED
FRAME AERIAL
Suitable for the "Super-
sonic Six"
Super Model
(as illustrated) Price 42/-
Popular Model " 32/6

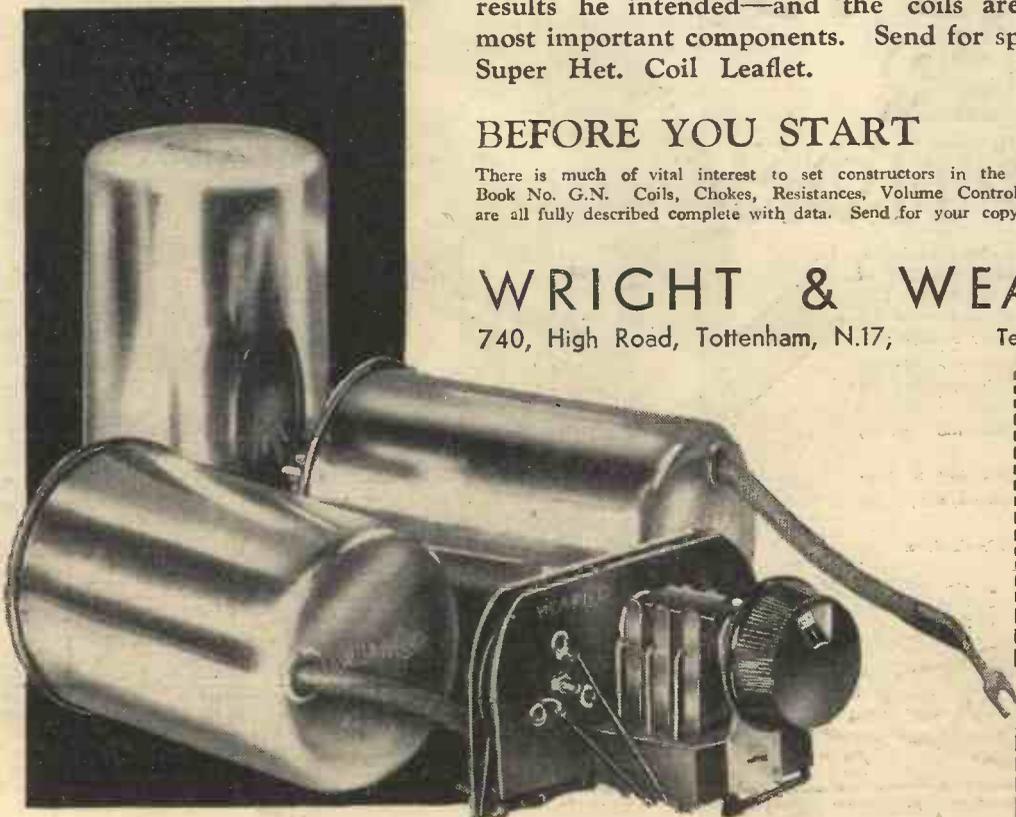
BEFORE YOU START

There is much of vital interest to set constructors in the Wearite Book No. G.N. Coils, Chokes, Resistances, Volume Controls, etc., are all fully described complete with data. Send for your copy NOW.

WRIGHT & WEAIRE LTD.,

740, High Road, Tottenham, N.17;

Telephone: Tottenham 3847/8/9.



The SPECIFIED COILS

- 1 .011/S-Dual Range Oscillator with switch - - Price 10/6
- 2 .OT2 Bandfilters Price 10/6 each
- 1 .OT1 Bandfilter - Price 10/6

ALSO SPECIFIED

- 1 Wearite Q.V.C. Volume Control 25,000 ohms. Price 4/6

THE FIRST "STRAIGHT" SET using the new **WESTECTOR**

The main problems which confront the designer of a battery-operated receiver are detector overloading, anode current consumption, and likelihood of stray H.F.

Present-day methods partly overcome these difficulties, but the "SUPERSONIC SIX" goes much further. It definitely removes them by the use of the WESTECTOR—the new high-frequency metal detector—which takes no anode or filament current, and which cannot be overloaded at all easily, thus eliminating the need for pre-detector volume control. It takes up but very little space, and the efficient rectification obtained by its use prevents high-frequency impulses from getting to the L.F. side.



The illustration shows the component which makes the "SUPERSONIC SIX" possible. Its straight line rectification, together with the efficient amplifying stage incorporated in this fine receiver, guarantees quality results.

Before building this receiver, you would perhaps like to know more about the Westector. The coupon will bring you full particulars.

The Westinghouse

WESTECTOR

high-frequency metal detector

THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD.,
82, York Road, King's Cross, London, N.1

COUPON

WESTINGHOUSE PUBLICITY,
82, York Rd., King's Cross, London, N.1.

Please send me full particulars of the new
WESTECTOR

NAME

ADDRESS

..... Pract. 84

A LEAD TO BETTER RECEPTION

Over 50 years wire manufacturing experience, intensive scientific research and the use of only the finest materials are the factors that combine to make LEWCOS Braided Wire the most efficient Aerial for inside or outside use.

A greater percentage of copper conductor near the surface of the Aerial is provided by two strips of copper twisted with the conductors stranded around the strips, giving greater receptivity.

The Braid is moisture resisting and it does not discolour wallpaper, woodwork, etc., when used indoors.

Obtainable at all reputable dealers.

PRICES:

50 ft. . . .	-	-	1/6
75 ft. . . .	-	-	2/2
100 ft. . . .	-	-	2/9

RADIO
COMPONENTS



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

MAKING A PUBLIC ADDRESS OUTFIT

An Efficient and Cheap Arrangement which will be Found Extremely Useful to Clubs, Sports Associations, etc. By J. H. REED.

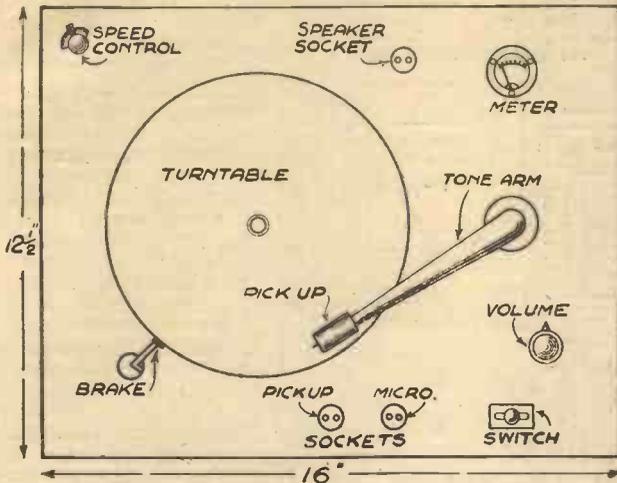


Fig. 1.—The lay-out of the motor-board.

particularly useful for work out of doors, and, provided that they are of reasonably large capacity, will not be found expensive to run.

In this case the mains unit may be omitted. A dotted line is marked round the unit on both the theoretical and practical wiring diagrams (see Figs. 2 and 6). Where, however, the mains are handy the anode current may be increased from the 10 milliamps used with batteries, to as much as 20 milliamps, by increasing the anode voltage and thus increasing the volume. The current for the microphone is obtained from the low-

should be noted that the dimensions given may be varied to suit particular components that the constructor may have to hand. This baseboard, which carries the controls on top, may be built into a suitable box or suitcase. The valve panel consists of a strip of 1/4 in. ebonite 10 1/2 in. long by 1 1/4 in. wide (Fig. 7), and is fitted with three sets of valve sockets. Ordinary valve holders may, of course, be used if desired. The valve strip is supported beneath the base by means of two vertical wooden strips. The top view of the baseboard shows, in Fig. 1, on the right front the three position switch which controls the microphone, pick-up, and valve filaments. Immediately behind this is a 250,000 ohms volume control which operates on both microphone and pick-up circuits. At the back of the volume control is the tone arm for the pick-up and again behind this is a milliammeter. The object of the meter is to enable the quality to be checked, and, by the aid of the volume control, to avoid overloading. To the left of the milliammeter is the loud-speaker socket and plug, and at the far left corner is the gramophone motor speed control. At the near left corner is the gramophone brake, whilst along the front are the sockets and plugs for pick-up and microphone.

It would be rather interesting if, at the meetings of any club to which you may belong, all announcements and speeches were to be made through the medium of one or more loud-speakers and interspersed from time to time with musical selections. As may be inferred from the title of this article, the actual equipment necessary is not only economical as regards running costs, but also as regards cost of construction. It should be noted that although gramophone equipment is included it may be omitted if speech only is required. It was, however, thought best to include it in the description.

As described, the outfit is equipped with two-volt valves and a self-contained direct current high-tension supply unit, with automatic grid bias. Where alternating current is available a transformer and rectifier may be added. Alternatively, dry batteries or H.T. accumulators may be employed, and these are

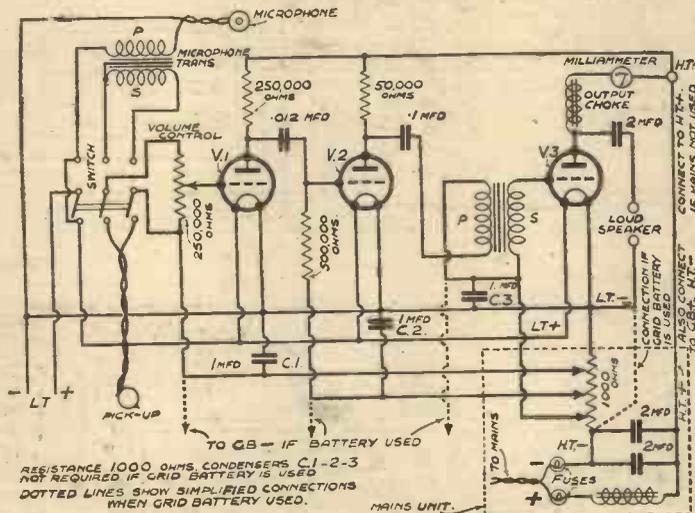


Fig. 2.—The complete circuit diagram.

The Amplifier

The amplifier uses three valves, which are coupled in the following manner. The first, with the volume control permanently wired between its grid and grid-bias leads, is connected by means of the switch to either the microphone or pick-up (see Figs. 2 and 6). Its anode circuit contains a 250,000 ohms resistance, which is in turn connected to the high-tension lead. The value of the anode resistance may be varied to

(Continued overleaf.)

tension or filament accumulator and is automatically switched on and off with the set itself.

Now to deal with the capabilities of the equipment. Using H.T. from the mains and at a pressure of about 200 volts, the volume obtainable is ample for a small hall and will be found to suffice for such occasions as Scout and Club meetings, private dances, whist drives, etc., and also out-of-door functions, such as garden parties; whilst by using six-volt valves and better loud-speakers, really serious work may be undertaken.

Arrangement of Components

With the exception of the low-tension accumulator, the whole of the amplifying and mains gear is mounted beneath a baseboard measuring about 12 1/2 in. by 16 in. It

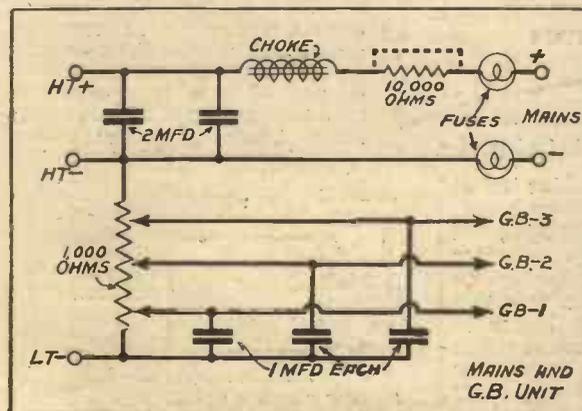


Fig. 3.—The mains and grid bias arrangement.

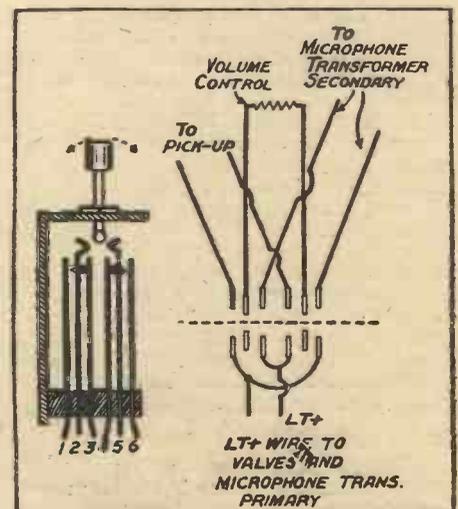


Fig. 4.—The connection to the change-over switch.

(Continued from page 117.)

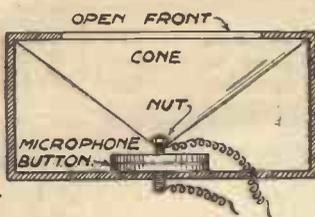


Fig. 5.—A simple cone microphone.

recess cut on one face to a depth of $\frac{1}{4}$ in. and $\frac{3}{16}$ in. wide and long (Fig. 10). A length of $\frac{1}{16}$ in. square brass rod is fitted at each side of the recess and these rods are of sufficient length to reach from the bottom of the hollowed part through the top of the block. Connecting wires are soldered to the projecting portions. The space between the rods is nearly filled with carbon granules and a layer of thin sheet rubber stretched

A microphone button is also used for the third type of microphone, and in this case is fitted inside a small wooden box. To the front of the box is attached a 3-in. diameter cone, which is made in exactly the same manner as a loud-speaker cone (Fig. 5.) and is attached to the button by the central screw thereon. This particular model has been found very good indeed.

suit the particular valve used, but should not be less than 100,000 ohms. The grid of the second valve is coupled to the first anode by a 0.012 mfd. condenser, which may be made up from a number of smaller condensers in parallel. The grid leak of the second valve is of 500,000 ohms resistance. The second valve anode circuit contains a 50,000 ohms resistance, which also goes to H.T. This resistance is also connected at the anode end to one side of a 0.1 mfd. condenser, the other side of which is taken to one of the primary terminals of a L.F. transformer, thus giving the popular parallel feed which enables a cheap transformer to be used without fear of undue distortion. The secondary of the transformer is connected to the grid and grid-bias leads to the third valve, and the grid-bias terminal of the transformer is also connected to the remaining primary terminal on the transformer. It may be necessary to reverse the primary connections of the transformer to obtain the best results and to avoid "motor-boating." The output valve is fed through an anode (L.F.) choke which in the case of the original is a scrapped transformer, the secondary winding of which, however, is in perfect condition. This is of rather large dimensions and acts quite satisfactorily. A lead is taken from the anode of this valve to one side of a 2 mfd. condenser, the other terminal of this condenser being connected to one of the loud-speaker sockets. The remaining socket is connected to L.T. negative.

Automatic grid-bias is obtained by connecting, in the case of the mains unit, a 1,000 ohms resistance between H.T. negative and L.T. negative, a 1 mfd. condenser being shunted across each lead (Fig. 3). The resistance must be of a type that can be easily tapped as the various G.B. leads must be connected to different points on it. A Graham Farish "Ohmite" is quite suitable. If desired this resistance may be omitted—with the condensers—and grid-bias batteries used, but about 20 volts will be necessary.

Different Types of Microphones

Three different types of microphones are used, although only one is actually necessary. The most satisfactory "mike" is made in the following manner. A solid block of hard wood, about 4 in. cube, has a

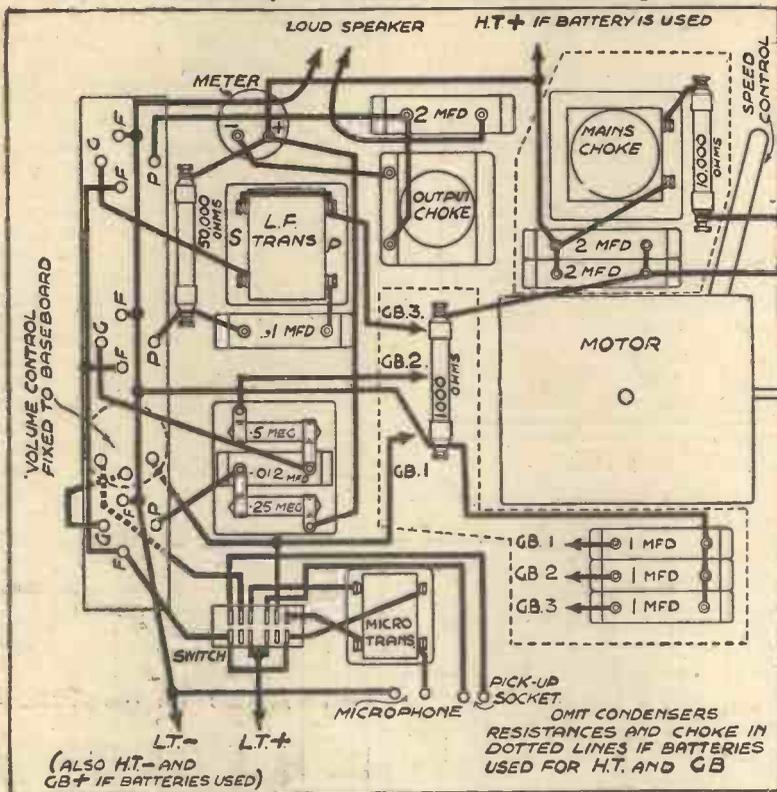


Fig. 6.—Wiring diagram of the outfit.

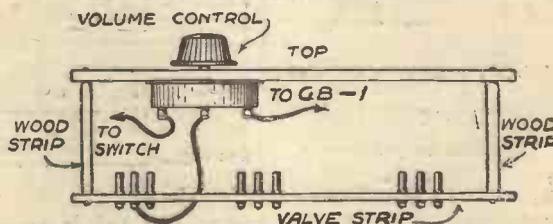


Fig. 7.—Connection to the volume control.

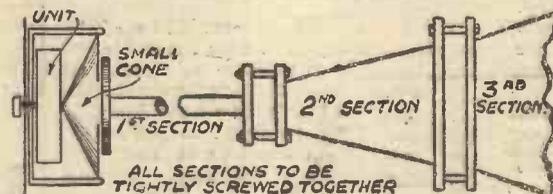


Fig. 8.—Method of building up the loud-speaker.

right across the front. The rubber is held in position by a small wooden frame, having inside measurements of $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in., and which is screwed to the block. Another type of "mike" employs a microphone button to which is attached a very thin aluminium diaphragm. The button is secured to the underside of a round switch block (Fig. 11), and the diaphragm, which is secured to the button by the central screw on the latter, is screwed to the base of the switch block.

Loud-speakers

The speaker used by the writer employs a balanced armature unit which drives a 5 in. diameter cone. The cone and unit are assembled in a small box, and the front of the cone is covered, except for a central hole of $1\frac{1}{2}$ in. diameter. Into this hole is fitted a 6 ft. long horn of more or less exponential type. Actually, this consists of three sections, the first having a parallel bore of $1\frac{1}{2}$ in. with a length of 2 ft. (Fig. 8), and is constructed from cardboard tubing. It carries at its free end, that is, the end away from the unit and cone box, a round switch block which may be screwed to a similar block on the next section. This section is also 2 ft. in length, and its diameter increases from that of the first section up to 3 in. at the far end.

The wide end of this tube also carries a wooden block which, in turn, is screwed to a similar block on the next portion. Here the construction varies and the end part is of square cross section. Its width at the narrow end is 4 in. increasing to 18 in. at the mouth. It may be constructed from thin wood.

If you happen to have a good cabinet type loud-speaker (cone), its directional qualities may be improved in the following simple manner. Obtain two wooden hoops of diameter a little more than the cone, and also one of twice the diameter of the cone (Fig. 9). One small hoop and the large one are fastened together with 2-ft. lengths of strip wood, and the inside of this "cone skeleton" lined with thin three-ply or stout cardboard. The remaining small hoop is fixed to the small horn on the part already constructed with a length of three-ply, so that there is a distance of about 2 ft. between the hoops. The three-ply should be fixed

(Continued on facing page.)

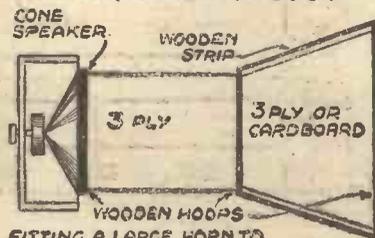


Fig. 9.—An alternative loud-speaker design.

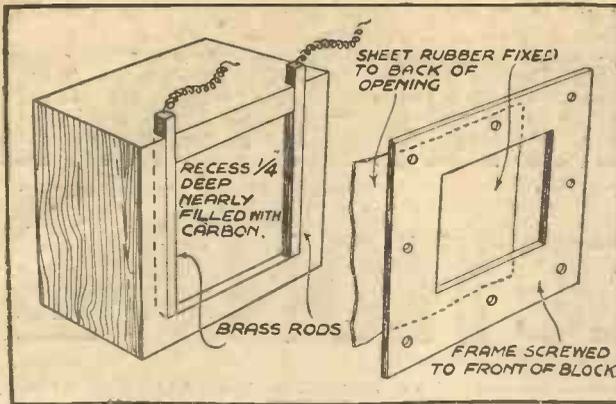


Fig. 10.—A simple carbon microphone.

(Continued from page 118.)

inside the small hoops so as to make a large diameter cylinder. The last hoop to be fitted is now screwed to the front of the loud-speaker, as seen in the sketch.

The following two-volt valves are recommended:

1st stage: R.C. or H.F., impedance about 30,000 to 60,000 ohms.

2nd stage: L.F. or small power, impedance not more than 10,000 ohms and less for preference.

3rd Stage: Super-power valve of less than 5,000 ohms impedance. Preferably 2,000 to 3,000 ohms.

Most of our readers will know practically all that is necessary regarding the operation of this equipment, but for the benefit of those who do not the following hints are

movement must be prevented. The volume control should be used with discretion, and it may, at times, be necessary to vary the volume whilst the set is actually in operation, particularly to check overloading due to sudden loud sounds.

The control switch, which was obtained for the sum of one shilling during a "wireless sale," is a twelve-point "Dewar," and really consists of two small double-pole double-throw switches combined, and operated by one knob (Fig. 4). If desired, however, an ordinary small double-pole double-throw switch and an ordinary filament switch may be used. One of the sections of the "Dewar" switch controls the accumulator, whilst the other, in one position, connects the secondary of the microphone transformer across the volume control. The other position switches in the pick-up across the volume

given. Perhaps the most important point to note, when using a microphone, is to arrange it some feet behind the mouth of the loud-speaker. This is really essential, as otherwise the "mike" will pick up the sound from the loud-speaker and a most violent howl will result. Using the milliammeter as a guide, adjust the grid bias voltages until the needle of the meter is steady, even on loud speech or music. A slight trembling of the meter may be overlooked, but violent

control in place of the "mike." The upright or central position of the switch is "off."

The high-tension unit consists of a smoothing choke—an old transformer of generous proportions will do quite well—and two 2 mfd. condensers (Fig. 3). Connected between the mains lead and the choke is a 10,000 ohms resistance which, for 220 volt mains may be used to cut down the voltage to about 120, with a corresponding anode current of 10 milliamps.

Alternatively, the resistance may be short circuited in order to get the full mains voltage, and an increased anode current.

This consists of a motor with turntable and controls. It may be mounted on the set,

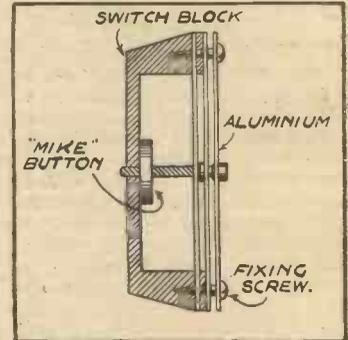
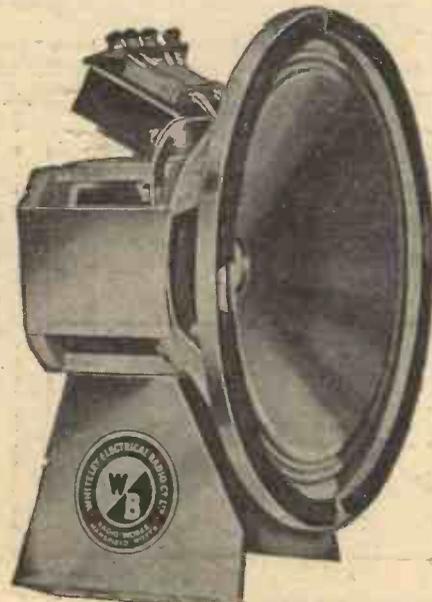


Fig. 11.—Another type of microphone.

as shown, or used as a separate unit. The pick-up (Fig. 6) may be of any good make, although that used by the writer was described by him in *Hobbies*, No. 1,844, dated February 21st, 1931. This also applies to the loud-speaker unit.

SPECIFIED for the 'Supersonic Six'

Again the experts sole choice—the famous W.B. "Mansfield Senior," (type PM 4)



Makes an AMAZING difference to ANY set. Write for 1933 folder



MANSFIELD
Permanent Magnet
MOVING-COIL
SPEAKER
42/- including
Transformer.
Junior model 27/6
including transformer

WHITELEY ELECTRICAL RADIO CO., LTD.
Dept. E., Radio Works, Mansfield, Notts.

MULTITONE SAVES AN EXTRA 30% H.T. for CLASS B users

TRUE TONE CONTROL in the first L.F. stage saves a further 30% in H.T. consumption above the H.T. economy resulting from Class B. It also ensures the best quality. That is why the designer of the BETA UNIVERSAL FOUR has used the

TONE-CONTROL TRANSFORMER 17/6
TOCO 1/4 3/6
Controlling potentiometer 3/6

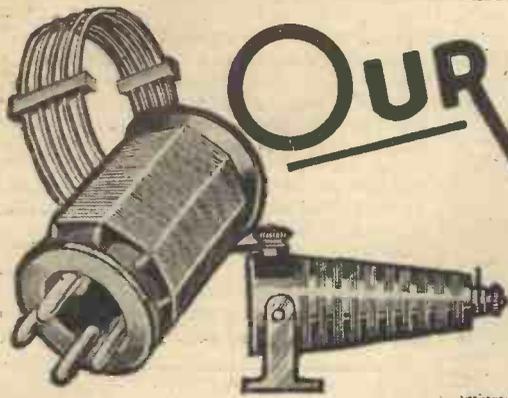
To couple Driver and Output valves use the Multitone Class B Transformer 9/6
BEPU 1/1 9/6

The best output choke is the PUCHOKE 9/6

From all good dealers. If in difficulty write to us.

MULTITONE ELECTRIC CO., LTD.,
95-98, White Lion Street, London, N.1. Telephone: North 5063.

MULTITONE
TONE CONTROL L.F. TRANSFORMER



OUR SHORT-WAVE SECTION



FAULTS in home-constructed short-wave receivers are due to a variety of causes, consequently, various methods must be used to overcome them. The home constructor invariably keeps an eye open for those radio gadgets which can be made throughout at home, with a minimum of expense. One of the most common troubles encountered by the inexperienced short-wave constructor when his first receiver is tried out is instability, due to the straying of H.F. currents into the L.F. stages. The result is that the headphones

A DUAL-PURPOSE UNIT

A Simple Choke Device for Curing Instability in Short-wave Receivers.

By ALF. W. MANN

much use has been made of the unit in order to allow fellow enthusiasts to hear the latest creation in operation. It is, therefore, a practical proposition, and the majority of

the cabinet—or box. This form of procedure may, at first sight, appear strange to my readers; nevertheless, it is the correct procedure, the reason being that although it is the simplest of wood-working jobs, everyone has not the same skill in the handling of edged-tools, and it is, under the circumstances, far easier to fit the choke-formers and panel to suit the box than *vice versa*. Reference to Fig. 1 will

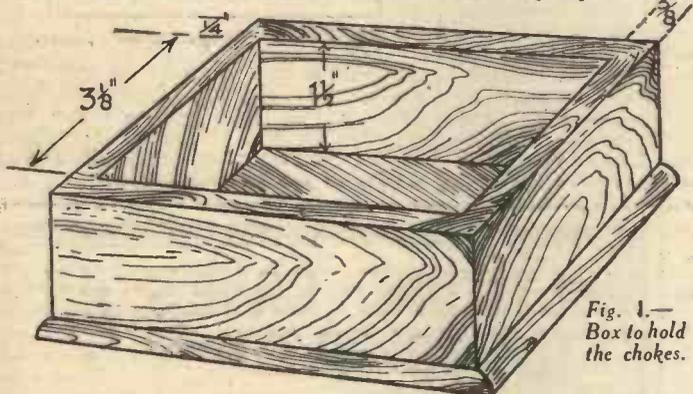


Fig. 1.—Box to hold the chokes.

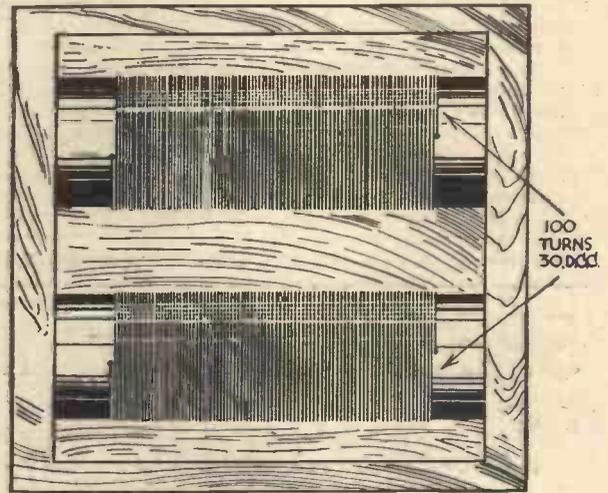


Fig. 3.—How the chokes are made up and mounted.

and cords are alive when touched by the hands. The receiver is difficult to tune, and even a movement of the head or body will cause the transmission being received to vanish entirely, accompanied by violent oscillation.

Experienced short-wave constructors know that decoupling and the incorporation of output devices are a sure cure and safeguard against straying high-frequency currents, but the beginner is not, as a rule, in the happy position of being able to purchase the necessary components in order to derive full benefit from such necessary refinements.

Under these circumstances readers will doubtless be interested in the little unit about to be described, which will greatly assist them to stabilize their receivers and prevent the H.F. effect in cords. An additional advantage of the unit is that provision is made for coupling two pairs of headphones in series in order that a friend may listen as the operator tunes around the wavebands.

Before entering into details concerning the construction of the unit, the writer wishes it to be understood that it has been tested over a period of years, during which efficient and inexpensive output devices were rare, and decoupling unknown. The pitch of efficiency which has been reached in short-wave receiver performances was, during the above period, undreamt of. Later, owing to the series headphones idea,

the material required, if not already in the reader's box of radio "odds and ends," can be obtained for a few pence.

MATERIAL REQUIRED

- 2 Plain Ebonite, Fibre or Wood Formers, 1" diameter by 3 1/4" long.
- 1 Piece of ebonite (panel), 4 1/2" by 3 1/4" by 1/4".
- 3 Banana plugs (red).
- 3 Banana plugs (black).
- 3 Sockets for above (red).
- 3 Sockets for above (black).
- 2 Pieces of wood (pine, oak, etc.), 4 3/8" by 1 1/2" by 1/4".
- 2 Pieces of wood, 3 1/8" by 1 1/2" by 3/8".
- 1 Piece of wood, 4 1/2" by 4 1/2" by 1/4".
- 3' length of connecting wire for coupling sockets C-D.
- 28' 30 D.C.C. wire (copper) for each choke; total length required, 56'.

make the construction of the box clear; note, however, that inside dimensions only are given.

After the four sides of the box have been sprigged together, the panel should be

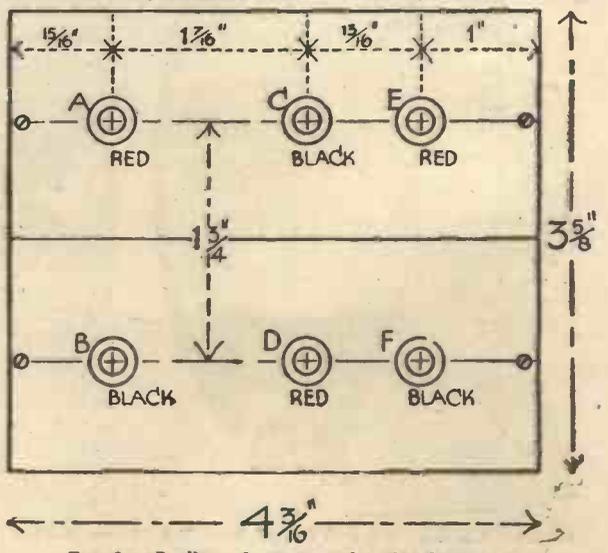


Fig. 2.—Drilling dimensions for the ebonite top.

Constructional Details

The first part of the constructional work which should be taken in hand is

marked out and drilled, and sockets fitted; next, fasten the panel to box-frame by means of four brass screws— $\frac{1}{2}$ in. will be quite suitable.

The chokes should now be taken in hand. If 30 D.C.C. wire is used, it will be found that one inch of former will consist of 44.7 turns (see Data Sheet No. 5). Winding should be commenced at approximately $\frac{1}{2}$ in. from end of former. The termination of same will be $\frac{1}{2}$ in. from the other end of former also. The number of turns required is 100 on each former.

When the choke windings are completed, thread the ends through the usual double holes, and leave at least $\frac{3}{4}$ in. of wire at each end. Fig. 2 gives a plan of panel; the sockets to the undersides of choke-leads should be connected, as follows:—

One end of choke to socket A, remaining end to socket E, the second choke being coupled to sockets B and F. Sockets C and D should now be coupled together with a short piece of Glazite wire.

The base of cabinet is $4\frac{1}{2}$ in. by $4\frac{1}{2}$ in. by $\frac{1}{2}$ in., so that all sides overlap $\frac{1}{8}$ in.

The complete unit should be coupled to your receiver, as follows (see Fig. 2):

Socket A (red) to + output of receiver.
Socket B (black) to - output of receiver.

Red Socket E=phones or speaker +.
Black Socket F=phones or speaker -.

To use two pairs of phones in series, the connections are Socket C—Socket E + of one pair of phones; Socket D + Socket F— of second pair of phones; the connection between C and D being, as previously stated, by a short length of Glazite inside the cabinet.

FURY-FOUR EXPERIENCES

(Continued from page 102)

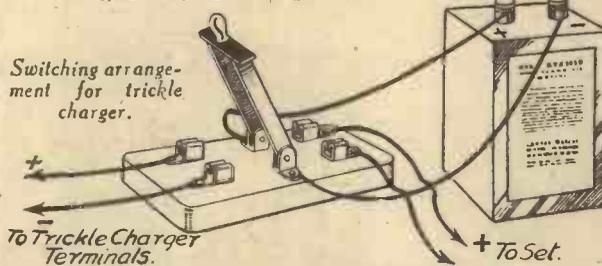
dealt with over the 'phone) and complained that the receiver was not functioning as I claimed. After being assured that everything had been done to endeavour to get it in working order I offered to examine the receiver at the workshop and see what the trouble was. In one case the builder appeared to have built the set out of all the parts which I had decided *not* to use. It was as much unlike the "Fury Four" as a motor-car. Ordinary baseboard-mounting valveholders were used; odd types of fixed condensers; odd spaghetti resistances, etc.; and the reader wondered why the set would not work! In the other case several components were not as specified, and when the wiring was checked it was wrong in several places. As soon as the wiring was corrected, the set worked, but not as the original "Fury Four," owing to some of the parts used being of the wrong electrical value. One reader inquired if a metal chassis could be used, and the reply to this is: Yes, if you like. Actually it is not essential, and the only thing which will be gained by using metal is simpler earth connections may be made to the holding down bolts, but the metal will be more difficult to cut and drill. For the same reason, metal foil may be used to cover the baseboard, but it is not essential.

I think that clears all the points which have so far been raised, and I shall be very pleased to hear from readers who have built the receiver and are obtaining the results I claimed, or who, for any reason not explained above, are unable to obtain satisfactory results.

I express my thanks to the hundreds of readers who have so eulogistically written to me regarding the "Fury Four." F. J. C.

ABOUT ACCUMULATORS

AN eminent electrical technician has this week made some apt remarks regarding the care of accumulators, and, although his advice was chiefly directed to those engineers who have large stand-by batteries in their charge such as those used for emergency lighting and the like, in hospitals, cinemas, liners and hotels, there is no reason at all why they should not be applied to the smaller users in the realm of wireless. The most important point was that it has been proved over and over again that the use of a trickle charger is much preferable to the practice of letting an accumulator run completely down and then charging it up again as quickly as



possible. In cases where large stand-by batteries are used as I have enumerated above, it often happens that they are not connected into circuit for many years, although they have to be ready at any

moment to deliver their full output if necessary. This is a tribute to the efficiency of our modern power stations, which so rarely break down, but should the odd chance happen, and the power supply fail for even a short time, the engineer in charge of the accumulators would have no excuse accepted if his batteries failed to deliver the current when required. As you all know, an accumulator has a certain leakage of charge even on open circuit if left for long intervals, and this slow discharge is more harmful to the plates than any definite load would be, and it is advised that a small trickle charger be connected in the circuit to counteract this small loss. If, therefore, you have mains in your house of any voltage (either A.C. or D.C.) a trickle charger would be a good investment. The rate of charging of the trickle charger is to

some extent regulated by the state of the battery, but if you use good judgment you can avoid excessive charging if your accumulators are in daily use for wireless purposes by switching on the charger as soon as listening is finished for the day. The charger is left on all night and the next day until listening is commenced again. The trickle charger should be switched off from the mains and from the accumulator when the set is working and a double throw double pole switch could be used as illustrated for accumulator switching. J. P.

UNDERSTANDING YOUR AERIAL

(Continued from page 103.)

unselectivity could have been rectified without the introduction of the unnecessary damping effect of the picture rail aerial. The tendency to-day is to think that it is no use having an efficient outdoor aerial because the great need is sharp tuning. While sets do tune sharply on a short indoor aerial, when they are coupled to an outside aerial the selectivity is seriously cut down. This is true in some cases, but the point is that with the short outside aerial it is far easier to isolate it and insulate it from the surrounding earthed objects than can possibly be done with the indoor variety, and thus secure a much better signal strength. By isolation is meant the ability to keep the conductor free from losses due to any stray capacities which may be formed with earthed objects. If the aerial runs for any length close to a wall, etc., some of the collected energy will leak to earth through the condenser action formed by firstly, the conductor, secondly, the air, which in this case is the dielectric, and thirdly, the wall. The only way to overcome these losses is to keep the aerial well away from other conductors. This is one of the chief difficulties with indoor aerials, for naturally they have to depend upon the wall for suspension. In Fig. 1 is shown a very good layout for the modern aerial; in the first place $\frac{7}{22}$ ordinary stranded copper wire is advised, insulated for preference, that is to say, either enamelled or covered wire can be used, this will safeguard it against corrosion, which rapidly takes place in a smoky city. The length should be between approximately 30ft. to 45 ft., but this is governed, of course, by the distance the set will be used from a large powered station. The main consideration is the height clear of any screening, for if this is kept in the region of 30ft. to 40ft. it will

not make the set any the less selective, but it will generally increase the signal strength on distant stations. Even a vertical wire, see Fig. 2, carried on supports well away from the outside wall by about a foot or more and run from the top to the bottom of the house, will give wonderful results and be very selective. The signal strength will be good on most average sets and better all round results should be obtained than with an indoor aerial.

The next best thing to the efficient outdoor aerial is the aerial which is erected in the roof. It should be well insulated, but it is not possible to isolate it entirely, for even in a roof it may be only a short distance of 6in. to 8in. from a conductor to earth and this will seriously affect results. The length of wire used must be fairly short, not more than 50ft. and sometimes less, otherwise capacity losses will be set up, this will counteract any gain in signal strength. Good results are often obtained by merely running a length of 22 gauge cotton covered wire around three sides of the room, slung from the picture rail about a foot away on insulators as shown in Fig. 3. The whole point is that with an indoor aerial there are many different kinds of metallic bodies in the building which are liable to effect the signal strength and mar reception.

This type is the least efficient of all aerials, the chief fault being its very low signal pick-up. It is very handy where space is a governing factor or if the owner is constantly moving about. Of course, the very handy portable sets are compelled to utilise a frame aerial, although this necessitates extra valves for amplification purposes. Therefore, it can be seen that in order of merit the outside aerial is first, then the vertical outside wire, followed by the indoors roof aerial, and then the picture rail conductor, followed by the frame aerial.

**Specified by the Experts
IN 5
MINUTES** ... you can give
YOUR Battery

Set a Mains Performance and reduce your battery expenditure.

"B" CLASS—FIRST

Sound Sales first with a Unit that all battery users have waited for.

THE "SOUND UNIT"
(incorporates "B" Class Amplification)

35'—
less Valve

35'—
less Valve



THIS AMAZING UNIT converts practically any Battery set or Radio-Gramophone to CLASS "B" Amplification without alteration or tools—you just connect it in the speaker circuit. **RESULT—2 WATTS OUTPUT** with Wonderful Tone and Surprising Economy.

Housed in a very attractive brown bakelite case, the instrument incorporates a MATCHED input and output circuit comprising a special input transformer and output choke together with tone compensated, dual impedance output making provision for all types of speakers. The system is fully decoupled and can be added to your receiver with perfect confidence and with excellent results.

FIRST AGAIN
with ideal components for home constructors of "B" Class Amplification.

THE DESIGNER'S CHOICE for "Practical Wireless"



CLASS "B" UNIT

"B" CLASS INPUT TRANSFORMER 9'—
Type SS/B

"B" CLASS OUTPUT CHOKE 9'—
Type SS/BC

Choose Sound Sales Transformer for the "STENTOR FOUR."
Send coupon for Catalogue of Quiescent Transformers, Chokes, Mains Transformers, etc:

SOUND SALES LTD.

Mr.
Address

SOUND SALES, LTD., Tremlett Grove, Highgate, N.19
Telephone: Archway 1661-2.

TELE-TALKIE TOPICS



Gas Discharge Lamps for Television

IN television apparatus in which the lamp is directly controlled by the incoming signals, and not where the light from a projection lamp is altered through a modulating device as in a grid cell, glow lamps have been very largely used as they require a comparatively low current for

By **H. J. BARTON CHAPPLE**,
Wh.Sch., B.Sc. (Hons.), A.C.G.I.,
D.I.C., A.M.I.E.E.

images were considerably brighter than with the normal neon lamp, the experiments using the ordinary scanning disc were not quite satisfactory. When using a mirror drum good pictures resulted when the lamp was used in the form of a "light sprayer." Here a glow cathode is in a metal tube, while the anode is outside the metal tube, the discharge being compelled to pass through the narrow cylinder and consequently produce a brightly illuminated spot at the tube end.



Fig. 2.—Showing very clearly how the mirror screw is built up like a spiral staircase.

Lamp Details

The development of the sodium lamp has, however, shown great promise of producing a light source for use with scanning discs. According to experiments which have been carried out on the Continent it is possible to obtain from the sodium lamp about 80 per cent. of the energy contained in it in the form of visible light, that is a degree of efficiency can be secured which is twenty to thirty times higher than the normal glow lamp and gas discharge lamp. If after this consideration a sodium lamp is used in a container which may be heated, then comparatively low energy will suffice to maintain a high light intensity of the lamp, several experiments confirming this statement.

normal operation. Higher current intensity is not advantageous inasmuch as the output valve has to furnish the current for the lamp and with higher currents the price and size of the apparatus, and the difficulty of handling, increase. Lower currents may, of course, be used when the positive column of a gas discharge lamp is chosen, but in this case very high voltages are employed as the older gas discharge lamps require this condition for proper functioning. Through the new development of a special light valve with glowing electrodes, however, it has been made possible to construct lamps which burn on ordinary lighting mains voltages.

Compared with glow lamps the use of gas discharge valves with positive columns and glowing electrodes presents a great improvement as the light intensity of the positive columns is much greater than that of the glow lamp. Lamps with neon filling and mercury filling have been constructed on these lines and although the resultant

The Fernseh A.G., who have used these lamps, have obtained with them television images of a brightness that had previously



Fig. 1.—One form of helical receiver used for television.

been considered impossible when employed in conjunction with a scanning disc. The current required for such a lamp is of the order of one-tenth of an ampere, the voltage at the lamp being about 100 volts and measured photometrically this produces a light intensity of 126 candles. The lamp is bent to a U shape so that the separating line between the 2ft. shanks does not cause interference and a matt glass disc is chosen as the front sealing arrangement through which the whole matt glass disc appears equally bright. Experiment has shown that the sodium light follows perfectly current oscillations up to over 100,000 cycles, so that the reproduction of images with great detail is possible.

Scanning Without Drum or Disc

Many ingenious schemes have been propounded for carrying out the operation of scanning, an essential function common to both the transmitting and receiving ends in television. Most workers, apart from those who stake their claim with cathode ray tubes, pin their faith in discs with holes punched direct or used in conjunction with lenses in one form or another, or else they prefer to use a mirror drum usually in the form of a narrow cylinder with mirrors round the edge. Each mirror is fixed at a slightly different angle to its immediate neighbour, so that when revolved this combination builds up the required light field.

Recently, however, a certain amount of attention has been given on the Continent to the "mirror screw" or "helicoidal" method of scanning. In effect this is somewhat similar to mirror drum working, but it enables the exploring device to be built up in a more compact form. Two examples of this mechanical form of scanning are shown in the accompanying illustrations, and they will be seen to resemble a screw with a large pitch or a "spiral stairway." At the end of each "arm" is a reflected device which projects this spot on to a screen, but by twisting the arms in the fashion shown the arrangement becomes quite novel in character. Up to the present, however, the images shown with this device have not equalled those portrayed with a disc or drum, but it is interesting to record the efforts made by various inventors in different directions in order to find that which is best for ultimate public use.

WIRELESS TERMS TRAVESTIED—4



Leaky Cell.

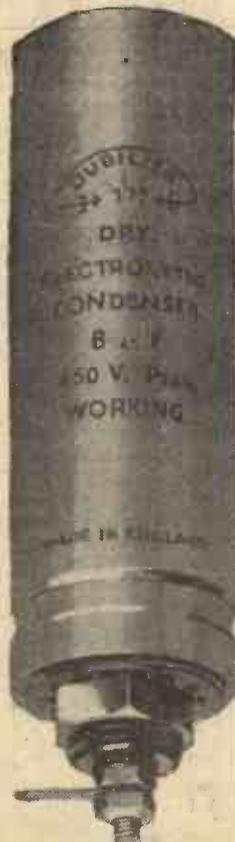
APART FROM
LOW PRICE



THERE ARE

**QUALITY
REASONS**

Why you should choose
DUBILIER
DRY
**ELECTROLYTIC
CONDENSERS**



QUALITY POINT No. 3

NO LIQUID

The electrolyte in these condensers contains no free water. Freezing is impossible and exposure to cold will not damage the condenser.

NOTE THESE PRICES

- 4 uf. . . . 4/6
- 6 uf. . . . 5/-
- 8 uf. . . . 5/6

These Condensers are designed for a Maximum Peak Voltage of 450 (D.C.+A.C.)

DUBILIER CONDENSER CO. (1925) LTD.
Ducon Works, Victoria Road, North Acton, W.3

A Great NEW Valve

New principles of construction have made possible the HIVAC Valves at specially low prices.

There is a HIVAC Valve for every wireless requirement which will save you money and give you longer service.

Write to us for our Comparative Valve Guide and state the set you have or the set you propose to make.



Telephone CLERKENWELL 7587

The HIGH VACUUM VALVE CO. LTD

113-117, FARRINGTON R.
LONDON, E.C.



MY OPINION! By the Editor

EVERY time I receive a query relating to selectivity I cannot help feeling that we are falling into the same mistake, and showing the same lack of foresight as our forefathers did regarding the making of roads. The congested state of our roads to-day is a "tribute" to the lack of vision of those who lived in the period of which we nowadays speak with veneration as "the good old days." They were really bad old days, and motor-car designers to-day have a pretty tough problem in producing cars—not as one would imagine to create a given performance—but to stand up to our abominably bad roads. Obviously, the solution to better motoring is better roads, and if the roads were perfect we could abolish the pneumatic tyre altogether. The roads of the ether bid fair to provide an analogy with the roads of to-day. The ether roads, it would seem, have been built by those who had no eye to the future. Hence its present congested state, and its bad condition. Radio designers have to design their sets to suit those roads which are badly in need of widening and ironing out. You will perceive that the gravamen of this note is that attempts to solve the selectivity problem can only be made by tackling the effect, instead of the cause. Selectivity is a question of waveband, not of receiver design, and the best receiver to-day is merely a compromise between what is ideally possible and what is practically permissible. If you want selectivity you can only have it at a price, and whilst broadcasting stations must compulsorily operate on the 9-kilocycle separation basis, no satisfactory solution can be found. It is just as well that we face that fact. PRACTICAL WIRELESS can give you selective circuits. It can give you circuits which will rope in all the stations, but you cannot have it in one receiver. If you want selectivity you must be content with fewer stations, and if you want the largest possible number of stations you must be prepared to sacrifice a certain amount of selectivity. If, therefore, your complaint is that your receiver (whether home-made or purchased) is non-selective do not always blame its designer; for whilst all receivers are not equally selective or equally sensitive, and whilst, too, the question of location plays an important part in the problem, under the present conditions of the ether the cause is external to the effect. On the present basis it is a drawback to the system of allocating wave-lengths. In a nutshell, radio designers and component manufacturers are operating under difficulties quite outside their control, and the fact that, in spite of the draw-backs to which I have drawn attention, such a marked degree of selectivity is possible bears tribute to their assiduity, enterprise, and service to their public.

My "Fury Four," of the selective properties of which so many readers have written in such glowing terms, is an example of the very best possible compromise between the diversity of factors alluded to above. It is thought that short of a superheterodyne, no more selective a receiver can be produced. Moreover, it gives selectivity with extreme purity, and there is plenty of volume on tap. The irreducible minimum only has been sacrificed.

F. J. C.

BE SAFE!

**THUNDERSTORMS
NEED HAVE
NO TERROR**
If you fit the Genuine
**SNAP ACTION
LIGHTNING SWITCH**

Special features:

1. SPARK GAP
2. SAFETY FUSE
3. INSULATED
4. FOOLPROOF

Price **2/6** each.

Each switch includes
£100 Guarantee Voucher



Send for 80 p. Catalogue "N."
Enclose 2d. Postage.

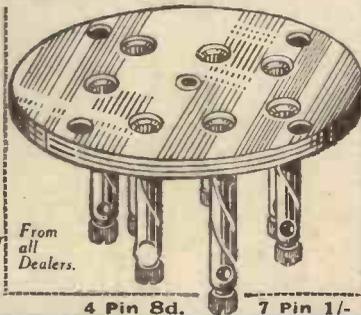
FREE INSURANCE
£100 GUARANTEE
that in the event
of apparatus
will be

A. F. BULGIN & CO., ABBEY ROAD BARKING.

The "BETA" UNIVERSAL FOUR depends on CLIX

Previous experience has proved to the designers of this receiver the wisdom of using CLIX Valveholders. Not only do the Turned Resilient Sockets guarantee full-surface contact (without fear of collapse) with any valve pin—solid or otherwise—but they also have a lateral movement which makes insertion of the valve much easier and prevents jamming. And of course the very sturdy construction, low-loss design and "easy-connection" terminals are other very good reasons why designers usually specify

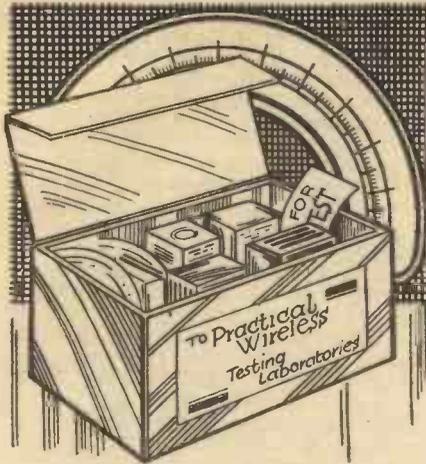
CLIX Chassis Mounting VALVE HOLDER



4 Pin 8d. 7 Pin 1/-

Write for
CLIX
Leaflet
N/8.
From
all
Dealers.

CLIX
CHEAPEST PERFECT CONTACT
LECTRO LINX, 79a, ROCHESTER ROW, S.W.1



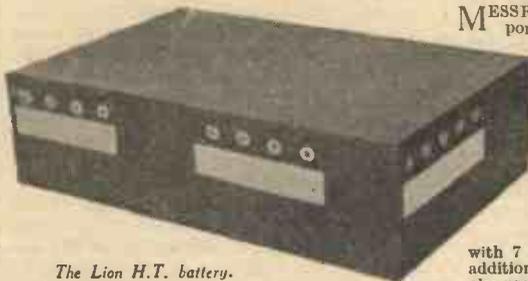
Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

LION H.T. BATTERIES

THE usual type of H.T. battery has the sockets spaced at various intervals all over the top of the battery, and this method of tapping has not been varied until the arrival of the battery shown on this page. Here the various sockets are brought to the side and arranged in a neat line, and this greatly facilitates the insertion of the plugs when the battery is used in a receiver where there is not too much space



The Lion H.T. battery.

allowed for it. The particular battery which is illustrated has a total voltage of 150 volts, tapped at 40, 50, 60, 120, 130, and 140 volts, with the addition of grid bias tappings at the side. Other models are obtainable with 60 volts, 100 volts, and 120 volts, at 4s. 6d., 7s. and 9s. each, and a 9-volt grid bias battery is obtainable at 10d. The internal resistance of the battery is very low, and the discharge rate of the battery is 11 mA. in the case of the 120 volt battery above mentioned. These batteries will stand up to hard wear, and may be recommended.

MAINS POWER RADIO UNIT

THE eliminator which is illustrated below is the model A.C.2 manufactured by the Mains Power Radio Company, and is a very attractive unit for the user of a receiver employing from one to five valves. The unit, as will be seen, is totally enclosed in a metal case and this is finished in a pleasing blue crackle enamel effect which is an effective insulator. There is thus little risk of a shock should the case for some reason be touched whilst the operator is also touching a high-tension positive point. This is a small but important point. The unit is provided with five sockets, three positive, one negative and one earth. To the latter the case is electrically connected. These sockets may be seen on the front of the unit, and they are not only very clearly identified, but the metal part of the socket is well sunk, so that it is impossible to touch them with the fingers. The sockets take the standard split or solid pin. The output at the various positive tappings is designed for a screen-grid valve, a detector valve, and a maximum-voltage tapping, and according to the amount of current taken the first gives 75 to 90 volts, the second a similar voltage, whilst the maximum tapping delivers 120 to 150 volts. The current



One of the M.P.R. Company's mains units.

rating of the unit is 18 to 22 mA., and this is ample for normal requirements. Tested on a four-valve set the unit worked perfectly silently and gave the required voltages with no trouble at all, and owing to the adequate ventilation holes provided there was very little trace of heating. The price of the unit is £2 10s.

EMICOL

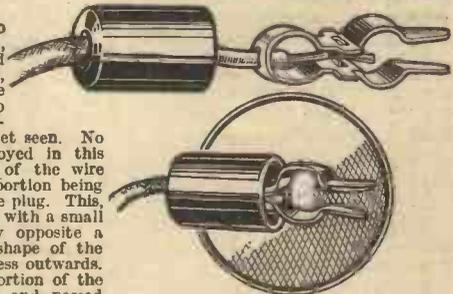
THE Electrical Measuring Instrument Co., Ltd., whose trade mark is Emicol, announce that they are now established at 55, Cardington Street, London, N.W.1, where they are continuing to manufacture measuring instruments of every description. The products of the firm are 100 per cent. British, and include voltmeters, ammeters, ohmmeters, pocket voltmeters, portable testing apparatus, etc.

LISSEN Q.P.-P. COMPONENTS

MESSRS. LISSEN have produced two new components for the quiescent push-pull circuits, one a Hypernik inter-valve transformer with a ratio of 1 to 8, and the other an output feed choke. The former is designed especially for feeding two power valves (or pentode valves) in order to fully load them and enable an output of 2 watts or so to be obtained. The primary inductance is 35 henries with no D.C., dropping to 20 henries at 4 mA. The resistance of the primary is only 370 ohms. The secondary has a resistance of 15,000 ohms. The output feed choke has an inductance of 12 henries at 40 mA. rising to 18 henries with 7 mA. The D.C. resistance is 400 ohms. In addition to these two components Messrs. Lissen have also produced two pentode valves, type P.T. 2A, and an interesting pamphlet describing the construction of a powerful two-valve circuit employing a screen grid valve as detector followed by the two pentodes in quiescent push-pull. The Lissen one-knob control unit is employed, and this enables a really powerful little set to be constructed from all Lissen parts. The pamphlet gives on one side a full-size blue print with all wiring and constructional notes. It may be obtained free on application to Messrs. Lissen.

METEOR WANDER PLUG

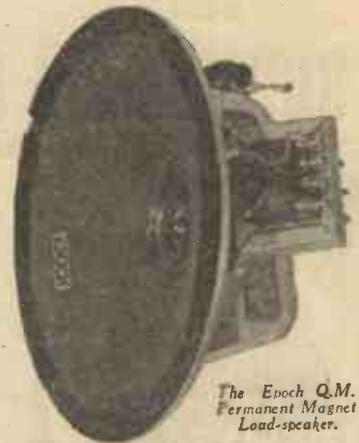
THE latest type of wander plug to be produced is shown on the right, and is a product of Messrs. Ward and Goldstone. There have, of course, been many different types of this little component produced from time to time, and this particular plug is certainly the simplest which we have yet seen. No screws or screw threads are employed in this arrangement, both the attachment of the wire and the holding on of the insulated portion being accomplished by the springiness of the plug. This, it will be seen, is made in one piece, with a small projection on one side immediately opposite a cut-out on the opposite side. The shape of the plug tends to cause the points to press outwards. To attach the wire the insulated portion of the plug is simply pulled off the metal and passed down over the lead, and a space of about a quarter of an inch of wire bared. This is then threaded through the hole in the end



Something new in wander plugs—The Meteor.

of the plug and passed across the small central projecting piece. If now the insulated sleeve is pushed down over the plug, the two sides are pressed together, and the wire is nipped between the projection and the small cut-out. The pressure against the sides of the sleeve retains this in position, and the wire prevents it from being withdrawn. The outward pressure

also ensures a good electrical contact against the sides of the battery sockets when it is inserted in a grid bias or H.T. battery. The plug costs 1½d. with red or black sleeve.



The Epoch Q.M. Permanent Magnet Loud-speaker.

EPOCH Q.M. LOUD-SPEAKER

THE loud-speaker illustrated is a new model produced by the Epoch Radio Mfg. Co., Ltd., especially for use in the output circuit of two valves working on the quiescent push-pull principle. This has a cobalt steel magnet of liberal dimensions, and is fitted with a 8½in. moulded diaphragm. To enable satisfactory matching to be carried out a special six-ratio transformer is fitted, and this provides ratios of 15 to 1, 22 to 1, 27 to 1, 34 to 1, 47 to 1, and 63 to 1, the speech coil being wound to 5½ ohms. This is a splendid little speaker handling up to 4 watts, and gives really first-class reproduction. Tested on the Q.P.-P. amplifier, the speech was brilliant, with a good high-note response, and bass was natural without being boomy. The volume from two pentodes was more than sufficient for the average room, and the sensitivity, when tested on a weak signal, was of a high order. The price is 32s. 6d., and it should be noticed that this is not one of the standard Epoch speakers just fitted with a Q.P.-P. transformer, but has been produced and balanced especially for that particular method of L.F. amplification. It may be obtained in a handsome oak cabinet for 45s.

HANDY BOOKS FOR HOME CONSTRUCTORS

FOUR USEFUL BOOKS

By F. J. CAMM (Editor of "Practical Wireless.")

- Twenty-five Tested Wireless Circuits.
 - Accumulators: Charging, Maintenance and Care. Each 98 pages, fully illustrated, 1/- each or 1/2 post free.
 - Modern Wireless Sets and How to Make Them. 80 pages, 6d. or 7½d. post free
 - Make Your Own Wireless Set. 80 pages, 6d. or 7½d. post free from
- Geo. Newnes, Ltd., 8/11, Southampton St., Strand, W.C.2

WATMEL AGAIN

SPECIFIED FOR THE "SUPERSONIC 6"

25,000 ohms Watmel Volume Control.



THE WATMEL POTENTIOMETER (TYPE 1)

This resistance is wound on a special non-shrinkable former, which gives perfect contact. Note the points :-

1. Back self-cleaning contact.
2. Bakelite case, protects winding.
3. Large contact plate.
4. Polished easy-grip knob.
5. Wire wound former (not compound with wire contacts).
6. Contact finger, phosphor bronze.
7. Positive stop.
8. One hole fixing, brass bearing bush, resulting in perfect bearing.

Any resistance up to 25,000 ohms ... **5/6**

If you cannot get this component from your local dealer, write to us and we will send what you require within 24 hours. Write for Catalogue.

Watmel COMPONENTS
GET THE BEST OUT OF ANY SET
WATMEL WIRELESS CO., LTD.,
 Imperial Works, High Street, Edgware.
 Telephone: Edgware 0323. (N.C.89)

H.F. PENTODES (Continued from page 104.)

Why are radio engineers so anxious to increase the sensitivity of receivers by introducing these high-amplification valves? One reason is undoubtedly the rapidly increasing condition of ether congestion, due to more and more high-powered broadcasting stations coming on the air. In order to cope with this situation it is necessary to adopt various devices to improve selectivity, all of which have the effect of reducing signal strength so that increased amplifying power in the set is necessary. Again, more and more listeners are demanding sets which will work quite satisfactorily and give a full choice of programmes without the use of an outdoor aerial, and it is only by using the most efficient types of radio-frequency amplifier that mains aeriels and plate aeriels within the cabinet can be suitably employed.

It may be asked what are the signal handling capabilities of the screened-grid pentode.

The answer is approximately the same as an ordinary screened-grid valve. In other words, apart from such minor alterations as the adjustment of voltage dropping resistances, screen potentiometers and grid bias, a high-frequency pentode can be substituted simply for an existing screened-grid valve, and will work well, although better results will be obtained if more efficient coils are also fitted. When the set is tuned-in to a very strong signal, however, such as that from the local station, there will be the same risk of distortion due to overloading as with a screened-grid valve, unless some form of input control is fitted.

For this reason it is expected that valve-makers will offer a choice of high-frequency pentodes, some of which will have characteristics similar to the variable- μ screened-grid valve, namely that by increasing the grid bias the valve is able to handle greater signals without distortion, but, of course, giving a smaller degree of amplification.

THE BEGINNER'S ABC OF WIRELESS TERMS (Continued from page 114.)

solid matter between the plate except at the one or two points where the plates are joined to the frame. This is the most effective type of condenser. However, it is not always possible to use air. The next best dielectric to air is mica. This is used extensively in small fixed condensers.

It should be noticed that the closer the plates are together, the greater is the capacity of a condenser, therefore the dielectric is always made as thin as possible, so as to reduce the number of plates necessary for a given capacity. For example, a condenser consisting of one or two sheets of tinfoil separated by the very thinnest strips of mica will have the same capacity, that is it will hold

as much electricity as one with much larger plates but separated perhaps $\frac{1}{8}$ in. apart in air. Although air is the most efficient dielectric, it stands to reason that an air-spaced condenser cannot be made as compact as one using thin sheets of mica, paper, or bakelite, since if the plates of an air condenser are placed very close they may accidentally touch, and so discharge the condenser. That is why if you buy a variable condenser with bakelite dielectric, such as the one shown at (b) Fig. 4, you will receive a much more compact instrument than one of the same capacity but with the vanes separated by air, as in the one shown at (a) Fig. 4.

See also CAPACITY, DIELECTRIC, DIFFERENTIAL CONDENSER, ELECTROLYTIC CONDENSER, etc.

WAVEBAND SWITCHING WITH PLUG-IN COILS

A READER who uses plug-in coils asks for a method of waveband switching without coil changing.

Here is a simple method of using plug-

reaction on both wavebands. One end of both the long and short-wave coils is connected to earth, and the other ends are connected to the two studs of a S.P.D.T. switch. The arm of the switch is connected to aerial, grid condenser and aerial side of aerial tuning condenser. Of course, the aerial coils in this case must be made movable, and the reaction coil fixed.

The reaction coil is connected in the usual way. For circuits employing capacity control of reaction it is simpler, as three single coil holders may be used, and all coils remain fixed. (See Fig. 2.)

-P. TREVOR (Salisbury).

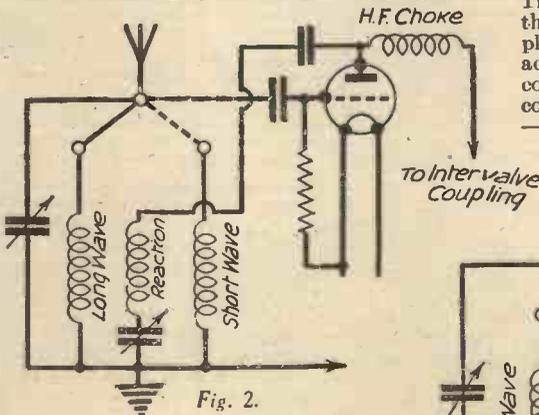


Fig. 2.

in coils for wavechange switching which I use with success. First, for use with "swinging-coil" reaction and using a 3-way coil holder, the coils are plugged in in the following order: Long-wave, reaction, short-wave (Fig. 1). The reaction-coil must be of a suitable size to provide

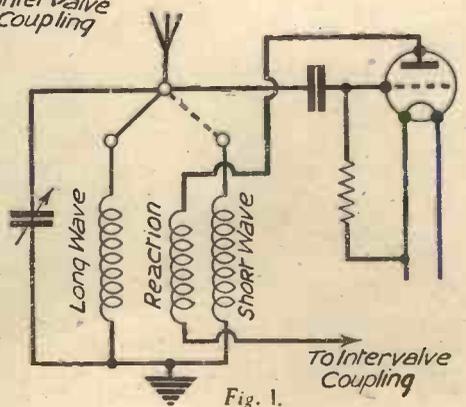


Fig. 1.

IMPRESSIONS ON THE WAX

A REVIEW OF THE LATEST DISCS

Some "Stars" Amongst
Funny Records
By E. REID WARR

THERE are few things in ordinary existence which cause more differences of opinion than what is, or is not, humorous. It is, perhaps, as well that we do not "all think alike," for it might well be that nothing (or everything) would appear funny—a very distressing state of affairs!

What is the test of humour? Since everybody has his own idea of humour, and everybody differs from his neighbour, it is impossible to reduce humour to a formula. There is one attribute of humour, however, which hall-marks it for the listener, and that is the number of times it will stand repetition and still "raise a laugh." Humour must awaken its response at once: if it does not, one of two things is true. It is not humour at all, or it is not the type of humour which appeals to the listener. We often hear a "turn" in a wireless vaudeville programme which delights us at first, leaves us unmoved the second time we hear it, and on its third repetition impels us to switch off. Conversely, there are occasions when our favourite comedian is broadcasting and we hope he will do such and such a number, which we always enjoy. Evidently our particular brand of humour!

Now I want to recommend some recent records, some of which will suit everybody. They will be so described as to allow readers to choose at least one which will give many laughs for months—even years—to come.

First, one by that wonderful little comedienne, Cicely Courtneidge. This is entitled "Double Damask." It recounts her efforts to buy "Two Dozen Double Damask Dinner Napkins." The ensuing tongue-twisting conversation between the shopper, assistant and shop-walker as they try to repeat the order is the most comical scene imaginable. It is impossible not to laugh even if one hears it every night for weeks. This is on H.M.V. B4314, and costs 2s. 6d., a price which works out at a very small fraction of a farthing a laugh.

Of a different school, but an equally brilliant artist—Stanley Holloway. His dialectical skill in the "Sam Small" monologues are models of perfection. The dry, imperturbable Lancashire characters he portrays cause one to chuckle continuously rather than to roar with laughter, leaving a feeling of real enjoyment at the end, and the chuckles go on and on. Test this out on his Columbia record No. DX353 (4s.), a "12-incher" with "The Lion and Albert" on one side and "Three Halfpence a Foot" on the other. There is nothing to choose between them; each is a gem of real comedy. The first has been heard on the wireless, by the way. If you belong to the North Country you'll have this

record already, if the South, you should have it.

Now for a "pair." The stock-in-trade of Billy Caryl and Hilda Mundy is incompatibility—increased to the *nth* degree. They quarrel, venomously. This dynamic pair go all out on a Broadcast record, "Soaked" and "At it Again" (No. 3253, 1s. 6d.). The lines are well written, and are so well put over that they never seem to get stale.

That very superior person, Gillie Potter, is capable of some very good performances, and some not nearly so good. His humour has a biting flavour and I have never yet met anyone who is undecided about him. You either enjoy his nonsensical arrogance immensely, or his satire exasperates you. Appropriately enough, I think his "Truth About the B.B.C.," his masterpiece (Decca, K650, 3s.). He scourges the lofty disdain of the officials for the smaller fry and their adulation of the great with such audacity that his hearers must wonder if "there isn't something in it." Gillie Potter's technique is quite apart, and his art can be best studied on this record.

A different type of monologist is John Tilley, who quickly jumped to the top in non-stop vaudeville. He meanders gently and disconnectedly from one episode to another in a strange, detached way. His extravagances have, nevertheless, such an air of comic possibility that he wears extraordinarily well. For example, his "Army Estimates" (which has nothing whatever to do with the title, by the way), on Imperial 2741 (1s. 3d.), is a record which seems always fresh, a test of the real artist in the most difficult medium, the humorous monologue.

It would be unfair to omit what is definitely the best character sketch ever put on a record, "Flat Footed Jean" (Columbia DB1009, 2s. 6d.). This is the story of a Scottish Wooing and the three parts are played by the Authoress, Valentine Dunn, John Laurie and a vocal prologue and epilogue are sung by Tom Kinniburgh. This is a perfect gem of quiet, subtle Scottish humour. The theme is the traditional caution of the Scot—even in his love affairs—and the delightful intimacy of the whole scene, so wonderfully acted, gives the hearer a feeling that he is overhearing by a piece of accidental good luck an entirely charming comedy of real life.

Here, then, are half a dozen records which are endowed with humour of such a quality as to justify their inclusion in the variety section of any record library, however small. Each can be heard again and again; each time it will evoke fresh laughter. Hear some of them and see if you agree with me.

Our Most Versatile British Band

If you set out to collect examples from every class of music between Dance and Oratorio, Opera and Military March, it would involve a lengthy and trouble-

(Continued on page 128.)

EASY TERMS

Everything Wireless supplied on lowest terms.
Prompt Delivery Guaranteed.
Price List Free on request.

THE BEST KIT

NEW LISSEN "SKYSCRAPER"

KIT including valves, £4:9:6
Cash Price
With order 5/-
and 11 monthly payments of 8/6.

NEW

BLUE SPOT UNITS

NEW BLUE SPOT 99 P.M. MOVING-COIL UNIT. With order 5/-
Cash Price £2/19/8.
And 11 monthly payments of 5/6.

NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 29 P.M. With input transformer. With order 5/-
Cash £1/12/6.
Balance in 6 monthly payments of 5/2.

NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 45 P.M. With input transformer. With order 5/-
Cash £2/5/0.
Balance in 9 monthly payments of 5/- only.

ATLAS ELIMINATOR A.C.244. Three H.T.appings. 20 M/A output. With order 5/-
Cash Price £2/19/8.
And 11 monthly payments of 5/6.

Q.P.P.

Everything for the new Q.P.P. circuits supplied promptly, Cash, C.O.D., or Easy Terms. We shall be pleased to advise customers on all Q.P.P. matters.

R.I. PUSH-PULL INPUT TRANSFORMER AND R.I. P.P. OUTPUT CHOKE. With two Mazda, Cossor or Mullard Pentode Valves. With order 5/10
Cash Price £3/4/0.
And 11 monthly payments of 5/10.

To avoid delay, will customers kindly send first payment with order. Dept. P.

The LONDON RADIO SUPPLY COMPANY ESTD 1925
11, Oat Lane, Noble St., LONDON E.C.2
Phone NATIONAL 1977

Famous Makers' Offer! £5 Radio-Gram CABINET for 65/- SEVEN DAYS' FREE TRIAL (OR 10/- MONTHLY)



"D" £6-15-0

Polished Oak and Piano built! The acoustic Tone brings a fine thrill. Makers to Radio-Press, B.B.C., 3,000 clientele. MODELS FROM 35/- to £15 Photographs and List FREE.

PICKETTS Piano-Tone Cabinets, (P.R.), Albion Road, Bexleyheath.

FOR DE-LUXE RADIO-GRAMS PICKETTS CABINETS

Recommended for Best Results!

LOUD SPEAKERS REPAIRED 4/- (Blue Spot a Speciality, 5/-)

Transformers 4/-, all repairs magnetised free. Eliminator Repairs quoted for. 24 Hours Service. Discount for Trade. Clerkenwell 9069. H. G. MASON, 44, EAST ROAD, LONDON, N.1.

Genuine AMPLION Units. Limited number. Over 75 per cent. reduction. Guaranteed. To clear, 2/3 each, carr. paid.—G.B. Pioneer Radio, Conle St., W.C.1.

THE IMPROVED "TONIC"

self-generating trickle-charger kit keeps 2-volt accumulators fully charged. Electric mains and charging stations unnecessary. Ideal for remote places. 7/- each, postage 9d. Particulars, testimonials, with pleasure. WILLIAMS, Netherend, Cradley, Birmingham.



Practical Letters from Readers.

The Editor does not necessarily agree with opinions expressed by his correspondents

A Magnificent Bargain

SIR,—I have duly received the "Encyclopædia," and desire to express my sincere thanks for such a magnificent bargain. Although I have not yet had time to more than glance through it, it is certainly beyond my expectations. I can thoroughly recommend all readers of PRACTICAL WIRELESS to apply for it without delay. One need have no fear now of not being able to trace faults, etc., in sets which cause trouble. Wishing your journal the success it fully deserves and again thanking you.—M. WOODLAND (London, S.W.).

"Interesting and Instructive"

SIR,—I have received your Wireless Encyclopædia, and being a novice at wireless, I am looking forward to spending many pleasant hours with it. I also think PRACTICAL WIRELESS equally interesting and instructive, and wish it every success.—F. G. ASKEW (Hinderwell).

Keeping Earths Moist

SIR,—I am quite in agreement with the remarks of D. F. C. (Gloucester). I would point out that if any reader employing an earth tube device will take the trouble to water it twice a week with two pints of water—to which two tablespoonfuls of salt have been added—he will get all the percolative earth he desires, and reception will be much improved.—REGULAR READER (Greenwich).

"A Wonderful Book"

SIR,—Just a few lines to say how delighted I am with my presentation copy of Wireless Constructor's Encyclopædia. It is a mine of information and is written so clearly and concisely that any amateur can follow it, with little or no knowledge of wireless. It is just the thing I have been waiting for and is a book to be cherished by every wireless fan. Those who have not yet received their copy have certainly a treat in store. Thanking both Mr. F. J. Camm and the Technical Staff of PRACTICAL WIRELESS for compiling and producing such a wonderful book at a price to suit the most humble of pockets.—R. J. FALOO (Wexford).

Congratulations from South America

SIR,—You may be surprised to receive a letter from an enthusiast of your popular radio paper from Buenos Aires. I have been a constant reader of your grand wireless journal since No. 1, and I heartily agree with other readers that this is the best paper on wireless matters yet published.—WALTER H. SMITH (Buenos Aires).

Congratulations from a Reader in India

SIR,—After receiving so many letters of appreciation from your readers in England, my letter will seem rather superfluous. You might almost characterize it as a voice from

the wilderness. All the same, allow me to join the host of your admirers and congratulate you for publishing a really useful and helpful radio journal, which fulfils every want of the amateur. It is undoubtedly the finest of its kind offered to the radio enthusiast. The paper contains a lucid exposition of wireless theory and practice, and is copiously illustrated with neat diagrams. Every page is full of interesting and instructive reading matter. What is more, the articles are totally free from "technical" mysticism, which is the bugbear of every beginner. In short, your paper caters for the novice as well as for the experienced amateur. If its present standard is maintained its success is assured.

In conclusion, I must tender my best wishes and thanks for an excellent achievement.—M. B. ICHAFORIA (Bombay).

Learning the Morse Code

SIR,—With reference to the "Wrinkle" on learning the morse code, published in the February 25th issue, I should like to state that I constructed an apparatus very similar some time ago but it differed in the following respect which I think would

CUT THIS OUT EACH WEEK

DO YOU KNOW?

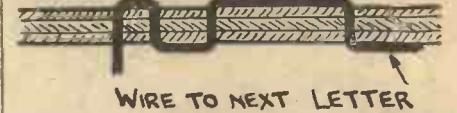
- THAT the B.B.C. are proposing to erect a new long-wave station having four times the power of the present Daventry 5XX.
- THAT Russia proposes to build a station working on approximately the wavelength of London Regional, with a power of 500 kW.
- THAT the highest power at present employed is 120 kW.
- THAT an ordinary Push-pull transformer may be used for the output circuit of Class B valves provided it is of the correct impedance.
- THAT there are some further new types of valves at present being developed.
- THAT one of these is known as the "diode-triode" valve.
- THAT two receivers may be joined in series on the same aerial for the purpose of receiving two stations at once.
- THAT this is the method employed for receiving both sound and vision for television receivers.
- THAT a special meter is necessary to detect distortion in a Q.P.-P. stage.

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 addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

make its construction very much more easy. A small sheet of plywood was obtained and the morse code including numerals marked out on it, allowing the correct spacing, equivalent to one dot, between the dots and dashes. My next step was to drill a small hole at the end of each dash and dot, and then to thread



WIRE TO NEXT LETTER

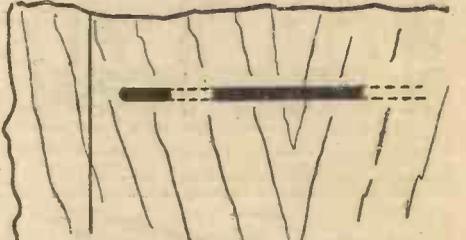


Diagram illustrating Mr. Neil C. Munro's letter.

bare copper wire of about 18 s.w.g. through these holes so that wherever there was a dot or dash the wire was uppermost, while in the spaces the wire was underneath the board. By this method a lot of connections were avoided, but the results obtained were very satisfactory. The accompanying sketch shows the idea.—NEIL C. MUNRO (Welling).

Short-Wave Station—C.T.I.A.A.

SIR,—In the S.W. section of PRACTICAL WIRELESS for March 11th, it is stated that Lisbon (C.T.I.A.A.) works on a wavelength of 31.19 m. on Wednesdays and Fridays, with cuckoo call ad lib. Allow me to correct these statements. Wavelength as announced is 31.25 m. Broadcasts on Tuesdays and Fridays 21.00–23.00 G.M.T. Cuckoo call is given three times only.—J. RIDDLE (Dumbarton).

[C.T.I.A.A., Lisbon, since leaving the 41 metre band has always announced its wavelength as 31.25 m. As, however, its broadcasts were marred by H.B.L. Prangins on 31.27 m.—a separation of 5 kc/s—the wavelength was reduced for some time to 31.19 m. It is now back again on about 31.25 m. The broadcasts are made on Tuesdays and Fridays, but have also from time to time been given on Wednesdays. As regards interval signal, the cuckoo call is transmitted, ad lib., in groups of 3.—ED.]

Takes the Place of Four

SIR,—I feel that I cannot let another week pass without expressing my appreciation of PRACTICAL WIRELESS. I have large numbers of wireless periodicals and magazines, dating back to 1921, and have been having four a week, but after reading the first few numbers of PRACTICAL WIRELESS, I cancelled all the others, finding that PRACTICAL WIRELESS gives me all the information and instructive articles I require. They are full of new interest, and written in such clear and simple language. I think that is why large numbers of keen amateurs are turning to PRACTICAL WIRELESS. I have lived in the Dominions for many years and only recently returned home, but I can assure you that many readers will be waiting for mail days to bring them their copy of PRACTICAL WIRELESS. Wishing PRACTICAL WIRELESS all the success it deserves.—"AMATEUR," (Streatham, S.W.).

(Continued on page 130.)



WITH A PIX IN YOUR AERIAL

Fix a PIX and have a choice of programmes usually enjoyed by only the most expensive sets. Make your set super selective by the simple operation of fixing a Pix between aerial and set. No other alteration necessary. Just undo aerial from set—connect to one end of PIX and join the other end with a piece of wire to aerial terminal on set.

Knife edge tuning is possible on any kind of set with a PIX, and it cuts out powerful stations



that "swamp" your tuning dial. Over 1,500,000 purchasers are our silent and most effective testimonial.

CLIP THE PIX TO YOUR SET

wall or window-ledge, etc. The clip holds the PIX securely, mounted on drilled insulated base with screws 6d.



Get a PIX from your Dealer, or send 2/- Postal Order (with clip, 2/6) direct to:—

THE BRITISH PIX COMPANY, LIMITED,
(Dept. 490), 118/28, SOUTHWARK ST., LONDON, S.E.1.

EASY TERMS PROMPT DELIVERY

Any Amplion, Blue Spot, Baker, Celestion, Epoch, R. & A. Rola, Sonochorde, or W.B. Moving Coil Speaker supplied.

Send 5/- only

and pay the balance by monthly instalments. No references. Entirely private and confidential.

KITS, PARTS, SETS, ELECTRIC CLOCKS ON EASY TERMS.

Write for Catalogue and details to:

TURNADGE & PARTNERS, LTD.
Ludgate House, Fleet Street, London, E.C.4.
Telephone: Central 1903.

Increased VOLUME!

Banish Earth trouble for good!

The latest scientific wireless wonder! Revolutionises Radio reception. Results guaranteed. Powerful permanent action. 61% of earth-wire soldered to container for direct connection to set. Raises your Radio to Super-hot standard. If unobtainable locally, direct from makers, 2/6 post free.

2/6 POST FREE

The WEEDON Ever-Damp EARTH

Weedon Power Link Radio Co. (Desk M), 165, Earsham Grove, London E. (Phone Marlynd 484).



PRACTICAL LETTERS

(Continued from page 129.)

The Goods

SIR,—I am writing to you to acknowledge receipt of Wireless Constructor's Encyclopædia. I must say I am more than delighted with it.

As regards PRACTICAL WIRELESS, it's the goods and the only wireless paper I am taking in now. Maybe I am a bit old fashioned, but I should like to see a plug-in coil set printed in your paper. I have tried several dual-range coils, but have gone back to plug-in every time.

Could your experts give us a way of switching with three plug-in coils, so that medium and long-wave could be received without changing coils? Again thanking you for the volume.—C. BLANDFORD (Smethwick).

Superb Production

SIR,—I have just finished looking through your splendid "Wireless Encyclopædia." It is a superb production all through, and I thank you very much indeed for it.—J. S. Shelly (Manchester).

Handsome Gift

SIR,—I wish to express my thanks for the handsome gift which I received under your generous scheme. It is, as stated, a splendid work, fit to grace any library. Wishing you every success.—J. D. MENZIES (Merton Abbey).

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received first post each Monday morning for publication in the following week's issue.

GLASGOW RADIO CLUB

A lantern lecture entitled "The Radio Valve; What it is and Does," was given at the last meeting of the Glasgow Corporation Transport Department Radio Club on March 10th, by Mr. J. McKenzie Wilkie. The lecturer dealt with the manufacturing and the various functions of the valve. All communications should be addressed to the Hon. Sec., Mr. C. Smith, Glasgow Corporation Transport Department, Possilpark Depot, Glasgow.

THE SOUTHALL RADIO SOCIETY

The easy method by which distant stations transmitting on short waves could be received, surprised a large audience at a recent meeting of the Southall Radio Society on the occasion of the visit of Mr. Hall, who gave a lecture and demonstration on Short-wave Adaptors. In a very interesting lecture on the design of short-wave adaptors Mr. Hall described the necessary features which should be incorporated for a successful circuit and showed various methods by which inherent difficulties in the circuits could be overcome. He also explained the autodyne circuit. Amongst the stations received during the demonstration were Moscow, Drummondville (Canada), Rocky Point, America, and a station in Java, but as the meeting was held in the "White Hart Hotel" on the main Uxbridge Road, considerable interference was experienced from passing buses. The demonstration proved most convincingly the scope for short-wave experimentation.

ILFORD AND DISTRICT RADIO SOCIETY

On February 23rd Messrs. Eugen Forbat and W. K. Alfrod lectured on the latest types of Ostar Ganz High Voltage Valves. After the practical uses had been described, illustrated by a circuit drawn on the blackboard, which showed how the "universal" operation was obtained, a demonstration was given of a 3-valve receiver incorporating these valves. Surprise and great interest was observed among members when a quick change was made from D.C. to A.C. supply, and the receiver went on working just the same, without adjustments being made at all.

On Saturday, March 4th, a large party visited the

Extremely Pleased

SIR,—Thank you very much for your Wireless Encyclopædia to hand last week. It is indeed a book for which constructors have been waiting and wanting, and I for one am extremely pleased with it.—ARTEUR M. HINDES (Great Yarmouth).

Useful Gift Volume

SIR,—May I express my appreciation of your extremely useful and practical gift volume, and also of your excellent weekly, PRACTICAL WIRELESS?—JOHN SLATER (Edinburgh).

The Best Weekly

SIR,—Many thanks for the souvenir Encyclopædia. It is really good, and contains a great deal of practical information, written in a concise manner. It is invaluable to the constructor. PRACTICAL WIRELESS is easily the best weekly for the keen amateur. Radio Ramblings is an excellent feature.—R. W. WINSTONE (Hampstead).

A Proud Possessor

SIR,—Please let me take this early opportunity of thanking you for your pleasant gift of the Wireless Constructor's Encyclopædia, of which I am now the proud possessor. Wishing your wonderful paper PRACTICAL WIRELESS every success for the future.—JAMES GRIERSON (Thornton Heath).

Brentwood Receiving Station, by courtesy of the Imperial and International Communications Ltd., and a really excellent instructive time was enjoyed among the short-wave receivers. After the beam-aerials had been examined at first hand, the visitors were conducted over the station by Mr. Keen, who had rigged a special amplifier to enable everyone to hear signals from EAM Madrid, which were being received, on one of the 14-valve superhets. The latter was explained by stages, including the transformation of the incoming jammed signals to a clear tone at high speed. Lastly, the party were privileged to examine the Standard Frequency Measurer, the working of which was explained in detail, and whose accuracy was to 1 part in 200,000. The Hon. Sec., Mr. C. E. Larsen, 16, Clements Road, Ilford, will be pleased to give details of the society on application.

THE CROYDON RADIO SOCIETY

On a recent Saturday morning members of the Society visited the factory of Celestion, Ltd., Kingston-on-Thames, and saw the various stages of a loud-speaker's construction. What was even more interesting, however, was the laboratory, and here the Chief Engineer, Mr. Tyrell, explained how a speaker's frequency curve was obtained.

Actually, such curves are of more value in judging performance than would be the ear alone, and it was seen how an oscillator gave notes from 30 to 20,000 cycles. The loud-speaker under test was placed in a heavily-damped room and fed by these oscillations, while a microphone picked up the results, and the frequencies could then be measured. Thus was the overall speaker response in the form of a varying curve obtained. Hon. Sec., E. L. Cumbers, Maycourt, Campden Road, South Croydon.

HACKNEY RADIO AND PHYSICAL SOCIETY

At our last meeting, held at the Hackney Electricity Showrooms, we had the pleasure of listening to an exceptionally interesting lecture when Mr. C. Gwinn, B.Sc., gave a talk on "Electric Condensers." Commencing his talk by a discussion on paper dielectric condensers, Mr. Gwinn dealt at length with their composition, method of manufacture, capacity induction and leakage. The lecturer's remarks on the causes of breakdown was most enlightening. After completing his remarks on paper condensers Mr. Gwinn next dealt with wet electrolytic condensers and after explaining the reason for development and their principle of working, went on to suggest many useful methods of utilising this type of condenser in preference to the paper type. Local readers of PRACTICAL WIRELESS are invited to write for particulars of membership of this Society and programme of future talks. A. F. ROGERSON, Hon. Secretary, 19, Sewdley Street, Clapton, E.5.

ANGLO-AMERICAN RADIO SOCIETY (HUDDERSFIELD BRANCH)

A very enjoyable evening was spent at a meeting held on March 21st in the society's club room. An

(Continued on page 132.)

LET OUR TECHNICAL STAFF SOLVE
YOUR PROBLEMS

REPLIES TO



If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to The Editor, PRACTICAL WIRELESS, Geo. Neumes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

QUERIES and ENQUIRIES
by Our Technical Staff

The coupon on this page must be attached to every query.

SPECIAL NOTE

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.

Please note also, that all sketches and drawings which are sent to us, should bear the name and address of the sender.

D.C. MAINS VOLTAGE

"I have a commercial receiver, bought last summer from a firm which has now gone out of business. It had an input adjustment of 200 to 250 volts. I am moving to another district in April, and the supply there is 150 volts D.C. How can I adjust the set so as to use it on the new supply? I do not want to meddle with the inside of the set as it has automatic bias and other refinements which I might upset as I am not technical."—(S. D., Muswell Hill, N.).

There is no need to be worried about the change-over, S.D., as you have a very simple way out of the difficulty. As the mains and receiver are D.C., all that has to be done is to include a good battery of 50 volts in series with the mains input to your receiver. To save trouble we would suggest a good wet H.T. battery of the accumulator type, and when you have found the correct polarity of the mains, join the battery in series in the negative lead to the set. This will augment the mains voltage and bring it to 200 volts.

METALLIZED VALVE

"I have a small portable set which I made some years ago, and in an endeavour to modernize it I fitted a metallized detector valve. I find now that I cannot get the London station on the set, and before this used to come in at 20 degrees. The Midland, which used to be at 50 degrees, now comes in in place of London. What have I altered in fitting the new valve? No wires have been touched, and no other component has been interferred with."—(W. H., Harrow).

You have probably got a tuning coil in the portable, or some other inductance, which is situated close to the valve. Previously this gave the tuning range which you required, but the new valve has the metallized coating connected to L.T. negative, and the presence of this earth potential body close to the coil has altered its value with the result which you have found. If you cannot move the coil away from the valve, we are afraid you must either make a new coil, or use an unmetallized valve as before.

FAULTY GRID CIRCUIT

"My set is a Detector and 2 L.F. with R.C. Unit and Eliminator. Up to now this has worked admirably, but lately has developed a very strange attitude. Having shut off L.T. and H.T. when retiring, next day on switching on again, nothing happens until I take out grid-bias negative plug, and immediately replace in same position, when everything appears to be O.K. until shutting off again, when the same performance has to be repeated. New valves have been tried—new L.T. and G.B. Also rewired, but without success. Aerial and earth appear quite satisfactory."—(D. U. D., Old Trafford.)

The fault points most definitely to a defective grid circuit in the L.F. stage, and therefore you must carefully check the wiring, and test each of the grid components. These will be the resistance in the R.C. stage, and the secondary of the L.F. transformer. If these prove definitely O.K., the valve-holders should be examined for a faulty connection between the terminals and the spring which grips the valve leg.

ALTERNATIVE COMPONENTS

"I notice that you do not give any alternatives to the parts which you specify for the 'Fury Four.' I have a whole lot of parts at home as the result of my experimenting in the past, and I should like to know whether it is absolutely essential that I should adhere to those you name. It does not seem to me that there would be any difference in using some of those parts which I have got, and I do not want to buy new ones just to try out the set. Can you advise me on this point?"—(R. J., Peckham.)

There is a reason for not giving alternatives. To the average listener there does not appear to be any difference in, for instance, an H.F. choke made by one firm, and a choke made by another firm. When designing a circuit, however, it is necessary to take the circuit as a whole, and then to decide on the values of various parts, in addition to other characteristics. For instance, two different makes of H.F. choke are employed in the two H.F. stages. The reason for this is as follows. The decoupling circuits consist of identical values of resistances and condensers, and if the two chokes were also identical in characteristics the result would be two similar oscillatory circuits, which would no doubt give rise to instability. The

in your district, a decrease of 1 to 2 milliamperes when tuned to London. If reaction is then employed the drop will be even greater, as the stronger the signal, the lower the current with this form of detector. The current from the L.F. stages, provided they are properly biased, will remain the same, no matter how loud (up to the overloading point, of course). Therefore, if you use reaction, you will reduce the current taken by your set. With Q.P.P., of course, this is not true, but you are not using that method of L.F. amplification, and therefore your friend was misinforming you.

ULTRA-EFFICIENCY

"I am making up a set to get really perfect results, and the following point occurs to me. The losses introduced by the valve holder and the base of the valve must be fairly large, if measured. Would I gain anything, therefore, by removing the base and soldering my connections direct to the wires of the inside of the valve? I am anxious to make everything absolutely tip-top in my set, and this point stumps me."—(W. G., Edgware.)

For short-wave work this method of connecting the detector can sometimes be advantageously employed. For normal broadcast-band reception, however, there is nothing to be gained. The losses in the other parts of the circuit will offset any gain introduced by decapping the valve, and provided the valveholder is of a good make, the losses will not worry you on the normal wavelengths. For short waves, of course, every little bit of stray capacity will be important, and a decapped valve will probably enable you to obtain better results.

TELEVISION LAMP

"I have made up the Televisor described in Twenty-five Tested Wireless Circuits, and have used an ordinary Beehive Neon lamp for the output arrangement. When I first connected it up, nothing happened. I then tried different methods of connection, and find that with a certain voltage the spiral arrangement glows, whilst with another connection the little disc glows. I can't, however, make them both glow together. Is there anything wrong with the lamp, and how should it work, please?"—(T. P. L., Tonbridge.)

With a D.C. current, only one element of the Neon lamp will glow. With an A.C. supply, however, the elements glow alternately. For television purposes, the lamp should be joined in the anode circuit so that the largest element glows, and in the beehive type of lamp the spiral should be the one to work on. In the correct type of Neon lamp, the two elements are divided up so that the correct one is a large, flat plate, whilst the other is a small rod. In the advertisement type of letter lamp, the letter should glow. You must have sufficient anode current, or other method of obtaining a current, to cause the element to glow at a fairly brilliant value, before signals are applied to it. If the anode current is insufficient to obtain the glow, then a separate source of supply must be used for the purpose, and the signal currents fed to it via a condenser.

SUPERHETERODYNE

"I have tried the 'Fury Four,' and all other sets, but have found that owing to my unfortunate position, I cannot get the stations such as Toulouse which work right on top of the London station. After hearing a friend's superheterodyne receiver I have decided that this is the only type of set which will do for me. Are you in agreement? If so, can you publish, at any early date, a constructional article on such a receiver? I guess it will be a bit hard for the average inexperienced amateur to make up a real super, but there must be thousands who would be satisfied with no other circuit. I should be glad to have your views."—(F. H., Potters Bar.)

In response to many requests for such a set we are giving our readers the Supersonic Six, preliminary details of which were announced in our pages last week.

DATA SHEET No. 29

Cut this out each week and paste it in a Notebook.

WEIGHTS OF MATERIALS

MATERIAL	lbs. per cub. ft.	Specific Gravity
Aluminium	160	2.56
Bismuth	615	9.85
Brass	505	8.10
Bronze	544	8.73
Copper	558	8.94
Cork	10.15	.16
Ebonite	71.7	1.15
Glass	168	2.7
Gold	1206	19.32
Lead	708.65	11.35
Mercury	846.51	13.56
Oak	50	.80
Paper	43	.7
Platinum	1342	21.5
Silver	655	10.5
Steel	489.6	7.8
Tin	454.6	7.3
Tungsten	1193	19.4
Zinc	449	7.2

choice was made therefore so that the characteristics are totally dissimilar. Other parts of the circuit require similar consideration, and unless you are thoroughly well-informed on technical matters it will not be advisable to change the parts indiscriminately.

EFFECT OF REACTION

"I have a simple little set employing a detector and L.F. stages. I am only poor, and therefore buy cheap batteries, etc., and while I was talking to a friend the other day he upset me rather by saying that when I used reaction I was using up the juice, and that the H.T. would run out quicker. Is this so? I like to hear it loud, but he says that the louder it is the more the battery goes. Can you please tell me if this is right?"—(R. S. D., Bethnal Green.)

Your friend was misleading you, or he did not know much about wireless matters. It is, of course, a fairly common fallacy that distant stations take more current. Your receiver employs only a normal detector and L.F. stages, and therefore the total current is probably about 8 milliamperes. When you receive the London stations you will find, if you were to put a meter in the anode circuit of the detector valve, that there would be a slight drop in the total anode current when the station was tuned in without reaction. As an instance, a normal leaky grid detector might show,

FREE ADVICE BUREAU
COUPON

This coupon is available until April 15th, 1933, and must be attached to all letters containing queries.

PRACTICAL WIRELESS 8/4/33.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, Geo. Neufnes, Ltd., 8/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed. No other correspondence whatsoever should be enclosed with applications for catalogues.

"CLIX" PLUGS AND SOCKETS

A LARGE percentage of reception troubles are traceable to faulty connections in a set, often through the use of inferior plugs and sockets or similar fittings. By the use of "Clix" fittings this sort of trouble is avoided, and the latest list issued by Lectro Linx, Ltd., gives particulars of several "Clix" terminals, plugs, sockets, and connectors which are well known for ensuring good contact. A recent addition to the "Clix" range is a neat chassis-mounting valveholder fitted with resilient helically-slotted sockets with terminal ends. Another efficient "Clix" fitting is the "Master" plug with specially made prongs which are adaptable to different sizes of sockets.

EDISWAN BATTERIES

A COMPREHENSIVE range of H.T. batteries, accumulators, torches and refill batteries is given in the latest booklet issued by Edison Swan Electric Company, Ltd. Included in the range are standard and double capacity H.T. blocks and grid-bias batteries. Batteries for hand lamps, bell and electric clock batteries, and 2-volt accumulators of various capacities (in glass cells) are included in this useful list, a copy of which can be obtained on application to the above firm at 123, Queen Victoria Street, London, E.C.4.

"TONIC" TRICKLE-CHARGER KIT

A PRACTICAL solution to the charging problem is to be found in "The Tonic" Self-generating Trickle-charger kit which is marketed by the patentee, T. R. P. Williams, Netherend, Cradley, Birmingham. The outfit consists of the necessary copper and zinc plates for forming a battery of improved Daniell cells suitable for charging a 2-volt accumulator at home, without any trouble. This simple trickle-charger should be a boon to anyone using a small capacity accumulator and especially to those living in remote country districts. The price of the outfit, with cardboard covers, is 7s., or, with Bakelite covers, 8s. 6d. Postage on either type is 9d. Leaflets giving full particulars can be obtained post free from the above address.

"GRIPSO" PLUGS AND SOCKETS

WE have received from The Gripso Company, a booklet giving a useful range of "Gripso" accessories, including shrouded plugs and sockets with coloured sleeves and indicating names; insulating bushes; tag ends; lead-coated spade-ends; indoor aerial hook insulators; earthing clips; and various types of push-pull indicating switches. The address is 32, Victoria Street, London, S.W.1.

THE SIX-SIXTY "SUPER FIVE"

ONE of the latest A. C. Mains Receivers to be placed on the market is the Six-Sixty "Super Five," a high-class model embodying many outstanding features. Although listed at the moderate price of 14 guineas, the receiver has two screened-grid stages and power pentode output giving maximum selectivity and ample volume without distortion. It has single tuning control, the dial being calibrated in wavelengths. The set and speaker, the Six-Sixty Ferrodynamic type, are housed in an attractive walnut cabinet. Further particulars are given in a new folder, a copy of which can be obtained on application to the Six-Sixty Radio Coy., Ltd., 17-18, Rathbone Place, Oxford Street, London, W.1.

FIX VALVES

A NEW folder we have just received gives particulars of Pix valves, together with their characteristics and curves. These valves, which are remarkably low in price, have a triple-coated Neodymium filament which produces a strong controllable emission. Printed on the folder is a useful comparison table of Pix valves, with various other makes. A copy of the folder can be obtained from British Pix Co., Ltd., 118, Southwark Street, London, S.E.1, enclosing a stamp for postage.

BELLING-LEE RADIO CONNECTIONS

A SMALL booklet is to hand from Belling-Lee, Ltd., giving particulars of their well-known terminals and connectors, including indicating terminals with non-rotating name; spade terminals with spring prongs; terminal mounts; wander plugs; shrouded plugs and sockets; mains input connectors; and fuses and battery cords. The terminal mount, listed at 8d., is now reduced to 6d. The address is Cambridge Arterial Road, Enfield, Middlesex.

ERIE RESISTORS

ERIE resistors and grid leaks are made of solid carbon and a rare earth composition having the property of carrying a high load without any tendency towards open circuiting. The wire leads are soldered to copper which is forced into the ends of the resistor under intense heat. It is claimed for these resistors that they are absolutely silent and stable in use. A simple colour code is used to designate resistance values, and in addition, the resistance value is indicated on a small label. Particulars of the full range of these components are given in a folder issued by The Radio Resistor Coy., 1, Golden Square, London, W.1.

ALL ABOUT CLASS B

A BOOKLET dealing with both the Q.P.P. and Class B forms of Push-push Amplification has been prepared by the Multitone Electric Company. Both systems are fully explained, and every point likely to crop up in fitting and using Push-push is dealt with in a thoroughly practical manner. In addition, the best methods of converting existing sets are described and illustrated by means of clear and simple diagrams. The booklet is obtainable free of charge from the Multitone Electric Company, 95-8, White Lion Street, London, N.1.

CLUBS AND SOCIETIES

(Continued from page 130.)

excellent programme was given, including a film of the recent visit of members of the society to Moorside Edge Station. We wish to appeal to all amateur transmitters in Huddersfield and district to join our society, as we are arranging some special experiments this summer which should be of great interest to them.

Will interested readers please write to the District-Organiser, Mr. L. Goucher, 10, West Grove Avenue, Dalton, Huddersfield, for full particulars.

LEICESTER EXPERIMENTAL SHORT-WAVE SOCIETY

The second meeting of this Society was held recently, and a competition was announced for the listener members on the 20 metre amateur band. Leicester stations 6SVH, 6GWV and 6GJQ have kindly consented to radiate slow Morse at certain times for the benefit of members who will shortly be applying for transmitting licences. This society was founded to bring together the short-wave enthusiasts, and to help generally with difficulties that most amateurs encounter. Particulars would be willingly forwarded on request. Hon. Sec., S. H. Whitley, 69, Wilberforce Road, Leicester.

Broadcast Query Corner

UNDER the above title, with the assistance of a recognized authority on foreign broadcasting matters and a regular contributor to wireless publications both at home and abroad, we have inaugurated a special Identification Service, which has proved of great

assistance to our readers. When tuning in well-known stations it happens frequently that listeners pick up wireless transmissions of which they fail to recognize the origin. It is to solve these little problems that the Broadcast Query Service has been organized.

Replies to Broadcast Queries

ADION (Glasgow): PAONC, cannot trace; advise you to write to N.V.I.R. Post Box 400 Rotterdam (Holland); PAOZK, W. Keeman, Canan Van Necklaan 227, Rijswijk (Holland); G6IA, T. H. Colehourr ("Ardochalligan" Selbourne Drive, Douglas (I. of Man)). F. G. DAVIES (Rhonda): Cairo (Egypt) working with Paris; on either 29.84 m. (SUV) or 31.17 m. (SUY)—via Abu Zabal. I. W. LOVELOCK (Acton): Cannot trace either call; would advise you to write to Radio Society of Great Britain, 53, Victoria St., S.W.1. HAM (East Finchley): (1) China—XGA to XUZ inclusive; (2) (a) F8 followed by 2 letters—France and Colonies (Amateurs) (b) F8M—Morocco (Amateurs); (c) RYA-RYZ, Lithuania; (d) YL not LY (Latvia). BRs 1038 (Herne Bay): W2XAF, Scheenctady (N.Y.) relays WGY on 31.48 m. Go BETTER (Kensington): Harmonic of Moscow T.U. on 25 metres.

(Continued from page 97.)

condenser between the input terminal which is joined to H.T.+ . You will find that the strength of signal which can be handled by the Class B valve is very great, and the result is that a really tremendous output is obtained. There is no grid bias to be juggled with, as in the case of Quiescent Push-pull, and no adjustments whatsoever have to be made in the output stage. The 215P. valve handles a really powerful signal, so that with the majority of receivers the bugbear of over-loading is completely removed. Naturally this is not an invitation to force reaction to its very limits as the result will be distortion, and in view of the high quality of the Class B valve it is obviously undesirable to spoil this by trying to get Johannesburg or Juan-les-Pins or some similar weak or long-distance station at full room strength with the very minimum of H.T. Provided you bear this point in mind, you will find that this unit, in conjunction with the average receiver, will give you results which have hitherto only been obtained with mains receivers employing super power valves in the output stage, and, you should, therefore, use the very best loud-speaker you can obtain.

MAINS TRANSFORMERS

Universal input, 110 to 240. Output, 300 x 300 at 60 M.A. 4 v. 4 amps. C.T. 4 v. 2 amps. C.T. Guaranteed 12 months. Price 12/6. EXCELSIOR RADIO. 9, Carthew Villas, Hammersmith, W.6.

REPAIRS

one fixed price 3/-

Any make of Loudspeaker
L.F. Transformer, or Pick-up
IN 24 HOURS
1 YEAR'S WRITTEN
GUARANTEE

Terms to trade.
Post extra. Quotations for
Inductors,
Moving Coils
and Mains
Transformers

TRANSFORMER REPAIR CO.

208 High St., Tooting, London, S.W.17

ADVERTISEMENT INDEX

	Page		Page
Amplion (1932), Ltd.	105	Lissen, Ltd.	90
Bennett College, Ltd.	89	London Electric Wire Co. & Smiths, Ltd.	116
Benjamin Electric, Ltd.	<i>Inside Front Cover</i>	London Radio Supply Co.	127
British Pix Co., Ltd.	130	Mains Power Radio	128
British Rola Co.	89	Mason, E.C.	127
Bulgin, A. F., & Co.	124	Multitone Electric Co., Ltd.	119
Columbia Graphophone Co., Ltd.	<i>Back Cover</i>	Newnes' "Home Photographer"	<i>Inside Back Cover</i>
Cossor, A. C., Ltd.	101	Newnes' "Modern Motor Repair"	<i>Inside Back Cover</i>
Direct Radio, Ltd.	<i>Front Strip</i>	Newnes' "Wide World Magazine"	<i>Inside Front Cover</i>
Dubilier Condenser Co., Ltd.	123	Newnes' "New Comprehensive Dictionary"	89
Edison Swan Electric Co., Ltd.	105	Ostar-Ganz (Eugen Forbat)	128
Excelsior Radio	132	Picketts	127
G. B. Pioneer Radio	127	Riverside Mfg. Co.	128
Hayberd, F. C., & Co.	128	Smith, S. & Sons (Motor Accessories), Ltd.	<i>Inside Front Cover</i>
High Vacuum Valve Co., Ltd.	124	Sound Sales, Ltd.	122
Lectro Linx, Ltd.	124	Telsen Electric Co., Ltd.	109
		The 362 Radio Valve Co., Ltd.	<i>105 and Inside Front Cover</i>
		Transformer Repair Co.	132
		Turnadge & Partners, Ltd.	130
		Wates Radio, Ltd.	128
		Watmel Wireless Co., Ltd.	126
		Weedon Power-Link Co.	130
		Westinghouse Brake & Saxby Signal Co., Ltd.	116
		Whiteley Electrical Radio Co., Ltd.	119
		Williams, T.	127
		Wright & Weaire, Ltd.	115

Important TO ALL MOTORISTS AND GARAGE MEN

A Great Success

THE NEW MAGAZINE FOR EVERY AMATEUR PHOTOGRAPHER



Part I
Ready
April
7TH

Free
**ENGINE
TIMING
CHART**

A FINE WORK FOR THE PRACTICAL MAN

In a convenient compass will be found all the practical points and special repair methods applicable to the leading makes of cars.

General methods of overhauling a car from stem to stern.

Detailed notes on decarbonising, valve grinding, electrical trouble tracing.

How to deal with engine stoppages and erratic running.

The maintenance of brakes, steering gear, electrical equipment and body-work.

And under each of these headings special notes dealing with the particular car in which you are interested.

**ORDER PART I TO-DAY
FROM YOUR NEWSAGENT**

*Deals with the over-
haul and repair of*

Austin

Morris

Triumph

Singer

Rover

Standard

Riley

Ford

Hillman

M.G.

*and other popular
cars.*



Contents for April Now on Sale

THE PHOTOGRAVURE SUPPLEMENT contains beautiful photographs, reproduced in tones actually obtainable on gaslight or bromide papers by any amateur using one or other of the simple toners now available.

SECRETS OF EXPOSURE. You will get much more amusement and interest from your hobby if you understand and appreciate the qualities and limitations of the "tools" of photography. An article on "Film Speeds—What They Are Worth and What They Mean" appears in this issue.

HOW TO MAKE A GASLIGHT PRINT. A simple lesson in home photography, explained by means of photographs! By making your prints at home you will get more satisfaction out of your hobby and have more money to spend on film.

YOUNG PHOTOGRAPHERS SECTION. In addition to valuable tips of all kinds there is a simple competition for junior readers;—two cameras are offered as prizes.

OPEN COMPETITIONS. A competition appears every month open to all readers—cash prizes for pictures illustrating a set subject are given.

FORTY PAGES PACKED WITH INTEREST

The HOME PHOTOGRAPHER and SNAPSHOTS

6d

Obtainable at all Newsagents, Bookstalls and Dealers, or post free 7½d. (Subscription rates: Inland and Abroad 7s. 6d. per annum; Canada, 7s. per annum) from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

MODERN MOTOR REPAIR 1/-

Obtainable from all Newsagents and Bookstalls, or post free 1s. 3d. from **GEORGE NEWNES, LTD.**, 8-11, Southampton St., Strand, London, W.C.2.

Geo. Newnes, Ltd.

Geo. Newnes, Ltd.

Get Original Tone

Immediately you hear the performance of this four valve mains model, you'll realise the amazing difference "tone" can make in radio entertainment. You will be listening to Columbia's latest development—ORIGINAL Tone—the perfect result of 30 years' continuous research in sound reproduction. Presented in fine walnut this set brings you the finest possible standards of efficiency in every detail. Test its superiority in *the actual reception conditions of your own home*. The coupon will bring you complete particulars.

USE THE COLUMBIA DEALER SERVICE
*Expert advice on local radio conditions
and service after sales.*

All - Electric Four
16 gns. cash (A.C. or D.C.)
or delivered on first payment of £1.13s



Columbia

ALL-ELECTRIC FOUR

CUT OUT AND POST TO-DAY!

Please send me fullest particulars of Columbia Model 355 and other Columbia instruments from £4.7.6 to 90 gns. (*write in block capitals*)

NAME.....

ADDRESS.....

Prac. W. 8/4/33.

Columbia Graphophone Co., Ltd., 98 Clerkenwell Rd., London, E.C.1



P. W. Gift Stamp No. 28

Printed by NEWNES & PEARSON PRINTING CO., LTD., Exmoor Street, Ladbroke Grove, W.10, and published by GEORGE NEWNES, LTD., 9-11, Southampton Street, Strand, W.C.2. Sole Agents for Australia and New Zealand: GORDON & GORE LTD., South Africa: CENTRAL NEWS AGENCY, LTD. *Practical Wireless* can be sent to any part of the world, post free, for 17/4 per annum; six months, 8/8. Registered at the General Post Office for Transmission by Canadian Magazine Post.

FREE INSIDE! DATA SHEET No. 17. "HANDY TABLES"

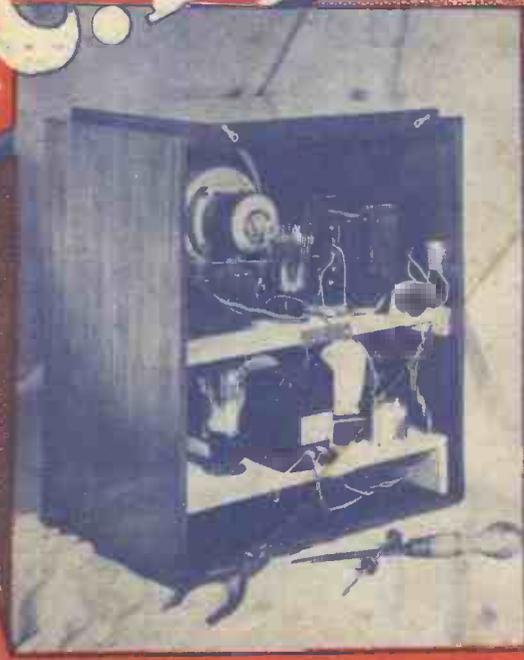
Practical Wireless

3^d

Published every Wednesday by
GEORGE NEWNES LTD.
Vol. 2. — No. 30.
APRIL 15th, 1933.
Registered at The G.P.O. as a Newspaper

*Announcing
The Self-Contained*

A.C. TWIN

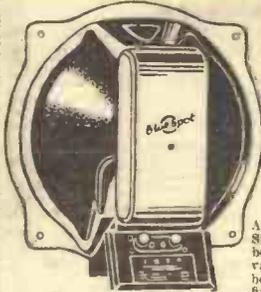


HEAYBERD MAINS TRANSFORMER

AGAIN—EXCLUSIVELY SPECIFIED! For the 'A.C. Twin'
Send for 36 page Handbook to: 10, FINSBURY ST., LONDON, E.C.2.

Write name in margin and send, with 3d. stamps—NOW!

SEND ONLY 2/6 FOR ANY OF THE NEWEST "BLUE SPOT" P.M. MOVING COIL LOUDSPEAKERS



FOR 7 DAYS' TRIAL



A new range of "Blue Spot" Speakers has just been introduced, of advanced design and embodying all the latest refinements. All these new Permanent Magnet Moving-Coil Speakers incorporate Output Transformers with tapings for matching with Power Pentode and Push-Pull Output. They represent the **FINEST VALUE obtainable**, therefore take advantage of the **7 DAYS' TRIAL** offer and easy monthly terms of E. J. HERAUD, Ltd.

"BLUE SPOT" MODEL 45 P.M., unquestionably a Speaker in a class of its own. Send only 2/6 for 7 days' trial; if satisfied pay further 5/- at once, then six monthly payments of 7/6. (Cash in 7 days, 45/-.) Mahogany Cabinet Model 62 P.M., incorporating the above chassis, 2/6 deposit, 5/- after 7 days, then nine monthly payments of 7/6. (Cash in 7 months terms of E. J. HERAUD, Ltd.)

"BLUE SPOT" MODEL 22 P.M., a brilliant Moving-Coil Speaker at a very moderate price. Send only 2/6 for 7 days' trial; if satisfied, pay further 5/- at once, then six monthly payments of 5/-. (Cash in 7 days, 32/6.) Oak Cabinet Model 22 P.M., incorporating the above chassis, 2/6 deposit, 5/- after 7 days, then six monthly payments of 7/6. (Cash in 7 days, 45/-.) For further details of these Speakers see the "Blue Spot" advertisement on Back Cover. We can supply any "Blue Spot" product on easy monthly terms. Write us.

Detect faults with the British-made **WATES UNIVERSAL METER**, the only popular-priced instrument testing resistances as well as batteries, valves, circuit, and all components; 4 readings on one dial.



SEND ONLY 1/6 for 7 days' trial. If satisfied, complete purchase by 5 monthly payments of 2/6 (cash 12/6).

E. J. HERAUD, Ltd., Dept. P20, NUMBER ONE, EDMONTON, LONDON, N.18.

Branches: 78-82, Fore St., Edmonton; 77, West Green Rd., Tottenham; 34, St. James St., Walthamstow; and 139, Hertford Rd., Enfield Wash.

WHY Buy a new set? ETA VALVES make your old set like new!

These are not times to disregard economies. Other valves may cost more than ETA valves but they give you no more for your money. **FREE:** Ask for the ETA "Comparative Table" No. 12c, showing which ETA valves to use in place of your old ones. Technical advice gladly given. Write to:

THE ELECTRICAL TRADING ASSOCIATION, Aldwych House, Aldwych, W.C.2.

Scottish Agents: **RADIOVISION LTD., 233, St. Vincent Street, Glasgow, C.2.**

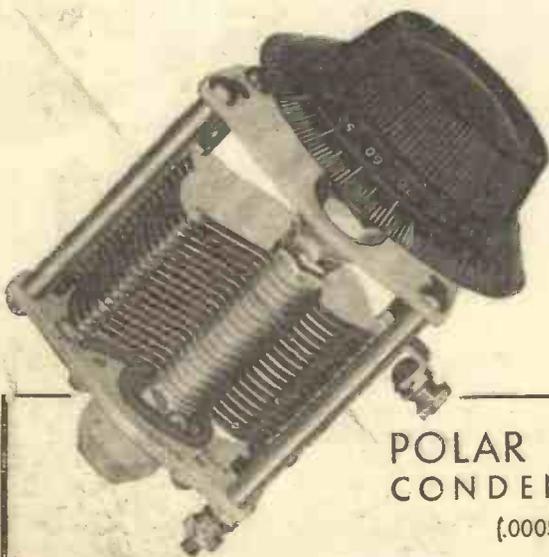


AMERICAN SETS
There are **ETA** valves for all types of American Sets.

ETA
THE INTERNATIONAL VALVE

As low in price as a really good valve can be

—tested—proved and SPECIFIED for the "SUPERSONIC SIX"



POLAR No. 2 CONDENSERS
(.0005)

6/6

(TWO REQUIRED)

The combination of Fast and Slow motion in this condenser gives quick and accurate tuning. The rigid construction and bonded rotor vanes ensure long service with permanent accuracy. Smooth, easy control is secured by the Polar ball-bearing action.

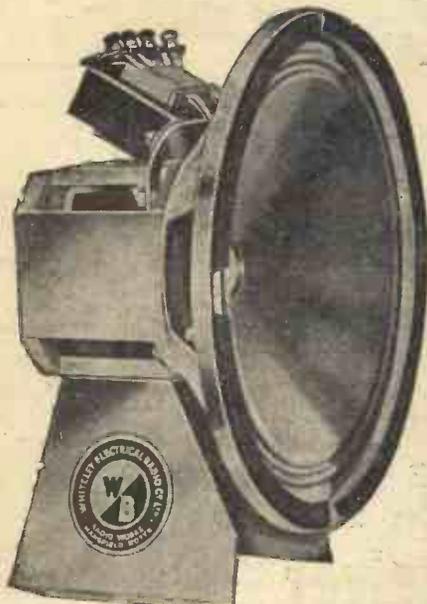
Because the designer of this most modern receiver demanded accuracy and because he wanted to be sure of absolute reliability—he insisted on POLAR—for those reasons alone you should follow his choice. Remember POLAR reputation is your safeguard.

POLAR
CONDENSERS

WINGROVE & ROGERS, LTD., 188-9, STRAND, LONDON, W.C.2. — POLAR WORKS, OLD SWAN, LIVERPOOL

SPECIFIED for the 'Supersonic Six'

Again the experts' sole choice—the famous W.B. "Mansfield Senior" (type PM 4)



Makes an AMAZING difference to ANY set. Write for 1933 folder



MANSFIELD
Permanent Magnet
MOVING-COIL
SPEAKER
42/- including
Transformer.
Junior model 27/6
including transformer

WHITELEY ELECTRICAL RADIO CO., LTD.
Dept. E., Radio Works, Mansfield, Notts.

THE NEW AND REVOLUTIONARY CLASS B AMPLIFICATION VALVE



The radio journals describe the CLASS B Valve as "a revolutionary valve development." MAINS VOLUME FROM BATTERY SETS at SMALL CURRENT DRAIN from the H.T. Battery obtained by using the marvellous BRITISH 362 "CLASS B" Valve. Send for one now on our Money-Back Guarantee. If you also require a "driver" valve we recommend the BRITISH 362 "P.2" price 4s.

Cash with Order
IMMEDIATE DELIVERY POST FREE



with full instructions
THE 362 RADIO VALVE CO., LTD. (Dept. W4),
415, MARE STREET, HACKNEY, LONDON, E.8

Other Types: B.C., H.F. or L.F., 3/8, Super-Power, 4/8, Sord.-Grid or Var.-Mu., 7/8, Pde, 10/-. In 2, 4 or 6v. Metallised 3d. extra. All post free. Fully Guaranteed. See our Advt. on page 161. Cheques and P.O.'s must be crossed and made payable to



Read this
QUALITY
Produces
EFFICIENCY

TESTED BEFORE DESPATCH

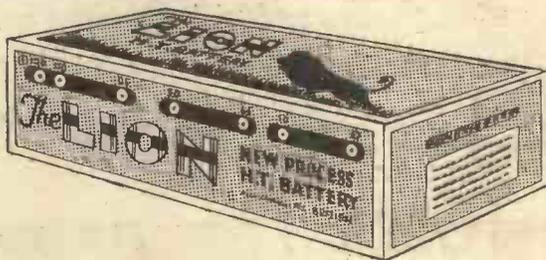
The original BECOL ebonite low loss formers are thoroughly reliable. They are used in all parts of the world. Look for the BECOL trade mark. Ask your dealer. If unable to supply, write direct. SEND NOW, enclosing 6d. (post free) for up-to-date handbook of tuning coils for DUAL RANGE, BAND-PASS, and SUPER-HET.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

RODS, SHEET, TUBES, PANELS

The BRITISH EBONITE Co., Ltd.,
Hanwell, London, W.7.

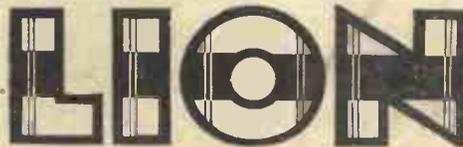
"... charging an army ... while all the World wondered."

BALACLAVA, June 18th, 1854



The Lion Patent H.T. Battery does not charge an army—but it charges your set with lasting energy—while all the world wonders how such a superlative Battery can be produced at prices which show such a saving.

The Lion Patent H.T. Battery has the lowest internal resistance of any battery. Fit one to-day and notice the all-round improvement in your set's performance.



Patent H.T. BATTERY

BRITISH MADE

Sold under Limited Licence

LOW Prices!

60 Volt H.T.	4/6
100 Volt H.T.	7/-
120 Volt H.T.	9/-
9 v. G.B.	10d.
4 1/2 v. Pocket Lamp Battery	4 1/2d.

Also all types of torch and dry-valve batteries.

VINCES DRY BATTERIES LTD., LION WORKS,
GARFORD STREET, LONDON, E.14. 'Phone EAST 1902.



Purveyors of
Electric Lamps
By Appointment

EDISWAN



Manufacturers
and Purveyors
of Electric Lamps
By Appointment

The name that means 'EXCELLENCE'

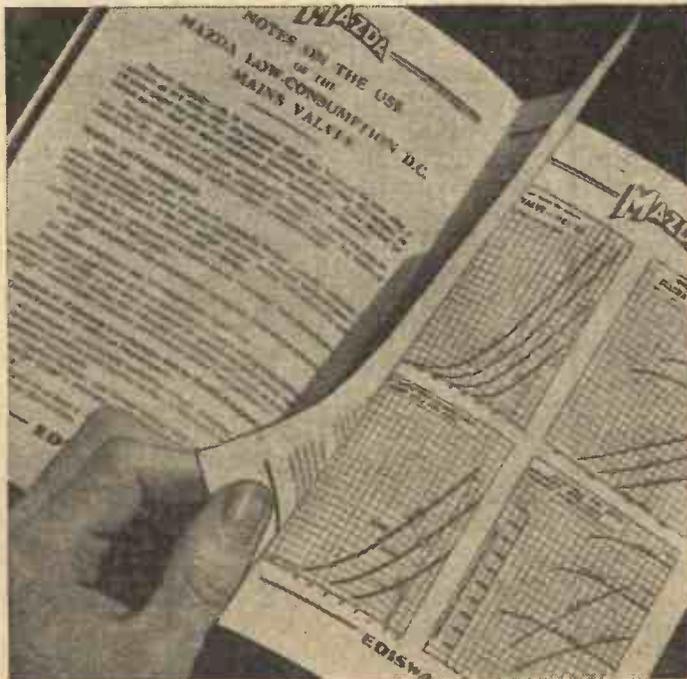
DO YOU KNOW

There are over a dozen ways of doing so, most of them unfamiliar to the man who hasn't had access to manufacturers' reports. This question of D.C. interference forms a striking instance of the usefulness of "The Book of the Mazda Valve." Instead of "working in the dark" until long and useless processes of trial and error are exhausted, you have all the facts you need, right from the start. You get the results you want—first time and all the time.

how to
reduce line
interference
in a
D.C. Mains ?
receiver

THIS BOOK TELLS YOU HOW

"The Book of the Mazda Valve," No. R.782, is a mine of useful information about valves in general and Mazda valves in particular. It contains facts and figures, circuit diagrams, component values, characteristic curves, in fact, all the valve user wants to know about valves. Send for your **FREE** copy to-day—or ask your dealer for one.



MAZDA

THE
BRITISH
VALVES



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

Mazda Radio Valves are manufactured in Great Britain for The British Thomson-Houston Co. Ltd., London and Rugby.

RECOMMENDED BY ALL GOOD RADIO DEALERS



EDITOR:
 Vol. II, No. 30 || F. J. CAMM || April 15th, 1933
 Technical Staff:
 H. J. Barton Chapple, Wh. Sch., B.Sc., (Hons.), A.M.I.E.E.
 W. J. Délaney, Frank Preston, F.R.A., W. B. Richardson.

ROUND *the* WORLD of WIRELESS

Ventriloquial Announcements

WHEN listening to Radio Barcelona (E.A.I.), you may have heard, at intervals, what appeared to be a dialogue between two men. This cross-talk is mimicked by the announcer, José Trorés, a skilled ventriloquist, who in these announcements incorporates a number of publicity "puffs." They are a regular and popular feature of the Barcelona studio.

Three Interval Signals

BEROMÜNSTER (Switzerland) on 459.4m. is a station heard by most radio fans. It takes its programmes from Berne, Zurich and Basle. In each instance the city which provides the entertainment is mentioned by the announcer, and each individual studio possesses its own interval signal—a musical-box melody. Try to memorize these tunes, as if you miss the announcements they will assist you in identifying the origin of the broadcast.

B.B.C. Statistics

OF the ten shillings paid by listeners to the Postmaster-General, during 1932, the B.B.C. as its share received 4s. 7d. In all the net annual revenue, totalling £1,628,738 showed an increase of £203,388, of which extra licences represented £127,421. In 1932-33, the B.B.C. made a return grant of £150,000 to the Exchequer. During 1932, £663,424 was spent on wireless entertainments, or £5,489 more than during the previous year. Considerable credit is due to the engineering side of the concern in view of the fact that of 59,547 broadcasting hours from the B.B.C. transmitters the total time lost through technical hitches was only 17 hours and 46 minutes. Taking the share of the licence money allotted to the B.B.C. into consideration, a rough calculation shows that the cost of the home entertainments, to the average broadcast listener, is about one penny per week! Proving without doubt that wireless is the cheapest form of entertainment.

A Sequel to the Madrid Conference

THE delegates of the postal and telegraphic administrations of all States interested in broadcasting will meet at Lucerne (Switzerland) on Monday, May 15th, to formulate a new plan of

European wavelengths. Their decisions will be based on the proposals discussed and passed at the last Madrid Conference.

America's Sponsored Broadcasts

THE National Broadcasting Company and the Columbia System have come to an agreement in respect to certain characteristics of the publicity entertainments transmitted over their individual networks. The prices of commodities advertised in these programmes are permissible so long as they are only mentioned

They emanate from Istanbul (Constantinople) on 1,200 metres. The announcer (Tanburi Djemie Bey) gives out the call in both Turkish and French, namely, *Allo, Allo, boucari Istanbul telsiz telefonou (Ici Radio Istanbul)*. You may sometimes identify the transmission by its repeated strokes on a gong, at intervals between items. Oriental music is broadcast in the early evening hours, a Western European concert and news bulletin following later.

Russian Press News Broadcasters

FOR the supply of official news bulletins to the provincial newspapers, the Soviet authorities, until the short-wave wireless stations are completed, are making nightly use of the high-power broadcasters at Moscow and Leningrad. At the conclusion of the day's programmes, you may hear these stations calling distant cities such as Samara, Sverdlovsk, Kiev, Samarkand, Vladikav Kaz and so on. There then follows a slow dictation of official news paragraphs, the word *Stotka* (comma) appearing at frequent intervals. Russian newspapers are not allowed to print any news other than that supplied through Government sources!

German Political Broadcasts

UP to the present, considerable use has been made in Germany of gramophone records for the rebroadcast during more convenient hours of topical events, and political speeches were re-transmitted to listeners in the same manner. With the advent of the Hitler administration, however, programmes are now interrupted for the inclusion, at any moment, of Government pronouncements. As all transmitters can be linked up with Berlin, a simultaneous broadcast is carried out at a moment's notice. The compiling of local programmes has thus been made increasingly difficult for the organisers as the day's entertainments have to be re-arranged at the "eleventh hour" to fit in with State requirements.

IN THIS ISSUE:

**BUILDING THE BETA
 UNIVERSAL FOUR
 THE A.C. TWIN
 THE SUPERSONIC SIX
 FRAME AERIALS
 A HANDYMAN'S TESTER
 A TWO-POINT AERIAL
 SYSTEM
 A SIMPLE REMOTE
 CONTROL**

once in a fifteen-minute broadcast. It has also been agreed that in such transmissions the representatives of the sponsoring firms will not make any comparison of their prices with competitive concerns when boosting their wares over the microphone. Every effort is to be made to make these entertainments of a lesser commercialized character in order to render them more acceptable to the listening public.

The Call of the Turk

ON some evenings, providing conditions are favourable, a few degrees above your condenser readings for Radio Luxembourg, but when this station is resting, you may hear strains of Oriental music.

NEXT WEEK!
**SOLVING THE PORTABLE
 PROBLEM.**

ROUND the WORLD of WIRELESS (Continued)

Testing Valves

WHEN testing a receiver in which the valves are suspected, few constructors are sufficiently fortunate in having a complete set of spare valves to try, but this disadvantage can often be overcome, as some types of valves will work temporarily in any position. An S.G. valve will make a perfectly good detector when plugged into the valve-holder in the ordinary way, the top terminal being ignored. In the same way an S.G. valve will make a reasonably good power-valve, its impedance being round about 5,000 ohms when used in this manner.

Mains Interference

INTERFERENCE with the volume of a receiver by the electric wiring in a house is becoming increasingly common. When it is found that the volume of a receiver is changed because somebody has switched on or off a light, the trouble may usually be obviated by earthing the lead covering or iron piping system in a number of places. This phenomenon is usually accounted for by a house wiring circuit having a natural wavelength roughly equal to the station being received.

Volume Controls

THE majority of volume controls are extremely noisy in operation, which is inclined to be irritating when searching for any length of time. This fault can be minimized, or completely stopped, by connecting a condenser of 2 mfd. or more between the slider and one side of the resistance. This method can be used equally well with 3 terminal volume control or 2 terminal control, such as the variable resistance controlling a variable- μ valve. This method should never be used with volume control on the L.F. side.

Modulation Hum

MODULATION hum can usually be cured by connecting two condensers in series across a mains, and earthing the centre point. This is so well known that it would seem that we should apologize for mentioning it again, but it is not generally known that it is possible to waste the electric current night and day if the on-off switch is in the earthed side of the mains. It is, of course, best to use a double-pull switch to shut off both mains when using this arrangement.

Class B Amplification

THERE is an enormous amount of attention fixed on Class B amplification at the present time, and readers will doubtless be aware that the whole principle of this output technique relies on the output current increasing with the incoming signal. This current may rise from two to forty-five milliamps, and secondly, it is almost impossible to use an eliminator, as the variation in current would cause the voltage from the eliminator to vary within wide limits on all the valves, which would result in distortion, in addition to the extraordinary effect it would have on the reaction control.

Metal Chassis

WITH the advent of the metal chassis, many constructors and, we fear to say, designers, completely lost their heads

INTERESTING and TOPICAL PARAGRAPHS

in their desire to connect every possible terminal to the nearest point of the chassis. On a four-valve set, there may be as many

A FINE PORTABLE.



Listening to the "His Master's Voice" "Superhet Portable Six," a self-contained battery instrument which receives all worth-while stations with amazing selectivity.

as twenty wires going to the chassis, and secondly, twenty separate currents

SOLVE THIS!

Problem No. 30.

After two or three days' work Blackman had practically finished his new receiver. This was a self-contained three-valve set, employing S.G. Detector and Power valve with Band Pass Tuning and a Three-gang condenser. A particular item was to be transmitted in the evening to which he was very keen to listen, and in his hurry to get the set into its cabinet he unfortunately broke the detector valve. He had no spares, and the shops were closed. What was the simplest way of using the receiver to provide the item to which he was so keen to listen? Three books will be awarded for the first three correct solutions opened. Address your solutions to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2, and mark your envelope Problem No. 30. No other correspondence should be enclosed in the envelope, which should reach here not later than April 17th.

SOLUTION TO PROBLEM No. 29.

Jefferies only needed a resistance of approximately 15,000 ohms to insert in series with the H.T. positive output from his Mains Unit. This would be the nearest commercial value of resistance obtainable to provide the necessary voltage drop.

The following three readers received books in connection with Problem No. 29.—

A. W. Freedy, 59, Kyree Road, Clapham Common, S.W.11. A. C. Peck, 15, Pelham Road, Wood Green, N.22. W. J. Butterfield, 104, Cambridge Road, Seven Kings, Essex.

would flow from one part of the chassis to the other. This method of omnibus returns can cause the most untraceable happenings, and instances have been known when a receiver that has been made completely unstable has had stability restored by connecting a slot in the chassis, and sending a troublesome current in another direction.

An Evil of Metal Chassis

ANOTHER evil which is common to metal chassis is the practice of connecting one side of the S.G. condenser in a mains set to the chassis. This means that the bias resistance of the valve is between the earth end of the condenser and the cathode of the valve, which can, in certain instances, cause violent instability. The low potential end of an S.G. condenser should always be connected to cathode and not to earth.

Blue Glow

FIVE years ago, a bluish glow in a valve would indicate that the valve was soft, i.e., the vacuum had become low, with the result that electrons were heating the particles of gas, and breaking them up. Until fairly recently, softness was unknown in the modern valve, and fortunately, still is, but all the same, some of the latest valves show a blue glow that would lead the average constructor to believe that it was soft. Curiously enough, this new blue glow is caused by the valve being exceptionally hard and denotes a particularly good specimen. This glow is fluorescence, and is a ray shot off the anode by the terrific impact of the electrons, which is not surprising when it is realized that an electron in a modern high-slope valve may exceed a speed of 10,000 miles per second.

"Free" Grid Bias!

THE very word "wireless" is a misnomer, and so are a good many of the associated terms. A particularly glaring example is "free" grid-bias, as, far from being free, the bias voltage supplied by it is subtracted from the H.T. voltage applied to the valve. Free bias is sometimes called automatic bias, which is equally ridiculous, as it rather implies that a grid-bias battery requires winding up, or some form of manual starting.

Keeping Your Radio Up-to-Date

EVERY year thousands of perfectly good radio sets are scrapped by their owners as worn out. Actually, the only parts of a receiver, apart from batteries, which can deteriorate, are the valves. New valves can work wonders with an out-of-date set. One important factor must be borne in mind, however. Modern valves are much more sensitive than those of two or three years ago, and care must be exercised in choosing suitable types. The Mazda range includes valves for every type of set, and radio dealers are always ready to assist purchasers in choosing them correctly. These valves are used by most of the leading set manufacturers and specified by the foremost designers. The Mazda valve research laboratories have been responsible for many of the most outstanding radio developments of recent years.

A two point Aerial System

An Ingenious Arrangement with Many Advantages

By A. C. BURNS, M.Sc., F.I.C.

It is not always realized that the average aerial is often unnecessarily long and, furthermore, that the usual "out-door" system can, in many cases, adequately be replaced by what might be termed a semi-outdoor type. This applies particularly in the case of the now commonly employed H.F. Det., L.F., set.

The alternative to the normal outdoor system, i.e., the strictly indoor arrangements, generally affords more "selective" reception or better elimination of unwanted stations, but only at the expense of volume.

The writer has for the last three years successfully employed an aerial system, arranged as shown in Fig. 1.

This system offers at least four advantages, viz:—

(1) The upright external portion is a distinct advance on the normal strictly indoor system and, if the house has unused attics or lofts, the portion inside the roof (shown by dotted lines) can be extended round and well clear of three walls of the attic and just clear of the roof. Foot-lengths of silk thread will afford ideal insulation, particularly since in many attics and certainly in lofts or lumber-rooms there is no need to sacrifice efficient insulation by fixing the aerial close to the ceiling or room walls, just for the sake of tidiness.

It is usually easy to find a point in the roof eaves, more or less directly above the windows, W1 and W2—a point where a hole is readily drilled through the wood-work, just under the roof gutter. Indeed, in most lofts there are ventilation gaps in many places where the roof meets the walls. In any case, the lead from window to roof need not be vertical and certainly can be less unsightly and less dangerous than the average outdoor aerial. As in the case of the strictly indoor type, there is no need to "earth" the aerial in thundery weather nor are atmospherics so dominant as those associated with the outdoor system.

(2) The effective pick-up of this system can be almost doubled by continuing the aerial back from the roof (see dotted lines) and down the outside of another wall of the house, thence leading it in once more, but to a different room via another window.

(3) Herein lies the main advantage of the two-point system. By providing a separate "earth" at this

second window, the set can conveniently be used in either room at will—an advantage particularly to owners of radiograms and sets with contained speakers and with no speaker extensions to other rooms. To operate the set in the other room, all that is necessary is to con-

nect the terminals in the first room unconnected. The total length of the aerial system will be unaltered by the change-over, so that tuning will remain unaffected and stations will come in at the same points on the dial in whichever room the set is used.

Variation of Aerial Capacity

An ordinary 6d. tuning-coil holder fixed in both rooms at the lead-in points, as shown in Fig. 2, makes a very neat anchorage for the aerial and earth leads, and has the advantage that it can easily be used as an earthing-switch by simply inserting the usual shorting-plug, "B" (see also Fig 3). Now for a little experiment!

Try the effect of inserting some of your obsolete tuning coils; if you no longer possess these in your junk box, they can be obtained very cheaply secondhand nowadays. The effect of inserting tuning coils in series with the aerial lead has been discussed from time to time, but equally interesting results are obtained by introducing these coils in parallel, i.e. across the aerial-earth leads. Not only is volume altered—both increased and decreased, according to the size of coil used—but the range of the tuning scale (condenser) of the set can be usefully extended.

For example, a number of well-known receivers, particularly when operated with small external aerials, cannot tune in the 1,875 metre Huizen (or Hilversum), which regularly offers such interesting programmes, particularly between 7.40 a.m. and 8.40 a.m. daily. In such sets, this station, in effect, is "off the scale." By inserting a 200 coil (or other long-wave coil) in the holder, the aerial-circuit capacity is so altered that the station now comes in at the upper end of the scale, and with a little margin to spare. Naturally the other station settings have become temporarily, but only slightly altered—being, in fact, displaced to slightly lower dial reading.

The introduction of these coils in the aerial circuit, both in parallel and in series, naturally alters the capacity of the aerial-tuning circuit, and its variable condenser, just as does the addition of a small variable condenser of the compression type. The fact that you are virtually shunting the aerial to

(Continued on page 140.)

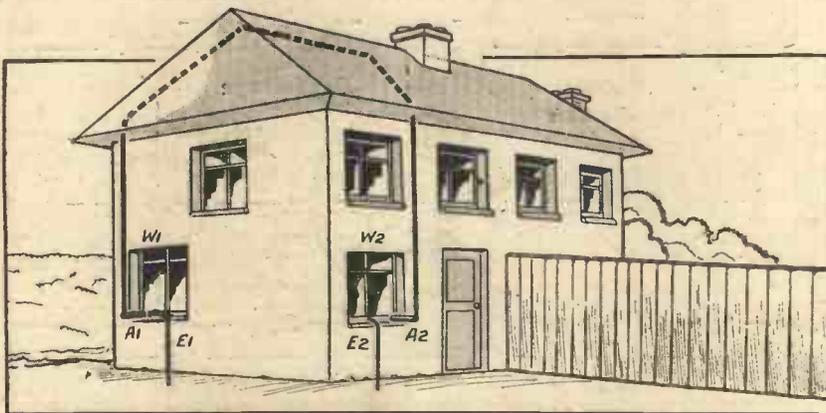


Fig. 1.—How the aerial system is arranged.

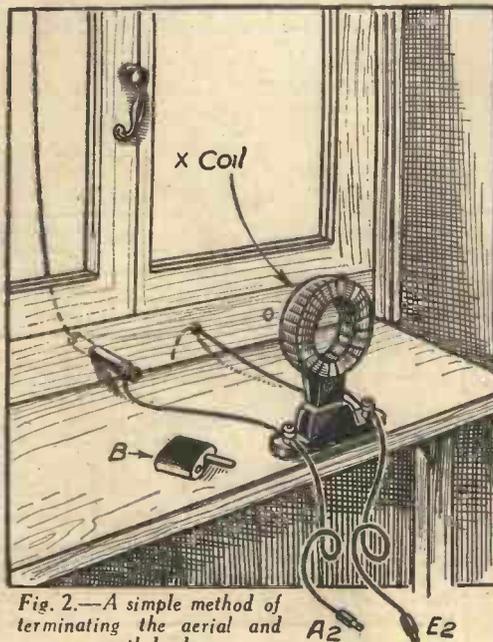


Fig. 2.—A simple method of terminating the aerial and earth leads.

A HANDYMAN'S WIRELESS TESTER

With this Easily-made Instrument Various Tests can be Quickly Carried Out.

By S. BRASIER

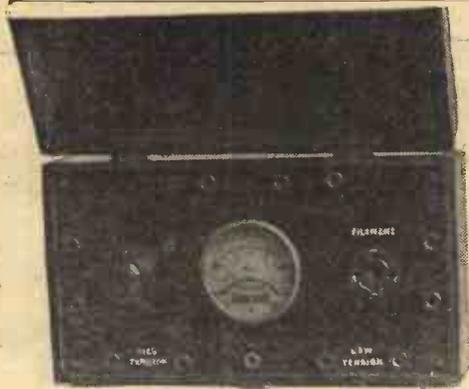


Fig. 1.—The finished tester.

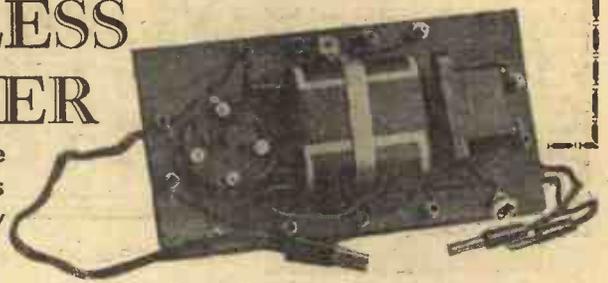


Fig. 4.—How the parts are mounted.

WHEN you are tracing that elusive fault in your set, how often have you wished that you had something to simplify and speed up the job? Quite a number of times, I expect! So with this thought in mind, the handy tester here illustrated was designed, but not without limitations. In the first place it had to be cheap to construct. Secondly, it was required to do everything that one wants to do when testing a receiver. Lastly, it had to be neat and compact.

Now as you see from the list of components, the most expensive item is the triple reading meter. In fact this more or less determines the cost of the whole outfit. The instrument used proved to be very accurate when tested against precision meters, and is quite satisfactory for all ordinary purposes. The other parts are quite usual items, and you will probably have most of them on hand. Regarding the second point, here are a few tests that can be made:—

Voltages of L.T., H.T., and G.B.; anode current of any valve; continuity tests; short circuits; valve filaments (including mains valves); tracing distortion, etc.

All this can be done without the usual confusion of pieces of wire, odd batteries, meters and the like. Just a neat box in a convenient place, and a testing lead.

Details of Construction

The construction should present no difficulties as the illustrations show everything quite clearly. The whole outfit is housed in a cigar box measuring 8½ in. by 4½ in. In the original model the lid of the box was taken off and used as the panel, and another lid, recessed to about ½ in. was made. This gives clearance for the leads when the tester is closed. If, however, you obtain a box about 3½ in. deep, you can use a separate piece of wood or ebonite for the panel, in which case it should be sunk about ½ in. into the box.

The position of the components can be seen from the panel layout (Fig. 3). A fretsaw should be used for cutting the holes for the valve-holder and meter, the latter being a good push fit to obviate other fixing. With regard to the valve-holder, the terminals on this must be reversed so that connection can be made from underneath. The holder is then pushed through the hole and screwed or bolted to the panel. A strip of thin metal, bent to shape and

wiring. Be most careful to put the 1½ and 4½-volt plugs in their correct sockets. This completes the important points regarding the construction, so now a few words about using the unit.

Using the Tester

Obtain a yard of twin flex and furnish each of the two ends with plugs. This completes the testing lead, and all you have to do is to plug one end into voltmeter, milliammeter, or whatever you like, and test with the other end. The testing points for high and low voltages and milliamp readings will be obvious. Sockets marked test 1 are for low resistance continuity tests such as point to point wiring, tuning coils, etc. Connect one end of testing leads to sockets marked test 1, the other end going to component under test. Short-circuits will also become obvious using this test, as on completion of a circuit a reading of 1½ volts will be obtained.

Test 2 is used in conjunction with telephones plugged into the sockets so marked, and should be used for testing continuity of transformer primaries, H.F. chokes, loud-speaker units, etc. Proceed as for test 1, but plug leads into test 2 sockets. A click in the 'phones on completion of a circuit gives you peace of mind here. By the way, don't forget to switch on before performing any tests. If a valve is plugged into the holder on the unit, a reading of 1½ volts will remove all suspicion from the heater or filament. Regarding the milliammeter test, it is a great advantage if you have a spare lead with one end permanently connected to a Bulgin 5-pin split anode adaptor. With this in use the milliammeter is automatically put into the plate circuit of any valve. All manner of other tests will suggest themselves to the constructor. It should, however, be realised that high tension eliminator voltages cannot be measured with the meter used. A good approximation of the voltage on the plate of a valve

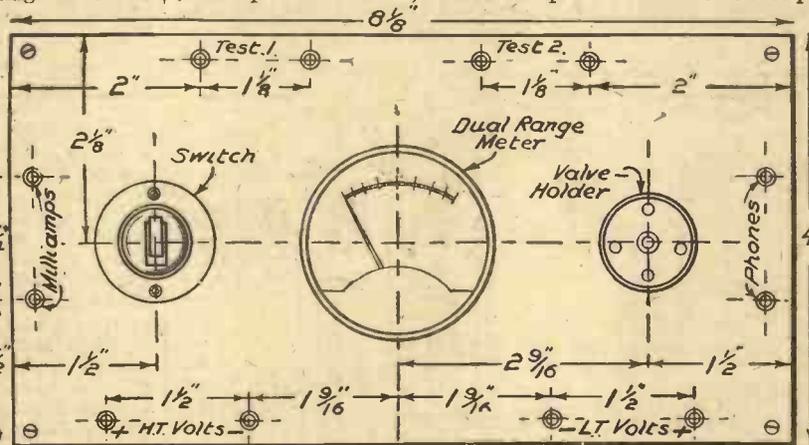


Fig. 3.—Panel layout.

screwed at each end to the panel holds the 4½-volt battery in position under the meter. This can be easily seen from Fig. 2. The .01 condenser which is connected across the milliammeter is held in position by its own wiring. Care should be taken when wiring up.

Here it should be noted that if you do not use the specified meter, the points of connection will probably be different. Also, when soldering to the spikes of the meter, do this as quickly as possible, otherwise you may disturb the inside

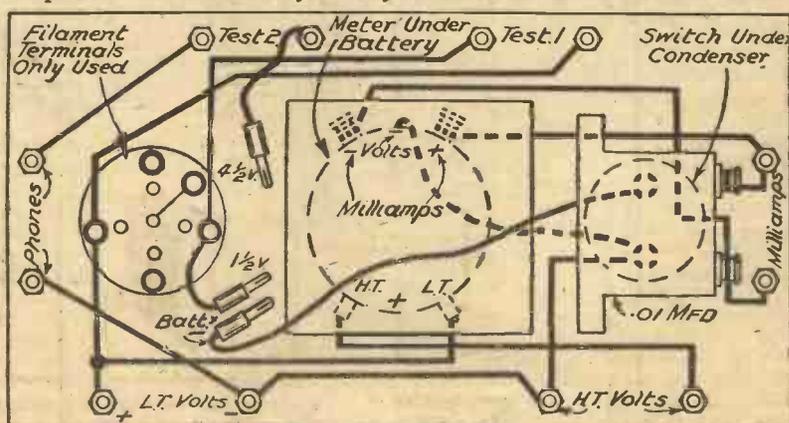
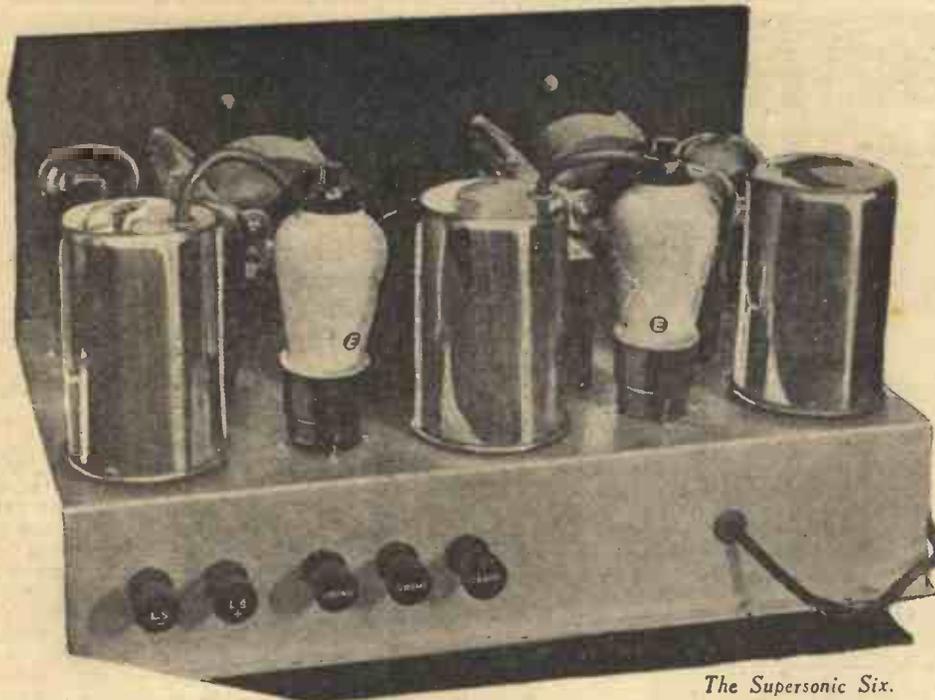


Fig. 2.—Underside of baseboard.

(Continued on page 172.)



The Supersonic Six.

(Continued from page 139.)

to cut-out the interference caused by a station working on a wavelength very close to that of the station you want, but which is situated much closer to you than the required station. With the ordinary type of receiver, or outside aerial, it is impossible to eliminate this form of interference, but with the frame aerial you simply turn it so that it forms an angle with the interfering station. Naturally, if the two stations are in the same direction you are still at a loss, but it is even then possible to make use of the directional feature and to practically get rid of the station. On the majority of European stations it will be found unnecessary to turn the lower right-hand control full on. If turned too far, the set bursts into oscillation, and naturally you cannot receive speech or music when it is in that condition. It must be used, therefore, to bring the station to just the strength you require and no more. There are no other

adjustments to be carried out, and the receiver is, therefore, simpler to operate than many sets employing half as many valves, but the number of stations which can be received is sufficient even for the most ambitious.

The Westector

As pointed out last week, this receiver lends itself admirably to the use of the new cold valve, or Westector, and the diagram published on page 139 shows the necessary modifications which have to be made to the second detector circuit. It will be seen that the H.F. choke is still required, but no grid condenser or gridleak are wanted, although there are one or two extra condensers and a resistance necessary to complete the cold-valve circuit. The pictorial diagram shows the arrangement for the benefit of those who cannot read the theoretical diagram, and it should not be found difficult to carry out this slight alteration. Fortunately, the second detector has no bearing on any other parts

of the receiver, and all the various voltage dropping resistances and decouplers are still of the same value as when the ordinary valve is employed in this stage. The cold valve does, however, result in a saving of low-tension and high-tension current, and this is no doubt of great value to those readers who find it difficult to get accumulators charged or who cannot afford to be continually renewing the H.T. battery.

Provided you obtain all the parts which are specified for this receiver, you will find no difficulty whatsoever in getting the receiver to work as soon as it is finished. There are no pitfalls which will prevent you getting the same results as were obtained with the original, and I should like to emphasize here that the circuit employed is one of the most selective known to the radio art, and if it is not possible to separate two stations on this superheterodyne receiver, then it is not possible to separate them on any other set, no matter of what make.

(Continued from page 137.)

earth does not necessarily mean reduced signal-strength. The writer finds that, with the set tuned to Radio-Paris, for example (using a tight coupling and minimum reaction), the simple insertion of the 200 coil boosts up the volume considerably. It is all a question of aerial capacity, a subject which does not call for further discussion here.

Interesting Effects

The effects are still more pronounced when the coil-plugging is conducted at the end of the aerial remote from the set, i.e., where the aerial returns in the other room, particularly if this room contains an extension-speaker, further interesting results can be noted by plugging in different coils. For example, tune in to Daventry National in one room and plug in a 200 or 150 coil in the other room. There is no particular change, except when using smaller coils, which give some drop in volume. Now insert the shorting-plug and note that, though the aerial is now

actually shorted to earth, there is still sufficient capacity in the aerial system to afford "nice quiet volume." With the set in the other room, here is a handy method of cutting down volume. Under these conditions, too, one can enjoy reasonably good reception during thundery weather, for the atmospheric noises are diminished considerably.



Fig. 3.—The shorting plug.

Another interesting effect can be obtained by tuning in the Midland Regional in one room and shorting the coil-holder in the other. Many of you will expect a distinct drop in volume, whereas, actually, there is no audible change. Tune into London Regional, with the shorting-plug still

in circuit, and you will note a distinct increase in volume. Individual experimenters must try for themselves the effect of introducing various sizes of tuning-coil across the aerial-earth leads at the point most remote from the set end of the aerial. It is all a matter of capacity, and it doubtless so happens that the natural capacity of the writer's aerial-system gives the above effects with the 200-coil and the shorting-plug.

Finally, the presence of aerial-earth leads in two rooms allows of convenient control of volume in those cases where the speaker in use is in a room away from the set. Volume can be readily controlled by shunting a suitably high-volume high-value variable resistance across the leads, which, incidentally, allows also of some degree of selectivity control. A low-capacity variable condenser can likewise be shunted across for purposes of controlling selectivity, though in this case better results are obtained by inserting the condenser in series with the aerial, and in the manner usually recommended.

LIST OF COMPONENTS FOR THE WESTECTOR SUPERSONIC SIX

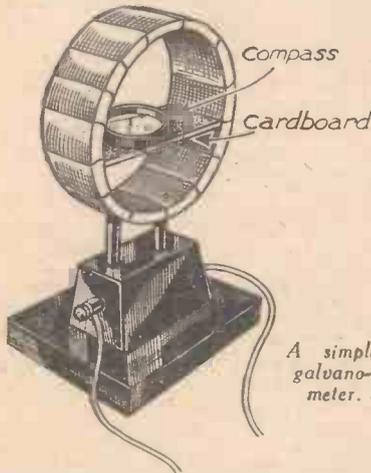
- 1 Paxolin Panel drilled 14 in. by 8 in. (Peto-Scott)
- 1 Aluminium Chassis: drilled 14 in. by 8 in. (Peto-Scott)
- 1 Oscillator Coil and Switch unit with window, dial and knob. (Wearite)
- 1 I.F. Transformer. (Wearite type O.T.1)
- 2 I.F. Transformers. (Wearite type O.T.2)
- 1 H.F. 10 Choke. (Belgin)
- 1 Special 8 mfd. condenser block. (T.C.C.)
- 0.1 mfd. condensers, type 65. (T.C.C.)
- 1 0.001 mfd. condenser, type 34. (T.C.C.)
- 2 0.01 mfd. condensers, type 34. (T.C.C.)
- 2 0.001 mfd., type 34. (T.C.C.)
- 1 Special Resistance Unit. (Dubilier)
- 1 500,000 ohms Grid Leak. (Dubilier)
- 1 20,000 ohms, 1 watt Resistance. (Dubilier)
- 2 40,000 ohms, 1 watt Resistance. (Dubilier)
- 1 100,000 ohms, 1 watt Resistance. (Dubilier)
- 1 1 amp fuse. (Microfuse)
- 1 25,000 ohms volume control. (Watmel)
- 1 Hypernik L.F., 3-1, Transformer. (Lissen)
- 2 0.0005 variable condensers with slow motion dial, type No. 2 S.M. (Polar)
- 5 Terminals (2 L.S. and Aerial 1, 2 and 3) (Belling Lee)
- 1 Centre-tapped frame aerial. (Elex)
- 8 4-Pin sub-baseboard valve-holders. (Clix)
- 1 5-Pin sub-baseboard valve-holders. (Clix)
- 1 4-way Battery Cord (H.T.+, H.T.-, L.T.+, L.T.-) (Belling Lee)
- 1 P.M. 4 Mansfield Moving-coil Speaker. (W.B.)
- 5 Cossor Valves, 210 H.F., 210 L.F., 220 V.S.G., 220 P.T.
- 1 Westector, type W4 (Westinghouse Brake & Saxby Signal Co.)
- 1 Lion 120 volt H.T. Battery.
- 1 Ediswan 2-volt 40-ampere hour Accumulator.

THE
HALF-
GUINEA
PAGE

Radio Wrinkles FROM READERS

An Improvised Galvanometer

THE accompanying sketch shows an improvised yet sensitive galvanometer made from an old "plug-in" type coil and a cheap compass. The latter rests on a piece of cardboard, and stands centrally



within the coil, the size of which, from experiments with coils of fifty and two hundred and fifty, seems to be of no great importance. In use, the instrument is set so that the coil and compass needle are approximately in the same plane. Any direct current flowing through the coil will, therefore, tend to turn the needle until it stands in a plane at right-angles to that of the coil. The instrument can be made to serve as a polarity indicator by marking one of the terminals of the coil + and noting to which side of the coil the needle head sets itself when this terminal is connected to the + pole of a cell of known polarity. When connected to any other source of supply the needle head will always tend to swing over to this side when the positive of the supply is connected to the marked terminal. Despite its simplicity the instrument is surprisingly sensitive as, for instance, when connected to one cell of a long disused pocket flash-lamp battery the needle is given a decided "kick." There need be nothing permanent about the instrument as the cardboard bridge and compass may be loose, and consequently a coil from a working set can be used.—E. MORRISON (Leicester).

A Useful Tool

HERE is a very useful and simple gadget, made solely out of a used hack-saw blade. Obtain a fine-toothed blade and break same about 1 1/2 in. from each end, so that the holes can be used for bolting



A handy tool made from parts of a hack-saw blade.

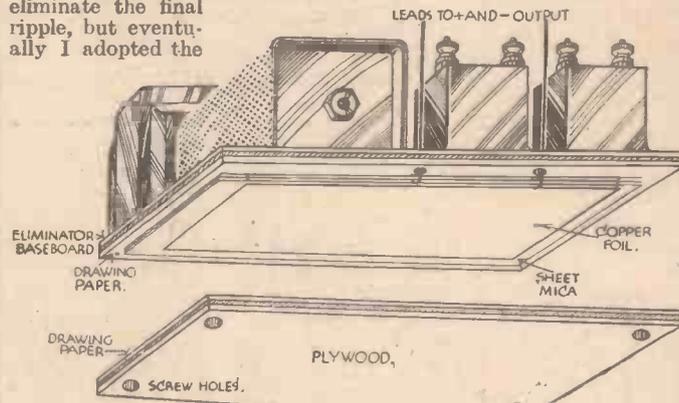
THAT DODGE OF YOURS!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us, addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

the parts together so that the blade edges are back-to-back. Grind the outside edges, so that when the two sections are placed together, they form a very good stripping tool for all gauges of wire, which will strip the finest and heaviest gauge of wire with ease. Now grind top edge of one blade not too sharp, which acts as a scraper for clearing corrosion from brass or copper, or anything that requires scraping. Grind teeth entirely off one piece of blade for forming an excellent wood scraper. The other set of teeth is used for cutting small pieces of ebonite.—A. T. COLLIES (Liverpool).

Method of Curling Mains Hum

HAVING constructed an eliminator to work from A.C., I found it difficult to eliminate the final ripple, but eventually I adopted the



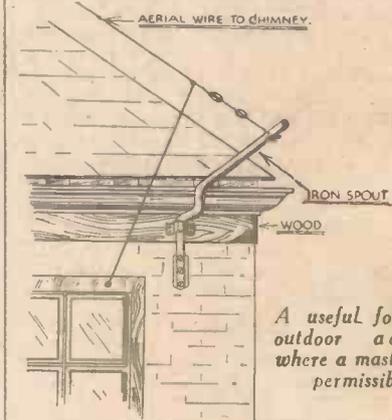
An efficient method of curing mains hum.

following dodge which worked with remarkable results. Enough copper foil was obtained to cut into four sheets 7/16 in. less (all round) than the eliminator baseboard. Also, enough sheet mica, split into quite thin layers, to make three sheets 7/16 in. larger all round than the copper foil, and one piece of thin plywood equal in size to the baseboard. Glued to the underside of baseboard is a covering of drawing paper, the upper sides of the plywood being treated in the same way. The copper foil and mica are arranged alternately, as shown in the sketch, and a connecting lead, consisting of 20 gauge wire, is neatly soldered to each copper foil. Two alternate wires are twisted together, making the two

connections to the condenser, and these are connected across the positive and negative rectified output. Finally, the plywood was screwed up to compress the "condenser" to the baseboard. All the required articles cost me less than one condenser, I had already purchased, and was infinitely more successful; in fact, I cannot hear any hum whatever.—R. WYNN (Ipswich).

An Aerial For Flat Dwellers

HAVING to reside in a top floor flat, I was at a loss how to instal an aerial system. However, I tried the

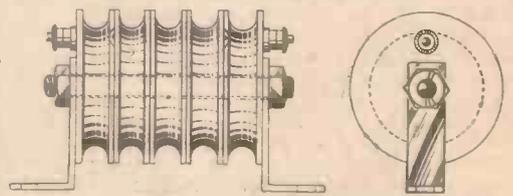


A useful form of outdoor aerial where a mast is not permissible.

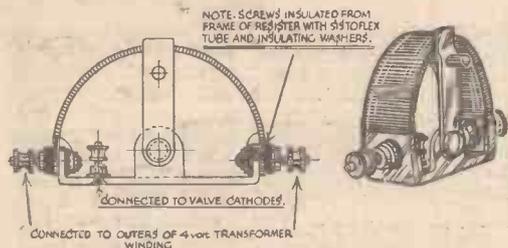
method shown in the accompanying sketch. The mast was a short piece of old conduit, as used by electricians for wiring purposes. It is very rigid when erected, if a short length is used. One end was flattened and driven into the bricks by long nails.—J. CATTON (Southport).

An H.F. Choke Former

AN efficient H.F. choke can be made from old rheostat formers. Four or five are required, also a piece of screwed brass rod to fix them together. A terminal is fixed at each end as shown in the sketch. Each division is then wound with 36 or 38 gauge enamelled wire. Brass strips are fitted for screwing the choke down.—H. J. JONES (Hengoed).



An H.F. choke former made from old rheostat formers.



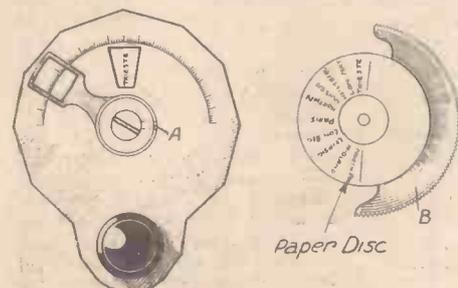
A simple centre-tapped resistance.

An Easily-made Hum-dinger

THE accompanying sketch shows a cheap artificial centre tap or (hum-dinger) resistance for the heater circuit of filament transformers in A.C. mains receivers. It often happens that although the turn ratio of the transformer and its centre tap be correct, the electrical centre tap will be incorrect, resulting in more hum than there should be. By constructing the device from old filament resistors that may be found in any constructor's junk box, and moving the contact arm in either direction, a place will be found where hum will be almost negligible. All that is required is to open the hole out on the side that is uninsulated and insulate with siftoflex tube and ebonite washers, taking end of wire to connection screw and fixing a terminal to one of the mounting holes in frame for cathode connection. In metal chassis receivers, where cathode is common to frame, this would not be necessary, as fixing screws would complete the connection. The same idea could also be adopted with a little modification, to the old circular resistances of 15 to 30 ohms capacity.—E. W. FURBANK (Leeds).

A Slow-motion Dial Improvement

IT is much more convenient to log the stations on the dial, than to keep a graph of them. In many cases, old-type slow-motion dials can be converted to this method quite easily. The dial shown below was converted in the following way. The pointer was removed by loosening the grub screw A which also released the driving plate B. A disc of cartridge paper was now made and cut away in the middle to clear the boss of the plate. This disc was glued to the plate as shown at B. A window was then cut in the bakelite moulding by drilling and filing. The dial was now assembled and mounted on the set. Those stations which it was required to log, were now tuned in, and their positions marked through the window on to the paper disc. By removing the plate, the names were then printed on in red ink. If required, another window can be cut in the bottom half of the dial, and the long-wave stations also logged. In most dials,

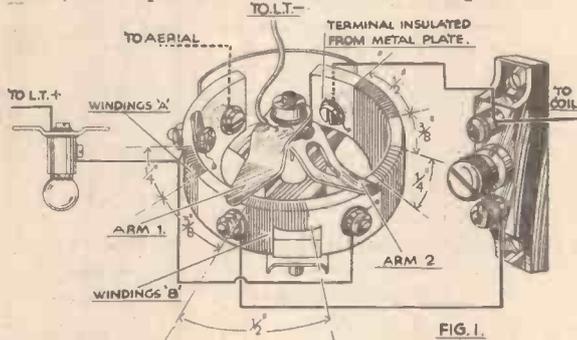


Improving a slow-motion dial.

the pointer will obscure the window in its central position, but the pointer can be removed altogether if desired.—K. CHALLIS (Watford).

A Multi-control Switch

THE attached sketch shows how I made a multi-control switch from an old rheostat. This switch gives selectivity by means of a pre-set condenser, which is shorted when maximum aerial strength is required. At the same time the dial lamp may be switched on or off, for either position. A glance at Fig. 3 should make this clear. To make this switch, first remove the resistance wire, insert the various terminals into position, and wire on with fairly thick wire, the various sections as shown in Fig. 1. The additional contact arm is made from 5-16in. copper strip similar to the contacts used on large-type torch batteries, and is drilled at one end with a hole 1-16in. larger than the diameter of the spindle. When attaching this arm make sure that it is fitting centrally, so that it does not short through the spindle. The angle between the arms 1 and 2, must be adjusted so that they make contact with windings "A" and "B" when in "X" position. But when in "Y" posi-



A multi-control switch made from an old rheostat.

tion, arm 2 makes contact with "B," whilst the contact between arm 1 and "A" is broken.—F. L. TAGG (Edmonton).

An Air Drier

MOISTURE and damp atmosphere entering the interior of a set causes the coils and variable condensers to leak and so dulls the reception. To prevent



How to keep the inside of a receiver cabinet free from dampness.

this, place a small quantity of dry lime or calcium oxide into a cotton bag. Perforate the sides of a small mustard tin with a nail as illustrated, put the bag into it and fix the lid on. If the tin is kept inside the set,

preferably in one of the corners so as not to interfere with the connections, any moisture that is present in the air will be absorbed.—J. K. HOLMES (Gosforth).



FIG. 1.



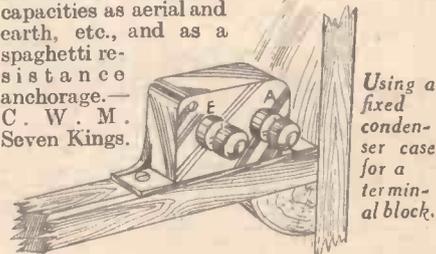
FIG. 2.

A Hanging Baffle Board

MANY constructors consider the best type of loud-speaker is one which is mounted upon an open baffle board, and the question often arises as to which is the best place to put the speaker, to prevent any of its qualities being lost; and from my experience I found the answer in a baffle hung from the picture moulding of a room, as shown in the accompanying sketch Fig. 1. Procure two picture hooks and bend the ends flat and drill two holes to take fairly strong screws. Screw these to the top corners of the baffle board and twist to the required angle to hang from the picture rail, as in Fig. 2. The result will be that your baffle board will be hanging from two points, the board itself being away from the wall about half an inch.—C. CROWLEY (Birmingham).

Utilising Old Fixed Condensers

OLD fixed mica condensers need not be thrown away when they fail to do their legitimate job satisfactorily. The back of such a condenser is sealed with wax. Dig this out and remove the mica and tinfoil which is beneath the wax. You are now left with a bakelite "shell" in which are fixed two terminals. This may now be used as a terminal block, mounting it upright or flat (as you would a fixed condenser) as occasion demands. If necessary, the small fixed condenser terminals may be replaced by the larger type by slightly enlarging the holes in the bakelite. The uses for such terminal blocks will be instantly apparent in such capacities as aerial and earth, etc., and as a spaghetti resistance anchorage.—C. W. M. Seven Kings.



Using a fixed condenser case for a terminal block.

Building the "A.C. TWIN"



A New Type of Receiver for All-mains Operation. Two Pentode Valves in a Circuit Designed for Quality Reception on an Energized Moving-coil Loud-speaker.

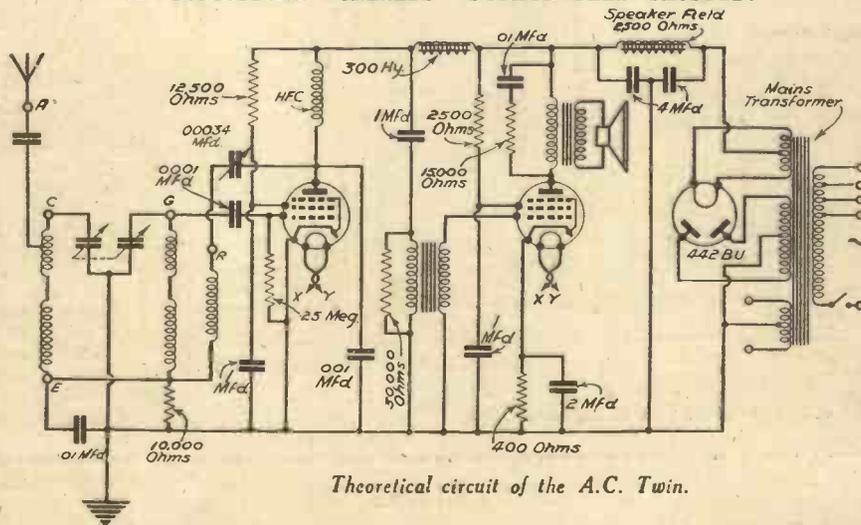
By W. J. DELANEY

FROM inquiries which I have made amongst radio retailers, and also from a number of friends, I have decided quite definitely that there is need for a mains receiver which is designed to give a really high-quality output from the local station. It is quite true that many listeners wish to receive fifty or more stations on the loud-speaker, but there are many more whose main aim is to hear the local station, with the choice of an alternative, at full room strength, with irreproachable quality of reproduction. So far, the majority of receivers which are available, either from the manufacturers, or from designs published in periodicals, and which are designed to give a really large output, are of the multi-valve type with one or more H.F. stages. The result of this is that there is more than one control to be handled, and the expense of the receiver is naturally rather high. There has not so far been available a receiver of the simpler type which will give that volume that many listeners require, without trouble and without a large outlay for a powerful receiver. Ten pounds seems about the limit to which those with whom I have discussed the question seem prepared to go, and they have asked for a receiver which will be simple to operate, capable of the volume which has come to be associated with high-class mains receivers, but which is not of the type designed to get every station in Europe.

My Experiments

I therefore set to work to try to design a small, compact receiver for as low a figure as possible, yet which would be capable of the performance which seemed to be required. I kept in mind the non-technical listener and especially the older generation to whom "knob-twiddling" would be right out of the question, and to whom a high-class musical performance from even one station would be sufficient. At the same time, I bore in mind that with both classes of listener just mentioned, there might be occasions when a little distant reception would not come amiss. At first I thought it would be quite easy to put together a receiver of this type, but one or two experiments showed me that there was quite an interesting field for study in this direction. The familiar detector followed by one L.F. stage was the basis, and

A "PRACTICAL WIRELESS" GUARANTEED CIRCUIT!



Theoretical circuit of the A.C. Twin.

COMPONENTS FOR THE A.C. TWIN

- One Lecwos Band-Pass Filter, Type 51, B.P.F./R.
- One Polar Uniknob 2-Gang Condenser, .0005.
- One Igranic Transformer, Type T/24/B.
- One Lotus .0003 Reaction Condenser.
- One Bulgin Standard H.F. Choke (H.F.9).
- One Varley 300 Henry L.F. Choke (D.P.16).
- One .0001 fixed Condenser (Type S), T.C.C.
- One .001 fixed Condenser (Type S), T.C.C.
- Two .01 fixed Condensers (Type 34), T.C.C.
- Three 1 mfd. fixed Condensers (Type 50), T.C.C.
- One 2 mfd. fixed Condenser (Type 50), T.C.C.
- Two 4 mfd. fixed Condensers (Type 84), T.C.C.
- Two 5-pin valve-holders (Clix Chassis type).
- One 4-pin valve-holder (Clix Chassis type).
- One 1 megohm Erie Resistor.
- One 12,500 ohm Erie Resistor.
- One 400 ohm Erie Resistor.
- One 2,500 ohm Erie Resistor.
- One 30,000 ohm Erie Resistor.
- One 10,000 ohm Erie Resistor.
- One 15,000 ohm Erie Resistor.
- One Heayberd Mains Transformer (Model A.C. Twin).
- One Gramplan Energized Speaker, Type E.1.
- One Bulgin Mains Toggle Switch, Type S.80.
- One Bulgin Small Mains Connector, Type P.21.
- One Clix Terminal Strip.
- Two Clix Wander Plugs (One black and one red).
- One Cossor 442 B.U. Rectifying Valve.
- One Cossor MS-PEN-A (H.F. Pentode Valve).
- One Cossor MP-PEN (Pentode Output Valve).
- One Smith Lyric Cabinet.
- One coil Glazite, 3 yards red and black flex, screws, bulb for panel light, etc.

after putting together such an arrangement (with the necessary mains equipment, of course) I decided that the power output was insufficient. Accordingly a pentode was used in the output stage, with the result that it was found impossible to fully load it and therefore it was not being efficiently employed. I next tried a good screened grid stage followed by a power detector operating straight into the speaker. This gave a slightly greater reach, but naturally the signal output was low. The next scheme to receive attention was a screen grid H.F. stage followed

by a pentode valve acting as a detector and feeding the loud-speaker direct. This showed a little more promise but was still failing.

The Final Circuit

Several more experiments were carried out, and finally I hit upon the most efficient arrangement. This consisted of a special high-frequency pentode valve, employed as a power grid detector, followed by an ordinary mains pentode. This gave great results, and all that remained was to decide upon the interval

(Continued overleaf)

INTRODUCING THE A.C. TWIN
(Continued from page 143.)

components, so as to get the very best from the circuit design. A power detector requires a very accurate matching of the load in the anode circuit, and when a pentode is employed in this way, the difficulty arose of obtaining the correct load so that the maximum signal was passed to the L.F. stage. A suitable resistance would have required an H.T. supply of over 500 volts, so that this was ruled out. No transformer was available which could be included in the anode circuit, but obviously a really high inductance L.F. choke would be suitable. Messrs. Varley step into the breach here with a choke having an inductance of 300 henries and a D.C. resistance of 3,000 ohms. This will carry a maximum current of 10 milliamps, which is just about what the pentode will give when operating on full power. The L.F. transformer may therefore be parallel fed, and the design of this need not be so critical, provided it will give a good step-up, with a good overall response. In view of the cost of the anode component, it was felt desirable to keep the cost of the transformer low, and the Igranic component which was chosen costs only 5s. 6d.,

but gives splendid results when used in the manner I have adopted in this circuit.

The Speaker

The pentode output valve requires a load of between 6,000 and 7,000 ohms, and the next thing was to find a loud-speaker capable of giving this load without the expense of output chokes, etc., and I also thought it desirable to remove the necessity for a separate mains smoothing choke, by employing one of the energized type of speaker. These are cheaper than the permanent magnet type, and at the same time, no smoothing choke is needed, if the mains output is correctly chosen. The Gramian loud-speaker which I selected provides a load in its primary winding of 7,500 ohms when a certain pair of its terminals are employed, and this will obviously be admirable for our pentode. The field has a D.C. resistance of 2,500 ohms and requires a dissipation between 3.5 and 7 watts. The two pentodes which I selected consume just over 40 mA., and this current passing through 2,500 ohms would result in a voltage drop of just over 100 volts. This gives a dissipation of 4 watts, which is just above the minimum required and should prove adequate for our purposes.

As 250 volts are required for the anodes of the valves, and there is a loss of 100 volts through the speaker, it is necessary to design the mains portion of the speaker to provide 350 volts.

The Cabinet

The final point was to find a suitable cabinet to house the various parts so as to provide a good-looking receiver which was capable of taking its place in the home, and which would not give "boxy" or "tinny" results. The Smith Lyric cabinet which is used may be obtained by itself, or in conjunction with a very neat stool, and this is shown in the photographs in this issue. The performance of the final receiver is really excellent. Although primarily designed, as I stated above, to give the local, with one alternative, at really high-class volume and quality, with no intricate adjustments, it is capable of receiving several stations at splendid volume. It is simple to build, and there is nothing difficult about the construction or operation.

This receiver will appeal to thousands, and will undoubtedly prove to be one of the most useful receivers which has yet been described to our readers. Further details will be published next week.

MOST constructors are, perhaps, anxious to take advantage of the improvements to be obtained from screened coils. The following is a description of simple and cheap home-made screens that any handy constructor can make for himself. Firstly, it must be remembered that it is important that the screens are sufficiently large in diameter to allow at least 1 in. clearance all round the coils. This, of course, can be exceeded a little with advantage. No attempt will be made to describe the construction of a suitable dual-range coil, as this has been dealt with in recent issues of PRACTICAL WIRELESS.

Constructional Details

Procure a suitable size tin and lid; an ordinary cocoa tin will serve the purpose admirably. Strip the tin of its labels and well clean it inside and out. Then cut out the required number of slots in lid and the open end of tin, as depicted at A, Fig. 1. These should be just sufficiently wide to

HOME-MADE COIL SCREENS
By W. G. MARSHALL

admit the wire used for wiring the coil in the set. Covered wire such as "Glazite"

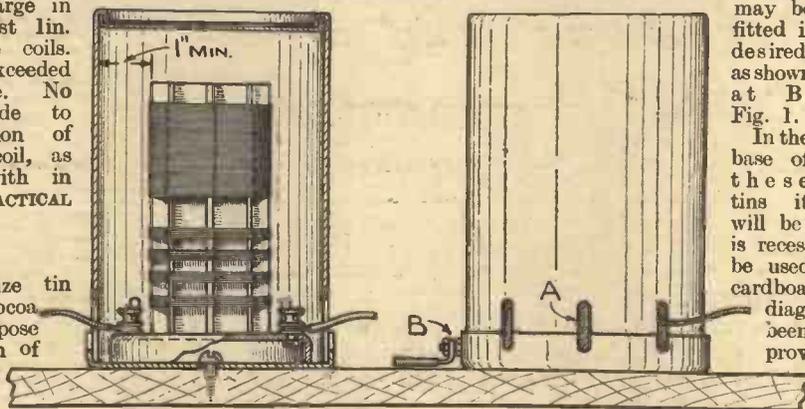


Fig. 1.—Section and elevation of the home-made coil screens.

A hole is punched in the centre for screwing down to the base board, or, alternatively, this may be omitted, as other holes will be needed to admit the screws for screwing down the coil base. An earthing terminal may be fitted if desired, as shown at B, Fig. 1.

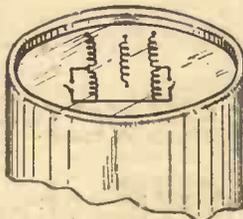
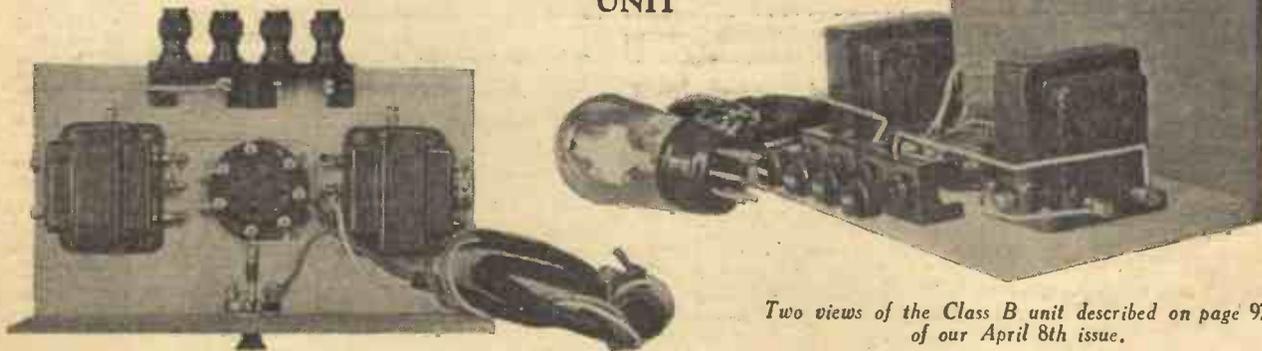


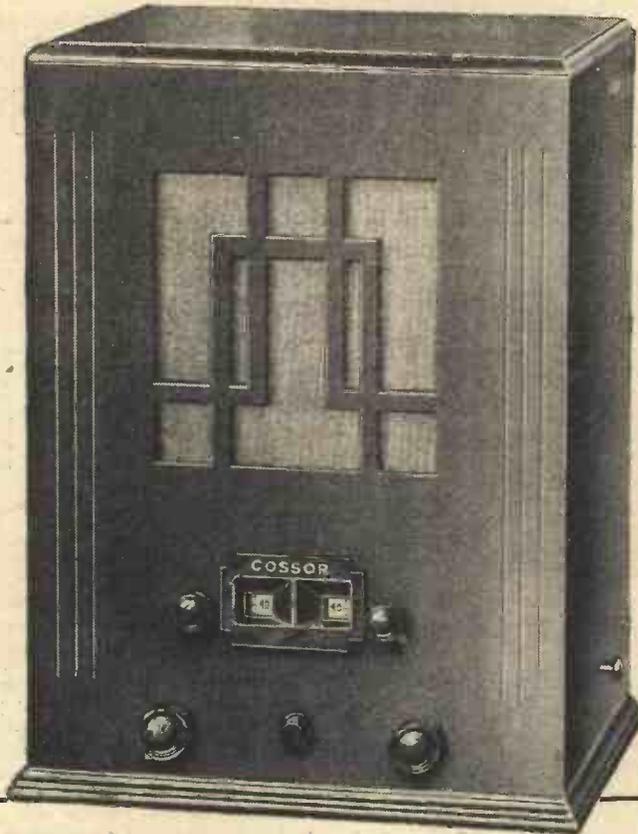
Fig. 2.—Identification circuit drawn on bottom of screen.

In the base of these tins it will be noticed that the bottom is recessed a little and this can be used for holding a disc of cardboard on which the circuit diagram of the coil has been drawn. This will provide a handy form of reference, as indicated in Fig. 2. Finally, the screens may be given externally a coat of aluminium paint, when they will assume quite a commercial appearance.

OUR CLASS B UNIT



Two views of the Class B unit described on page 97 of our April 8th issue.



NEW PRICES

BATTERY MODEL 335

with Self-Contained Loud Speaker
 Kit of Parts includes 3 Cossor Valves (220 V.S.G. Variable-Mu Metallised Screened Grid, 210 H.L. Metallised Detector and 220P. Output); Individually Shielded Coils. All-meral Chassis and all parts for assembling the Receiver as illustrated; handsome cabinet 18½ in. x 13½ in. x 10½ in. and 10 in. Balanced-Armature Loud Speaker. Provision is made for fitting Gramophone-Pick-up Socket and Plug.
Price £6.17.6

Hire Purchase Terms: 17/6 deposit and 9 monthly payments of 15/-

BATTERY MODEL 334

Kit of Parts, similar to Model 335 except that no loud speaker is supplied. Handsome cabinet 9½ in. x 13½ in. x 10½ in.
Price £5.15.0

Hire Purchase Terms: 15/- deposit and 9 monthly payments of 12/6

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

Hire Purchase Terms: 15/- deposit and 9 monthly payments of 10/6

ALL-ELECTRIC MODEL 337

With Self-Contained Loud Speaker
 Kit of Parts for All-Electric Melody Maker Model 337 similar to Model 335 (as illustrated) but for all-electric operation, including Cossor Valves, handsomely finished Cabinet, 18½ in. x 17½ in. x 10½ in., Loud Speaker and all parts. For A.C. Mains only 100-125 or 200-250 volts (adjustable). 40-100 cycles.
Price £8.10.0

Hire Purchase Terms: 20/- deposit and 9 monthly payments of 18/6

ALL-ELECTRIC MODEL 336

Kit of Parts, similar to All-Electric Model 337 except that no loud speaker is supplied. Handsome cabinet 10½ in. x 17½ in. x 10½ in.
Price £7.10.0

Hire Purchase Terms: 21/- deposit and 9 monthly payments of 16/-

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 £6.15.0

Hire Purchase Terms: 28/6 deposit and 6 monthly payments of 20/-

Models 336 and 338 are available for use on A.C. Mains only, 200 to 250 volts (adjustable). 40-100 cycles.

Prices do not apply in I.F.S.

A. C. Cossor Ltd., Highbury Grove, London, N.5. Depots at Birmingham, Bristol, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Sheffield, Belfast, Cardiff and Dublin.

♥ 2683

"SELECTIVITY all one could desire . . .
and TONE and **QUALITY** are wonderful . . ."

writes Yorkshire user

This satisfied Cossor owner continues: "I have had all kinds of home constructed Sets since 1923 but your Melody Maker is the best yet."

For less than ever before you, too, can enjoy the remarkable performance of the Cossor Melody Maker. Equipped with Cossor Variable-Mu Valve—individually shielded coils—graded volume control—every up-to-date feature of design—the Cossor Melody Maker, at to-day's prices, undoubtedly represents the greatest possible value for money in Screened Grid Radio. Send at once for full details—use the coupon.

COSSOR
MELODY MAKER

To A. C. COSSOR LTD.,
 Melody Dept., Highbury Grove,
 London, N.5.

Please send me free of charge a full size Constructional Chart, which tells me how to build the Cossor Battery All-Electric Melody Maker.

(Strike out type not required.)

Name My usual Retailer is

Address Address

FRAC. 15/4/33.

THERE is an old adage which describes a misfit as a "square peg in a round hole." How easy it is for a radio valve to be a square peg; how frequently are unsuitable valves plugged into valve holders.

The choice of valves for a given receiver is not merely a matter of taking any screened grid valve, and any detector and any output valve, and of knowing that they will all work together satisfactorily. If that were so, the catalogues of valve manufacturers would each contain but half a dozen types in each range—battery operated and mains operated.

Number of Types

In the current lists of half a dozen well-known valve makers, however, this number of types is very greatly exceeded. To take the 2-volt range, for example, most makers list at least three screened grid valves, including variable mu types; four or five valves suitable for use as detectors and low-frequency amplifiers; three or four different three electrode output valves, and two or three pentodes.

Even supposing that each valve of one particular make had its practical counterpart in the list of each of the other manufacturers—which, by the way, is not always the case, the owner of a three-valve set of the screened grid, detector and L.F. class has the choice of at least four grades of screened grid high-frequency valves, five different types of detectors and seven different output valves. A similar state of affairs exists in the case of A.C. mains valves.

The questions which immediately suggest themselves are: How is it that such a large number of different valve types have been developed? Are they all necessary? Could not each maker's range be greatly simplified by some process of standardization?

A Logical Process

A development of a large number of valve types is the logical outcome of the great progress which has been made in valve technique during recent years. In the early days of broadcasting, a single type of valve was used indifferently for high-frequency amplification, detection and low-frequency amplification.

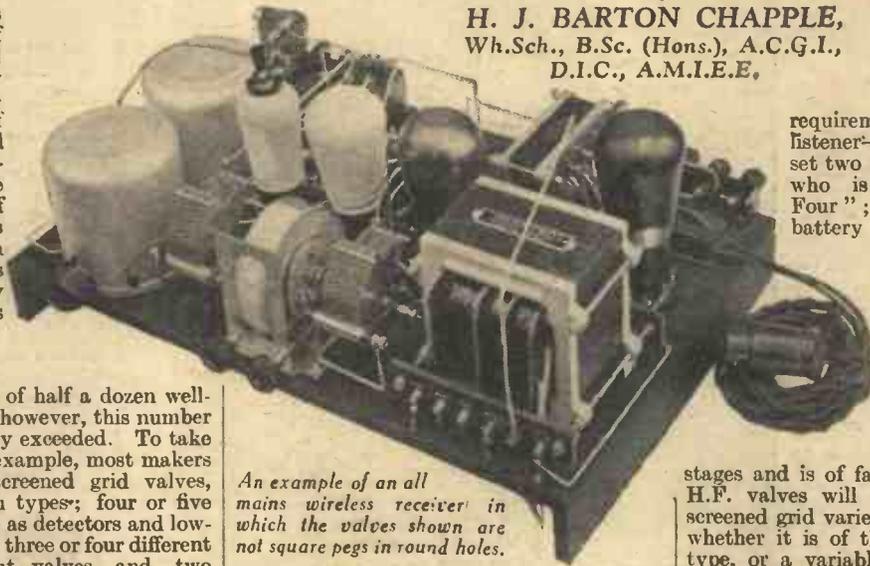
The natural process of competition tended still further to increase the number of valve types, while another factor was the invention of screened grid and pentode valves, both of which have characteristics which fit them for certain functions almost to the exclusion of all other types. Another reason for the multiplication of valve types was the demand for valves of ever-growing sensitivity and efficiency for use in battery-operated portable sets. Here the size and weight of both the low-tension and high-tension batteries are subject to severe limitations, and any development which resulted in even slightly improved output or in the saving of even half a milli-ampere of high tension current was welcome.

SQUARE PEGS IN ROUND HOLES

Notes on The Correct Choice and Use of Valves

By

H. J. BARTON CHAPPLE,
Wh.Sch., B.Sc. (Hons.), A.C.G.I.,
D.I.C., A.M.I.E.E.



An example of an all mains wireless receiver in which the valves shown are not square pegs in round holes.

Replacements

It will naturally be asked why, when more efficient valves are produced, are not the older types discontinued. The answer here is that to a very great extent they are. The published valve lists of to-day contain a very small proportion of the valve types developed even during the last three years.

As a matter of fact, all sets of really modern design can be equipped with suitable valves from a very restricted selection—say, two screened grid types (one variable mu and one of the normal type), a single detector, and a choice of two triode and two pentode valves. But such a range would be far too limited for the many different forms of receiver which are still in existence but, having been built two or three years, do not represent the latest practice.

An Example

To take a simple example, so greatly has the modern low-frequency transformer been improved that a very high percentage of the detector valves of to-day are coupled to the following stage by a transformer, and results from the quality point of view are as good as and if not better than the earlier resistance capacity couplings, while, of course, the stage gain is much higher. The modern detector valve has been developed to work in conjunction with the modern transformer, and its characteristics are such that it will function equally well with direct or resistance fed transformer coupling. In sets of two or three seasons ago, however, many different forms of intervalve coupling were employed. There had to be, therefore, high amplification, high impedance valves for use in conjunction with resistance capacity couplings, others suitable for choke coupled amplifiers and general purpose valves for use as detectors and low-frequency valves for use as detectors and low-frequency amplifiers with transformer couplings.

It is but right that listeners who are not able for the moment to procure a modern-to-the-minute receiver should be able to obtain still the valves which operate best with their old and possibly obsolescent receivers. A careful analysis of current catalogues reveals that the ranges of valves listed represent the minimum assortment to meet the reasonable

requirements of every class of listener—the man who owns a set two years old, and the man who is building the "Fury Four"; the owner of an all battery set, he who uses low tension batteries and mains unit for high tension and the fortunate possessor of an all mains set.

A Few Hints

To begin with, if your receiver incorporates one or more high frequency amplifying

stages and is of fairly modern design, the H.F. valves will undoubtedly be of the screened grid variety. You will also know whether it is of the normal screened-grid type, or a variable mu valve, for in the latter case there will be on the panel provision for volume control by varying the grid bias. You can hardly go wrong in the selection of valves for these stages, as most makers list only one variable mu valve and two normal screened grid valves, and you would do well to adhere to the types specified for the set you have bought or built, or at any rate to valves having very similar published characteristics. If, on the other hand, your high frequency valves are of the three electrode type, there are several alternatives. Should the stage be a neutralised one, a valve of the medium impedance type (20,000 to 25,000 ohms or thereabouts) should be chosen. For an untuned high frequency stage such as is often found in portables, a high impedance (R.C.C. type) valve, rated at 40,000 to 50,000 ohms is necessary for a resistance capacity coupled stage, or a medium impedance valve sometimes called "H" or "HF" for a choke capacity coupled stage.

For the detector in a modern set, valves of the type almost universally known as HL should be chosen, these being very sensitive and efficient valves with an impedance of the order of 20,000 ohms, and an amplification factor between the figures of 25 and 30. In an older set you will probably obtain best results from a valve designated as type L or LF if transformer coupled, or type H or HF if resistance or choke capacity coupled. In some receivers employing resistance capacity coupling with resistances as high as $\frac{1}{2}$ to 1 megohm, valves of the RCC type must be employed as detectors. Where there is an additional low frequency stage between the detector and the output valve, the valve employed should certainly be of the L or LF type which can accept a stronger input signal without over-loading than the HL general purpose type.

(Continued on page 148.)

AN INGENIOUS DEVICE

A SIMPLE REMOTE CONTROL

Consumes No Current While the Set is in Use and Gives Positive On-off Contact

By J. C. DRINKWATER

THIS instrument, although of simple construction, is the result of considerable experiment. A special feature is that, unlike most other controls, it consumes no current while the set is in use, and gives a positive on-off contact. The action is similar to a G.P.O. line relay and sounder, and complicated, unreliable clock actions, etc., are avoided. The parts required are two electric bell bobbins (complete), about 18ins. of $\frac{3}{16}$ in. springy brass strip 1.32in. thick, two small iron or steel cycle bolts (as used for fixing mudguards), two 2 B.A. brass bolts $\frac{3}{16}$ in. long with two nuts on each, five terminals, seven $\frac{3}{16}$ in. wood screws and a piece of wood for base 3 by 4ins. by about $\frac{3}{4}$ in. thick. The bell bobbins are best bought, if an old bell is not to hand, and they usually cost about sixpence each without core. In this case two small iron or steel bolts will serve as cores.

Details of Construction

First drill a hole through the base

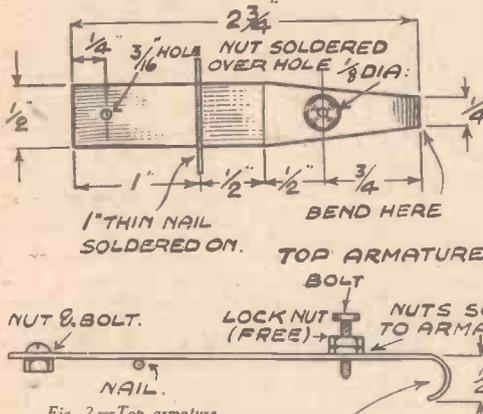


Fig. 2.—Top armature.

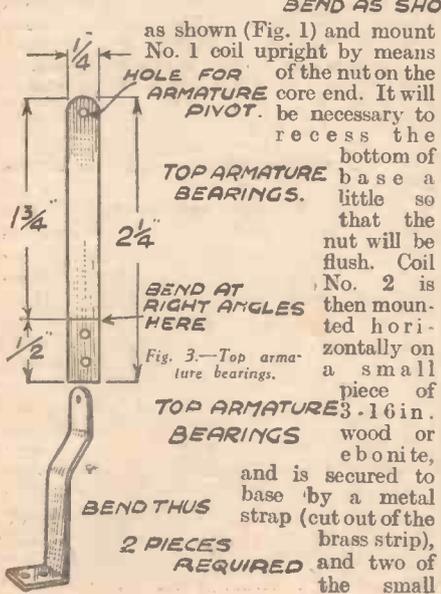
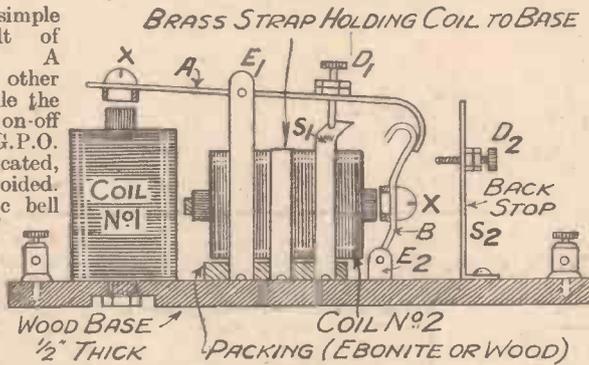


Fig. 3.—Top armature bearings.



E₁ & E₂ ARE BEARINGS SUPPORTING THE ARMATURES "A" & "B."
D₁ & D₂ ADJUSTING SCREWS.
X IRON CYCLE NUTS & BOLTS.

Fig. 1.—Completed relay showing armature "B" attracted, and relay in closed position after No. 2 coil has been momentarily energised. L.T. circuit is then closed and L.T. current then flows up the bottom armature to top armature through bearings to set.

wood screws. The armatures, bearing supports, and stops are next cut to size out of the strip and the holes drilled.

Solder the lin. nails to the armatures, as shown in Fig. 2 and fit the iron cycle bolts. Cut the bolts off flush with face of nuts and give the nuts a thin film of solder—this secures them further and also prevents them "sticking" to the magnet cores. Fit the 2 B.A. bolts in position and solder the bottom nut only on each. Bend the armatures, stops and bearings to approximately the shapes shown in Figs. 3 to 7, then assemble the top armature and bearings first. See that

the iron nuts on armatures are directly opposite the magnet (coil) cores. Fix the terminals and connect up as in Fig. 8. Before testing it will be advisable to explain the action of the relay.

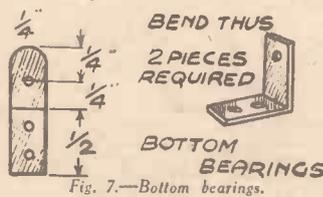


Fig. 7.—Bottom bearings.

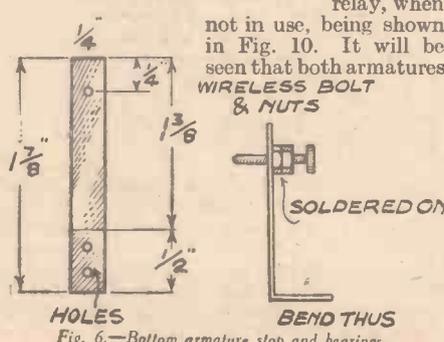


Fig. 6.—Bottom armature stop and bearings.

are so balanced that they normally rest on the "stops." When a current is passed through coil No. 2 the bottom armature is attracted to the core, and in doing so knocks against the top armature and lifts it up. The top armature acts as a kind of latch, and immediately drops back over the bottom armature, and effectively locks it when properly adjusted. This action takes place instantaneously.

On sending a current through coil No. 1, the top armature is attracted to core of No. 1 coil and releases the bottom armature, which falls by its own weight back to its stop.

It will be seen that only a momentary current is needed to operate the relay. The operating circuit is quite distinct and separate from the low tension circuit of the set which it throws on and off. The

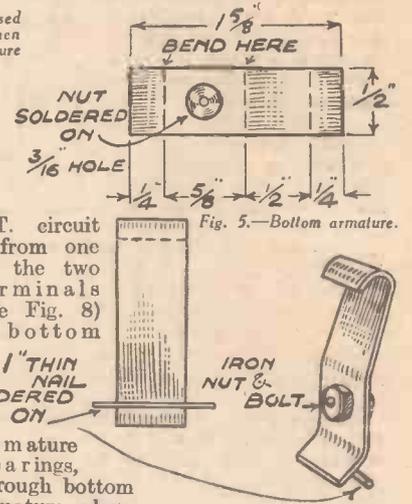


Fig. 5.—Bottom armature.

armature bearings, through bottom armature along top armature (wherein contact), down top armature bearings and out to other L.T. terminal on relay base. To test the relay before using (as is advisable), connect temporarily one end of a battery to terminal 3. Touch terminal 2 and bottom armature should be attracted as explained. On touching terminal 1 the top armature should be attracted thereby releasing the bottom armature.

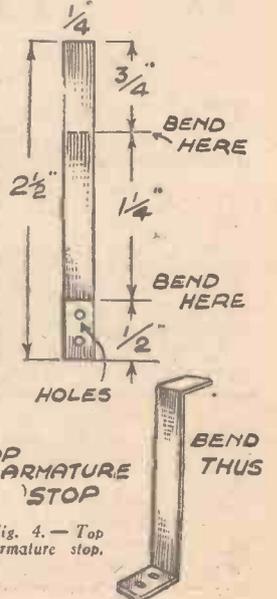


Fig. 4.—Top armature stop.

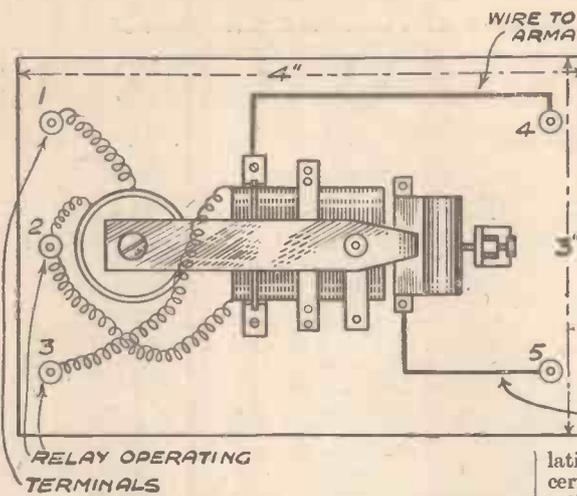
Simple Adjustments

A certain amount of adjustment will be necessary on both armatures to get smooth working, but this will not be difficult as they are made of springy brass. For operating the relay 3 volts will usually suffice (or a flash lamp battery), but up to 6 volts can be used, especially if there is a long length of wire to the control pushes.

Two ordinary bell pushes are used for operating. One push is used to switch the set off and the other to switch it on. The pushes should be mounted on an oblong switch block, and may be of different colours or simply marked with panel-transfers, but this is, of course, optional. Any number of control points, with two pushes at each point, may be used. Three wires are necessary to each point. Both relay and operating battery should be as near to the wireless set as is possible to keep the low tension wiring on the set as short as possible. Finally, see that the relay is kept in a horizontal position and not moved, otherwise, if tilted, its working will be erratic. A neat wood casing can be made to house the relay if desired. If properly adjusted it will be found to operate efficiently without attention.

Of course, it is not necessary to give any instructions as to how to adapt this control to your own

particular receiver, as there are so many different arrangements which may be made up, and these depend naturally, on the type of receiver which is in use, and what form of reproduction is used, i.e., 'phones or loud-speakers. In PRACTICAL WIRELESS dated December 10th, a special illustrated supplement was given showing the use of reproducers at a distance from the receiver, and an article was published in the December 24th issue relative to this supplement. It may be that certain of the instructions given in this article may be of use in the fitting of this form of remote control to your own receiver, and you should, therefore, refer back to these issues. There is one point which must always be borne in mind when fitting up this form of relay, and that is that the current which operates it has naturally to pass through the extension leads, and when only a very small battery or cell is used to operate the mechanism there is a risk of such a loss of current in passing through the long leads, that the relay fails to operate. Therefore obtain a really heavy extension lead—one of the multiple leads sold by Messrs. Bulgin especially for the purpose is admirable—and try to avoid a heavy loss through the leads by using large capacity batteries, or alternatively one of the smaller types of accumulator.



Figs. 8 and 9.—Showing wiring and circuit to relay.

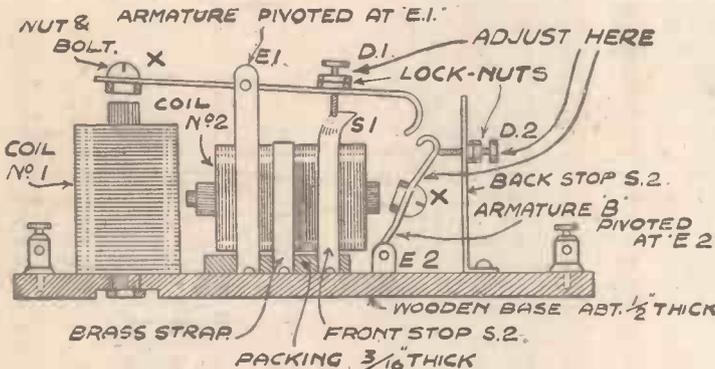
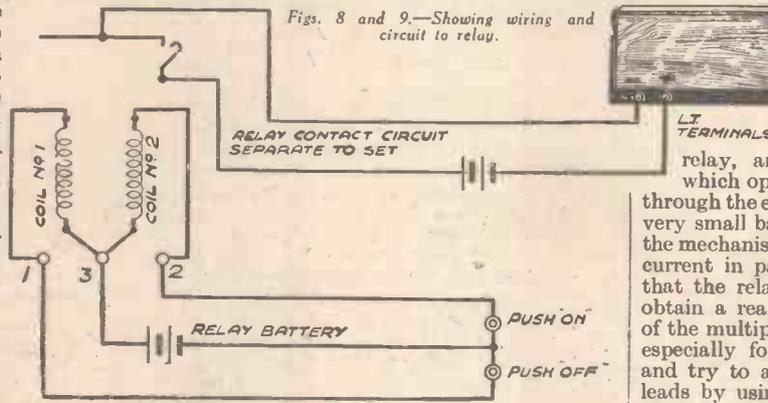


Fig. 11.—Relay in normal position—note top armature, resting on stop, as also bottom armature. No coils energised.

Fig. 10.—Showing top armature in action at the moment of energising No. 1 coil. The armature is clear of its stop for a moment, and this frees the bottom armature which is shown dropped clear by its own weight. The dotted lines show the previous position of the armatures. Top armature drops back on to its stop after being momentarily energised.

The Output Valve

Finally comes the selection of the output valve. This must be chosen with regard to three things—first the volume of sound you require from your receiver; second, the strength of signal available from previous amplifying stages to be applied to the output valve; and, third, the type of high tension supply you are using. Dealing first with volume, if you are content with medium volume—sufficient to operate, say, a small moving-coil or moving iron speaker, and to fill comfortably a small room, an output valve of the "power" class, or a small pentode will suffice. The choice between the two will depend upon the previous stages in your receiver. The pentode valve is the more sensitive of the two, that

SQUARE PEGS IN ROUND HOLES
(Continued from page 146.)

is to say, it will give its rated output for a smaller input signal. It should be employed, therefore, for the conditions just mentioned, in a set having no high frequency valve and no other low frequency stage. That is to say, in the simple two-valve receiver. If, however, you employ a high frequency stage, a "power" triode, which is a little cheaper, will give you all you want. Both small pentode and "power" valve types can be operated economically from small high tension batteries.

For big volume, say, a moving coil speaker of medium size, or for a large room, a bigger power output is necessary and the valve to use is either a "super power" triode, or a large pentode. Here again the pentode valve can be used immediately following the detector valve, but for equivalent output the triode super power valve requires a bigger grid input and should be employed only where a previous stage of amplification is available. Large pentodes and super power triodes impose a drain of from 10 to 15 milliamperes on the high tension supply, and are therefore recommended only where a mains high tension unit, or at least a triple capacity high tension battery is available.

FRAME AERIAL CONSTRUCTION

This Article Explains How Interference Can be Eliminated by Using a Frame Aerial and Gives Particulars for Making Such a Component.

By FRANK PRESTON, F.R.A.

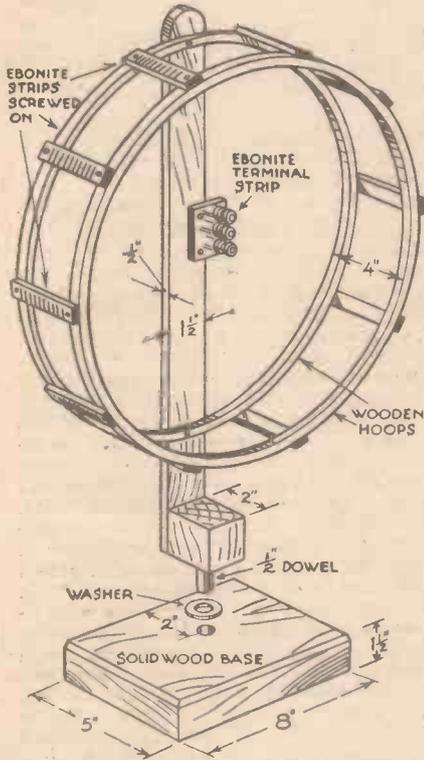


Fig. 2.—This shows how a circular frame aerial can be made quite easily.

FASHIONS in wireless change rapidly and I am perfectly certain that they do not always change for the better. Rather like those of ladies' clothes, they have a habit of dying out and then re-appearing again at a later stage. Examples of such repetitions in wireless history are to be found in the superheterodyne, cylindrical tuning coils, grid-leak detection and push-pull amplification, to mention just a few. But a few years ago frame aerials became very popular and it was prophesied at the time that they would eventually supersede entirely the more usual elevated wire. Of course, they have not done so, and in fact almost the reverse has taken place, with a result that the frame is now scarcely ever employed for broadcast reception.

Improved Selectivity

I should be one of the last to say that a frame is by any means so efficient a "collector" of wireless signals as even an average indoor aerial, but I am quite convinced that it still has much to recommend it. Probably nearly every reader knows of the valuable directional properties of a frame aerial and realizes the importance of these from the viewpoint of selectivity, and yet how few take advantage of them.

Many an old set which is now insufficiently selective to receive even the local Regional free from interference by a powerful foreigner could be improved beyond recognition by the simple expedient of converting it for use with a frame aerial. And, moreover, the conversion would cost only a matter of a shilling or two, whilst the expense of fitting a band-pass tuner or other similar device would probably amount to at least a pound. It is admitted that a frame would cut down the range of reception to a certain extent, but long range is of absolutely no value if the set is incapable of separating the stations that it brings in. Besides, any method of increasing selectivity must necessarily produce a certain reduction in sensitivity, and the frame aerial is only slightly inferior in this respect to many other far more complicated devices. It also possesses another advantage which is of paramount importance at the present time when interference from various electrical devices is so common and troublesome; a frame is much less susceptible to electrical disturbances than is any other type of aerial.

Prevents Electrical Interference

There is a prevalent idea that the reason for this is to be found in the lower sensitive-

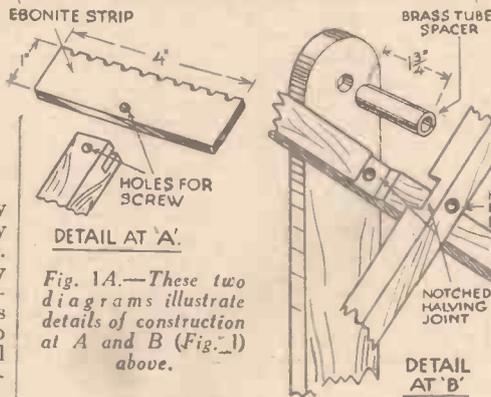


Fig. 1A.—These two diagrams illustrate details of construction at A and B (Fig. 1) above.

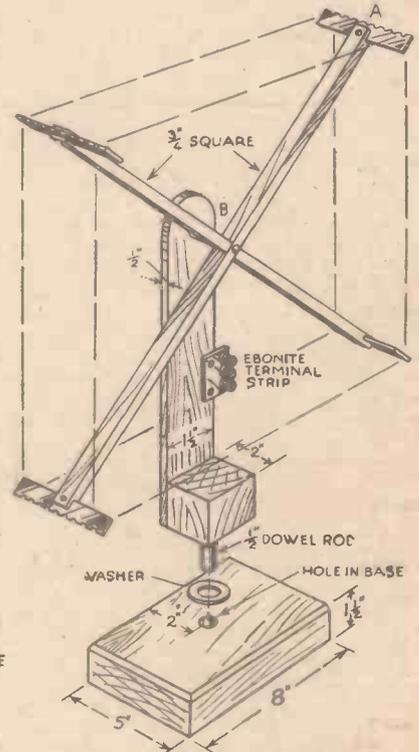


Fig. 1.—Constructional details for a square frame aerial.

ness of the frame and that interference is reduced only in the same proportion as are the legitimate signals. If that were the case the frame would confer no real benefit, because as the set were made more sensitive so as to bring signals up to greater strength the interference would return. But this is not true by any means. A frame aerial does actually give less response to local electrical disturbances than to proper wireless signals and therefore offers a marked advantage. I suppose you

will wish me to qualify this statement since it is contrary to a rather general opinion. To do so as briefly as possible I would point out that any signal (either a proper one emanating from a broadcasting station, or a parasitic one produced by electrical machinery) consists essentially of two parts or "components," one of which is magnetic in character and the other electrical. Both are sent out together and eventually combine, but near their source the electrical one is far more powerful than the magnetic. Now a frame aerial is actuated by magnetic impulses only, and scarcely responds to the electrical ones; in consequence it is affected to a much lesser comparative extent by nearby "transmissions." Since disturbances from elec-

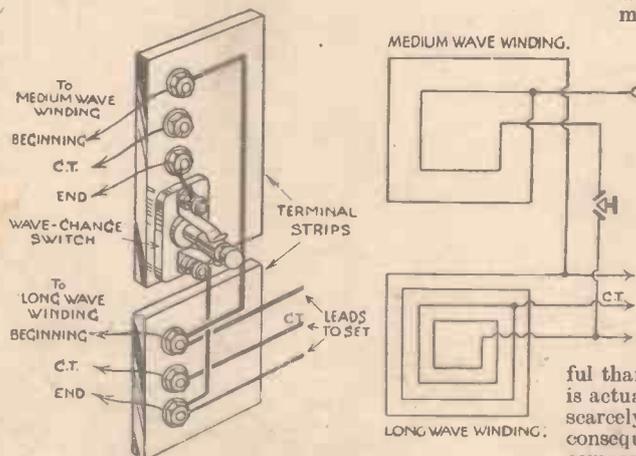


Fig. 3.—The connections required when the frame is wound for both long and medium wave reception.

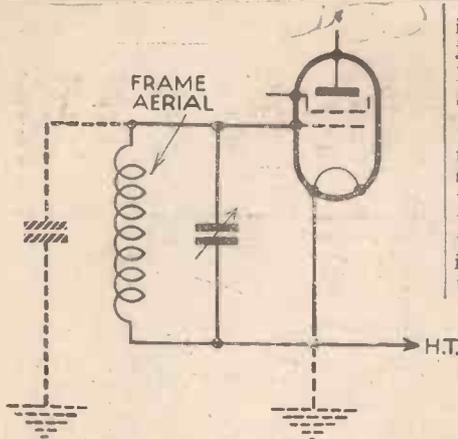


Fig. 4.—This diagram illustrates the effect of stray capacities when using a "plain" frame aerial (the aerial is shown as a coil to simplify the illustration).

trical devices are invariably near to our aerial (they do not travel over any great distance) the frame does not recognize them. An elevated aerial responds quite readily to both the electrical and magnetic components and therefore picks up the interference.

Making a Frame Aerial

Should any of the advantages quoted above appeal to you I am going to suggest that you make a frame aerial, if only for experimental purposes. It need cost no more than a shilling or two at the most; whilst if you have a few odd pieces of timber, some scrap ebonite and a reel of wire on hand there will be nothing further to buy.

Size of Frame

The first question that arises is in connection with the size of the frame; the larger it is the greater will be its sensitiveness and (to a small extent) the lower its directional properties. As a "happy medium" I would suggest that it might be about 3ft. square, but if you are of an experimental turn of mind, and have the facilities, you should try various sizes and carefully compare the results from each. The wooden framework may easily be constructed in one of the ways shown in the sketches of Figs. 1 and 2. Fig. 1 shows a square frame and Fig. 2 a circular one; both are equally effective, but some readers may prefer one particular shape from the purely aesthetic point of view. It will be seen that the square frame is made up from two pieces of 1/2 in. square material which are fastened together by means of a notched halving joint. An ebonite strip is slotted into each end of both pieces and is used to carry the windings; the ebonite should therefore have a number of notches filed at distances of about 1/4 in. along its edge.

The circular frame is made up from two wooden hoops (of the kind sold as children's toys) to which ebonite strips are attached at distances of about 8 in. round the circumference.

Whatever kind of frame is adopted it must be easily rotatable, and for this reason the method of mounting shown in the sketches is very good and convenient. An upright member is screwed to the frame proper and has a solid block of wood screwed to its lower end. The block is fitted with a short length of 1/4 in. dowel rod and this slots into a hole made in the solid wooden base; to reduce friction a washer is put on the dowel. If the rod is smeared with graphite or black lead the frame will be found to turn very easily, but

if you prefer you might make rather a better job by using a short length of iron rod in place of the wooden dowel.

The Windings

I think the sketches will be self-explanatory, so I will say no more about constructional details, but will pass on to the winding particulars. The frame can be wound to cover both long and medium waves, but as the long wave winding introduces some complication I recommend that for a start you should wind the medium wave portion only. This may consist of 20-gauge wire or of special stranded frame aerial wire such as Lewcos "9/40." The latter material is slightly more efficient and, being silk-covered, has a somewhat smarter appearance. The correct number of turns will naturally depend upon the size of your frame and as a start you should try a total length of wire of about 75ft.—this will probably be rather too much but it can be reduced later if necessary. Space the turns by about 1/4 in. and make a tapping after winding half the total length of wire, because this might prove very useful, as I shall explain later. The ends of the winding, and also the tapping, should be connected to three terminals mounted on a small ebonite strip and attached to the frame as shown in the sketches of Figs. 1 and 2.

The Long-wave Winding

If a long-wave winding is required it will be best to arrange this in such a way that it may be connected in parallel, rather than in series, with the other so that there will be no need to short-circuit it for medium-wave reception. The reason for this is that short-circuited turns are liable to act as a screen and to impair the efficiency of those in use. The long-wave coil should have a maximum length of some 220 feet, and may consist of 26-gauge wire. The turns do not need to be spaced so the wire can be piled wound at one edge of the frame. A centre tapping should be taken as before, and the three leads brought out to a second terminal block. It is important that both long and medium wave windings should be put on in the same direction. An ordinary push-pull wave-change switch will be required and should be mounted on one of the terminal strips and connected up, as shown in Fig. 3.

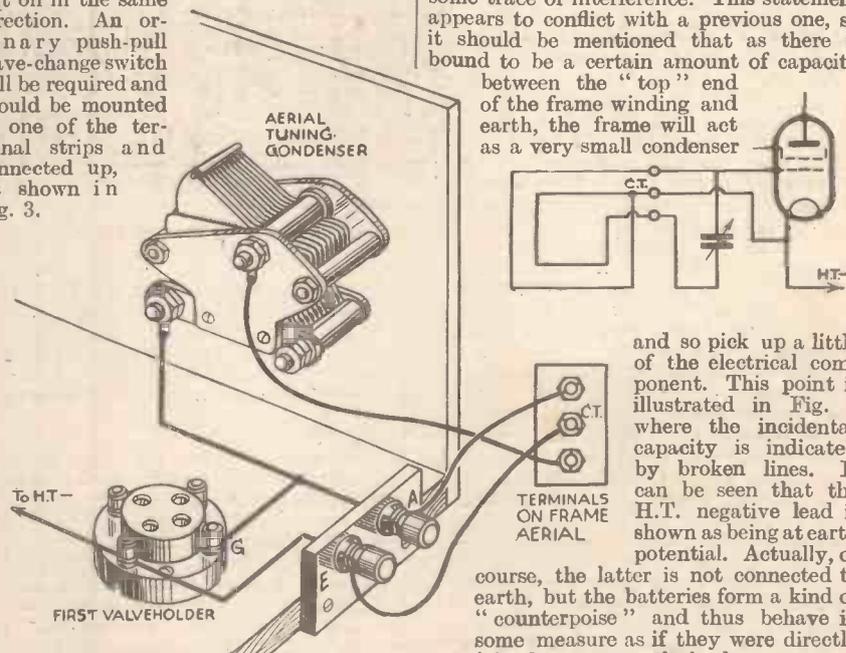


Fig. 6.—The method of connecting a centre-tapped frame aerial to eliminate electrical interference.

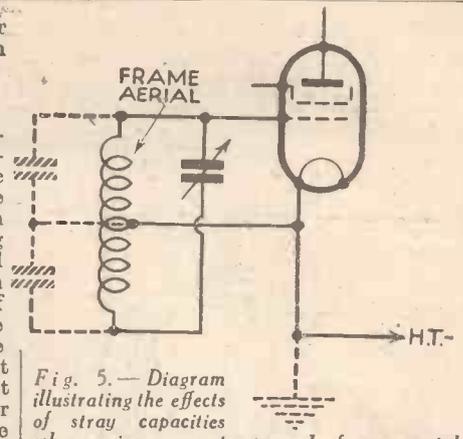


Fig. 5.—Diagram illustrating the effects of stray capacities when using a centre-tapped frame aerial.

Connecting the Frame Aerial

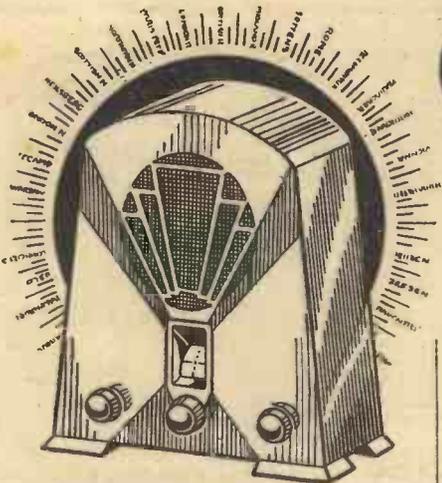
And now let us see how the frame is to be wired up to the receiver. In the first place the aerial coil must be removed entirely, and the two ends of the frame connected to the aerial and earth terminals, ignoring for a moment the centre tapping. This procedure will be just the same whether the frame is wound for both wavelength ranges or for medium waves only. The leads to the aerial tuning condenser should be removed, and wires taken from this component to the aerial and earth terminals of the set. Tuning will be exactly as before, since the aerial condenser will now operate on the frame and the other condenser (I assume that the set has an H.F. stage) will tune the inter-valve coupling circuit. The only difference in operation will be that the frame must be rotated to bring any transmission up to full strength. When two stations interfere with each other it will be found quite easy to eliminate the unwanted one by turning the frame until it is at right angles to the direction of that station.

Eliminating Electrical Interference

In the case of electrical disturbances the frame will go a long way towards eliminating them when connected as just described, but there might still be some trace of interference. This statement appears to conflict with a previous one, so it should be mentioned that as there is bound to be a certain amount of capacity between the "top" end of the frame winding and earth, the frame will act as a very small condenser

and so pick up a little of the electrical component. This point is illustrated in Fig. 4 where the incidental capacity is indicated by broken lines. It can be seen that the H.T. negative lead is shown as being at earth potential. Actually, of course, the latter is not connected to earth, but the batteries form a kind of "counterpoise" and thus behave in some measure as if they were directly joined to an earth lead.

(Continued on page 172.)



OUR VIEWS ON RECEIVERS

THE SUNBEAM UNIVERSAL MAINS RECEIVER MODEL U.35

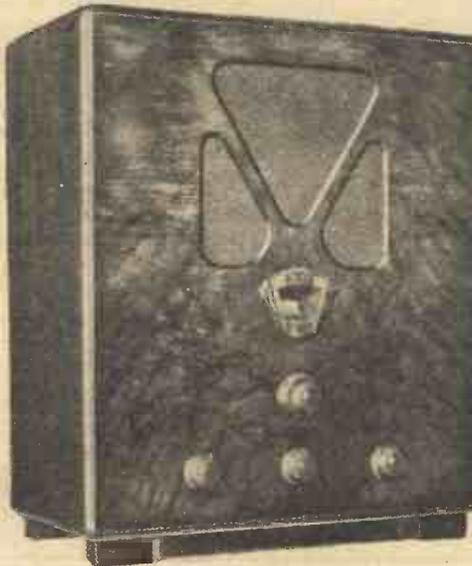
A RECEIVER which is available for either A.C. or D.C. mains, without alteration, is a valuable arrangement for many listeners. The first one to be received by us for test is the Sunbeam, which is, incidentally, the first all-electric model to be produced by the Sunbeam Electric, Ltd. This is, as may be seen from the illustration, a very attractive looking receiver, from both the front and the back view. The cabinet is of neat walnut, with a simple but pleasing loud-speaker fret, and contains only four controls. These are, top centre, main tuning knob with concentric trimming control, and beneath it the mains on-off switch. On the right is a combined reaction and volume control, and on the left a combined wave-change and radio-gram switch.

The Circuit

The circuit, whilst of the orthodox S.G., detector and Pentode arrangement is very novel in many ways. First of all, the H.F. valve is of the ordinary S.G. type (specially designed, as are all the valves in this receiver for D.C. mains) and the cathode is returned to earth via a fixed and variable resistance. This introduces a variable factor across the aerial circuit and so acts as a pre-H.F. volume control, the actual component being ganged with the Reaction condenser so that the selectivity is also improved with the use of this particular knob. As the sensitivity of the H.F. stage is reduced, the reaction applied to the detector stage results in the sensitivity of this stage being increased. When these two controls are suitably chosen, as in this receiver, the result is a very nice adjustment of volume and selectivity combined. A special tuned-anode arrangement is employed for coupling the H.F. and detector stages and a change-over switch is inserted between the grid of the detector valve and the anode coupling condenser. This changes over from radio to gramophone reproduction. The reaction is capacity-controlled. An L.F. transformer is included direct in the anode-circuit of the detector valve and feeds the output pentode, which, as in the case of the remaining valves is of the Osram D.C. mains type. The output circuit of the Pentode is provided with a transformer to match the moving-coil correctly, and two additional terminals are provided for the use of an external loud-speaker when required. The mains equipment is, of course, the most interesting, in a receiver of this nature. No mains transformer is

employed, as when the receiver is employed on D.C. mains there must, of course, be direct connection with the heaters, etc., of the valves. Accordingly a metal rectifier is included in one mains lead, whilst a smoothing circuit and special resistances are joined in series with this circuit for the purpose of voltage adjustment. The remaining mains lead is joined direct to the chassis, via the on-off switch. This necessitates the mains plug being inserted in the mains socket in the correct relation, and when using the receiver on D.C. mains

the volume obtained from London, in our laboratory, was more than would be needed in the average home. There was no trace of cabinet resonance, or "boxiness," and there was no difficulty in handling the receiver. The disposition of the controls enabled the best results to be easily obtained, and the receiver should appeal to many, especially those who are not in permanent residence and change from time to time from one type of mains to the other. There are one or two points which we should like to mention in the design of this type of receiver, principally with regard to the obtaining of the various potentials. First of all, the heaters of the valves are fed in series and the arrangement of feeding these valves is such that the risk of induced hum is practically removed. From the voltage dropping resistance the positive H.T. lead is fed to one side of the pentode heater from whence it passes to the S.G. heater. From this it goes to the Detector, and thence direct to the chassis. This is a splendid method of obtaining heater supplies for valves of the type employed and the advantage is reflected in the reproduction which bears no trace of commutator ripple (in the case of D.C.) or hum in the case of A.C. mains. To ensure adequate smoothing the condensers which are used in conjunction with the mains smoothing choke are of the aqueous electrolytic type, and, although the metal rectifier only provides half-wave rectification when using the receiver on A.C. mains this provides adequate smoothing. Finally, the price asked for this particular receiver, considering it is of the universal type, is very moderate, and we can thoroughly recommend it to our readers.



The Sunbeam Universal Mains Receiver Model U.35.

We congratulate the Sunbeam Electric, Ltd. on their enterprise in producing a receiver of such advanced design, and, at the same time, of such outstanding performance, at the extremely competitive price of 9 guineas. The specification which is given in brief below compares very favourably with many battery receivers.

no signals will result when the plug is in one position, whilst with A.C. mains, hum will be excessive unless the plug is in a certain position. This is pointed out by the makers in the instruction chart so that the listener need have no fear on this score.

Test Results

Unfortunately we had very little time to give this receiver a really thorough trial, but the short test which was given showed that it was a really sound job, and was capable of really great things. On D.C. the smoothing appeared adequate and no trace of hum or ripple was observed. The volume was ample, and the tone was very pleasing indeed. It was characterised by forwardness and brilliance, whilst there was no lack of bass. A special internal aerial is fitted inside the cabinet, and with this

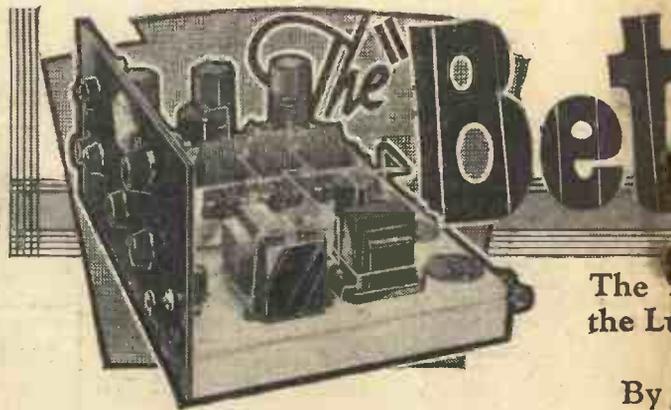
SPECIFICATION

Receiver: Sunbeam Universal U.35.
 Makers: Sunbeam Electric, Ltd.
 Circuit: S.G., Detector and Pentode tuned-anode coupling, directly-heated D.C. mains-type valves. Circuit arranged for use indiscriminately on A.C. or D.C. mains with no alteration.
 Speaker: Moving-coil, with transformer matched to the Pentode.
 Consumption: 50 to 70 watts.
 Controls: Three—tuning, wave-change and radiogram (combined) and volume and reaction (combined).
 Cabinet: 18in. by 15in. by 9in., walnut.
 Price: £9 9s. 0d.

FIRST AGAIN!

LAST week we gave a description of this new receiver, and explained the reason for the development of a set of this type. It will be seen from this week's illustrations that the panel appears to bear a formidable array of controls, but, as was pointed out in the first notes, this is not actually the case. Although there are seven knobs on the panel front, it will be found that only two are normally required, namely, the main tuning control—which is, of course, used to select the station to which you wish to listen—and the volume control (which may be the variable-mu potentiometer used to reduce the strength of the station or the reaction condenser used to increase the strength). The remaining knobs control tone or selectivity, or change the wave-band or

round the edge with a $\frac{1}{16}$ in. drill, each hole being separated by a space of about 1-16th. A sharp penknife should then be inserted in each hole and levered backwards and forwards, doing this on both sides. It will then be found very simple to give the piece of ebonite enclosed by the holes a sharp tap or two, when it will fall out. The hole need not be cleaned up, as the window will be found to fit comfortably. Drill and countersink the holes for the wood screws along the correct line, and then mount the panel components as shown in the illustration (Fig. 5). Now, before putting the panel on to one side, cut off a short length of Glazite and join one terminal on the potentiometer to the nearest terminal on the on-off switch, as shown in the wiring diagram, Fig. 6. Also attach the 10,000 ohm spaghetti to the slider terminal of the potentiometer.



The
the Lu
By

the different baseboard components, taking your guide from the wiring diagram (Fig. 6). For the three-gang condenser, again use the makers' template, marking for the purpose a line down the centre of the baseboard. When each component is in its correct position, mark with an awl or similar tool the position for each screw hole, and in addition pencil a dot where each of the numbered holes is shown. Note that there are two holes in the coil L.3 and one in the coil L.2. These should be marked through the holes in the bases of the Telsen coils. When all positions are accurately marked, remove the components and carry out assembly in the following manner. First of all attach the variable condenser, and then push the panel into position to make quite certain that the dial is accurately registered and that the spindle is on its correct centre. Next attach the three coils, but before driving in the fixing screws, remove the two band-pass coils from the small base on which they are supplied, and fit a three-gang rod through all three coils. This will ensure that the three coils are correctly centred. Again push the panel into position to make certain that the coil spindle will clear. If this is so, attach the small indicating plate on the panel for the wave-change switch. This will be found in the envelope in the coil box. Do not attach the coil L.1 too near the panel, or the bolts for the indicating disc will foul the coil screen. Attach the small limiting device

Fig. 4.—Components mounted on baseboard and partially wired.

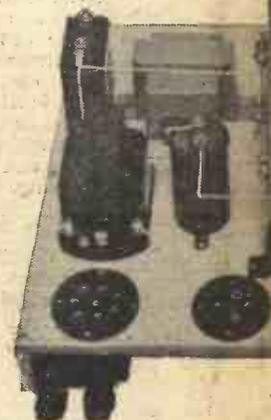


Fig. 3.—Front of panel.

switch the set on or off, so that actually the receiver has two controls, with the others acting purely as refinements. However, the utility of these controls will be appreciated when you come to handle the receiver.

The Panel

The first part of this receiver to build is the panel, and for this purpose the panel should be drilled from the dimensions shown in Fig. 2. In this illustration, by the way, the various controls are marked to show their purpose. The holes should be drilled to just take the individual components, and, unfortunately, these are not all of the same size. Therefore drill $\frac{1}{16}$ in. holes at each point, and enlarge out to just take the various one-hole fixing bushes. The condenser escutcheon is marked out from the template supplied by the makers of the three-ganged condenser, and great care should be exercised to get this exact, as otherwise the dial markings will not be accurately registered in the window, and the pointer will not be of much use. To cut out the window for the escutcheon the best method is to scratch out the shape (from the template) and then to drill all

meter. This part of the work may now be laid aside whilst the remaining constructional work is carried out.

The Chassis

The wooden chassis is made up from the 15in. by 10in. baseboard, with side runners $1\frac{1}{2}$ in. deep. Before attaching these, drill the four holes for the valve-holders. For the valves V1, V2 and V3 these should be $\frac{1}{16}$ in. in diameter, but for V4, the 7-pin valve, a slightly larger hole is required. If a larger bit is not available, the hole may be drilled to $\frac{1}{16}$ in. and then filed out to just clear the seven valve legs. Now position all

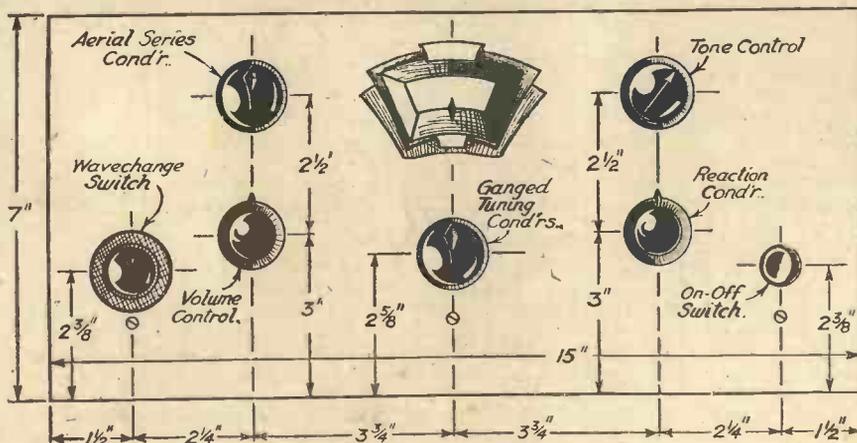
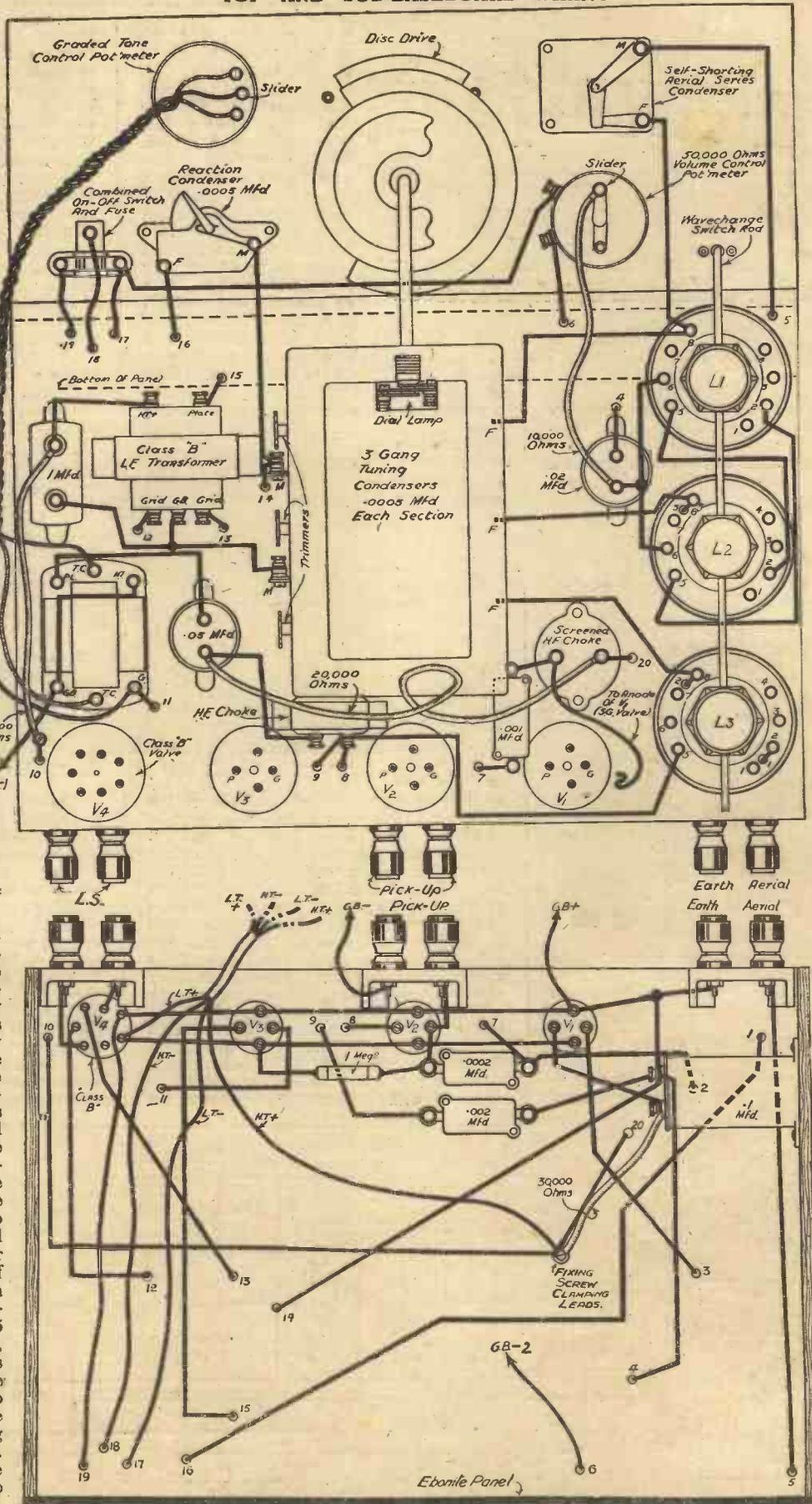


Fig. 2.—Panel-drilling dimensions.

TOP AND SUB-BASEBOARD WIRING

LIST OF COMPONENTS FOR THE BETA UNIVERSAL FOUR

- One Pair Telsen Band Pass Coils (Type W. 290).
- One Telsen single Matched Coil (Type W. 216).
- One Telsen Three-gang Condenser with Disc Drive.
- One Telsen Aerial Condenser with shorting switch.
- Three 4-pin chassis-type valveholders. Clix.
- One 7-pin chassis-type valveholders. Clix.
- One .02 Dubilier fixed condenser, type 9200.
- One .001 Dubilier fixed condenser, type 670.
- One .002 Dubilier fixed condenser, type 670.
- One .05 Dubilier fixed condenser, type 9200
- One 1 mfd. Dubilier fixed condenser, type BB.
- One .0002 mfd. Dubilier fixed condenser, type 670.
- One .1 mfd. Dubilier fixed condenser, type 9200.
- One 10,000 ohm spaghetti resistance. Lissen.
- One 20,000 ohm spaghetti resistance. Lissen.
- One 30,000 ohm spaghetti resistance. Lissen.
- One Bulgim H.F. Choke, Type H.F. 9.
- One Lissen standard H.F. Choke.
- One .0005 mfd. reaction condenser. Lissen.
- One Multitone Toco 1-4 L.F. Transformer.
- One Multitone Graded Potentiometer.
- One Benjamin Class B Driver Transformer.
- One Busco three-point switch with fuseholder.
- One Lewcos 20,000 ohm Potentiometer.
- One Becol Ebonite Panel, 15in. by 7in.
- One 1 megohm Lissen Grid Leak with wire ends.
- One Lissen 16-volt Grid Bias Battery.
- One Lissen 120-volt H.T. Battery.
- One Lissen 2-volt Accumulator.
- One Relo Loud-Speaker, Type F.6/PM/O1/Class B.
- One 5-Ply Baseboard, 15in. by 10in.
- One Cabinet. Peto-Scott.
- One Cossor 220 VSG valve (metallized).
- One Cossor 1210 Det. valve (metallized).
- One Cossor 215 P. valve.
- One Cossor 240 B. valve.
- Three Belling-Lee Terminal Mounts.
- Six Belling-Lee Type B Terminals (Aerial, Earth, Pick-up, Pick-up, Loud-Speaker, Loud-Speaker).
- One Belling-Lee Four-Way Battery Cord.
- Three Wander Plugs, G.B.+ , G.B.1 and G.B.2.
- Sundry Screws, Fuse Bulb, Coil of Glazite, Flex, etc.



(Continued from previous page.)

and although we propose to wait until next week before giving complete operating instructions, the following brief instructions will enable those who cannot wait to try out the receiver and get some idea as to its capabilities. The battery leads, having only four plugs, are extremely simple to connect, the L.T. leads being joined to the accumulator, and the H.T. leads being plugged into the negative and positive ends of the battery. The grid-bias is a little more complicated, the plug marked positive (that connected direct to the filament wiring) being plugged into the positive end of the battery, and the lead from the potentiometer being plugged into the other end of the 16-volt battery. The lead from the Multitone transformer is inserted, for the time being, in the 7.5 volt socket. Pull out the switch, and the receiver should show signs of liveliness. Adjustment of the potentiometer should be made to bring the set into its most sensitive condition, and then the main tuning knob rotated to tune-in a station. The series-aerial condenser and the reaction condenser may be used to adjust the degree of selectivity.

The BEGINNER'S SUPPLEMENT

Conducted by F.J. CAMM

THE EASY ROAD TO RADIO



Condenser Microphone

A MICROPHONE which consists of two plates forming a condenser. When the sound waves from the orchestra or other item being broadcast impinge on the plates (which are very thin) they vibrate in sympathy with them, thus varying the distance between the plates. This naturally varies the capacity of the plates. The variation in

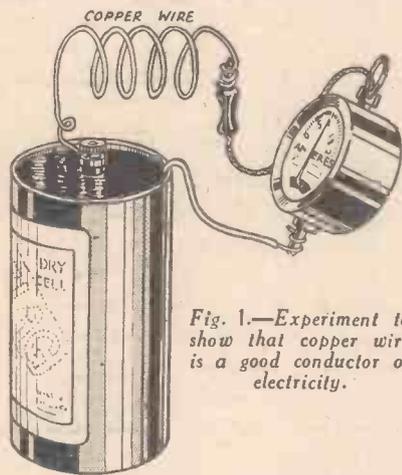


Fig. 1.—Experiment to show that copper wire is a good conductor of electricity.

capacity effects the voltage of the circuit in which the condenser microphone is connected, and thus varies the magnitude of the wireless waves being transmitted. The condenser microphone differs from the ordinary carbon microphone in that it works by varying the capacity of the circuit in which it is joined whereas the latter varies the resistance. See also *Carbon Microphone and Microphone*.

Conductance

The property which a wire or other body has for conducting electricity. Another term meaning the same thing is "conductivity." Substances like copper, which offer very little opposition to the flow of an electric current, are said to have large conductance or good conductivity, while insulators and other high-resistance media have small conductance. Conductance is the converse or opposite of resistance, and is measured by its reciprocal (unity divided by the resistance). Thus, for example, if a wire had a resistance of 5 ohms, then its conductance would be 1/5.

The unit of conductance is the *MHO* (ohm reversed). Thus a body with a resistance of 1 ohm has a conducting power of 1 mho, or one with a resistance of 2 ohms a conductance of half a mho (no pun meant).

THE BEGINNER'S ABC OF WIRELESS TERMS

(Continued from April 8th issue, page 126.)

Conductor

Any substance which will readily allow the flow of electricity through it. There is no hard and fast rule as to what is a conductor and what is an insulator, as the terms are of a comparative nature. In the same way there is no such thing as a perfect conductor or perfect insulator. However good a conductor is it always offers some slight opposition or resistance to the flow of current, even as the best of insulators will pass some current if the voltage is high enough.

Most metals are good conductors. The following table is a list of substances in the order of their conductance. The

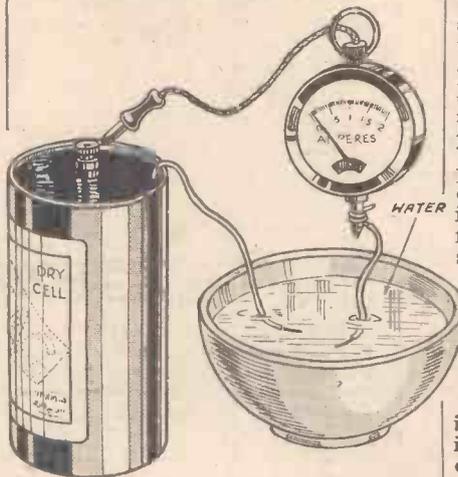


Fig. 2.—This experiment demonstrates that water is a poor conductor.

best conductor is placed first on the list, while the worst conductor is shown last.

- | | |
|--------|----------------|
| Silver | German Silver |
| Copper | Mercury |
| Brass | Charcoal |
| Iron | Acids |
| Tin | Impure water |
| Lead | The human body |

A little test to show the difference in the conducting properties of substances can easily be carried out with a battery and an ammeter as in Figs. 1 and 2. In Fig. 1 a coil of copper wire is under test. Momentarily connecting the battery (it must not be left on more than a second, otherwise the battery will be

discharged) will show by the reading on the ammeter that a comparatively large current is flowing. On replacing the copper wire by a dish of water in which a little salt has been dissolved, as in Fig. 2, we get a very small reading, thus showing that the water passes less current than the copper wire. In other words, the copper wire is the better conductor.

Connector

This term is used to denote various devices such as clips and plugs which are used to join electrical apparatus or electric wires. A few well-known examples are illustrated in Figs. 3, 4 and 5. The upper connector in Fig. 3 is a little brass sleeve which slips over the ends of the wires to be joined. The two set-screws are then screwed down on to the wires. The other connector is a plug and socket arrangement used for connecting the wireless set to the mains. The bracket holding the plugs is mounted on the baseboard at the back of the set, and the socket part is joined by flex to the wall plug. Fig. 4 shows a type of connector which has to be used to join the terminal on the top of a screen-grid valve to the other parts of the set. In this case it has to connect with an H.F. choke, so the choke itself is provided with a connector ready fixed by the manufacturers. As you can see, it emerges from the top of the choke, and thus ensures a short, non-inductive lead straight to the valve.

The connector shown in Fig. 5 is chiefly used for joining high-tension and grid-bias batteries together. It consists of a tightly coiled spring with a plug at each end. Normally it is straight, but to use it, it is bent "U" shape and inserted in the sockets as shown. The springiness of the connector keeps the plugs pressing against the inside of the sockets on the batteries and so ensures good contact all the time.

(Continued overleaf.)

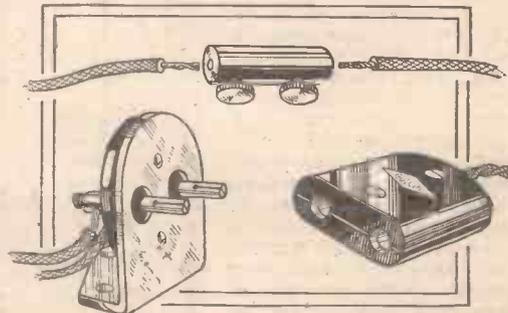


Fig. 3.—Two typical examples of connectors.

(Continued from previous page.)

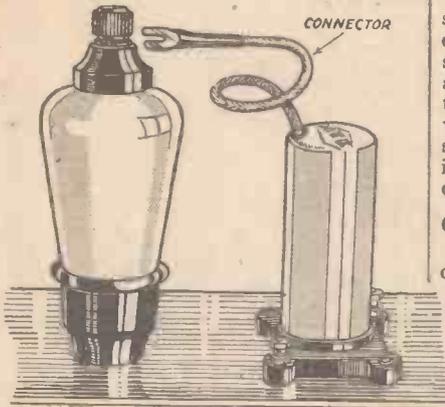


Fig. 4.—An H.F. choke fitted with a connector for joining it to a screen-grid valve.

Contact Breaker

The usual type of contact breaker is a small automatic device used to continuously make and break an electrical circuit. The best-known type is that found in the "works" of an electric bell. This is shown in Fig. 6. The whole unit is called a buzzer, the principle of which was explained under the heading "Buzzer," but the term "Contact breaker" is limited to the part that moves backwards and forwards. Normally the spring shown presses against the screw which is adjusted by the locking nuts annotated in the illustration. When a current is applied it travels via the contact of the screw with the spring, and thence through the electro-magnets. These immediately attract the iron armature and so pull the spring away from the screw. This, of course, breaks the circuit, and the magnets then become demagnetised again; thus they no longer attract the armature, and so it flies back and once more the contacts are "made." The making of the contacts causes a repetition of the whole thing, and so the process goes on, the contact breaker rapidly making and breaking the circuit.

Continuous Current

Another name for direct current. It means an electrical current which flows in one direction only. See *Direct Current*.

Continuous Waves

There are two distinct types of wave motion used in wireless—*damped waves* and *continuous waves*. Damped waves are given out by spark transmitters used for ships' wireless telegraphy and similar purposes. The waves emitted by this type of transmitter start off at a large amplitude and gradually die down. When they have subsided, another train of waves is given out. This dies down in the same way, and so a third train starts, and so on *ad infinitum*.

Continuous waves, as their name implies, do not die down, but continue all the time at the same strength. For the transmission of speech and music continuous waves are essential. You can readily understand that it would be impossible to employ waves which fluctuated all the time. The only fluctuations

which must occur are those due to the speech itself. Any others would cause extraneous noises. In the case of a spark station the sudden rise, the dying down and cessation occurs sufficiently quickly to give a definite musical note as can be verified by listening to the numerous ships and commercial stations transmitting in the morse code just outside the broadcast wavebands.

Copper Pyrites

A natural mineral, one of the copper ores, which is used as a crystal detector in wireless, usually in conjunction with zincite and tellurium. It is a brilliant brass-yellow colour. Chemically it is known as copper-iron sulphide.

Corrugated Insulators

A type of insulator used chiefly for

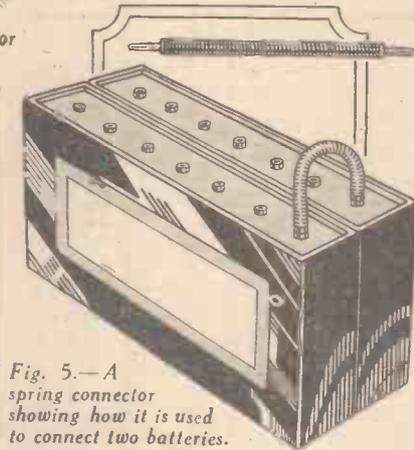


Fig. 5.—A spring connector showing how it is used to connect two batteries.

insulating transmitter aerials. The particular merit of this pattern, two examples of which are shown in Fig. 7, is that it provides a long surface path for any current which might tend to leak

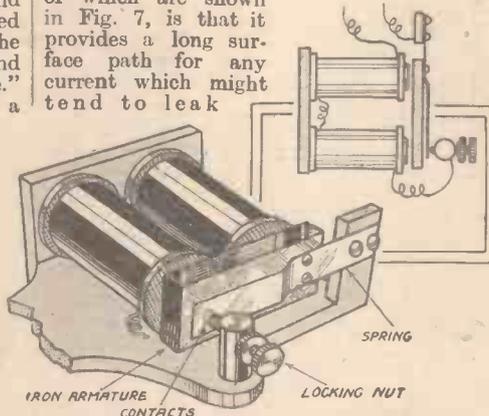
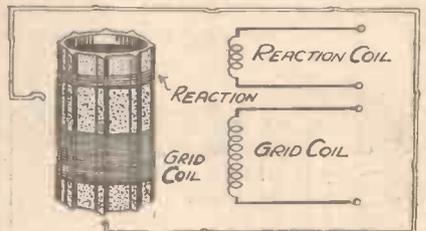
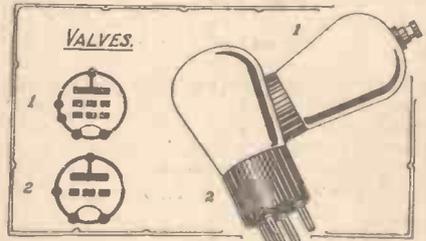


Fig. 6.—A typical contact breaker as fitted to a buzzer.

across it. The shape is also conducive to rapid draining during wet weather. These insulators are, of course, quite suitable for receiving as well as transmitting, their only disadvantage being that they are somewhat heavy.

A USEFUL BEGINNER'S HANDBOOK
25 Tested Wireless Circuits
By F. J. Camm
1/- or 1/2 by post from
Geo. Newnes, Ltd., 8/11, Southampton Street, Strand, W.C.2.

THE SHORTHAND OF WIRELESS.—5.



DISTANT VOLUME CONTROL

IT is not generally realised that the leads to the potentiometer controlling the variable-mu characteristics of the S.-G. valve in Battery Receivers are at a low potential, and I have found that there is no reason why the length of these leads should not be increased so that the potentiometer may be operated at some point distant from the set. If the set should show signs of instability when this remote control is operated, a little adjustment in the values of the decoupling components of the S.-G. valve will rectify matters. In actual practice I had to increase the value of the capacity of the bypass condenser in the anode circuit.
—L. G. STOKES.

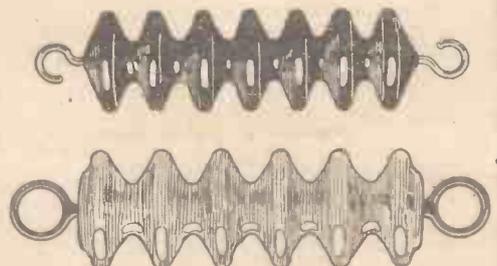


Fig. 7.—Two types of corrugated insulator.

£9.9.0 only—

brings you a perfect set for reception whether your mains be A.C. or D.C.

A demonstration of the

SUNBEAM
UNIVERSAL A.C. or D.C.
3 VALVE ALL-MAINS SET

will convince you of its wonderful performance. It is really unnecessary to use an outdoor aerial in normal situations as it is possible to receive from 15 to 20 stations at full speaker strength on the internal aerial, with selectivity of a high degree—altogether a Receiver of extraordinarily high efficiency.



See "test" report in this issue of "Practical Wireless."

MODEL U.35.

SPECIFICATION :

UNIVERSAL—D.C. or A.C. 3-valve set.
CIRCUIT—S.G.H.F., Det. and Pentode.
RECTIFIER—Westinghouse.
MAINS—D.C. or A.C.
VOLTAGES—200-250 variable.
PERIODICITY—25-100 cycles.
SPEAKER—Moving Coil; also sockets for using extra speaker.
PRICE—£9:9:0 complete.

CONTROLS—Tuning: Single dial. Switching: Combined Gramo-Long-Short. Combined Reaction and Volume control.
AERIAL—Self-contained and socket for external aerial.
SELECTIVITY: Adjustable.
PICK-UP—Sockets provided.
CABINET—Walnut. Size: Height 18½". Width 15". Depth 9".

Send a Post Card to us now and we will arrange for your Local Dealer to give you a Free demonstration. Write Dept. "U."

SUNBEAM ELECTRIC LTD.,
SUNBEAM ROAD, LONDON, N.W.10.

Telephone: Willesden 1575 (3 lines).

"A common state of affairs"

and experimental work. The information given in some of the arrangements described and the trader would be well advised to consult the Technical Queries Editor:

QUESTIONS AND ANSWERS

WAS IT A BREAKDOWN?

"PUZZLED" (Andover).—"I was very interested in the loudspeaker tests of frequency of Mr. Watson Watt, but did the thing break down when he said he would go from 100 down to 35? I got nothing of this, nor did a friend to whom I mentioned it, but he was told that his set must have been at fault, as other people could hear below the 100 frequency."

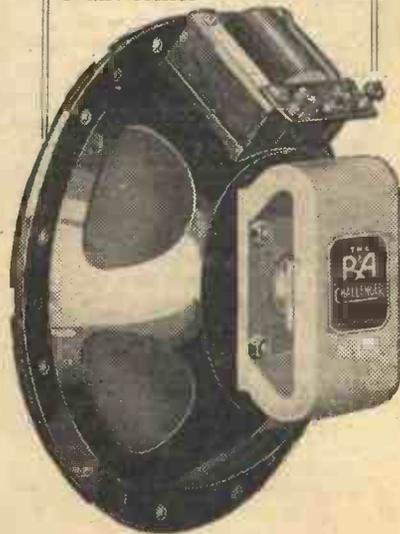
There was no breakdown so far as we are aware, so probably either your set or your loudspeaker "cuts off sharply" at 100 or so—which is a much more common state of affairs than is often suspected. Owing to the accommodating nature of the ear such a limitation in frequency response often goes quite unsuspected until shown up by a test of the kind referred to.

and a remedy

The above reprint is from a recent issue of a Wireless Journal. A remedy for the sharp cut off in response below 100 cycles lies in installing an R & A "Challenger," the reproducer which does not cut off, but which reproduces the complete orchestral range from 50 up to 8,000 cycles.

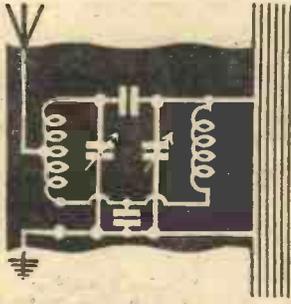
Ask your dealer to demonstrate this remarkable Reproducer, and write us for copy of Laboratory Test Reports.

"CHALLENGER" P.M.M.C. REPRODUCER, complete with 3-ratio Ferranti Transformer 35/-



REPRODUCERS & AMPLIFIERS LTD., WOLVERHAMPTON.

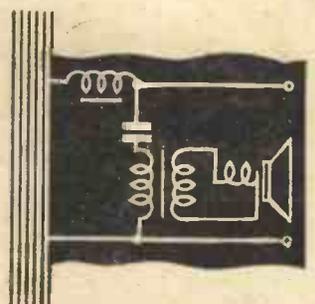
The **R & A**
"CHALLENGER"



RADIO RAMBLINGS

By JACE

Gottings from my Notebook



Radio Bargains

WE see every day glowing advertisements in the Press of wonderful radio bargains. Sets which have been selling from £50 to £60 are offered at prices ranging from £10 to £20. To the uninitiated this is apparently a wonderful chance of obtaining a well-known set at a knock-out price. The first cost in most things is not the most important to consider, but the utility, the pleasure and the upkeep. When a manufacturer replaces an old model with a new one, which combines all the latest improvements and advancements in radio, the obsolete models are gathered together and sold to dealers and stores. Some of the sets which brought in stations loud and clear are found to be unselective, others that were selective, so selective that they choked off the rich harmonies and produced distortion, some are "howlers." If you have had no past experience in radio, ask a "fan" who is a reader of a radio paper, and who has had actual experience with a radio set, for advice, or write to a journal for it. Hear his set, then, if you like it, buy or make just that set, and buy it from a regular radio dealer who will accept some form of responsibility for its good behaviour and give you service after sale. You cannot expect that when you buy a junk bargain. As a rule the store or dealer in regular radio products does not buy junk, for it does not pay to buy poor radio merchandise at any price.

Superhet or Band-pass

A COLLEAGUE said to me a few days ago: "You see, I was right when I told you the superhet would come into its own this season." I frankly admitted he was right. It has come into its own but, from a broadcast reception point of view, "it's own" does not approach the level which I think is necessary for the fidelity of perfect musical reproduction. It is willingly granted that the greatest need to-day, in wireless reception, is selectivity. There is an ever increasing number of high-power transmitters on the air, and it cannot be denied the problem is no longer how to receive them, but rather how to separate them. Exceptional selectivity is essential if programmes are to be heard free from interference or background. My contention is, the superhet gives all the selectivity needed, but, generally speaking, it is at the expense of quality, and it is for this reason my sympathies are more in the direction of the band-pass principle of tuning. The whole idea of the band-pass filter is that it should accept only a certain limited band of frequencies, consisting of the carrier waves of the wanted station and its side-bands. For good quality reproduction this band width should be preserved intact on all wavelengths. With well-chosen coils of this type, which give a 10-kilocycles separation, used in a circuit comprising two stages of screened-grid high-frequency amplification, a power

detector, and push-pull output, sufficient selectivity can be obtained, with perfect reproduction, which is far and away superior to any superhet circuit for broadcast reception.



"Grid Leak," the popular writer on wireless

Eliminators and Mains Fuses

I SEE the old subject of two-tariff electric power supplies has again cropped up when a man was fined for using an electric lamp off a power plug. Non-technical users find it difficult to appreciate why current identical in character should be charged at two widely different rates merely because they come out of different plugs, and the temptation to use a lamp from the cheapest socket is very great. I do not know if an official ruling has ever been given regarding wireless sets, but I believe it is generally accepted that as our valves are really small editions of heaters it is quite in order to use them wired up to a cheap heating supply. In any case it does not matter much on the score of cost, for this is infinitesimal, but it is usually much more convenient to plug-in to a heater socket placed low in the room than to have a long lead reaching up to the electric light hanging from the ceiling. The latter is a nuisance to everybody, and for this reason alone the heating plug is the best one to use. When wiring up to the heating circuit, however, it pays to use some sort of fuse arrangement between the switch and the eliminator, or if you prefer it, the power supply unit. This is because the fuses fitted to the house heating circuits are very hefty in order to carry the large currents needed

to warm up resistance heaters, and the average wireless set could be a smouldering heap of ashes, should anything untoward happen, before the main fuses would blow.

Electrical Unit as Basis of Monetary Transactions

DO you notice how one subject leads to another? Talking of mains reminds me of an account I saw the other day of how an American scientist and economist suggested that the best standard for basing monetary transactions is the electrical unit, and that an "Edison dollar" of 40 kilowatt-hours would have absolute stability, a property gold never seems to have had. The argument is that electricity costs much about the same to produce the world over and that something approaching the ideal standard would be obtained. This is as maybe, and funny things come and go in America, but I think the problem of transporting sufficient "juice" to pay off our war debts across the Atlantic would be quite a considerable one.

New Astronomer Royal

YOU will have read that our Astronomer Royal has recently retired and that Dr. Spencer Jones, F.R.S., has taken the place of Sir Frank Dyson, K.B.E., F.R.S., at Greenwich. The coming of broadcasting has given Greenwich some valuable publicity, and radio and electricity plays a large part in the time-keeping function of the Observatory. All the world looks to Greenwich for the time, and many other things besides, and great is the responsibility of those in charge there. The new Astronomer Royal has done good work in the interests of both astronomy and radio; he has been in charge of the astronomical station at Cape Town for many years and took over his new duties in March. When you think of it, the relationship between astronomy and radio is very close indeed. Both rely on ether vibrations for their being, and practically all we know of our solar neighbours is through the medium of the light rays they give off. These travel at practically the same speed as wireless waves and who can say that this is anything but a coincidence?

The Care of Condensers

TO avoid trouble with ganged condensers great care should be taken when fixing these components to the baseboard or chassis. The makers test the sections and adjust them to have practically equal values of capacity, but it stands to reason that if you afterwards twist the frame the capacities will be altered.

Twisting is usually caused by screwing down unevenly. The base plate or board to which the component is being fixed may not be flat. The result of tightening the fixing screws must therefore be to twist the condenser. In order to avoid the difficulty of not being able properly to gang the circuits, screw down very carefully.

THE MECHANICAL PROPERTIES OF METAL DIAPHRAGMS IN SOUND REPRODUCTION

The Possibility of Varying Sound Pitch and Tone by Diaphragm Control

—By WM. CROMPTON—

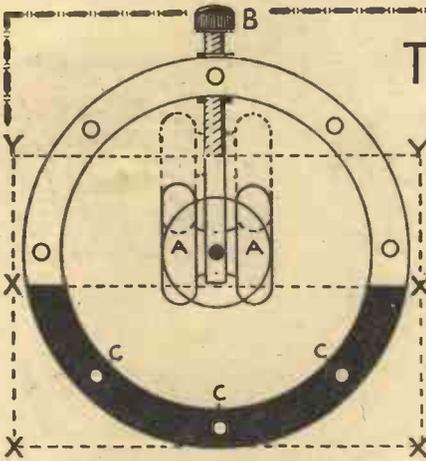


Fig. 1.—Plan view of base unit of speaker in diagram form.
 A Pole pieces of magnet.
 B Knob for adjusting the horizontal movement of pole pieces.
 C Three screw holes for clamping the cap, diaphragm and base in position.
 X—X Dark portion of base rim supporting the diaphragm. The light portion has been filed down 1/64th of an inch.
 Y—Y Shows amount of horizontal travel of pole pieces.

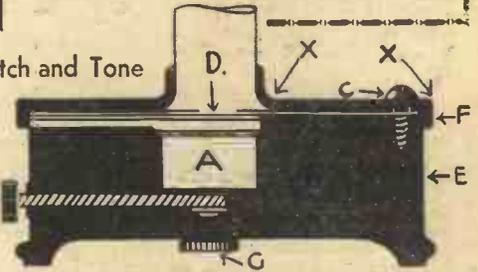


Fig. 2.—Diagrammatic illustration of the partially held diaphragm, and pole piece adjustments.
 A Pole piece of magnet.
 B Knob for adjusting the horizontal movement of pole pieces.
 C Retaining screw gripping cap, diaphragm and base piece.
 D Free portion of diaphragm.
 E Base piece casing.
 F Turned-down rim of cap.
 G Knob for controlling the longitudinal or upward movement of pole pieces.

IT may seem rather bold to suggest that the pitch, or tone of the sound transmitted at the broadcasting station, can be altered or transposed into a different key, as it were, at the receiving end. If that was possible we should be treated to some rather startling and even fantastic reproductions. For instance, a tenor voice could be changed to baritone, or even bass, while music of a normally high frequency ratio could be transposed to frequencies of the lower octaves, and *vice versa*. Whilst musical trapeze after this fashion would no doubt amuse the few, and irritate the great majority of serious listeners, yet it would appear that further research into the mechanical properties of metal diaphragms might lead to something extremely helpful in our quest for pure reproduction throughout the wide frequency range of modern broadcasting programmes.

The writer has achieved some rather interesting and novel results whilst experimenting with the ordinary circular metal diaphragm used with horn speaker models. Though the cone type of speaker is now almost universally used in the home, nevertheless the principle of sound reproduction is unchanged, and possibly the writer's experiences may open up new fields of investigation among those readers who delight in experimental work.

An Interesting Experiment
 The first experiment is shown in Figs. 1 and 2,

which give in diagram form a plan and sectional view of an old type loud-speaker base unit. In the original construction the diaphragm (D) was held rigid between the circular metal base (E) and the metal cap (F), the three components being clamped together with eight screws (C). The magnet coils (A) were fitted in the base concentric with the diaphragm and had a longitudinal adjustment (G). This arrangement follows closely that adopted in earphones. The alterations effected for experimental purposes aimed to ascertain whether the mechanical properties of the diaphragm affected reproduction in a large or small degree. The results certainly justified the work entailed.

The re-arranged unit (see Figs. 1 and 2) provided for a semi-rigid diaphragm and horizontal movement of the magnet coils, in addition to the up and down adjustment of the latter. The first part of the alterations was not difficult. About two-thirds of the upper rim of the base (shown blank in Fig. 1) was filed down, taking off approximately 1/64 of an inch, and a similar operation was performed on the corresponding portion of the inside face of the cap. Fig. 2 shows the resultant fit. The diaphragm (D) is held in position by a section of the cap and base (X-X, Fig. 2), the latter being clamped with three screws instead of eight. Thus, approximately, five-

eighths of the diaphragm is left free. The second alteration was more complicated. In order to allow a lateral movement of the coils and magnet, the metal base had to be cut away and mounted on a specially-constructed baseboard.

Comparative Results

In order to test out fully the qualities of the unit, two scales were incorporated and calibrated in sixty-fourths of an inch. The original setting was accepted as zero for both the longitudinal and lateral adjustments, and comparisons were made with a similar horn speaker (unaltered) and a moving-coil cone speaker. These tests proved beyond all doubt that the semi-rigid diaphragm was exceedingly sensitive at certain settings, and further that zero setting was by no means the best setting. There appeared to be an effective lateral variation equal to about one-third of the diameter of the diaphragm. Within these limits there was a pronounced variation in the sound reproduction with hardly a trace of distortion, and very pleasing effects were obtained with pianoforte transmissions. The results were superior to those of the other speakers, particularly in recording the notes in the lower octaves. The higher efficiency of the semi-rigid diaphragm was noticeable in the case of speech, singing, orchestral suites, and pianoforte

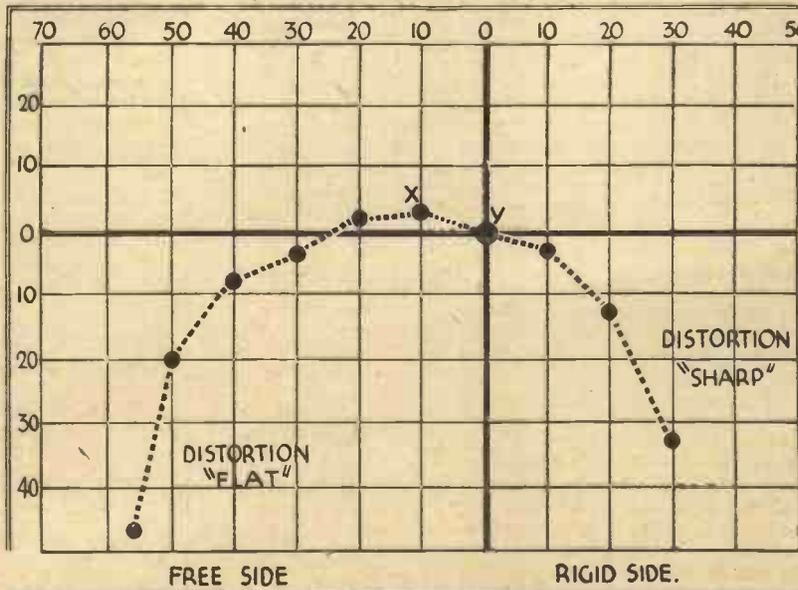


Fig. 3.—Chart showing results of tests with the semi-rigid type of diaphragm.
 X Denotes the peak of efficiency in pure sound reproduction being considerably higher than the normal good setting of the ordinary type loud-speaker unit.
 Y Ordinary setting of orthodox loud-speaker unit for good reproduction.

appeared to be an effective lateral variation equal to about one-third of the diameter of the diaphragm. Within these limits there was a pronounced variation in the sound reproduction with hardly a trace of distortion, and very pleasing effects were obtained with pianoforte transmissions. The results were superior to those of the other speakers, particularly in recording the notes in the lower octaves. The higher efficiency of the semi-rigid diaphragm was noticeable in the case of speech, singing, orchestral suites, and pianoforte

(Continued on page 163.)

Returning the Compliment

The Receiver Responds to Care and Attention, and also to Inattention and Carelessness!

By CYNIC

A WIRELESS set, like any other apparatus, will always respond to care and considerate treatment. When you come to think about it, a radio receiver operates solely on account of and by virtue of certain electrical impulses and electric currents fed into it from various sources. What it does with these impulses and currents is settled once and for all by the technical design and physical condition of the apparatus, so that within the limits of these factors the performance of the set depends entirely upon the character of the various inputs of electrical energy. If these inputs are of correct quality and quantity, the set cannot fail to give reproduction as perfect as its technical design will permit.

Electrical Inputs

Now what are the electrical inputs to a receiver? Well, first of all there is the radio signal, introduced through the aerial circuit. Then there is the heating current for the valves, supplied by the low-tension accumulator in the case of a battery-operated set, or from the filament winding of the power transformer in an A.C. mains set. Thirdly, there is the anode feed which is provided by the high-tension battery or supply unit; and last, but by no means least, there are the grid biasing voltages applied to the grids of the amplifying valves either from a small dry battery, or by making use of the voltage drop across a resistance in the negative end of the high-tension supply.

It is a definite fact that if any of these is incorrect in quantity, or variable in quality, the receiver will not be able to reproduce faithfully the programme radiated from the broadcasting station to which the set is tuned. The technical name for any departure from accurate reproduction is "distortion." It will be of the very greatest service, therefore, to see in what ways distortion can be introduced, and the ways in which it can be prevented by the exercise of that little extra consideration which will enable the receiver to respond and to return the compliment.

The First Rule

Undoubtedly the first point to consider is the radio signal itself. It may be thought that, as this emanates from the broadcasting station, it is entirely out of the listener's control, and that, provided no distortion is introduced at the transmitting end, the signal will be applied to the first valve of the receiver in a perfect and undistorted condition. But this is far from being the case. It is fatally easy to introduce the element of distortion into the radio signal before it reaches the first valve.

In the first place, if your set is unselective—that is to say, unless the tuning is sufficiently sharp to eliminate all but the actual station to which you wish to listen for the moment—any interference from stations operating on adjacent wavelengths will be amplified throughout the various stages of the set, and will mar the final reproduction. On the other hand, if you make your receiver too selective, too sharply tuned, then, by cutting off what are known as the "sidebands," the higher notes and tones in both music and speech will be lost, and the quality of reproduction will be most unpleasant. Golden rule number one, therefore, for the listener who wishes to be kind to his set is to make the tuning neither too flat nor too sharp—just sharp enough to give the normal 9 kilocycles separation, and no more and no less.

Next, even if no actual distortion is introduced either by interference or by sideband cutting, a poor aerial or earth, or an inefficient tuning system may so reduce the signal strength that the detector valve, whose job it is to convert the radio signal into an audio frequency signal, is unable to operate efficiently and will, in consequence, distort. Distortion at this point is most likely to occur if the detector is of the "anode bend" variety, for this type of detector is only at its best when called upon to handle a fairly strong signal. Note rule number two—have the most efficient aerial and earth you can provide, and give your set reasonably robust signals to work upon.

Signals too Strong

But, as if to contradict the foregoing, it is possible to ask too much of your valves by applying a signal which is too strong for them to handle without distortion. This applies particularly to the screened grid high-frequency valve if one is fitted to your set. This valve is intended to amplify the incoming radio signal before it is passed to the detector, and is therefore a most sensitive type of valve. It will accept the weak signals arriving from distant stations



Fig. 1.—A good multi-purpose test set for carrying out measurements on a set to ensure absence of distortion.

and magnify them until they are powerful enough for the detector to handle them efficiently. You are not always listening to distant stations, however, and it is more than likely that, when you tune in to your local station, the full amplification of the high-frequency valve or valves is not required. Not only may the amplified signal be too powerful for the detector to handle, but the original incoming signal itself may be too strong for the high frequency valve to handle without distortion. Rule three for the proper treatment of your set, therefore, is to provide means for relieving the high-frequency valve from overloading. There are two main methods of doing this: first, the fitting of an input volume control, and, second, by employing in the high-frequency stage a variable-mu valve, which is a special type of screened grid valve whose sensitivity can be reduced, when it is required to handle strong signals, by increasing the grid bias. Details of these devices have all been described from time to time in PRACTICAL WIRELESS, so the matter need not be amplified further in this article.

L.T. and H.T.

Having assured ourselves that no cause of distortion is being introduced by way of the incoming signal, let us consider the effect of improper low-tension supply. The low-tension current heats the filaments or cathodes of the various valves, and causes them to emit the stream of electrons by virtue of which alone the valves can function. If your accumulator has run down, the filament temperature will be too low to give full emission; the value of the anode current will therefore drop, and, although everything else in connection with the set is in order, both volume and quality will suffer. Rule four, therefore, is to have your accumulator regularly charged so that the full voltage is always available for the valve filament circuit. Our French friends have a term for the low-battery which can be interpreted as "feeding battery." It is an expressive and very apt term, for to use a run-down accumulator is analogous to starving your valves—and an ill-nourished servant cannot do good work.

(Continued on page 163).



Fig. 2.—It is a good plan to have a voltmeter and milliammeter as part of the mains eliminator equipment.

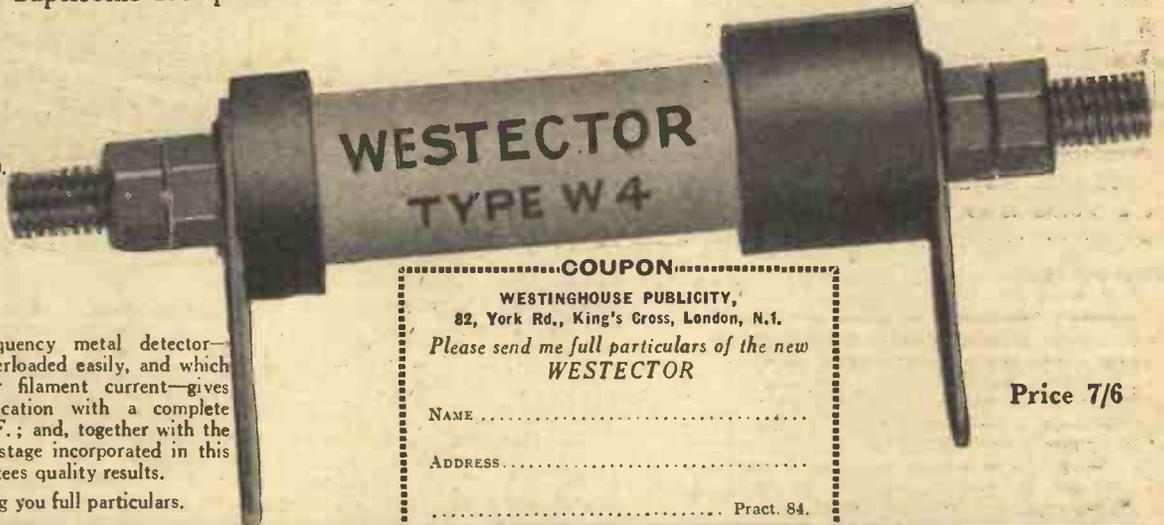
EXCLUSIVELY SPECIFIED

for the SUPERSONIC SIX—

the new WESTECTOR

In order to remove the problems of detector overloading, anode current consumption and stray H.F., the designer of the Supersonic Six specifies the new WESTECTOR.

Half-wave Westector
(3 times actual size).



This new high-frequency metal detector—which cannot be overloaded easily, and which takes no anode or filament current—gives straight line rectification with a complete absence of stray H.F.; and, together with the efficient amplifying stage incorporated in this fine receiver, guarantees quality results.

The coupon will bring you full particulars.

COUPON

WESTINGHOUSE PUBLICITY,
82, York Rd., King's Cross, London, N.1.

Please send me full particulars of the new
WESTECTOR

NAME

ADDRESS

Pract. 84.

Price 7/6

Get a HET for Your Set!

HET

PROV. PAT. NO. 9149/33

AMALGAMATED METAL INDOOR AERIAL

Away with unsightly wires. Get greater selectivity, more stations and more volume with the neat and elegant "HET" Indoor Aerial. Just fix this adhesive aerial round the picture rail. It has the appearance of a frieze. It looks as good as it is—better than any other aerial.

BRITISH MADE

1/6

In gold or silver finish
From all radio dealers
or direct from
UNIVOLT ELECTRIC Ltd.
Balfour House, Finsbury
Pavement, London, E.C.2.

BRITISH 362 VALVES FULLY GUARANTEED

DIRECT BY POST AT MONEY-SAVING PRICES

Compare the prices of British 362 Valves and observe that they are GUARANTEED to be equal to any other valve (British or foreign) of similar characteristics, GUARANTEED NON-MICROPHONIC, and GUARANTEED to give entire satisfaction. Use them for that Set you are building, or to replace worn-out valves.

SAVE 50% without sacrifice of quality.

IMMEDIATE DELIVERY OF

CLASS B 9 1/2



R.C. H.P. or L.F.	POWER	SUPER POWER	SCREENED-GRID or VAR-MU.	P.D.B.
3/6	4/6	4/6	7/6	10/6

All Post Free. In 2v., 4v., or 6v. Metallised 3d. extra.

For further details of Class B Valves see our Advt. on page 133.

WHY CONTINUE TO PAY EXORBITANT PRICES?

Post your order direct to the actual makers. If our valves do not give you SATISFACTION, return them undamaged and we will REFUND YOUR MONEY.

An Invaluable Handbook

ACCUMULATORS

An up-to-date practical handbook dealing with every type of accumulator, methods of charging them at home, care and maintenance. This little handbook also explains how to erect a charging station.

This is one of

Newnes' HOME MECHANIC Books

Ask your Newsagent to show you other Titles in This Helpful Series

Obtainable at all Booksellers, or by post 1/2 each from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2

1/- EACH

If valves of a certain make have been specified for your Set, send the name and type with your order and we will send you 362 Valves of similar characteristics. Cash with order. Cheques and P.O.'s must be crossed and made payable to:—

The 362 RADIO VALVE Co., Ltd. (Dept. W.4), 415, Mare St., Hackney, London, E.8.

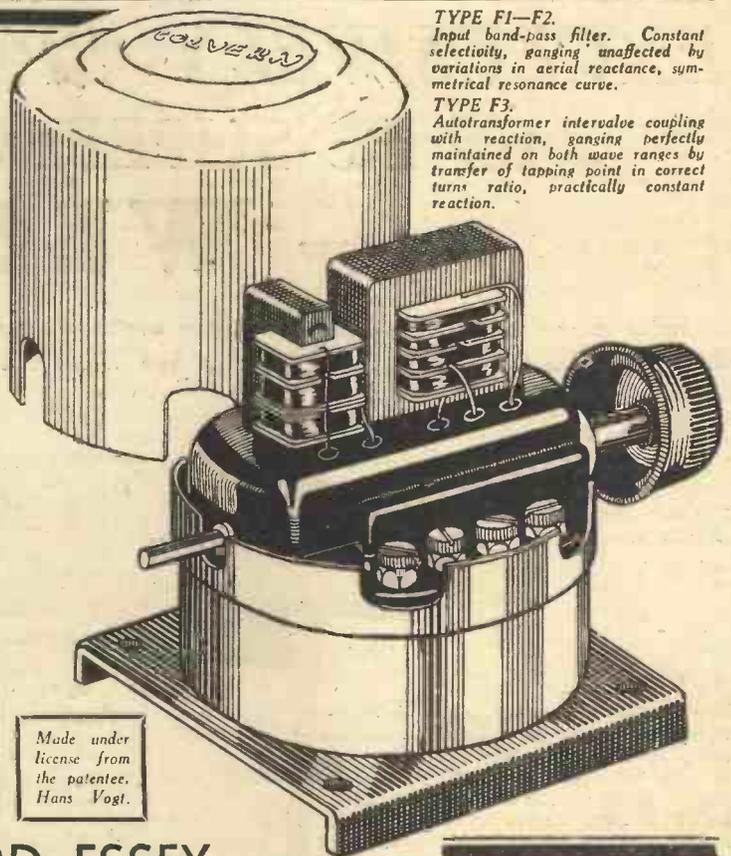
PROGRESS!

COLVERN FERROCART COILS open a new era in radio reception

Tuning coils of maximum efficiency are essential in the attainment of selectivity and sensitivity.

Colvern Ferrocart Coils though of considerably smaller dimensions than the relatively inefficient screened air-cored coils, are actually more efficient than unscreened Litz wound large diameter coils.

Remarkably high selectivity obtained in the "FERROCART Q.P.-P. HI-MAG THREE" with the Colvern Ferrocart coils.



TYPE F1-F2.
Input band-pass filter. Constant selectivity, ganging unaffected by variations in aerial reactance, symmetrical resonance curve.

TYPE F3.
Autotransformer intervalve coupling with reaction, ganging perfectly maintained on both wave ranges by transfer of tapping point in correct turns ratio, practically constant reaction.

SPECIFIED FOR THE FERROCART-Q.P.-P. HIGH MAG THREE
One set F1, F2, F3 Coils ganged on sub base plate with wave change switch ... Set **50/-**

Made under license from the patentee.
Hans Vogt.

COLVERN LTD., ROMFORD, ESSEX

London Wholesale Depot—150, King's Cross Road, W.C.1.

PRACTICAL WIRELESS POSTAL RADIO BARGAINS

SAVE MONEY ... ORDER DIRECT ... ORDER WITH CONFIDENCE

SET CRACKLING IS ANNOYING!

IF IT'S YOUR SWITCH

1/0

each
1/3 Post Free.

FIT THE "BUSCO" SWITCH

and ensure perfect switch contact! There is no contact point to turn round, and when you "switch on" you have contact like a power switch. They are as cheap as the inferior type, but far superior in operation.

From your local dealer or
BUSBY & CO., LTD. (Patentees)
Dept. P.W., PRICE ST., BIRMINGHAM

EASY TERMS PROMPT DELIVERY

Any Amplion, Blue Spot, Baker, Celestion, Epoch, R. & A. Rola, Sonochorde, or W.B. Moving Coil Speaker supplied.

Send 5/- only

and pay the balance by monthly instalments. No receipts. Entirely private and confidential.

KITS, PARTS, SETS, ELECTRIC CLOCKS ON EASY TERMS.

Write for Catalogue and details to:

TURNADGE & PARTNERS, LTD.
Ludgate House, Fleet Street, London, E.C.4.
Telephone: Central 1903.

UNIQUE SPEAKER BARGAIN

GENUINE 1'33 LINCOLN-STEWART P.M. M.C. SPEAKER

Complete fidelity of reproduction is assured with the Lincoln-Stewart P.M. Moving Coil Speaker. Includes universal transformer for all types of output valves. Will handle immense output without distortion and is guaranteed in every way. List Price 30s. 6d. Special offer to PRACTICAL WIRELESS set receivers ... **16/11**

Diam. of cone 8", depth 4 1/2"
Cash or C.O.D.

PEARL & PEARL
190, Bishopsgate, London, E.C.2.

Every Speaker fully guaranteed.

SOUTHERN RADIO'S SET MANUFACTURERS' GUARANTEED SURPLUS
MAINS TRANSFORMERS. 250-250 00 m.a. 4-volt 3 amp., 4-volt 1 amp., 10/3 each. All capacities in stock and specials made to order. Mains Transformers to suit Westinghouse Rectifiers 12, 4, 5, 6, 7, 8 or 9, 12/- each. ALL TRANSFORMERS GUARANTEED 12 months. **READY RADIO "303"** Three Valve Battery Kits less Valves, 21/-, with three specified Mullard Valves, 20/- each (List. £23/10/0) Ready Radio Meteor Screen Grid 3-valve Kit less valves, 27/6, with three specified Mullard Valves £29/0/6 each (List. £27/7/6); Ready Radio Meteor Screen Grid 3-valve "A" Kit, including Cabinet and Celestion Moving Coil P.M. Speaker less Valves, £37/8; with Three Specified Mullard Valves, £41/2/6 each. **MULLARD RADIO FOR MILLION THREE-VALVE A.G. Kit**, complete with Three Specified Mullard Valves, £31/8/6 each (List. £25/10/0). ALL ABOVE KITS ARE BRAND NEW AND PACKED IN ORIGINAL SEALED CARTONS. Screened Chokes (H.M.V.), 2/- each, 3/- doz. Genuine Amplion Loud Speaker Units, 2/9 each (Listed, 12/6); Radiophone Volume Controls and Switch combined, 3/9 each (Listed, 10/6); Dual Gang Condensers 0.0005 (H.M.V.), 6/- each (Listed, 29/6). **CYLDON THREE GANG CONDENSERS**, .0005 with Trimmers and fully screened, 8/9 each (Listed, 32/-). **S.G. BROWNS A.C. MOVING COIL Speakers**, incorporating Irradio Elton Rectifier, 12in. cone, 35/- (Listed, £28/10/0); Condensers 4 mfd., 2/6, 2mfd. 1/9, 1mfd. 1/- each. (All 700-volt Test.) **EVERY ARTICLE SOLD BY US IS GUARANTEED** and Carriage Paid. **SOUTHERN RADIO**, 323, Enslin Road, London, N.W.1 (Near Warren St. Tube). Phone: Museum 6324.

FRONT OF PANEL

FIT THIS ELECTRIC CLOCK TO YOUR SET!

NO MAINS NEEDED!
KEEPS CORRECT TIME!
NO WINDING!

Works off small battery lasting 12 months, or can be plugged into G.B. battery without affecting reception. Uses practically no current. Fits into hole 3 1/2in. dia. in any panel up to 1/2in. thick. Easy to fit—no screws required. Only 1/2in. from front of panel to back of case. Swiss movement. Hands set from front. Nickel-plated brass. Useful addition to any set.

12/6
COMPLETE WITH BATTERY
POSTAGE 6D

RIVERSIDE MFG. Co., Ltd.
Dept. 21, Crisp Road,
Hammersmith, W.6.
Telephone: Riverside 6392.

600 RADIO BARGAINS

DATA CHARTS & HINTS

—in One BIG 50-page Handbook

Manufacturers' surplus offered under cost! Satisfaction or money refunded. Complete kits worth 21/-, from 10/6. 15/6 Pickups for 5/5. 3-valve Battery sets at 75/-, worth 6 gu. Hundreds of other amazing bargains—Eliminators, Units, Speakers, etc. Electrical and Sporting bargains also. Send only 7id. to-day for the "GOLD-MINE" Handbook which describes them all, and state your interests for last-minute offers.

Send NOW to the Premier Mail Order House,
SHAFESBURY SUPPLIES,
Head Office and Mail Order Dept.,
224, SHAFESBURY AVENUE, LONDON, W.C.2. (Tem. 4175)
SHOP SALES: 13, Cumberland Street, Stokes Croft,
Bristol, and 247, London Road, Sheffield.

RETURNING THE COMPLIMENT

(Continued from page 160.)

But what of the high-tension supply? Well, here again it must be remembered that the high-tension power, or at least a part of it, is the actual power required to operate the loud-speaker, and if only a restricted ration is available, both quality and volume will deteriorate. Moreover, unless each valve is fed at the correct anode voltage, it cannot work efficiently—the degree of amplification will be reduced, and probably distortion will also ensue. A third effect of a run-down high-tension battery is that a high resistance may be introduced by one or more faulty cells, and, this resistance being common to the anode circuits of several valves, will cause electric coupling between the various circuits, leading to several forms of instability ranging from howling to that curious popping noise known as "motor-boating."

The next golden rule, therefore, is to maintain the high-tension supply in good order by renewing the high-tension battery when it is showing signs of running down; to assure yourself that each anode is connected to the correct high-tension tapping; and to test the H.T. supply occasionally by means of a milliammeter in the anode circuit of each valve. One form of multi-purpose home-constructed instrument I always keep by me for this and other tests is shown in Fig. 1. The approximately correct value of the anode current to each valve is always quoted by the valve maker on his instruction sheets and catalogues, and this should be checked up in the meter. Another good scheme, especially when using an eliminator, is to have a voltmeter and milliammeter as permanent parts of the equipment as shown in Fig. 2. This will enable the user

to test immediately and see that all the "feeds" are satisfactory.

Grid Bias

Now comes the great question of grid bias. The object of applying grid bias voltage to amplifying valves is to maintain the average value of the grid voltage at such a figure that the alternate positive and negative swings of the incoming signal fall within the range which the valve can amplify without distortion. Either too high or too low grid bias results in partial rectification; that is to say, unequal amplification of positive and negative swings, and this means distortion. Check up, therefore, the value of grid bias, as indicated by the tapping used on the grid bias battery, with the anode voltage applied to the valve. The two should be in accordance with the figures given in the valve-maker's catalogue. An additional check can be made by testing the value of anode current, which should also correspond to the figure given in the catalogue.

At the same time, the nominal value of grid bias cannot be depended upon as being accurate if the bias battery has been in service for a considerable period, and it is a wise precaution to renew this small and inexpensive battery when the high-tension battery is replaced.

There is just one other cause of distortion which we have not dealt with—namely, the possibility of the amplified signal applied to a late stage of the set—say the output valve—being too great to be handled without distortion. The inclusion of a volume control after the detector stage will obviate this risk, and should you find distortion occurring and you are certain that you have eliminated all other causes, the use of a post detector volume control will no doubt remove the trouble.

THE MECHANICAL PROPERTIES OF METAL DIAPHRAGMS IN SOUND REPRODUCTION

(Continued from page 159.)

solos. It was possible to get a finer adjustment for each of these items than was possible with the all-rigid type and only a longitudinal regulator. These tests also showed that thickness and quality of the metal used affected the efficiency of the diaphragm; in fact, the writer came to the conclusion that pure reproduction depended very largely on the purity of the metal—all other things being equal, of course. For example, one test with a diaphragm having a highly-polished surface produced much better results than the use of a diaphragm of the same metal but coated with varnish.

Peculiar Distortion Effects

The graph shown in Fig. 3 sums up the results of these tests. The audible range of the lateral adjustment extends to approximately one inch beyond zero on the free side and about half that distance on the rigid side. The range for good reproduction is decidedly less, extending to 20 degrees ($\frac{1}{3}$ in.) on the free side and about 12 in the other direction. At either end of the scale distortion is encountered, but with slightly different effects. The tendency on the free side is to impart a change of key or pitch—from "open" to "flat"; whereas on the rigid side the distortion is definitely "sharp." Hence the writer's opening remarks.

These latter characteristics, admittedly, may be more novel than useful, but they certainly show that the mechanical properties of the metal diaphragm are worthy of more serious consideration than has hitherto been given them. The last word in metal diaphragms has not yet been spoken, and anyone who has the facility for trying out diaphragms made from the different alloyed-ferrous metals will quickly realize the vast possibilities in that sphere of research once they have made a few tests.

The writer makes bold to state that the standard of reproduction obtained with this combination of semi-rigid diaphragm—lateral and longitudinal adjustment—is easily 20 per cent. purer over the optimum frequency band of broadcasting than obtainable with either the all-rigid diaphragm or moving-coil cone speaker. Another important point to watch in making tests of this kind is that particular attention to the longitudinal adjustment is of supreme importance. The slightest variation of the air gap between the pole piece of the magnet and the free side of the diaphragm has tremendous effect on the quality of reproduction, particularly when experimenting at the extreme end of the lateral scale. The tendency for the metal to set up violent mechanical oscillations predominates at certain points, and is productive of some very weird sound effects. Whenever the true coincidence of the two adjustments is arrived at, the range of pure reproduction does, however, more than compensate for the time and patience exerted in finding it.

RADIO IN EVERY ROOM

WIRE IN AND WIRE UP

those loud-speaker extension points by means of Bulgin Midget Wall Jacks and be sure of perfect reception. You will be delighted with their handsome appearance and general utility. They are installed in thousands of homes WITH EVERY SUCCESS.

WALL JACKS
Price 1/6 each
Walnut or Mahogany
L. S. PLUGS
Price 1/6 each

SET OUTPUT

BULGIN

Send for 80-page Catalogue "N" giving full wiring diagrams. Enclose 2d. postage.

A. F. BULGIN & CO. ABBEY RD., BARKING.

OSTAR-GANZ

UNIVERSAL "ALL MAINS THREE"

The circuit for this splendid receiver was fully described and illustrated on page 96 "PRACTICAL WIRELESS" (April 8th issue.)

It works off either A.C. or D.C. supply without any alteration whatever. Economical to build, as the Ostar-Ganz High Voltage Mains Valves cut out all costs for Transformers and Resistances.

KIT COMPLETE ... £9.9.0
with Valves and Rectifier.

Ostar-Ganz Valves, as in the above: W.310 R.C., 17/6; A.520 G.P., 17/6; L.1525 Super Power, 18/-; E.G.50 Rectifier, 14/6.

FREE BLUE PRINT with first order.

OSTAR-GANZ UNIVERSAL ALL MAINS VALVES AND KITS

Valves Prices:		Highly efficient yet cheap. Work off either A.C. or D.C.
A.520 General Purpose ...	17/6	2-Valve Receiver with Rectifier ...
U.920 L.F. Power, 17/6		... £5.15.0
L.1525 Super Power 18/-		2-Valve Receiver with Rectifier ...
E.G.50 50 m.a. Half Wave ...	14/6	... £5.15.0
E.G.100 125 m.a. Half Wave ...	15/6	2-Valve Amplifier with Rectifier ...
N.G.40 40 m.a. Voltage Doubler ...	29/6	... £4. 4.0
V.G.45 45 m.a. Full Wave ...	42/-	3-Valve Amplifier with Rectifier ...
		... £5. 5.0
		Latest type Energised Moving Coil Loud-speaker, complete with Ostar-Ganz Valves £2. 5.0
		Write for leaflet.
		FREE BLUE PRINT with first order.

Write for descriptive leaflet.

EUGEN FORBAT, c/o Nivalight, Ltd., 1, Rosebery Avenue, E.C.1. Telephone: Clerk. 1227.

AGAIN... "CLIX"

Experienced designers know that only CLIX ensures highest working efficiency, so again CLIX is specified —for the

"SUPERSONIC SIX"



Chassis Mounting VALVEHOLDER

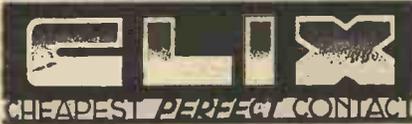
Absolutely low loss — Highest insulating material used for plate—Resilient sockets guarantee full-surface contact with every type of valve pin. No arcing in mains sets—Sockets "float" and align with valve-pins—Screw terminals give easy, perfect contact.

4 Pin 8d. 5 Pin 9d.

You require: 8, 4-pin, 1, 5-pin.
7 Pin (for the new Double Diode-Triode valve), 1/-.

From all dealers.

Write for CLIX Leaflet N15.



Lectro Linx Ltd., 79a, Rochester Row, S.W.1

SOUND SALES FIRST with a

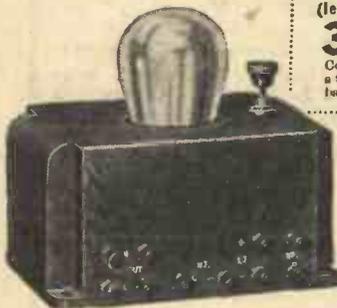
CLASS B UNIT

Give your Battery Set a Mains Performance with the

SOUND UNIT

PRICE (less valve)
35/-

Complete to attractive skellette case.



THIS AMAZING UNIT converts practically any Battery Set or Radio-gramophone to CLASS "B" Amplification without alteration or tools—you just connect it in the speaker circuit. RESULT—2 WATTS OUTPUT with Wonderful Tone and Surprising Economy.

Unit incorporates a matched input and output circuit, also tone-compensated dual impedance output, making provision for all types of loud-speakers. The system is fully decoupled.



Write for Catalogue N.15.

SOUND SALES, LTD., Tremlett Grove, Highgate, N.19
Telephone 2 Archway 1661-2.

ALL ABOUT ALTERNATING CURRENT RECTIFIERS

By G. H. WRAY, F.C.S.

AN alternating current is one which alternately reverses its direction in a circuit in a periodic manner. That is to say, it flows first in one direction and then in another, at regular equal intervals of time. To rectify an alternating current is to convert it into a unidirectional or direct current, that is, a current which

rectifier circuits for half- and full-wave rectifying respectively.

There are several kinds of rectifiers in use at present, from the simple "wet" electrolytic, to the more complex mercury-arc type in which an arc is maintained between two electrodes, the cathode being kept at an incandescent temperature by

the passage of the rectified current. It depends for its action upon the thermionic discharge from the cathode allowing the passage of current in one direction only. The mercury-arc type is unsuitable for dealing with small currents such as

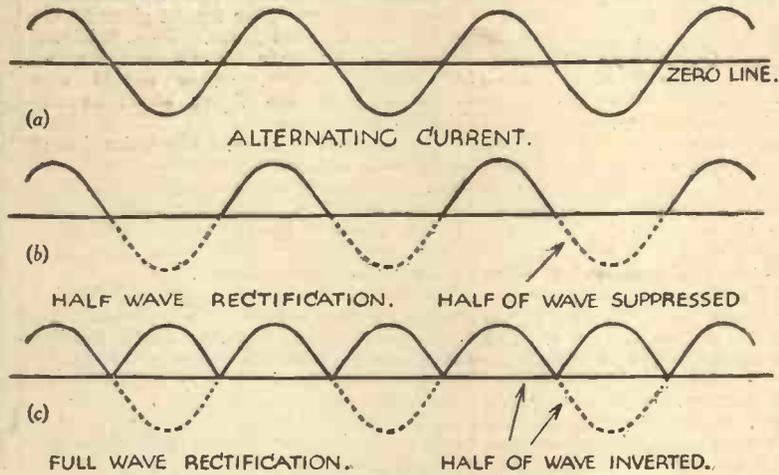


Fig. 1.—(a) The method of showing alternating current. (b) Half of the wave rectified. (c) Full-wave rectification.

flows continuously in one direction by means of a device known as a rectifier. This conversion is accomplished either by the suppression or the inversion of one half wave. Rectifying by suppression of one half wave is termed half-wave rectification, and by the inversion of one half wave full-wave rectification. The typical wave form of an alternating current, also that of half- and full-wave rectified currents are shown in Fig. 1.

A rectifier simply connected in series

those required for wireless receiving sets, and is usually employed in large undertakings where heavy currents are dealt with.

Chemical Rectifiers

Chemical rectifiers may be either the liquid or the dry type. The liquid type consists of two metals such as lead and aluminium, immersed in a suitable solution such as ammonium phosphate, or lead and tantalum, in a 20 per cent. solution of sulphuric acid. The disadvantages in the use of the "wet" electrolytic rectifier, are, its low efficiency, sedimentation

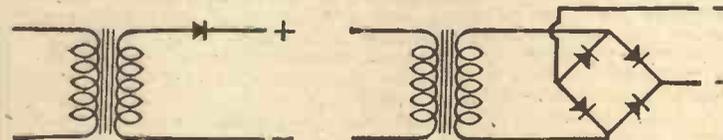


Fig. 2.—Circuit diagram of a half-wave rectifier, and a full-wave rectifier.

with an A.C. supply provides an easy path of low resistance for the current in one direction only, and offers a high resistance to the passage of current in the opposite direction. In other words, the rectifier allows the passage of the positive half of the A.C. wave, and rejects or suppresses the negative half, thus providing half-wave rectification.

Full wave, which is the more efficient method of rectifying, is obtained by the use of rectifiers connected in a suitable manner in order to utilize both the positive and the negative half of the wave, thereby converting both alternations into a movement of current in one direction. Both in half- and in full-wave, rectifying the rectified current is a unidirectional one of a pulsating character. Fig. 2 shows the

necessitating frequent cleaning and renewing, temperature rise, creeping of the electrolyte, and evaporation.

The dry electrolytic type consists of plates of such substances as copper sulphide and magnesium in contact with each other, or silver sulphide and copper oxide, and their functioning as rectifiers depends upon chemical action between these materials. This chemical action results in chemical change in the composition of these substances, which in turn results in a lowering of the efficiency and steady deterioration of the rectifier. All substances that conduct electricity, both electronically and electrolytically, can act as rectifiers. Both the wet and the dry types of electrolytic rectifier depend for

(Continued on facing page.)

(Continued from facing page.)

their action on the property possessed by certain metals and materials when immersed in a suitable electrolyte in the case of the wet type, and in contact with each other in the case of the dry type, of allowing the passage of current in one direction.

The two types usually employed and incorporated in modern wireless receiving sets, are the thermionic-valve rectifier, and the metal-oxide rectifier. The thermionic-valve rectifier consists of a discharge tube, the cathode of which is maintained at an incandescent temperature by an external source of energy. Like the mercury-arc rectifier, it depends for its action upon the thermionic discharge from the cathode allowing the passage of current in only one direction.

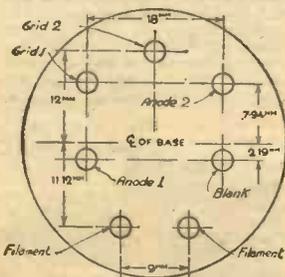
Full-wave Rectifier Valve

The full-wave rectifier valve differs in general construction from the wireless valve in that it has no grid. It consists of a glass bulb filled with an inert gas, usually Argon, and contains three electrodes, one of which is the filament or cathode. Argon gas for filling lamp bulbs and valves is produced from liquid air, which is purified, and the oxygen which contains 5 per cent. of Argon, is withdrawn and submitted to further purification. When the cathode of the valve is heated, the gas becomes ionized, thereby providing a low conductivity path for the free electrons flowing from the filament. The cathode is usually oxide coated, which provides for a copious electron flow at a lower filament temperature than would otherwise be possible. The filament is heated from a separate source of supply, and it is advisable that the voltage specified for this purpose should be adhered to.

The life of a valve rectifier is generally accepted as about one thousand hours, during which time the valve suffers a gradual decrease in efficiency, but with ordinary use its life is usually prolonged much beyond this period. Although the valve is a satisfactory rectifier, and is manufactured in various sizes suitable for small wireless purposes or for dealing with one kilowatt or so, it has the definite disadvantage that its life is limited. Its efficiency also is low compared to that of the metal-oxide type of rectifier.

The copper oxide, or metal rectifier, consists of a number of copper discs with a film of oxide formed on the surface. Its action as a rectifier is due to the electrolytic and electronic effect at the junction between the copper metal and the film of oxide. The metal rectifier possesses one great advantage over the valve type, that of permanence. Metal rectifiers may be connected in series or in parallel to provide required outputs of any magnitude.

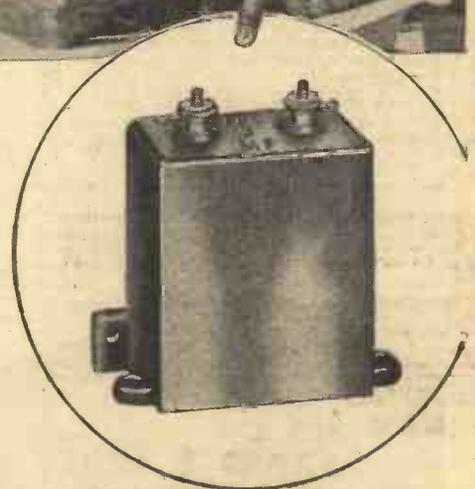
CLASS B VALVE HOLDERS



2 STANDARD SPLIT PINS 1/8" DIAM. APPROX.

This diagram gives dimensions of the new valve-holders for 7-pin (Class B) valves. The diagram is a top view.

THE DESIGNER SAID . . .



A highly efficient receiver such as the "Supersonic Six" calls for fixed condensers of unquestioned reliability. Without hesitation the designer says "T.C.C. of course." He knows that every "condenser in the green case" is the outcome of specialised work—that 100% effort in condenser research is behind them. He knows too, that every worth-while condenser development has emanated from the T.C.C. Factory. That is why he insists that you use T.C.C. Be sure of your results with your "Supersonic Six"—follow the designer.

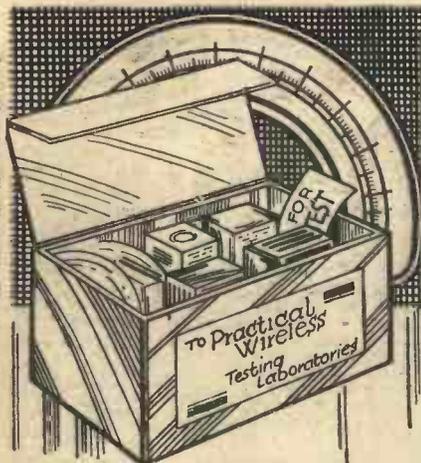
for the
"SUPERSONIC
SIX"

T.C.C.
ALL-BRITISH
CONDENSERS

THE SPECIFIED CONDENSERS

- 1 — Special 8-mfd. block type W.R.8 13s. 6d.
- 2 — 0.1-mfd. type 65 1s. 8d. each
- 1 — 0.0002-mfd. " 34 1s. 3d.
- 1 — 0.0003-mfd. " 34 1s. 3d.
- 1 — 0.002-mfd. " 34 1s. 6d.
- 1 — 0.01-mfd. " 34 3s. 0d.

The TELEGRAPH CONDENSER Co. Ltd., Wales Farm Rd., ACTON, W.3



SOUND SALES CLASS B UNIT

THE arrival of the Class B valve, and its valuable use with a battery-operated receiver, has led Sound Sales, Ltd., to produce the unit shown herewith. It is on similar lines to the unit which was described in our pages the week before last, and does, in fact, employ the same transformers. In addition, however, Messrs. Sound Sales have introduced one or two refinements, which enable the unit to be employed with practically any type of receiver. A tone compensating device is included in the unit, which is finished in brown mottled bakelite. The 7-pin valve-holder is sunk below the top of the unit and as seen from the illustration the valve-base comes level with the top of the unit. The switch on the right of the valve breaks the lead, and so prevents being left in operation



The Sound Sales Class B unit.

the receiver is switched off. The results given by the unit are really splendid, and it will be found a most valuable addition to the usual broadcast receiver. Where two L.F. stages are used in the latter, it is preferable to join the input terminals of the unit to the anode circuit of the first L.F. valve, and to use a power-valve of the Cossor 215.P type in that socket. This prevents the risk of overloading the driver valve, and so introducing distortion in the Class B valve. The price of the unit is 35s.

HIVAC VALVES

WE recently had the opportunity of visiting the factory of the High Vacuum Valve Co., Ltd., in London, and were able to inspect the elaborate machinery which is used by that firm in the production of the HIVAC Valves. No pains are spared to produce a really high-class valve at a cheap figure, and great care is taken to ensure that individual valves are up to characteristic, and all the usual machinery for life test, vacuum test, etc., is installed. In addition, there are several novelties, such as the employment of a special electrode assembly for the screen-grid valves. The particular method of making this valve enables the metal coating which is usually associated with the valve to be dispensed with, and the process of making up the complete assembly is very interesting. The valves are sold at remarkably low figures, the general types of valve, such as the H210 and the L210, costing only 4s. 6d., whilst the screen-grid valve is 10s. 6d. A variable-mu valve is obtainable at 10s. 6d. also. The L.210 valve is of the 2 volt .1 amp. type, with an impedance of 8,000 ohms and an amplification

Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

factor of 10. The P.220 has a filament rating of .2 amps. at 2 volts, and an impedance of 3,000 ohms with an amplification of 6. The characteristics were checked over and were found remarkably consistent, very little error being traced. In actual use in standard receivers, the valves were all very good and noticeably free from microphony. Although these valves are cheap they may be highly recommended, and will be found to offer efficient service at a very reasonable figure.

DRIVER TRANSFORMERS

WITH the arrival of the Class B amplification a completely new type of intervalve coupling transformer is required, and the reasons for this, and the considerations governing its design, have already been described in our pages (see the issue dated April 1st, page 51). We have so far received four of these special driver transformers, and they have all apparently been designed round the Cossor 240.B valve. The Lotus component is housed in a neat aluminium-finished case, and is very clearly marked with the particular type. Unfortunately, the majority of makers do not give this special marking, and it is, therefore, difficult to distinguish one type of transformer from another. The Lotus has a ratio of 1 : 2, and a primary winding of approximately 350 ohms. This gives an inductance of approximately 30 henries under working conditions, and is intended for use with the Cossor P.215 or similar valve as the driver. The cost of this component is 11s. 6d. The Benjamin Driver transformer is made to sell at 10s. 6d., and has a primary resistance of 300 ohms, with an inductance of 8 or 9 henries at .5 mA. The ratio is 1 : 1. The Multitone Class B Driver has a ratio of 1 : 2, and the primary resistance is only 200 ohms. This component costs 9s. 6d. The Sound Sales Driver is a cheaper product, costing 9s., and the ratio is 1 : 1. The primary resistance is approximately 300 ohms, and it will be seen that this figure is practically standard with this type of transformer. In addition to those transformers which we have received, we understand from Messrs. Lissen that they are producing a special Class B Hypernik transformer and this will cost 12s. 6d. We have not yet received any technical details of the windings or the ratio.

GARRARD MOTORS

TO convert a radio set into a radiogram, the principal addition is the gramophone motor, and this can take two forms, either clockwork or electric. The Garrard Engineering Company have produced three very suitable models for this purpose, one of which is reproduced on this page. This is the Double Spring Radiogram Unit, and, as will be seen, is complete with motor-board, pick-up and arm, needle-cups, etc. All that is required, therefore, is to attach this to the upper board of the gramophone cabinet and connect up the pick-up. This unit is highly suitable for a battery-operated receiver, as the motor is of the ordinary clockwork type, fitted with a double spring, enabling a 12in. record to be played on both sides with one winding. The reserve of power supplied by the double spring ensures that there will be no slowing down due to drag on very loud passages, and the mechanism employed in the motor works delightfully smoothly and silently. The cost of this complete unit is 63s., and this will be found a valuable addition to the broadcast receiver. The other two types are built up with induction and Universal electric motors, and are, of course, only of use where the electric mains supply is accessible. They will be dealt with in a future issue.

BELLING-LEE CLIP-ON PICK-UP

SOMETHING entirely new in pick-ups has just been received by us, and has evoked considerable praise. This is an ordinary pick-up with tone arm, but is intended for a definite purpose, namely, the conversion of a portable gramophone into a radiogram. As all our readers are aware, the only addition to the normal radio set is a gramophone motor and turntable, and doubtless, many listeners already have a small portable gramophone. With this type of

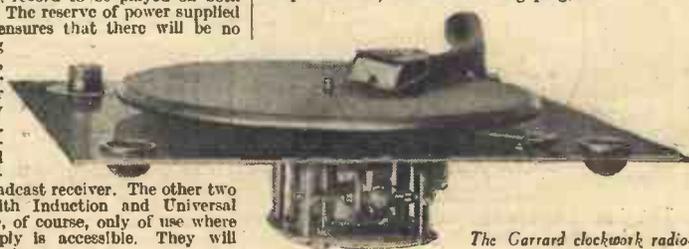


An ingenious gramophone connecting unit made by Messrs. Belling-Lee.

instrument it is very difficult to find accommodation for the ordinary type of pick-up and tone arm, as the space is so restricted. The motors usually fitted to these gramophones are quite suitable, however, for reproduction by the wireless receiver, and the problem is therefore to fit the pick-up in some convenient position which will permit of correct tracking. This Belling Lee Pick-up is mounted on a small rectangular box, covered with leatherette on three sides. The remaining side is provided with two "key-holes," and to attach it to your portable gramophone, all that is necessary is to fit two small screws on the side of the gramophone case, and then, when the unit is required for use, it is simply slipped over the screw-heads and a downward pressure locks it in position. Two terminals are provided for connecting the output of the pick-up to the receiver, and in addition, a volume control is fitted on the side of the base. Strips of felt on the side which fixes to the gramophone prevent damage to the cabinet work, and the unit may be called in every respect a "de luxe" production. The actual pick-up is of very small dimensions, but the electrical characteristics are of a high order. The reproduction is splendidly balanced, providing good quality reproduction from average records, without the use of a tone-compensating circuit. The design of the unit enables any form of tone correction to be employed, and the cost of the unit, with template to ensure correct fitting of the attaching screws, is 35s.

CLIX MOUNTING STRIPS

WE recently illustrated in these pages the new Clix chassis mounting strip for making a plug-in connection for aerial and earth. This component is used in the A.C. Twin, and Messrs. Lectrolinx have now developed a further type of strip which is especially suitable for mains receivers. This is exactly similar in appearance to the original terminal strip, but is only provided with two sockets. There are, however, three holes. Between the two holes which are the sockets, the word "IN" is engraved, and between the end hole and the socket the word "OUT" is engraved. A small ebony rod with two plugs fits these holes, and the mains aerial may thus be connected or disconnected by altering the position of the shorting plug. The strip costs 6d., and the shorting plug, 3d.



The Garrard clockwork radiogram unit.

MY OPINION!

By the Editor

8-11, Southampton Street,
Strand, W.C.2.

The Bogies of Radio

ONE by one are the old bogies of radio, which were regularly dangled before awed readers by the radio parrots in the early days of wireless, being, to use a *cliche*, relegated to the limbo. The bogy-in-chief, the *bête noir*, in fact, was ebonite. Constructors were solemnly and regularly adjured to use ebonite for panels and baseboards if they wished to hear the sibilant whispers and dulcet declamations which sneaked away into the eager ether from the crude equipment which constituted Writtle—2MT. Nothing else would do, for the pundits had edicted that high-frequency currents had aversion to wood or aluminium, and would indicate the fact by stealing across the surface. Readers were even told that shiny ebonite should be dulled with emery powder to prevent surface leakage, and that the ebonite should be scoured lest any trace of the tinfoil used in its manufacture remained. It had not occurred to anyone in those days of chronic hand-capacity effects that a screened-surface ebonite would have been a boon.

Nowadays wood and metal panels and baseboards are used with impunity, and none of the dire effects forecast has been experienced.

Someone in the early days of motoring wrote that a visiting card should be used to gauge the tappet clearances, and that monstrously incorrect statement has been copied and handed down ever since, which shows that every industry has its parrots.

Have Your Copies Bound

REGULAR readers of PRACTICAL WIRELESS should carefully peruse the announcement on page 82 of issue dated April 1st. Next week we shall give details of a special offer to bind the twenty-six issues which make up Volume 1 of this paper. It is a tedious task to have to wade through twenty-six issues of a paper to find a particular article to which you wish to refer. Quite often the issue is missing or has been mislaid. I advise every reader of the paper to collect his issues together and to have them bound in the very attractive binding case, together with the title page, and very full cross-referenced index, which we have had prepared as a service to the reader. You will find that this can be done at a special bargain price of 5s. 6d., and the completed volume will provide you with a remarkable work of reference. If you require back issues to complete your file, these may be obtained for 4d. each, post free, from the Back Number Dept., Exeter Street, Strand, W.C.2. See next week's issue for details of this special bargain offer.

Readers' Queries

WE make no charge for answering readers' questions, but we stipulate that where a postal reply is desired a stamped and addressed envelope must be enclosed as well as the Query Coupon appearing on the Queries and Enquiries page. This coupon must be enclosed even when a postal reply is not required. Please note also that we cannot answer queries over the telephone, nor for obvious reasons can we modify commercial receivers. F. J. C.

A Great NEW Valve

New principles of construction have made possible the HIVAC Valves at specially low prices.

There is a HIVAC Valve for every wireless requirement which will save you money and give you longer service.

Write to us for our Comparative Valve Guide and state the set you have or the set you propose to make.



Telephone CLERKENWELL 7587

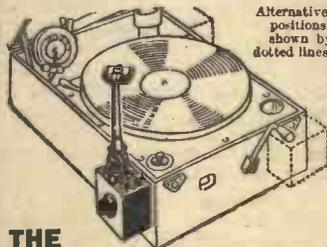
The HIGH VACUUM VALVE CO. LTD



113-117, FARRINGTON RD.
LONDON, E.C.

ELECTRIC REPRODUCTION FROM YOUR PORTABLE

Gramophone without loss of portability



Alternative positions shown by dotted lines.

THE BELLING-LEE "CLIP-ON" UNIT PICK-UP. Clips on and off in an instant. With self-contained volume control, price, 35/-. Write for Booklet.

BELLING-LEE
FOR EVERY RADIO CONNECTION

Cambridge Arterial Road, Enfield, Mdx.

LOUD SPEAKERS REPAIRED 4/-

(Blue Spot a Speciality, 5/-)
Transformers 4/-, all repairs magnetised free. Eliminator Repairs quoted for. 24 Hours Service. Discount for Trade. Clerkenwell 9069
E. C. MASON, 44, EAST ROAD, LONDON, N.1.

M.P.R. BATTERY CHARGER

Send for particulars of complete Charging Equipment for A.C. Mains to charge 100 2-volt Cells weekly.

Price £4 : 4 : 0

MAINS POWER RADIO LTD., ROMFORD, ESSEX

EASY TERMS

Everything Wireless supplied on lowest terms. Prompt Delivery Guaranteed. Price List Free on request.
THE BEST BATTERY KIT

NEW LISSEN "SKYSCRAPER" KIT including valves. Cash Price £4 : 9 : 6 With order 5/- and 11 monthly payments of 8/6.

NEW BLUE SPOT UNITS just released by the manufacturers.
NEW BLUE SPOT 99 P.M. MOVING-COIL UNIT. Cash Price £2/19/6. With order 5/-
And 11 monthly payments of 5/6.
NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 29 P.M. With input transformer. Cash £1/12/6. With order 5/-
Balance in 6 monthly payments of 5/2.
NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 45 P.M. With input transformer. Cash £2/8/0. With order 5/-
Balance in 9 monthly payments of 5/- only

ATLAS ELIMINATOR A.C. 244. Three H.T. tappings. 20 M/A output. Cash Price £2/19/6. With order 5/-
And 11 monthly payments of 5/6.
12 EXIDE W.H. HIGH TENSION ACCUMULATORS (120 Volts, 5,000 M/a.) With order 7/-
The cheapest and best High Tension Supply where Mains are not available. Cash Price £3/15/0.
And 11 monthly payments of 7/-
To avoid delay, will customers kindly send first payment with order. Dept. P.

The LONDON RADIO SUPPLY COMPANY ESTD 1925
11, Oat Lane, Noble St., LONDON, E.C.2
Phone NATIONAL 1977

Tune in on this 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.

No 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 Servicing, 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. 94, International Buildings,
Kingsway, London, W.C.2.

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

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

Name..... Age.....

Address.....

IMPRESSIONS ON THE WAY

A REVIEW OF THE LATEST DISCS

ALTHOUGH the present time of the year is usually regarded as the "close" season for

By E. REID WARR

is *Once in a Blue Moon*. It has more than the usual appeal of its class and I recommend the singing of the Hon.

recording, there is a surprising number of good issues just now, especially in the "popular" class. First of all, some of the best of the light orchestral tunes, in which Columbia excel this month. You will like *A Wedding in Java* and *The Chinese Story Teller* on Columbia DB1018. These are two very brightly played numbers by *The Bohemians*, a clever orchestra.

Soothing, very soothing, is a record by *Albert Sandler's Orchestra* on Columbia DB1061. They play Eric Coates's *By The Sleepy Lagoon* and *Under Heaven's Blue* with a most attractive delicacy. And then, very similar is DB1056, with that very graceful little thing *Loim du Bal* and *Sans Souci (A Waltz Intermezzo)*. *J. H. Squire's Celeste Octet* are the players here, and either of these last two may be kept as a permanent cure for frayed nerves! *The Song of the Nightingale with Butterflies in the Rain* by *Fred Hartley's Quintet* on *Regal Zono MR853* is quite pleasant, too, with a vocal thrown in.

It is not a frequent occurrence to find modern dance music good enough to buy as music, but here are two records which have much to commend them as companions for some time—*He was Only a Poor Musician* and *In Santa Lucia* on Columbia CB567. This is by a very good band, *Eddie Saxon's*. The other has a pair by the *Dajos Bela Orchestra*, *In a Little Café in Hernalds* and *Play Me a Song of my Homeland*. These are on *Parlophone R1430*. *Leslie Bridgewater's Quintet* are very popular wireless artistes. They have done Strauss's *Voices of Spring and Wine, Women and Song* on *H.M.V. B4257*, and it is a very pleasant performance indeed. Then (German again) there is one of those performances which fairly shouts enjoyment with both titles and tunes. This is *Marek Weber's* performance of *Jollity on the Mountains* and *Viennese Singing Birds (H.M.V. B4008)*. The first is especially good, with a yodelling background here and there. And, writing of Vienna, here is a record to have. Try *Waldteufel's Skaters' Waltz* and *The Schoenbrunner Waltz* on Columbia DB1064. These are by the *Vienna Symphony Orchestra*, who put up a sparkling performance. The orchestration is different from anything I have heard before in the *Skaters*. It is uncommonly good all through.

Before leaving the "band" records, I must confess to a quite unashamed liking for an occasional brass band. Another of the massed brass band records (*Regal Zono MR844*) can't justly be called a "stunner." If you let your radiogram have full throttle, you may have a broken window, but you'll enjoy every bit of *The Gladiator* and *The Crusader Marches*.

W. Brownlow on Columbia DB1072. Its backing, *Sylvia*, is a pretty little song, too. Then, in a different sphere, that superb artiste *Supervia* has a great record in *Parlophone RO20202*. She sings (in Italian) *Santa Lucia* and *Mendelssohn's Spring Song* (in Spanish). Apart from the popularity of each, this record should be bought as an example of beautiful soprano singing. There is a vogue for what I believe are called "swamp" songs. I have come across a pair of negro laments which are very well sung. They are by *George Doshier* (bass) and the songs are *Take Me Away from the River* and *I Want to Go Home (Sterno 1142)*. Here is a voice of tremendous depth and extreme richness.

A New Musical Play

Columbia presents some of the big numbers from *He Wanted Adventure*, which has just come to London from its Manchester trial run. The songs have been recorded on the stage and there is also a little dialogue here and there. There are several attractive songs, notably *The Monarch of the Seas*, by *Raymond Newell and Chorus*, and *You Come to Me*, a duet by *Raymond Newell and Marie Burke*. There are also some neat lines in *Smile and Be Bright* by *Bobby Howes and Wylie Watson*. A short appearance of *Judy Gunn* gives evidence of a very sweet voice. Those who have seen the play will like to have these records, for they are all admirably done, although recorded on the stage. The numbers are *DX459-462*.

A Great Symphony

As you know, the Brahms Centenary is being celebrated this year, and there will be many performances of his works. There is probably no other of his compositions which will be more liked than his *No. 3 Symphony in F Major*. Not the least of its charms is the versatility which is so apparent throughout. Brahms had an uncanny knack of passing from one passage to another, each entirely diverse in character. There are movements of crashing majesty immediately succeeded by a theme which is almost pastoral in its simple melody, and yet there is no incongruity. Space is needed to analyse each movement, but I do earnestly ask those who would be really stirred to hear the fourth movement. The early part is one of the most impressive episodes in music. This Symphony is done by the *Amsterdam Concertgebouw Orchestra* under *Mengelberg*, on four records—*Columbia LX220-LX223*. The recording is superb, and, as always, one can feel *Mengelberg's* conducting. A very important contribution to musical history is here in this performance.

Singers of All Sorts

One of the most popular of the new songs



Practical Letters from Readers.

The Editor does not necessarily agree with opinions expressed by his correspondents

An Excellent Book

SIR,—I write to thank you for my "Wireless Encyclopædia," which I received in good condition. I think it is an excellent book, and it will be very much used by me in my wireless experimenting. It is in every way up to the standard of PRACTICAL WIRELESS, a paper I look forward to each week. The part dealing with television is most interesting and concise. Of course, I have not yet read it through from end to end, but the portion I have read contains information that gets right to the point. Thanking you again for a wonderful book and a sensible weekly paper.—E. ANYON (Huddersfield).

Getting the Foreigners in Daylight

SIR,—This morning I fully exploded the idea that a medium-sized set cannot bring in the "foreigners" in daylight. Reading in PRACTICAL WIRELESS that "Poste Parisien" was starting early morning transmissions, I got up a little earlier one morning last week to give myself time to find him. I have a big aerial, 120ft. long and a D-2 L.F. Trans. set. I cut out all selectivity and gave him the benefit of the full aerial. However, he did not take any finding—as soon as my dial was within 3 degrees of where he should be the volume was tremendous, so good-bye to the idea that medium-wave foreign stations cannot be received in daylight with ordinary battery sets.—"PRACTICAL READER" (London, W.).

An Appreciation: Television Reception

SIR,—Having read PRACTICAL WIRELESS since its introduction I must say that I am agreeably disappointed. Having been connected professionally with radio for twelve years, I have seen the rise of several so-called practical radio journals, all of which have degenerated into semi-fictional magazines within a short period. Naturally, I expected PRACTICAL WIRELESS to follow the same course. Fortunately, I was wrong. More power to your elbow, sir, and keep up the good work.

There is one point I should like to raise. As a progressive journal, cannot you give us some practical details on television reception? For example, how many amateurs know the speed of scanning discs, or their construction? Again, various types of illumination might be described. I am sure that many of your readers possess the necessary skill to construct the actual apparatus, given the necessary data. PRACTICAL WIRELESS is the type of paper which appeals most strongly to the mechanic, either professional or amateur. Another point, what about those D.C. mains? The foregoing is not intended critically, but as you've already given so much, may we have this little more? Wishing long life to PRACTICAL WIRELESS.—R. J. LÖFFE (Upper Heyford).

[We hope to publish in the near future an article on television construction covering the points mentioned.—ED.]

The Fury Four: "Wonderful Undistorted Volume"

SIR,—I have finished the "Fury Four," and am well satisfied with results. I have not heard a set that comes anywhere near it, as regards the wonderful undistorted volume. It's a real treat to listen to the pure reproduction.—E. T. SPARKE (Newport, I. of W.).

The Fury Four: A Wonderful Set

SIR,—I have made up the Fury Four and it is a wonderful set. I have fitted it into its cabinet, and I must say it is an A1 job. I get hand capacity effects when near the knob of single Lotus condenser. How can I cure this?—W. WIGHTMAN (Londonderry).

The "Wonderful Encyclopædia"

SIR,—Please accept my thanks for your wonderful De Luxe Encyclopædia, which is a most interesting book. I have also your binder for the Data Sheets which I look forward to every week. I find your paper, PRACTICAL WIRELESS, is the most interesting and practical weekly wireless journal at the low price of threepence. Wishing your paper and your staff every success.—F. MAROE (Merton).

CUT THIS OUT EACH WEEK

DO YOU KNOW?

—THAT screening a complete receiver will not cut-out interference from electrical apparatus, as such interference usually arises through the Mains.

—THAT the remedy in such cases is to fit special Mains H.F. chokes in the input leads to the receiver.

—THAT a special combination 5-amp. fused plug should be used to couple a Mains receiver to a power point, as the latter is usually fused at a much higher value.

—THAT omission to attend to the above point may result in serious damage to the receiver and the house.

—THAT a larger condenser than that specified by the valve makers should not be used in the input side of a Mains unit employing a valve rectifier.

—THAT an ordinary valve may be used as a Diode and will provide practically distortionless signals.

—THAT either the grid, or the anode, or both, may be used for the purpose of using a normal valve as a Diode.

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 addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

One-Valver Wanted

SIR,—I wish to acknowledge receipt of the Wireless Constructor's Encyclopædia, Standard Edition. One can see by a casual glance through that the diagrams of components are right up to date, and the tables, etc., are of real value. I am a one-valve fan, and should like to see published in PRACTICAL WIRELESS a one-valve set using home-made coils. Wishing PRACTICAL WIRELESS success.—H. H. ASH (Lincoln).

Splendid Book

SIR,—I received the Encyclopædia all right, and I am highly delighted with it. I think it is a splendid book.—W. DEN-
DERSON (Batley).

Old Wireless Set Wanted

SIR,—Will you be kind enough to find space in your journal for an appeal to your readers on behalf of an unemployed Club.

We would ask if any reader has a wireless set which is not required by him or her, and which could be given to the above Club for educational and recreational purposes.

The Club is situated in a distressed area and cannot afford to purchase a new set. The suggestion was made of appealing to PRACTICAL WIRELESS for help, and this is what I am now doing. Can you or any of your readers come to our aid?

WM. EVANS (Rhondda).

[Letters containing offers will be forwarded.—Ed.]

"Practical Wireless" in the Navy

SIR,—We are pleased to see that you are giving us more of the ultra S.W. stuff. I am going to build that "Below 10 metres" circuit that you gave us recently and I will send my results on to you.

The data sheets are most useful. I think that many of your readers would appreciate a really good two or three valve ultra S.W. receiver. Furthermore, I shall never be without PRACTICAL WIRELESS.—E. H. SLOMAN (H.M.S. Erebus).

3 Valve Short-wave Set

SIR,—The short-wave notes in PRACTICAL WIRELESS have proved very useful. May I suggest that you publish the information contained therein in tabular form so that the particulars can be seen at a glance?

I should like to see published full constructional details for a 3-valve short-wave receiver, e.g., S.G. with tuned circuit, detector, and 1 L.F. valve.—W. W. WOODMAN (Willesden).

Quality Reproduction

SIR,—I would like to endorse H. S. Bassett's appeal for quality in PRACTICAL WIRELESS of March 25th. True, designers have to cater for the majority, but people who demand range and selectivity do not usually realize that they are sacrificing quality to obtain these things.

I appeal to PRACTICAL WIRELESS to give us a receiver, with a level frequency response between 50 and 8,000 cycles, with an output not too great, for the home, preferably with triodes in push-pull for the power stage (A.C. mains). I, for one, have a speaker capable of doing justice to such a receiver, and intend buying another, to use two speakers at half volume, rather than one at full volume, merely to improve quality.—JAMES T. BRINKWORTH (Bellingham).

(Continued overleaf.)



WITH A PIX IN YOUR AERIAL

Fix a PIX and have a choice of programmes usually enjoyed by only the most expensive sets. Make your set super selective by the simple operation of fixing a Pix between aerial and set. No other alteration necessary. Just undo aerial from set—connect to one end of PIX and join the other end with a piece of wire to aerial terminal on set.

Knife edge tuning is possible on any kind of set with a PIX, and it cuts out powerful stations



that "swamp" your tuning dial. Over 1,500,000 purchasers are our silent and most effective testimonial.

CLIP THE PIX TO YOUR SET

wall or window-ledge, etc. The clip holds the PIX securely, mounted on drilled insulated base with screws 6d



Get a PIX from your Dealer, or send 2/- Postal Order (with clip, 2/6) direct to:—

THE BRITISH PIX COMPANY, LIMITED
(Dept. 500), 118/28, SOUTHWARK ST., LONDON. S.E.1

THE IMPROVED "TONIC"

self-generating trickle-charger kit keeps 2-volt accumulators fully charged. Electric mains and charging stations unnecessary. Ideal for remote places. 7/- each, postage 9d. Particulars, testimonials, with pleasure. **WILLIAMS, Netherend, Cradley, Birmingham.**

Write for illustrated Catalogue of
Radio-Gramophone Cabinets
of exclusive modern design, made by craftsmen in highly figured Oak, Walnut or Mahogany, post free.
REMARKABLE VALUES
Cabinets made to order a speciality.
Maker, under license, of the **HOWE BOX BAPLE**. Recommended by the B.B.C. Full details on request.
GILBERT
Cabinet Maker
SWINDON. Estimates free. Est. 1866.



Genuine **AMPLION** Units, Limited number. Over 75 per cent. reduction. Guaranteed. To clear, 2/3 each, carr. paid.—G.B. Pioneer Radio, Coptic St., W.C.1.

SILENT BACKGROUND

A faulty earth connection is often the cause of crackling noises in your receiver. Put down "Filttron," the earth that "grows roots." Price 2/- of all dealers.

AMPLION (1932) LTD.
82/84, Rosoman Street, London, E.C.1.
Clerkenwell 5440-1.

PRACTICAL LETTERS

(Continued from page 169.)

An Interesting and Instructive Book

SIR,—I should like to acknowledge the receipt of my copy of the "Encyclopædia," and thank you sincerely for a most interesting and instructive book.—**REX. TAYLOR** (West Norwood).

A Remarkable Free Gift

SIR,—I have received my copy of "Wireless Constructor's Encyclopædia" safely, for which please accept my thanks, and congratulations for such a remarkable free gift.—**R. H. WAIN** (Sheffield).

Fills a Long-felt Want

SIR,—Just a few words of appreciation concerning your wonderful Encyclopædia, which I received safely. I think it is a great work and fills a long-felt want of every wireless enthusiast, amateur or professional.—**F. W. SALT** (Long Eaton).

More than Satisfied

SIR,—Having received my "Wireless

Encyclopædia" yesterday and by this time well examined it, I feel I should write and congratulate you on being able to offer such a fine volume at such cheap rates. I am more than satisfied—I am delighted.—**G. J. (Liverpool).**

Exceeds Expectations

SIR,—I can assure you that it is a great book, and, though I do not understand wireless technique, I will soon be able to pick it up from this book. It exceeded my expectations in all respects, and, those that did not go in for one have missed a real good thing.—**A. C. V. (Shepherd's Bush).**

A Fine Book

SIR,—I received my copy of your presentation volume, "Wireless Constructor's Encyclopædia," and wish to express my admiration for such a fine book. So well put together, and the illustrations are a fine example of much thought. The "completeness" of the volume leaves nothing to be desired.—**E. S. (Sheffield).**

programme of meetings, etc., is invited to write to the Hon. sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

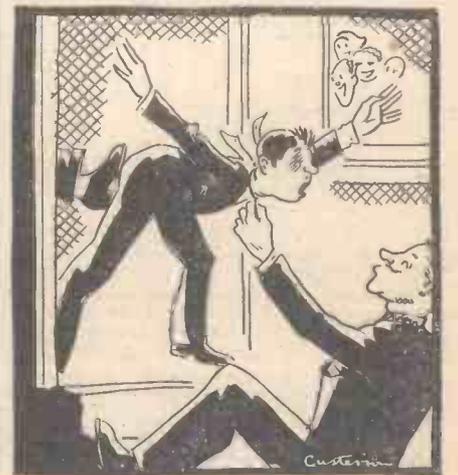
ILFORD AND DISTRICT RADIO SOCIETY

The meeting held on March 16th was a very enjoyable one, and members co-operated to make a very interesting series of demonstrations, which were as follows: Mr. Largen demonstrated the use of a mains valve as a light-operated cell, which operated a series of relays and associated apparatus, when a light beam from a torch was impressed on the grid. There was a slight lag as compared with a photo-cell, but a definite rise in anode current in the valve in proportion to the distance of the source of light. Some amusement was caused by a demonstration of his "Coal-scuttle Three," a three valve R.C.C. amplifier, using lumps of domestic fuel for the necessary resistances, with 6,000-volt coupling condensers, but, nevertheless, it worked well. A number of Gesler tubes were worked by Mr. Dennis, the phasing of which were most impressive, and some high frequency experiments were then made. Details of the society may be obtained from the Hon. sec., Mr. C. E. Largen, 10, Clements Road, Ilford.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

In order to correspond more readily with members in foreign speaking countries the Anglo-American Radio and Television Society and associated society, the International Radio Society, have organized a committee of members who have a good knowledge of foreign languages. This committee, known as the Foreign Committee, is proving of great service. The readiness of members to join this committee when it was first suggested is a sure proof of the goodwill and fellowship these big radio societies foster. Mr. Karl Halpern has organized a New York City Branch of the A. A. R. and T. S. and I. R. S. The headquarters of the societies are at 11, Hawthorn Drive, Willowbank, Uxbridge, England. Hon. Pres.: Leslie W. Orton.

WIRELESS TERMS TRAVESTIED—5



Push-pull Output.

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received first post each Monday morning for publication in the following week's issue.

KETTERING RADIO AND PHYSICAL SOCIETY

"Gramophone pick-ups and automatic record changers" was the title of an excellent lecture delivered to the society on Monday, March 27th, by Mr. A. Freeman. A "Heath Robinson" pick-up, weighing several pounds and having a reed nearly a foot long, was shown by the lecturer, who described the construction and action of pick-ups in a delightful non-technical manner. The whole meeting had the novel experience of "feeling" music by joining hands across the output of a 50-watt amplifier connected to the pick-up. Explaining automatic record changers, Mr. Freeman exhibited an ingenious type of machine invented by himself, which played and automatically changed twelve 10in. or 12in. records.

Hon. sec.: Mr. R. J. Pankhurst (G5YF), 9, Shakespeare Road, Kettering, and Mr. Thomas H. Hall (BR3 1018), 59, Tresham Street, Kettering.

THE CROYDON RADIO SOCIETY

"The Transmission of Sound by Light" was discussed at a recent meeting in the Horse and Groom, Cherry Orchard Road, E. Croydon. The lecturer was Mr. V. H. Gilbert, who began by describing the Raycraft bridge and its uses with a relay, such as when light on to the bridge was interrupted, the relay was closed. This was it used for burglar alarms, and similar applications. In transmitting sound by light, signals from a wireless set's output were modulated on to a light beam, obtained by a flash-lamp bulb. Then this modulated light was directed at the light sensitive cell, which, with associated amplifier, reproduced the signals as sound in the loud-speaker. The society's club set was used for the demonstration, its loud-speaker being disconnected from the output, and connected to the Raycraft bridge's amplifier. Excellent signals were heard, and experiments were suggested, such as conversing by light across the street, and even invisible-ray messages might be sent, using the infra-red portion of the light.

Hon. sec.: E. L. Cumbers, Maycroft, Campden Road, S. Croydon.

SLADE RADIO

A lecture and demonstration was given by Mr. S. H. Cohen at the meeting of the above society held recently. Commencing with a description of Class B amplification and the problem which it had set the designers of eliminators he gave a demonstration in which the latest type of eliminator and also an experimental valve of British manufacture were used. The volume proved ample, the quality very good, and the current consumption exceedingly small. Iron core H.F. coils, and also Litz wound coils were then dealt with after which some details were given of a new type of loud-speaker which is being developed. A demonstration of this was given, the results portending great possibilities for the future. Anyone who would like details of the society and advance

Important TO ALL MOTORISTS AND GARAGE MEN



Part 1 Now on Sale 1/4



DEALS WITH

The Overhaul, Maintenance, and Repair of the following popular makes :—

- | | |
|----------|---------|
| AUSTIN | M.G. |
| MORRIS | HILLMAN |
| ROVER | B.S.A. |
| RILEY | FORD |
| TRIUMPH | JOWETT |
| STANDARD | SINGER |
| WOLSELEY | |

This Chart contains :—
Valve Timing Data
Ignition Timing Data.
Tappet Clearances for In-
let and Exhaust Valves.
Order of Firing.

For over 100 engines.
DAIMLER FLUID FLYWHEEL
CHART IN PART 2. READY
APRIL 21st.

A SPLENDID INVESTMENT FOR ALL INTERESTED IN CAR MAINTENANCE AND REPAIR.

In a convenient compass will be found all the practical points and special repair methods applicable to the leading makes of cars.

General methods of overhauling a car from end to end are given. Detailed notes on decarbonising, valve grinding, electrical trouble tracing.

How to deal with engine stoppages and erratic running.

The maintenance of brakes, steering gear, electrical equipment and bodywork.

Under each of these headings special notes are given dealing with the particular car in which you are interested.

This up-to-date work will save you time and money.

WONDERFUL ILLUSTRATIONS

Contains hundreds of action photographs, showing the best methods of carrying out adjustments and repairs on all current popular models.

VALUABLE TABLES

MODERN MOTOR REPAIR contains many tables which have been specially compiled for the work and which show, in a striking manner, comparative values of items such as :—

- Miles Per Gallon.
 - Oil Pressures.
 - Tyre Pressures.
 - Braking Efficiency.
 - Acceleration Values.
 - Normal Charging Rates.
 - Dynamo Cut-In Speeds, Etc.
- for more than 50 current models.

ALL PRACTICAL MEN

Even if you have not yet acquired a car of your own you will certainly be interested in the wonderful developments which have taken place recently in connection with modern cars.

THE OPERATION OF THE DAIMLER FLUID FLYWHEEL; THE WHY AND WHEREFORE OF THE FREE WHEEL; THE SELF-CHANGING GEAR-BOX; THE STARTIX AUTOMATIC STARTER; ELECTRIC PETROL PUMPS; CAR WIRELESS INSTALLATION, and other innovations are all dealt with in a clear and practical manner.

GET YOUR COPY OF PART I FROM YOUR NEWSAGENT TO-DAY

MODERN MOTOR REPAIR

Obtainable from all Newsagents and Bookstalls, or post free, 1s. 3d., from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

NEW BLUE SPOT MOVING COIL SPEAKERS

The new Blue Spot Moving Coil Speakers have been produced after the most exacting and painstaking research, for it is realised that the public are more than ever very critical of the standard of reproduction which they expect from their Loudspeaker. These new Blue Spot models represent the very latest achievement in Speaker technique, both from the point of view of design and reproduction. The known and dependable quality of all Blue Spot products has never been better exemplified than in these new Moving Coil models.

Write for Catalogue No. P.R. 11.S.



29 P.M.

This is another splendid Blue Spot achievement. The performance of the new 29 P.M. will enhance the already enviable Blue Spot reputation. The price will enable those whose means have not previously allowed them to consider the possibility of owning a Moving Coil Loudspeaker, to secure the added enjoyment of Radio which it brings. The performance and reliability of this Model are really astonishing. Complete with Matching Transformer and other special features, price Attractive Cabinet model in Oak 22 P.M. 45/- BRITISH MADE

32 1/6



45 P.M.

N.B. Standard Models 99 P.M. and 45 P.M. are suitable for Class B Output. 29 P.M. on request.

This Blue Spot Moving Coil Speaker will be hailed with delight, for two reasons. It embodies the latest engineering and technical refinements, while its reproduction sets a new standard, a new ideal. Having an even response throughout, no excessive bass and no shrill top, 45 P.M. will meet the most exacting requirements. Dust proof plates have been fitted to the special magnet, specially designed Cone and Speech coil. The Matching Transformer which is included is complete with plugs and sockets for easy and trouble-free valve matching.

Exceptionally attractive cabinet models made in mahogany or walnut with the new Blue Spot grille 62 P.M. 67/6

45 1/2



99 P.M.

Blue Spot 99 P.M. represents the highest achievement in moving coil loudspeaker technique to-day. Its reproduction is sheer delight. Its response throughout the whole musical range of frequencies is extraordinarily even, true bass, true middle, true top. An exclusively designed magnet, ensures powerful and permanent energy. Moulded side-plates exclude dust and magnetic particles from entering the air gap. De Luxe Transformer is fitted with plugs and sockets. New process Cone and Speech Coil prevent trouble from moisture, warping or fouling in the gap. To own a Blue Spot 99 P.M. is to have at your disposal the most perfect rendering of broadcast programmes the world has known. Luxurious cabinet model in beautiful walnut 32 P.M. 87/6

59 1/6

SPECIAL FEATURES OF ALL MODELS

Scientifically designed and well made Output Transformers with each Chassis ● Plugs and sockets in lieu of solder tags for easy valve matching ● Suitable for Power, Super-Power, Pentode and Q.P.P. (Triode) Output, Special Q.P.P. Pentode models 2/6d. each extra ● New process Cones and Speech Coils—no trouble from moisture, warping or fouling in the gap ● Cadmium plated pole pieces, copper plated chassis with felt surrounds ● Every model stands firmly on its own base ● Cabinet models have special acoustic features, the Chassis being mounted to an independent baffle specially fitted to cabinet ● Unrivalled finish, construction, performance.



THE BRITISH BLUE SPOT COMPANY LTD

BLUE SPOT HOUSE · 94/96 ROSOMAN STREET · ROSEBERY AVENUE · LONDON · E.C.1
Telephone: Clerkenwell 3570.
Telegrams: "Bluspot, Isling, London."
Distributors for Northern England, Scotland and Wales: H. C. RAWSON (Sheffield and London), Ltd., 100 London Road, Sheffield; 22 St. Mary's Parsonage, Manchester; 177 Westgate Road, Newcastle-upon-Tyne; 37, 38, 39 Clyde Place, Glasgow.

P. W. Gift Stamp No. 29

Printed by NEWNES & PEARSON PRINTING CO. LTD., Exmoor Street, Ladbroke Grove, W.10, and published by GEORGE NEWNES, LTD., 8-11, Southampton Street, Strand, W.C.2. Sole Agents for Australia and New Zealand: GORDON & GOTCH LTD. South Africa: CENTRAL NEWS AGENCY, LTD. Practical Wireless can be sent to any part of the world, post free, for 17/4 per annum; six months, 8/8. Registered at the General Post Office for Transmission by Canadian Magazine Post.

53 Collier

THE LEADING HOME-CONSTRUCTORS' WEEKLY!

Practical Wireless

3^D

Published every Wednesday by
GEORGE NEWNES LTD.

Vol. 2. — No. 31.

APRIL 22nd, 1933.

Registered at the G.P.O. as a Newspaper.

The SELECTONE A.C. RADIO-GRAM TWO



VOLUME CONTROL
ADDING A VALVE
MAKING COIL FORMERS
WIRING EFFICIENCY
THE DOUBLE-DIODE-
TRIODE
OPERATING THE BETA
FOUR Etc., Etc.



HEAYBERD MAINS TRANSFORMER

AGAIN—EXCLUSIVELY SPECIFIED! For the 'A.C. Twin'

Send for 36 page Handbook to: 10, FINSBURY ST., LONDON, E.C.2.

Write name in margin and send, with 3d. stamps—NOW!

MONARCH OF THE MAINS.

ADVT.

WHY TROUBLE?



The Utility Bakelite Condenser with the disc dial.

You may think "Why should I trouble to buy a Utility Bakelite Condenser when I can get a dozen others all the same." But there is as much difference between a good and bad bakelite condenser as between chalk and cheese. We believe that a bakelite condenser justifies care in design and in construction, that it should be accurately rated, that H.F. losses should be kept as low as possible. We may be wrong, but a check is easily applied; substitute a Utility for the bakelite condenser you are using for reaction control. We feel sure that you will prove that we are right.

Coupled with the famous Utility disc dial, the condenser costs **4'6** in the following sizes:— .0002, .0003, .0005. The condenser can be purchased separately for 2'.

If your dealer cannot supply write direct to:—

WILKINS & WRIGHT LIMITED

Utility Works, Hollyhead Road, Birmingham

London Agent: E. R. Morton, Ltd., 22 Bartlett's Buildings, Holborn Circus, E.C.4

Utility BAKELITE CONDENSER

Belmont

STRONGLY RECOMMENDED

Innumerable specifications of Lewcos Components by experts for the most successful sets of the year indicate that these renowned units are recognised as the most modern and efficient obtainable.

fit Lewcos Radio Components transform even the most indifferent receivers into instruments of outstanding brilliance.

Lewcos

RECD

Radio Components

A Lewcos Band Pass Filter (Ref. B.P.F/R) is exclusively specified by the

designer for the "A.C. Twin" described in this issue.

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

THE VALVE OF THE MOMENT!



THE BRITISH 362

CLASS B

FOR IMMEDIATE DELIVERY

All radio journals agree that "Class B" Amplification is a great and revolutionary development, since this new valve gives tremendous volume and good quality for insignificant expenditure of H.T. Send direct to the makers for a British 362 "CLASS B" Valve with full instructions—you will be delighted with the marvellous results obtained.

Price

9'6

POST FREE

If you also require a "driver" valve, send for the British 362 "P.2." price 4'6, post free. For full list of British 362 FULLY GUARANTEED VALVES see our advt. on page iii of cover.

Cash with order. Cheques and P.O.'s must be crossed and made payable to The 362 RADIO VALVE Co., Ltd. (Dept. W.7), 415, Mare St., Harkney, London, E.8.

'SMITHCRAFT' LYRIC CABINETS

Exclusively specified for the

A.C. TWIN

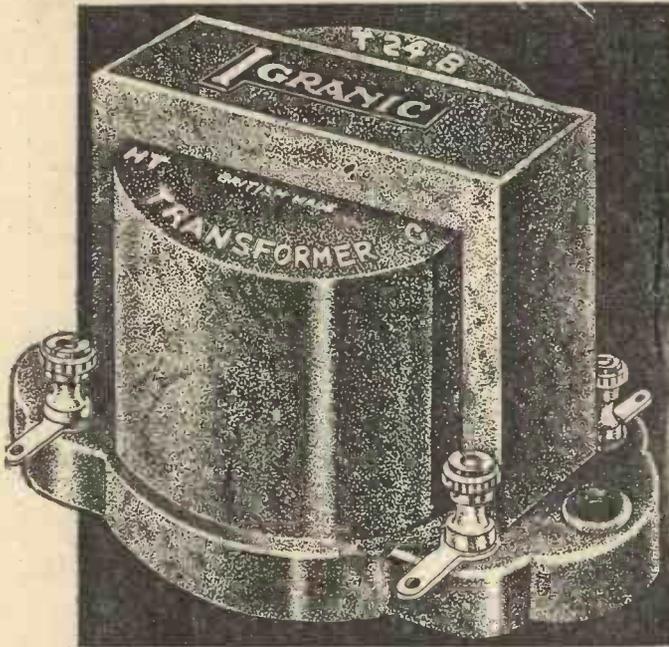
PRICE £2 : 18 : 6
SMITH'S CABINETS LTD.

18-20 HERTFORD RD., N.1



AN EXAMPLE OF 'SMITHCRAFT'

IGRANIC T.24.B TRANSFORMER SPECIFIED FOR THE A.C. TWIN



"I do not know what the life of a transformer is supposed to be, but this one has been in constant use for 7 years and has given about 10,000 hours' actual performance and is still going strong."
J.A.L., Liverpool. Extract from letter.

Through long experience of wireless construction, Igranic have evolved the perfect general purpose transformer—specified to-day for the A.C. Twin. The Igranic T.24.B Transformer reproduces over the whole scale of musical frequencies. Ratios 3-1 and 5-1. Price only 5/6.



Write to-day for fully-illustrated Catalogue No. J.1248 of complete new range of Igranic Quality Components.

Igranic Electric Co., Ltd.,
149, Queen Victoria Street, London, E.C.4.

**IGRANIC COMPONENTS WILL
BE THE MAKING OF YOUR SET**

CVS-72

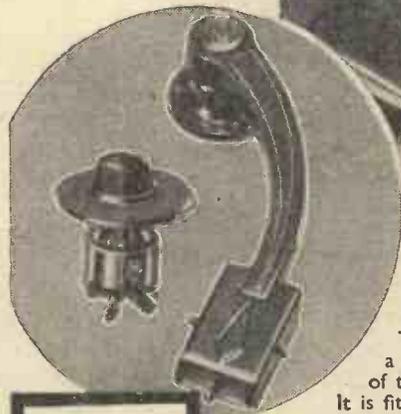
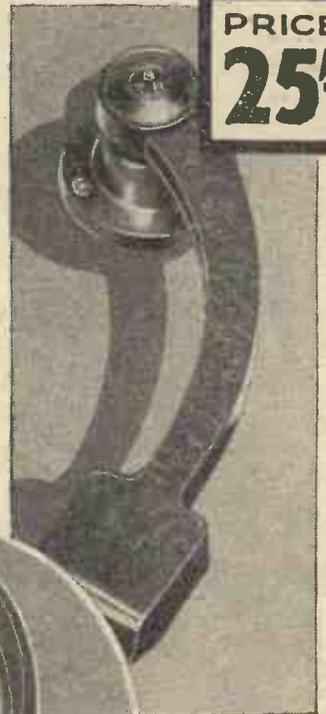


EDISWAN

The name that means 'EXCELLENCE'

Convert your radio into a RADIO- GRAM

PRICE
25/-



The B.T.H. Pick-up has, since pick-ups were first used, always been acknowledged as the finest obtainable. The "Minor" model is a worthy representative of the latest B.T.H. range. It is fitted in a highly finished tone-arm moulding. A volume control of the correct value is incorporated in the tone-arm pillar. It is supplied complete with rest and fixing screws. For the connoisseur in radiogram reproduction, the "Senior" model is ideal. It is finished Florentine bronze and supplied complete with separate volume control.

PRICE
42/-

B T-H PICK-UPS and TONE ARMS



The Edison Swan Electric Co. Ltd.
155 Charing Cross Rd., London, W.C.2

GOOD RADIO DEALERS RECOMMEND EDISWAN

W.207

The First Completely Practical-Completely Safe—
ALL-ELECTRIC RECEIVER
 for the Home Constructor!

KIT COMPLETE WITH FOUR VALVES

£7.19.6



The **ALL-ELECTRIC A.C. SAFETY "SKYSCRAPER"**

Now, at last, you can equip your home with ALL-ELECTRIC RADIO, SELF CONSTRUCTED. Here for the first time is a complete All-Mains Kit for the Home Constructor which is at once completely practical and completely safe. You build the "All-Electric Skyscraper" yourself, and by a few hours of fascinating home construction you will have a powerful receiver, complete with every modern reception device—bringing you in every receivable station at full moving-coil volume.

UNIQUE SAFETY FUSE PLUG



No harmfully powerful current can possibly flow from your mains to your A.C. Skyscraper. The special safety fuse plug completely protects you by introducing a small valve fuse into each lead.

FOUR MATCHED HIGH POWER VALVES

The four valves of the A.C. Safety Skyscraper are matched to each other and to the rest of the special circuits to give the utmost power, utmost range, utmost fidelity of reproduction.



The "All-Electric Skyscraper" works from A.C. Mains. It is a self-contained receiver, with provision for Mains Aerial. You simply plug in and switch on. Unique to this A.C. "Skyscraper" is the special Safety Power Unit and Safety Fuse Plug giving the fullest possible protection, and making this the first really SAFE A.C. Constructor's Kit, AS SAFE TO HANDLE AS A BATTERY SET! Lissen has published a beautiful and practical coloured Chart which gives you plans and photographs and exhaustive descriptions of every single point in the construction, operation and enjoyment of this receiver. Matched Valves. Pentode Output. Variable Mu Screened Grid H.F. Stage. Drives Moving Coil Speaker at full volume. Metal Chassis. One Dial Tuning. Ganged Reaction, and Volume Control. Walnut Console Cabinet which you assemble yourself and so save money. Power Pack an integral part of the chassis. Heavily insulated Mains Lead. Every refinement of the most expensive All Mains Receiver is incorporated in the All-Electric "Skyscraper"—and SUCCESS IS CERTAIN WHEN YOU FOLLOW THE GREAT LISSEN CHART.

MOST COMPLETE AND DETAILED CHART EVER PUBLISHED

Obtainable from all Lissen Dealers at the following prices:
 "All-Electric A.C. Skyscraper" Chassis Kit, complete with Power Unit, 4 Matched Valves and Mains Lead with special Power Unit and Safety Fuse Plug. Price £7 19s. 6d.
 "All-Electric A.C. Skyscraper" Kit, as above, including valves, with Table Model Walnut Cabinet. Price £8 15s. 0d.
 "All-Electric A.C. Skyscraper" Kit, as above, including valves and with Walnut Console Cabinet, as illustrated, and full power MOVING COIL LOUDSPEAKER. Price £10 12s. 6d.

LISSEN

AC SKYSCRAPER SAFETY

To LISSEN LTD., Publicity Dept., Isleworth. Please send me FREE copy of the Chart of "All-Electric Safety A.C. Skyscraper."

Name

Address

..... PRACT. A.C. 2

POST THIS COUPON



EDITOR:
 Vol. II. No. 31 || F. J. GAMM || April 22nd, 1933
 Technical Staff:
 H. J. Barton Chapple, Wh. Sch., B.Sc., (Hons.), A.M.I.E.E.
 W. J. Delaney, Frank Preston, F.R.A., W. B. Richardson.

ROUND *the* WORLD of WIRELESS

Good News for Battery-Set Users

A CELL that will hold its charge for a longer period has been the dream of accumulator experts for years past. At last that desirable goal has been realized by the introduction of the new Edison "Extralife" accumulator. In developing the new cell, Ediswan have made use of a new principle. It is called by them "balanced capacity." By special designing of the plates, an exact electrical balance is maintained between the positive and negative elements of the cell. This has the effect, not only of conserving the charge, but also of prolonging the life of the cell, even under adverse conditions. A range of these trouble-saving accumulators has recently been placed on the market at the same prices as ordinary accumulators.

Two Stations for Christmas Island

THE value of wireless communications to highly-developed countries has been so widely demonstrated in recent years, during which a vast network of radio telephone and telegraph services has been established between practically all the principal nations of the world, that, paradoxically enough, the special value of wireless to isolated communities is less emphasized to-day than in the earliest period of Marconi's inventions. Yet modern wireless apparatus has attained a degree of efficiency and reliability, combined with simplicity of operation, that renders it an essential part of the equipment of any settlement that is outside the world's established communications systems.

A typical example of such a community, and the utility of wireless to its members, is the small British settlement on Christmas Island, in the Indian Ocean. Christmas Island lies some 800 miles south of Singapore and 1,000 miles north-west of the Australian continent. It is served by no cables, and it is far from the regular shipping routes.

Without wireless, its inhabitants would be isolated from contact with the outside world, except through the medium of trading ships.

Pentode Output Stage

THERE are a number of circuits about showing a pentode output stage coupled by means of a choke fed trans-

former. While this circuit undoubtedly gives excellent results we wonder how many listeners realize the danger of using such an arrangement. Should the detector-valve heater suddenly break, which it must at some time, the following set of events takes place. The anode current, which was passing through the choke to the valve, suddenly stops, with the result that the magnetic field round the choke suddenly collapses, which sets up an abnormal voltage across it, say, 10 volts.

New German Interval Signal

TO commemorate the Potsdam celebrations in connection with the re-opening of the German Reichstag on March 21st last, the Königs Wusterhausen (Deutschlandsender) has adopted as an interval signal the first bars of the patriotic hymn, *Ueb' immer Treu und Redlichkeit*, played on the carillon of the Potsdam Garrison Church. As the sounds are reproduced by a musical box of the barrel-organ type, they do not sound like bells but closely approximate the tones of a piano.

Radio Luxembourg and Istanbul

MANY readers have been puzzled by a call from the super-power Luxembourg station, which has led them to believe that they were also hearing a broadcast from Istanbul (Constantinople) on a neighbouring wavelength (1,200 m.). There should be no confusion between these two transmitters; the announcement given in a feminine voice is not *Ici Radio Istanbul*, but *Ici Radio Luxembourg*—the last word being pronounced *Lix-am-boor*. The Turkish studio does not possess a woman announcer.

Hungary's Seven Transmitters

CONSIDERABLE developments have taken place during the past few months in the Hungarian broadcasting system which now comprises a network of seven stations. The Budapest main programme is broadcast through the Lakihegy 18.5 kilowatt transmitter on 550.5 metres, and also through three 1½ kilowatt relays installed at Magyarovar, Pecs and

Miskolc which work on a common wavelength (209.8 metres). In addition, the same wireless entertainments are taken by Nyiregyhaza (6.25 kilowatts) on 267.2 metres. An alternative programme for the Hungarian capital is now transmitted through the old Csepel station on 840 metres, with a power of 3 kilowatts. For experimental purposes only tests are made with a small mobile plant at Craciunelu on 2,000 metres.

A Royal Birthday Broadcast

TO celebrate the birthday anniversary of Princess Juliana of Holland on April 30th, a special programme will be broadcast by the A.V.R.O. association

**HAVE YOUR COPIES OF
 VOLUME 1 OF
 "PRACTICAL WIRELESS"
 BOUND!**

**SEE THE
 SPECIAL
 BINDING OFFER
 ON PAGE 200**

**NEXT WEEK:
 SOMETHING ENTIRELY
 NEW IN LIGHTWEIGHT
 CLASS B PORTABLES**

Assuming a 3 to 1 transformer, this 10 volts will become 30 across the secondary. Allowing the pentode moderate magnification of 40, the 30 volts will become 1,200 volts between anode and cathode of the pentode. Granted this voltage will only be present for an infinitesimal part of a second, it is often long enough to blow every condenser in the power pack. To prevent such an unhappy occurrence, a resistance should be connected across the choke. The value may be anything between 50,000 and 200,000, and will not alter the quality of reception if the value is chosen with some regard to the inductance of the choke.

ROUND the WORLD of WIRELESS (Continued)

through Hilversum station on 296.1 metres on May 1st. As this date in previous years was always conceded to the V.A.R.A. Socialist Clubs for their Labour Day wireless entertainments, these celebrations will be postponed to the following week.

Atlantic Ice Patrol

FOLLOWING the sinking of the s.s. *Titanic*, on her maiden trip in April, 1912, when she collided with an iceberg, the United States coastguard service instituted a regular iceberg patrol in the North Atlantic. As the movement of these bergs from the Polar regions has already begun, special vessels from New York and Norfolk are already patrolling the international shipping routes to locate the icebergs, the positions of which are wirelessed at regular intervals throughout the day and night.

The Strasbourg German Programmes

PITT STRASBOURG since its installation has always broadcast in both French and German in view of the mixed population in the Alsace province. In view of the fact that complaints by listeners are made regarding anti-French propaganda put out by the neighbouring German stations, the authorities are considering a suggestion to make Radio Strasbourg an all-French studio, and to cut out German entertainments and announcements.

Listen to West Regional

THE new West Regional transmitter at Washford Cross is now ready to operate and listeners may hear the station testing from April 24th, when from that date it will be on the air daily between 11.10 and 11.50 a.m. The B.B.C. also proposes to broadcast the late dance music through this station. The wavelength is the one at present used by Cardiff, namely, 309.9 metres.

The Awakening of the Orient

COMPLETE re-organization of the French broadcasting system in Northern Africa is to take place during the next eighteen months. Radio Algiers will be completely rebuilt in order to house a 75-kilowatt transmitter and a 60-kilowatt plant will also be installed at Tunis. Radio Maroc (Rabat) may also see its energy considerably increased by next autumn and plans have been drawn up for the erection of two further relay stations. According to reports, work on an official Egyptian transmitter at Cairo is making good progress and a second station may be built at Alexandria. Even Jerusalem in the near future will broadcast wireless programmes, with a short-wave relay transmitter at Tel-Aviv, to make the entertainments available to the New World.

Bringing the Orient to Italy

IN order to give listeners an impression of native life in the Italian-African Colonies, the E.I.A.R. intends to relay running commentaries from the native "souks" in Tripolitania. A well-known

INTERESTING and TOPICAL PARAGRAPHS

journalist and two radio engineers have been sent to the capital, Tripoli, to study ways and means. The relays would probably be carried out by short-wave transmission to Rome and then re-broadcast over the Italian net.

HOW IT IS DONE!



The Columbia van at Marble Arch recording an organ recital from inside the cinema.

The Moscow Foreign Broadcasts

ON 1,000 metres (300 kc/s) and 50 metres (6,000 kc/s) broadcasts in foreign languages are carried out by the Moscow

SOLVE THIS!

Problem No. 31.

A rather peculiar fault had developed in Smith's three-valve set. This employed a grid leak rectifier, resistance-coupled to the next valve which was in turn transformer-coupled to the output valve. When the set was switched on it gave good signals for about one minute and then the strength fell to about one-third of normal, at which it would remain constant for the rest of the evening. When, however, Smith was looking for the fault and testing the soldered joints he suddenly touched the grid terminal of the second valve and signals were immediately restored to full strength. What was wrong with the set? Three books will be awarded for the first three correct solutions opened. Address your solutions to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2, and mark your envelopes "Problem No. 31." Do not enclose any other correspondence with your solution.

SOLUTION TO PROBLEM No. 30.

Blackman should have inserted the S.G. valve into the detector socket (ignoring the anode connection), and connected the aerial, via a small fixed condenser, to the junction of coil, tuning condenser and grid condenser. The following three readers received books in connection with Problem No. 29.

A. Feakins, 37, Rosebery Road, Brixton Hill, S.W.2; M. H. Hayton, 11, Park View, Harton, South Shields; W/O L. H. Metz, Fighting Area H.Q., R.A.F., Usbridge.

(Old Komintern) transmitter according to a regular time schedule as under:— From 8.0-9.0 p.m. B.S.T., in German, on Sundays, Mondays, Thursdays and Saturdays; from 10.0-11.0 p.m., in Dutch, on Fridays; and between 8.0-9.0 p.m. on Tuesdays; from 10.0-11.0 p.m. on Thursdays and Saturdays in Swedish; in Spanish (Sundays); Magyar (Tuesdays) and in Czech (Wednesdays and Fridays). Moreover foreign talks are also transmitted by the

Trades' Union station in English on Monday, Wednesday, Friday, Saturday and Sunday, and in French on Tuesday, Thursday and Saturday, between 9.0 and 11.0 p.m. B.S.T. These are also relayed on the short-wave transmitter working on 46.6 metres.

Man-Made Statics?

AUSTRIAN papers report that in order to prevent German listeners from hearing the Polish broadcasts, the German authorities have deliberately jammed the Warsaw transmissions. Interference on the Moscow wavelength is also said to be due to the same cause. Similar complaints have been levelled against Italy by the Jugo Slavian studios and in particular by Ljubljana, of which the transmissions on several occasions were destined for the Trentino districts. All quiet on the ether front!

The Monte Ceneri Tests

OWING to an unforeseen "technical hitch" the first broadcasts to be carried out by the new Tessin station on 680 metres may be postponed for another three weeks. The wavelength has been temporarily adopted and may be changed for a more favourable channel at a later date.

Regular Night Programme from Zeesen

AS already stated in these columns, DJC, Zeesen, is now carrying out a nightly broadcast between 1.0 and 3.0 a.m., B.S.T., on 49.83 m. (6,020 kc/s). This special transmission is destined to German residents in North and South America and in order to favour reception beam aerials will be used. The station will no longer act as a short-wave relay for Berlin or other German studios, but will put out original programmes of special overseas interest.

The Ether Controllers

IN addition to the special station designated by the International Union of Broadcasters to check the wavelengths of all European transmitters, there exist other "listening posts" acting for individual States, such as Tatsfield (England), the Telegrafentechnisches Reichsamtsamt (Berlin), Csepel (Hungary), Mojauk (U.S.S.R.); Sesto Calende (Italy), Noiseau (France) and recently-opened radio laboratories at Madrid, Warsaw and Stockholm. Officials appointed for the purpose measure the transmissions at regular intervals during the broadcasts with a view to assisting the transmitters to maintain their allotted positions in the waveband.

ADDING A VALVE TO YOUR SET

By W. B. RICHARDSON

If you are Thinking of Altering Your Receiver to Include Another Valve You Should First Read This Article. It Tells You When the Alteration Would be Advisable and Gives the Pros and Cons of the Various Possible Arrangements.

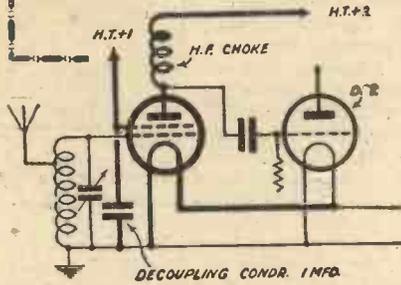


Fig. 1.—Adding an untuned H.F. stage. Heavy lines indicate the new parts required.

SOMETIMES the home constructor possessing a two-valve or three-valve set feels he could do with a little more "punch," or with rather greater range. Must he scrap his present receiver, he asks, and make or buy a more powerful one, or can he add another valve to it and thus achieve the desired result without any great additional expense?

The answer to such a question depends on a variety of things. Perhaps the most important is the type of set. If it is a commercial receiver it is usually practically impossible to alter it; but if it is home-constructed it may be possible. The amount of space available will probably be the deciding factor.

H.F. or L.F.?

The first thing to decide is whether the valve is to be an H.F. or L.F. amplifier. Broadly speaking, adding a screen-grid valve will give increased selectivity and greater range, while an L.F. valve will increase the volume.

similar to L.F. amplification. However, it differs from the latter in that it is able to increase the range of the set. This is due solely to the imperfections of the detector.

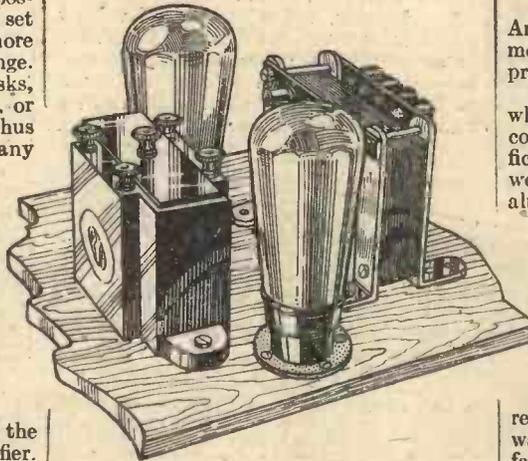


Fig. 6.—One way of adding a valve is to connect it in push-pull with the existing output valve. The lay-out for such an arrangement is shown here.

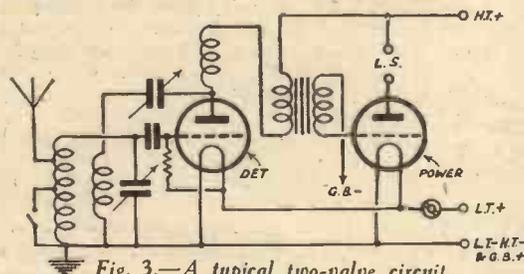


Fig. 3.—A typical two-valve circuit.

The average detector is unresponsive to very weak inputs. This means that weak or distant transmissions provide only the most feeble rectified outputs, while powerful stations give signals out of all proportion louder.

The screen-grid valve in Fig. 1 being placed before the detector amplifies the feeble H.F. currents set up by the distant stations so that they are made powerful enough to be properly rectified.

Before dealing with the practical side of the problem it will be just as well to have a look at the theory of the thing and find out the pros and cons of the two possible arrangements, for needless to say, there are many subsidiary points which need consideration.

Taking the question of H.F. amplification first, we find that there are two possible ways of coupling the additional valve. An H.F. choke can be used as in Fig. 1, or an extra tuned circuit as in Fig. 2.

Increasing Sensitivity

The first method is the simplest, but suffers from the drawback that it does not increase selectivity. In fact, owing to the increase in sensitivity the selectivity may appear to be actually worse than without it, since both the wanted and any unwanted stations are amplified alike. In this respect it is

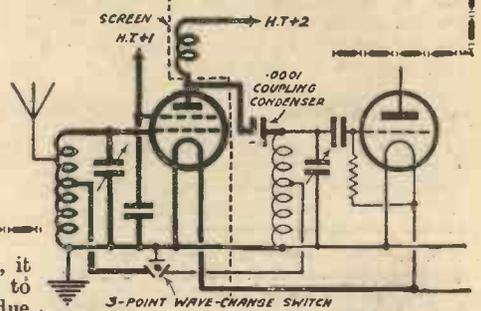


Fig. 2.—Circuit showing how to add an S.G. valve.

An L.F. valve on the other hand cannot do more than amplify what the detector provides it with.

From the foregoing it is easy to see in what circumstances the addition of a choke-coupled or untuned stage of H.F. amplification would be desirable. Briefly, it would be useful where the selectivity is already quite sufficient, but where the sensitivity is poor. Such conditions might be found where a small indoor aerial was in use, or where the receiver was situated many miles from the nearest broadcasting station. One fact which recommends its use with a short aerial is that it gives better amplification on the long waves, thus compensating for the naturally poor response of such an aerial on the upper wave-band. Other strong points in its favour are its cheapness and simplicity—no extra coils or condensers are necessary and thus no extra tuning is involved.

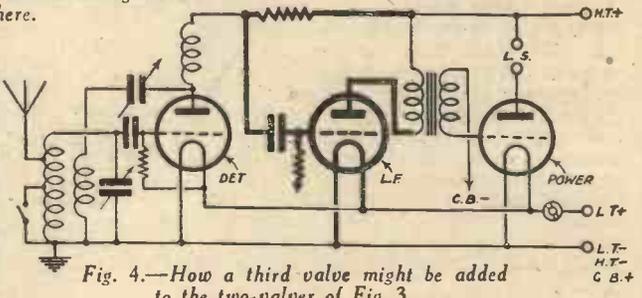


Fig. 4.—How a third valve might be added to the two-valver of Fig. 3.

Adding a Tuned H.F. Stage

Owing to the great power of the local stations, it is not often that the selectivity of a set is more than sufficient. It is usually the reverse, and it is here that the addition of a stage of tuned H.F. amplification is useful. The circuit is shown in Fig. 2. The thin lines represent the original circuit, and the heavy ones the additional part.

The advantages are as follows: First, there is the increase in selectivity. This is due to the extra tuned circuit. Each additional tuned circuit in a receiver provides an additional barrier against the unwanted stations. Next, there is the increase in sensitivity. This is greater than with the choke coupled arrangement, especially on the medium waves.

Effects of an Extra L.F. Valve
Now for L.F. amplification. This is (Continued overleaf.)

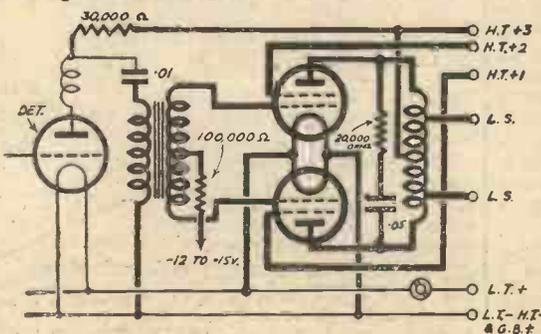


Fig. 5.—Circuit for pentodes in push-pull.

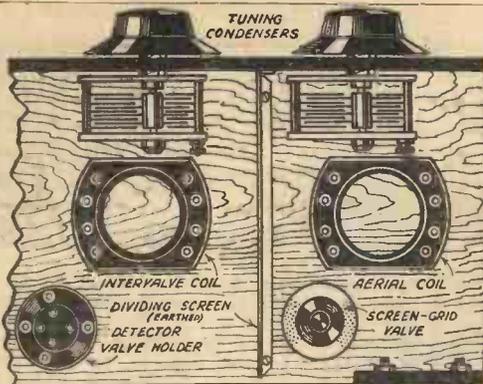


Fig. 7.—How to arrange the lay-out when adding an S.G. valve to a EARTH receiver.

(Continued from previous page.)

undoubtedly the best method of increasing the volume from the loud-speaker. It will not increase the selectivity for the reasons already mentioned, nor will it mean a great increase in the volume of the very weak stations, but it will certainly add plenty of "punch" to all others. The extra parts necessary to make the conversion are comparatively cheap and do not require a lot of extra room, or any special positioning or screening as with H.F. amplification. This means that in quite a large number of cases the same panel and baseboard can be used by altering slightly the position of the present components to accommodate an extra valve and transformer, and possibly a decoupling condenser.

Now let us take one or two examples of typical receivers and see how and where the extra valve should be added. First of all there is the popular two-valver, consisting of det. and power valve, or pentode. If it has a power valve, undoubtedly the cheapest conversion is to add an additional resistance-coupled stage between the detector and the output valve. The extra parts required will be an anode resistance of about 100,000 ohms, a .01 coupling condenser, a ½ or 1 meg. grid leak, a valve holder, and an L.F. type valve. The original circuit is shown in Fig. 3 and the conversion in Fig. 4. The heavy lines represent the new part of the circuit.

The Extra Valve in Push-Pull

Adding a valve in this way although cheap to fix up, and unlikely to introduce any howls or other unforeseen accompaniments, has its limitations. It will increase the volume from all stations, but it must be remembered that the maximum volume depends on the capacity of the last valve. If the transmission from the local station already loads this to the limit, the addition of an intermediate valve will not increase the volume beyond this limit but will merely overload the last valve. Therefore, if it is more power from the local which is required, not only must an intermediate valve be added but the output valve must be replaced by one capable of handling more power. Of course, if it is found with a two-valve set that the output valve is more than fully loaded by the local transmissions, and it is desired to increase its power handling so that the full volume may be turned on without fear of distortion,

then the best way to add another valve is to connect it in push-pull with the output valve. Adding a valve in this way, unlike the method shown in Fig. 4, will not give any increase in the volume of the weak and medium powered transmissions but will allow full volume to be obtained from the local station for a very modest consumption of H.T. current. Instead of having to keep the volume of the local throttled down to avoid distortion it will now be possible to turn it right up. When adding a valve in push-pull it must, of course, be identical with the one at present in the set and with which it will be used. The circuit in the case of two pentodes is shown in Fig. 5, while a view of the usual lay-out showing the disposition of the input transformer and the output choke is given in Fig. 6.

Incidentally, where the output valve of a two-valve set of the det. and 1 L.F. type is a pentode, the push-pull arrangement is the only practical way of adding an additional L.F. valve, since to interpose an additional stage between the detector

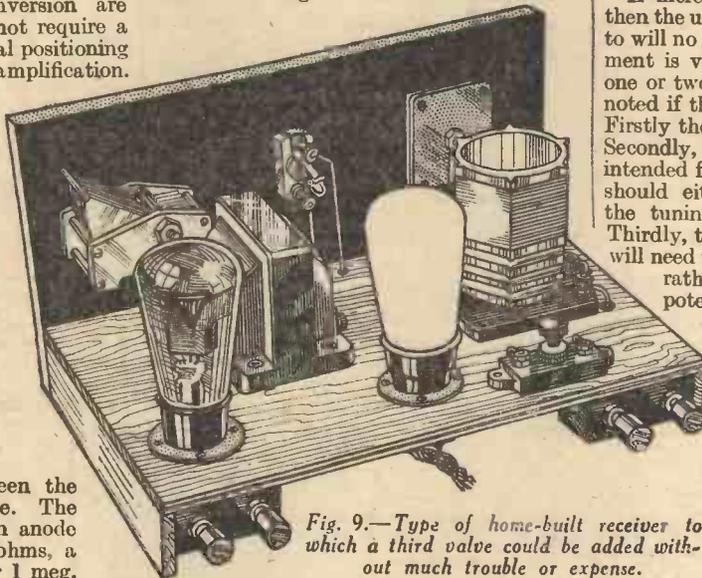


Fig. 9.—Type of home-built receiver to which a third valve could be added without much trouble or expense.

and the pentode would almost certainly overload the latter.

How to Get More Stations

Many users of two-valve sets find the volume quite sufficient for domestic purposes, but desire an increase in range. They wish to receive a few "foreigners" at full loud-speaker strength. In this case the only possible solution is to add a tuned screen-grid stage. Without doubt this will mean a larger panel and baseboard to accommodate the extra valve, coil, tuning condenser and choke, etc. Fig. 2 shows the circuit, with the additional part in heavy lines. Fig. 7 shows how the high-frequency end of the receiver should be arranged. The new baseboard and panel should be long enough to accommodate another tuning condenser and tuning coil each of the same make and type as the ones already employed. It will be noticed that a single metal screen is erected between the two coils and condensers, so as to

completely separate the two tuned circuits. This screen is, of course, earthed. The coils should both be the same distance from either side of the screen. In the case of two-inch coils, this should preferably be not less than 2in. The screen-grid valve, which should be metallised, is placed on the aerial coil side of the screen. If the wave-changing with the particular coils used is carried out by shorting the long-wave turns, then a single three-point switch will suffice to operate both coils.

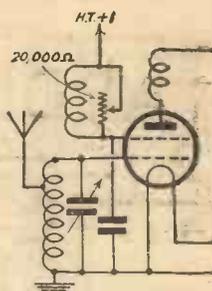


Fig. 8.—Reaction from the screening grid.

Of course, if the original coil in the set is of the screened type, then another similar one should be purchased and the dividing screen will be unnecessary, also they may be placed as close together as desired.

A Simple Way of Adding an H.F. Valve

If increased sensitivity is only required, then the untuned H.F. stage already referred to will no doubt fill all needs. This arrangement is very easy to fix up, but there are one or two practical points which should be noted if the best results are to be obtained. Firstly the S.G. valve should be metallised. Secondly, the H.F. choke must be one intended for use with screen-grid valves and should either be placed well away from the tuning coil or else screened from it. Thirdly, the voltage on the screening-grid will need to be only about 30 volts. Being rather critical it is best to use a potentiometer control, unless the H.T. can be tapped at intervals of not more than three volts round about the 30-volt mark. Fourthly, it is usually better to take the reaction from the plate of the S.G. valve than from the detector. Another method is to take it from the screening grid. A circuit using this method is given in Fig. 8. It is that employed by the Ferranti Co., Ltd., in one of their designs and being the subject of a patent must not, of course, be used on a set intended for re-sale without their consent.

Converting a Three-Valver to a "Four"

When it comes to adding another valve to a three-valve set, the decision as to its position depending chiefly on the circuit. (Continued on page 204.)

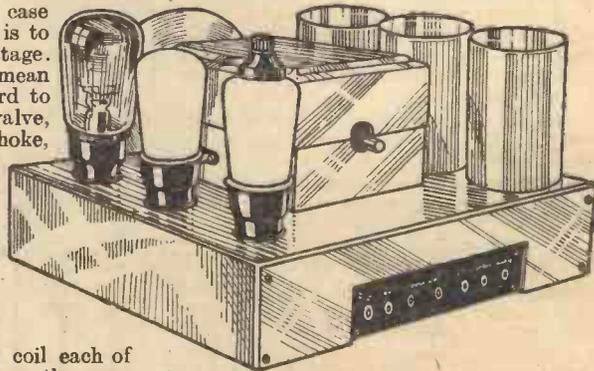


Fig. 10.—The compact type of commercial receiver which does not lend itself to any additions or alterations.



Forms & Methods of Volume Control



CONTROL of volume may be effected in a dozen or more different ways, but each system of control has its good and bad points. The reason for volume control is either to prevent overloading in one of the valve stages, or to permit the listener to vary the sound emanating from the loud-speaker to suit his own particular taste. In either case

Simple and effective means of obtaining it are briefly described in this article by J. B. SKETCH.

when it is used in sets having ganged circuits; it will be found that when the pre-set condenser is varied, it upsets the ganging of the circuits and alters the tuning of the set. It then becomes necessary to retune the set slightly.

distortion. This form of volume control also varies the high-frequency amplification.

Control of Volume by Variable Mu Valves

The most successful of all methods of volume control is made possible by the use of variable mu valves, which have only been introduced within the past few years. The method used is to vary the amount of grid bias applied to the grid of the vari mu valve.

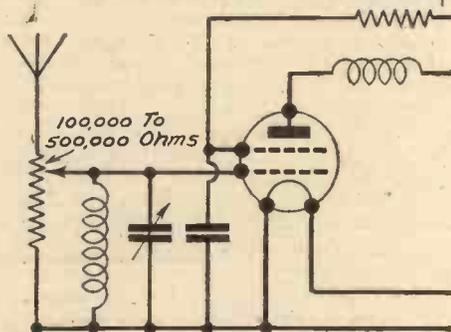


Fig. 1—Control of volume by potentiometer in aerial-earth circuit.

volume may be controlled by limiting the high-frequency signal input to the first stage of the receiver or by adjusting the degree of amplification in one of the high or low-frequency stages.

Limiting High-frequency Signal Input

The high-frequency signal voltage applied to the grid of the first valve, which is usually a screen-grid, may be controlled by the adjustment of a potentiometer connected between the aerial and earth as in Fig. 1.

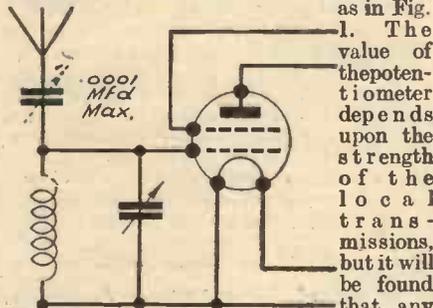


Fig. 2—Control of volume by pre-set condenser in the aerial circuit.

The value of the potentiometer depends upon the strength of the local transmissions, but it will be found that any potentiometer with a value ranging between 100,000 and 500,000 ohms will be found quite satisfactory. Another important point concerning this type of volume control is, it is preferable to use a wirewound potentiometer as the carbon or other form of resistance element becomes very erratic in operation after a certain amount of use.

Control by Pre-set Condenser

The next form of volume control is obtained by inserting a pre-set condenser (.0001 mfd. max.) in the aerial input circuit, in Fig. 2. This is a similar form of control as the previous one (i.e., limiting H.F. signal input), its disadvantage is noticeable

Control of High-frequency Amplification

The third form of volume control is effected by varying the temperature of the filament of the screen-grid valve by inserting a variable resistance of about 20 or 30 ohms in the filament circuit of the valve, Fig. 3. When the temperature of the valve is lowered the sensitivity of the valve is reduced, which in turn reduces the high-frequency amplification or stage gain. This type of control is very fierce in operation and is not to be recommended before other methods to be described.

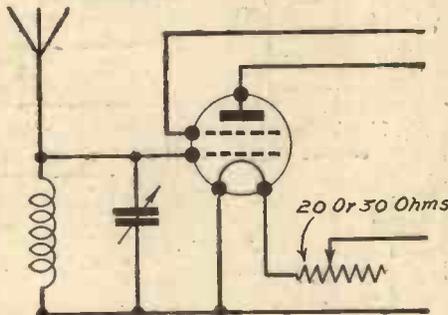


Fig. 3—Control of high-frequency amplification by filament control.

Variation of Screen Voltage

A system of control which possesses a much smoother variation of volume is by varying the voltage applied to the screen of the screen-grid valve. The connections for a battery set may be seen in Fig. 4, and the mains set in Fig. 5. The constructor will not encounter any difficulties with this arrangement in general practice, but if too big a voltage variation is used even this type of control will produce its disadvantages, such as self oscillation, and possibly become unstable in operation and produce

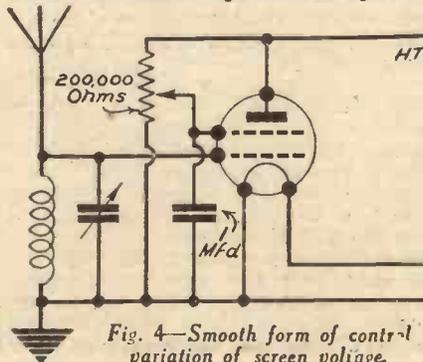


Fig. 4—Smooth form of control variation of screen voltage.

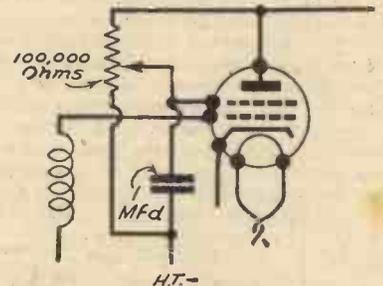


Fig. 5—Variation of screen voltage mains connections.

The amount of variation is from 0-15 volts in the case of a battery set, and from 1.5-40 or 50 volts in the case of a mains set. It may be well to insert here a brief description of the working of the variable mu valve. The variable mu valve is a new and special form of screen-grid valve. The special feature of the valve is that it is possible to vary its mutual conductance (which in simpler terms means its amplification). To vary the mutual conductance of a valve we vary the grid bias applied to its screen grid. If we wish the valve to amplify to its maximum, we must reduce

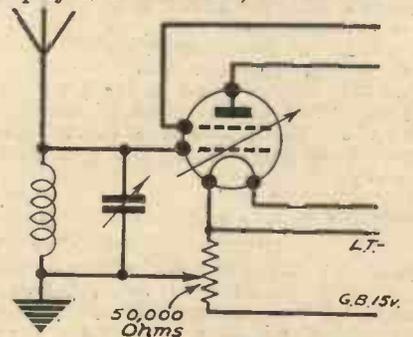


Fig. 6—Control of volume by battery variable mu valve.

the grid bias to nil or to a very low value. As we gradually increase the value of the grid bias applied to the valve, its amplification is reduced until when the maximum grid bias has been applied, no signals will be heard from the receiver. The connections for the battery set will be seen in Fig. 6. The value of the potentiometer is about 50,000 ohms.

A.C. Variable Mu Valves

The arrangement of the mains variable mu volume control is a little more complicated. It is to be seen in Fig. 7. It has been stated that the amount of grid bias

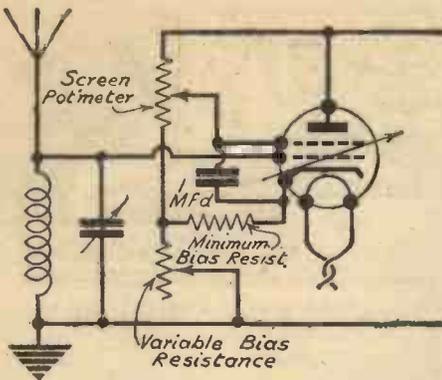


Fig. 7—Connections for A.C. variable mu valve.

required for a mains variable mu is about 40 or 50 volts, thus it would be impracticable to supply this from batteries as in the battery arrangement of the variable mu. The easiest method of obtaining this voltage is to use automatic grid bias, by connecting a resistance between the high tension negative and the cathode of the variable mu valve. The anode current of the valve passes through this resistance and a voltage drop is set up across it, making the

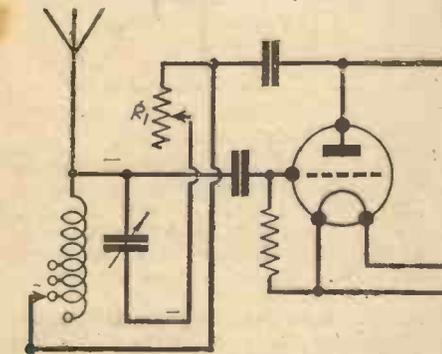


Fig. 10—Special form of volume control, reaction controlled by a resistance.

potential of the cathode higher than that of the grid by the amount of the voltage drop across the bias resistance.

To avoid grid current in the variable mu valve it is essential not to lower the grid bias voltage lower than 1.5 volts, and to do this it is necessary to have the bias resistance in two separate units, one of permanent value calculated to allow the minimum bias value (1.5 volts) and the other variable to allow control above this limit. It is difficult to give any definite values for

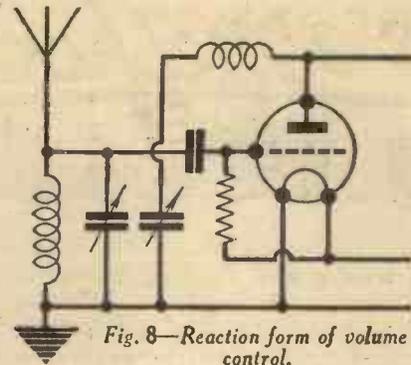


Fig. 8—Reaction form of volume control.

these resistances as they vary with the many characteristics of the various valve makers. However, most valve makers state on the operating slip the best values to use.

Control of Volume in Detector Stage

The simplest way of controlling volume in this stage is by reaction. Only two forms are shown (Figs. 8 and 9), as reaction is not a good form of volume control, for if it

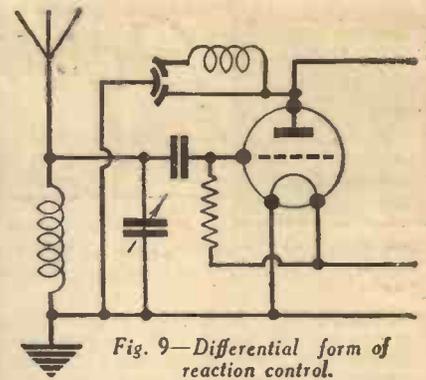


Fig. 9—Differential form of reaction control.

is improperly used it will oscillate and cause interference and distortion. Another method of volume control in the form of reaction control is shown in Fig. 10. The control is effected by variation of the resistance R1. Both these forms of reaction volume control are quite satisfactory in operation and are only included for the sake of completeness.

Control of Volume in Low-frequency Stages

One of the most common methods of volume control in low-frequency stages is

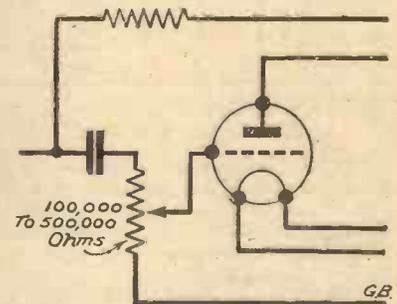


Fig. 12—The same method is used here as in Fig. 11. Resistance capacity stage.

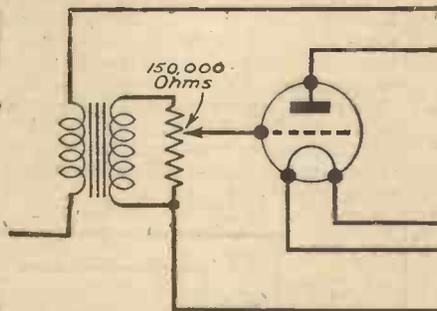


Fig. 11—Volume controlled in the transformer coupled stage by a potentiometer.

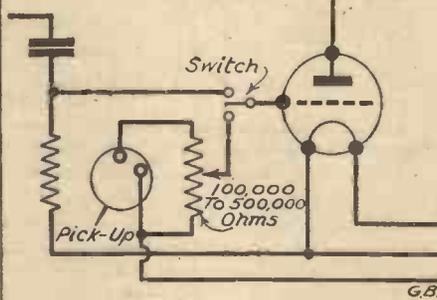


Fig. 13—Control of input from pick-up by a potentiometer.

shown in Fig. 11, which is a transformer coupled stage. Control is effected by variation of the potentiometer connected across the low-frequency transformer, the same idea being used in the resistance capacity coupled stage in Fig. 12. In Fig. 13 the input from the gramophone pick-up is controlled by the potentiometer connected in parallel with the pick-up.

In all three cases the input to the grid of the valve, thus effecting the amplification or stage gain, is controlled by the potentiometer.

TELEVISION for the Amateur Constructor, by H. J. Barton-Chapple, Wh. Sch., B.Sc., etc.; 12s. 6d. net; Demy octavo; 234 pages. Sir Isaac Pitman and Sons, Ltd., Parker Street, Kingsway, W.C.2.

Television, which is now on the threshold of success, is a subject on which literature is all too scanty. The author of "Television for the Amateur Constructor" has already covered the general principles, the history, and the development of television in a companion volume entitled "Television—To-day and To-morrow," which was recently reviewed in these columns. The present volume is essentially practical. The first chapter forms a brief but complete introduction to the general theory of television, but from that point the author plunges straight away into the practical avenues of his subject. The cohesion

BOOKS RECEIVED

of the chapters and the scheme of the book may be gauged from the following list of chapter headings:—

A Workshop in the Home; The Vision Wireless Receiver—H.F. and Detective Stages; The Importance of the L.F. Side; Suggested Experimental Circuits; H. T. Power for Television; A Wireless Set for Television Reception; Further Practical Details of Wireless Apparatus for Television Reception; Building the Television Apparatus; and Making Vision Apparatus. The last chapter deals practically if prophetically with future developments. The extremely lucid and simple style adopted in the text is rendered

even more understandable by the generous proportion of excellent illustrations in half tone and line which punctuate it at almost every page. This is not a work for the highbrow; it gets down to the level of the man who wishes to build television apparatus at small cost and with limited income, and I can thoroughly recommend it. A word of congratulation to the publishers for the attractive manner in which they have presented the book. It is similar in size, style, and binding to "Television—To-day and To-morrow."

HAVE YOUR COPIES OF VOLUME 1 OF "PRACTICAL WIRELESS" BOUND. SEE SPECIAL OFFER ON PAGE 200.

MORE ABOUT— INTERFERENCE

A Practical Article Explaining the Various Causes of Interference and the Best Means for Dealing With It.

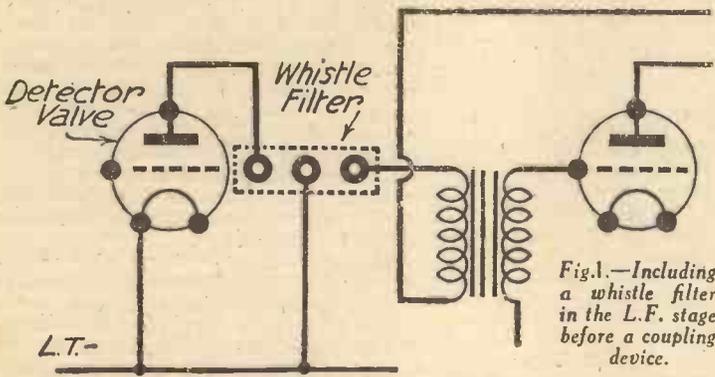


Fig. 1.—Including a whistle filter in the L.F. stage before a coupling device.

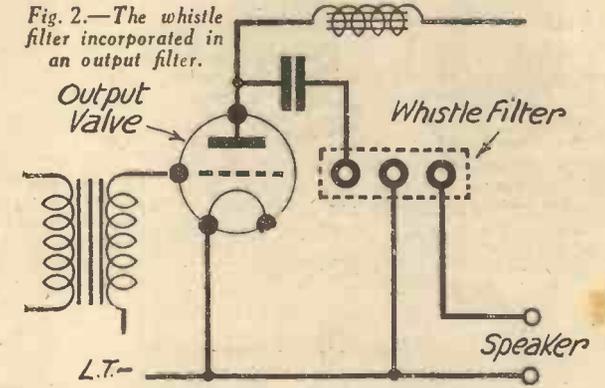


Fig. 2.—The whistle filter incorporated in an output filter.

THE modern wireless receiver, in conjunction with a good moving-coil speaker, is capable of giving clear and faithful reproduction of the broadcast, with almost complete absence of background noise. Interference with reception is unpleasant under any circumstances, but when a high level of quality has been attained, interference due to local disturbances is still more annoying and unpleasant, as the effect of the interference seems to be accentuated by contrast with the quality and clarity of the reception obtained.

Interference may come from three sources—from the set itself or its associated components, from natural static charges known as atmospheric, and from artificial static charges sometimes termed "man-made statics." The latter may be divided into two categories, distant and local.

At the present time, the prevention of interference from natural atmospheric provides an insoluble problem. Although they are practically untuned, atmospheric are usually found to be less troublesome on the medium than on the long wave-band. Fortunately, reception in this country is not seriously marred by atmospheric disturbances, this form of interference being generally confined to short periods during the summer months. A type of this interference only experienced very occasionally, is that set up by electrically charged raindrops, falling on the aerial. This is due to the rain having recently passed through an electrically charged atmospheric area and, on precipitation, carrying with it small individual static charges.

Heterodyne Whistles

Distant interference is usually caused by Morse from broadly tuned transmitters, or heterodyne whistles produced by stations' carrier-waves overlapping each other. The Morse trouble can generally be removed by sharper tuning of the receiver, but even the sharpest tuning may not completely

eliminate the heterodyne whistle. It can, however, be fairly effectually cured by fitting a whistle filter to the set. The filter can

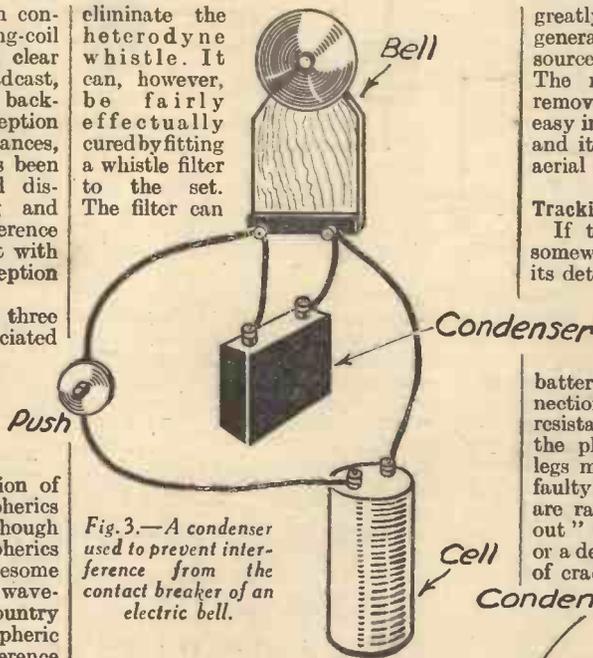


Fig. 3.—A condenser used to prevent interference from the contact breaker of an electric bell.

be purchased as a complete unit, and is best connected to the detector circuit, so that the low-frequency stages do not have to handle the high notes unnecessarily. Fig. 1. If, however, difficulty is experienced in connecting it to the detector circuit, it may be connected to the output stage, in the speaker circuit, Fig. 2. Heterodyne whistles are usually more pronounced on moving-coil speakers, owing to their better response to the upper register.

When persistent or recurring interference exists, the first step in its elimination is, of course, to discover its cause or origin. The aerial connection to the set should be removed, and, if the trouble ceases or is

greatly reduced in intensity, it may generally be taken for granted that the source of the trouble is outside the set. The method of testing by temporarily removing the aerial connection, is not as easy in the case of sets with built-in aerials, and it is better to short circuit the frame aerial rather than disconnect it.

Tracking Internal Causes of Crackling Noises

If the trouble is found to be located somewhere in the set, the best method for its detection is by a process of elimination.

That is, taking each circuit or component in turn and testing for faults in the usual way, beginning with the H.T. battery if the receiver is battery operated. Loose terminal connections, badly soldered joints, faulty resistances, intermittent contacts between the plates of a variable condenser, valve legs making bad contact in their holders, faulty switches (some push-pull types are rather prone to give trouble), "burnt out" low-frequency transformer winding, or a defective grid leak, are possible sources of crackling noises.

(Continued overleaf.)

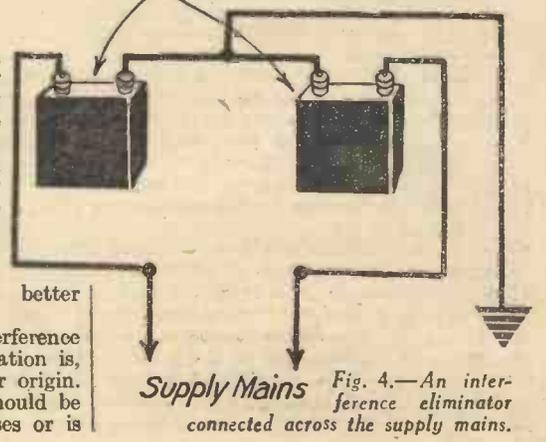


Fig. 4.—An interference eliminator connected across the supply mains.

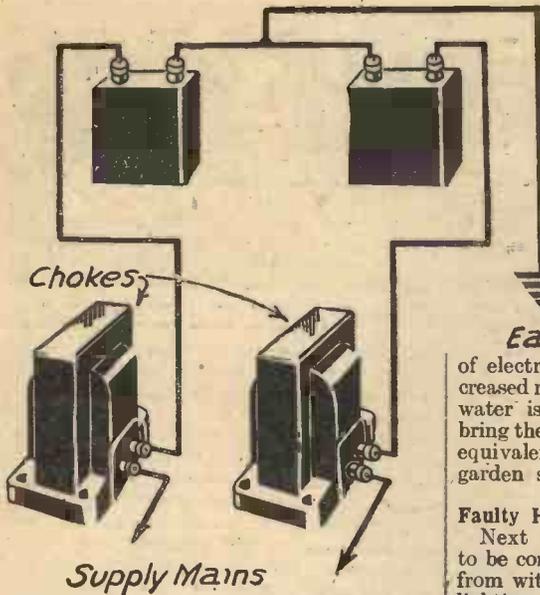


Fig. 5.—To prevent interference from machinery, etc., special chokes may be used as shown here.

(Continued from page 181.)

Other possible causes of noise from within the set are interaction between components through bad layout, over-loaded mains unit, or insufficient decoupling of the high-tension feeds to the valves. Either of these causes may result in what is known as "motor-boating." A run down H.T. battery causing feed-back may also give this trouble. Motor-boating or low-frequency instability, is not usually difficult to overcome. Microphonic noise is often more difficult to cure owing to the difficulty of definitely locating the cause, particularly in the case of receivers with powerful built-in speakers. The usual cause is through lack of rigidity in the electrodes of the detector valve. The sound waves from the speaker impinging on these electrodes set up vibrations which produce a singing noise in the speaker, which in turn causes sympathetic vibration of the valve electrodes, and so a cycle is established which results in the building up of a ringing volume of sound which eventually blots out the programme.

Placing two rubber bands round the bulb of the valve, or binding a jacket of cotton wool round it by means of rubber bands will often effect a cure. Caution is advised, however, in using this method in the case of mains valves, owing to temperature rise which may cause scorching of the cotton wool, and internal damage to the valve due to overheating. It is sometimes found necessary to mount each of the valves on sponge rubber feet, or else to fit rubber pads under that part of the receiver upon which the valves are mounted. Microphonic noises may also be produced by other causes such as vibrating condenser vanes, or even the walls of the cabinet containing the set may be the cause of the trouble.

Defective Earths

A defective earth is a prolific source of crackling in a receiver. If the earth lead is a long one, interference may be caused by induction in the wire from the house-lighting mains. The lead should be carefully soldered to the earth tube, and not just bound round it. Unless the wire is

soldered, the surface of both the tube and the wire becomes oxidized and sometimes corroded, which results in a high resistance earth with consequent losses. The lower the resistance to earth the greater will be the efficiency of the receiver.

The earth tube or plate should also, if possible, be placed in a situation where it will be maintained in a moist condition. Recent tests carried out by the National Physical Laboratory, indicate that while dry soil is a poor conductor of electricity, the conducting power is increased more than one thousand times when water is added in sufficient quantity to bring the moisture content of the soil to the equivalent of that usually found in normal garden soil.

Faulty House-lighting Fittings

Next in the order of interfering noises to be considered are those which may come from within the home itself. Faulty house-lighting switches may cause trouble, and this can be ascertained by operating each of the switches in turn. If a faulty switch is found it can be corrected by removing the switch cover, and slightly closing the switch contacts with a wooden

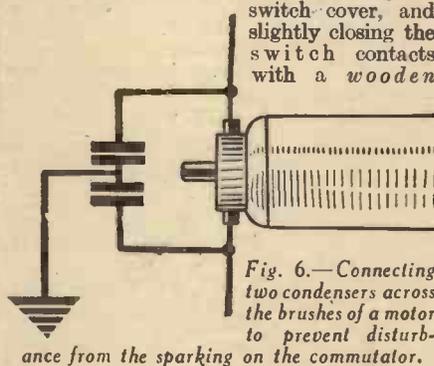


Fig. 6.—Connecting two condensers across the brushes of a motor to prevent disturbance from the sparking on the commutator.

handled screwdriver. Another possible source of trouble is the electric light bulbs. When these have been in use for some time and are approaching the period for replacement, the filament sometimes becomes defective and produces intermittent cracklings in the receiver when the bulb is in use. Trouble from this cause can be located in the same manner as in the case of the faulty switches.

Electric vacuum cleaners, refrigerators, heat regulators, hair driers and fans, are also probable offenders, and in purchasing household electrical apparatus of this description, a definite guarantee should be obtained from the supplier that interference with wireless reception will not be caused by their use. Trouble from electric bells may be cured by connecting a 1 mfd. condenser in the bell circuit, in the manner shown in Fig. 3.

Stray high-frequency currents find their way into the supply mains from outside sources and may cause H.F. trouble in the receiver, especially if it is operated from the mains. This form of interference is difficult to definitely identify, but if the presence of H.F. currents in the mains is suspected, two 2 mfd. condensers (400 working voltage type) should be connected across the mains supply, with the centre point earthed, as in Fig. 4. Where

serious high-frequency interference is experienced it may be necessary also to connect chokes in series with each of the supply mains leads, Fig. 5.

Interference from Electrical Equipment

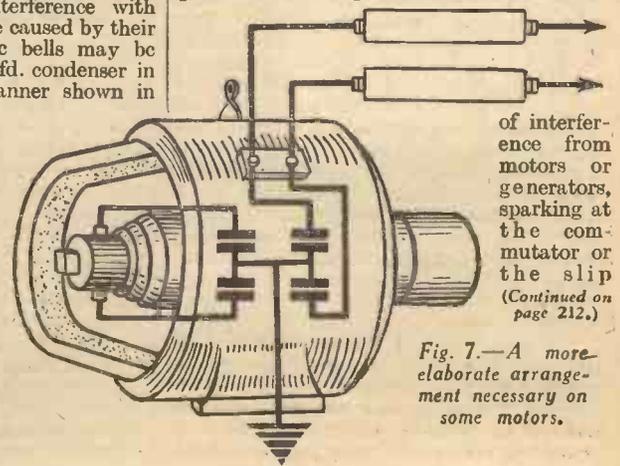
Turning next to interference from external sources, an opinion was recently expressed in the technical Press to the effect that owners of electrical equipment which caused interference should not be called upon to take any steps for its elimination, as wireless users, being the last comers, should so arrange their apparatus as to render it unsusceptible to unwanted influences. This view, however, is a debatable one.

External interference is generally of an intermittent nature, and varies in character from humming or buzzing of differing pitch and strength, to crackling or tearing noises, or even loud cracks reminiscent of the sounds of minor explosions. The nature and intensity of the interference reproduced by the speaker depends upon the character of the equipment from which the trouble emanates and upon the type of receiver which is subjected to its influence. It is often possible to identify the character of the offending equipment from the nature and recurrence of the interference.

Interference from another wireless receiving set in the immediate neighbourhood is inexcusable in these days of high power broadcast transmissions and sensitive receivers. This form of disturbance consists of a high-pitched howl, or if the set is working very close to the oscillation point without actually breaking into oscillation, the result is a low-pitched moaning noise. The interference is caused by the use of excessive reaction, which converts the receiver into a miniature transmitter. Fortunately trouble from this source is becoming much less prevalent.

Electrical equipment which may be the cause of considerable interference includes electric trams and trolley buses, flashing signs both ordinary and of the Neon lamp type, automatic traffic signals, violet ray apparatus, arc lamps used as spot lights for cinema or theatrical purposes, sparking at the commutator of accumulator charging sets or of motors or generators in workshops and factories, and leakage currents from the earth return system on tramway and trolley bus routes. With the exception of emanations from tram and bus overhead wire conductors, and earth leakage currents, the other sources of interference do not usually extend beyond a radius of 250yds.

High-frequency emanations are caused every time an electrical circuit is broken, and sparking is not necessarily an accompaniment of their production, but in the case



of interference from motors or generators, sparking at the commutator or the slip (Continued on page 212.)

Fig. 7.—A more elaborate arrangement necessary on some motors.

MAKING COIL FORMERS WITH CARDBOARD

A Practical Article Describing the Construction of a Highly Efficient Set of Low-loss Band-pass Coils

By F. THORNE

TO the average constructor, the making of these formers, and the winding of the coils, will present very little difficulty and, as the whole thing can be made and finished off in a couple of nights at a total cost of less than 2s. 6d., it will provide the practical man of modest means with a ready solution of how to bring his wireless set up to date. The first step is to procure some pieces of pliable cardboard, the actual thickness used in the model about to be described was about $\frac{1}{8}$ in. and was part of a large carton.

Constructional Details

After procuring your cardboard, cut a piece $6\frac{1}{2}$ in. by 5 in., and carefully bend it into a tube $5\frac{1}{2}$ in. long by $2\frac{1}{2}$ in. outside diameter, leaving an inside diameter of 2 in. Something which is about 2 in. diameter on which to bend the tube will readily be found knocking about the house. A washing stick or rolling pin will just about suit the purpose.

After making the tube, do not stick the edges of it together, but cut another piece of cardboard $1\frac{1}{2}$ in. by $6\frac{1}{2}$ in., and bend this around the tube to shape it, and then Seccotine or glue it in the position shown in Fig. 2. A piece of wire wrapped around near the top and bottom edges of this piece will keep it in position till set. The next operation is to cut two rings $2\frac{1}{2}$ in. outside diameter and $2\frac{1}{2}$ in. inside diameter; slip one of them over the top and one over the bottom of the tube so that they rest, Seccotined, against the edges of the last piece put on, as in Fig. 3.

Two pieces are now cut $1\frac{1}{2}$ in. wide, and these are built on to the tube one at the top, and one at the bottom, flush with the ends. The joints of these should face the same way as the centre piece previously put on, and should be opposite the joint of the tube. A space of $\frac{1}{4}$ in. should now exist between the rings and the pieces just fixed on. Another two $1\frac{1}{2}$ in. pieces are now cut and put on at top and bottom of the tube as before, but with the joints the opposite way round; again, two $1\frac{1}{2}$ in. pieces are cut and put on in a

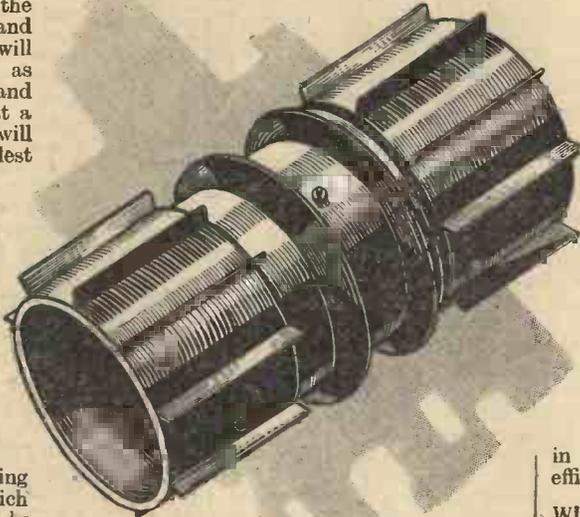
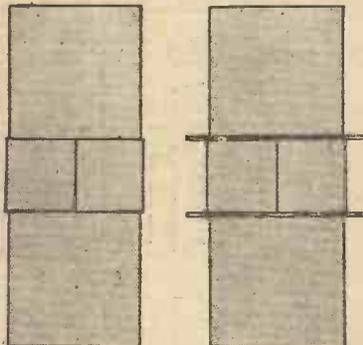


Fig. 1.—The complete dual former.



Figs. 2 and 3.—The method of building up the former.

similar manner to the last two pieces, the joints again being put opposite. The former should now appear as shown in Fig. 4, having the dimensions indicated.

Now cut a few lengths of card, of such a width that when stood on edge along the biggest diameters of the former, and running parallel with the centre of the tube, they will be level with the top of the rings already in position; this width will be about $\frac{1}{4}$ in., according to the thickness of cardboard and the amount of adhesive used in the previous operations. The strips are now cut into eighteen pieces $1\frac{1}{2}$ in. long and fixed with adhesive, nine at the top of the former, the ends being level with the top of the former, and nine at the bottom, the ends again being made flush. All these pieces are to be equally spaced around the larger diameters of the former as shown at Fig. 4. Do not cut these pieces with scissors or they will bend in cutting, in fact a sharp

knife and the use of a straight edge is the way that all the cardboard should be cut, if flat edges and straight lines are to result.

The formers are completed by making a tube $2\frac{1}{2}$ in. long by $1\frac{1}{2}$ in. outside diameter, from a piece of board $2\frac{1}{2}$ in. by 6 in., Seccotined along the joint and kept in position until set, by pieces of wire; any surplus adhesive showing on the outside of the tube after setting should be removed with sandpaper. The formers can now be well coated with shellac varnish, but, should it be the constructor's idea to use cotton-covered wire to wind them, this operation can be deferred until after winding the coils, when the wound formers can be rotated in a shallow bath of shellac varnish and completely saturated, after which a good baking (not burning)

in an oven will result in a very highly efficient set of low-loss band-pass coils.

Winding the Coils

Winding the coils by hand is not difficult, and a start on this part of the job is made by first piercing an anchoring hole $\frac{1}{4}$ in. from the ring end of a rib at each end of the large former. These anchoring holes, by the way, should be made near to where the ribs are fixed on to the former so that the tension exerted in winding the wire will not pull the rib over. After threading the wire through one of the holes to the length of 6 in. or so, make a half-hitch to fix it, then, in the direction indicated in Fig. 5, wind on 38 turns of 26 or 28 D.S.C. or D.C.C. wire. Before going further, it is advisable to point out that D.S.C. wire is to be preferred on account of the silk having greater resisting powers to the absorption of

(Continued on page 186.)

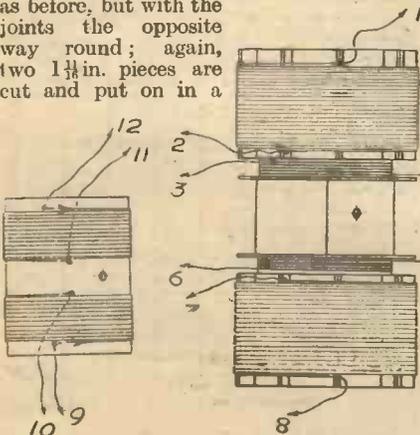


Fig. 5.—The long-wave coil.

Fig. 6.—The connections.

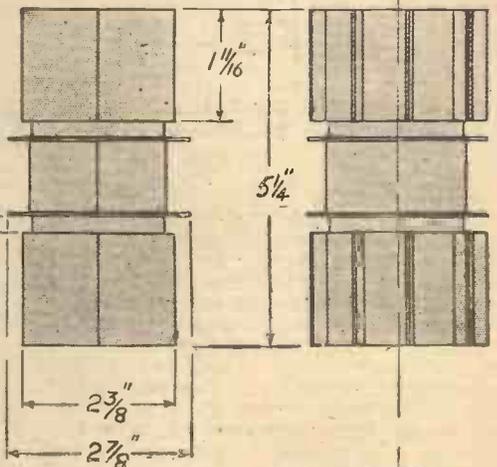
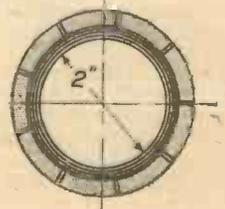


Fig. 4.—The principal measurements.



COSSOR 240B

—the new valve
for



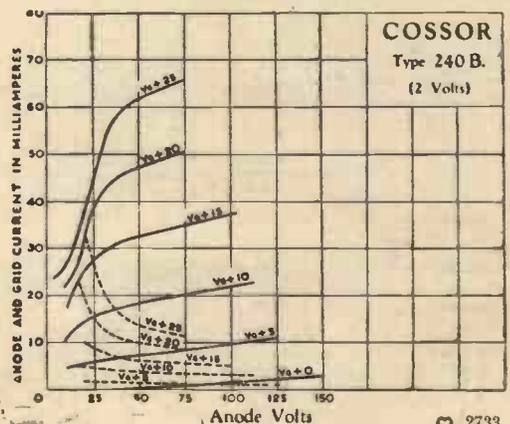
CLASS "B" AMPLIFICATION

Filament volts 2.0; Filament amps 0.4;
Anode volts 150 max.; Max. Anode
Current Swing 50 mA.; Max. Peak
Applied Signal (Grid to Grid) 40 volts;
Static Anode Current at
 $V_a=100, V_g=0$ (each half) **14/ =**
1.5 mA. Price

Full instructions for the use of this remarkable
new valve, including circuit diagrams will
be supplied on application to our Technical
Service Department.

Volume equal to that of the average Mains Receiver is now obtainable from Battery Sets with this new Cossor Valve, and with this remarkable output, the H.T. Current demand of the Cossor 240 B. is lower than that of a small power valve. Thus, a really large output is obtainable without in any way over-stressing the average H.T. Dry Battery.

Anode and Grid Current/
Anode volts curves of
Cossor Class "B" Valve
Type 240 B.



THE HALF-GUINEA PAGE

Radio Wrinkles FROM READERS

Fixing Terminal Tops to S.G. Valves

MANY readers probably have on hand an S.G. valve from which the top has been accidentally screwed off. To make a serviceable repair is not such a formidable job as one would at first think.

BROKEN S.G. VALVE TO BE REPAIRED



RECESSED TO 1/4" AND FILLED WITH MERCURY

Repairing the terminal top of a screen-grid valve.

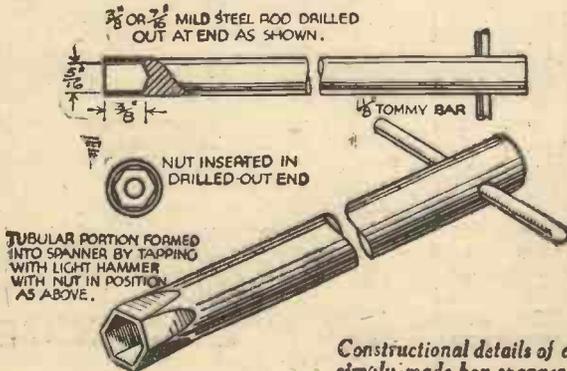
This is one way to effect it: Make a cup-shaped recess in the underside of top by drilling with a rather large bit (about 3/16 in.), to a depth of about 1/4 in. If, when this is done, the terminal pillar still holds fast, proceed to cement that part of the top which

contacts with glass of bulb with either celluloid cement or white wax. Now, holding the top—carefully gripped upside down in a vice—perfectly upright, fill the recess to its utmost capacity with mercury, and replace bulb in as near its original position as possible. If sufficient mercury has been put in the glass bulb it will displace the superfluous quantity when pressure is made on it. This will ensure a perfect metallic connection between terminal pillar and the broken wire protruding from glass. Should the terminal pillar be damaged or slack, obtain a short length of threaded rod and place through the top, securing with a nut on either side, as shown in the illustration. Celluloid cement can be made by dissolving some clippings of celluloid in amyl acetate. If white wax is used, the whole job will require warming when making the final fixing. This method has been adopted with success when the wire of the bulb was broken flush with glass.—R. E. BEALL (Plymouth).

Making a Box Spanner

A HANDY box spanner to reach awkward corners, or places where terminals are close together, can be made by drilling a hole 1/8 in. diameter, in a piece of 3/8 in. or 1/2 in.

Extending a lay-out without increasing the size of the baseboard.



Constructional details of a simply-made box spanner.

THAT DODGE OF YOURS!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-Guinea. Turn that idea of yours to account by sending it in to us, addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

round mild or silver steel, or just large enough to take a terminal nut, and about 1/2 in. deep. Put the nut in the edge of the hole and, with a light hammer, tap the steel rod on the flats of the nut, thus closing the metal in and forming a hexagonal opening. An 1/4 in. hole drilled through the other end of the rod will accommodate a handle, as shown in the sketch. Where nuts are close to the side of components file off two sides, thus forming a kind of "claw foot" spanner.—T. URWIN (Monkseaton).

Mounting Additional Components

SOMETIMES at the L.F. end of a set it is desired to fit a filter or add an extra stage. It may be that there is no

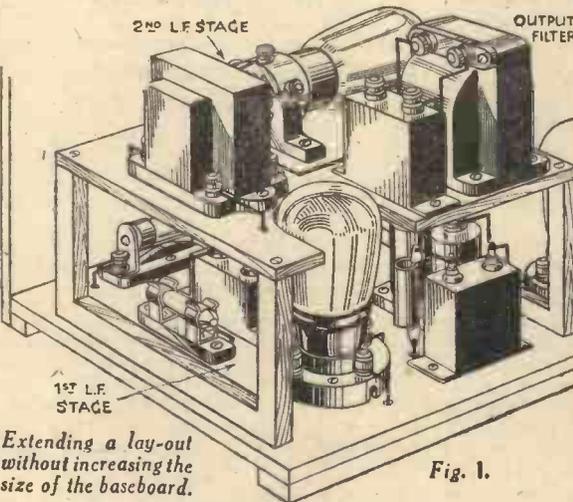
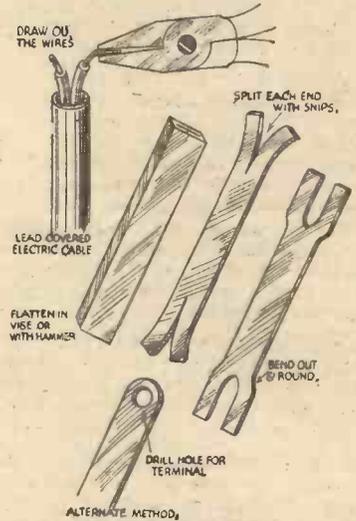


Fig. 1.

which in turn are screwed down on the baseboard. Part of the platform can be cut away to clear a valve underneath, if necessary.—G. D. BRUCE (Edinburgh).

Useful Accumulator Connectors

THE lead covering on ordinary household electric cable is very convenient for making strip connectors or terminal

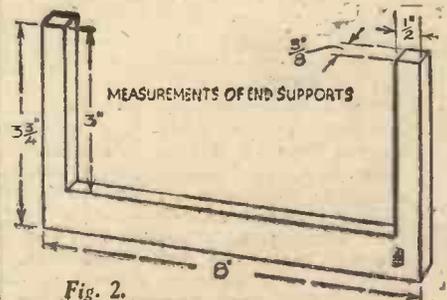


Some useful types of accumulator connectors.

lug extensions for accumulators. These can be made quite easily by flattening the lead covering after first removing the twin wires as shown in the illustration, then snipping off to the required length. Cut down the centre of each end for about 1 in. and then bend round, as shown. The ends can of course be drilled, provided the terminal is not of too great a diameter. A word of warning might be in order here as to connecting up accumulators. These, unless of the same make and capacity, should not be joined up in parallel.—R. GRAPER (St. Albans).

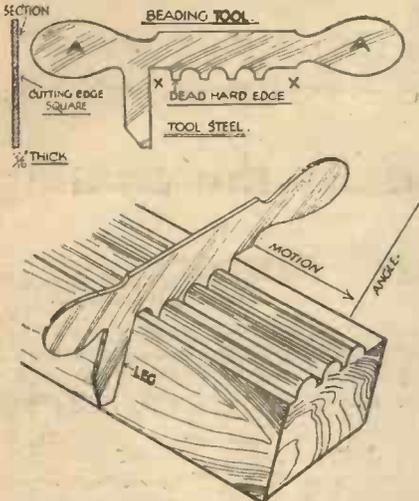
(Continued overleaf)

room on the baseboard, but this can easily be overcome by placing the additional components on a raised platform in the manner shown in the accompanying sketch. Valves can be mounted horizontally so that they will not project above the panel. First get two pieces of plywood, about 8 in. by 3 1/2 in., and cut them to the shape shown in Fig. 2. The platform, which measures 8 in. by 6 in., can also be cut from a piece of plywood. The platform is screwed to the upturned ends of the brackets,



Details of the supports for the baseboard.

(Continued from previous page.)



A simple beading tool made from sheet metal.

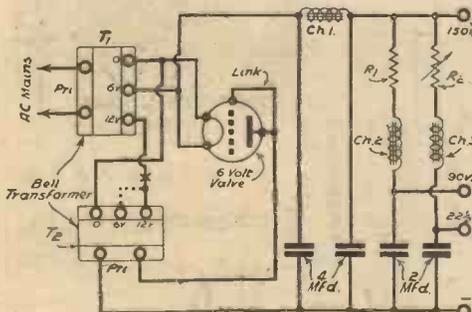
A Handy Beading Tool

THIS simple tool will be found very useful for making beadings, as shown in the illustration. It can be filed to shape out of $\frac{1}{16}$ in. tool-steel or mild steel, case-hardened. The edges for cutting should be left square and then the scraper can be used in both directions. The bead produced, if started gently until a groove is formed, is equal to any produced by machine. The tool is held in the fingers at A-A, pressing the leg to side of the wood. Depth is regulated by X-X, and the bead is left smooth when finished, requiring no sandpapering whatever.—G. W. BARRATT (Whetstone).

A Cheap Eliminator

SOME experimenters may not be aware of the fact that a very simple H.T. eliminator may be constructed at very little cost by the use of a couple of ordinary bell transformers, as shown in the accompanying illustration. These should be of a type which delivers 12 v. at two of its terminals, with a third connection at 6 v. The plate current requirements of a small receiver will be met if an ordinary 6 v. detector valve is used as a rectifier; its plate and grid being linked together, as shown. The output voltage for the output valve is the direct connection marked 150 v. plus; two additional, lower potential leads may be obtained through the use of a fixed resistor of about 15,000 ohms at R1 to deliver about 90 v., and resistor R2, variable between 0 and 5 meg., may be used to adjust the detector plate potential to exactly the correct voltage.

As illustrated, the choke coil shown may be the secondary winding of a "Ford" spark coil; the fixed condensers from these coils may be connected in parallel to form



A cheap H.T. Eliminator using bell transformers.

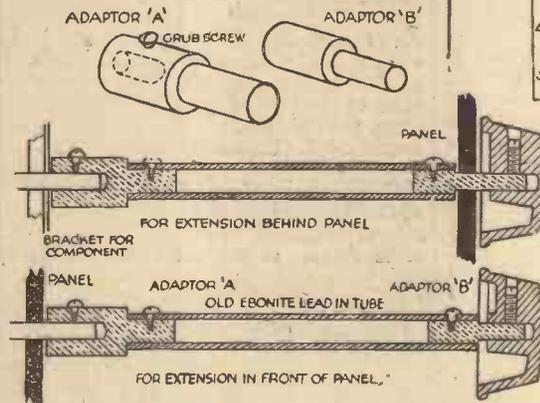
the required filter capacity shown by the 4 and 2 mfd. condensers.

Tracing through this circuit, we find that the m/v supply fed into the primary of transformer T1 is stepped down; 6 volts output from part of the secondary drops to a little over 5 v. when it is applied to the filament of valve.

The 12 v. output of this secondary may be connected as shown by the solid lines, resulting in output voltages not exceeding the line potential; by connecting transformer T2, as shown by the dotted line, breaking the 12 v. lead at X, the output voltage may be doubled at a sacrifice in output current.—F. R. (Manchester).

Extending Condenser Spindles

IN some short-wave sets, and especially in adaptors, where hand capacity gives trouble, it is not always possible to mount the condensers back from the panel, owing to the proximity of coils, valves, etc. The diagrams show how extension handles may be made from old discarded lead-in tubes about 6 in. long. They are quite efficient, and cost very little. The two adaptors A and B are cut from wood, and are quite simply made. Care must, of course, be taken to keep the two sections and the spindle hole concentric, and the wood chosen must be capable of

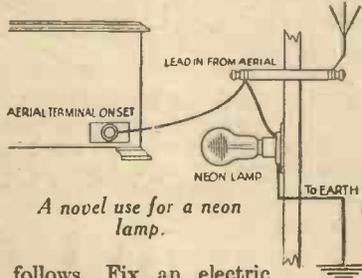


Method of making extension handles for condensers in S.W. sets.

being bored easily, and taking a screw through a small thickness without splitting. The two holes in the ebonite tube may be burnt out with a hot bradawl.—R. NYE (Southampton).

Novel Lightning Arrester

A NOVEL lightning arrester which not only protects the set but indicates the approach of thunderstorms some distance away can easily be rigged up as



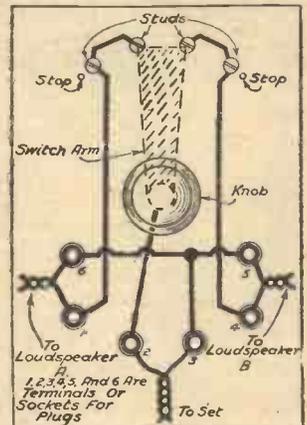
A novel use for a neon lamp.

follows. Fix an electric lamp holder beside the aerial lead-in tube and connect up as illustrated. One terminal of the holder is joined to the aerial and the other is earthed. Insert a standard 240-260-volt neon lamp into the holder; most electrical dealers can supply these for about 3s. each. When a thunderstorm

draws near the neighbourhood the lamp will indicate the fact by emitting dull red flashes corresponding to each flash of lightning. This is due to the aerial receiving oscillatory waves which are radiated by the lightning. The lamp will also glow if charged raindrops strike the aerial. Should a storm break overhead and the aerial be struck by lightning, the current, like the oscillatory waves, will pass between the electrodes of the lamp and direct to earth, this being the shortest path.—J. K. HOLMES (Gosforth).

Switch for Two Loud-speakers

A LOUD-SPEAKER switch for one or two speakers, either single or

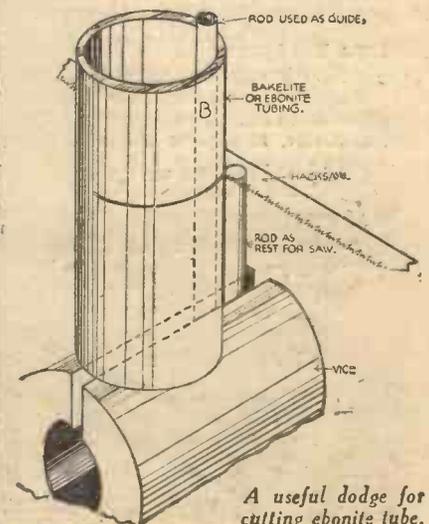


A switching arrangement for two loud-speakers.

coupled, can easily be made as shown in the accompanying sketch. The parts required, which are usually to be found in the scrap-box, consist of a piece of ebonite, 4 studs, 2 stops, and a switch arm from an old crystal set, together with terminals or banana plugs and sockets.—D. C. TOY (Ickenham).

Cutting Ebonite Tubing

HERE is a simple dodge for cutting ebonite tubing squarely. A metal rod, B, is held firmly in the vice, and is used as a guide for the tubing, while another rod, on which the saw rests, can be adjusted to the length of tubing to be cut off.—A. G. PEACOCK (Southbourne).



A useful dodge for cutting ebonite tube.

CLASS B PUSH-PULL

NEW VARLEY PRODUCTS

for a modern need—a range of tested components ensuring maximum results from Class B amplification.

The Input Transformer, DP 40.

- (1) gives good amplification of low notes because of its high primary inductance.
- (2) prevents grid current distortion by employing a low resistance secondary.
- (3) permits accurate matching of the Class B and "Driver" valves by means of alternative ratios.



DP 40

CLASS B INPUT TRANSFORMER

Ratios, 1.5:1 and 1:1. Primary inductance 28 Henries with 2 m/a D.C. Maximum primary current 6 m/a. Secondary resistance 100 ohms on the 1.5 to 1 ratio and 145 ohms on the 1:1 ratio. Price 15/-

CLASS B OUTPUT CHOKE

Ratios, 2.5:1, 2:1, and 1.5:1. Inductance, 10 Henries per half primary with 33 m/a D.C. D.C. Resistance 350 ohms. Price 16/6

All prices include Royalty.

The Output Choke, DP 42, gives a choice of three ratios making the matching of the Class B valve and loud-speaker an easy matter.



DP 42



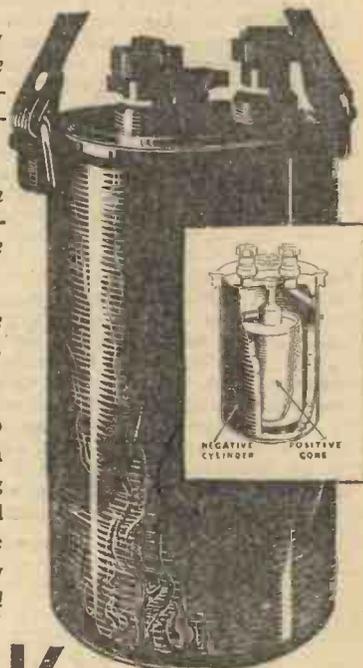
A revolution as wonderful as the coming of "1/2 watt" lamps



Do you remember when "1/2 watt" lamps appeared—giving twice the light for the same electric current? They changed the faces of our cities. To-day there is a revolution, no less startling, in accumulators—

double capacity accumulators

- ① No weight-wasting plates—just a core inside a cylinder (itself the acid container.)
- ② Far more thorough action (the plate-grids used to cause interference.)
- ③ Total result—twice the capacity per lb. weight!



AT present you use a 40 a.h. accumulator? Now you can have one that lasts twice as long per charge, for little more. And instead of a lumbering glass case—just a neat cylinder of lovely bakelite! See your dealer at once!

BLOCK plate-less accumulators

2. 80 AMP. 11/6^D.
v. HRS.

THE first essential in a detector valve is that it should be a good detector. This sounds a very obvious statement, but it is a fact which is very often lost sight of because we have become so accustomed to the three electrode detector valve, which does other things besides detecting, that we are rather apt to neglect the detecting action proper.

In essence, the process of detection is simply that of half-wave rectification. Let me explain. Fig. 1 is the familiar representation of a modulated radio signal. The little waves vibrate at radio frequency—some hundreds of thousands or even several millions of times a second—and it is the variations in strength, as shown by the varying height of the waves, which constitutes the audio frequency signal. Now the "positive" and "negative" half waves follow each other so rapidly that, from the mechanical point of view they cancel each other out, so that, were they applied directly to a pair of telephones, the nett effect on the diaphragm would be nil, and no sound would be forthcoming.

Suppressing the Negative Half Cycles

If, however, we apply the incoming signal to a device which allows current to pass in one direction but not in the reverse direction (see Fig. 2) the "negative" half cycles will be suppressed, and the so-called "rectified" signal will then appear as shown in Fig. 3. The signal is now in a form suitable to operate a telephone instrument or, after further amplification, a loud-speaker.

It is just that phrase, "further amplification" which makes efficient detection so difficult. The original Fleming two electrode valve, and the crystal detector, are purely half-wave rectifiers, and give no amplification whatsoever. Under the most favourable conditions, the output of such a detector can only operate headphones, and that only on fairly strong signals. Moreover, this output generally is not sufficient to operate a power valve or pentode, so that if a loud-speaker is required to be used, two low frequency amplifying valves must be employed.

When the three electrode valve was developed, it was found possible to employ it in such a way that it acted both as a detector and as an amplifier at the same time. Two methods are available. In the anode bend detector the valve is biased to the bottom bend of its characteristic. It amplifies the positive half-waves of the high frequency signal fully, but the negative half-waves are amplified very little. The valve thus acts as a high frequency amplifier and detector combined.

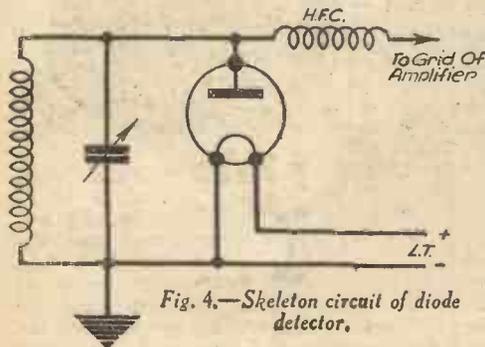


Fig. 4.—Skeleton circuit of diode detector.

About the Double-Diode-Triode

The Latest Development in Detection

By H. J. BARTON CHAPPLE,

Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

Alternatively, in the leaky grid detector, the grid and filament act as a half-wave rectifier, suppressing or partially suppressing one half of each signal wave, after

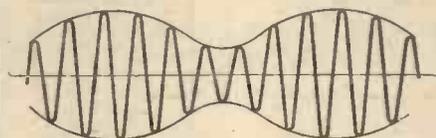


Fig. 1.—Modulated H.F. signal.

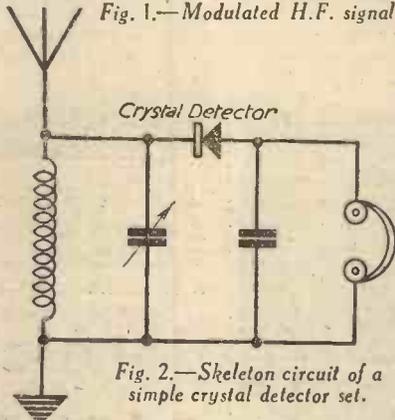


Fig. 2.—Skeleton circuit of a simple crystal detector set.

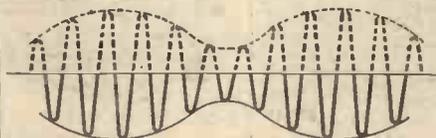


Fig. 3.—The result of half-wave rectification—the "negative" half-cycles have been suppressed.

which all three electrodes come into play to amplify the signal at audio frequency.

Not Perfect

Although this sounds very satisfactory and efficient, it must be admitted that the arrangement is not perfect. Neither arrangement gives 100 per cent. rectification, so that the result is something less than perfect undistorted reproduction. The reason, of course, is that the conditions for good amplification are not ideal for perfect rectification. It is true that in a well designed wireless receiver, carefully adjusted as to operating conditions, detection with a three electrode valve can reach a high standard of excellence, but it is equally true that in many sets, more care has been taken to obtain a big degree of amplification in the detector stage than in ensuring distortionless rectification. Recently more attention has been paid to detection proper. Owing to the increased sensitivity of modern valves, a high degree of amplification in the detector stage is not quite so vitally important, and in a certain number of sets the designer has referred to the "diode" or two electrode valve as detector. Fig. 4 shows this principle. The "anode" of the diode rectifier may be, and usually is, the grid of a normal three

electrode valve, the anode of which is not used in this circuit. (Then again we have the recently developed Westector unit whose action I have recently described in the columns of this paper).

A diode valve is merely a rectifier, and if it is employed, all amplification in a receiver must be obtained from high frequency and low frequency stages. For greater efficiency, two diodes are sometimes used to give a species of push-pull detection. The principle of full-wave detection can be seen from Fig. 5.

Saving Space and Cost

But diode rectification, although giving wonderful freedom from distortion, does necessitate the use of an additional stage of low frequency amplification. This means, in the usual way, an additional valve and associated circuits, and results in increased low tension current consumption, and extra baseboard space, all of which cost money. What is required, therefore, is a method of combining diode detection with low frequency amplification in one valve, thus saving space and cost, and at the same time it is desirable to avoid the unsatisfactory features of the three electrode detector in which one set of electrodes have to serve the dual purposes of detection and amplification. For it is due to this double use of one set of electrodes—this compromise between two sets of conflicting conditions, that the triode detector just falls short of perfection.

The solution of the problem has now been found and will, before very long, be available to listeners generally. Valve designers have now succeeded in developing a valve which combines in one bulb one or two diode elements for detection, and also either a triode or tetrode (four electrode valve) for use as a low frequency amplifier. Not only this, but the two parts, although enclosed within one bulb, act entirely separately, so that working conditions for each part can be adjusted independently so as to ensure the highest efficiency for both functions.

Valve Details

So far, British valve manufacturers in general have not made known full details of their programmes with regard to these new valves, but it is probable that indirectly heated valves for use on A.C. electric

(Continued on page 207.)

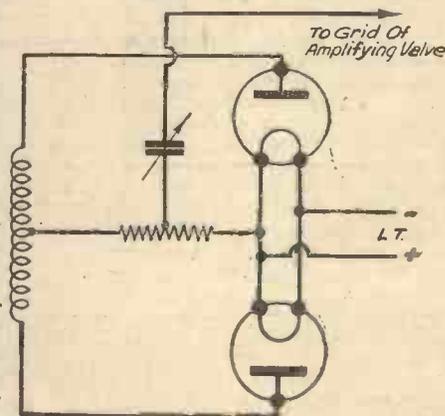
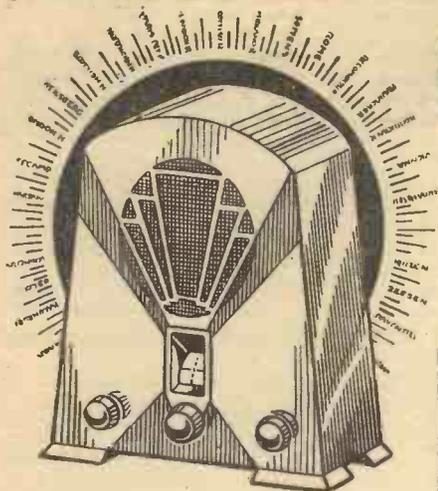


Fig. 5.—Push-pull diode detection. Instead of two diodes two triodes may be used, their grids being employed as the diode anodes and their anodes left disconnected.

OUR VIEWS ON RECEIVERS



THE original Lissen Skyscraper is too well known to need any reference in these pages, and this receiver has now made its appearance in an all-electric form under the title of the A.C. Skyscraper. This is an all-mains (A.C.) receiver with the mains portion of the set separately contained in a metal box. It is put up in two cartons, one of which contains all the parts for building the receiver, with the addition of the four valves, each separately boxed. The second carton contains the complete mains unit, which you do not have to assemble. This method of separating the parts ensures that no damage will be done to some of the more delicate parts of the complete apparatus. To prevent some of the smaller parts from being lost or mislaid when unpacking the carton, some are fastened to a card, whilst others are enclosed in six separate envelopes. This shows a certain amount of care in putting up this attractive kit and gives no cause for complaint from the customer.

The Circuit

The circuit consists of a variable- μ screen-grid stage followed by a power detector which is in turn transformer-coupled to a pentode valve. The first two valves are of the indirectly-heated type, and the pentode is directly heated. A biasing resistance is included in the cathode lead of the detector valve and comes into operation when the gramophone pick-up is inserted in the sockets provided at the rear of the chassis. The standard Lissen screened dual-wave coils are used with a substantial two-gang condenser for tuning. This is provided with a concentric trimmer. The coupling between S.G. and detector valves is of the parallel-fed tuned anode arrangement with capacity-controlled reaction. To prevent parasitic oscillation in the output valve a resistance of 100,000 ohms is inserted in series with the grid lead. Three alternative aerial connections are provided, two being *via* small fixed condensers and one direct to the aperiodic aerial coil. In addition a plug is fitted to enable a mains aerial device to be employed.

Assembling the Kit

The Kit is extremely simple to assemble, the large chart which is supplied having very complete instructions tabulated into a number of Steps. Thus under Step 1 you are told how to assemble the metal

THE LISSEN A.C. SKYSCRAPER

chassis and mount the condensers, etc. In Step 2 you are instructed how to assemble the components on the upper side of the base and so on. In this way, and



with the special connecting wires supplied, it does not take long to make up the receiver.

The mains unit is bolted to the chassis after the principal assembly is completed. An interesting point in the wiring is that you are told how long to cut the wires, and a rule is printed on one edge of the chart. It would appear, therefore, that everything has been thought of to assist the constructor in putting this receiver together in the easiest and most efficient manner possible.

Results

The receiver is remarkably efficient, and if you had any experience with the original Skyscraper (battery version) you will have some idea of what to expect in a mains operated version of the set. The sensitivity of the H.F. stage is very high indeed and stations simply roll in. The quality, due to the power rectifier, is very good, and is characterized by that crispness and good response to transients. The output from the pentode is ample and when used with a moving coil loud-speaker, correctly matched, the tone of reproduction is very

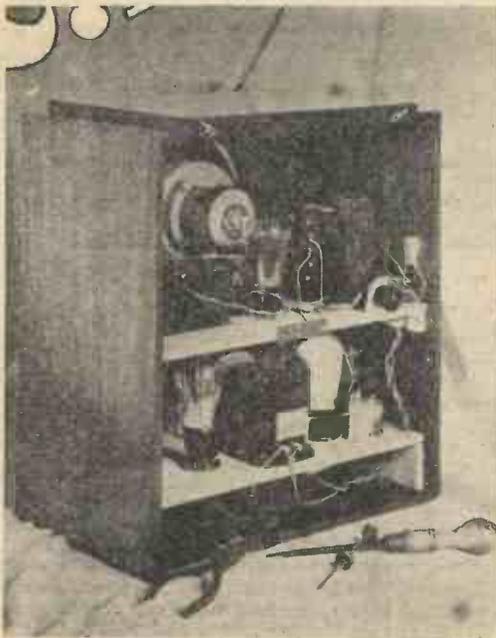
good indeed. The number of stations which can be received on the receiver will, of course, depend on the locality, but with the mains aerial in use, in the heart of London a dozen stations could be easily tuned in at really good loud-speaker strength. When used with an outdoor aerial the range is vastly increased, and there are many stations to choose from. When used with a gramophone pick-up the reproduction is also of a high order, the detector valve having very good characteristics as an L.F. valve. It was found with the particular pick-up which we used, that a volume control was necessary across the pick-up input, and this fact is mentioned in the Lissen chart. The price of the Kit, with 4 valves is £7 19s. 6d. With table cabinet the price is £8 15s. For those who require a complete outfit, a console cabinet, with permanent magnet loud-speaker is obtainable, and this, with the complete kit costs £10 12s. 6d.

Special Features

It is always interesting to examine these commercial kits for points of interest and there are one or two small features included in the Skyscraper which we should like to mention before concluding. Firstly, the particular form of automatic volume and reaction control. This consists of a bakelite moulding carrying a circular resistance on one edge. Mounted on a central point is a small variable condenser of the bakelite dielectric type. Rotation of the control knob varies the setting of the reaction vanes as well as adjusting the grid bias on the screen-grid valve. Consequently as the sensitivity of the H.F. stage is reduced, the sensitivity of the detector stage is increased and this results in a very fine form of control over both volume and selectivity. A further interesting feature is the inclusion of a special fused combination output plug from the



mains unit. This is of bakelite and in each lead from the mains unit is a fuse forming the connection from wire to pin. The two wires are enclosed in a single rubber covering and the plug has the usual 5-amp. wall socket pins



Compact, quickly assembled, and cheap—
a star performer.

SINCERELY hope that the preliminary notes which I gave you last week filled you with ambition to build this interesting two-valve set. I am certain there are hundreds of readers who will find that this receiver fills a long felt want. I will not go over again the essentials of the circuit, but will start right away on the instructions for building the set, a task which, while not difficult, is a little more complicated than the ordinary type of receiver. But as the finished product will bear the hall-mark of the factory-built receiver, this extra work will be well justified. Well then, the first operation is to purchase the cabinet, and this will be fitted with the side rails to take the shelf and the main baseboard. It will be noticed, by the way, that there are actually two baseboards, one which I will call the main base, upon which the principal parts of the receiver proper are accommodated, and the second, which is the upper shelf, upon which the mains portion of the set is built. As with all PRACTICAL WIRELESS receivers, the sub-baseboard of mounting is employed, and this is a most valuable feature as it enables the component parts of the receiver to be divided into two parts with wiring also split up. If you have never built a receiver on this principle you will find that it is a novel idea which greatly simplifies the wiring. The hole for the escutcheon will also be cut out of the front.

Commencing Construction

First of all, take the main baseboard and rule a line across the centre so that you can correctly position the Polar gang condenser. With the template which is supplied with this component, mark *very carefully* the position of the screw holes. If this condenser is mounted even slightly out of line the control knob will be found to set awkwardly outside the cabinet and the ivory scale will not fit neatly behind the window of the escutcheon. Next mark out the positions for the valve-holders and the small cut-out on the right of the

baseboard to accommodate the various leads. Next take the upper shelf and mark the position of the valve (on the centre line), and also the cut-out on the right, which is similar to that on the main base. If you wish to use a light behind the dial (a feature which I would definitely advise you to do), you will have to cut out a small section from the edge of the upper shelf to clear the bulb and its holder. This latter is held in position by the escutcheon bolts. A further piece is cut from the rear of the upper shelf to clear the small Clix socket mount. The holes for the valve-holders are 1in. clearance. Three holes will be found on the side of the cabinet, and these are for the on-off switch, the reaction condenser, and the wave-change switch.

Mounting the Components

With the wiring diagram of the under-side of the main base before you (or the full-size blue print, which is obtainable for 1s.), carefully position the fixed condensers and the L.F. transformer. Now turn the base over and screw on the two valve-holders and the gang condenser. Measure a line 1½in. from the right hand side of the base, and with the switch rod on the centre line fit the Lewcos coil. The switch rod may then be withdrawn and placed on one side for the time being. The .0001 fixed condenser, and the .01 condenser should then be attached in their respective positions, and finally the H.F. and L.F. chokes. This completes the main base, and you may proceed to the upper shelf. The first part to attach here is the aerial and earth strip, and this is simply held in position with small wood screws. The two 4 mfd. condensers are next fitted, after which the .01 condenser should be attached close to the valve-holder. Fit the valve-holder, and then place the mains transformer on the right. The Bulgin mains plug and its mounting is the final component to be fitted to the shelf, and you can therefore attach the on-off switch and the reaction condenser to the side of the cabinet.

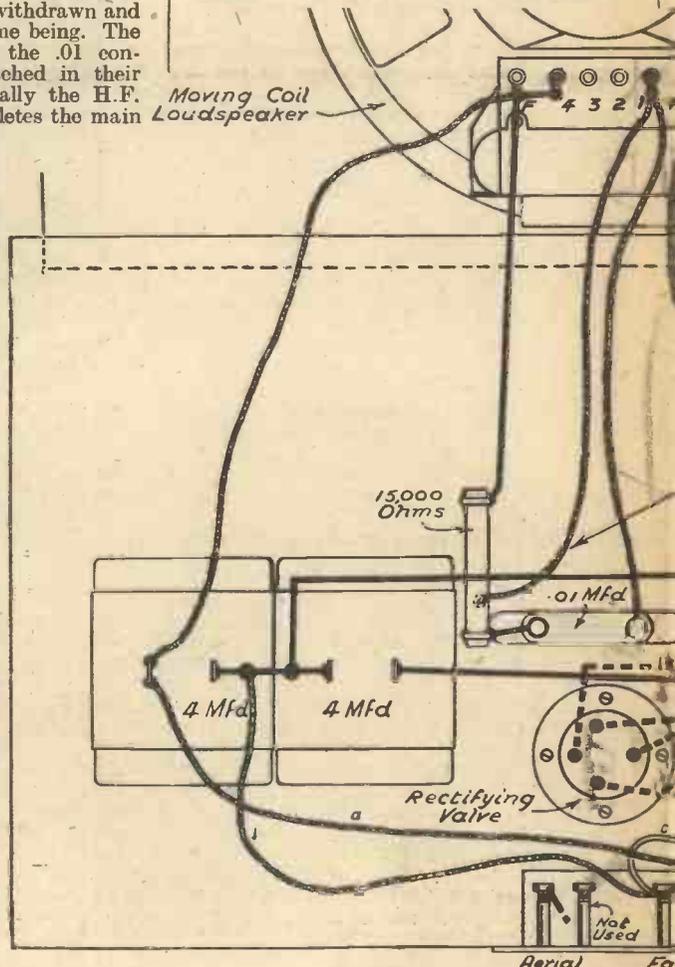
The Wiring

The constructional work so far carried out will have been found extremely simple, and the wiring, whilst not difficult, is a little complicated, and the following instructions should therefore be carefully carried out. First of all, attach a short length of Glazite from the terminal marked E on the Lewcos coil to one side of the .01 mfd. condenser, putting one wire of the 10,000 ohm resistor under the terminal head before tightening it up. Attach the other end of the resistor to the other terminal on this condenser, and at the same time connect a length of wire to the terminal and take this down through hole No. 1 in the base and join it to the .001 mfd. fixed condenser on the under-side of the

Building "PRACTICAL"

Complete Constructional Details of
Receiver which was Introduced

base. From this terminal take a short lead to the nearest terminal of the 1 mfd. fixed condenser, and a further wire to the central terminal of valve-holder V.1. A wire must also be taken from this condenser terminal to terminal H.T. on the L.F. transformer, and this terminal is also joined to the G.B. — terminal on the transformer. From the latter terminal a wire runs to a terminal on the 1 mfd. fixed condenser on the left of the base, and this is in turn joined to the 2 mfd. condenser. A short wire is next attached to the terminal



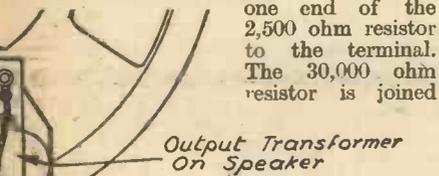
Wiring diagram of the power section of the A

the TWIN

FIRST AGAIN! The First Two-Pentode Receiver

or Making Up the Ingenious
Last Week by W. J. DELANEY

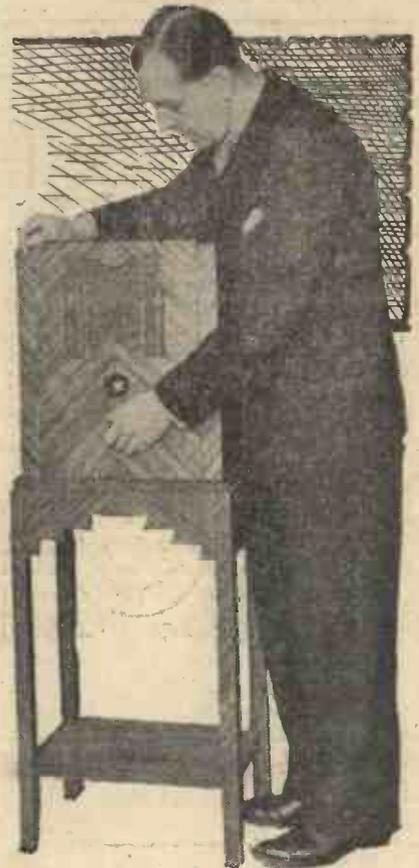
on the rear of the gang condenser, and this is passed down through hole No. 4 and joined to the G.B. — terminal on the L.F. transformer. Now join the 400 ohm resistor across the 2 mfd. condenser, and connect the right-hand terminal of this condenser to the central terminal of valve-holder V.2. Two and a half inches of wire will join terminal G of the transformer to the grid terminal of this latter valve-holder, the normal plate terminal of which is joined to the 1 mfd. condenser, which is close handy. Before tightening this nut, attach one end of the 2,500 ohm resistor to the terminal. The 30,000 ohm resistor is joined



by one end to terminal H.T. on the transformer, and by the other end to terminal P on the transformer, and a wire from this point is taken to the 1 mfd. condenser which is situated under the L.F. choke. From the other terminal of this condenser, a wire is joined to terminal 4 on the choke, whilst a 12,500 ohm resistor is joined from the same point to the normal plate terminal of valve-holder V.1. Now turn the base over and join terminal 4 of the L.F. choke to the rear terminal of the H.F. choke, and to the remaining terminal on this latter choke attach a 3in. length of flex, a 9in. length of flex and a 4in. length of Glazite. The Glazite is passed down through hole No. 3 and joined to the remaining terminal on the .001 fixed condenser, whilst the short length of flex is bared at its end for subsequent connection to the anode terminal on top of the valve. The longer piece of flex will be attached to the reaction condenser when the base is placed into its position. A similar remark applies to the short length of flex which is attached to terminal R on the Lewcos coil. An inch or so of Glazite is now used to connect together terminals 2 and 3 on the Varley choke, and a short length of wire is joined to terminal 1 on this choke for connection to the free end of the 2,500 ohm resistor. This connection may be made by soldering, or using one of the Erie special connectors.

Completing the Wiring

Only one or two wires remain, and the next to attach is that from terminal C on the Lewcos coil to the terminal on the gang condenser which is just below the trimming wheel. From terminal G on the Lewcos coil a wire is taken down to the nearest terminal on the .0001 mfd. condenser, and a further wire joins this terminal to the remaining terminal on the side of the ganged condenser. The remaining terminal on the .0001 fixed condenser is now joined, via hole No. 2, to the grid terminal on valve-holder V.1, attaching at the same time one end of the .25 megohm grid leak. The other end of this leak is joined to the terminal of

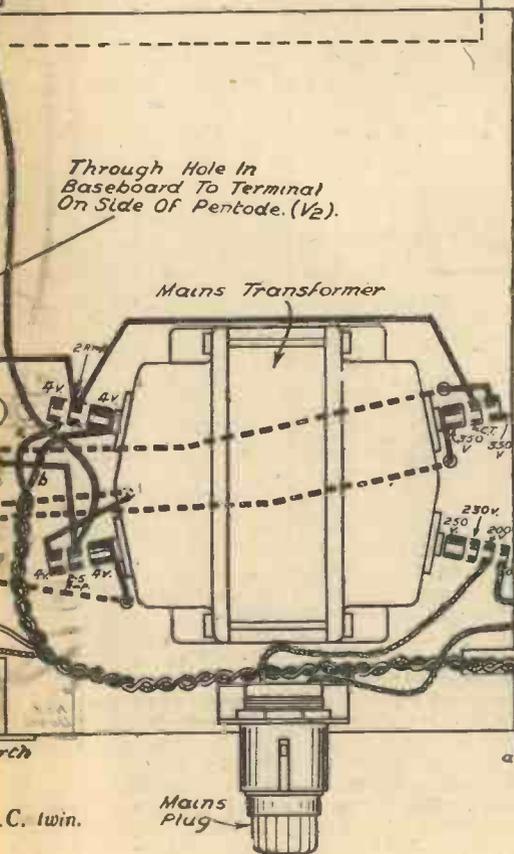


the .001 condenser, which already has two wires on it. Before tightening this up, attach a 2ft. length of flex, and in order to identify this, strip off the cotton covering, so exposing the rubber. Now tighten up the terminal, and this part of the wiring is finished, and the base may be put on one side whilst the shelf is wired up.

The Mains Unit

Join together the two centre terminals of the two 4 mfd. condensers, and attach at the same time a 9in. length of flex and a similar length of Glazite. The flex should be attached to the earth socket on the Clix

(Continued overleaf.)

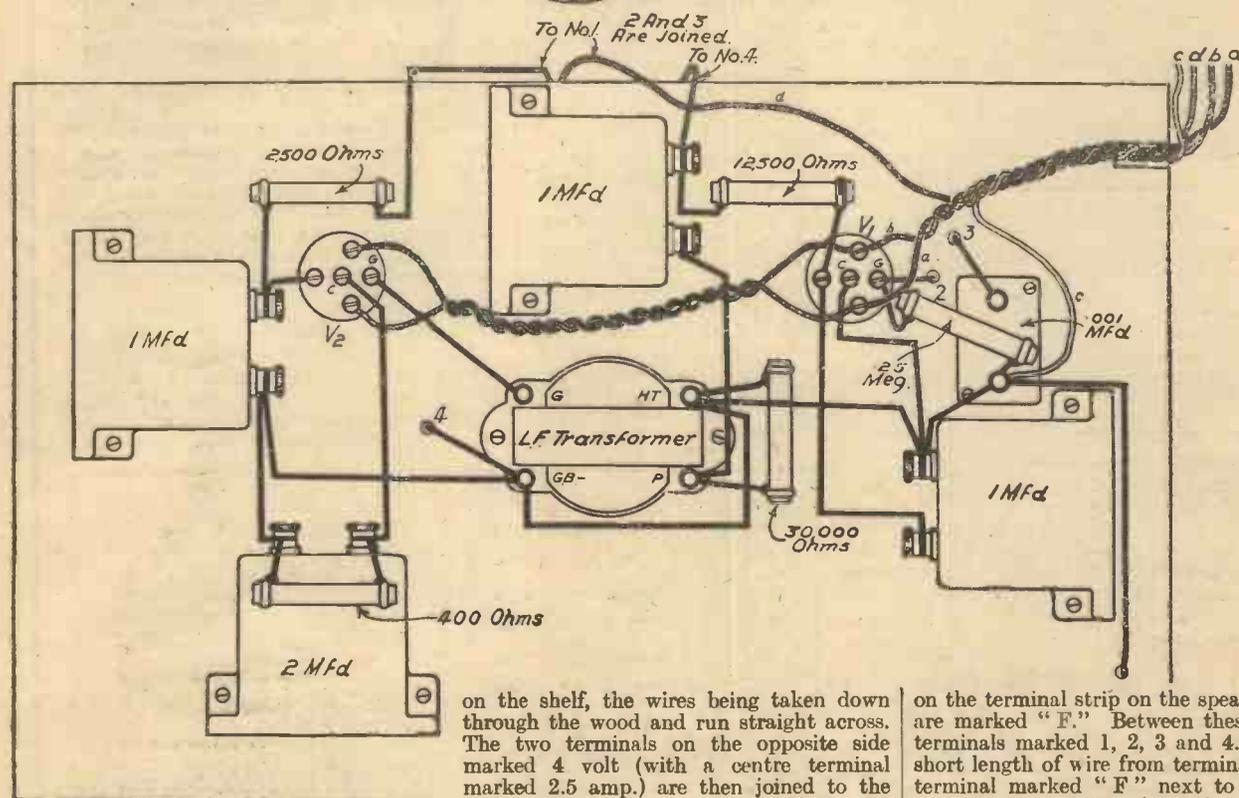
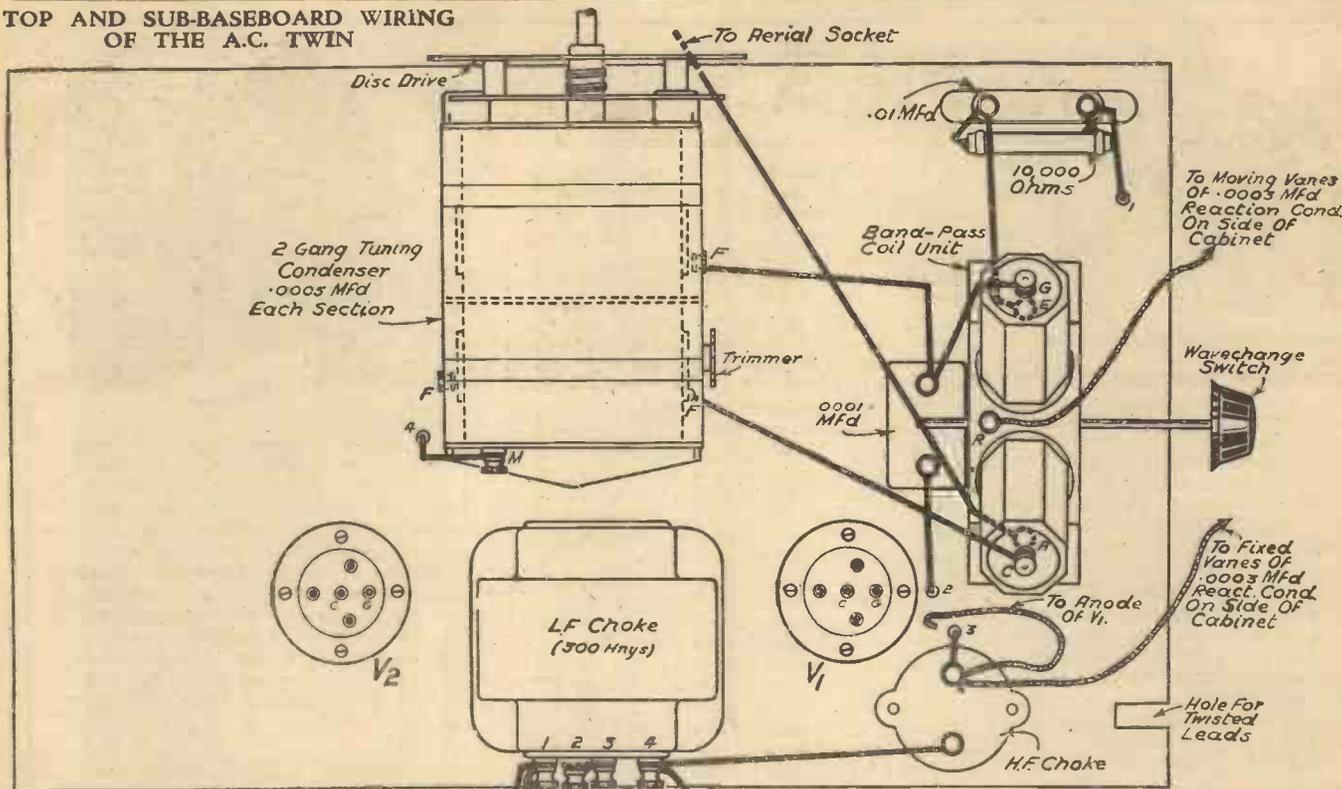


COMPONENTS FOR THE A.C. TWIN

- One Lewcos Band-Pass Filter, Type 51, B.P.F./R.
- One Polar Uniknob 2-Gang Condenser, .0005.
- One Irganic Transformer, Type T/24/B.
- One Lotus .0003 Reaction Condenser.
- One Bulgin Standard H.F. Choke (H.F.9).
- One Varley 300 Henry L.F. Choke (D.P.16).
- One .0001 fixed Condenser (Type S), T.C.C.
- One .001 fixed Condenser (Type S), T.C.C.
- Two .01 fixed Condensers (Type 34), T.C.C.
- Three 1 mfd. fixed Condensers (Type 50), T.C.C.
- One 2 mfd. fixed Condenser (Type 50), T.C.C.
- Two 4 mfd. fixed Condensers (Type 84), T.C.C.
- Two 5-pin valve-holders (Clix Chassis type).
- One 4-pin valve-holder (Clix Chassis type).

- One 1/2 megohm Erie Resistor.
- One 12,500 ohm Erie Resistor.
- One 400 ohm Erie Resistor.
- One 2,500 ohm Erie Resistor.
- One 30,000 ohm Erie Resistor.
- One 10,000 ohm Erie Resistor.
- One 15,000 ohm Erie Resistor.
- One Heayberd Mains Transformer (Model A.C. Twin).
- One Grampian Energized Speaker, Type E.1.
- One Bulgin Mains Toggle Switch, Type S.80.
- One Bulgin Small Mains Connector, Type P.21.
- One Clix Terminal Strip.
- Two Clix Wander Plugs (One black and one red).
- One Cossor 442 B.U. Rectifying Valve.
- One Cossor MS-PEN-A (H.F. Pentode Valve).
- One Cossor MP-PEN (Pentode Output Valve).
- One Smith Lyric Cabinet.
- One coil Glazite, 3 yards red and black flex, screws, bulb for panel light, etc.

TOP AND SUB-BASEBOARD WIRING OF THE A.C. TWIN



(Continued from previous page.)

strip, whilst the Glazite is joined to the centre terminal of the group of three on the mains transformer marked 4 volts 2 amps. From this latter terminal a wire is run round the transformer and joined to the centre terminal on the opposite side, marked CT. The terminals on each side of this latter, marked 350, are now joined to the normal grid and anode legs of the valve-holder

on the shelf, the wires being taken down through the wood and run straight across. The two terminals on the opposite side marked 4 volt (with a centre terminal marked 2.5 amp.) are then joined to the filament terminals of the valve-holder, and the centre terminal joined to the nearest terminal on the 4 mfd. condenser. Two 6in. lengths of flex are now connected to the terminals on the Bulgin mains connector, and the shelf may be placed on one side whilst the loud-speaker is prepared.

As has already been pointed out, the speaker field acts as the smoothing choke for the mains unit, and it will be seen that there are two terminals (one at each end)

on the terminal strip on the speaker, which are marked "F." Between these are four terminals marked 1, 2, 3 and 4. Solder a short length of wire from terminal 4 to the terminal marked "F" next to it, at the same time attaching a 7in. length of flex and one end wire of the 15,000 ohm resistor. To terminal 1 attach a 12in. length of flex and a 4in. length, whilst to the remaining "F" terminal a 6in. length of flex should be soldered. Now position the speaker behind the baffle and screw it into place. Fix a 2in. length of flex to one terminal on the on-off switch and attach this to the side of the cabinet. Now attach the ends of a

(Continued on page 201.)

The BEGINNER'S SUPPLEMENT

Conducted by F.J. CAMM

THE EASY ROAD TO RADIO



Coulomb

THE name given to the unit of quantity of electricity. It is the amount of electricity conveyed in a second by a current of one ampere. To take an example: suppose the accumulator of a multi-valve set were supplying current to the filaments of the valves at the rate of exactly one ampere as measured by an ammeter connected in the circuit. How many coulombs of electricity would

THE BEGINNER'S ABC OF WIRELESS TERMS

(Continued from April 15th issue, page 156.)

the aerial, porcelain insulators and a lead-in tube being used.

Coupled Circuit

In a receiving set this term is used to refer to two circuits, which by means of inductance, capacity or a resistance are able to influence one another, so that electric currents fluctuating in the one circuit induce currents in the other. The two circuits thus combined or "coupled" together are spoken of as a *coupled circuit*. The aerial circuit of a receiver, that is, the circuit which receives the incoming wireless waves, is often a coupled circuit. The reason in this case is that the coupled circuit gives greater selectivity than a single circuit.

Coupling

Coupling is the connection between two circuits, by means of which the energy is transferred from one to the other. There are three methods of obtaining coupling, namely: directly, inductively, or capacitatively.

Direct coupling simply means that there is a metallic connection between the two circuits. A modification of this method employs a resistance, and is accordingly called resistance coupling.

Inductive coupling, which is the form most commonly met with in wireless, is obtained by arranging the two circuits (Continued overleaf.)

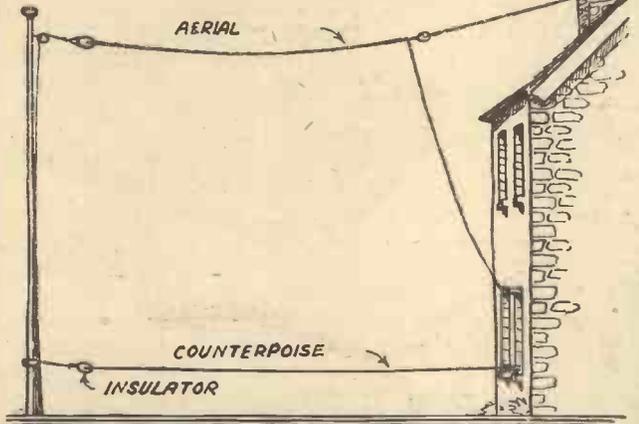


Fig. 1.—How to fix up a simple counterpoise earth.

be used in, say, ten minutes? Well, as the rate of flow is one amp., therefore one coulomb must flow every second (See "AMPERE"). Thus, in ten minutes, six hundred would be used. If the current used were half an amp. for five minutes then the quantity of electricity consumed would be half a coulomb every second, that is, one hundred and fifty coulombs in five minutes.

Counterpoise

A wire or network of wires suspended a foot or so above the ground which is used as the earth connection to a wireless or transmitting station, instead of making direct connection with the earth itself. A proper counterpoise earth is insulated in the same way as the aerial, and is usually placed directly under it. It has certain advantages over the ordinary type of earth connection. For one thing it gives more consistent results and is less affected by the seasons, change in temperature, dampness of soil, etc. It sometimes helps towards the reduction of interference caused by atmospherics. An example of how simple a counterpoise can be fixed up by the amateur is shown in Fig. 1. This arrangement is worth trying where disturbance of reception is caused by near-by electrical machinery. It is insulated in exactly the same manner as

in dry weather, they function almost entirely by virtue of the capacity effect. A piece of wire netting spread on the ground is a good example of this type of "earth."

Countersinking

The act of making a conical recess to a screw hole, so that the head of the screw may sink in to the wood, ebonite or other material, and thus lie flush with the surface. Countersinking gives a much better finish to a job than is obtained by just boring a plain hole for the screw. It should always be resorted to when fixing brackets to ebonite panels and such-like jobs. The usual method of carrying out the work is to first drill the hole for the screw and then to countersink it by means of a special countersinking drill or bit. The process is shown in Fig. 2. The inset shows a typical drill used for this purpose, which may be obtained for a few pence. The fixing holes of many components supplied to the constructor are already countersunk but where they are not this should either be done by hand or else roundheaded screws should be used. To screw an ordinary wood screw down really tight into a bakelite flange when the hole is not recessed may split off the flange. Thus, you see, there is a structural reason for countersinking beside the question of appearance.

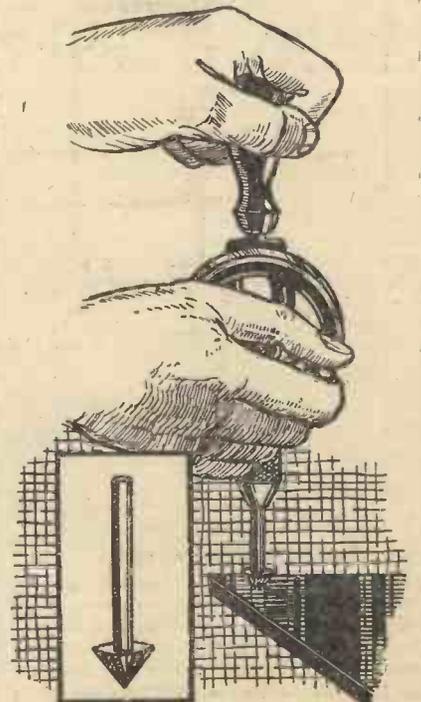


Fig. 2.—Countersinking an ebonite panel. Inset, countersink drill.

(Continued from previous page.)

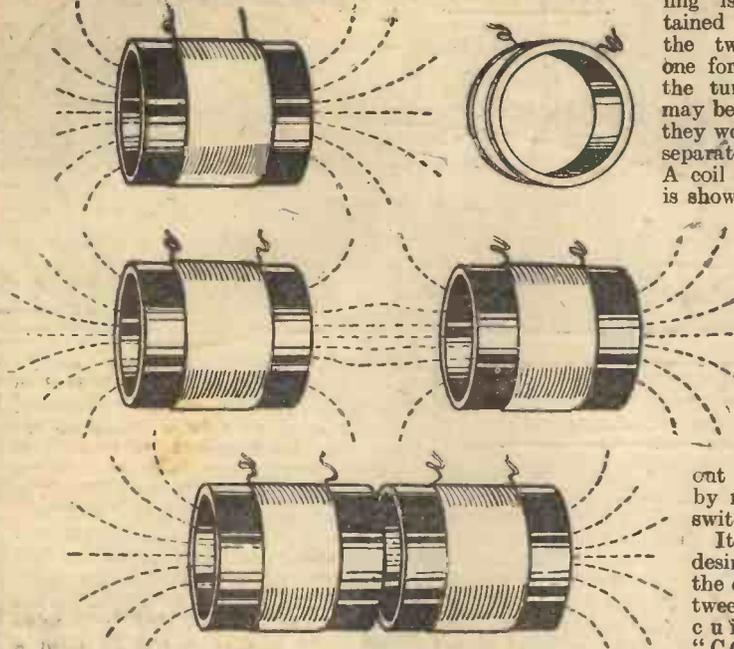


Fig. 3—Illustrating various degrees of coupling between two coils.

so that the magnetic fields around them interact. This is illustrated in Fig. 3, which shows two coils coupled together in varying degrees.

When a current is passed through a coil a "magnetic field" is produced round the coil, that is to say, the space round the coil exhibits magnetic properties. A compass held near the coil will point in different directions, according to where it is held. The direction of this magnetic force round a coil is represented by the dotted lines in Fig. 3. Now, when two coils are placed near together their respective fields will interact and some of the lines of force will join up so that they are common to both circuits. The amount to which they do this depends not only on the nearness of the coils to one another, but also on their relative positions. If you look at the top coils in Fig. 3 you will see that they are at right angles to one another. In this position there is little or no interaction. In other words, there is no coupling, or else it is very loose. The

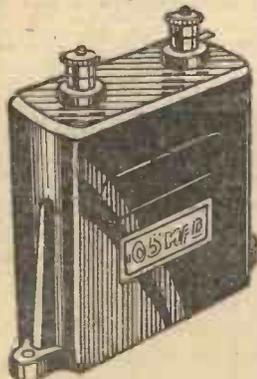


Fig. 7—A fixed condenser as used in coupling circuits, particularly band-pass circuits.

centre coils are shown end-to-end some little distance apart. Here there is more linking up and the coupling is said to be tighter. In the third position the coils are placed as close as possible. This ensures the maximum transference of energy from the one end to the other and the coupling is tight. Tight coupling

is often obtained by winding the two coils on one former so that the turns of wire may be closer than they would be if on separate formers. A coil of this type is shown in Fig. 4.

It is a commercial short-wave coil with three windings. Two of these are used at a time, the third one being cut out of circuit by means of a switch.

It is often desirable to vary the coupling between two circuits (See "COUPLED CIRCUIT" and "SELEC-

TIVITY," etc.), and so various methods have been devised to accomplish this. Fig. 5 shows one of them. Here one coil is made smaller than the other and is mounted on a spindle so that it can be rotated inside the larger one.

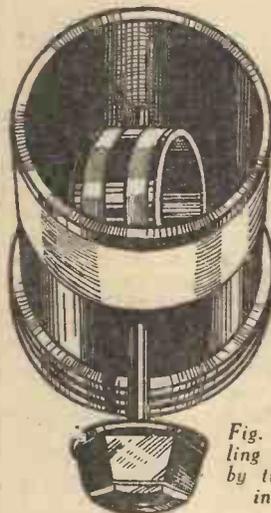


Fig. 5—How coupling may be varied by turning one coil inside another.

Coupling by means of capacity means that the two circuits are joined with a condenser. According to the way the condenser is connected up, a large condenser will give tight coupling and a small one loose coupling, or vice versa. The method of connecting, which gives the latter effect, is shown diagrammatically in Fig. 6 (right-hand sketch).

Two coils of wire may be either in-

ductively coupled, capacitatively coupled, or both. Examples of the first method are shown in Figs. 3, 4 and 5. In the second method the coils are either so far apart as to have no inductive coupling, or else are screened from one another by means of a sheet of metal to attain the same object. They are then joined by a condenser, such as the one in Fig. 8. The coupling is then purely capacitive. If the coils are allowed to have some magnetic interaction as well as being joined by a condenser, then the coupling is not pure but mixed. The three different methods all have their various merits and drawbacks with which we need not concern ourselves here.

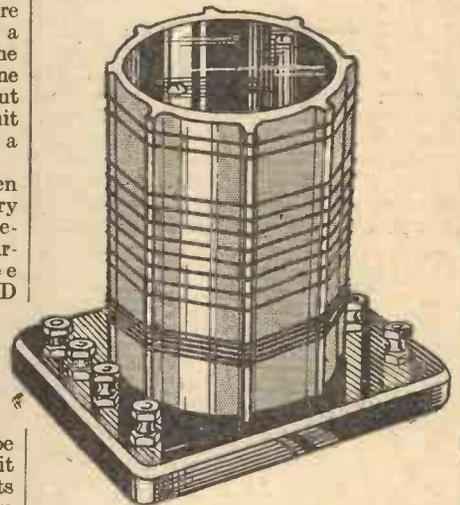


Fig. 4—Shows three windings on the same former. The coupling here is fairly tight.

Intervalve coupling, which refers to the method of joining together the various valves in a set, may be divided into three classes, namely, Resistance-capacity, Choke and Transformer coupling. They are dealt with under their respective headings, which see.

Have Your Copies Bound

REGULAR readers of PRACTICAL WIRELESS should carefully peruse the announcement on page 200 of this issue. It is a tedious task to have to wade through twenty-six issues of a paper to find a particular article. Every reader should collect his issues together and have them bound in the attractive binding case, together with the title page, and index, which we have had prepared as a service to the reader. This can be done at a special bargain price of 5s. 6d., and the completed volume will provide you with a remarkable work of reference.

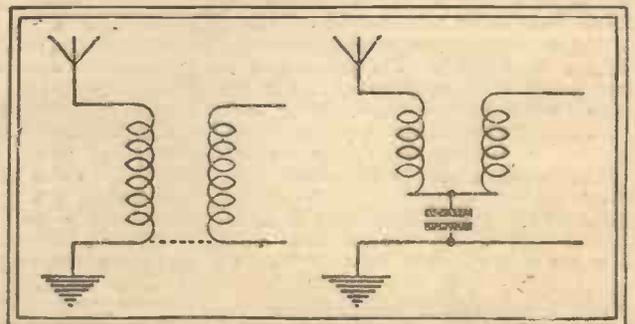


Fig. 6.—Diagrams showing inductive coupling (left) and capacitive coupling (right).

FOR EVERY SET — there's a PILOT AUTHOR KIT

CASH — C.O.D. — or H.P.

TELSEN "SUPER" 6. Complete Kit of Telsen Parts in Sealed Carton. Cash or C.O.D. Carriage Paid, £5/18/6. Balance in 11 monthly payments of 10/10, only (Set of valves add 7/8 to each of 12 payments.) **Send 10/10**

JUST RELEASED

LISSEN ALL-ELECTRIC SKYSCRAPER 3

Complete with 4 valves and constructional chart in sealed Lissen carton. Cash or C.O.D. Carriage paid, £7/19/6. **Send 14/8** only
Balance in 11 monthly payments of 14/8.

BLUE SPOT UNIT AND CHASSIS. Type 99 P.M. Including matched transformer. Cash Price, £2/19/6. **Send 5/6** only
Balance in 11 monthly payments of 5/6.

ROLA PERMANENT MAGNET MOVING-COIL SPEAKER F.6. With Universal tapped input transformer. Cash Price, £2/9/6. Carriage Paid. **Send 4/6** only
Balance in 11 monthly payments of 4/8.

SEND 2/6 ONLY

Just pay a further 2/6 on delivery and balance in 5 monthly payments of 5/6 for **PETO-SCOTT GUARDIAN Q.P.P. MOVING-COILSPEAKER** specially designed for Q.P.P. output. Extremely sensitive, and gives perfect quality. Cash or C.O.D., Carriage Paid, 29/6.

Just pay a further 2/6 on delivery and balance in 5 monthly payments of 5/6 for **PETO-SCOTT PERMANENT MAGNET MOVING-COIL SPEAKER**, ideal for all sets except Q.P.P. Cash or C.O.D. Carriage paid 29/6.

NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 29 P.M. With input transformer. Cash or C.O.D. Carriage Paid. £1/12/6. **Send 5/2** only
Balance in 6 monthly payments of 5/2.

SNIP BLUE SPOT 100U

Special Bargain Offer to "Practical Wireless" Readers. Speaker and Chassis. For high or low-powered sets. Original Price £1 12s. 6d. Our Price (for a limited period only) **19/6** CASH or C.O.D.

ATLAS ELIMINATOR. Type A.C.244. Three Send 5/6
tappings, S.G., Detector and Power. Output 120 volts at 20 m/A. Cash Price, £2/19/6. Carriage Paid. only
Balance in 11 monthly payments of 5/6.

GARRARD INDUCTION GRAMOPHONE MOTOR. For A.C. Mains. Model 202. Mounted on 12-inch nickel motor plate with fully automatic electric starting and stopping switch. only **Send 4/7**
Cash Price £2/10/0. Carriage Paid.
Balance in 11 monthly payments of 4/7.

Send 1/- for splendid **SHORT-WAVE BOOK**, written and edited by Mr. G. T. KELSEY, the world-famous short-wave expert. Describes four efficient receivers with full building and operating instructions; 48 pages, 4-colour cover. Amply illustrated. **FULL SIZE BLUE PRINT WITH EVERY COPY.** Obtainable from all shops and branches of W. H. Smith and Sons.

A.C. TWIN As described in this week's issue

KIT "A" Author's Kit of first specified parts less valves, cabinet, panel, baseboard and speaker, CASH or C.O.D. Carriage Paid, £7/1/6.

Delivered, Carriage Paid on first payment of **13 -**
Balance in 11 monthly payments of 13/-.

KIT "B" As Kit "A" but with valves only. Delivered, carriage paid, on first payment of **17/5**
Balance in 11 monthly payments of 18/-.
Cash or C.O.D. Carriage Paid, £9/16/6.

KIT "C" with valves, cabinet, panel, and baseboard, but less speaker, Delivered, carriage paid, on first payment of **21/3**
Balance in 11 monthly payments of 21/3.
Cash or C.O.D. Carriage Paid, £11/11/6.

If specified speaker required, add £1-10-0 to each Kit Cash Price or 2/8 to each monthly payment. Selected C.O.D. Items. You pay the postman. We pay post charges over 10/-.

- KIT-BITS**
- | | | | |
|---|-------|---|--------|
| 1 Polar Uniknob 2-gang .0005 Condensers with disc drive | 19 6 | 1 Leweos B.P.F./R Coil | 12 0 |
| 1 Heayberd Mains Transformer, Model A.C. Twin | 1 9 6 | 3 Specified Valves | 2 15 0 |
| | | 1 Smith Lyric Cabinet | 1 15 0 |
| | | 1 Gramplan Energised Speaker, Model E.1 | 1 10 0 |

SEND DIRECT to AVOID DELAY

FURY FOUR

BATTERY MODEL

KIT "A" Author's Kit of specified parts, including ready drilled panel, but less valves and cabinet. Delivered, Carriage Paid, on First Payment of **12/-**. Balance in 11 monthly payments of 12/-.
CASH or C.O.D. Carriage Paid, £6/10/0.

A.C. RADIOGRAM

KIT "A" Author's Kit of specified parts, including Motor, Pick-up and Speaker. CASH or C.O.D., Carriage Paid. £10-0-0. Delivered, Carriage paid, on first payment of **18/4**. Balance in 11 monthly payments of 18/4.

KIT "B"

As Kit "A" but with valves, less cabinet. Delivered, Carriage Paid, on First **17/3** Payment of
Balance in 11 monthly payments of 17/3. CASH or C.O.D., Carriage Paid, £9/7/6.

KIT "C"

As Kit "A" but with valves and Peto-Scott American Type Cabinet with lift-up lid. Delivered, Carr. Paid. **18/6** on First Payment of
Balance in 11 monthly payments of 18/6. Cash or C.O.D., Carriage Paid, £10/2/6.

- ESSENTIAL ACCESSORIES**
- 1 Simpson Electric Turntable, £1/19/6
 - 1 Amplion Pick-up with Volume Control, 25/-
 - 1 W.B. Permanent Magnet Moving-Coil Speaker, £2/2/0.

EXCLUSIVELY SPECIFIED PETO-SCOTT 1933 ADAPTGRAM Cash or C.O.D. Real Inlaid Walnut. With Motor Board and ready for Set. Or send 8/3 deposit and 11 monthly payments of 5/9. Carriage Paid **65/6**

CASH, C.O.D. or EASIWAY



PILOT GUARDIAN Q.P.P. 4-VALVE KIT

KIT "A" Complete Kit of Parts, including ready-drilled panel, but less Valves and cabinet. CASH or C.O.D., Carriage Paid, £3/19/6. 7/6 Deposit and 11 monthly payments of 7/3. **7/6**

KIT "B" As Kit "A" but with Valves, less cabinet. CASH or C.O.D., Carriage Paid, £6/18/0. Delivered, Carriage Paid, **12/6** on First Payment of
Balance in 11 monthly payments of 12/6.

KIT "C" As Kit "A" but with Valves and Table Cabinet. CASH or C.O.D., Carriage Paid, £7/13/0. Delivered, Carriage Paid, **14/-** on First Payment of
Balance in 11 monthly payments of 14/-.

KIT "D" As Kit "C" but with Console cabinet less meter and speaker. CASH or C.O.D., Carriage Delivered Carriage Paid, on First Payment of **15/-**
Balance in 11 monthly payments of 15/-.

Send for Full Size Blue-Print and Constructional Chart. Usual price 1/- Sent FREE to "Practical Wireless" Readers.

IMPORTANT Parts, Kits, Miscellaneous Components, Finished Receivers or Accessories for Cash, C.O.D., or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid.

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

Telephone: Clerkenwell 9406/7. West End Showrooms: 62, High Holborn, London, W.C.2. Phone: Holborn 3248. Dear Sirs, Please send me CASH/C.O.D./H.P.

for which I enclose £.....s.....d. CASH/H.P. Deposit.

NAME

ADDRESS

Pr. W. 22/4/33

STRICT PRIVACY GUARANTEED — WE DEAL WITH YOU DIRECT

OPERATING



How the Beta Should Be Handled to Bring You Music from all Parts of Europe, with Any Tone You Desire

BEFORE we give detailed instructions for handling this interesting four-valve receiver, there are one or two points which may be explained at more length than was done last week. First of all, the coil L.3 (see page 154 of last week's issue) should be earthed, and owing to a draughtsman's error this was not shown on this diagram. Therefore, a wire must be joined to terminal 6 on this coil, and the other end of the wire taken across to the earth terminal. It is also preferable, in some cases, to connect the switch rod and the cans of the coils to earth, and for this purpose a bare wire should be attached to this terminal (No. 6 on coil 3), and the end of the wire placed below the metal base of the coil before tightening up the screws. As the switch rod bears on a small spring which is in contact with the case, the remaining two screening cases will also be automatically "earthed." This point should not be overlooked, as it prevents hand-capacity effects and also assists in ganging.

Connecting the Batteries

The battery connections are simple, as stated last week, but to assist those who are new to wireless, the following detailed hints are given. The Lissen battery is marked with a minus sign at one end and a plus sign at the other. The two battery leads carrying the plugs marked H.T. — and H.T. + should be inserted in these two sockets, the H.T. — plug being inserted in the end marked with the minus sign, and the H.T. + plug in the other end of the battery. The grid-bias battery will have three plugs inserted in it normally, and a fourth when the pick-up is employed. The lead from the potentiometer is inserted in the negative end of the grid battery, that is, the 16-volt tapping. The lead joined to the filament leg of valve-holder V.1 is inserted in the opposite end of the grid battery, and the lead from the Multi-tone transformer should be inserted in the socket marked 7.5 volts. The L.T. leads

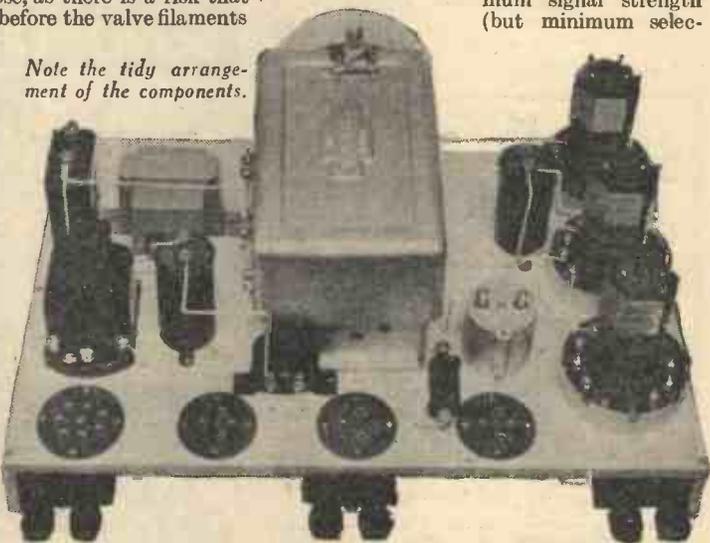
are joined to the accumulator, the L.T. — lead being joined to the black terminal and the positive lead to the red terminal. Before the receiver will work, a fuse bulb must be inserted in the special holder on the on-off switch on the panel. It is important to note that unless this bulb is in position no high-tension supply is in circuit. Do not use an ordinary flash-lamp bulb for the purpose, as there is a risk that this will not blow before the valve filaments in the event of a short-circuit occurring. Obtain one of the special Belling-Lee, or Bulgin fuses, and obtain one of the correct rating, which is .150 amps. On the transformer fitted to the speaker will be found three soldering points, and lengths of flex should be attached to these. The centre lead must be joined to the battery plug H.T. +, and the remaining two leads are then joined to the L.S. terminals on the receiver base-board. The inclusion of the lead to the centre terminal is most important, as the set will not work without this.

Testing Out

Now, before switching on, turn the knob of the potentiometer half-way between its maximum and minimum positions, and set the reaction control so that the vanes of the condenser are all out. That will be with the knob turned to the left as far as it will go. The knob immediately above the reaction knob should also be set to a

mid-way position, although this control is not important at the moment. If you now examine the rear of the aerial-series condenser (above the potentiometer) you will see a small arm, which rotates with the control knob, and the knob should be set so that this arm is touching the lower contact on the condenser. In this position the condenser is short-circuited, and maximum signal strength (but minimum selec-

Note the tidy arrangement of the components.



tivity) will be obtained. Now pull out the switch, and you should hear a certain amount of rushing noise from the loud-speaker. If there is no sound at all, rotate the reaction knob, and if nothing at all happens, switch off, as some connection is faulty, or the set is not correctly wired up. Check over, therefore, and get everything correct so that this rushing is heard when the switch is pulled out. Now rotate the dial until the wavelength corresponding to your local station is in line with the pointer, and you should hear the station

(Continued on page 201.)

LIST OF COMPONENTS FOR THE BETA UNIVERSAL FOUR.

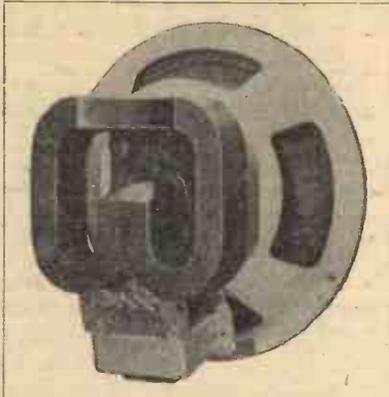
One Pair Telsen Band Pass Coils (Type W.290).
One Telsen Single Matched Coil (Type W.216).
One Telsen Three-gang Condenser with Disc Drive.
One Telsen Aerial Condenser with shorting switch.
Three 4-pin chassis-type valveholders, Clix.
One 7-pin chassis-type valveholder, Clix.
One .02 Dubilier fixed condenser, type 9200.
One .001 Dubilier fixed condenser, type 670.
One .002 Dubilier fixed condenser, type 670.
One .05 Dubilier fixed condenser, type 9200.
One 1 mfd. Dubilier fixed condenser, type BB.
One .0002 mfd. Dubilier fixed condenser, type 670.
One .1 mfd. Dubilier fixed condenser, type 9200.
One 10,000 ohm spaghetti resistance, Lissen.

One 20,000 ohm spaghetti resistance, Lissen.
One 30,000 ohm spaghetti resistance, Lissen.
One Bulgin H.F. Choke, Type H.F.9.
One Lissen standard H.F. Choke.
One .0005 mfd. reaction condenser, Lissen.
One Multitone Toco 1-4 L.F. Transformer.
One Multitone Graded Potentiometer.
One Benjamin Class B Driver Transformer.
One Busco three-point switch with fuseholder.
One Lewcos 20,000 ohm Potentiometer.
One Becol Ebonite Panel, 15in. by 7in.
One 1 megohm Lissen Grid Leak with wire ends.
One Lissen 16-volt Grid Bias Battery.
One Lissen 120-volt H.T. Battery.
One Lissen 2-volt Accumulator.

One Rola Loud-Speaker, Type F.6/PM/O1/Class B.
One 5-Ply Baseboard, 15in. by 10in.
One Cabinet, Peto-Scott.
One Coscor 220 VSG valve (metallized).
One Coscor 210 Det. valve (metallized).
One Coscor 215 P. valve.
One Coscor 240 B. valve.
Three Belling-Lee Terminal Mounts.
Six Belling-Lee Type B Terminals (Aerial, Earth, Pick-up, Pick-up, Loud-Speaker, Loud-Speaker).
One Belling-Lee Four-Way Battery cord.
Three Wander Plugs, G.B.+ , G.B.1 and G.B.2.
Sundry Screws, Fuse Bulb, Coil of Glazite, Flex, etc.

A.C. TWIN

The Grampian again the Designer's Selection



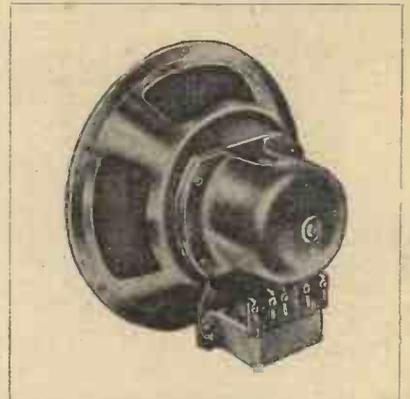
The Nipper
Type P.C.2. Price 27/6

A MOVING COIL SPEAKER
FOR EVERY SET TO
SUIT EVERY OUTPUT

Grampian Speakers are used by wide world manufacturers, one of whom says: "The reproduction from the Loudspeaker is quite exceptional—no less than sheer delight."

All Speakers are fitted with Multi-Ratio Transformers and are guaranteed for Two Years.

Write for Catalogue K.1.



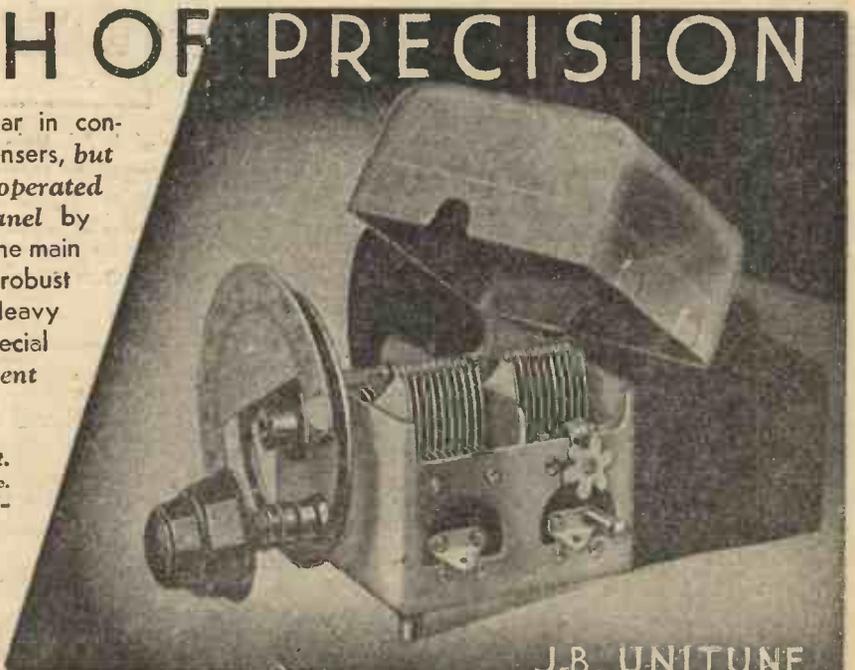
Specified for the "A.C. Twin."
Type E.1. 2,500 ohms, 6" cone. Price 25/-
Type E.8. 2,500 ohms, 8" cone. Price 37/6

GRAMPIAN REPRODUCERS LTD.
KEW GARDENS, SURREY

A TRIUMPH OF PRECISION

● Gives extremely fine tuning. Similar in construction to the J. B. "NUGANG" Condensers, but the trimmer of front section is operated independently from the receiver panel by means of a second knob concentric with the main tuning knob. Rigid one piece chassis, very robust construction. Trimmer to each stage. Heavy gauge wide spaced aluminium vanes. Special bearings to rotor ensure permanent accuracy. Capacity .0005.

Matched to within $\frac{1}{2}$ mmfd. plus $\frac{1}{2}$ per cent.
Complete with disc drive and bakelite escutcheon plate.
2 gang - 18/6 3 gang - 27/-



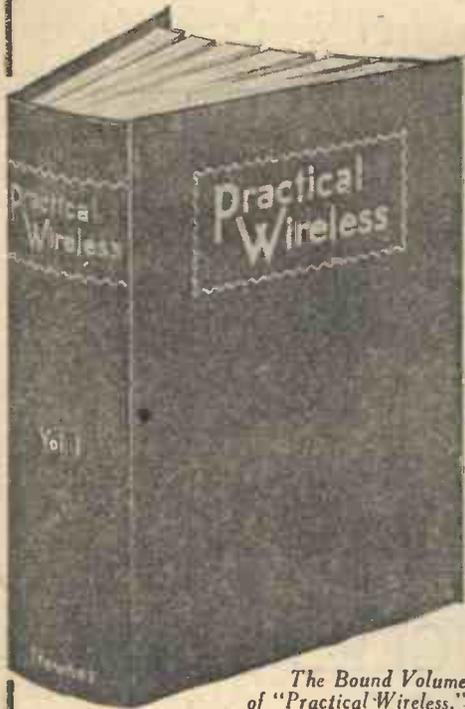
J.B. UNITUNE

PRECISION INSTRUMENTS

Write for Complete Catalogue.

Advertisement of Jackson Bros. (London) Ltd., 72, St. Thomas' Street, London, S.E.1.
Telephone: Hop 1837.

THE EDITOR RECOMMENDS this Simple Way of having Your Parts of "Practical Wireless" Bound in Convenient Volume Form.



The Bound Volume of "Practical Wireless."

This illustration shows the exceptionally attractive style of binding case supplied. It is of Rich Royal Blue art book cloth, boldly lettered on the shelf and front side with Peerless Silver Leaf. These binding cases and semi-annual indexes have been produced for the convenience of the reader so that he can readily turn up the particular article to which he wishes to refer.

FILL IN AND POST THIS ORDER FORM

TO-DAY

with your copies of "Practical Wireless"

No. 1 (dated Sept. 24th, 1932) to No. 26 (dated March 18th, 1933).

To **A. W. BAIN & Co., Ltd.,**
17-19, Bishop's Road,
Cambridge Heath,
London, E.2



Don't hesitate, don't delay—bound immediately, before copies are lost or damaged, "Practical Wireless" in convenient Volume form will find a place on your bookshelf ready for immediate reference at any time. Do not waste the money you have spent in purchasing your copies of "Practical Wireless" by omitting to have the first Volume bound in the Publishers' authorised covers. For utility, lasting service and good appearance these handsome binding cases in Rich Royal Blue Cloth with Silver lettering and design are ideal.

IMPORTANT

The Binding House of A. W. Bain & Co. Ltd., have arranged to receive and bind each volume of "Practical Wireless" in the Publishers' authorised Covers. Missing parts can be obtained at post free rates from the Publishers.

URGENT

So that you shall not miss this opportunity of having your parts bound at this special inclusive price, forward your copies (dated Sept. 24th, 1932, to Mar. 18th, 1933) of Volume One for binding TO-DAY, using the order form below.

INCLUSIVE BARGAIN PRICE OFFER

The cost of the Case and Binding, including Title Page, fully cross-referenced Index and Return Carriage is 5'6.

ALL YOU HAVE TO DO

Send your 26 copies, clearly marked with your name and address (use order form), to A. W. Bain & Co., Ltd., 17-19, Bishop's Road, Cambridge Heath, E.2, together with P.O. or cheque for 5/6.

Return carriage is paid on all orders in U.K. If parcels are not clearly marked, the binder cannot accept responsibility for delay or loss. Payments acknowledged and orders executed in strict rotation. Average time—three weeks.

To A. W. BAIN & Co., Ltd.,
17-19, Bishop's Road,
Cambridge Heath, London, E.2.

Please find P.O. (or cheque) attached for 5/6 to include cost of Cover, Binding, Title Page, Index, and Return Carriage for Volume I of "Practical Wireless" in Rich Royal Blue Art Cloth.

Name

Postal Order Address.....

No enclosed.

Please cross / & Co/

BETA UNIVERSAL FOUR

(Continued from page 198.)

if it is working. If not, rotate the potentiometer control, and also the reaction control, until you hear the station. Now carefully turn the series-aerial condenser knob and see if any increase in signal strength is obtained. If so, then the small star-wheel on the variable condenser nearest the panel should be carefully turned with a long, thin piece of wood. Now, with one hand holding the main tuning-knob, swing the condenser backwards and forwards over a few degrees, and at the same time rotate the other two star-wheels in order to gang the three circuits. This is a tedious business, but must be carried out carefully, if you are going to receive distant stations, as two or three degrees difference on two sections of the condenser will result in a weak station not being heard at all. The idea is to get the three wheels adjusted so that the movement of any one wheel, either forwards or backwards, results in a weakening of the station. When you have carried out this operation, turn the dial to a reading at the other end of the scale and try and pick up a station there, and see if any further adjustment is needed. If not, the receiver is ganged, and may be now installed in the position it is to occupy.

The method of handling all the knobs is really quite simple and should be carried out in the following manner. Suppose you wish to try and receive Rome. From Data Sheet No. 15, or other source, you see that the wavelength of Rome is approximately 441 metres. The first thing to do,

therefore, is to set the dial to give this reading. Now take the reaction knob in the right hand and the potentiometer knob in the left hand and turn the two together until you hear the station (if it is transmitting at the time). You will find that as the reaction is increased probably Stockholm also can be heard, but then by reducing the potentiometer setting the two stations will fade away. An increase of the reaction condenser will bring back the Rome station, but the Stockholm signal will be weaker. When these two controls have been juggled to get the very best, without oscillation, the Rome station should be received quite clear of interference. It may happen,

however, that you are situated in such a position, or your aerial is arranged in such a way that it is impossible to get rid of Stockholm. In this case, and in other cases where an interfering station cannot be got rid of, the following procedure is carried out. The reaction and potentiometer are adjusted for maximum results as just described, and when the best setting has been found the left hand should be transferred to the knob above the potentiometer, and this should be slowly turned anti-clockwise. At the same time, the reaction should be increased to make up for the loss in signal strength. If it is found that the condenser value has to be so reduced that the H.F. valve oscillates, the potentiometer should be turned back a degree or so. You will find, however, that these three controls may be handled quite easily, and it is possible to get most stations clear of interference. Naturally, the series-aerial condenser only requires adjusting when interference is experienced, and the reaction is only wanted when a distant station is required. When the station is received at its best, the tone control may be called into use to vary the reproduction, but it will probably be found that for most types of reception, the knob may be turned to a midway position, where it gives a practically uniform response. If a heterodyne whistle is heard or a soprano is screeching away, the top may be removed by turning the control towards one end. On the other end, if a violin lacks "bite," due to, perhaps, an excessive use of reaction, the knob may be turned the other way to remove some of the lower notes and give brilliance.

BUILDING THE A.C. TWIN

(Continued from page 194.)

length of twin flex to the filament terminals of valve-holder V.2 on the main base, connecting them also to the filament terminals on valve-holder V.1. Take a length of flex with red cotton covering and attach this to terminal No. 1 on the Varley choke and plait together the twin filament leads, this red-covered lead and the plain rubber lead which you attached to the .001 mfd. condenser. Pass them up through the slot on the right of the base and carefully slide the base into the cabinet. When right home, attach the two leads (from H.F. choke and R terminal on coil) to the terminals on the reaction condenser, and push the wave-change rod through the hole into the coil base. Attach the condenser knobs to the spindle.

WEARITE COILS

are SPECIFIED
for the
SUPERSONIC SIX

Again and again Wearite features as exclusive specification for Oscillator and I.F. Transformers in Superheterodyne Sets. The "Supersonic Six" uses Wearite. Only by following the designer implicitly can you obtain the results he intended—and the coils are the more important components.

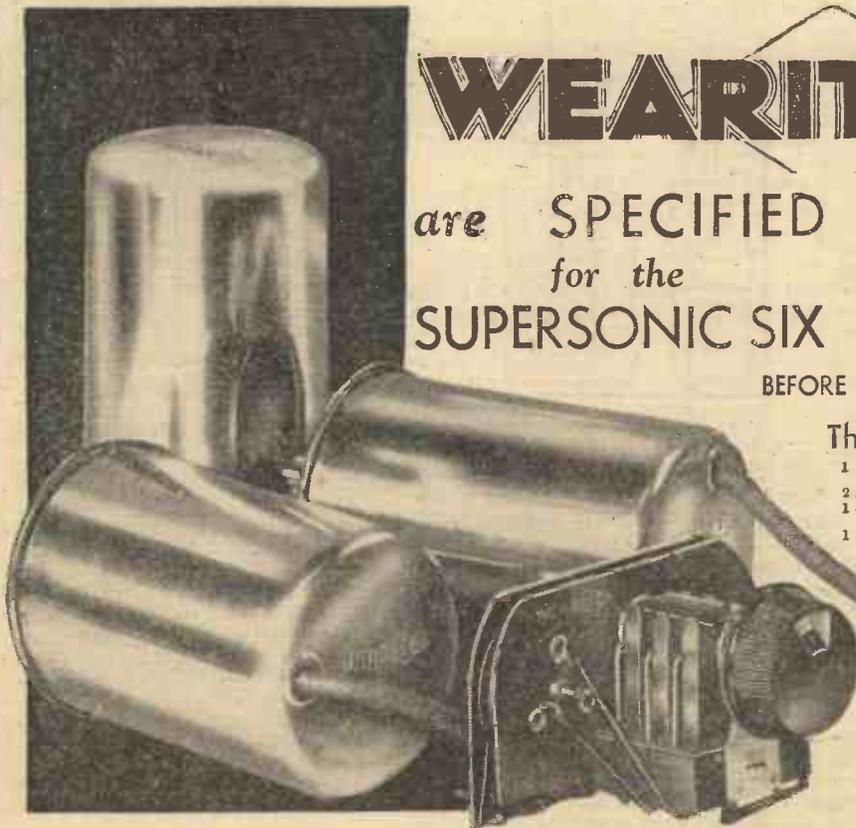
BEFORE YOU START—SEND for BOOK No. G.N:

The SPECIFIED COILS

- 1 .011/8 Dual Range Oscillator with switch Price 10/6
 - 2 .0T2 Bandfilters .. Price 10/6 each
 - 1 .0T1 Bandfilter .. Price 10/6
- ALSO SPECIFIED
- 1 Wearite Q.V.C. Volume Control, 25,000 ohms .. Price 4/6

The WEARITE
Centre-Tapped
Frame Aerial

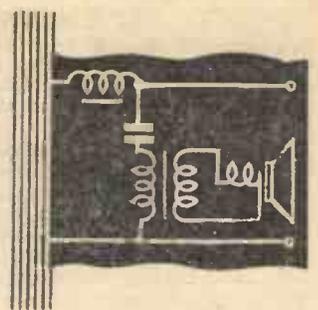
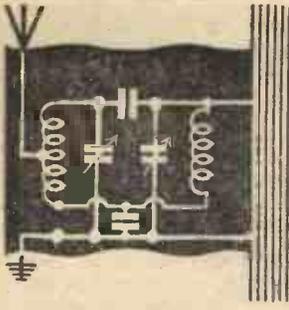
Suitable for the "Supersonic Six."
Super Model (as illustrated) .. Price 42/-
Popular Model 32/8



RADIO RAMBLINGS

By JACE

Gettings from my Notebook



H.T. Current and Volume

IT is surprising to find how mistaken ideas, especially in regard to wireless matters, manage to circulate so freely before they are corrected. I make this remark after being entertained to tea by some friends who have owned a battery-fed radio receiver for the past seven years. The "wireless" was switched on after tea and I was rather horrified at the very poor volume and "thin" tone. On tactfully making reference to this, however, I

The reason is that the ear is less responsive to both high and low notes, especially at low sound levels; as a result the "middle frequencies" are heard quite well, but the high and low ones can scarcely be detected. Under such conditions music seems to lack all "punch" and "vigour," so that most of the enjoyment in listening is lost. This effect is so noticeable that one or two American receivers are fitted with what is called an "Acoustically Compensated Volume Control." The name is something of a mouthful, but the principle of operation is perfectly simple and can easily be tried in any set fitted with a potentiometer volume control. A circuit diagram showing how the idea is applied is given in Fig. 1, where the extra components required are enclosed by a broken line. P is the usual potentiometer volume control and R is an additional variable resistance. When the potentiometer is set to "full volume" the tone compensating circuit has no appreciable effect, but it comes into play as volume is reduced. Since the choke and condenser "tune" to the middle frequencies they allow these to "leak away" to a certain extent and emphasis is thus given to the higher and lower notes. By experimenting with the setting of resistance R a position can be found with which the tone is automatically balanced for any setting of the potentiometer. You might care to try this idea for yourself if you have the necessary parts on hand.

side by side with the set instead of being above or below it as is more usual; this gives a particularly pleasing and business-like appearance.

The 1933 Portable

TALKING of summer time and portables reminds me that I have not yet finished working out the final design for my 1933 model (portable, I mean). This I am sure of, it will have "Class B" L.F. amplification and in all probability one of those small permanent-magnet moving-coil speakers. I would also very much like to use Ferrocart coils because of their high efficiency and compactness, but at the time of writing I understand that they are only available in sets of three, whereas only one, or possibly two, would be required. A portable designed on the above lines and fitted with an H.F. pentode should make an almost perfect outfit for, unlike most sets of this type, it would provide really ample volume for open-air and picnic use. I am afraid it would be rather on the heavy side, but it need not be much worse in this respect than many

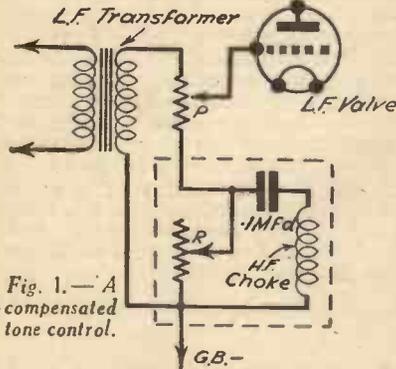


Fig. 1.—A compensated tone control.

was told that the set was certainly capable of much better things but that the batteries were rather low and might not last the night out if the volume was turned full on. It was a little difficult to see the meaning of this statement at first, but I gathered that my host was under the impression that the set's current consumption depended upon the signal strength obtained from the loud-speaker.

The time was not an opportune one for correcting this wrong impression, but if by chance any new readers are under the same misapprehension I would like to emphasize the fact that, with most sets at any rate, the consumption of either H.T. or L.T. current is scarcely affected by the volume of reproduction. The only slight difference which does occur is that the H.T. current to a leaky-grid detector falls as the signal strength applied to it is increased. Thus when the programme is made louder by increasing reaction the set consumes rather less H.T. current than otherwise.

When a variable-mu valve is employed the H.T. current consumption certainly does rise when volume is increased by reducing the V.-M. grid bias, and in that case there is some justification for keeping down the volume in the interests of economy. The same thing applies to a set using a Q.P.-P. output stage—H.T. current consumption is then almost proportional to the volume level.

Compensated Volume Control

THIS reminds me of another effect of reducing the loud-speaker volume below certain limits. You have probably noticed yourself that when the strength is turned down "quality" becomes worse.

S.W. Superheterodynes for the Colonies

IN view of the previous references on this page to the dearth of battery-operated S.W. superheterodynes suitable for Colonial listeners, it is interesting to note that two such instruments have recently been put on the market by two well-known firms. Both of these instruments are exceptionally well made and specially designed for the conditions under which they are likely to be used. One model has a zinc-plated chassis which is proof against all climatic variations, whilst both employ a special insulating material for the coil formers, etc., which has been found to withstand the disintegrating effects of heat and humidity.

The other set is interesting in that it has a built-in moving-coil speaker arranged

of the sets which are already very popular. It would at least be trans-portable and could easily be carried into the garden or stowed in the car.

A Suggestion for a Lightweight Portable

THIS brings us back to the old question: "When is a portable portable?" I must confess that I do not know of any set on the market which I should care to carry for more than a few hundred yards—at least, not for pleasure. But I have just rigged up a simple two-valve receiver which I think could be made up in portable form at an inclusive weight of 16 pounds or so. It uses a pentode detector, followed by a pentode output valve and really does give quite good loud-speaker volume up to 30 or 40 miles of the Regional stations when used on a small frame aerial. Should

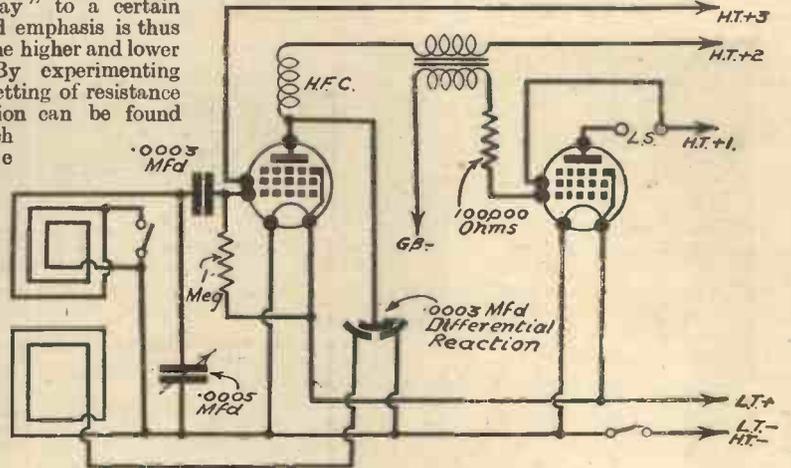


Fig. 2.—A novel portable circuit.

you care to try this excellent arrangement for yourself I give the circuit diagram in Fig. 2. As can be seen, it is straightforward enough and entirely devoid of "frills." The frame aerial contains two windings, one for tuning and the other for reaction, and is wound in the manner described on page 950 of PRACTICAL WIRELESS No. 20. Three separate H.T. tappings are provided to save the necessity for decoupling resistances and condensers; these should receive voltages approximately as follows: "H.T. +1," 100 volts; "H.T. +2," 70 volts and "H.T. +3," 30 to 50 volts. Using two pentodes of the high efficiency type (such as Cossor 220 HPT) the total H.T. current consumption is only about 6 milliamps and can economically be derived from the smallest size of high-tension battery.

Detector Overload

I DARESAY that very much of the distortion found in the average S.G.—D.P. receiver is due to the detector valve being overloaded, and yet this source of trouble is very rarely suspected. The point is that if a power valve is to be fully loaded the detector must supply a large output or else be coupled through a fairly high ratio transformer. When the transformer is not of high step-up the detector is liable to overload long before the power valve. If the latter fault is suspected it can be checked fairly easily by tuning in a foud station and observing the effect of increasing and decreasing reaction; if this makes practically no difference you can be fairly certain that overloading is taking place. The cure is to fit an aerial-input volume control or to increase the detector H.T. voltage. Maximum volume will naturally be reduced when the former method is employed, but it can be brought back to its previous level by using a higher ratio L.F. transformer or changing over to resistance-fed transformer coupling.

Excessive Oscillation

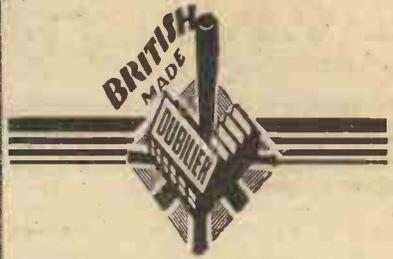
EVERYONE who handles a wireless receiver should be able to recognise the signs of self-oscillation, as H.F. instability is still the most fruitful source of trouble in receivers with H.F. amplification.

For instance, in some cases, when the potentiometer volume control of a set is advanced to "maximum" the signal strength drops considerably. This is almost a certain indication that, when loading is removed from one of the tuned circuits, the H.F. valve passes into a state of violent self-oscillation, with the probable result that the succeeding detector-grid circuit is choked.

Summer-Time Reception Conditions

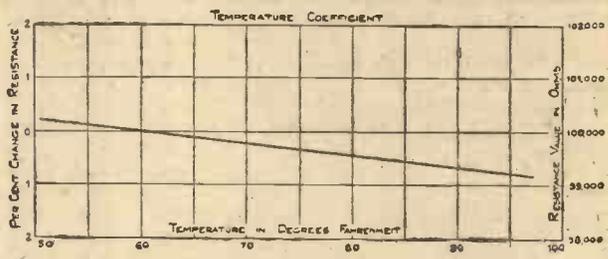
WITH the advent of "Summer Time" we can expect to find conditions for long-distance reception considerably worse than they have been during the last few months. I give this timely hint because about this season every year for the last decade I have been inundated with questions such as "What can be wrong with my set? I used to be able to get scores of foreign stations and now I can hear nothing of them." If this is your present trouble I can only make three suggestions. One is that you add an extra H.F. valve, another is that you build a new set specially designed for long-distance reception (you can't beat the "Fury Four") and the third is that you try the short-waves.

**BUY THE
RESISTANCE
OF
PROVED
PERFORMANCE
TEMPERATURE**



**DUBILIER
TESTS**

COEFFICIENT



For every one degree centigrade rise in temperature the change in resistance value of a Dubilier resistance is only .04%. The small effect of this change in the resistance value under normal working conditions is emphasised by the curve shown herewith, the right-hand scale of which gives the actual resistance values of a 100,000 ohm resistance at various temperatures; while the left-hand scale gives the average percentage changes.

Dubilier resistances are made according to value and rating to cover every requirement—insist on Dubilier make when buying resistances and be certain of absolute satisfaction.

Have you seen the new Dubilier Component Booklet, "Choosing your Resistances and Condensers"? Ask your dealer for a copy or write to us.



1 watt type 1/-, 2 watt type 2/-, 3 watt type 3/-

**DUBILIER
METALLISED
RESISTANCES**

DUBILIER CONDENSER CO. (1925) LTD.,
Ducon Works, Victoria Road, North Acton, London, W.3.

A Great NEW Valve

New principles of construction have made possible the HIVAC Valves at specially low prices—from 4/6 upwards.

There is a HIVAC Valve for every wireless requirement which will save you money and give you longer service.

Write to us for our Comparative Valve Guide and state the set you have or the set you propose to make.

ALL HIVAC VALVES ARE BRITISH MADE



Telephone CLERKENWELL 7587

The HIGH VACUUM VALVE CO. LTD. 113-117, FARRINGTON RD. LONDON, E.C.



ADDING A VALVE TO YOUR SET

(Continued from page 178.)

already employed. If it is a det. and 2 L.F. circuit, then the most obvious addition is a screen-grid stage. The only exception might be in the case where the receiver was used chiefly for local reception and gramophone records, from which extra volume was required, when the extra valve could with advantage be used in push-pull with the existing output valve.

With the S.G.-det.-pentode type of receiver, the position of the additional valve is not quite so obvious. As with a two-valver, there are again two possible positions, namely, before and after the detector. However, there are certain difficulties which would not be met with in the case of the two-valver. These are chiefly connected with the pre-detector arrangement. First of all, the addition of another screen-grid stage would make the input to the detector rather large, with the consequent risk of overloading it on the loud stations. There are two ways of avoiding this. One is to use a variable-mu valve as the additional amplifier so that large inputs can be reduced by using the usual grid bias volume control employed with these valves, and the other is to adjust the working characteristics of the detector so that it will handle larger signals than with the normal arrangement. This is, of course, power grid detection and consists of using instead of a 2 meg. leak and .0003 mfd. condenser, a .25 or .5 meg. leak and a .0001 mfd. condenser, together with a high anode voltage.

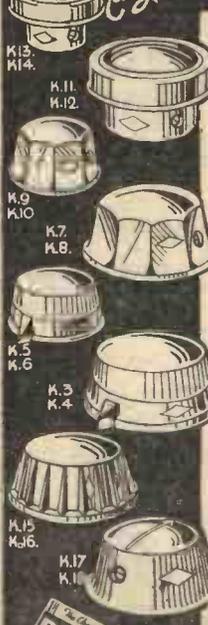
If there are already three tuned circuits in the set, namely, band-pass input and a tuned interval circuit, then another tuned H.F. stage is unlikely to be necessary except in the very worst cases of interference and will in any case add to the tuning difficulties, so that the best use for the extra valve is either as a choke-coupled H.F. amplifier between the present S.G. valve and the detector, or as an extra L.F. amplifier. In the former case it will add to the sensitivity of the receiver and also assist the ganging, since the third tuned circuit will now form the grid circuit of the new valve instead of that of the detector. The removal of the damping imposed on this circuit by the detector will mean sharper tuning and better ganging.

Pros and Cons

On the face of things the inclusion of the additional valve after the detector has much to recommend it. For instance, there is no likelihood of H.F. instability, there is no need for extra tuning and no possibility of detector overload. On the other hand, however, adding an L.F. stage, either R.C.C. or transformer coupled, means replacing the pentode output valve with a power or super power type. To retain the pentode as the last valve would mean overloading it. Again the additional L.F. stage would most likely call for extra decoupling, especially where the high tension current is derived from the mains.

A method of adding an extra L.F. valve which will appeal to many, especially those using battery sets from which a large undistorted output is desired, is to connect it in push-pull with the existing pentode, as suggested for the two-valver. Of course, there will be the added expense of the necessary push-pull transformers or chokes, but against this must be reckoned the fact that only one extra valve will be needed and no extra decoupling. Of course the push-pull method is not confined to pentodes. Triodes may be used equally well.

A Complete Range KNOBS



MATCH UP!
... that odd assortment of knobs on your panel by making a selection from our range.

- POINTER KNOBS**
Black.
K.3. 1 1/2" dia. x 3-16" bore 6d.
K.4. 1 1/2" " x 1/2" " 6d.
K.5. 1" " x 3-16" " 4 1/2d.
K.6. 1" " x 1/2" " 4 1/2d.
- WALNUT KNOBS**
K.11. 1 1/2" dia. x 3-16" bore 6d.
K.12. 1 1/2" " x 1/2" " 6d.
K.13. 1" " x 3-16" " 4 1/2d.
K.14. 1" " x 1/2" " 4 1/2d.
- OCTAGON KNOBS**
Black.
K.7. 1 1/2" dia. x 3-16" bore 6d.
K.8. 1 1/2" " x 1/2" " 6d.
K.9. 1" " x 3-16" " 4 1/2d.
K.10. 1" " x 1/2" " 4 1/2d.
- RIBBED KNOBS**
Black.
K.15. 1 1/2" dia. x 3-16" bore 4 1/2d.
K.16. 1 1/2" " x 1/2" " 4 1/2d.
- ARROW LINE**
Black.
K.17. 1 1/2" dia. x 3-16" bore 4 1/2d.
K.18. 1 1/2" " x 1/2" " 4 1/2d.
Delivery ex. stock.



SEND FOR 80 PAGE CATALOGUE & MANUAL
Enclose 2nd Postage.
(Dept. N)
A. F. BULGIN & Co., Ltd.,
ABBEY ROAD, BARKING, ESSEX.

EASY TERMS

Everything Wireless supplied on lowest terms. Prompt Delivery Guaranteed. Price List Free on request.

JUST RELEASED
New Lissen All-Electric Sky-scraper Kit. Complete Kit, incl. valves, for building this outstanding new receiver.
Cash Price £7/19/6
And 11 monthly payments of 14/4.
Lissen Sky-scraper, Battery Model.
Cash Price £4/9/6.
And 11 monthly payments of 8/6.

With order **14/4**
With order **5/-**

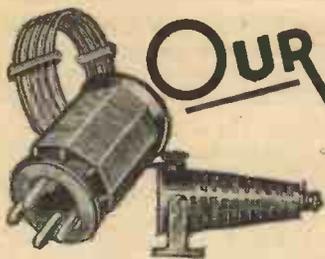
NEW BLUE SPOT UNITS
inst. released by the manufacturers.
NEW BLUE SPOT 99 P.M. MOVING-COIL UNIT.
Cash Price £2/19/6
And 11 monthly payments of 5/6.
NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 29 P.M. With input transformer. Cash £12/6.
Balance in 6 monthly payments of 5/2.
NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 45 P.M. With input transformer. Cash £2/8/0.
Balance in 9 monthly payments of 5/- only.

With order **5/-**
With order **5/-**
With order **5/-**

ATLAS ELIMINATOR A.C. 244. Three H.T. tappings. 20 M/A output. Cash Price £2/10/6.
And 11 monthly payments of 5/6.
All carriage paid. Quotations sent by return.
(Dept. P)

With order **5/-**

The LONDON RADIO SUPPLY COMPANY ESTD 1925
11, Oat Lane, Noble St., LONDON, E.C.2
Phone NATIONAL 1977



OUR SHORT WAVE SECTION



SHORT-WAVE work has always excited a great deal of interest, and in many people a sort of awed wonder, by reason of the remarkable long-distance reception that is possible with quite reasonable consistency, and since the opening of the new Empire transmitters it has been more in the limelight than ever. Incidentally, it is curious that, since short-distance signals are seldom strong on short waves, the new Daventry transmitters should have caused such a burst of activity in this country, since they will probably be heard worse in England than in Dominions five thousand miles away! In spite of their possibilities, however, many people fight shy of short waves for no better reason than that they believe them to be "tricky sort of things," as they put it, having the impression that anything under 200 metres cannot possibly obey the same laws as govern the action of longer waves. Yet these same people will cheerfully tackle the construction of a super-het., complete with band-pass tuning, provided that there is no suggestion of short waves about it! Personally, I would never think twice about building an ordinary short-waver, but the complications of ganged tuning and band-pass filters on ordinary broadcast waves do cause me to "gang warily," literally as well as figuratively!

At the same time, one is bound to admit that a certain percentage of those bold enough to try short-wave work do find it tricky, and in some cases give up in despair. It is my purpose in this article to diagnose one of the principal causes of this complaint and prescribe a remedy. Before going on to specific circuit details, let me mention one or two effects that occur in short-wave work and are responsible in part for its reputation for devilry. In the first place, the signal strength of any station working on short waves will vary enormously more during a period of twenty-four hours than it would if the station was operating on either the 2,000 or the 200-550 metre band.

Elusive S.W. Transmissions

Consequently, if, say, W8XK is heard R8 on its 19-metre transmission when the set is first tested one Saturday afternoon and later the set is tried on the same station in the evening, the listener will almost certainly blame the receiver, valves, batteries, and general perverseness of short waves, severally and collectively, when he finds not so much as a whisper of the American, although he knows that he is on the air. And yet this is quite in order, at any rate, in the winter, when the fade-out may occur as early as four o'clock in the afternoon, although in the summer the same station may be audible at midnight. Then again, not only is there a very great daily variation in signal strength, but conditions for reception vary much more from week to week and month to month on short waves than on

SIMPLIFYING TUNING ON THE SHORT WAVES

A Practical Article Explaining the Band-Spread System and How to Improve Reception.

By K. E. BRIAN JAY

long, so that while one week you may be able to listen day after day to a certain station, a week later you can hardly hear him, even at the most suitable time of the day. As an example of this, quite recently

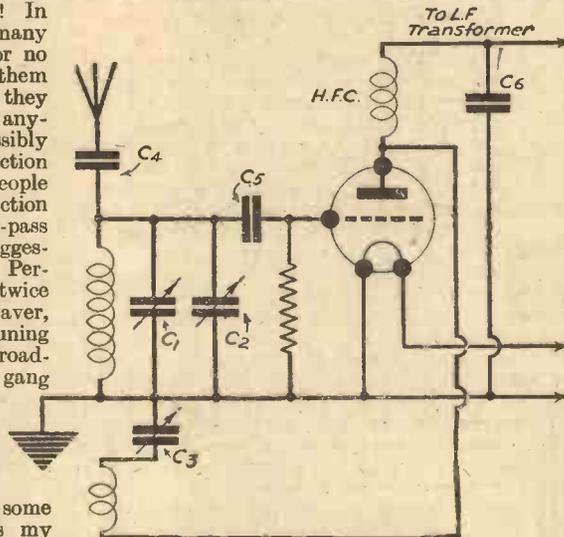


Fig. 1. Circuit.

American amateur transmitters were audible on the 40-metre band as early as 6.30 in the evening, and by nine o'clock there were so many that it was difficult to separate them enough to read their call-signs; but a week later, on listening at 9.30 p.m., not a single one was heard; the band was as quiet as a graveyard.

It is effects like these, then, that give short waves their name for trickiness, although actually, the same thing happens to some extent on long waves, but because, generally, one does not listen to stations more than a few hundred miles away, the variations are not so noticeable. Unfortunately, however, many constructors and designers add to their difficulties by a wrong choice of apparatus in their receivers, and especially is there a tendency to choose a variable condenser for tuning that is much too large for the job. Let me illustrate what I mean.

A certain, commercially-produced, dual-range short-wave coil is supposed to cover, approximately, from 19 to 80 metres on the two ranges, when used with a .0003 mfd. variable condenser. By way of a test, a few rough measurements were made on the lower range of one of these coils, using a .0003 mfd. condenser, and it

was found to cover from rather below 19 metres to 50 metres, approximately. Superficially, this seems very nice; most of the principal stations lie in this range, and the rest are covered by the long-wave winding, the total range appearing to be quite small compared with the usual 200 to 550 metres. But let us compare these ranges, not in terms of wavelengths, but of frequencies. Take the 200 to 550 metres band; this, in terms of frequency, is from 1,500 kilocycles to 545 kilocycles, i.e., a range of 955 kilocycles. Now 19 metres is the same as 15,790 kilocycles, and 50 metres as 6,000 kilocycles; that is to say, the short-wave range is equivalent to 9,790 kilocycles, over ten times as great as the range of the broadcast band. In short, tuning on the short waves will be ten times as sharp as tuning on the long waves. Suppose, on the long waves, you use a slow-motion dial with a ratio of 10 : 1, by no means a high ratio for comfortable tuning; in order that tuning shall be equally easy on short waves, a ratio of at least 100 : 1 will be needed, and only a very good dial will provide this ratio without backlash. Furthermore, even if such a dial is obtained, tuning will be a very weary process, because broadcasting stations are not distributed evenly over the whole band as on long waves, but are in little groups placed at intervals. Consequently, although a high ratio will be needed when a group is reached it will be a great nuisance when tuning from one group to the next.

Reception of Amateur Transmissions

This trouble arises in a very much more acute form in the reception of amateur transmissions which take place in very small bands of frequencies, the most popular being from 7,000 to 7,300 kilocycles and 14,000 to 14,400 kilocycles. Consider, for example, the case of anyone chiefly interested in amateur transmissions on the latter band. This band lies in the 19 to 50 metre range of our coil, and was found actually to occupy little more than 5 degrees on the dial, into which space there may be crowded as many as a hundred stations all working together, a prospect calculated to appal the most expert operator!

A similar state of affairs would exist on any of the other bands and clearly something has to be done about it. The simplest thing to do is obviously to use a smaller variable condenser, but this alone is not sufficient to spread each band over 180 degrees of the dial, and so various methods of band spreading have been devised. Of these only one is of interest to listeners to short wave broadcasting stations, because all the others require the use of plug-in coils, or tapped coils of non-standard sizes, and their band spreading is so effective that the frequency range is more limited.

(Continued on page 206)

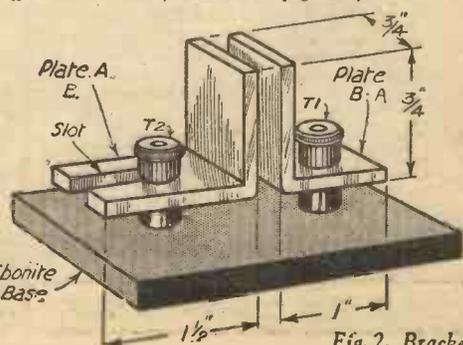
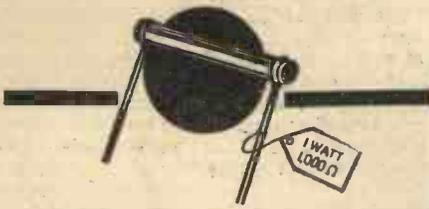


Fig. 2. Bracket



SPECIFIED again & again
ESSENTIAL for SAFETY

ERIE RESISTORS

NECESSARY for the
"A.C. TWIN"

Notice how Erie Resistors are specified for one set after another. That's because they are indispensably safe—positively Guaranteed against breakdown! Seven of them are essential for the "A.C. Twin." You need them for every set. They save money too!

1/- PER WATT IN ALL VALUES
50 ohms to 5 megohms, in
1 to 5 watts. Tag identified
and colour coded.

At all dealers. Ask firmly for Erie
Resistors. WRITE FOR LEAFLET
AND COLOUR CODE CHART.

THE RADIO RESISTOR CO.

1, Golden Square, Piccadilly Circus,
London, W.1.

EASY TERMS PROMPT DELIVERY

Any Amplion, Blue Spot, Baker,
Celestion, Epoch, R. & A. Rola,
Sonochorde, or W.B. Moving Coil
Speaker supplied.

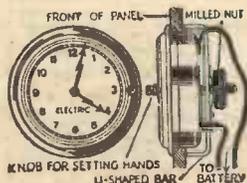
Send 5/- only

and pay the balance by monthly instalments. No
references. Entirely private and confidential.

KITS, PARTS, SETS, ELECTRIC
CLOCKS ON EASY TERMS.

Write for Catalogue and details to:

TURNADGE & PARTNERS, LTD.
Ludgate House, Fleet Street, London, E.C.4.
Telephone: Central 1903.



FIT THIS ELECTRIC CLOCK

TO YOUR SET!
NO MAINS NEEDED!
KEEPS CORRECT TIME!
NO WINDING!

Works off small battery lasting 12 months, or can
be plugged into G.B. battery without affecting recep-
tion. Uses practically no current. Fits into hole
3/4 in. dia. in any panel up to 1/2 in. thick. Easy to
fix—no screws required. Only
1/4 in. from front of panel to back
of case. Swiss movement. Hands
set from front. Nickel-plated
bezel. Useful addition to any
set.

RIVERSIDE MFG. Co., Ltd.,
Dept. 21, Crisp Road,
Hammersmith, W.6.
Telephone: Riverside 6392.

12/6

COMPLETE WITH BATTERY

POSTAGE 6D

Genuine AMPLION Units. Limited number. Over
75 per cent. reduction. Guaranteed. To clear, 2/3
each, carr. paid.—G.E. Pioneer Radio, Copth St., W.C.1.

SHORT WAVE SECTION

(Continued from previous page.)

Band Spread System

The method referred to is absurdly simple and consists merely in using two variable condensers in parallel, one being smaller than the other. These condensers are marked C_1 and C_2 in Fig. 1, and may be respectively .00005 and .0002 mfd. capacity; C_1 should never be more than .00005 mfd., but C_2 should be chosen so that the total capacity of the two condensers together is equal to that recommended by the makers of the coil. Thus, for example, if the wavelength range of a coil is specified as being obtained with a .0002 mfd. condenser, C_2 should be .00015 mfd. when C_1 is .00005 mfd. C_1 is the main tuning condenser, but because of the band spreading effect a slow motion ratio of no more than 16:1 is quite satisfactory. C_2 is called the band spreading condenser and need not be fitted with a slow motion dial at all.

Before describing the *modus operandi* of this band spread system (not to be confused with band pass) let me say a word in answer to those who may think, and say, that this is a lot of fuss about nothing, and the same effect could be obtained merely by using a smaller condenser. Within limits this criticism is justified, but let us consider a concrete case. Using the same coil a .0001 condenser was substituted for the .0003 mfd. instrument and the frequency range was now found to be from 15,790 kilocycles to about 8,000 kilocycles (37.5 metres). We have, therefore, lopped about 2,000 kilocycles off the range, which is a little help, though not very much, but has introduced the further complication that we shall need at least one extra coil to tune down to our previous lowest frequency of 6,000 kilocycles. On the longer wave range the difference would be a little greater, but still not very much better, and another extra winding would be required. We shall, incidentally, find that the amount of spread available on C_1 will be greater the longer the wavelength, that is to say that stations will be more crowded on the dial of the small variable condenser on the shortest wavelengths than on the longest. In this respect C_1 might well be as little as .000025 mfd. on 20 metres, but this capacity would be found inconveniently small on 50 metres; the size suggested is therefore in the nature of a compromise.

The band spread system is quite simple in use. C_1 is set to the middle of its scale and C_2 is tuned until a station is heard; fine tuning is then completed on C_1 . Since the broadcast stations are grouped together at intervals over the short-wave spectrum several other stations will be found nearby and tuned in on C_1 only, and the much greater ease of tuning will be at once appreciated. Even with a band spread arrangement, however, always obey the golden rule in short-wave reception and tune slowly. When each group of broadcasting stations has been located the dial reading for C_2 , which places the centre of the group in the middle of the dial of C_1 , should be noted so that the receiver can be retuned quickly to any group. This is another point in favour of the band spread arrangement, since each group can be found quickly without the laborious dial twisting which the use of a high ratio dial involves in getting from one reading to another some distance away.

As a matter of fact, with a modification of this method I have been able to use an ordinary direct drive dial on both condensers quite comfortably down to 18 metres.

S.W. Station Groupings

The principal groups of broadcasting stations on short waves are located at:—
from 17,750 to 17,780 kilocycles, or 16.90 to 16.87 metres.
from 15,075 to 15,330 kilocycles, or 19.90 to 19.56 metres,
from 11,180 to 11,905 kilocycles, or 26.83 to 25.20 metres
from 9,500 to 9,860 kilocycles, or 31.58 to 30.43 metres
from 6,000 to 6,667 kilocycles, or 50.00 to 45.00 metres
with a number of odd stations scattered between them and on wavelengths up to 80 metres (frequencies down to 3,750 kilocycles).

Condenser Capacities

Now a word about the kind of condensers to use. The points to look for in any short-wave tuning condenser are rigidity of bearings and frame, small physical dimensions, absence of dielectric material, good, well-insulated pigtail connection, smoothness of action, and low minimum capacity with reasonably well-spaced vanes. If you do not possess a .00005 mfd. condenser for C_1 , try reducing the size of one you have by you. Remember, double spacing reduces the capacity to one-quarter of its nominal maximum, since you are both doubling the spacing and halving the number of plates; if plates are removed and the spacing kept the same, the approximate resultant capacity will be:—

$$\text{Original maximum capacity} \times \frac{\text{Number of plates left in}}{\text{Original number of plates}}$$

For C_2 any good air dielectric condenser can be used, and in order to save panel space midget condensers may be preferred; this condenser should be mounted close to C_1 .

In choosing the reaction condenser C_3 , the chief thing to look for is, as before, good bearings, in order that the condenser shall be noiseless. For this reason air dielectric instruments are preferable to the small bakelite or mica dielectric type. The capacity may be from .0001 to .0003 mfd., and a slow-motion dial with a high ratio, say, about 8:1 is helpful, but not essential.

With regard to the other condensers in the diagram there are a few points worth noting. The aerial series condenser C_4 , for example, must be quite small, or the damping of the grid circuit will be so great as to prevent the receiver from oscillating. Quite often even a .0001 mfd. pre-set condenser has too large a minimum capacity for use here, since actually something of the order of .00001 mfd. is required. A semi-variable condenser suitable for this position can be made very easily from two 1/4 in. or 1/2 in. wide strips of brass or aluminium in the manner indicated in Fig. 2.

The grid condenser C_5 should be smaller than the standard value of .0003 mfd. used with leaky-grid rectification; .0001 mfd. is ample for C_5 , and it should preferably be of small physical dimensions. The value of the grid leak may often be increased to five megohms or more with considerable improvement.

(Continued from page 190.)

light systems will be among the first to appear. For the sake of economy in low tension supply, a single cathode will be employed and will be shared in common by all the elements of the valve. For the diode portion—whether one or two diodes are incorporated—the anode for each will consist of a metal ring or rectangle surrounding but not touching the cathode. Above the diode anodes a metal screen will be fitted, to shield the triode portion from the diode. The amplifying section of the valve will consist of a grid and anode, arranged very similarly to the electrode system of the ordinary indirectly-heated three electrode valve. Those valves in which the amplifying element is of the four electrode variety will have, of course, two grids instead of one. Some little uncertainty recently existed, also, regarding the type of valve base which will be employed. It now appears that seven terminals are required for each valve, and how the pins are arranged was shown in last week's issue.

There are several different ways in which valves of this type may be employed, and some of these are indicated below. It is, of course, not possible at present to give full practical circuits, as the actual characteristics of the valves have not yet been published. As the double-diode-triode type of valve seems the one most likely to be adopted, the diagrams reproduced in Figs. 6 and 7 refer to this class of valve.

Fundamental Circuits

In the first diagram, the valve is employed as a full wave rectifier and a low frequency amplifier. The drawing is self explanatory and it is easy to trace the detector arrangement and the way in which the combined output of the two diodes is led to the grid of the amplifying portion. Possibly a more useful way of applying the double-diode-triode, however, is that shown in Fig. 7, where only one of the diodes is employed for detection (as a half wave rectifier). The second diode is used for applying the automatic gain control or volume control biasing voltage to previous high frequency stages fitted with variable-mu valves. Several variants of this automatic volume control

circuit are possible, some of which are capable of adjustment so that a delayed action occurs, whereby no extra biasing voltage is applied to the variable-mu valve or valves until the signal has reached a predetermined minimum strength. In another circuit the triode portion also plays a part in the

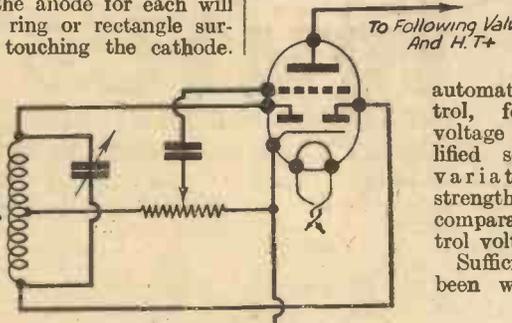


Fig. 6.—Fundamental circuit for using double-diode-triode as full-wave detector and L.F. amplifier. For the sake of clearness all decoupling components have been omitted.

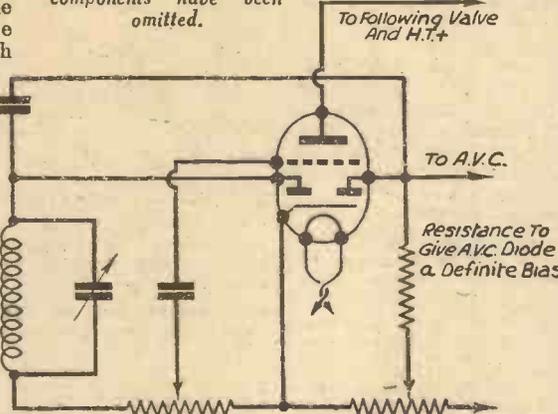


Fig. 7.—Fundamental circuit for using double-diode-triode as half-wave rectifier, L.F. amplifier and delayed automatic volume control valve.

is hoped, however, that the valve manufacturers will see their way to produce these valves cheaply.

automatic volume control, for the biasing voltage itself is amplified so that a small variation in signal strength will give a comparatively large control voltage.

Sufficient has now been written to enable the reader to judge of the application of these new valves, and it only remains to say how they may be applied to new receivers which have already been described in these pages. One of the principal points which the reader wishes to know is, of course, the price, but so far no details are available, and it is not, therefore, possible to say whether the valves will prove popular. It

HANDY BOOKS FOR HOME CONSTRUCTORS

FOUR USEFUL BOOKS

By F. J. CAMM
(Editor of "Practical Wireless.")

Twenty-five Tested Wireless Circuits.
Accumulators: Charging, Maintenance and Care.

Each 98 pages, fully illustrated, 1/- each or 1/2 post free.

Modern Wireless Sets and How to Make Them.
80 pages 6d. or 7½d. post free.

Make Your Own Wireless Set.
80 pages 6d. or 7½d. post free from:

Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

FOR BETTER RECEPTION WITHOUT INTERFERENCE

The selectivity of every set can be improved by fixing a PIX in the aerial lead-in. Even if a pre-set aerial condenser is fitted inside the set, a PIX will give better and sharper tuning. With a PIX in your aerial you can cut out the local station and get foreign concerts.



2/- WITH CLIP 2/9

Why suffer the inconvenience of dual and mixed programmes; fix a PIX and separate them and enjoy pure reception. A PIX can be fitted to any set, crystal, battery, or all mains, and will improve the reception of any set. No skill is required to fix a PIX. For 2/- any set can get super-het selectivity. From your local dealer, or send postal order to manufacturers:—



OVER A MILLION AERIALS LEAD DOWN TO A PIX

The British Pix Co., Ltd. (Dept. 504), 118/28, Southwark Street, London, S.E.1.

SET CRACKLING IS ANNOYING!



IF IT'S YOUR SWITCH FIT THE "BUSCO" SWITCH

1/0 each 1/3 Post Free. Patented.



and ensure perfect switch contact! There is no contact point to turn round, and when you "switch on" you have contact like a power switch. They are as cheap as the inferior type, but far superior in operation.

From your local dealer or BUSBY & CO., LTD. (Patentees) Dept. P.W., PRICE ST., BIRMINGHAM

M.P.R. BATTERY CHARGER

Send for particulars of complete Charging Equipment for A.C. Mains to charge 100 2-watt Cells weekly.

Price £4:4:0

MAINS POWER RADIO LTD., ROMFORD, ESSEX

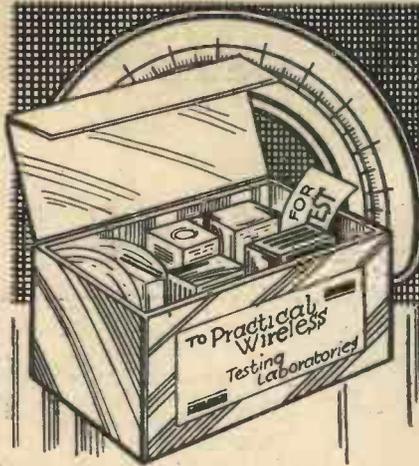
LOUD SPEAKERS REPAIRED 4/-

(Blue Spot a Speciality, 5/-) Transformers 4/-, all repairs magnetised free. Eliminator Repairs quoted for. 24 Hours Service. Discount for Trade. Clerkenwell 9069.

E. C. MASON, 44, EAST ROAD, LONDON. N.1.

THE IMPROVED "TONIC"

self-generating trickle-charger kit keeps 2-watt accumulators fully charged. Electric mains and charging stations unnecessary. Ideal for remote places. 7/- each, postage 9d. Particulars, testimonials, with pleasure. WILLIAMS, Netherend, Cradley, Birmingham.



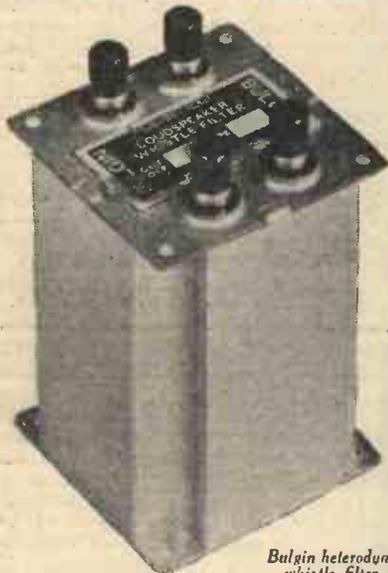
Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF.

BULGIN HETERODYNE WHISTLE FILTER

THE filter illustrated is of great value where the annoying whistle which accompanies some transmitting stations is so marked as to spoil reception. There are many whose hearing prevents them noticing the higher notes in the musical scale, but to others, especially in the younger generation, the heterodyne whistle can prove a real nuisance. The inclusion of a filter in the circuit results in all frequencies above a



Bulgin heterodyne whistle filter.

certain value being cut off, and Messrs. Bulgin have developed two different types of filter, one cutting off at 3,250 cycles and the other at 4,750. As the normal moving-iron loud-speaker is not so sensitive at the higher parts of the scale the former is recommended for use with that type of speaker, whilst the latter should be used on receivers employing moving-coil loud-speakers, and having circuit arrangements which do not cut off the top notes. The now standard Bulgin universal type of case is used for the filter which is about 4in. high. The provision of fixing holes at top and bottom enables the filter to be mounted on the top of a baseboard, or beneath a metal chassis, with the terminals protruding through four specially-drilled holes in the chassis.

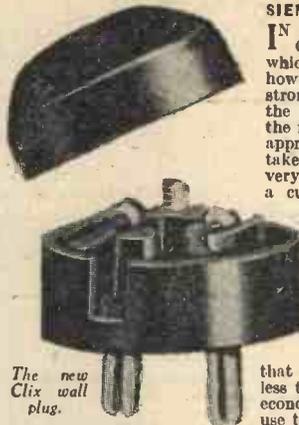
Four terminals are provided, two of which are to be joined to the L.S. terminals on the receiver, and the loud-speaker then joined to the other two terminals on the filter. Inside the filter is a special tuned series circuit, with parallel paths, and it therefore forms the link between the receiver and the speaker. In use it is very effective indeed, and by fitting a double-pole change-over switch it is possible to demonstrate quite clearly the effect of this component, which really does do the job it is intended to. The price, for either type, is 10s. 6d.



"Fotos" nipper transformers.

NEW CLIX WALL PLUG

NO doubt the majority of readers are familiar with the ordinary type of 5 or 15 amp. wall plug, intended for connecting apparatus to the two-pin sockets fitted in the house. The majority of these plugs are not too easily fitted up, the method of connecting the ends of the flex, and of reassembling the plug, being anything but simple. The new Clix plug is a most marked advance in the design of this type of plug, and possesses several remarkable features. First of all, it is finished in neat black bakelite and only one retaining screw is employed. This is mounted between the two pins, and to take the plug to pieces to wire it up takes but a second or two. In place of the usual small screws with a small diameter hole in which to force the flex, Messrs. Lectrolinx have included an enlarged version of their wander plug for this particular plug. This is, as we have mentioned before in these pages, in the form of a large split, or lynch-pin, and it forces down through a hole in the bakelite plug base. To anchor the ends of the flex they are simply passed through the large loop in the top of the pin, and the pin then pressed home. A small brass fitting then locks the wire in the loop. To prevent strain on the leads they are fed round through a circular groove in the base and given a turn round a bakelite pin, after which they are passed out through a side slot. The circular groove is amply proportioned, and will take the thickest of flex, and the cover does not prevent any number of leads being used with the plug. The particular type of split pin enables it to give perfect contact in practically any sort of wall socket, and there is a very sound contact with the wire when the cover of the plug is drawn down by means of the retaining screw. Finally, the price is only 9d., and it marks one of the most interesting developments in electrical equipment that we have seen for some time.



The new Clix wall plug.

PETO SCOTT GUARDIAN Q.P.-P. KIT

IN our issue dated April 1st, on page 88, we reported on the Pilot Guardian Kit, and it was stated that a chart of this receiver was available for 1s. We should like to correct this statement, as we are informed that Messrs. Peto Scott will supply this chart, together with full-size blue print and details concerning this wonderful kit, gratis. A postcard is all that is necessary, and this should be sent to 77, City Road, London, E.C.1.

FOTOS "NIPPER" TRANSFORMER

THIS is a particularly neat and cheap transformer, costing only 4s. 6d., and being obtainable in ratios of 3:1 or 5:1. It is of extremely small dimensions; the base being less than 1 1/2 in. wide by about 2 1/2 in. long, and the overall height being 2 in. The performance is quite large compared with its size, and it gives very good results for a component of the cheap type. The overall response is quite good, and the resonant points are not so marked that they detract in any way from its reproduction. The bass is quite clear, and the higher notes are reproduced without screech. We passed up to 10 mA. through the primary without noticing any ill-effects, although naturally this small type of transformer is not intended for such loads. For the builder of a really cheap set, where price is a consideration, this transformer will be found to satisfy all normal requirements, and can thoroughly be recommended for this purpose. We have also received a series of valves made by the same firm, and we shall have more to say about these in a later issue.

SIEMENS BATTERIES FOR Q.P.-P. SETS

IN the various descriptions of the Quiescent and Class B amplification which we have given, we have explained how the current rises on the arrival of a strong signal, and we also gave figures in the case of one of our receivers showing the maximum current taken. It will be appreciated that the maximum current taken will be quite large in the case of a very strong signal, and furthermore, as a current is a fluctuating value all the time the signals are being received, there is a great necessity to use one of the triple capacity, or specially-designed batteries for the purpose. Messrs. Siemens manufacture a very suitable H.T. battery for this purpose in the Power Type, which costs 12s. for the 90-volt size, and 20s. for the 100-volt size. The capacity of this type of battery is more than double that of the standard type, but it costs less than double, and therefore, is a very economical line. For those who intend to use the larger types of pentode or super-power valve on the Class B principle, there is a still larger battery obtainable in the Super Radio battery, which costs 20s. for 45 volts. This will stand up to the very largest of valves and may be depended upon for really hard wear.

BELLING-LEE FUSE-HOLDER

THE illustration shows one of the neat fuse-holders made by the Belling and Lee Company. This is obtainable in two types, a single fuse-holder and a twin fuse-holder. As the names show, one takes a single fuse, which is included in one lead, whilst the other takes one fuse in each lead. The base is of neat moulded bakelite, and inside at either end is a standard wire attachment. This is of the "telephone terminal" type, with a small pillar having a transverse hole, and a screw tapped down into the top of the pillar: The side of the case is drilled with a hole in line with the hole in the side of the pillar. The end of the lead is, therefore, pushed through the pillar from the outside of the case, and the screw tightened down on the wire. In this manner no bare wires are accessible outside the fuse-holder. The lid, as can be seen in the illustration, has two clips at the extreme ends, and two smaller clips are raised from the same piece of metal a little



Belling-Lee fuse-holder, showing how the cartridge fuse is held.

nearer the centre. The latter two clips accommodate the standard Belling-Lee fuse, and the outer clips fit over the metal pillars at the end of the base. Therefore, when the lid is pressed into place the fuse makes connection from one end of the lead to the other, and removal of the lid breaks the connection. It is thus possible to remove the lid to replace a fuse without having to disconnect any leads. The twin fuse-holder inserts a fuse in each lead, and at least one of these holders should form part of the equipment of all mains apparatus. The single holder costs 1s. 6d., complete with 1 amp. fuse, and the twin holder costs 2s. 6d., fitted with twin 1 amp. fuses. The particular fuses which are fitted may be exchanged at the time of purchase for any other value. Readers should note that if the holders are purchased without fuses the above prices are increased by one-third.

Have Your Copies Bound,
See page 200.



Practical Letters

from

Readers.

The Editor does not necessarily agree with opinions expressed by correspondents.

Readers Abroad and Advice Bureau Coupon

SIR,—I am pleased to have your free gift Handy Metal Gauge given with the January 28th issue of your valuable journal, for which I thank you. Your paper furnishes all the necessary information for amateur wireless enthusiasts. May I bring to your notice that the time you allow for free advice bureau coupon is too short for people in India, as the post takes more than fifteen days to reach London? Under the circumstances, I trust you will be in a position to extend the time stipulated, especially to your Indian readers? I am reading every issue of PRACTICAL WIRELESS with great interest, and wish it every success in the future.—P. V. RANGAM (Madras, India).

[The correct extension of time for receiving Advice Bureau coupons from readers residing abroad is always allowed.—Ed.]

A Wonderful Volume

SIR,—Being a regular and satisfied reader of PRACTICAL WIRELESS, allow me to thank you for the Encyclopædia, which is a wonderful volume. It is certainly packed with the good things we amateurs enjoy. More power to PRACTICAL WIRELESS.—E. F. ASHTON (Romford).

A Fine Book

SIR,—Permit me, as a regular reader of PRACTICAL WIRELESS, to thank you for the Wireless Constructor's Encyclopædia. After even a brief examination it is obvious that it is a fine book.—Wishing PRACTICAL WIRELESS every success.—R. SQUIRES (Rotherham).

Of Great Value

SIR,—It is a really splendid book, both with regard to the reading matter and the binding. The book will be of great value to the amateur wireless constructor.—E.B. (Leeds).

A Store House of Information

SIR,—I have been so interested that I have not had time to write before. It is a store house of wireless information, those who have not subscribed do not know what they have missed.—E. W. C. (Birmingham).

The Development of Tuning Coils

SIR,—I am somewhat surprised at Mr. Barton Chapple's reply to my letter re "Coils." May I point out that with regard to his plea that he intended his remarks to be construed as meaning that the new coils are "New," inasmuch as they are only

now "commercially possible" is entirely wrong. Had he read the paragraph in the book to which I referred him he would have discovered that not only is the idea not new, but on the page facing the description of the coils "tuned with a core of finely divided iron," he would have seen the photograph of a "Commercial" receiver (Marconi Co.) employing this idea. As I pointed out, a visit to the Air Port (GED) would have shown one in use.

How about a really good short-waver in the near future. (Not a converted medium-long-wave, please!)—ALBERT L. BEEDLE (Balham, London, S.W.).

A Scottish Reader's Appreciation

SIR,—Many thanks for answering my queries re suitable values of resistances and condensers in connection with my three-valve short-waver, employing a S.G. valve as detector.

I have followed your suggestions and the result is that I now have a really "hot stuff" S.W. receiver. My first turn round the dial brought in W3XAL on 16.87 m.

CUT THIS OUT EACH WEEK.

DO YOU KNOW?

—THAT a temporary small value fixed condenser may be made up by twisting two short lengths of ordinary flex together.

—THAT the readings of a meter may be increased but they cannot be reduced.

—THAT Luxembourg now provides high-power programmes on a wavelength of 1,191 metres.

—THAT Class B amplification renders the design of a portable more efficient.

—THAT portable receivers may now be fitted with moving-coil loud-speakers in view of the above.

—THAT long-distance reception is not so reliable in the longer summer days.

—THAT the cause of the falling off in signal strength is the absorption effect of the sun's rays.

—THAT the new Ferrocart coils should be fitted where they are well away from high-power valves or other sources of heat.

—THAT we may expect great things from a "three-valve set" next autumn.

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. The Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped addressed envelope is enclosed. All correspondence in ended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, Geo. Neufnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

on a moving-coil speaker. I have the set fully decoupled, and even on such a low wavelength there is no hand capacity. Of course, I have my panel backed with tinfoil. I found the set gave best results with the reaction circuit connected to the screening grid. I can vary the current at will by means of a potentiometer, and I have also a 400 ohms potentiometer between L.T.+ and grid leak. This, in conjunction with a variable condenser, gives me perfect reaction control.

When I first put the set together I used two high-class transformers of well-known make. The first one was parallel fed, and when I switched on I got the finest imitation of a motor-cycle race that one could have wished for. I had the cores at right angles and the metal cases were earthed. Well, I replaced the first transformer with an old "Hedgehog," and the set at once behaved like a gentleman. I made no other alteration to the circuit. Perhaps you will find space sometime to explain the reason for this. It has puzzled me.

For a short-waver I could wish nothing better, and on some nights the 49-metre Yankees come in at R7 to 8 on the loud-speaker. Zeesen on 31 metres, and Moscow on 50 metres usually wipe out everything in their immediate vicinity. In fact, I could tune in Zeesen on good phone strength without any aerial at all. In concluding, I would just like to say how much I appreciate PRACTICAL WIRELESS. It is practical in every sense of the word, and although I have made about a score of sets in my time, there's not a week passes but I learn something new from your columns.

I was very much struck with the "Fury Four," but as I expect some startling developments in radio before another winter, I will "wait for it."

Wishing PRACTICAL WIRELESS continued success.—ALEX. HENDRY (Longside, Aberdeenshire).

Exceeds Anything I Expected

SIR,—Please allow me to thank you for the Wireless Constructor's Encyclopædia, just received. It far exceeds anything I expected, and I am more than delighted with it. I am looking forward to some really pleasant hours reading.

It's a pity every amateur constructor cannot possess one. I am very grateful for mine.

Wishing PRACTICAL WIRELESS and its staff every success.—A. HUDSON (Erdington).

Another Reader's Appreciation

SIR,—Allow me to express to you my appreciation of the Wireless Encyclopædia, safely to hand. It has far exceeded my expectations and will, I am sure, be the most useful book of reference I possess.

(Continued in col. 2 overleaf)

HEAYBERD MAINS TRANSFORMER

Exclusively Specified for the
"A.C. TWIN"



Constructed to the designer's specification, the Heayberd Mains Transformer is exclusively specified for the "A.C. Twin"—you can therefore be fully confident that you have the very best transformer for the job. Time and time again the technical experts of "Practical Wireless" and other radio papers, specify Heayberd mains components for their most important receivers—convincing testimony to the sound design and high quality of these sterling components.

Remember—the mains transformer is the heart of an A.C. mains receiver, unless that heart is sound the whole receiver is rendered weak and ailing. Technical experts ensure the efficiency of their sets by specifying Heayberd.

The transformer described below is made by craftsmen from the finest British materials. Windings are adequately protected by special metal end-plates, and the insulation will withstand even tropical conditions. Excellent voltage regulation, with negligible temperature rise.

HEAYBERD "A.C. TWIN" MAINS TRANSFORMER.

SECONDARY OUTPUTS:

350+350v. 60 ma.
2+2v. 2 amps.
2+2v. 2.5 amp.

29/6

Complete

Guaranteed Twelve Months.

If you have any difficulty in obtaining supplies locally please write to us direct.

F. C. HEAYBERD & CO.,
10, Finsbury Street, London, E.C.2.

—POST COUPON TO-DAY—

I enclose 3d. in stamps for 36-paged Handbook and Catalogue of Radio mains equipment. Packed with hints and diagrams.

Mr.

Address

Prac.



PRACTICAL LETTERS

(Continued from previous page.)

May I conclude with the following lines: An excellent "volume" with perfectly "controlled" "output," which no amount of "amplification" can do justice to. It is an "accumulator" of facts which requires no "re-charging." In which you can "switch" over from query to query and run them all to "earth."—A. R. WOTTON (Altringham).

A Useful and Interesting Book

SIR,—Very many thanks indeed for your splendid Encyclopædia just received. It is a very useful and interesting book, which, with your Data Sheets, enable amateur wireless enthusiasts to successfully tackle jobs they could not otherwise do without professional help. Wishing your-

paper every success.—F. J. FREEGARD (Bishop's Stortford).

"More than Satisfied"

SIR,—Just a few lines to say I have received the Encyclopædia quite safe and am more than satisfied with it. Of course I have not been able to fully explore it yet, but from what I have read I find there the same consideration for beginners as given in PRACTICAL WIRELESS which I have taken from No. 1. I have found this journal most helpful in explaining to me a lot of what was to me the mysteries of wireless. Apart from this I think the Encyclopædia, by its external appearance a welcome and pleasing addition to any bookcase or shelf. I will close wishing your publications the success they deserve.—C. SHELLED (West Wittering).

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

ILFORD AND DISTRICT RADIO SOCIETY

On March 23rd a talk and demonstration was given by Mr. R. M. Weston on "Meters and Measuring Instruments." Practical details were given which would enable members to construct their own instruments, and to adapt their meters for other purposes. The acquisition of a good standard instrument to start with was advised.

Mr. Weston had brought a large array of apparatus and meters, and with these before him was able to explain their construction and use, and they included micro-ammeters, a valve voltmeter, and many types of A.C. and D.C. meters, complete with multipliers. A pick-up was measured for output, and the signal from constant frequency records was measured through an amplifier showing stage gain and voltage output. A Dynatron modulated oscillator was demonstrated, also. On March 30th a sale of apparatus was held.—Hon. Sec., C. E. LARGEN, 16, Clements Road, Ilford.

THE SOUTHALL RADIO SOCIETY

The winter session of this society closed with the Annual General Meeting. The session has been one of the most successful in the life of the society, and the retiring officers expressed their appreciation of the interest shown in the society's winter activities. During the summer it is proposed to arrange social events and visits to places of technical interest. Intending members are cordially invited to communicate with the Hon. Secs., Mr. G. Lee, 261, Beaconsfield Road, Southall, and Mr. A. J. Stephens, "Buena Vista," Pole Hill Road, Hillingdon.

THE CATFORD AND DISTRICT RADIO AND TELEVISION SOCIETY

At a meeting of this society held recently, Mr. Radford gave an interesting lecture on the "Acoustic Side of Radio Reproduction." This difficult subject was very simply explained and illustrated by means of lantern slides. Many problems which hitherto puzzled the wireless enthusiast were admirably explained. Various studios at Broadcasting House were put on the screen and their points of interest explained, also a studio at Budapest was shown. The discussion that followed all went to prove that the members had been following the subject with close interest.—Hon. Secretary, Mr. H. W. Floyd, 38, Como Road, Forest Hill, S.E.23.

MERSEYSIDE AMATEUR TRANSMITTERS' SOCIETY

This society have now acquired premises in a central position in Liverpool which are being prepared as a club-room in which a transmitter and receivers will be installed, and also a workbench for the use of members. Further particulars of the society can be obtained from the Hon. Sec., J. DAVIES, 13, Exeter Road, Wallasey.

THE CROYDON RADIO SOCIETY

Mr. H. Bevan-Swift, President of the Radio Society of Great Britain, presided over a recent meeting, the occasion being a lecture-demonstration entitled "The Output Stage," by Mr. F. Youle. He discussed, firstly, harmonic distortion, and explained very clearly why second harmonic distortion came in the triode valve and the third in pentodes. Measuring the permissible distortion was also very fascinating, it being seen how its percentage was derived, using load lines and a valve's characteristic curves. He said much about

quiescent push-pull, ordinary push-pull, and Class B amplification. Finally the lecturer's special amplifier was demonstrated, using quiescent push-pull.—Hon. Sec., E. L. CUMBERS, Maycourt, Campden Road, Croydon.

BLACKPOOL AND FYLDE RADIO SOCIETY

The inaugural meeting of this society was held at the Café Suisse, Queen's Square, Blackpool, on Friday, March 24th, at 8 p.m., and eighteen prospective members were present. Mr. Gray taking the chair. The offices of President and Treasurer were left in abeyance until a more representative meeting could be held, but Mr. Howard was elected Secretary and a committee consisting of five members, together with the Secretary, was formed. Subscriptions were fixed at 10s. 8d. per annum for senior members (that is, over eighteen years of age) and 5s. per annum for junior members. An interesting programme is being compiled by the committee and will be published in due course, and the society will welcome any new members who may be interested. All communications should be addressed to Mr. Howard, 43, Cumberland Avenue, Blackpool.

SLADE RADIO

A recent meeting of the above society was devoted to "How you can win the D.F. (Direction Finding) Cup." Mr. G. T. Peck gave some very interesting details covering the procedure to be adopted from the commencement to the finish of a test. These were based on his own experiences in past tests, and as he has been successful on several occasions some very useful information was given. Details of the types of sets which can be used were given, and also a number of questions were dealt with. Anyone who is interested in D.F. work is invited to write to the Hon. Sec., who will be pleased to give details of the society's activities in this particular branch. Address: 110, Hillaries Road, Gravelly Hill, Birmingham.

SUGGESTED RADIO CLUB FOR SOUTHPORT AND BIRKDALE (LANCS)

All amateurs residing in these districts who are interested in radio, television or gramophones are invited to communicate with C. H. TURNER, 62, Zetland Street, Southport, sending stamped envelope for reply concerning the first meeting, which will be arranged as soon as enough members can be got together.

WIRELESS TERMS TRAVESTIED—6.



Resistance Feed.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO



If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to The Editor, PRACTICAL WIRELESS, Geo. Neumes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

QUERIES and ENQUIRIES by Our technical Staff

The coupon on this page must be attached to every query.

SPECIAL NOTE

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
 - (2) Suggest alterations or modifications of receivers described in our contemporaries.
 - (3) Suggest alterations or modifications to commercial receivers.
 - (4) Answer queries over the telephone.
- Please note also, that all sketches and drawings which are sent to us, should bear the name and address of the sender.

DIODE AND REACTION

"I have recently been trying out the diode method of detection, and whilst I heartily endorse all claims made for its purity, I find there is a sad loss of volume. The diode is preceded by a variable- μ valve, and followed by a pentode, but the distant stations are now lost to me. Is there any way of boosting the strength of this form of detector so that I can get a few foreigners? I do not want to add another L.F. stage if I can help it, as I am using a mains unit and it is already fully loaded."—(W. D., Edgware.)

We presume that you are using the valve which originally served as the detector for your diode, and this may be used to provide signals quite as loud as previously. The grid of the valve should be used for the diode, and the anode ignored. We do not know whether this is the arrangement you are using, or whether you have bonded the grid and anode or are using the anode alone. However, use the grid as above-mentioned, and then connect the anode to the reaction condenser (which we presume you previously used). A further H.F. choke will, of course, be required to connect the anode to the H.T. supply, but the reaction will act as with an ordinary valve and will give you the advantage of distant reception. The quality does not appear to suffer from this method of using a diode.

CLASS B.

"My receiver is a bit ancient, but has stood the test of time. It employs a neutrodyne H.F. stage, anode bend detector, and three resistance-capacity stages. Would you think the addition of a Class B-stage in the last socket would be an improvement? I get very pure signals, but not much punch, and I think the Class B arrangement would be worth while, but I should like your advice first."—(U. C. B., York.)

It is not very easy to give you a reply to this question, U. C. B. Presumably, from the circuit arrangement, you have gone all out for quality, irrespective of high stage gain. Therefore, the input to your third L.F. stage is quite small. Class B requires a fairly strong signal to be passed through the primary of the driver transformer, and it is probable that even now, after all your R.C. stages, the output valve does not handle a sufficiently large signal. We think, therefore, that probably the best arrangement would be to scrap the two last L.F. stages, fit a really high-class L.F. transformer with high ratio between the detector and the first L.F. valve, and to follow this by the Class B stage driver. This would give you the punch, and would not give bad quality. In view of the three stages you are now using, however, we would hesitate to recommend you to add the Class B and driver after the present set, as there would be a great risk of L.F. instability.

AERIAL INSULATION

"I have just moved from a flat into a house, and have now for the first time got the chance of building an outdoor aerial. I am not clear as to the best arrangement of the insulators for an outdoor aerial, and I notice from a catalogue that there two types of china

insulator, one like a reel and the other called the 'egg.' Which is the best, and would I want more than one at each end? They seem to be rather small to me."—(A. L., Weston-super-Mare.)

The principal consideration in arranging aerial insulation is to provide a long leakage path. Therefore, you may use either of the types of insulator you mention, but more than one is required. The best arrangement is to obtain a dozen insulators, and to wire them in two chains of six. The wire which you use for the aerial may be used to join them together, and the space between each insulator should be about 3 or 4 in. Pass the joining wires through opposite holes so that there is no metallic connection from one insulator in the chain to the next. Then fit one chain to the aerial pole and the other to the chimney or house end of the aerial, and suspend the aerial between the two chains. The aerial should be lowered periodically and the entire chain thoroughly washed in warm soda water and brushed with a wire brush to remove the sooty deposit which coats it.

TRIPLE RANGE COIL

"I like making my own coils, and have used for some time now a very efficient dual range coil. I also have a spare set which is wound for short waves, and I like to listen on the 10 metre band now and then.

DATA SHEET No. 31

Cut this out each week and paste it in a Notebook

UNITS AND THEIR EQUIVALENTS

One foot-pound	.. 1lb. raised 1ft. high
One B.Th. Unit	.. 778.8ft. lb.
	.. 1,005 joules.
One H.P. hour	.. 0.746 kw. hour
	.. 2,645 B.T.U.'s.
	.. 1,000 Watt hours.
	.. 1.34 H.P. hours.
One kw hour	.. 3,412 B.T.U.'s.
	.. 2,654,200ft. lbs.
	.. 3,600,000 joules.
	.. 746 watts.
	.. 3,412 B.T.U.'s.
	.. 39,000ft. lb. per minute.
One H.P. 550ft. lb. per second.
	.. 2,645 B.T.U.'s per hour.
	.. 42.4 B.T.U.'s per minute.
	.. 0.707 B.T.U.'s per second

Could I wind a coil to take me over the whole range and so save myself the trouble of d'sconnecting one set when I wish to change the range? I should like winding data, if this is possible, and to receive your valued advice."—(A. I., Wood Green.)

It is quite possible to make up a coil of the type you mention, but it is not very efficient. As you have probably found, the short waves require very careful treatment, and the use of a three-range coil means that the medium and long-wave coils have got to be short-circuited when listening on the short waves. This may introduce losses which will prevent the maximum efficiency being obtained. A much better arrangement is to build a complete short-wave detector stage in one part of your cabinet, and to arrange a switch in the anode circuit of the valve. This should connect to the L.F. coupling arrangement so that the short-wave detector or the ordinary detector could be coupled to the L.F. stages. A separate filament switch would also be advisable to switch out the unused valve.

SCREENING A LEAD

"I am afraid I am getting hum from the pick-up leads in my set and should like to try the effect of screening them. As I am not sure that it is this which is causing

the trouble I do not want to buy screened leads until I have found out the actual fault. I think I could carry out screening by winding some copper wire round and round the rubber covering of the pick-up leads and connecting this to earth. Is this so?"—(W. J., Crystal Palace.)

You could screen the wire by this means, but there is one serious snag. If you wind the wire round and round (and use ordinary covered wire for the purpose) you will have an inductive covering over the wire and this may give rise to even worse troubles. You could overcome this by using bare wire and winding it so that each adjacent turn touched and so short-circuited the inductance, but it would tend to open and when the lead was bent the turns would not be in contact and this would lead also to trouble. It does not cost much for the screened cable and it is a much more satisfactory arrangement. You can get three feet of cable, with all clips and earthing tags for 1s., and this is therefore the better course to adopt.

WOODEN PANEL

"I have just finished my radio-gram, and I want to fit the set into it. I have fretted out a neat vignette in the front of the cabinet, but as this is of walnut I do not like the look of a sheet of ebonite inside it. Could I mount the panel controls on a piece of the walnut so as to match the cabinet, or is there any reason why wood is not good enough for the purpose?"—(B. H., Highbury, N.)

A great deal depends upon what controls are mounted on the panel. If only components which are connected to earth, or which have an ebonite fitting are attached to the panel, then wood may certainly be employed. In some parts of the circuit it is still possible to use wood, provided it is quite dry and that metallic bodies in contact with the wood are separated by a good space and are in parts of the circuit where there is little risk of inter-action. You will, therefore, have to study your circuit and note what controls are mounted close together. An alternative, of course, is to use a very thin ebonite panel and mount the components on that, with a facing of walnut veneer with clearance holes cut in it.

AUTOMATIC GRID BIAS

"I have read all your articles on grid bias and I am now going to build up a set employing this method of biasing. Which method, however, do you recommend me to adopt? There are several methods, apparently, and I am not sure which is best."—(P. R. V., Manchester.)

This is a question which it is not possible to answer. First of all, you do not state what circuit arrangement you are proposing to use. Secondly, you do not say whether battery-operated or mains valves are in use. As you know, the bias resistance may be inserted in the cathode lead of an I-H valve, or in the common negative lead. You must, therefore, study the articles again and adopt the method which best suits your circuit arrangement.

D.C. MAINS SETS

"I have built a circuit shown in your book, and am using it with a home-made D.C. mains unit. When I switched it on at first it sounded all nice and clear, but when I went to adjust the loud-speaker after a few minutes I found it was almost red-hot. I switched off and examined the output choke arrangement, and this appeared to be O.K., but after switching on again the same thing happens. What can be the reason of this? The unit is a good one and the circuit seems all right."—(W. G., Kentish Town.)

As you have made up an ordinary circuit and connected it to an ordinary D.C. mains unit, you have probably overlooked one point. The receiver should not be joined direct to earth. It should be earthed via a large fixed condenser, say 2 mfd. It is also advisable to fit a 2 mfd. fixed condenser on each side of the loud-speaker if this is fed from an ordinary output choke arrangement. These remarks only apply, of course, to D.C. mains receivers.

FREE ADVICE BUREAU COUPON

This coupon is available until April 29th, 1933, and must be attached to all letters containing queries. PRACTICAL WIRELESS 22-4-33.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed. No other correspondence whatsoever should be enclosed with applications for catalogues.

THE COSSOR MP/PEN

WE have received a leaflet giving full particulars and curve diagrams of the new Cossor A.C. mains pentode valve which has several advantages over an output valve of the triode type, including improved bass response, higher power sensitivity and larger output. The valve is designed for a heater voltage of 4 at 1 amp. and a maximum anode voltage of 250. A copy of the leaflet can be obtained from A. C. Cossor, Ltd., Highbury Grove, London, N.5.

BRYCE POWER PACK

IN a leaflet issued by W. Andrew Bryce and Co., details are given of this useful unit for converting a battery set to all-mains working and supplying the field current for a moving-coil speaker. The pack consists of a mains transformer, L.F. smoothing choke, valve holder, fixed condensers, and sheet steel chassis, complete with sockets clearly marked with input and output voltages. Two models are obtainable, one giving a smoothed H.T. output of 350 v. 80 mA. and L.T.-A.C. 4 v. 3 amps, the other giving 500 v. H.T. at 120 mA. and L.T.-A.C. of 4 v. 2-3 amps. The address is Woodfield Works, Bury, Lancs.

MAGNACORE COMPONENTS

FULL particulars of a Quiescent Push-Pull Transformer and a Q.P.P. Output Choke, are given in a folder we have just received from Magnacore, Ltd., 57, James Street, London, N.W.1. The transformer has a ratio of 8.5 to 1, with a D.C. primary resistance of 950 ohms, each half of secondary having a resistance of 525 ohms. The choke, which has a total primary D.C. resistance of 840 ohms, can be obtained with a ratio of either 1 to 1, 1.8 to 1, or 2.9 to 1, for matching, to any ordinary type of speaker. Both components are priced at 7s. 6d., with an additional 1s. 6d. royalty on the transformer.

GRAHAM FARISH COMPONENTS

A COMPLETE range of the latest components made by Graham Farish, Ltd., is given in a booklet issued recently by this firm. A new potentiometer volume control, the "Megite," has an element of fine nickel-chrome wire embedded in bakelite. The action is through a slipper plate, giving a smooth, silent operation. Among the other components listed are a new H.F. choke, grid leaks, "Ohmite" resistances fixed and variable condensers, valve holders and "Filt," the new percolative earth. The address is Masons Hill, Bromley, Kent.

FERRANTI POWER UNITS

THE construction of mains units calls for a certain amount of technical knowledge and experience. Messrs. Ferranti, of Hollinwood, Lancs, have specialised in such apparatus for years, and have prepared an interesting and useful folder, No. Wa. 522. This contains constructional details for several different types of mains units, with theoretical diagram, wiring diagram, chart of D.C. output, list of components, and valuable technical details. In addition there is a chart showing at a glance the value of resistance required to drop practically any voltage at any current. Copies of this folder may be obtained by readers by sending threepence in stamps to Messrs. Ferranti at the address given above.

Replies to Broadcast Queries.

DIGGER (Leicester): Ship telephony on about 200 m. M. SYMANS (W.12): (1) Norddeich (Germany) calling S.S. Cap Ancona; (2) regret, cannot trace; (3) possibly W2XA, New York, on 48.9 m.; (4) DJA; Zeesen, on 31.381 m. F. G. CHARITON (Southgate), (1) GSA, Empire Broadcaster on 49.586 m.; (2) DJC, Königs Wusterhausen, on 49.83 m. Two VALVE (Jedburgh): G6YJ is the call sign of Mr. F. R. Canning, "Crindan," Newport (Mon); he would like your report on his transmission. Pop (Birmingham); (1) W2PP is the call sign of W. F. Scott, 207 N. 11 St., Newark (N.J.); (2) G51S; call sign of P. Johnson, 49, Carson Road, Dulwich, S.E.21; (3) cannot trace; (4) this would be the call sign of a coastal station, but we cannot trace it in lists.

MORE ABOUT INTERFERENCE

(Continued from page 182.)

rings is usually the cause. Sparkless commutation is the first thing to be aimed at by careful bedding of the brushes, and condensers should be connected in series across the brushes, with their centre point earthed, Fig. 6. In obstinate cases a heavy duty choke, capable of carrying the full current of the machine, should also be connected in each of the mains leads, together with condensers, in the manner shown in Fig. 7.

Interference from overhead conductors of trams and trolley buses is now being dealt with by some municipal authorities, and although at present it has not been found possible to completely eliminate the trouble, a great reduction of the annoyance has been brought about by the fitting of protective devices on each vehicle.

Earth Leakage Currents

All the sources of interference already enumerated, with the possible exception of earth leakage currents, may be quietened down without much difficulty, if suitably dealt with, each case requiring its own particular treatment, and in cases where the interference has been reduced, but not completely removed by this treatment, altering the direction of the aerial so that it is at right angles to the direction from which the interference is coming will usually have the desired effect.

THE MOTOR-CYCLISTS' REFERENCE YEAR BOOK, 1932-1933.

The Motor-Cyclists' Encyclopaedia.

Edited by F. J. CAMM (Editor of "Practical Wireless").

The Only Year Book relating to Motor-Cycles (Fourth Year of Issue).

Complete and comprehensive information relating to Machines, details, facts, and figures regarding records, legal matters, overhauling. Classified Buyers' Guide, etc. etc.

128 pages, 1/- net or 1/2 by post from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

Earth leakage currents present a more difficult problem. They may cover a wide area, and although regulations are laid down for their control, these are not always effective from the wireless user's point of view. Where this type of interference is experienced, the most effectual remedy is the use of a counterpoise in place of the usual earth. This, however, is not always to be recommended, as in the case of mains operated receivers the use of a counterpoise may introduce hum, which may possibly be as unpleasant as the interference which it is desired to cure.

The B.B.C., in collaboration with the Post Office engineers, has carried out a great deal of research, and has done much valuable work in the investigation of problems connected with interference to wireless reception, and over 10,000 cases of complaints from listeners are being dealt with annually.

Where reception is suffering due to the influence of outside electrical disturbances, the origin of the trouble should be located if possible and the owner of the offending apparatus approached with a view to its cure. If difficulties arise, the complainants may with confidence look to the B.B.C. and the P.O. engineers for assistance.

No actual or legal responsibility for correcting the trouble rests with the owner of the apparatus, however, and whether he takes any steps in the matter is entirely a question of good will. The onus of responsibility in the future should really fall upon manufacturers of electrical equipment which is likely to cause interference, and the introduction of legislation to this effect is desirable. A decree on these lines has already been passed and is being enforced by the Belgian Government.



THE EARTH THAT GROWS A ROOT

● FOR SENSITIVITY. ● AND SILENT BACKGROUND. PRICE OF ALL DEALERS 2/-

Famous Maker's Offer? £5 Radio-Gram CABINET for 65/- SEVEN DAYS' FREE TRIAL (OR 10/- MONTHLY)



Polished Oak! and Piano built! The acoustic tone brings a fine thrill. Makers to Radio-Press, B.B.C., 3,000 clientele.

MODELS FROM 35/- to £15 Photographs and List FREE. Piano-Tone Cabinets, (P.B.), Albion Road, Bexleyheath.

FOR DE-LUXE RADIO-GRAMS PICKETTS CABINETS

Recommended for Best Results!

ADVERTISEMENT INDEX

Block Batteries, Ltd.	Page 189
British Pix Co., Ltd.	207
Bulgin, A. F. & Co.,	204
Busby & Co.	207
Columbia Graphophone Co., Ltd.	Back Cover.
Cossor, A. C. Ltd.	185
Crafts, Ltd.	Inside Back Cover.
Dubilier Condenser Co., Ltd.	203
Edison Swan Electric Co., Ltd.	173
Filtron!	212
Grampian Reproducers, Ltd.	199
Heyberd, F. C. & Co.	Front Strip and 210
High Vacuum Valve Co.	204
Igranic Electric Co., Ltd.	173

Jackson Bros.; Ltd.	Page 199
Lissen, Ltd.	174
London Electric Wire Co.; & Smiths, Ltd.	Inside Front Cover.
London Radio Supply Co.	204
Mains Power Radio	207
Mason, E. C.	207
Newnes "Modern Motor Repair."	Inside Back Cover.
Newnes "Home Movies"	Inside Back Cover.
Newnes "Practical Wireless" Binder	200
Peto Scott, Ltd.	197

Picketts	Page 212
Pioneer Radio	206
Radio Resistor, Ltd.	206
Riverside Mfg. Co.,	206
Smith's Cabinets, Ltd.	Inside Front Cover
The 362 Radio Valve Co., Ltd.	Inside Front Cover and Inside Back Cover.
Turnadge & Partners, Ltd.	206
Varley, Ltd.	189
Wilkins & Wright, Ltd.	Inside Front Cover.
Williams, T.	207
Wright & Weaire, Ltd.	201

The Gentle Art of Cine Faking!

AN interesting feature of the April issue of *Home Movies* is a section dealing with "HOW IT'S DONE!" in film production, which includes some remarkable "Behind-the-Scenes" shots of the wonderful film *Cavalcade*, and striking pictures from a British Production.

Other features include:

CINE FILMS FROM MOVING VEHICLES
ADRIAN BRUNEL ON TITLING
SOUND ON FILM EXPLAINED
NEW PRIZE COMPETITIONS
AMONG THE AMATEUR SOCIETIES

HOME MOVIES

and HOME TALKIES

SIXPENCE

Obtainable at all Newsagents, Bookstalls, and Dealers, or post free, 7d. (Subscription rates: Inland and Abroad 7s. 6d. per annum. Canada 7s. per annum) from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

BUY A COPY TO-DAY!

Geo. Newnes, Ltd.

A Remarkable New Work

WILL SAVE YOUR TIME AND YOUR MONEY

If you are interested in cars there can be no question that you will find this work wonderful value for money. It shows the best and quickest methods of overhauling, dismantling, and repairing the most popular types of cars now on the road. The articles are written by experienced men in the industry, and they are illustrated by hundreds of photographs showing actual methods of working.

You will be specially interested in the clear explanation of the new Daimler Fluid Flywheel which is given in Part 2. The operation of this wonderful invention is explained in a manner that all can understand. **GET A COPY FROM YOUR NEWSAGENT TO-DAY.**

DEALING WITH

The Overhaul and Repair of—

AUSTIN M.G.
MORRIS HILLMAN
ROVER B.S.A.
RILEY FORD
TRIUMPH JOWETT
STANDARD SINGER
WOLSELEY

**PART 1
NOW ON
SALE** **PART 2
ON SALE
APR. 21ST**

MODERN MOTOR REPAIR 1!

Obtainable from all Newsagents and Bookstalls, or Post Post 1s. 3d., from **GEORGE NEWNES, LTD.**, 8-11, Southampton Street, Strand, London, W.C.2.

Geo. Newnes, Ltd.

AERIALS

NO LONGER NECESSARY



Amazing new radio instrument eliminates indoor and outdoor aerials. No alterations to Set—just plug in to Aerial and Earth Socket. Fixed in a moment. No sticky tape. Increases selectivity and range. Reduces mains hum and static and obviates all lightning risk.

Your dealer stocks the VEGA Aerial Eliminator, or send direct to—

CRAFTS (Pr.W.), LTD.,
7, DUKE STREET, ADELPHI,
LONDON, W.C.2.

Telephone: Temple Bar 1693

VEGA

AERIAL ELIMINATOR

Satisfaction Guaranteed... Or money returned

Buckingham

WHY PAY EXORBITANT PRICES FOR VALVES?



Direct from the Actual Makers
POST FREE

SEND DIRECT TO THE MAKERS FOR

BRITISH 362 VALVES

Compare the prices of British 362 Valves. They are FULLY GUARANTEED to have as high, or higher, characteristics as any valve (British or foreign), equal to any, better than most. Non-microphonic. Buying direct by post from the makers SAVES YOU 50%. Post your order to-day. Immediate delivery of all types

THE "CLASS B" 9/-

For further details see our advt. on inside front cover.

R.C. H.P. L.F. & DETEC.

POWER

SUPER POWER

SCREENED-GRID or VAR-MU.

PENTODE TYPE

3/6

4/6

4/6

7/6

10/6

All Post Free. In 2v., 4v., or 6v. Metallised 3d. extra.

If valves of a certain make have been specified for your Set, send the name and type with your order and we will send you 362 Valves of similar characteristics. Cash with order. Cheques and P.O.'s must be crossed and made payable to:—

The 362 RADIO VALVE Co., Ltd. (Dept. W. 6), 415, Mare St., Hackney, London, E.8.

A Six-valve a Portable
and a **SUPERHET**



Buying radio to-day calls for extreme caution. Broadcasting conditions are changing but you certainly cannot afford to change your set from time to time. *Better be sure!* This six-valve portable battery superhet in polished walnut is definitely the set of the future. It will keep ahead of every possible broadcasting development for years yet. Test it at home—in every room—you'll be delighted!

17 gns. cash or delivered on first payment of **£1. 16s.**

TWICE as many stations!

Running costs **HALVED!**

No aerial—no outside wires!

Columbia

Use the
COLUMBIA DEALER SERVICE

Expert advice on local radio conditions
and service after sales.



CUT OUT AND POST TO-DAY!

Please send me fullest particulars of Columbia Model 380 and other Columbia instruments from £4 7. 6 to 90 gns.

NAME.....

ADDRESS.....

Prac. W 22/4/33

(write in block capitals). Columbia, 98, Clerkenwell Rd., E.C.1

P. W. Gift Stamp No. 30

Printed by NEWNES & PEARSON PRINTING CO., LTD., Exmoor Street, Ladbroke Grove, W.10, and published by GEORGE NEWNES, LTD., 8-11, Southampton Street, Strand, W.C.2. Sole Agents for Australia and New Zealand: GORDON & GOTCH LTD. South Africa: CENTRAL NEWS AGENCY, LTD. *Practical Wireless* can be sent to any part of the world, post free, for 17/4 per annum; six months, 8/8. Registered at the General Post Office for Transmission by Canadian Magazine Post.

FREE BLUE PRINT OF NEW LIGHTWEIGHT PORTABLE—NEXT WEEK!

Practical Wireless

3^D 1

Published every Wednesday by
**GEORGE
NEWNES
LTD.**

Vol. 2.—No. 32.
APRIL 29th, 1933.

Registered at the G.P.O. as a Newspaper

Solving the Portable Problem



All the new receivers will incorporate 'Class B' Output
Convert your set NOW with

DIRECT RADIO 'CLASS B' CONVERSION KIT

Send for free details and prices. A 6d. Postal Order will bring you new summer list of extra special radio bargains.
DIRECT RADIO LTD., 159, BOROUGH HIGH STREET, LONDON BRIDGE, S.E.2. 'Phone: Hop 3,000. 'Grams: Dirrad Sedist, London.
[ADVT.]

The First Completely Safe - Completely Practical - ALL-ELECTRIC RECEIVER for the Home Constructor!



**KIT COMPLETE
WITH
4 VALVES
£7.19.6**

The

LISSEN ALL-ELECTRIC "SKYSCRAPER" A.C. SAFETY

Here is the All-Electric "Skyscraper."
So phenomenal has been the success of the Battery "Skyscraper"—so universal the delight expressed by its builders in its simplicity, in its great power, in its wonderful ease of operation, that Lissen could not bear to give this famous name to an All-Electric set UNTIL ABSOLUTE SAFETY—the one feature for which the home constructor has previously looked in vain in any Mains-driven set—had been achieved by the Lissen designers. IT TOOK MONTHS, BUT HERE IT IS. There are two chief safety features in this set. First, the Lissen "Skyscraper" Power Unit . . . so completely enclosed and protected in sheet metal, so rigorously designed within for safety as well as electrical efficiency, so simplified, that YOU USE IT JUST LIKE A BATTERY. Actually you connect up the terminals of this "Skyscraper" Power Unit exactly as though they were the battery terminals of a battery set. Second, THE SAFETY FUSE PLUG. You simply plug in to the mains from which you are going to draw your power, and instantly the set is completely protected. For in each lead from the mains inserted ingeniously into the plugs is a tiny fuse, which adequately protects the receiver from harmful effects of excess current. Thus, when you have built the All-Electric "Skyscraper" you and your set are perfectly protected.

HOME CONSTRUCTORS MAINS SET WITH ALL THE FEATURES OF LUXURY COMMERCIAL RECEIVERS
Four matched valves—Variable Mu Screened Grid H.F. stage—Power Pentode Output Stage—Mains Aerial—One dial tuning—One dial Volume and Reaction Control—all metal surface—Moving Coil Speaker—Safety Power Unit—Universal Safety Mains Fuse Plug—and a beautiful walnut cabinet which you can build yourself.

**MOST COMPLETE & DETAILED
CHART EVER PUBLISHED**

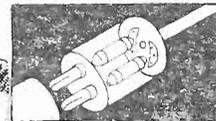
Send for this coloured new constructional chart—every detail is explained—every single stage of construction is shown by coloured photographs. Post the coupon below and see for yourself how easy it is to build this wonderful new All-Mains receiver.

COMPLETE WITH TABLE MODEL CABINET

COMPLETE WITH CONSOLETYPE CABINET AND MOVING COIL LOUDSPEAKER

£8.15.0 £10.12.6

UNIQUE SAFETY FUSE PLUG



No harmfully powerful current can possibly flow from your mains to your A.C. Skyscraper. The special safety fuse ring completely protects you by introducing a small valve fuse into each lead.



FOUR MATCHED POWER VALVES

The four valves of the A.C. Safety Skyscraper are matched to each other and to the rest of the special circuits to give the utmost power, utmost range, utmost fidelity of reproduction.

LISSEN

SKYSCRAPER SAFETY

POST THIS COUPON

To LISSEN LTD., Publicity Dept., Isleworth,
Please send me FREE copy of the Chart of "All-Electric Safety A.C. Skyscraper."
Name
Address
FRACT. A.C.S.



ROUND *the* WORLD of WIRELESS

Fighting for the Long Waves

It would appear that seven European countries to whom wavelengths in the medium band were originally allotted have now put forward claims to broadcast on channels above 1,000 metres. As, at present, the upper band can only accommodate eleven transmitters on wavelengths already allocated to some of the older established transmitters, it is very doubtful whether, and how, the Lucerne Conference will see its way to satisfy all applicants.

More Russian Stations

If news from Finland is to be believed, when Moscow has launched its 500-kilowatt broadcaster on the air the Soviet authorities will begin the construction of a further twenty high-power transmitters with a view to flooding Europe with official news bulletins. These transmissions will be carried out in various languages. As capital is required for this further development of the Russian broadcasting system, with the exception of members of the Red Army, all owners of wireless apparatus will now be compelled to pay an annual radio tax. It is stated that, in view of the fact that Germany has suppressed all communist organizations, including newspapers, the new super-power Noghinsk transmitter will devote most of its time to propaganda and special bulletins destined to that country.

Radio Vatican Time Table

As we have received a number of queries from readers in respect of the Vatican broadcasts, it may be of interest to detail the transmissions carried out by this Italian station. On 19.84 m. daily a bulletin is issued at 11 a.m. G.M.T. for missionaries throughout the world. It is given out in various languages, namely, Italian (Monday and Friday); English (Tuesday); Spanish (Wednesday); French (Thursday); and German (Saturday). Every evening Papal *communiqués* are broadcast in Italian at 8.0 p.m. G.M.T. on 50.26 m. On Sundays, between 11.00 and 11.30 a.m. on 50.26 m. prayers are transmitted in Latin and French, followed by an Italian sermon. They are destined to the sick and chronic invalids who cannot attend Mass. This transmission occasionally closes down with a short programme of Sacred Music.

Jugoslavia Wants More Stations

DURING the course of the present year the Belgrade station is to be endowed with a 40-kilowatt transmitter, and the older plant will be transferred to Subotica, as a relay. Another 8-kilowatt station is to be erected at Skolpje. Zagreb also will transfer its existing transmitter to Spilt (Spalato) and will replace it by a broadcaster capable of radiating some 20 kilo-

WVBC broadcasting on a frequency of 960 kc/s (312.3 m.) and also on 6,120 kc/s (49.02 m.). We are located in Caracas, Venezuela, and welcome reports from foreign listeners, which are acknowledged. The acknowledgment consists of a profusely illustrated booklet in Spanish and English with descriptions of the Venezuelan capital and the transmitting station, all complete with maps.

NEXT WEEK :

**FREE BLUEPRINT
(FULL-SIZE)
OF
F. J. CAMM'S NEW
FEATHERWEIGHT
PORTABLE
(CLASS B) FOUR.**

**AN ENTIRELY NEW
RECEIVER WITH MANY
NOVEL CONSTRUCTIONAL
FEATURES.**

And Another Star Short-waver

W²XE, the Columbia Broadcasting System's new transmitter at Wayne, N.J., is now working at increased power. It is on the air daily alternately on three separate frequencies; namely, from 4.0 p.m.-6.0 p.m. G.M.T. on 15,270 kc/s (19.646 m.); from 8.0-10.0 p.m. on 11,830 kc/s (25.36 m.) and from 11.0 p.m.-4.0 a.m. G.M.T. on 6,120 kc/s (49.02 m.). The transmissions carried out on 19.646 m. (15,270 kc/s) are made with an aerial specially directional to Great Britain in order to assist in the reception of the broadcasts. They are very well heard towards 5.0 p.m.

Wireless for New Air Services

ALL the aircraft for the new air services operated by Hillmans Airways from their aerodrome at Romford are to be fitted with Marconi equipment, which will enable the pilots to keep in touch with aerodrome stations throughout their flights.

Experience has shown that air-and-ground wireless services of this kind are practically essential to the safe and regular operation of modern air routes, which are expected to operate to schedule under conditions when even land and sea transport services are sometimes severely dislocated. Wireless assists the pilot by keeping him informed of changing wind and weather conditions all along his route, the state of aerodromes, and other vital matters, while with the type of Marconi equipment installed in the Hillman aircraft the pilot himself can also "ring-up" the nearest air port and ask for any information he may require.

watts. With this development of the system Jugoslavia will control a network of five stations.

Tune in to Caracas

If you care to search the 49-metre band towards 3.0 a.m. G.M.T., you should have no difficulty in picking up WVBC, Caracas, on 49.02 metres. During intervals between somewhat oldish numbers of gramophone records you will hear an English announcement: *This is the station*

"PRACTICAL WIRELESS" DATA SHEETS

Data Sheet No. 19, given with this issue, completes the first series. A second series is in course of preparation, and an announcement concerning them will be made in an early issue.—ED.

"Bulgin" is Now a Registered Trade-Mark

A. F. BULGIN & CO., LTD., have recently been notified by the Registrar of Trade-Marks that their name "Bulgin"

ROUND *the* WORLD of WIRELESS (Continued)

is now registered as a trade-mark. It is on very rare occasions that a surname is granted this privilege.

In order to substantiate the claim that the name "Bulgin" was alone in the Radio Industry, and so justify the registration, it was necessary for the firm to obtain some hundreds of affidavits from wholesalers, dealers and heads of trade organizations, and from all the leading radio trade journals, wherein they stated that the name "Bulgin" had been used for the past nine years, and that the name had never been used by anybody else connected with the industry.

Wireless at the Ideal Home Exhibition

AN interesting and unusual feature of this year's Ideal Home Exhibition at Olympia (which closes on April 29) is the special display entitled "Rooms of the Scientists."

This section of the Exhibition provides a glimpse of the studies and laboratories of some outstanding figures in scientific research and discovery, from Archimedes to Marchese Marconi.

Among such names as Newton, Lister and Darwin, the progress of electricity is represented by Faraday and Marchese Marconi.

Faraday's Laboratory

A CORNER of Faraday's laboratory at the Royal Institution has been copied with remarkable fidelity, while the reproduction of part of the wireless room in Marchese Marconi's famous steam-yacht *Elettra*—his floating laboratory—represents the most modern application of Faraday's basic discoveries.

The "Elettra"

THE *Elettra* cabin has been furnished with a Marconi short-wave transmitter, Type SWB4, of the class used by Marchese Marconi for his early experiments in long-distance ship-and-shore wireless telephony, and also in March, 1930, for the transmission of the special signal from the S.Y. *Elettra*, lying off Genoa, which lit the lamps of an exhibition at Sydney, New South Wales. An example of the new Marconi micro-wave apparatus is also in the cabin. Other apparatus represents the newest developments in marine wireless equipment, such as the Marconi Type DFM4 direction finder and radiogoniometer, which operates with a small fixed loop aerial, a marine receiver, Type 394, which has a wave-range of 100-2,000 metres and is designed particularly for loud-speaker reception of telegraph or telephone signals, and a telegraph transmitter of the emergency type.

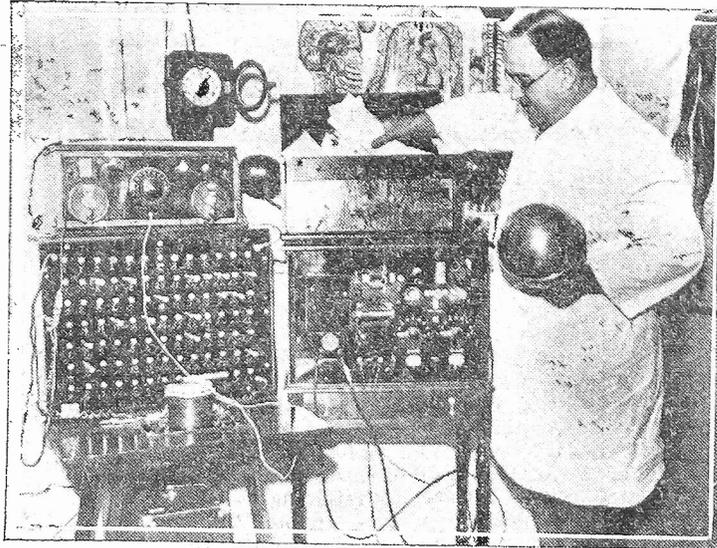
Sponsored Concerts from Athlone

ARRANGEMENTS have now been completed to broadcast sponsored concerts from the Athlone (I.F.S.) high-power station on 413 m. every evening between 9.45 and 10.45 p.m., B.S.T. The Irish

INTERESTING and TOPICAL PARAGRAPHS

Free State Army Band will be one of the regular features of these special entertainments.

THE RADIO DOCTOR!



An American doctor has devoted his efforts to developing electro-therapeutic broadcasting devices by means of which he could cure body infections by remote control machines. He is seen in picture examining one of the 48 machines he has so far assembled.

It operates on a short wavelength, enabling him to give remote control treatments to 100 patients a day within a radius of 150 miles, without their knowledge that he is giving them treatment, as long as they are wearing his crystal receiving set (a small metal tin containing crystals composed of the various elements that go to make up the human body.)

SOLVE THIS!

Problem No. 32.

Miller made a one-valve set using an all-metal chassis, wooden panel, and a baseboard mounting type of anti-microphonic valve-holder. The receiver was completed, the valve plugged into the socket, and the on-off switch pulled out. Immediately, the fuse blew. A new fuse of higher rating was inserted in the holder, and again it blew directly the on-off switch was operated. Valve and fuse were removed, and careful tests were carried out in the circuit, but there were definitely no short-circuits anywhere. A fresh fuse was, therefore, tried, but with the same result. Even the highest value fuse obtainable was blown as soon as the set was switched on. The valve was perfectly in order. What do you think was wrong? Three books will be awarded for the first three correct solutions opened. Address your envelopes to the Editor, PRACTICAL WIRELESS, Geo. Newnes Ltd., 8-11, Southampton Street, London, W.C.2. and mark your envelopes Problem No. 32. Do not enclose any other correspondence with your solution, and post to reach this office not later than May 1st.

SOLUTION TO PROBLEM No. 31.

The grid leak of the resistance stage in Smith's receiver was faulty, and therefore the coupling condenser was accumulating a charge which partially choked the first L.F. valve.

The following three readers received books in connection with Problem No. 30:—

L. C. Jones, 24, Whitworth Road, S. Norwood, S.E.25; A. E. Peck, 15, Felham Road, Wood Green, N.22; A. A. Dodd, 6, Ferndale Road, Banstead, Surrey.

Cyclones and Short-Waves

DURING April, when strong magnetic disturbances are to be expected, relays on short-waves from Europe by the American broadcasting nets are cut down to an absolute minimum. According to the Radio Corporation of America, during such periods atmospheric disturbances are such that considerable interference is experienced, even on short-wave channels.

Military Training by Radio

THE Spanish broadcasting stations have been instructed to include in their transmissions to schools special courses on military subjects and lectures relative to the physical training of Army cadets.

Radio Toulouse Partly Destroyed

A SEVERE fire recently greatly damaged the transmitting plant of Radio Toulouse; the studio was completely destroyed. As it is estimated that repairs to the building and plant will cost some £20,000, a request has been made to the authorities to bring the new St. Agnan station into operation for which, up to the present, no licence has been granted. So far permit has been refused, as it was feared that the broadcasts from a 60 kilowatt transmitter would interfere with those of the State station (Toulouse Pyrenées) in the same city.

More Wireless Telephony Services

IN addition to the public telephony service which was recently opened between Paris (St. Assise) and Bouffarik (Algiers), the latter has now initiated shore-ship communication with steamers in the Mediterranean and Atlantic. A wireless telephony service has also been officially opened between Great Britain and Palestine. On this side messages are transmitted via Rugby and received at Baldock; the corresponding stations being Abu Zabal (Cairo) and Mahdi, in Egypt. The route then taken to Jerusalem, Haifa, Jaffa, and Gaza is by land-line, with repeater stations at Ismailia and Lydda. All controls of the service are situated respectively at the London and Cairo Telephone Exchanges.

Belgium and Congo Broadcasts

THE Belgium Government is carrying out tests in an endeavour to relay the Brussels wireless programmes to the Congo, via the Leopoldville station. The experiments are being made by the Ruysselede (Bruges) short-wave transmitter.

No Summer Time in Portugal

BEAR in mind that as Portugal has not adopted Summer Time this year, if you wish to hear the broadcasts from CTIAA, Lisbon, on either medium or short-waves, they must be tuned in one hour later than their usually advertised G.M.T. times.

WE ALWAYS LEAD AND SHOW THE WAY!



Advance Details of our powerful Featherweight Portable Class B Four-Valver, with many novel features, Blueprint of which

will be given next week.

By F. J. CAMM

It was revealed that the average commercial portable cabinet weighs anything between 10lbs. and 12lbs., and I decided that practically all of this could be usefully dispensed with whilst retaining the necessary rigidity. I therefore adopted the same methods of weight reduction as are used in

wood, between which the components are screwed.

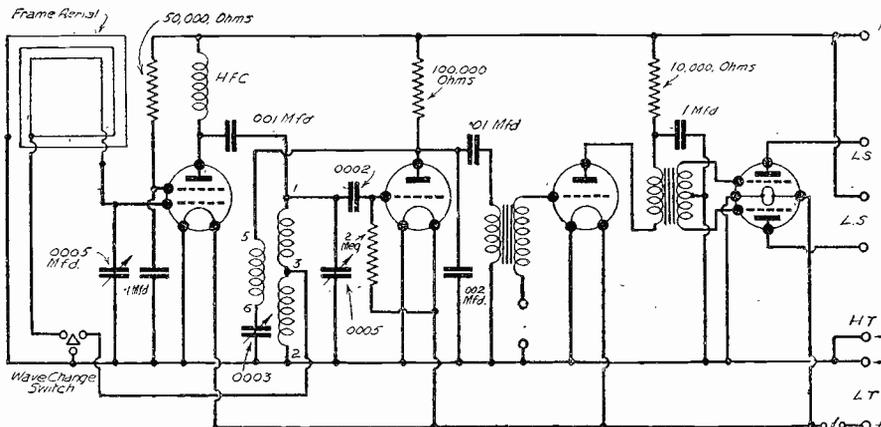
Another problem which I sought to solve was the usual difficulty of assembling a portable set, for normally, with this type of receiver, it is necessary to fiddle about in the restricted space usually allowed in order to connect the components to the controls. This arrangement necessarily endows the receiver with numerous obscure corners in which it is impossible adequately to get the fingers in order to

tighten terminals or attach wires. As a consequence, I decided that the stripwood baseboard should be attached to a fretted front built from 1/4 in. stripwood and that the frame aerial, speaker, and all components should be mounted on it as well. This front comprises the receiver proper, and the remainder of the case is merely a protective covering providing also accommodation for the small H.T. battery, grid-bias battery, and accumulator. The

front, with all the components attached, is merely hinged at the bottom to the covering case, and is secured at the top with a simple swing hook which locks it. It is thus only necessary to release the hook in order to swing the set outwards on its hinges when adjustments may readily be carried out. I also decided that in order to reduce H.T. consumption, and further to enhance

the compactness of the receiver, Class B amplification was necessary. The total consumption is only 8 milliamps, and bearing in mind that this is really a 5-valve receiver (the Class B output valve really constituting two valves in one) this is extremely economical. The overall size of the complete receiver is only 15in. by 12in. by 6in., and it may quite

(Continued on page 246.)



Theoretical circuit of the Featherweight Portable Class B Four

the aircraft industry. The case of the Featherweight Portable Four is an easily-assembled structure made from 1/4 in. by 1/4 in. stripwood which, when covered with thin cardboard, and finally with leather cloth, has produced a cabinet which weighs only 11lb. I carried the stripwood idea even farther, for the baseboard merely consists of three spaced strips of the same

IT has become accepted by the radio industry that wireless is a seasonal hobby. It is my firm conviction that it has been seasonal in the past mainly because no one has taken the trouble to make it anything else. Obviously, in the brighter weather, people follow outdoor pursuits, but there is no reason why radio should not be enjoyed in the open as well, and at the same time. Portable sets with this idea in view have been produced which have merely given a new meaning to the word portable. Apparently it has been assumed that any wireless receiver which may be awkwardly humped a few yards is a portable receiver. Of course, it is absurd to expect anyone, especially in the hot weather, to carry a wireless receiver on a hiking tour, or even to the venue of a picnic, when its weight would give rise to the greatest discomfort, even admitting that all hikers and all those who wish to picnic were members of a race of Goliaths. It is fair comment to say that few portable receivers at present available are really intended for such use. As room-to-room sets, or for use in the garden, they may be ideal, but for taking on the river or on a picnic they would be useless. Accordingly, when designing the Featherweight Portable Class B Four, which forms the subject of

next week's free gift full-size Blueprint, I determined to tackle the problem of weight reduction. A preliminary survey showed that weight was not a necessary appendage to first-class performance, for there are many extremely efficient but lightweight components such as transformers, valve-holders, condensers, etc., which lend themselves admirably for portable purposes.

SPECIFICATION OF FEATHERWEIGHT PORTABLE.

- Two Utility Bakelite Condensers, .0005 Type W. 297.
- One Wearite H.F. Choke, Type H.F.P.A.
- One Lissen Dual Range Shielded Coil.
- One Graham Farish Litlos Condenser, .0005.
- One Graham Farish Ohmite Spaghetti Resistance, 15,000 ohms.
- One Graham Farish Ohmite Spaghetti Resistance, 50,000 ohms.
- One Graham Farish Ohmite Spaghetti Resistance, 100,000 ohms.
- Three Clix 4-pin Chassis Type Valve-holders.
- One Clix 7-pin Chassis Type Valve-holder.
- One Bulgin On-Off Switch, Type S. 38.
- One Bulgin Wave-Change Switch, Type S.36.
- Four Bulgin Frame Aerial Spacers, Type L.12.
- One Bulgin Senator Transformer, Type L.F. 12.
- One Lissen Class B Driver Transformer.
- One 2 megohm Grid Leak, with wire ends, Lissen.
- One T.C.C. .01 mfd. Fixed Condenser, Type M.
- One T.C.C. .0002 mfd. Fixed Condenser, Type M.
- One T.C.C. .002 mfd. Fixed Condenser, Type M.
- One T.C.C. .1 mfd. Fixed Condenser, Type 50.
- One T.C.C. 1 mfd. Fixed Condenser, Type 50.
- One T.C.C. .001 mfd. Fixed Condenser, Type M.
- One Cossor 220 S.G. (Metallised) Valve.
- One Cossor 210 H.F. (Metallised) Valve.
- One Cossor 215 P Valve.
- One Cossor 240 B Valve.
- One Rola Loud-speaker, Type F.5-PM-14-Class B. 2 ozs. 24 D.C.C. wire and 2 ozs. 34 D.S.C. wire for frame.
- One Ediswan 120 volt H.T. Battery, ref. 69706.
- One Ediswan 9 volt Grid Bias Battery, ref. 69807.
- One Ediswan 2 volt accumulator, E.L.M.2.
- Four Wander Plugs, (H.T.+, H.T.-, G.B.+ and G.B.-).
- Two Spades (L.T.+ and L.T.-).
- One coil Glazite, flex, screws, wood for case, carrying handle, etc.

SELECTIVITY IN SIMPLE TERMS

Ways and Means of Increasing Selectivity in Ordinary Three-Valve Sets

By F. WHITE

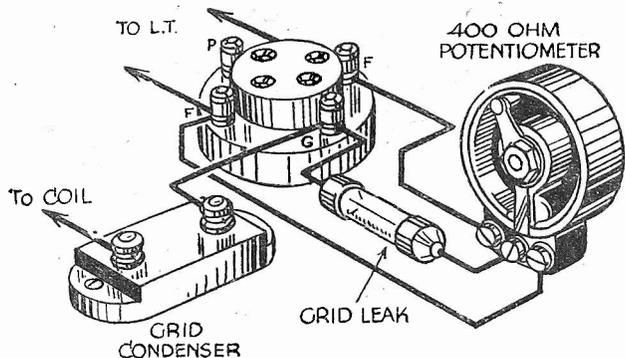


Fig. 1.—Obtaining smooth reaction.

TWO or three years ago the ability of a receiver to "get foreign stations" depended on its sensitivity more than its selectivity. Now that the position is reversed and there are numerous stations working at high power, selectivity is of vital importance.

The ideal method of obtaining the required selectivity is to use a multi-stage H.F. receiver with many tuned circuits. Such a solution is expensive and rather laborious if the receiver is home-constructed. It will be the object of the writer to show means of increasing the selectivity of a simple receiver. Let us consider a three-valve set—a detector and two L.F. stages.

Single Tuning Circuit

Such a set has only one tuning circuit (in absence of band-pass filter) and the most has to be made of this. The lower the resistance of the circuit and the higher its inductance, the greater will the selectivity be. Now the aerial and earth system adds to the circuit resistance, and so blunts the tuning to some extent. The earth should be a large buried object in moist soil. A water-pipe makes a good earth, and one should be used which goes directly to mains, and not one which runs all over the house and into the tank. Use a short stout earth wire.

The aerial should be as short as the sensitivity of the set will allow, but such a procedure will, of course, not favour the weaker stations. These will not then interfere with their powerful neighbours (in kilocycles), and surely it is better to receive a few stations clearly than many which interfere with one another.

The degree of selectivity is dependent on the coil employed. It has already been shown that a shield or screen on the coil in such a receiver is unnecessary and only blunts selectivity. Choose then a dual-range coil in which the long-wave portion is not wound right next to the medium-wave portion. If these two portions are very near then the long-wave coil (when shorted) exercises a damping effect on the medium-wave coil which blunts selectivity.

Choose a coil which is tapped, or, better still, one which has several tapings. You can then use that tapping most suitable to your conditions. Alternatively use a coil with aperiodic aerial winding, *i.e.*, one which has a separate winding for aerial and earth. The degree of selectivity can then be varied by loosening or tightening the coupling between the two coils.

When the aerial is long, and the coil has only a centre tapping, greater selectivity can be obtained by the use of an aerial series condenser. This may be a solid dielectric type with a maximum capacity of .0003 mfd. It is connected between the aerial and aerial terminal of set. Unscrewing it increases selectivity, but decreases the volume. A satisfactory setting must be found by experiment. Signal strength may be increased by the use of reaction.

Reaction

Reaction is a good servant but a bad master. Used properly it

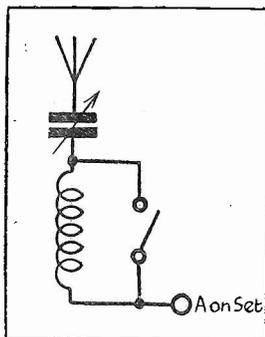
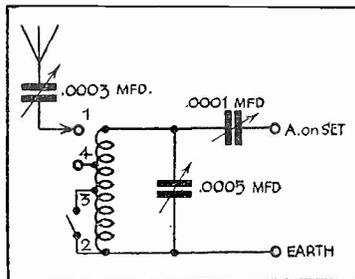


Fig. 2.—An arrangement for preventing the medium wave station breaking through on long waves.

will increase signal strength and also selectivity. If it is fierce or "ploppy," then it is of no use at all. Increasing it from zero to maximum should at some point result in a gentle hissing from the loud-speaker to be followed by oscillation as



the reaction is advanced. Oscillation should cease (when decreasing reaction) at that point where it commenced. If the reaction dial has to be moved through several

Fig. 3.—An additional coil to provide a "band-pass" effect.

degrees before oscillation stops, then you are not obtaining the best results. You may be using an unsuitable valve in the detector stage. Try varying the detector tapping (on H.T. battery) to get smooth reaction. The best results are obtained when the grid-leak is returned to the slider of a potentiometer across the L.T. battery instead of being connected to L.T.+. Such an arrangement is shown in Fig. 1. The slider is slowly advanced to the negative side of potentiometer till the best position for working is found.

On the Long Waves

On the long waves a simple set (such as the type mentioned) suffers badly from lack of selectivity. What sometimes happens is that the two London stations (or two local stations) are heard together over half the dial. We will not go into the theory of this form of interference called cross-modulation, but a cure is given. It consists of the use of a specially designed H.F. choke, which is so designed that the impedance to medium waves (*i.e.*, to frequencies of about 1,500 kc/s to 600 kc/s) is very much greater than the impedance to long waves. Thus, while medium-wave

signals are completely blocked, long-wave signals are passed through almost unchecked. The method of wiring the choke into circuit is shown in Fig. 2.

The switch is closed when the medium waves are worked and left open when long waves are received.

The .0003 mfd. maximum condenser is set at a suitable setting, its value not being very critical. If greater selectivity is required another compression condenser may be added to the previously described unit. It is placed between the aerial and the terminal marked aerial on unit.

Double-Circuit Tuning System

So far the schemes for improving selectivity have been very simple. It is quite possible that after trying the aerial series condenser, and other simple devices, that

(Continued on page 232.)

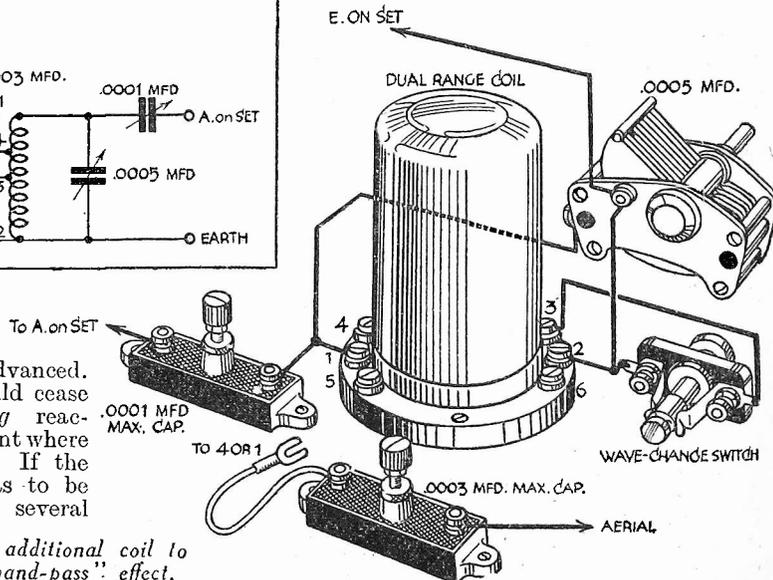


Fig. 3.—An additional coil to provide a "band-pass" effect.

SAFETY FIRST!

A Few Suggestions for Protecting the Receiver and its Accessories from Damage.

By FRANK PRESTON, F.R.A.

DESPITE the above title, I do not wish to suggest that by following our fascinating hobby we are at all likely to be electrocuted or injured in some other way. What I have in mind is the safety of the receiver and its components. I have heard it said—probably truly—that over fifty per cent. of the breakdowns and failures of certain components, especially valves, high-tension batteries, resistances, transformers, and even loud-speakers, are due to carelessness or lack of forethought. It is also said that “to be forewarned, is to be fore-armed,” so perhaps I may be excused for giving a few friendly warnings and suggestions which might result in a saving of time, temper and money.

A switch for connecting the aerial to earth when the set is out of use is always recommended, its ostensible purpose being to protect the receiver in case the aerial is struck by lightning. The switch also transforms the aerial-earth system into

switch is “off,” but with the other type both aerial and earth are entirely disconnected. It is because of this that we are often told that the single-pole

to the aerial and earth leads-in. Theoretically, the best place would be outside the house on the window frame, but there are very few of us who feel like taking a walk in the garden last thing before going to bed. It is not necessary to do so, for, provided the switch is screwed to the window-sill near the lead-in wires, all will be well.

A Spark Gap

Quite apart from lightning discharges, it is probably not fully realised to what extent very powerful atmospherics can be harmful, especially when the set is in use. They act rather like strong signals, and, coming so suddenly, are liable to produce rapid voltage surges in the set which might even cause the breakdown of a transformer or valve. For this reason it is always wise to switch off when atmospherics become really troublesome. In any case, reception cannot be enjoyable, but one is sometimes tempted to hang on until a programme is finished. If for any reason it is particularly necessary to keep the

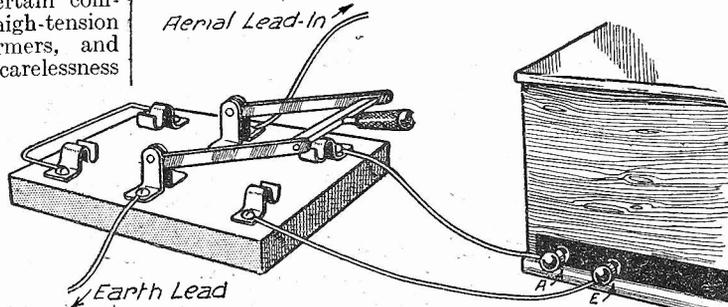


Fig. 1.—The connections to a double-pole aerial-earth switch.

switch does not offer real protection. Actually, however, it is perfectly “safe,” provided that the earth lead is reasonably efficient, because any electrical charge

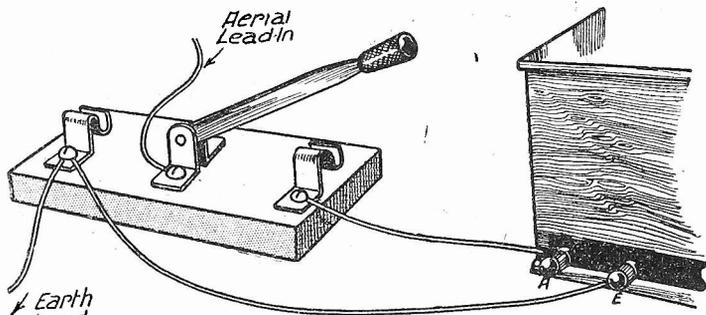


Fig. 2.—The connections to a single-pole aerial-earth switch.

an efficient lightning arrestor, which affords protection to the house. Of course, the probability of an average aerial being struck by lightning is extremely remote, but it is by no means impossible for atmospherics of the most powerful kind to cause minor injuries to components in the aerial tuning circuit, and on this score alone the aerial switch is justified.

which reaches the aerial will always leak away through the path of least resistance, which is, of course, the earth lead. The position of the switch is probably of greater importance than its type, and it should be mounted as near as possible

set in use in spite of atmospherics, some measure of protection can be secured by fitting a spark gap between the aerial and earth leads; this will allow any exceptionally strong discharge to leak away without doing much harm. The gap may be made quite easily from the simple parts indicated in Fig. 3. Incidentally, it might be added that a number of aerial-earth switches are now fitted with a suitable spark gap of the type illustrated in the sketch of Fig. 4. In addition to serving the purpose mentioned above the spark gap is a good stand-by when one forgets to turn off the switch, for in case of lightning it will provide a reasonably low-resistance path between aerial and earth for electrical discharges, although having no effect on

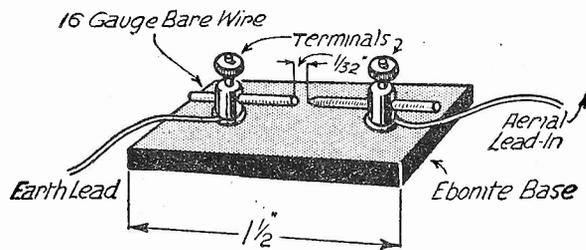


Fig. 3.—A simply made spark gap for connecting between the aerial and earth.

Single-pole and Double-pole Switches

There are two principal kinds of switches in common use, one called a single-pole, and the other a double-pole change-over switch, and they are connected as shown in Figs. 1 and 2. When using the single-pole component the aerial is connected to the set (via the earth wire) even when the

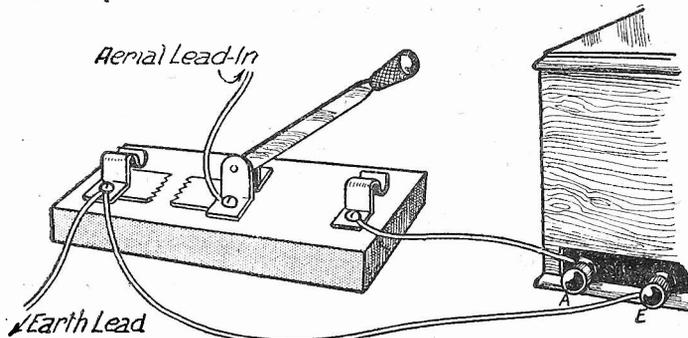
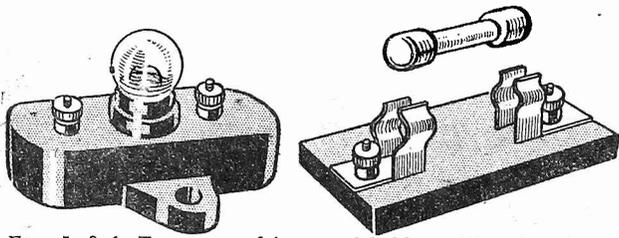


Fig. 4.—A single-pole aerial-earth switch fitted with a spark gap.



Figs. 5 & 6. Two types of fuses and holders: (5) a flash-lamp-bulb fuse and (6) a cartridge fuse

normal reception. For the benefit of newcomers to wireless I might mention that although atmospheric discharges are practically unknown in winter, they are frequently very troublesome during hot and sultry weather. Consequently, if an aerial-earth switch has not yet been installed it might pay to attend to the matter before summer comes along.

Fuses

Whenever one thinks of safeguarding the receiver the idea of fuses immediately comes to mind. And no wonder, because they are particularly useful, especially to the constructor and experimenter. We are none of us infallible, and little mistakes will occur; let the accumulator spade terminal fall on to the H.T. battery terminal and, unless a fuse is fitted, we must say goodbye to a set of perfectly good valves; it only needs a loose wire in the set to short-circuit the high-tension terminals to result in the ruination of the battery or eliminator. A newly-made set should never be tried out without making sure that a fuse is fitted in the negative H.T. lead.

There are two or three kinds of H.T. fuses, but of these the cartridge and flash-lamp bulb types, which are shown in Figs. 5 and 6, are most popular. Whatever kind is employed, it should be connected between the H.T. negative and L.T. negative terminals; one way of doing this is illustrated in Fig. 7, where the wire which has been removed is shown in broken lines. Another very convenient way of fitting a fuse to an existing set is to replace the ordinary H.T. negative wander plug with a special one of the type shown also in Fig. 7. The "Wanderfuse," as this plug is called, is of tubular construction, and is made to hold a cartridge-type fuse.

With a battery set the fuse should be rated at about 60 milliamps, which means to say that it will burn out when any current greatly in excess of the latter figure is passed through it. As a matter of fact, most fuses are designed to "blow" at a current 50 per cent. greater than that for which they are rated. It is unwise to use an ordinary flashlamp bulb as a fuse in a set having less than three valves, because it might possibly carry sufficient current to impair, even if not to burn out, the valve filaments. Special fuse bulbs are made, however, in ratings of 60 and 120 milliamps, which are suitable for all requirements. In addition to the fuse in the H.T. negative lead, it is often an advantage, especially with an experimental receiver, to fit one in all

Fuses in Mains Receivers

In the case of a mains-operated receiver the question of fuses is a little more involved.

Those of the flash lampbulb type are practically useless since the contacts are so

except one of the positive tappings. It can be seen that the latter tappings often have a sufficiently high voltage between them to damage the valve filaments in case of a wrong connection, and besides this, a short-circuit of even a portion of the battery might render the whole component more or less useless.

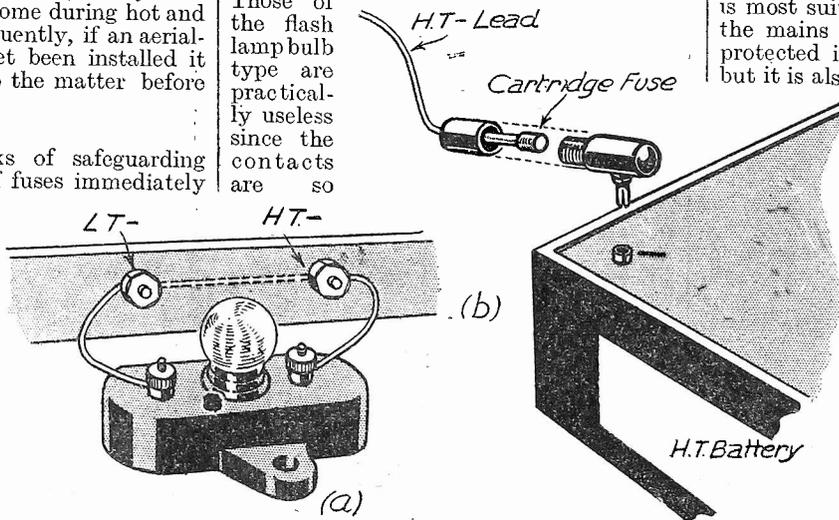


Fig. 7. Two ways of fitting a fuse to a battery set.

near together that the higher voltages (especially when A.C.) have no difficulty in "jumping" across them, so forming an electric arc which itself will carry sufficient current to do no end of harm. The shorter cartridge fuses are unsuitable for the same reason, and most firms make a special one having a length of about 1 1/2 ins., and which is therefore proof against the

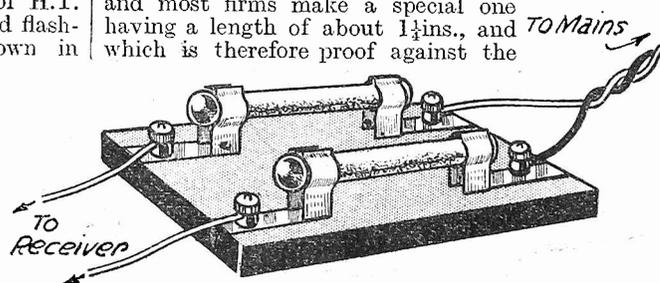


Fig. 8. A double mains fuse

latter potential source of trouble.

A fuse should always be inserted in at least one of the mains leads to a receiver, eliminator or trickle charger, whilst with D.C. supplies it is generally preferable to include one in each lead. This applies in particular when it is not known which side of the mains is earthed. Double fuses, of the type shown in Fig. 8, are most convenient for the latter purpose.

Fuse Ratings

The beginner is often at a loss to know what size of fuse is required for any particular circumstance, but there is no difficulty in deciding this question. A simple rule to remember is that the fuse should have a rating of about twice the current it is normally called upon to carry; it will then burn out before sufficient current could be passed to do any harm, but will not be affected by the comparatively heavy surge which occurs on first switching on. As an example it can be stated that a .5 amp. fuse is just about right for any mains receiver having up to four valves. For a bigger set or a radiogram a 1 amp. component is most suitable. By connecting a fuse in the mains lead the set will be fairly well protected in the normal course of events, but it is also worth while to wire a second one on the output side of the rectifier to prevent damage to the latter component in the event of a condenser breakdown. Alternative positions for the fuse are shown in the circuits of Figs. 9 and 10, where a valve and metal rectifier are represented. (Fig. 10. is unavoidably held over this week, but will be included in the next article—Ed.)

Safety Connectors

Another useful "safety first" tip is to employ insulated connectors for the flexible wires which are used to make contact with the anode terminals of S.G. valves and with the priming grid terminals on pentodes. These wires are connected to high tension positive and it is an easy matter to let one slip on to a metal screen or the metal coating of a valve (which is, of course, joined to H.T. negative). If a fuse is fitted no real harm will be done, but the fuse will have to be replaced, and that means more expense. Safety anode connectors are made by two or three firms and an illustration of one of these connectors will be given next week. A plug contact is fitted inside an insulated tube and this fits into a corresponding socket which is screwed on to the valve in place of the terminal nut. These connectors are quite cheap and might effect a saving of many times their cost.

(To be continued.)

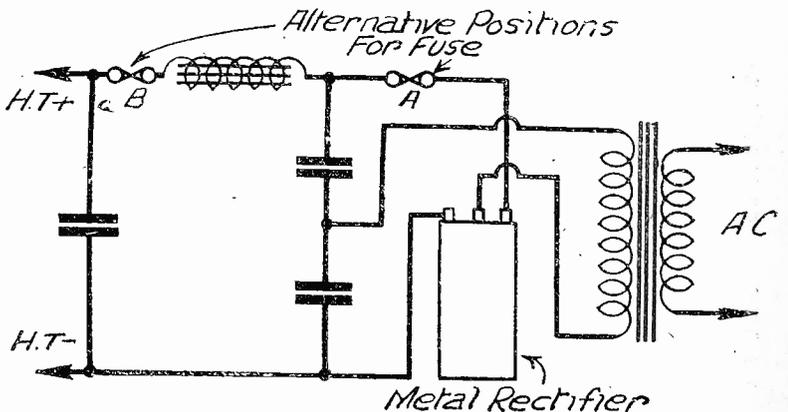
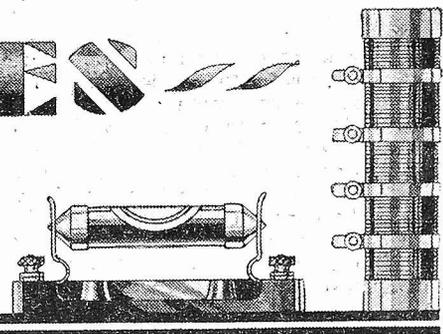
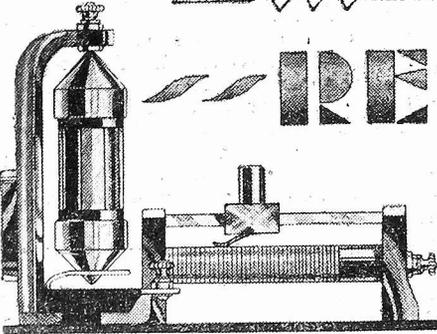


Fig. 9.—Fitting a fuse in a mains unit.

RESISTANCES

WHY AND HOW THEY ARE USED.

By W. B. RICHARDSON.



Part I: Resistances in a Battery Receiver

ONE very noticeable feature of modern design is the use of an increasing number of resistances of all kinds. Whereas a few years ago such things as decoupling and grid-bias resistances were almost unknown, nowadays receiving sets, especially of the all-mains type, seem to be positively bristling with resistances of all types and varieties. It is small wonder, then, that the home-constructor, when building a set requiring, perhaps, ten or twenty different grid leaks, fixed resistors, potentiometers and what not, is often a little confused as to the reason for so many. Again, in the case where he is building from a circuit diagram he may be in doubt as to the correct value and type to use in each position, since such details are not always given by the designer. It is for this reason this information is now given.

I am going to take two typical examples of modern receivers and endeavour to explain the use of all the resistances used therein, besides giving some practical hints on their values and the types to use in your own set.

I shall first deal with the resistances in a typical battery operated three-valve of the S.G.-det. pentode type, the circuit diagram of which is given in Fig. 1.

Bias for the Variable-mu Valve

Starting from the left of Fig. 1 the first resistance we come across is R1. This is a potentiometer controlling the grid bias of the first valve, a variable-mu. If you follow out the circuit you will see that it is placed across the ends of the grid-bias battery. Naturally, in this position current will flow through the resistance all the time it is in circuit. In order that the grid bias battery shall not be rapidly discharged the resistance is made very high, say about 25,000 ohms or 50,000 ohms. Of course, from the point of view of obtaining a variation of grid bias, for which it is intended, it does not matter much what its value is. It would be just as efficient if of 200 ohms as 20,000 ohms. The sole reason for making it of high value is, as I say, to prevent undue wastage of current from the grid bias battery. Another precaution, with the same object in view, is the pro-

vision of the 3-point switch S1, instead of the usual 2-point filament switch. The third contact enables the resistance R1 to be disconnected from the grid-bias battery directly the set is switched off; thus the battery does not discharge when the set is not in use.

mediate point along the resistance must be at some potential between 0 and -15 volts. By moving a slider along the resistance any voltage between these two points may be obtained; hence the reason for connecting the grid of the valve to the slider.

As you know, the resistance, complete with slider, is called a potentiometer. It is also sometimes called a "volume control." This latter term is not a very good one to use as there are various types of volume control. "Potentiometer," on the other hand, has only one meaning.

Two types of potentiometer, each of which would be suitable as R1, are illustrated in Fig. 2. A very suitable value to choose is 20,000 ohms. This is quite high enough to ensure very small current consumption from the G.B. battery, and will not give rise to the slight crackling noises which sometimes occur when operating a 50,000 or 100,000 ohms instrument. If you care to work out the consumption of current you have only to apply Ohms' law. Thus, in the case of a 20,000 ohms resistance the current from a 15 volt battery would be $\frac{15}{20,000}$ amps = .00075 amps!

Decoupling Resistances

The next resistance we arrive at is R2. This in conjunction with condenser C2 is used for decoupling purposes, and prevents instability in the H.F. stage. The condenser C2 is large (1 mfd.), therefore, a very high resistance is unnecessary. One of 500-1,000 ohms is quite suitable. It should preferably be non-inductive, although so long as it is not placed right next to an unscreened coil or choke, it does not matter very much. Three suitable types are shown in Fig. 3. There is no objection to using higher values than 1,000 ohms, except that it cuts down the voltage on the anode. If this is already only just sufficient as supplied by the H.T. battery you can see that it must not be too large if the valve is to operate under the best conditions. Not all sets are fitted with R2 and C2, as, if the circuit and layout is well designed, there may be no need for them.

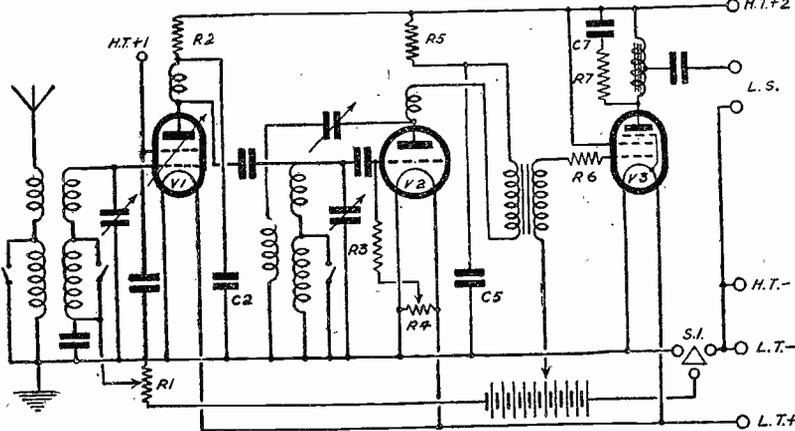


Fig. 1.—A typical battery operated three-valve set showing the various resistances used.

Why a Potentiometer is Used

Now let us see how R1 works. As you know, variation of the grid-bias on a

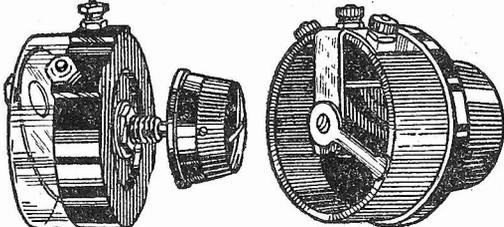


Fig. 2.—Two typical potentiometers for use as volume controls with variable-mu valves.

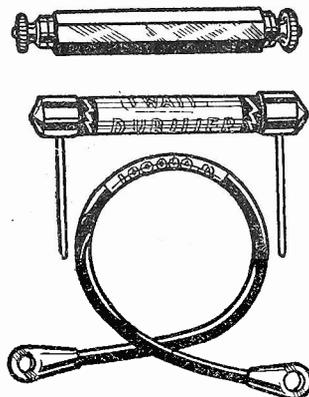


Fig. 3.—Three types of resistances suitable for decoupling purposes in the early stages of a battery set.

variable-mu valve provides an almost ideal volume control, thus, when the bias on the grid is zero, that is, at the same potential as the earth-cum-filament connections, the valve gives maximum amplification, but when it is gradually made negative so the amplification is reduced until at about 15 volts negative it is very small indeed. To obtain a variable control the grid of the valve is connected (via the secondary of the tuning coil in this case) to the slider of R1. Now as one end of R1 is connected to the positive end of the 15-volt G.B. battery (which is at the same potential as earth) and the other to the negative end, it stands to reason that one end of the resistance is at zero, and the other end at 15 volts negative. Therefore, any inter-

mediate point along the resistance must be at some potential between 0 and -15 volts. By moving a slider along the resistance any voltage between these two points may be obtained; hence the reason for connecting the grid of the valve to the slider.

As you know, the resistance, complete with slider, is called a potentiometer. It is also sometimes called a "volume control." This latter term is not a very good one to use as there are various types of volume control. "Potentiometer," on the other hand, has only one meaning.

Two types of potentiometer, each of which would be suitable as R1, are illustrated in Fig. 2. A very suitable value to choose is 20,000 ohms. This is quite high enough to ensure very small current consumption from the G.B. battery, and will not give rise to the slight crackling noises which sometimes occur when operating a 50,000 or 100,000 ohms instrument. If you care to work out the consumption of current you have only to apply Ohms' law. Thus, in the case of a 20,000 ohms resistance the current from a 15 volt battery would be $\frac{15}{20,000}$ amps = .00075 amps!

The next resistance we arrive at is R2. This in conjunction with condenser C2 is used for decoupling purposes, and prevents instability in the H.F. stage. The condenser C2 is large (1 mfd.), therefore, a very high resistance is unnecessary. One of 500-1,000 ohms is quite suitable. It should preferably be non-inductive, although so long as it is not placed right next to an unscreened coil or choke, it does not matter very much. Three suitable types are shown in Fig. 3. There is no objection to using higher values than 1,000 ohms, except that it cuts down the voltage on the anode. If this is already only just sufficient as supplied by the H.T. battery you can see that it must not be too large if the valve is to operate under the best conditions. Not all sets are fitted with R2 and C2, as, if the circuit and layout is well designed, there may be no need for them.

Current-carrying Capacity

With resistances such as R2 which are placed in the anode circuit of a valve there is always the question of current-carrying capacity, that is to say, they must be able to pass the maximum anode current the valve is likely to develop without overheating or breaking down. The current in the anode of the valve V1 is unlikely to be more than 4 milliamps, in which case the normal spaghetti, composition, or metallized resistance, would be working well within its capacity. A glance at the makers' catalogues shows that the average

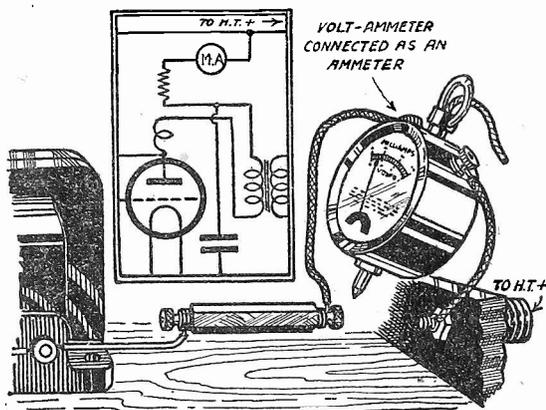


Fig. 4.—Testing the current passing through a resistance in the anode circuit of a valve.

resistance of 1,000 ohms in any of these types will stand a current of about 30 milliamps, so there is more than a sufficient margin of safety. It may seem rather superfluous to mention this point here, but all examples do not work out quite so satisfactorily as this one. Sometimes, on calculation, you will find that the resistance you were about to use would be seriously overloaded, and you are then able to substitute one of heavier rating before any trouble occurs. It is usually with the higher values that overloading is likely, since with most makes the higher the resistance is the smaller is its current-carrying capacity. As an example, I have before me a table of the ratings of a series of resistances of well-known make. I see that a 100 ohms component will stand 100 milliamps. The equivalent 1,000 ohms resistance will safely pass 31 milliamps; but the 50,000 ohm one will only stand 4.6 milliamps.

While on the subject of rating it may be mentioned that some resistances are sold as 1-watt, 2-watt, 3-watt types and so on. This rating indicates the power which may be dissipated with safety through the resistance. The power in watts is arrived at by multiplying the maximum current permissible by the maximum voltage. For example, a 10,000 ohm resistance may pass 10.00 milliamps without overload. It would, of course, require a voltage of 100 to pass this current through it. (By Ohms' law voltage = current × resistance

$$= \frac{10}{1,000} \times \frac{10,000}{1} = 100 \text{ volts.}) \text{ The power rating of such a resistance would}$$

$$\text{thus be 1 watt. } \left(\frac{10}{1,000} \text{ amps} \times 100 \text{ volts} = 1 \text{ watt.} \right)$$

Grid Leaks

Taking them in numerical order the next resistance in the circuit is the grid leak R3. Here the question of current carrying ability does not arise since the grid current is of infinitesimal proportions. However,

the value of the leak is of some importance. It used to be the common practice to use a 2-megohm leak in conjunction with a .0003 mfd. condenser as striking the happy medium; but it is found that with a screen-grid stage before the detector this value is somewhat too high for the heavier transmissions so that during the loud passages the grid charge does not leak away fast enough. In extreme cases the grid may become so heavily charged that the valve refuses to function for a fraction of a second.

To avoid any possibility of this it is usual to use a .0001 mfd. condenser and a 1 meg. or ½ meg. leak. With this arrangement the detector may not be quite so sensitive to very weak transmissions; but gives better reproduction from the louder ones.

The potentiometer R4 is a refinement which is not often found in a receiver but since it may be there I will say a few words about it.

Its function is precisely the same as that of R1, namely, it is used to control the grid-bias. In this case, of course, it is the bias on the detector. When there is no potentiometer fitted it is usual to connect the grid leak return to L.T.+ thus making the grid 2 volts positive in respect of the earthed end of the filament. This connection is better as regards sensitivity than connecting the leak to L.T.—, but is inclined to give "ploppy" reaction. The best connection is somewhere between these two points, but is not so critical that a slider is essential. In fact a fixed potentiometer with one or two tapplings is practically as useful as one with a slider. Taking the grid-leak return to one of these points provides just the happy mean between the two extremes and is a great help in smoothing the reaction. A tapped potentiometer is illustrated in Fig. 5. It has four terminals, two of which are connected to the filament leads while the other two are the tapping points.

The value of the potentiometer, whether of the sliding or fixed type, need not be greater than 1,000 ohms, since there is only 2 volts across it. Many instruments sold for this purpose are, in fact, only about 400 ohms. There is, of course, no wastage of current when the set is not in use as the potentiometer is connected across the filament leads and is thus put out of action as soon as the valves are switched off.

Overcoming Battery Resistance

Resistance R5 is a low-frequency decoupling resistance. Together with the condenser C5 it performs in the L.F. part of the set much the same function as R2 C2 does in the H.F. part. The idea behind its use is to prevent coupling between one valve and another through the common impedance of the H.T. battery. It is usually due to the internal resistance of the H.T. battery that a set starts to howl or "motor-boat." You will notice that it is always when the battery is running down that the howling is most likely to occur. This is because when the battery is "on its last legs" it has a very high internal resistance. This resistance being common to the plate circuit of all the valves tends to produce an undesirable coupling between them. To prevent this the resistance R5 is used in conjunction with condenser C5.

The resistance offers an impedance to the passage of L.F. current and the condenser provides an alternative path. For full benefit to be derived from this device the impedance of R5 must be large compared with the impedance of the H.T. battery, and also with that of C5. Generally speaking the condenser should not be smaller than 1 mfd. With this a resistance of 30,000 or 40,000 ohms would be suitable. If a 2 mfd. condenser is employed then the resistance may be reduced to 20,000 ohms.

Voltage Drop

The idea of using a lower resistance with a larger condenser is to keep the drop which would naturally occur in the H.T. voltage applied to the valve as small as possible, otherwise a higher voltage H.T. battery would be necessary to make up for the volts lost across the resistance.

There still remains the question of the current varying capacity of R5, but as the anode current of the detector valve is unlikely to exceed 3 milliamps the usual 1-watt type of resistance will be quite up to the job. If the valve V2 were a power valve it would be a different matter. The current taken by such a valve would be considerably more and might very easily overload a low rated resistance.

Controlling Tone with a Resistance

R6 is what is called a grid-stopper resistance. Its purpose is to prevent any H.F. currents which may have got past the H.F. choke in the plate circuit of the detector valve from arriving at the grid of the pentode V3. A suitable value is 100,000 ohms, but if it is desired it can be increased up to 250,000 ohms, when it will act to a certain extent as a tone compensator by offering a higher impedance to the upper frequencies and so counteracting the over-emphasis of the high notes which is peculiar to a pentode. As it is in the grid circuit of the valve the question of current carrying

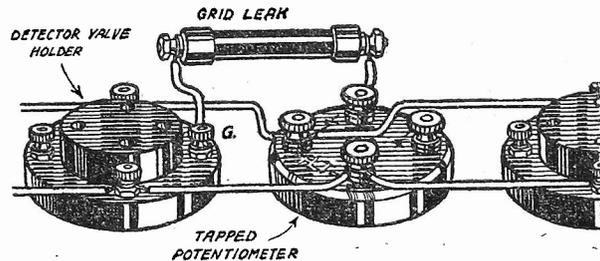


Fig. 5.—Using a tapped potentiometer in the filament leads.

ability does not arise. A resistance of the grid-leak type is quite suitable.

R7 used in conjunction with C7 is the tone control proper. Its value may be from 20,000 to 50,000 ohms according to the tone required. The lower the resistance the more the high notes are reduced. The value of the condenser is .01 mfd. If it is desired to vary the tone while the set is in operation then a potentiometer of the type shown in Fig. 2 may be used instead of the fixed resistance. Connection would then be made to the slider and one end of the resistance element, the other end being left free. If a fixed resistance is used then one of those illustrated in Fig. 3 would be suitable. A "power" type is not necessary as there is no D.C. passing through it.

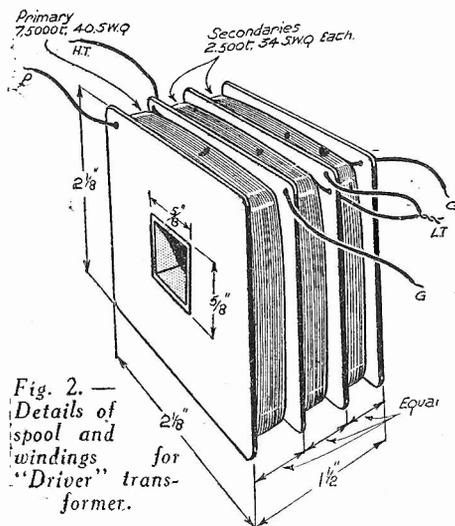
In the next article the resistances in an all-mains set will be dealt with.

NEXT WEEK!
FREE BLUEPRINT OF A NOVEL LIGHT-WEIGHT PORTABLE (CLASS B) FOUR.

Class "B" Components!

THERE is no doubt whatever that Class "B" amplification has come to stay. That it offers undoubted advantages in the way of large signal output for a most economical input of H.T. current cannot be denied, whilst the excellence of the results to be obtained (previously described in PRACTICAL WIRELESS) is beyond question. Perhaps the greatest deterrent to the immediate adoption of Class "B" is the necessity for special components, namely a "driver" transformer and output transformer or choke. Admittedly, a number of manufacturers have already produced suitable components, and at prices which are by no means high, but many constructors will not feel disposed to buy the new parts when this will involve scrapping old ones which are on hand.

The Cost of a Class "B" Amplifier
The total cost of converting an ordinary three-valve set for Class "B" works out at



something like forty-five shillings, inclusive of the necessary valve, but anyone who cares to make his own transformers can just about halve this expenditure. In the hope that a large number of PRACTICAL WIRELESS readers may take full advantage of the latest system of L.F. amplification

In this Practical and Explanatory Article, All Necessary Particulars are Given for the Construction of a "Driver" Transformer and an Output Choke.

it is proposed to give constructional details of the necessary apparatus. It must be pointed out in the very first place, however, that the home-made parts will neither

conditions its "optimum load" will approximate to some 10,000 ohms, and therefore the primary of the transformer must be designed to provide this load. The secondary has to supply power (not merely voltage as in the case of an ordinary L.F. transformer) to the output valve, and therefore it must be of low resistance. In practice a resistance of not more than 150 ohms on each side of the centre tap is found to be required. Additionally, to enable the transformer to supply the

necessary power it must have a *step-down* ratio of between 2 : 1 and 3 : 1 to each half of the secondary. Expressed in other words, the turns ratio between primary and the *whole* secondary must be from 1 : 1 to 1.5 : 1.

The output from the Class "B" valve must be supplied to the loudspeaker through a push-pull output transformer or a centre-tapped choke. Both methods of coupling are equally effective but since the choke is rather easier to make we shall assume the

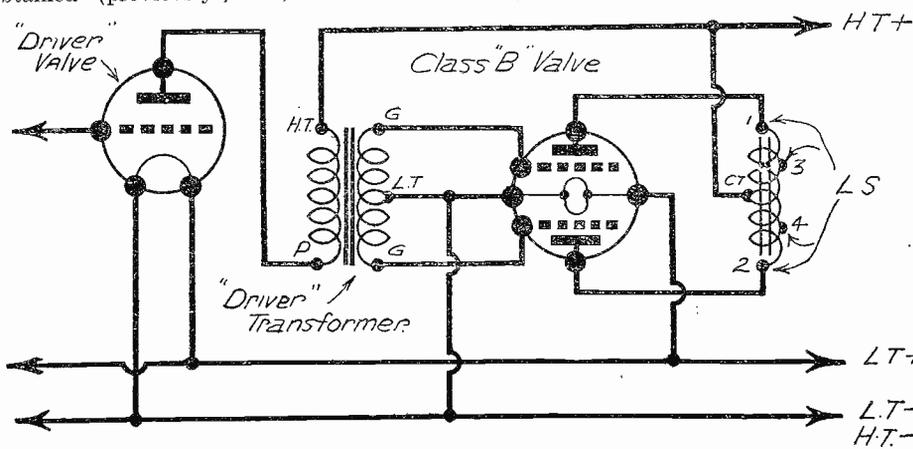


Fig. 1.—Circuit diagram of Class "B" amplifier.

be quite so efficient nor so neat as the factory-produced articles but they will not fall far short if care is expended on their construction. Moreover, the making of the parts will prove extremely interesting and also instructive.

Circuit Requirements

Before passing on to the actual constructional work, it will be as well to sum up the position and study the requirements of the circuit arrangement. The latter is shown in Figure 1, where it can be seen that a "driver" valve (this may be the first L.F. amplifier of the existing set) is used to feed the special push-pull transformer which supplies the grids of the Class "B" valve. The "driver" valve may be one of the small power type and it is normally biased to a point at which its anode current is between 2 and 3 milliamps. Under these

use of this component in the present case. The choke must, of course, be centre-tapped to feed both anodes of the valve and it should offer a total impedance of approximately 10,000 ohms at average audio frequencies.

To enable the valve to be matched to different moving-coil speakers two tappings are taken so that a step-down ratio of about 2 : 1 can be obtained. Although the output choke carries an average D.C. current of 8 milliamps or less it has to deal with "peak" values up to some 50 milliamps and it must therefore be capable of handling the latter current. Another requirement of the choke is that its D.C. resistance shall not exceed about 400 ohms, otherwise there will be a loss of signal output.

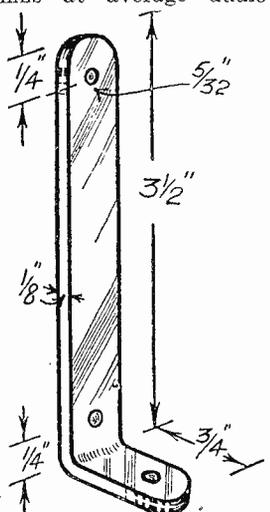


Fig. 4.—Dimensions of transformer core clamps—four are required.

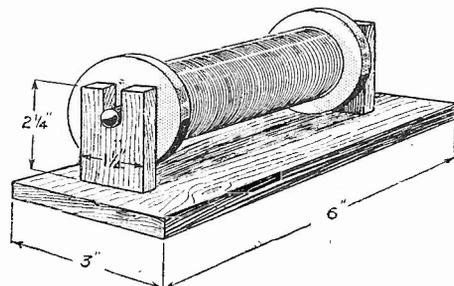


Fig. 3.—A simple reel holder which is useful when winding the spools.

Designing the "Driver" Transformer

In working out the design of the "driver" (Continued overleaf.)

(Continued from previous page.)

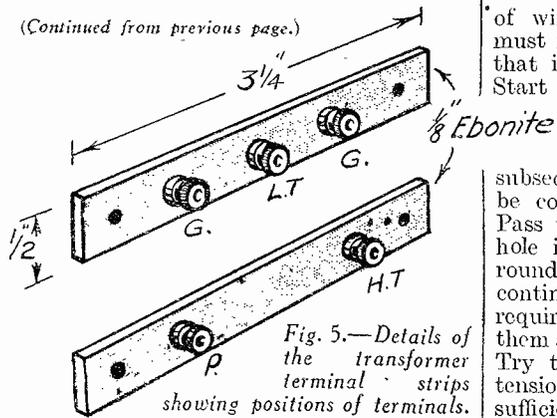


Fig. 5.—Details of the transformer terminal strips showing positions of terminals.

transformer for amateur construction it is very difficult to comply exactly with all the requirements without making the component unwieldy or using extremely fine wire which is difficult to handle. Consequently some compromise has been made with a result that the transformer to be described has the following characteristics:—Primary Inductance under working conditions, about 25 henries; Primary Turns, 7,500 turns of 40 gauge enamelled wire; Primary Resistance (D.C.), 1,350 ohms; Secondary Turns, 5,000 turns 34 gauge enamelled wire; Secondary Resistance (each half), 125 ohms; Step-down Ratio (to each half of the secondary), 3 : 1. The transformer is perfectly satisfactory for use after a Cossor 215 P or similar "driver" valve and can be made for about five shillings. The materials required are: 3 doz. No. 5 Stalloy stampings; piece of mild steel hoop 18 in. by 1/2 in. by 3/16 in.; four 1 1/2 in. by 3/2 in. bolts and nuts; 4 ozs. 40 gauge enamelled wire; 9ozs. 34 gauge enamelled wire; sheet of fibre, 1/8 in. thick; strip of 1/4 in. ebonite, 6 1/2 in. by 3/4 in.; five 6 B.A. terminals; odd pieces of flex, etc.

The Winding Spool

The first job is to make the winding spool, of which all dimensions are given in Figure 2; it consists of a square tube with four fibre checks. The tube is made by winding a strip of good cartridge paper (or, better still, presspahn in 10 mils thickness) round a 3/8 in. square wooden rod. Thin glue is applied whilst winding so as to produce a fairly rigid tube having a thickness of about 1/16 in. After winding, the tube should be removed from the rod and allowed to dry. Next, the four fibre checks should be cut out—with a sharp chisel or saw—to the sizes indicated and made to fit tightly in the tube, where they are held in position with glue. To prevent the possibility of the middle checks slipping due to side pressure of the windings a few turns of Empire tape should be wound round each section of the finished spool.

Windings

The windings must next be put on, and this job can be done most easily if a lathe is available. If not, a hand-drill held horizontally in the vice will make a good substitute. Should neither of the latter tools be available it is possible to do the work entirely by hand, but this will prove rather tedious. Whatever method

of winding is finally adopted the spool must first be put on to the wooden rod so that it can be rotated without difficulty. Start with the primary and solder a 12in. length of thin flex to the end of the 40 gauge wire. Resin should be employed as a flux to avoid subsequent corrosion, and the joint should be covered with a spot of sealing wax. Pass the end of the flex through a small hole in the end cheek and wind it once round the spool. You can then continue to wind on the 7,500 turns required, taking care to arrange them as evenly as possible in layers. Try to keep an even and steady tension on the wire, but not sufficient to stretch or break it. There is no need to count the turns, since the exact number is not too important and will certainly not be far wrong if one section of the spool is just barely filled. After winding, the wire can be cut off and another length of thin flex soldered to it, taken once round the spool and anchored by passing it through a hole in the end cheek.

The secondary winding can now be proceeded with; this actually consists of two equal windings of 2,500 turns each, which are arranged in the remaining slots. They are both wound in exactly the same way as the primary, but using the thicker (34 gauge) wire. To ensure that both halves of the secondary are alike it is well to count the turns with reasonable

particulars given in the sketches of Figs. 4 and 5. Mild steel hoop is employed for the clamps, and this material is obtainable from any ironmonger's.

Lastly the core stampings can be fitted and the transformer completely assembled. The method of fitting the stampings is shown in Fig. 6, where it can be seen that a "T" and a "U" piece is inserted first from one end of the spool and then from the other until the "tunnel" is quite

accuracy. It should be mentioned that the bobbin of wire from which the windings are taken must be mounted in some kind of holder so that it can rotate easily without any danger of the wire becoming entangled or broken; details of a simple holder are given in Fig. 3. If a break does occur, the ends of the wire must be properly soldered and the joint covered with sealing wax, or a slip of paper, to prevent any rough edges scraping the insulation from adjacent turns. After the windings have been completed they should be covered with Empire tape, which will protect them from injury.

Core Clamps

The next step is to prepare the core clamps and terminal strips according to

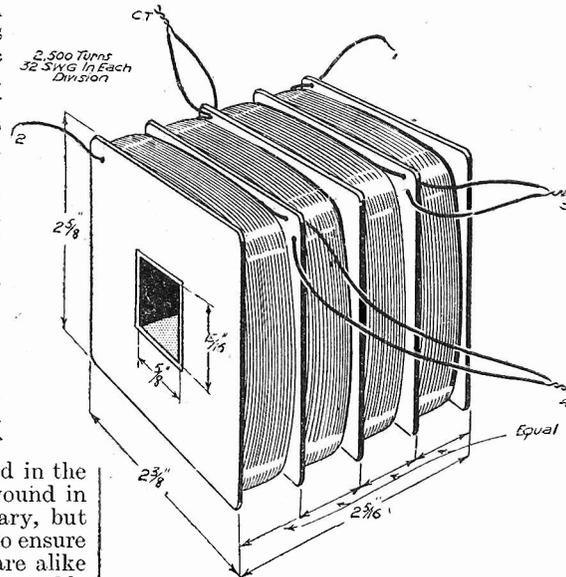


Fig. 7.—Details of spool and windings for output choke.

full. Fig. 8 shows the appearance of the complete instrument and the positions of terminals to which all connections are made.

The Output Choke

In order to obtain a sufficiently high inductance combined with a low D.C. resistance the output choke is somewhat larger than the transformer and is built up round a core consisting of 3 dozen pairs of No. 4 Stalloy stampings. The other materials required are: 1 1/2 lbs. 32 gauge enamelled wire; piece of mild steel hoop, 20in. by 1/2 in. thick; four 1 1/2 in. by 3/2 in. bolts and nuts; sheet fibre 1/8 in. thick; strip of 1/4 in. ebonite; 7 1/2 in. by 3/4 in.; five 6 B.A. terminals; odd pieces of flex, etc. This component will have approximately the correct inductance and a D.C. resistance of about 250 ohms. The total cost of all materials works out at just over six shillings.

(Continued on page 239.)

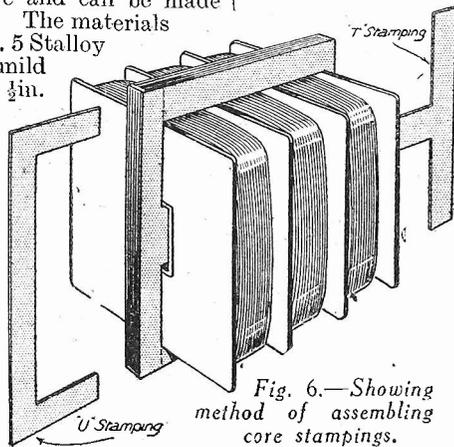


Fig. 6.—Showing method of assembling core stampings.

ing the insulation from adjacent turns. After the windings have been completed they should be covered with Empire tape, which will protect them from injury.

Core Clamps

The next step is to prepare the core clamps and terminal strips according to

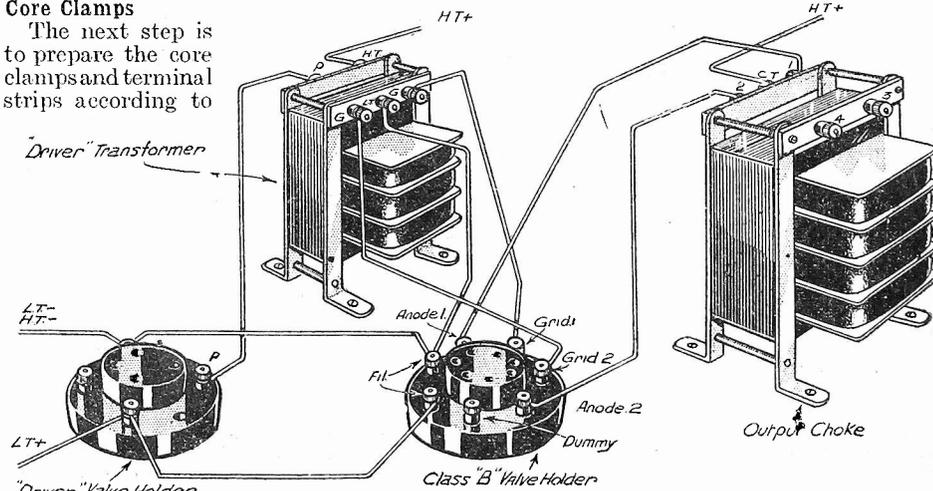


Fig. 8.—This sketch shows how the home-made components are connected up.

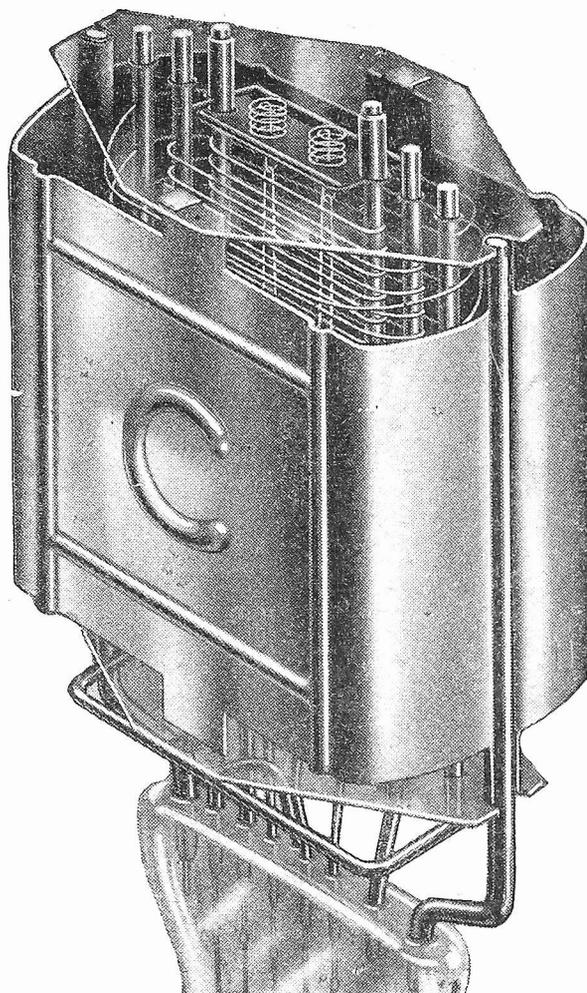
UNIFORMITY EFFICIENCY LONG LIFE

BETTER RADIO RECEPTION

Be a critic for once. Switch on your Set and listen—listen critically. Is the bass rich and full—is the treble brilliant, clear cut? Can you get the volume you want? And will it bring in the stations it used to?

It's a simple matter to make your Set like new again. You can easily give it a new lease of life. With the right types of Cossor Valves (your dealer knows them) you can improve its performance out of all recognition—it's surprising what a difference they make.

Send for a free copy of the 40-page Cossor Valve and Wireless Book which contains a wealth of interesting and useful information including Radio Definitions—Useful Circuits—List of Stations, etc. Please use the Coupon



2-VOLT TYPES

Type	Filament Amps.	Anode Volts	Imped	Amp. Factor	Mutual Conductance m.a.v.	Price
*215 S.G.	.15	120-150	300,000	330	1.10	16/6
*220 S.G.	.2	120-150	200,000	320	1.60	16/6
*220 V.S.G.	.2	120-150	110,000	—	1.6	16/6
210 R.C.	.1	75-150	50,000	40	0.8	7/-
*210 H.L.	.1	75-150	22,000	24	1.10	7/-
*210 H.F.	.1	75-150	15,000	24	1.5	7/-
*210 DET.	.1	75-150	13,000	15	1.15	7/-
210 L.F.	.1	75-150	10,000	14	1.4	7/-
215 P.	.15	75-150	4,000	9	2.25	8/9
220 P.	.2	75-150	4,000	9	2.25	8/9
220 P.-A.	.2	100-150	4,000	16	4.00	8/9
230 X.P.	.3	100-150	1,500	4.5	3.00	12/-
230 P.T.	.3	100-150	—	—	2.0	17/6
220 H.P.T.	.2	100-150	—	—	2.5	17/6
220 P.T.	.2	100-150	—	—	2.5	17/6
210 D.G.	.1	75-100	27,000	5.1	0.19	20/-
240 B.	.4	120-150	—	—	—	14/-

* These Valves available with or without Metallised Bulbs.

COSSOR VALVES

To A. C. COSSOR LTD.
Melody Dept.,
Highbury Grove,
London, N.5.

Name

Address

Please send me free of charge, a copy of the 40-page Cossor Valve and Wireless

Book B.17. PRAO. 29/4/33.



KINGS OF THE AIR

A. C. Cossor Ltd., Highbury Grove, London, N. 5. Depots at Birmingham, Bristol, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Sheffield, Belfast, Cardiff and Dublin.

COMPLETING and OPERATING THE A.C. TWIN

By W. J.
DELANEY

The Final Details for Constructing this interesting All-mains Two-Valve, Two-Pentode Receiver, with Operating Instructions

THE A.C. Twin is nearly completed, and before adding any more connections I must mention the dial light, which, although fitted in the original receiver, is not really essential. If you are installing the receiver in a dark corner of the room the light will greatly facilitate dial setting, but there is a much more important reason why I advise you to fit this light. When you switch the receiver on (by means of the switch on the side of the cabinet), you may forget to also set the room switch controlling the plug to which the receiver is connected. The result will be that you will stand waiting for the programme to come through, and may perhaps think that something has gone wrong. The light, however, will come on instantly the switch is operated, if the mains are connected, and you will then know that the receiver is "alive" and not perhaps miss an important item waiting for an unnecessary time with no supply to the receiver. The fitting for the light is supplied with the variable condenser, and before fitting it to the nut which retains the escutcheon window, you should solder two 8in. lengths of flex to the two soldering tags on the holder. Twist these lengths of flex together and then fit the lamp holder behind the retaining nut. Now carefully slide in the shelf, and before it is right home lift up the flex lead to the lamp so that it comes above the shelf, then push the shelf right home. The ends of the flex are attached to two terminals marked 4 volt, nearest to the loud-speaker, and these are not shown on the wiring diagram given last week. Pass the plaited length of flex, which comes through a slot in the lower base, up through the corresponding slot in the shelf and connect the four leads carefully, taking your guide from the letters on the diagrams in last week's issue.

Mains Connections

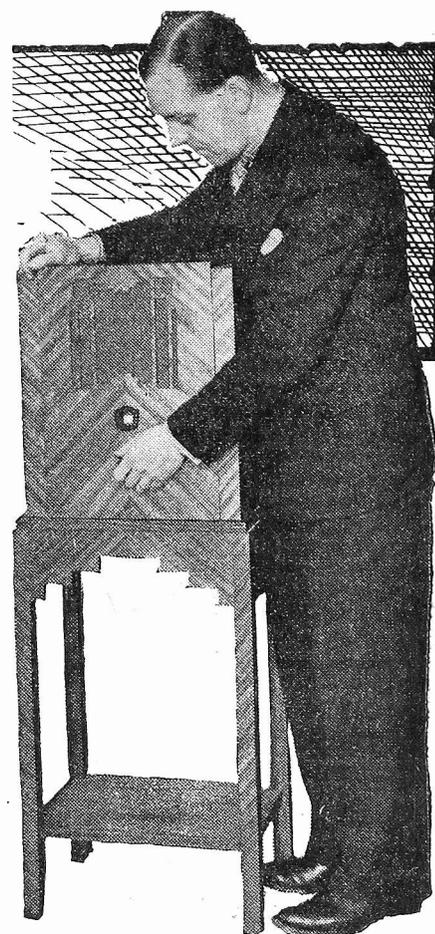
The wire "d" is the H.T. positive lead and is attached on the main base to terminal No. 1 on the Varley choke. On the shelf this must be joined to the 4 mfd. condenser together with the flex lead which is joined to the left-hand terminal on the loud-speaker transformer. The twin flex supplying the heaters of valves V1 and V2 is next joined to the two 4 volt terminals nearest the speaker, and lead "c" is joined to the earth socket. One side of the mains connector is joined to terminal marked 50P. on the mains transformer, and the other lead on this connector is joined to

the on-off switch. The short lead already attached to this switch must be joined to the terminal above 50P. which bears the rating of your particular mains. If there is no exact mark corresponding to this voltage you must use the nearest value above. For instance, if your mains are rated at 230 volts, you would use the terminal marked 240. Attach the 15,000 ohm resistance to the left-hand side of the .01 condenser, and join the short flex from the other side of this condenser to the loud-speaker terminal No. 1. The flex on right-hand terminal "F" on the speaker is next connected to the 2.5 terminal and the long flex on speaker terminal No. 1 is passed down through the hole in the shelf ready for connection to the pentode. A similar length of flex is now joined to the aerial terminal and taken down to terminal A on the base of the Leweos coil.

A "Practical Wireless" Free
Advice Guaranteed Set!

Connecting the Valves

The Cossor rectifying valve is inserted in the socket on the shelf and the S.G. valve (the metallized one) is inserted in the right-hand socket, marked V1. The L.F. pentode is inserted in V2, and the lead hanging from the shelf is joined to the terminal on the side of the base. The short flex on the H.F. choke must now be attached to the terminal on top of the S.G. valve and the receiver is now ready for its preliminary test out. The plug of the Mains connector must, of course, be supplied with a length of flex suitable for connection to the nearest mains socket in the house, and this should be plugged into the socket at the rear of the shelf. Now switch on, and the dial should light up. If all is well, after a short interval of about 15 seconds, a very faint hum will be heard from the loud speaker. If at the end of 30 seconds no hum can be heard with your ear quite close to the speaker grille, you should switch off and make quite certain that the house socket is alive and that all connections are intact. Remember, however, that the valves take at least 15 seconds to obtain the necessary temperature for emission, and that the receiver is "dead" for this period. As soon as the faint hum can be heard, the tuning knob should be slowly turned. The



main tuning knob is the section nearest the cabinet and the local station should soon be heard. When it is found, turn the front part of the tuning knob to obtain the best signal strength, and there should be a definite position for this, on each side of which the strength falls off. If you find, however, that this small knob has to be turned to its maximum position to either right or left, turn the cabinet round and with a thin piece of wood carefully push round the star-wheel on the rear of the variable condenser. This must be set so that on any station the rotation of the small condenser knob to right or left results in a decrease of signal strength. The wavechange switch on the side of the cabinet will enable the long or short waves to be received, and the upper knob on this side will bring up the strength of the distant stations. There are no other adjustments and the receiver is, therefore, an ideal one for general household use, being practically a one-knob receiver. At least a dozen stations can be heard by mere rotation of the tuning knob, although, as pointed out in the preliminary remarks, the receiver is designed primarily for those who wish to have a neat, small, self-contained receiver which will give a choice of two or three programmes at really high quality and good volume with a minimum of expense. As with all PRACTICAL WIRELESS receivers, if you are in any difficulty, drop a line to us, marking your envelope "A.C. Twin," and you will receive a reply by return, for which no charge is made. Finally, remember that this is yet another Guaranteed Receiver.

COMPONENTS FOR THE A.C. TWIN

One Leweos Band-Pass Filter, Type 51, B.P.F./R.
One Polar Uniknob 2-Gang Condenser, .0005.
One Igranite Transformer, Type T/24/B.
One Lotus .0003 Reaction Condenser.
One Bulgin Standard H.F. Choke (H.F.9).
One Varley 300 Henry L.F. Choke (D.P.16).
One .0001 fixed Condenser (Type S), T.C.C.
One .001 fixed Condenser (Type S), T.C.C.
Two .01 fixed Condensers (Type 34), T.C.C.
Three 1 mfd. fixed Condensers (Type 50), T.C.C.
One 2 mfd. fixed Condenser (Type 50), T.C.C.
Two 4 mfd. fixed Condensers (Type 84), T.C.C.
Two 5-pin valve-holders (Clix Chassis type).
One 4-pin valve-holder (Clix Chassis type).
One 3 megohm Erie Resistor.
One 12,500 ohm Erie Resistor.
One 400 ohm Erie Resistor.

One 2,500 ohm Erie Resistor.
One 30,000 ohm Erie Resistor.
One 10,000 ohm Erie Resistor.
One 15,000 ohm Erie Resistor.
One Heayberd Mains Transformer (Model A.C. Twin).
One Gramspan Energized Speaker, Type E.1.
One Bulgin Mains Toggle Switch, Type S.80.
One Bulgin Small Mains Connector, Type P.21.
One Clix Terminal Strip.
Two Clix Wander Plugs (One black and one red).
One Cossor 442 B.U. Rectifying Valve.
One Cossor MS-PEN-A (H.F. Pentode Valve).
One Cossor MP-PEN (Pentode Out-put Valve).
One Smith Lyric Cabinet.
One coil Glazite, 3 yards red and black flex, screws, bulb for panel light, etc.

THE MOST NOVEL
PORTABLE YET!

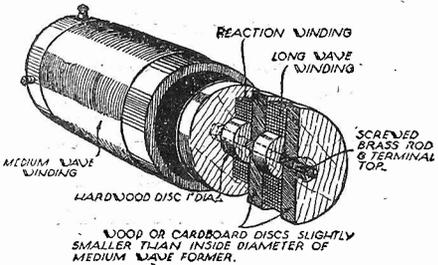
FREE FULL-SIZE BLUEPRINT NEXT WEEK!

THE HALF-GUINEA PAGE

Radio Wrinkles FROM READERS

Home-made Coil Construction

A TYPE of dual wave tuning coil popular with home constructors is made with a paxolin former on which are fixed cardboard or plywood flanges between which the reaction and long wave windings are wound. No doubt many have discovered

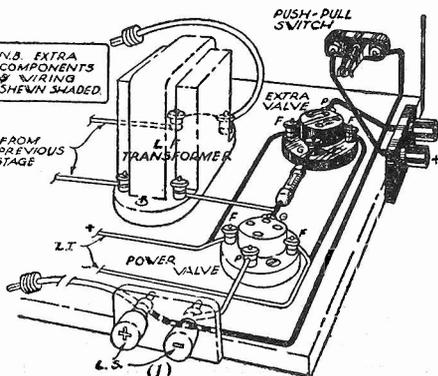


A neat method of making a dual-wave coil.

that cutting the flanges to fit well is a tedious job. A neater method is to make a bobbin on which to wind the long wave and reaction windings. To construct the bobbin cut three discs from cardboard or plywood the diameter of the inside of the former and two discs about 1 in. diameter and 1/4 in. thick. The smaller discs may be cut from a cotton reel or a cork. Holes are made in all the discs which are then threaded on to a bolt, first a large disc, then a small one, and lastly the nut. The bolt should be about 1/4 in. longer than the thickness of the completed bobbin. The windings having been put on, the bobbin is pushed inside the former and the ends of the windings connected to the terminals on the former, allowing sufficient wire to enable the bobbin to slide from one end of the former to the other. This is a great advantage as it renders it possible instantly to find the position which will give the smoothest reaction. A terminal may be screwed on to the bolt by which means it is easy to slide the bobbin up and down.—READER (London).

Output Valves in Series Parallel

INSTEAD of using two ordinary valves in parallel with a negligible increase in volume, the following method may be of interest. An extra valve-holder, switch, and terminals are mounted, and connected in "series-parallel," as shown. Thus the speakers (2) are wired, one in each anode circuit, and when the switch is open L.S.1



Connecting output valves in series-parallel.

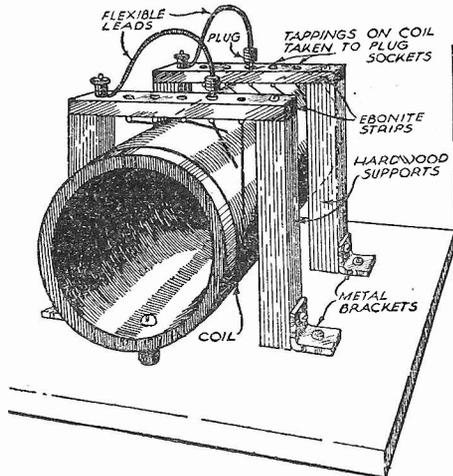
THAT DODGE OF YOURS!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

is working, and when closed, both valves and both speakers are working, with a consequent increase in volume. The second loud-speaker may well be mounted in another room, when the increased output will more than compensate for the long leads.—G. E. WALCHON (Derby).

Tapping Home-made Coils

MANY constructors may have experienced a difficulty in tapping home-made coils, and I have found this little device very useful for the purpose.



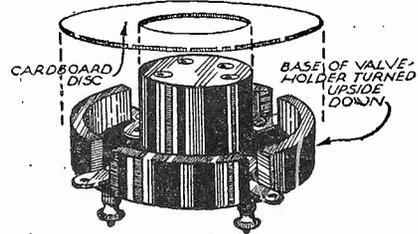
Mounting and tapping a home-made coil.

All it consists of is two strips of ebonite (about one inch wide and varying in length according to the size of the coil) mounted on some strips of wood, some sockets, and two ordinary plugs. The construction, as will be seen from the sketch, is very simple, and does not need very much explanation. After boring the holes and inserting the sockets in the ebonite, mount this on the strips of wood which have been previously fixed to the baseboard by means of small angle brackets. Wires can now be soldered from the required taps on the coil to the sockets. When another tapping is required on the coil, the plug is simply put into a different socket, according to the number of turns it is desired to take in.—K. F. FRIENDSHIP (Harpenden).

FREE FULL-SIZE BLUEPRINT OF A NOVEL LIGHTWEIGHT CLASS B PORTABLE NEXT WEEK!

Adapting Valve-holders for Chassis Mounting

WHEN wanting some chassis mounting valve-holders, but only having the ordinary kind on hand, I turned them inside out by removing the nuts and screws and taking the four-pin socket out of the



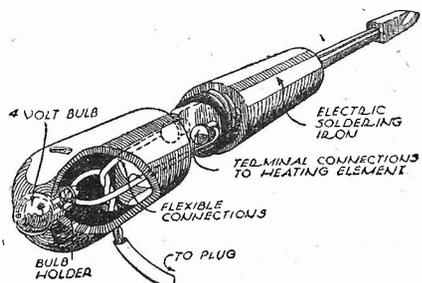
Adapting an ordinary valve-holder for chassis mounting.

terminal ring. I then turned it the other way round and screwed it back, as shown in sketch. If turned round the right way the grid and plate will go in their own places, only the filament pins being reversed. Most of these holders will fit a one-inch hole in the chassis, and on a metal chassis, to prevent shorts, it will be advisable to cut a cardboard ring to fit round the socket and over the springs.—H. CHURCHMAN (London).

For Users of Electric Soldering Irons

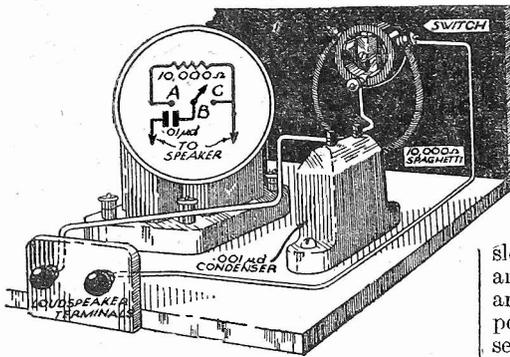
NOWADAYS, when one has to watch the pence totalling up on the meter, this threefold wrinkle should prove useful. It provides a visual indication that the soldering iron is on, prevents your wasting current and getting burnt, and acts as a local fuse, which is quickly replaced. Remove screw-cap and detach flex from terminals, drill out flex entry hole to fit a small saddle type torch bulb holder, remove saddle and connect one flex end to bottom terminal of bulb; connect about 2 in. of flex to side terminal of bulb. Push holder into hole from inside cap until flush with outside, then connect the flex to the terminals on iron, as depicted in the sketch. A fresh entry hole for the flex can be drilled through the side of the cap. Assemble handle and insert a 4-volt torch-bulb, switch on and this will light up, whilst the iron is on. The average electric iron takes about 75 watts or .26 amperes at 240 volts., which is sufficient to light the bulb filament. Should your iron take more or less current, a little experiment in different sized bulbs will be necessary. L. GEORGE (Margate).

(Continued overleaf.)



Fitting an indicator to an electric soldering iron.

RADIO WRINKLES
(Continued from previous page.)



Simple device for controlling frequency response.

Controlling Frequency Response

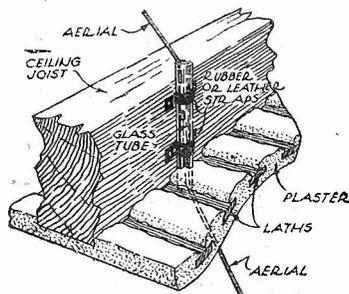
I HAVE recently discovered a simple device for controlling the frequency response of a receiver which uses a pentode valve. The novelty of this tone control lies chiefly in the method of control used, as the customary condenser and resistor form the basic circuit. The parts required are as follows:—

- 1 .01μ condenser.
- 1 10,000 ohm resistor.
- 1 Single-pole change-over switch.

The first two parts may be already incorporated in the receiver, when the switch only would be required. The condenser and resistance should be disconnected and wired as shown. When the switch shorts B and C, the tone will be deep and mellow; when it shorts A and B, the tone will be normal, but when the switch remains central, the tone will be brilliant, due to the uncorrected pentode valve. The two terminals should be connected across the loud-speaker, as indicated, or, better still, the output choke or transformer. It may be used in the first L.F. stage by connecting the terminals across the L.F. transformer secondary winding. This system is also applicable to Q.P.-P. when it is connected across the loud-speaker transformer input terminals.—A. MACIVER (Leicester).

Down-lead Tube for Loft Aerial

WHEN taking a down-lead from an aerial in the roof space, care should be taken in bringing it through the ceiling. A convenient method of doing this is shown in the accompanying sketch. Secure a strong glass tube, and make a hole in the ceiling, big enough to push the tube through, at the side of one of the joists and fix the tube as shown in sketch by means of strips of rubber or leather. The aerial can then be taken through the tube and led straight to the set without a break

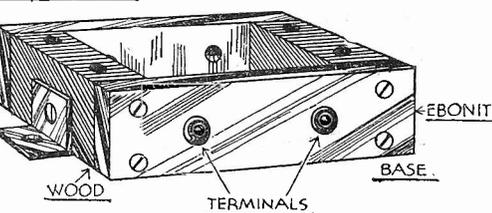
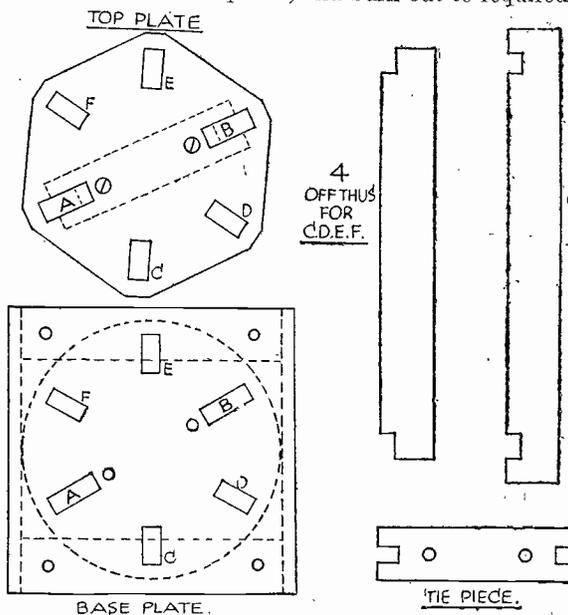


Method of taking a down lead through a ceiling.

and without fear of damaging the plaster of the ceiling if the aerial should start swinging.—WILLIAM MUTRHEAD (Falkirk).

Making Coil Formers from Scrap Ebonite

THE accompanying sketches show a method of turning scrap pieces of ebonite into a useful coil former. I have omitted all dimensions as these will depend on size of coil and thickness of ebonite, but it will be noticed that the slots in the top, and baseplate, marked A and B, are the full width of the strut. These are the fastening struts which are held in position by the notch at each end, and by a secured tie piece (marked in dotted lines) secured by two small bolts. Terminals can be fitted on the two ebonite sides of the base for the winding connections. To obviate filing the slots marked off top and baseplate, and drilled holes for tie pieces. The parts are bolted together with two small bolts. Drill two or three small holes where slots are required, and burn out to required

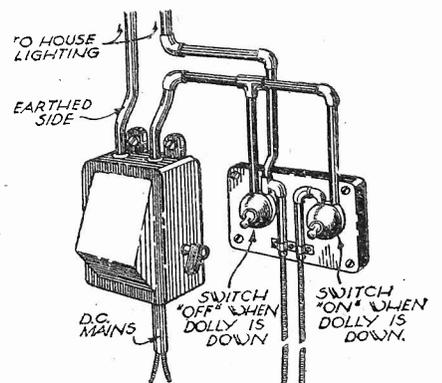


Details of a coil former made from scrap ebonite.

size with a file tang heated in a fire; clean up and fit strut finally with a small file. With the aid of data sheets No. 5 and 6 any amateur should be able to make an efficient dual wave tuner.—J. W. HESLOP (Sunderland).

Switching Arrangement for Accumulator Charging

THE accompanying sketch shows a handy switching arrangement that I have successfully rigged up for accumulator charging from D.C. mains. The advantages of this arrangement are that standard tumbler switches are used; minimum cost; absolute safety is assured for operator; no interference with house lighting when changing over, and all connections are made in the switches themselves, thus avoiding outside connectors. It will be noted that one switch



A handy accumulator switching arrangement.

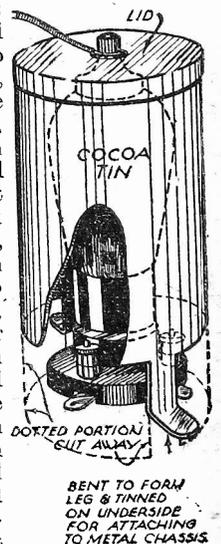
is inverted to enable the dollies to be raised or lowered together, thus facilitating a bar connector to absolutely ensure that accumulator is not shorted.—W. JONES (Smethwick).

Set Sales

ACCORDING to figures recently published, relating to the number of complete receivers sold in this country during the past year, battery and mains sets have sold in almost equal numbers—653,000 as against 684,000 to be exact. As one might expect, the three-valve has been most popular, and its sales have actually been greater than those of all other types combined. Surprising though it may seem, the two-valve set has proved to be second in popularity. It is interesting to note that the sale of superheterodynes has by far exceeded that of any previous year. This is hardly to be wondered at in view of their extremely low prices and undisputed advantage in the way of selectivity, and I should not be surprised to find the superhet. actually rivalling the three-valver in a couple of years or less. I believe that in America this kind of set is by far the most popular even at the present time.—F.P.

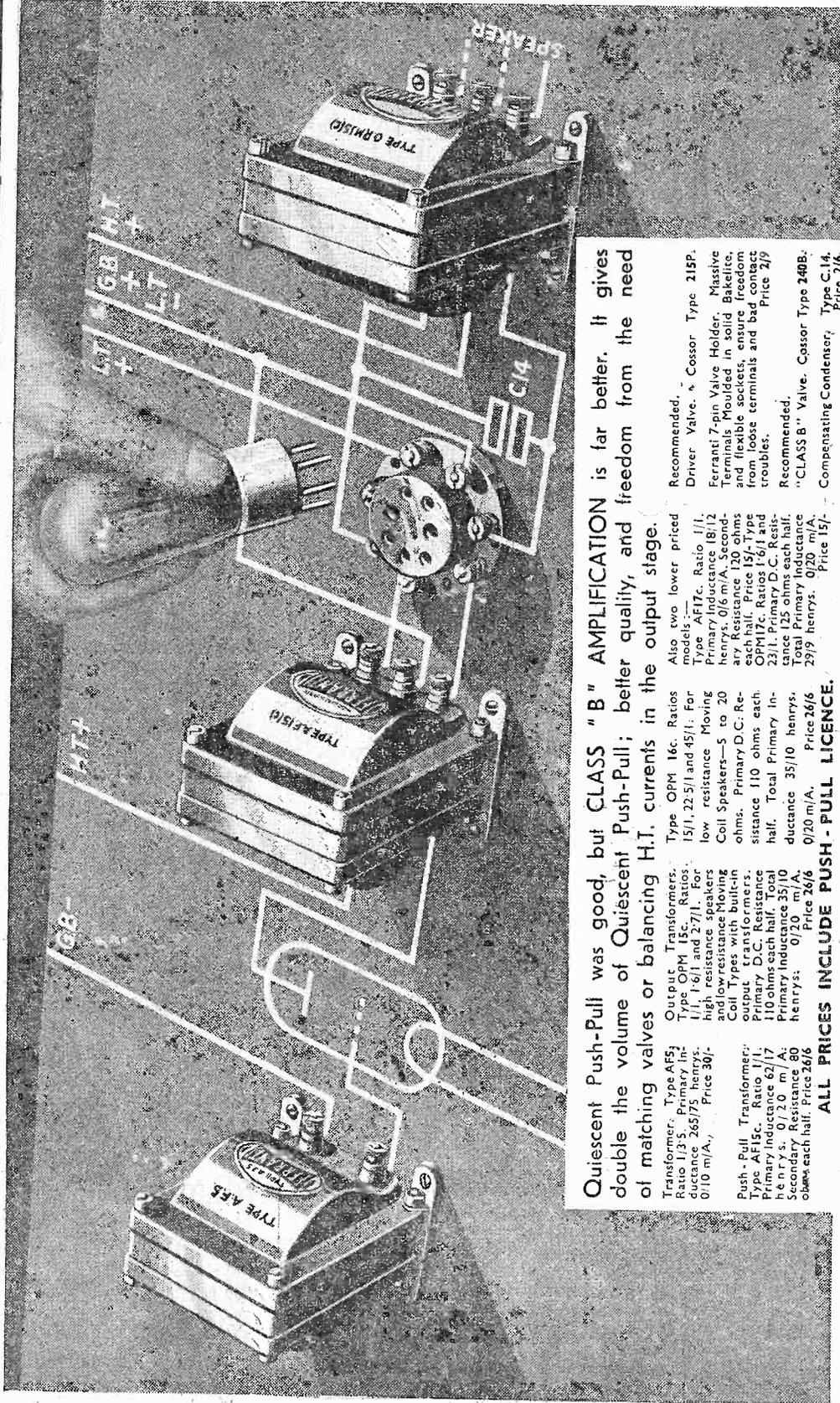
A Cheap and Efficient Valve Screen

HERE is a useful hint regarding valve screens that will be found most useful besides being economical. Procure a tall tin that will clear the soldering tags on the valve holder—a ½lb. cocoa tin meets these most useful requirements perfectly. Remove the paper round the tin, cut along the dotted lines as shown in sketch and then bend the two "legs" at right angles, about ½in. up. Tin the underside of each foot, smear a little flux on the chassis or metal baseboard, press a hot iron on and then you have a securely fixed, efficient screen with ample room to get to the valve terminals, and a negligible danger of "shorts." To finish off the job, take off lid and hammer out the printing, drill a hole in the top just big enough to take the terminal stem or screened lead which will automatically earth itself against the lid.—A. S. HALE (Clapham).



FERRANTI

CLASS B AMPLIFICATION AND



Quiescent Push-Pull was good, but CLASS "B" AMPLIFICATION is far better. It gives double the volume of Quiescent Push-Pull; better quality, and freedom from the need of matching valves or balancing H.T. currents in the output stage.

Transformer, Type AF5; Ratio 1/3.5; Primary inductance 265/75 henrys; 0/10 m/A. Price 30/.

Push-Pull Transformer, Type AF15; Ratio 1/1; Primary inductance 62/17 henrys; 0/20 m/A; Secondary Resistance 80 ohms each half. Price 26/6.

Output Transformers, Type OPM 16c; Ratios 15/1, 22.5/1 and 45/1; For high resistance speakers and low resistance moving coil types with built-in speakers. Primary D.C. Resistance 110 ohms each half. Total Primary inductance 35/10 henrys; 0/20 m/A. Price 26/6.

Type OPM 16c; Ratios 15/1, 22.5/1 and 45/1; For low resistance Moving Coil Speakers—5 to 20 ohms. Primary D.C. Resistance 110 ohms each half. Total Primary inductance 35/10 henrys; 0/20 m/A. Price 26/6.

Type OPM 17c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 18c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 19c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 20c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 21c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 22c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 23c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 24c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 25c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 26c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 27c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 28c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 29c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 30c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 31c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 32c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 33c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 34c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 35c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 36c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 37c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 38c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 39c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 40c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 41c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 42c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 43c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 44c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 45c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 46c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 47c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 48c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

Type OPM 49c; Ratios 1/6/1 and 23/1. Primary D.C. Resistance 25 ohms each half. Total Primary inductance 29/1 henrys; 0/30 m/A. Price 15/.

Type OPM 50c; Ratio 1/1; Primary Inductance 18/12 henrys; 0/6 m/A. Secondary Resistance 120 ohms each half. Price 15/.

ALL PRICES INCLUDE PUSH-PULL LICENCE.

FERRANTI LTD., HOLLINWOOD, LANCASHIRE. London: Bush House, Aldwych, W.C.2.

FERRANTI COMPONENTS

The latest and greatest boon to the Battery-set builder.



The Pentode Valve

By H. T. GODLEY, F.R.A.

In this article the author deals with the various methods of coupling, and tone control of modern pentode valves.

THE history of the development of the thermionic valve is marked by a series of achievements which stand out as milestones along the path of radio progress. One of these milestones, the Pentode, is now in universal use, and it is thought that a simple explanation of its construction and the way in which it differs from the ordinary output valve, may be of interest. Furthermore, as the full benefit from a pentode is not derived by merely inserting it into the last valve-holder, the various methods of coupling the pentode to the loud-speaker, methods of tone-control, etc., are discussed fully.

Evolution of the Pentode

Perhaps it will be as well to commence by explaining how the pentode came by its name. Any valve which contains only two electrodes, the filament and the anode, such as the early Fleming valve, and the modern half-wave rectifying valve, is known as a "diode." Hence the term "diode-rectification" in which a two-electrode

pentodes are sometimes used as detectors, and even as H.F. amplifiers, but as such, their use is at the present time chiefly confined to America, where they are known as R.F. (radio-frequency) pentodes.

The general theory of the thermionic valve has already been fully discussed in previous articles, and it is therefore necessary for me to touch only very briefly on the functions of the usual three electrodes as contained in the triode.

Function of the Triode

The filament, upon being heated from an accumulator, emits a copious stream of negative electrical particles which are termed "electrons." Largely by virtue of

briefly the principle upon which the valve amplifies.

Now as I have already said, the grid is composed of fine wire mesh almost like a cage between the filament and the anode, and as the electrons have to pass through the grid, obviously the closeness of the mesh affects very considerably the characteristics of the valve. For example, the super-power valve is a "low-impedance" valve, i.e., the mesh of the grid is so open that it offers little resistance or impedance to the electron flow which, in practice, results in the fact that such a valve will handle fairly large grid-swings and will deliver a considerable undistorted output, but it will not amplify to any great extent the signals impressed on its grid.

Therefore, the closer the mesh of the grid, the higher is the impedance and, consequently, the greater is its amplification factor. It follows, therefore, that an ordinary power valve with a fairly high impedance will have a larger amplification factor and will amplify weak signals to a greater degree than would a super-power valve. On the other hand, the super-power valve will handle a stronger signal input without distortion and will deliver a much greater undistorted output.

The pentode valve possesses the advantages of both types of valve—it is much more sensitive to weak signals than a low-impedance triode, and yet, for a given grid-swing, will deliver a much greater, undistorted output than the triode. This happy result is achieved by the use of the two additional grids already referred to, the "screen" and "suppressor" grids. In order to explain the functions of these grids, it is necessary to consider the S.G. tetrode.

Amplification Factor

I have already made it clear that the closer the mesh of the grid, the higher is the amplification factor, but it will be easily appreciated that in endeavouring to obtain extremely high magnification, a point

occurs where the mesh is so close that it forms a definite barrier to the electron stream, thus preventing the flow of current from filament to anode and rendering the valve useless. This difficulty is overcome in the S.G. valve, by interposing between the control-grid and the anode an additional grid, the "screen." This additional grid is maintained at a potential of some 75 volts.

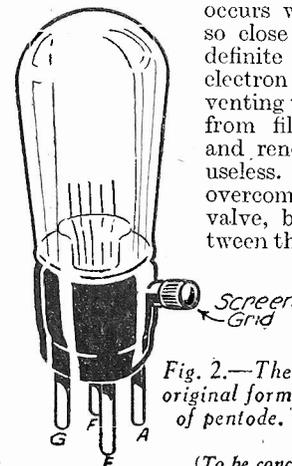


Fig. 2.—The original form of pentode.

(To be concluded next week—Ed.)

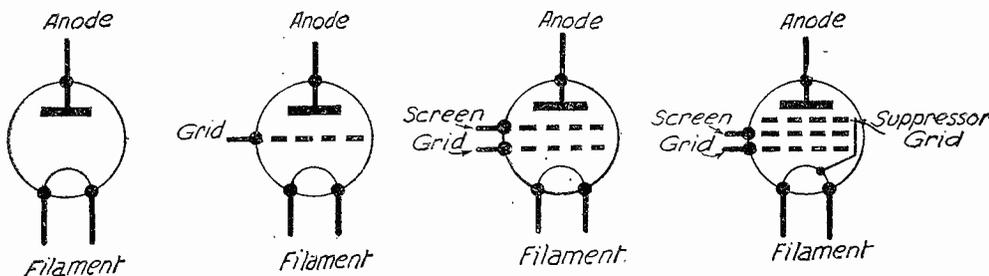


Fig. 1.—The evolution of the pentode valve.

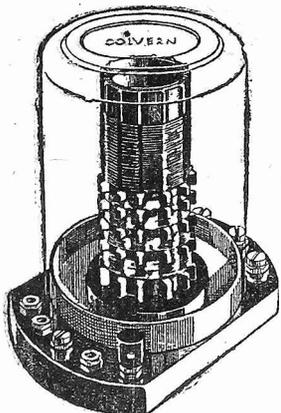
valve is used for detection. The first really practical wireless valve, was actually the Fleming diode into which a third electrode, the grid, has been introduced. As the valve now possessed three electrodes, it became known as the "triode" which type of valve is still, of course, widely used. Then, in order to obtain extremely high amplification for high-frequency valves, an additional grid was introduced into the triode, and now having four electrodes, the valve was known as the "tetrode"—the familiar S.G. valve.

Attention then turned to the output stage, and in order to obtain much greater sensitivity and amplification than was possible with a triode output valve, the tetrode was modified by the addition of yet another grid, as will be explained later, and now possessing five electrodes, was logically enough, termed the "pentode." The pentode is then primarily an output valve possessing five electrodes, the filament, and anode, the control-grid, and two additional grids which are termed respectively the "screen" or "auxiliary" grid and the "earth" or "suppressor" grid, as shown both symbolically and pictorially in Fig. 1. I have said that the pentode is primarily an output valve; that is so, but

the fact that the anode is maintained at a high positive potential, these electrons are attracted through the vacuum existing in the valve to the anode, and this steady electron stream is the "anode-current." The normal or "control" grid, is interposed in the valve in such a way that the electrons on their way from the filament to the anode, have to pass through the fine wire mesh or gauze of which the grid is composed.

When there is no signal from the preceding valve, this electron stream remains at a constant value, and is called the "standing" or "quiescent" anode-current. But when a signal is being received from the aerial or from the preceding valve, the grid potential becomes alternately positive and negative in sympathy with the signal oscillations. When the grid potential is negative, the presence of the grid tends to keep back some of the electrons, but when it is positive, the reverse is the case and the electron flow is greater than when no signal is being received. Thus the anode-current oscillates in sympathy with the signal oscillations impressed on to the grid, and therefore small voltage changes in the grid circuit produce comparatively large voltage changes in the anode circuit, and that is

You must have a



**COLVERN
TD COIL**
for the

**“Selectone A.C.
Radiogram”**

*Selectivity and quality combined
in this receiver.*

*Super Selectivity is vitally necessary
under present-day broadcasting con-
ditions. This is achieved with the
Colvern TD Screened Coil.*

*Four Alternative Tappings are provided.
They are arranged as sockets with a
wander plug, giving varying degrees of
selectivity. The first two tappings give
aerial couplings similar to those
normally employed but with greatly
increased selectivity. Nos. 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
EACH**

*Send for the Colvern
circuit booklet, RL 10.*

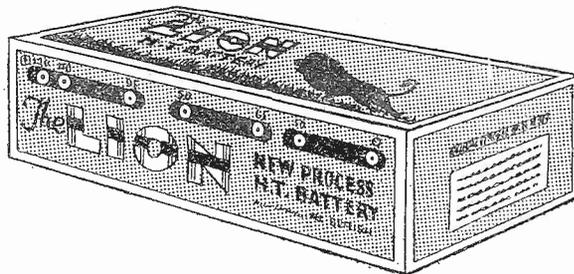
**COLVERN
LIMITED**

**MAWNEYS RD., ROMFORD,
ESSEX.**

**LONDON WHOLESALE DEPOT:
150, KINGS CROSS ROAD, W.C.1.**

*“... charging an army ... while
all the World wondered.”*

BALACLAVA, June 18th, 1854



*The Lion Patent H.T. Battery does not charge an army—
but it charges your set with lasting energy—while all the
world wonders how such a superlative Battery can be pro-
duced at prices which show such a saving.
The Lion Patent H.T. Battery has the lowest internal
resistance of any battery. Fit one to-day and notice the
all-round improvement in your set's performance.*

LION

**Patent H.T.
BATTERY**

BRITISH MADE

*Sold under
Limited Licence*

LOW Prices!

60 Volt H.T.	4/6
100 Volt H.T.	7/-
120 Volt H.T.	9/-
9 v. G.B.	10 d.
4½ v. Pocket Lamp Battery	4½ d.

Also all types of torch and dry-valve batteries.

**VINCES DRY BATTERIES LTD., LION WORKS,
GARFORD STREET, LONDON, E.14. 'Phone EAST 1902.**

LAST week preliminary details of the "Selectone Two" were dealt with and simple instructions for building the instrument are now given.

The constructional work is perfectly straightforward, as can be gathered from the photographs and from the complete wiring plan, Fig. 3. It is best to commence by drilling the panel according to the scale drawing in Fig. 2. The positions of the four holes for the switches and tone control potentiometer are clearly indicated in the latter figure whilst those for the spindle and escutcheon of the tuning condenser are most easily obtained by using the metal template conveniently supplied with this component. The template should be laid on the back of the panel and the holes marked through by means of a scribe or sharp pencil. A circular hole is required for the spindle, and is made in the usual way with a brace and bit. The opening for the escutcheon plate, however, is of irregular shape and can best be made by drilling a series of small holes just inside the lines and then cutting between them with a sharp knife or chisel; the rough edge can finally be smoothed with a half-round file.

The arrangement of baseboard components can readily be followed by reference to the wiring plan and photographs. Half-inch screws are suitable for mounting everything except the L.F. transformer (to which the "Tone Compensator" is attached), and for this two 1 1/2 in. (8's) screws are required. The only parts which are not screwed down to the baseboard are the four fixed resistances, which are mounted directly by means of their connecting wires.

Wiring

Little explanation seems necessary in regard to the wiring; it is straightforward, and there will be no difficulty in following it in Fig. 3. The majority of connections are made in Glazite insulated wire, but those between the filament terminals of the valve holders and corresponding terminals on the transformer are in twin

flex. Two flexible wires are attached to the smoothing choke instead of the more usual terminals, and these are, of course, joined directly to the other components. Nearly all the wires are secured under the heads of terminals, but there is a variation of this method in respect to the tuning condenser; this is not fitted with terminals, but has two tubular soldering tags instead. The wires may be soldered to the latter, if desired, or may be attached by inserting them into, and nipping up, the tubular tags. Notice that a wire is taken from one of the holding-down screws of the H.F. choke to high tension negative; the object of this is to "earth" the metal screen.

One wire from the mains flex is attached to the .5 amp fuse, whilst the other must be taken to one of the three primary terminals on the mains transformer, marked "200v." "230v." and "250v.," respectively. Naturally, connection must be made to that terminal which is appropriate to the mains voltage available. In case the latter is not exactly the same as that marked on any terminal the wire should be joined to the one which most nearly corresponds to the mains voltage. For example, if the voltage were 220, the wire would be taken to the "230v." terminal, or if it were 240, connection could be made to either of terminals "230v." or "250v."

Operating Note

Having completed the constructional work you will be ready to give the set a thorough test. Insert the metallized valve in the left-hand holder and the power valve in the other one. Connect the earth lead and then an external aerial or the mains aerial tapping. It now only remains to put the plug of the mains lead into a convenient lamp-holder and to switch on. Switching is, of course, done bottom right-

SELECTONE A.C.

action condenser; that is, clockwise rotation increases reaction whilst an anti-clockwise movement produces the opposite effect. Start, then, by turning the reaction knob to its central position and rotating the tuning dial until the local station is heard. Next the strength can be adjusted as necessary by means of the



By FRANK...

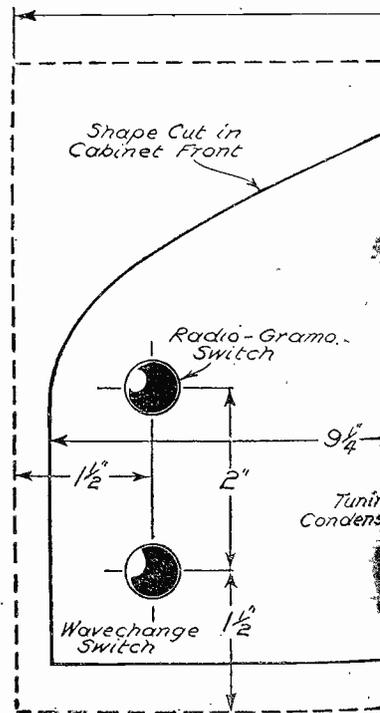


Fig. 2.—This drawing shows the shape cut in the cabinet front. A "PRACTICAL WIRELESS"

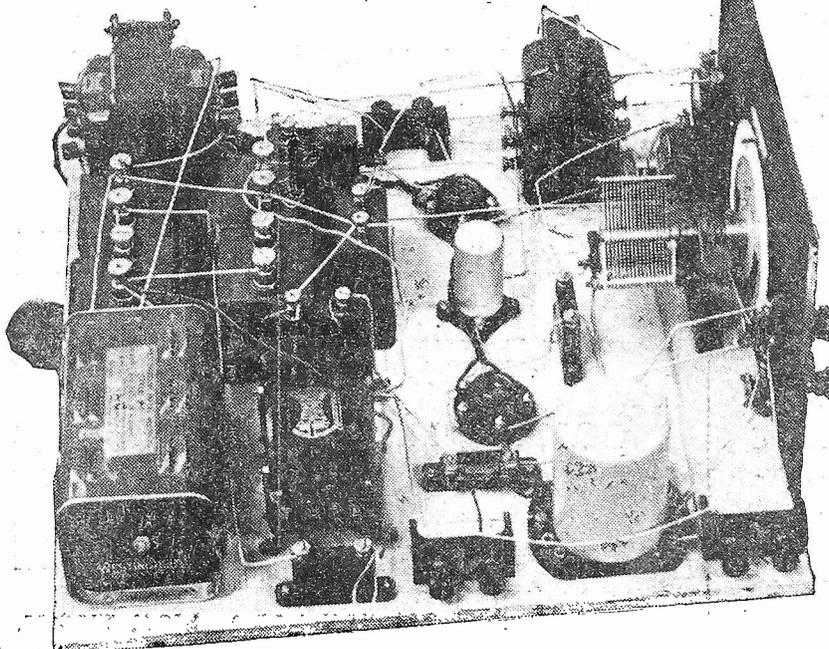
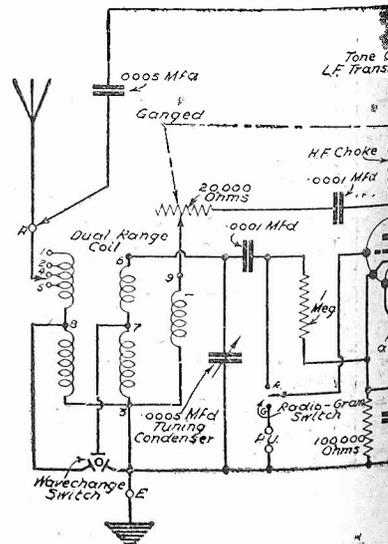


Fig. 4.—This view shows the simple component lay-out. It can be seen that the mains equipment is mounted all together at the back of the baseboard.

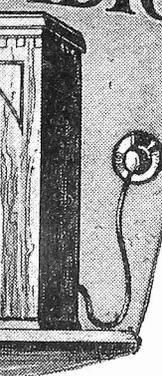
Switching is, of course, done bottom right- by means of the hand knob; the first slight movement closes the contacts, and any subsequent rotation affects reaction control. For "radio," the top left-hand switch knob is pulled out, when the lower switch sets the tuner for long waves (pushed in) or medium waves (pulled out).

Tuning

The method of tuning is the same as with any ordinary type of detector-L.F. set, and the variable resistance used for reaction is operated in precisely the same way as is a re-



RADIO-GRAM TWO



reaction control. It might be added at this juncture that the set can cause interference to neighbouring listeners if it is allowed to oscillate, and, in consequence, reaction should be slacked off at the first signs of a whistle. Having suitably adjusted the volume, try the effect of the tone control. By turning the potentiometer knob to the

ON, F.R.A.

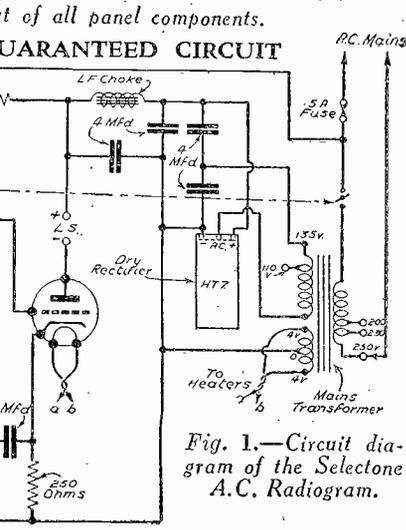
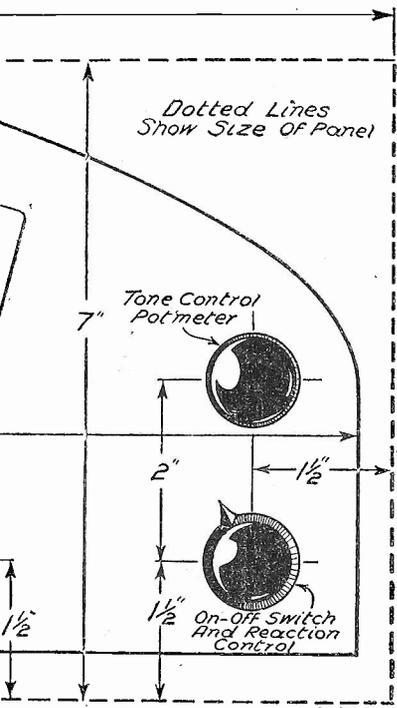


Fig. 1.—Circuit diagram of the Selectone A.C. Radiogram.

right there should be an increase in high-note response and a consequent reduction in bass; rotating the knob in the other direction gives a reverse effect. It should be noted that variation in tone alters to a certain extent the overall volume, and this is at a maximum when the control is set to its midway position.

Adjusting the Selectivity

As previously mentioned, the degree of selectivity can be varied by inserting the coil plug into different sockets. The least amount of selectivity and, incidentally, the greatest volume, is obtained when the plug is in socket number "1"—by putting it into sockets "2," "4," and "5," the degree of selectivity is progressively increased and there is a corresponding loss in maximum volume. When using the mains as aerial it will probably be found best to put the plug into socket number "1," but in the case of an outside aerial its best position will be dependent entirely upon the length and characteristics of the particular aerial in use; a certain amount of experimentation will, therefore, be necessary in this respect.

Results

In describing the results obtained from the "Selectone A.C. Radio-Gram. Two" over fairly lengthy tests I am not going to give a long list of stations received. I have actually brought in a fair number even when using the mains aerial, but I much prefer to consider this set as an ideal "quality" receiver for local work. There has always been an ample volume of really good well-balanced reproduction from at least three stations (the two locals and Daventry); by setting the reaction control "full-on" the volume has been found to be more than sufficient easily to fill a very large room, whilst it could be reduced to little more than a whisper by slacking-off reaction and putting the coil plug into socket "4" or "5."

It might be of assistance to mention the approximate tuning positions of a few stations, since they will give you some idea as to where your own local transmitters are to be found. On the medium wave-band (switch pulled out), London National comes in at 60 degrees, Scottish National at 80 degrees, North National at 90 degrees, London Regional at 115degrees,

Scottish Regional at about 120 degrees, Midland Regional at 135 degrees, and North Regional at 150 degrees. On long-waves, Daventry is received at about 150 degrees and Radio-Paris at 165 degrees.

Aerial and Earth

It has been found very important that a really good earth lead should be employed, but the aerial is of much less consequence, especially within thirty or forty miles of the local station; up to such distances the mains aerial is perfectly satisfactory and probably better than a short indoor one. At least, this has proved to be the case with the mains on which the set has been tested, but it should be pointed out that occasionally one finds that a particular mains supply is unsatisfactory for use as an aerial, due to the fact that it carries a good deal of H.F. current, which produces an unpleasant hum, or some kind of instability. In a case of this kind it is generally better to employ an external aerial, although an improvement can often be obtained by connecting a suitable H.F. choke in series with each supply lead—special chokes are made for this purpose, since those of the usual type are incapable of carrying the necessary current.

If you wish to make up these chokes yourself, you will require for each choke a piece of ebonite or paxolin tube 3in. long by 1 1/4in. in diameter. The winding of each choke consists of 100 turns of No. 22 D.C.C. wire. The ends should be anchored, and the two coils should be mounted at right-angles to one another, and then, to avoid the risk of shocks, they should be enclosed in a small wooden box. Two input leads, and two output leads of heavy flex, or, alternatively, an input and output mains socket, completes the unit.

The method of mounting and connecting the gramophone motor and pick-up will be described in the next article.

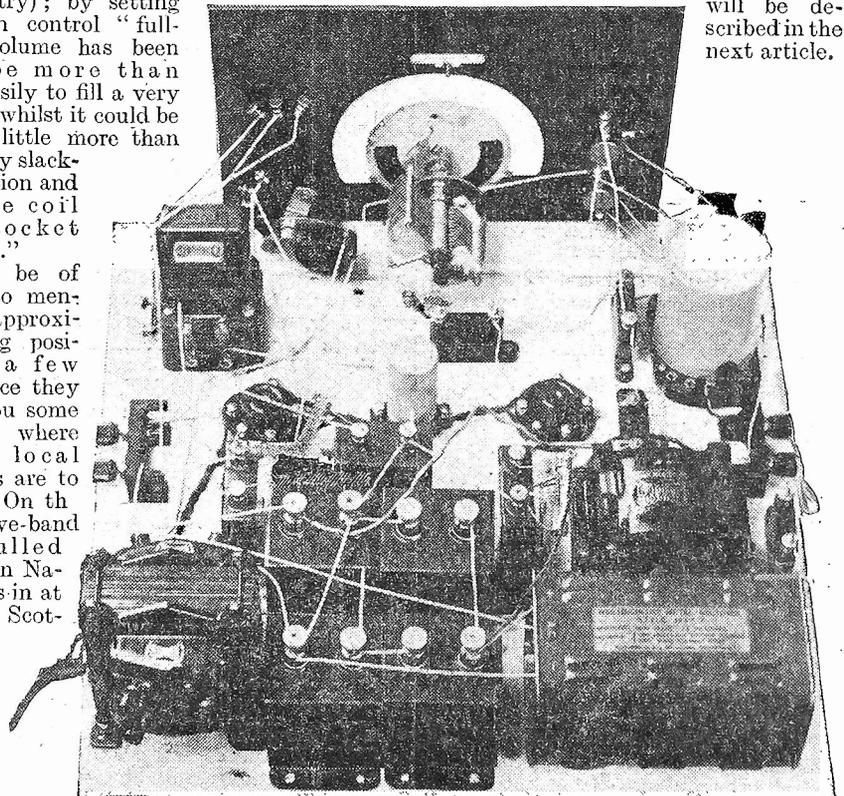


Fig. 5.—Here you see the set itself removed from the cabinet—Simplicity and ease of construction are the keynote.

COMPONENTS FOR THE SELECTONE A.C. RADIOGRAM

- 1 Polished Plywood Panel, 10in. by 7in. (supplied with Cabinet specified).
- 1 5-ply Baseboard, 15in. by 14½in. (supplied with Cabinet specified).
- 1 Utility "Mite" .0005 mfd. Condenser with disc drive.
- 1 "Wearite" 3-point Wavechange Switch (Type G.W.C.).
- 1 "Wearite" Changeover (Radiogram) Switch (Type G.C.O.).
- 1 "Wearite" 20,000 ohm volume control with combined Mains Switch.
- 2 Lotus 5-pin Valve Holders.
- 1 Colvern Type "T.D." Coil.
- 2 Dubilier .0001 mfd. Fixed Condensers.
- 1 Dubilier .0005 mfd. Fixed Condenser.
- 1 Graham Farish Ohmite 1 megohm Grid Leak.
- 1 Graham Farish Horizontal Grid Leak Holder.
- 1 "Wearite" Screened H.F. Choke (Type H.F.P.).
- 1 Lissen "Hypernik" L.F. Transformer.
- 1 Lissen "Tone Compensator."
- 3 Belling-Lee Terminal Mounts.
- 6 Belling-Lee Type "R" Terminals, 2 marked "Pick-Up" and 1 each marked "A," "E," "L.S.+", "L.S.-".
- 1 Heyberd Type W.25 Mains Transformer, giving outputs of 135 volts, 70 mA. and 2-0-2 volts, 4 amps.
- 1 Heyberd Type 751 Smoothing Choke.
- 1 Westinghouse Style H.T.7 metal Rectifier.
- 4 Dubilier (400 volts D.C. working) 4 mfd. Condensers.
- 1 Dubilier (400 volts D.C. working) 2 mfd. Condenser.
- 2 Dubilier (400 volts D.C. working) 1 mfd. Condensers.
- 1 Belling-Lee Fuseholder with .5 amp. fuse.
- 1 Graham Farish Ohmite 100,000 ohm, 1 watt Resistance.
- 1 Graham Farish Ohmite 50,000 ohm, 1 watt Resistance.
- 1 Graham Farish Ohmite 1,000 ohm, 1 watt Resistance.
- 1 Graham Farish Ohmite 250 ohm, 1 watt Resistance.
- 1 Heyberd Mains Flex with Lamp Adaptor.
- 2 Coils Glazite, screws, short length flex.
- 1 Mazda A.C.2 H.L. Valve, metallized.
- 1 Mazda A.C.P. Valve.
- 1 Simpsons Electrical Turntable.
- 1 Becker Q.M.B. On-Off Switch.
- 1 B.T.H. "Minor" Pick-up.
- 1 Celestion "Soundex" Speaker Chassis.
- 1 "Camco" Selectone-Telegram Cabinet.

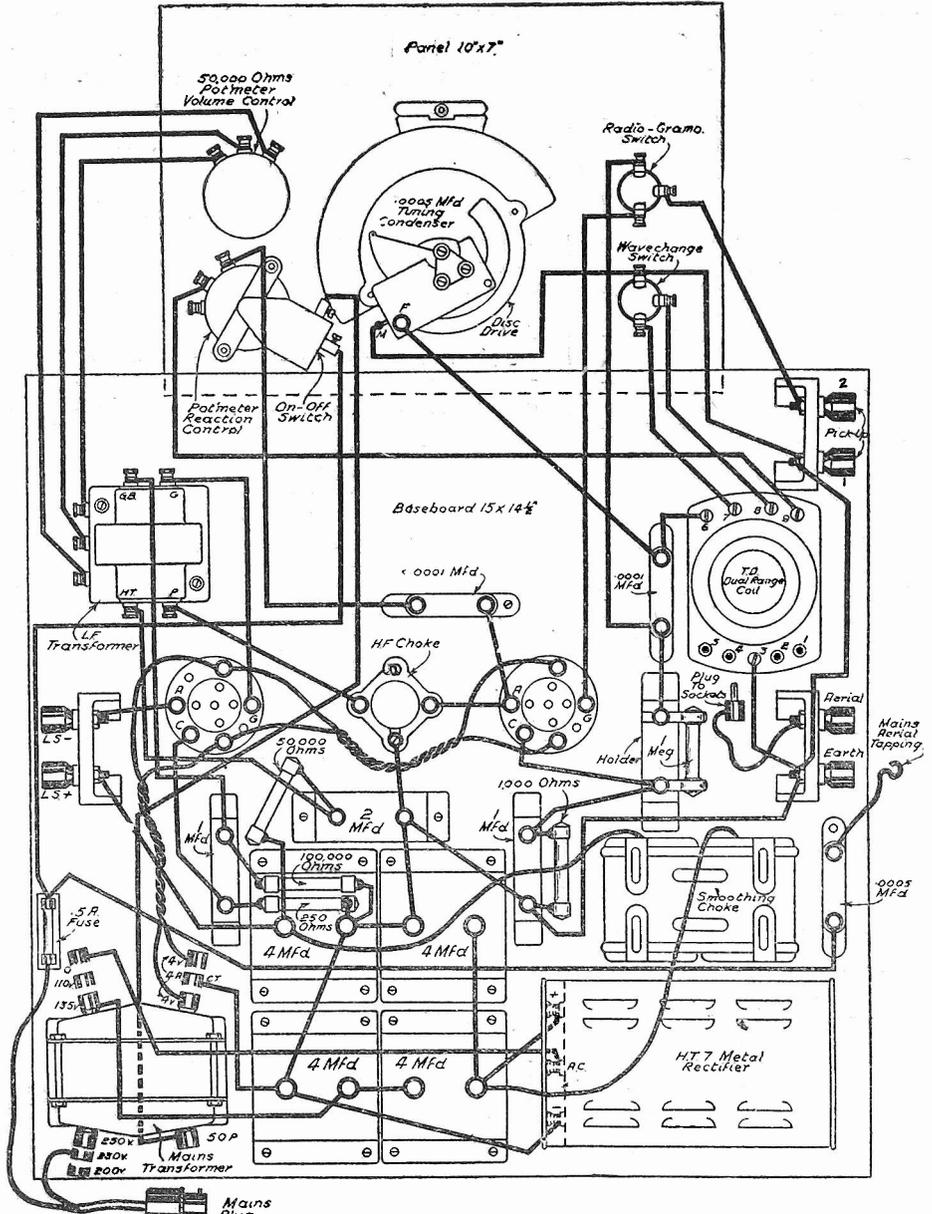


Fig. 3.—Wiring diagram of the Selectone A.C. Radiogram.

SELECTIVITY IN SIMPLE TERMS

(Continued from page 216.)

adequate selectivity is still not obtained, in which case a double circuit tuning system must be employed. This means that some form of band-pass tuning must be used. Now to buy a commercial unit and ganged condensers will cost anything from 25s. to £2. Few people will want to spend that amount and so an add-on circuit is here described. This unit will convert your present set into one with band-pass tuning.

The parts required are:—

- 1 .0001 mfd. compression condenser.
- 1 .0003 mfd. compression condenser.
- 1 .0005 variable condenser.
- 1 dual-range coil and wave-change switch, terminals and wire.

The dual-range coil must be totally screened and the screen earthed. This stipulation is made because direct coupling (which would otherwise upset tuning) between the two coils would be difficult to eliminate. Moreover, a screened coil enables greater compactness to be obtained.

The circuit and wiring diagram are shown in Fig. 3.

The aerial is connected to A. Terminal marked "A on set" is joined by a short

wire to the aerial terminal on set. If tapings are used on coil in set they should be discarded, and the short piece of wire joined to the "grid end" of coil. Terminal marked E on set is earthed. The coil screen is earthed by terminal on top of screen.

This is connected to MV, terminal 2, or to the earthing terminal; whichever is more convenient. The aerial series condenser may be joined either to 4 or 1. Connection to 1 is to be preferred on the score of volume.

To use the unit tune in a station (one not too powerful) on both dials for greatest volume. If the station still persists even though condenser dials are turned through a space of five degrees the .0001 mfd. compression condenser must be slackened off till the station occupies one or two degrees on the dials.

A second station far removed (in frequency) from the first is then tuned in. The .0001 mfd. compression condenser is re-set to give the required results. Finally, this condenser is left in a position intermediate between the two settings. Stations are then tuned in on the two dials alone. If a powerful station comes in at two set-

tings on the dial the .0003 mfd. compression condenser is slackened off till only one reading is obtained. Long-wave stations are received by opening the wave-change switch (i.e., pushing it in). One last word on this arrangement. A short aerial is a disadvantage when used with this arrangement. You lose too much volume. This does not contradict previous statements on short aeriels, as a moment's consideration will show.

An article on selectivity would hardly be complete without a word or two on wave traps. A wave trap needs to be very good. Good does not mean the ability to cut out one station only. There are plenty of good wave traps in that respect. Some of them reduce the strength of wanted stations very much; thus making the final state of affairs as bad as the first. When considering the use of a wave trap don't run away with the idea that you can use two—one for each local. Each individual wave trap functions perfectly by itself, but when the two are connected in series the probability is that they will couple with one another and upset each other's adjustment: thus making the use of two ineffective.

The BEGINNER'S SUPPLEMENT

Conducted by F.J. CAMM

THE EASY ROAD TO RADIO



Cowl Insulator

AN insulator so called because of its hollow conical shape. A good example is illustrated in Fig. 1. The object of such a design is twofold—firstly, it offers a long path to any currents which might tend to leak across the surface, and, secondly, by virtue of the cowl shape, the inside surface is kept dry in wet weather, so that even under these

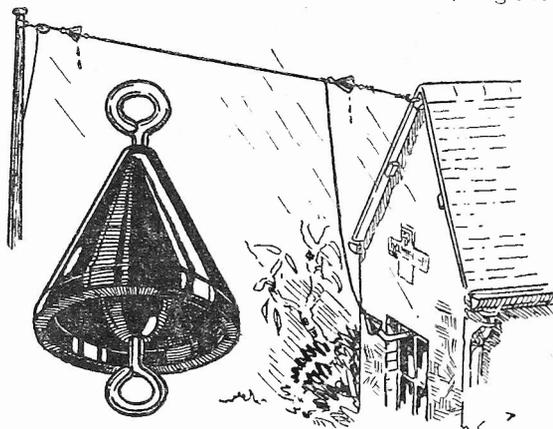


Fig. 1.—Cowl insulator showing method of use.

conditions the risk of surface leakage is small. Thus its insulating properties in the wet are comparable with those in dry weather.

If you examine the illustration, you will see that any current which may try to leak from one ring to the other must travel over the outside surface, across the edge, along the inside, and down the centre part. If it is only dry right up inside the apex of the cone it will offer a barrier to the current. Of course, the conical shape is also conducive to rapid draining as the water runs off from the edge.

Some types of lead-in are also fitted with a conical cowl similar to a cowl insulator. The lead-in is bent so that the apex of the cone points upwards, thus the underside is always dry. Cowl insulators, if kept clean, are as efficient as any, and more so than most.

Crystal Control

A method of controlling the wavelength of a transmitting station by means of a quartz crystal. This has nothing to do with the ordinary type of crystal used as the detector in a crystal set. A quartz crystal would be quite unsuitable for this purpose. The property of the quartz crystal which determines its use in a

THE BEGINNER'S A B C OF WIRELESS TERMS

Continued from page 196, April 22nd issue.

transmitter is that mechanical vibrations are set up in it by the passage of an alternating current of suitable frequency. By cutting the native crystal at a certain angle it will exhibit the desired characteristics when the current is applied to opposite faces. The thickness of the crystal determines within very fine limits the frequency to which it will respond, thus by cutting the crystal the right thickness and connecting it in a suitable manner in the transmitting circuit, the oscillations in the latter can be maintained at one frequency or wave-length all the time.

A quartz crystal in the various stages of cutting and grinding is shown in Fig. 2.

Crystal Detector

A device used for rectifying or "detecting" wireless waves. It depends for

opposite direction. The crystal overcomes this neutralising effect by cutting out the reverse current. The telephones are then able to respond to a current always flowing in one direction.

The crystal used in the detector may consist of various natural minerals. A very popular one is galena, which is another name for lead sulphide. The type suitable for wireless purposes is a hard grey substance which when broken exhibits a bright metallic surface composed of small crystals. It is usually sold in pieces about the size of a large pea, and may trade under various high-sounding proprietary names usually ending in "ite." The crystal is held in a metal cup by means of set screws or plastic metal and the other contact is made by means of a thin coiled wire called a "cat's-whisker." The cat's-whisker is so mounted that it can be moved over the surface of the crystal until a sensitive spot is discovered. The object of the cat's-whisker is to give a very light contact. This is important, and the results obtained depend very largely on getting the setting of the whisker just right.

The need for careful adjustment and the likelihood of its being disturbed by a slight jar when once obtained is one of the chief drawbacks to crystal reception. Another is that no amplification of signals is obtained with a crystal as with a valve detector, so that the strength of reception is dependent entirely on the power picked up by the receiving aerial.

(Continued on page 234.)

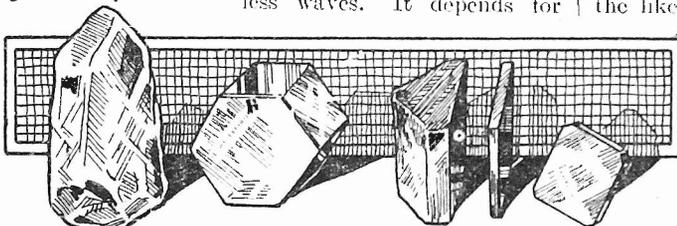


Fig. 2.—Stages in the cutting of quartz crystals as used for crystal control.

its action on the fact that the mineral "crystal" it contains permits an electric current to pass through it in one direction only. If an attempt is made to pass current through it in the opposite direction its resistance is very high indeed.

As you know, wireless waves arriving at the receiving aerial set up electric currents in the aerial coil of the receiver. These currents oscillate backwards and forwards so rapidly that if they were taken straight to the headphones there would be no response at all. That is to say, no sound would be produced. This is because as soon as the diaphragm of the 'phone started to move in response to the current in one direction the effect would be immediately cancelled by the current instantly flowing in the

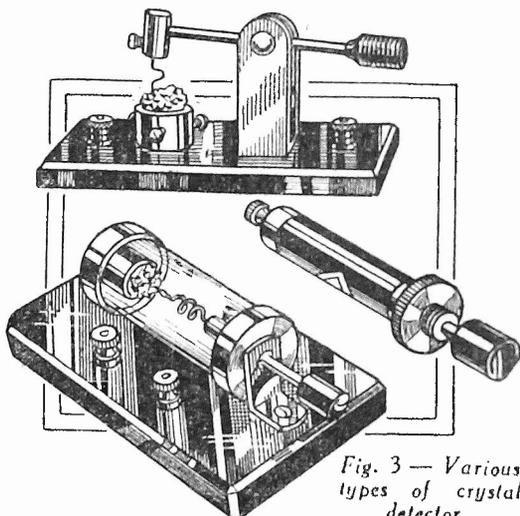


Fig. 3.—Various types of crystal detector.

(Continued from page 233.)

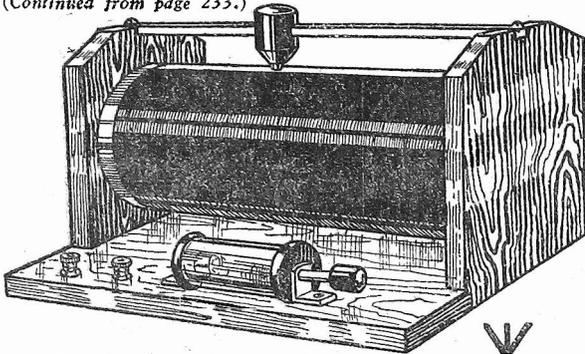


Fig. 4—An early type of crystal set.

There are other kinds of crystal than galena. Some of these do not require a cat's-whisker, and are therefore of a more permanent nature. However, although being more stable, they are usually less sensitive. Some well-known crystals are carborundum, zincite, and bornite, "Perikon" and silicon. Carborundum is used with a steel spring pressing on it instead of a cat's-whisker. Zincite and bornite are two other minerals which are used together. The two crystals are mounted in cups facing one another, and held in contact by means of a spring. "Perikon" is a similar pair, but using copper pyrites and zincite, while silicon is used in the same manner as galena.

Three typical examples of crystal detectors are shown in Fig. 3. The one above is of the cat's-whisker variety. It will be noticed that control of the whisker is obtained by mounting it on a small arm working on a ball joint. The crystal is held in place by means of set screws so that it can be moved easily and re-inserted another way round if it becomes insensitive after long use.

The detector in the centre is of the semi-permanent variety, and is intended to be mounted on the panel by the usual one-hole-fixing method. The knob allows of a limited amount of adjustment. The lower detector is similar to the top one, but the cup is mounted horizontally and totally enclosed by a glass or celluloid tube. This prevents the crystal from becoming covered in dust, which is a frequent cause of failing performance.

Crystal Set

A simple type of receiver employing a crystal detector instead of valves. Owing to the fact that a crystal does not

give any amplification of the signals received, the use of such a receiver is limited to within a few miles of a broadcasting station. A crystal set necessitates the use of headphones, but it is generally possible to use several pairs without any very great loss in signal strength. This is the best way if several people wish to listen at once, as the use of a loud-speaker, even under the most favourable condi-

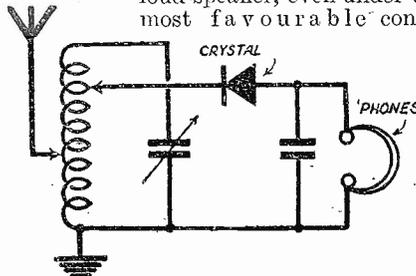


Fig. 5—Circuit of crystal set.

tions, is practically impossible. There are admittedly one or two amplifiers of the microphone type still on the market which it is claimed will boost the signals sufficiently to make speaker reception possi-

THE SHORTHAND OF WIRELESS—(Concluded)

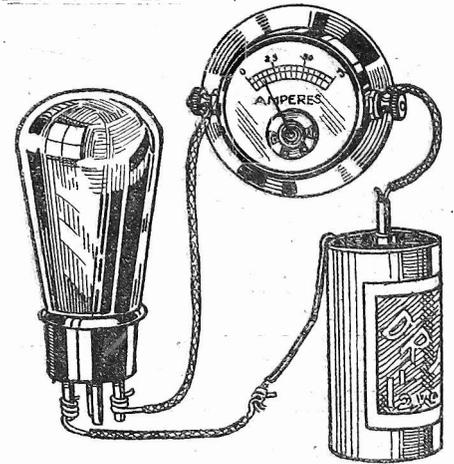
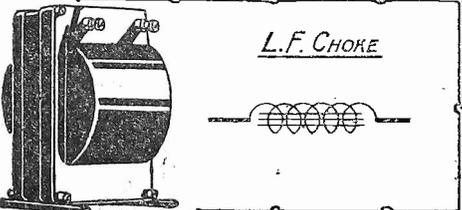
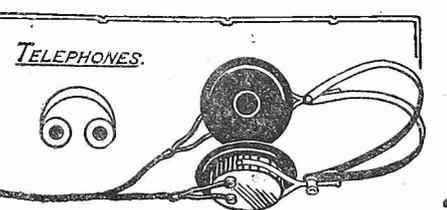
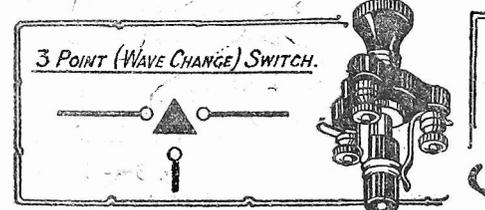
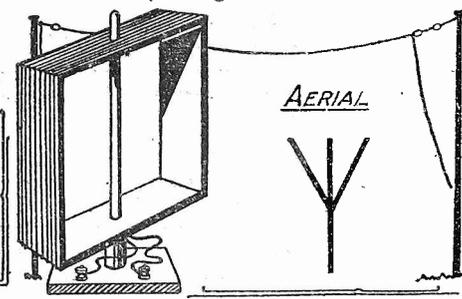
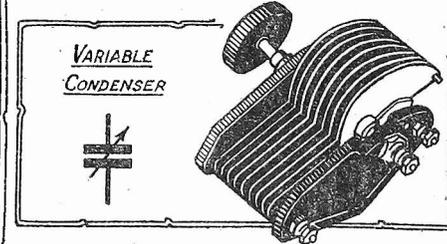
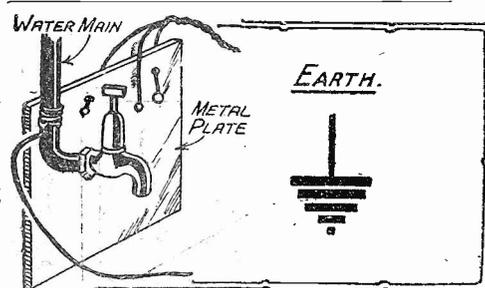
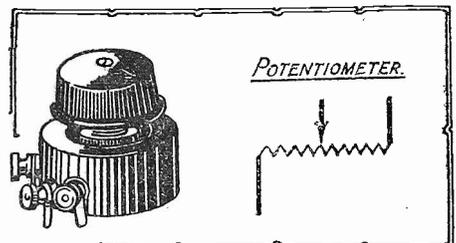
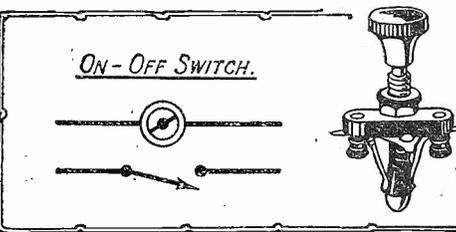


Fig. 6—An ammeter is used to measure current. The illustration shows a valve under test.

ble, but the results do not in any way compare with the average cheap valve set.

One of the early types of crystal set is shown in Fig. 4.

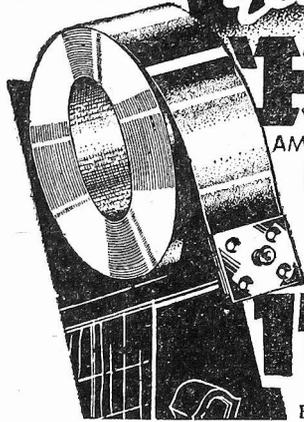
A circuit for a crystal set is given in Fig. 5. For best results the tuning coil must be of an efficient type wound on a fairly larger former, and not screened in any way. The aerial tapping is for the purposes of selectivity. The nearer it is taken to the earthed end of the coil, the sharper will be the tuning and the weaker the signals. The other tapping is used to adjust the circuit according to the resistance of the crystal used. The condenser across the 'phones is not absolutely essential, but is recommended by many designers. Its value should be round about .001 mfd.

Current is the flow of electricity along a wire or other conductor. It may flow in one direction only, when it is called a *Direct Current*, or it may flow first in one direction and then in the opposite direction. In this form it is called an *Alternating Current*. Alternating current is again divided into two kinds. If the alternations or flow backwards and forwards is at a very fast rate, or "frequency," it is spoken of as a *high-frequency current*; but if it is comparatively slow, then the current is called a *low-frequency current*.

The rate of flow of current is measured by means of an ammeter, the unit of current being the *ampere*. Fig. 6 shows the current passing through a valve from a small battery being measured.

BRITISH MADE

Get a HET for your set!



HET PROV. PAT. NO. 9145/33
AMALGAMATED METAL INDOOR AERIAL.

Get more stations, more volume and greater selectivity with this efficient and convenient indoor aerial fixed neatly round the room. No unsightly wires. The "Het" adhesive aerial gives a finishing touch to the walls, and improves reception. In gold or silver finish, with special brass terminal plate. It looks as good as it is—better than any other aerial.

1/6

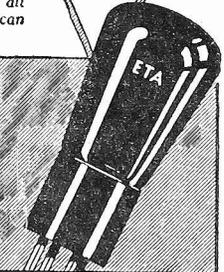
From all radio dealers or direct from
UNIVOLT ELECTRIC LTD.,
 Balfour House, Finsbury Pavement, London, E.C.2.

WHY Buy a new set?
ETA VALVES
 make your old set like new!

These are not times to disregard economies. Other valves may cost more than ETA valves but they give you no more for your money. **FREE:** Ask for the ETA "Comparative Table" No 13d. showing which ETA valves to use in place of your old ones. Technical advice gladly given. Write to:
THE ELECTRICAL TRADING ASSOCIATION, Aldwych House, Aldwych, W.C.2.
 Scottish Agents: **RADIOVISION LTD.,** 233, St. Vincent Street, Glasgow, C.2.

PRICES FROM
5/6

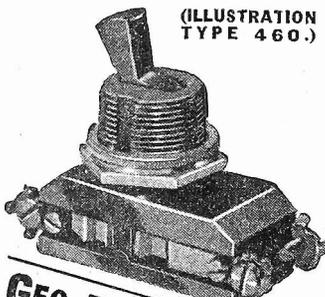
AMERICAN SETS
 There are ETA valves for all types of American Sets.



ETA
 THE INTERNATIONAL VALVE

As low in price as a really good valve can be

(ILLUSTRATION TYPE 460.)



SPECIFIED for the SELECTONE A.C. RADIOGRAM

The Becker Type 460 is a most efficient quick make-and-break sunk switch in Bakelite, rated at 4 amps. and tested at Faraday House to 29 amps.!

If you find any difficulty in obtaining Becker Switches 'phone or write direct to us.

Write for free illustrated Switch catalogue.

GEO. BECKER, LTD.
 AMPERE WORKS, WEMBLEY, MIDDX. 'Phone: WEMBLEY 3737

PRICE 1/11

M.C.9.

Read this



QUALITY Produces EFFICIENCY

TESTED BEFORE DESPATCH

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

RODS, SHEET, TUBES, PANELS
The BRITISH EBONITE Co., Ltd.,
 Hanwell, London, W.7.

JUST FIGURE IT OUT!

Without mathematics the Wireless Amateur—and especially the Home Constructor—wallows in a morass of doubt and uncertainty. This brilliant book will enable you quickly to grasp the essentials of Mathematics as applied to Radio. You'd hardly believe it, but it hasn't a dull page! The author knows his subject and how to make it interesting even to the absolute beginner. *You need this book.*

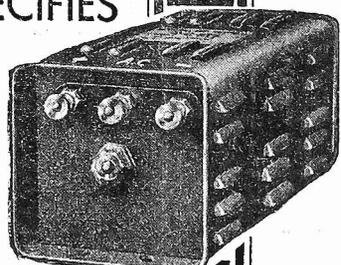
THE
MATHEMATICS OF WIRELESS
 by RALPH STRANGER
 5/-

Obtainable at all Booksellers, or by post 5/3 from Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

THE MAIN SUPPORT
 for the
SELECTONE A.C. RADIOGRAM

A constant and undiminishing high-tension supply, with no replacements or renewals of the rectifier, is ensured by the designer of the Selectone A.C. Radiogram, who
EXCLUSIVELY SPECIFIES

THE H.T.7 WESTINGHOUSE METAL RECTIFIER



"Chosen Wherever Absolute Reliability is Essential"

THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD.,
 82, York Road, King's Cross, London, N.1.

AUTO-TONE BALANCE

WHEN the sound emanating from a loud-speaker differs from that performed in the studio, it is said that "distortion" has been introduced. Distortion can occur in almost every stage of a receiver, but in most cases it is a simple matter to guard against it by using components of good design and high quality and by keeping a careful watch on operating conditions in order to ensure that valves and other apparatus are not overloaded, and that correct grid bias and anode voltages are applied.

There are, however, certain conditions under which a definite amount of distortion is inevitable. It cannot be prevented from occurring, and until recently distortion of this kind has had to be endured with what patience the listener could command.

The Use of Reaction

Distortion of the kind referred to is that due to the effects of reaction. Practically every receiver of reasonable efficiency is capable of reproducing at good volume the programme radiated by the local station without recourse to reaction, and a modern set employing a screened grid high-frequency stage should be able to give a fairly wide choice of programme without the reaction knob requiring attention. If the more elusive foreigners are to be picked up at comfortable strength, however, the additional fillip to sensitivity given by wisely applied reaction is of great assistance.

As most listeners know, reaction is a process in which part of the energy in the anode circuit or "output" circuit of the detector valve is returned to the grid circuit and is re-amplified. The amount of energy so fed back is controlled, in a modern set, by a variable condenser, which passes more or less energy, according to the adjustment of the vanes, back to a reaction coil which is coupled to the grid coil, the normal scheme of connections being indicated simply in Fig. 1.

Now not only does reaction greatly increase

By H. J. BARTON CHAPLE, Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

In this article the author explains a method of counteracting distortion caused by reaction.

the volume of sound from the loud-speaker, but it adds also to the apparent selectivity

above upper "C" on the piano, and even some notes between middle and upper "C."

As already stated, until recently no satisfactory method of counteracting this form of distortion has been available. It is now possible, however, to compensate almost completely for high note losses due to the use of reaction.

The method is, briefly, this: Since the HT+ losses in high notes become greater as reaction is increased, can we not find a piece of apparatus or a circuit arrangement in which the high tones are automatically strengthened as reaction is increased? The practical solution to the problem is a development of a method of balancing out losses, well known and practised frequently in the past with varying degrees of success. In the original scheme, known deficiencies in one part of a circuit were compensated by known increases in another part of the circuit, and by carefully choosing components with suitable characteristics, various elements of distortion and loss were cancelled out.

"Hit-or-Miss" Principles

Such principles are usually of the "hit-or-miss" type, and as examples mention may be made of the use of a pentode output valve in conjunction with a moving-coil loud-speaker known to be rather "boomy." Again, needle scratch in a pick-up circuit, which means in effect, the addition of extra and unwanted high notes, can be reduced by using a filter to divert all or a part of the notes above a certain frequency from the amplifying stages.

Usually, too, no attempt was made to ensure that these compensating devices should be self-adjusting. Based entirely upon the electrical characteristics of various pieces of apparatus, the arrangement was so planned that tolerably good quality

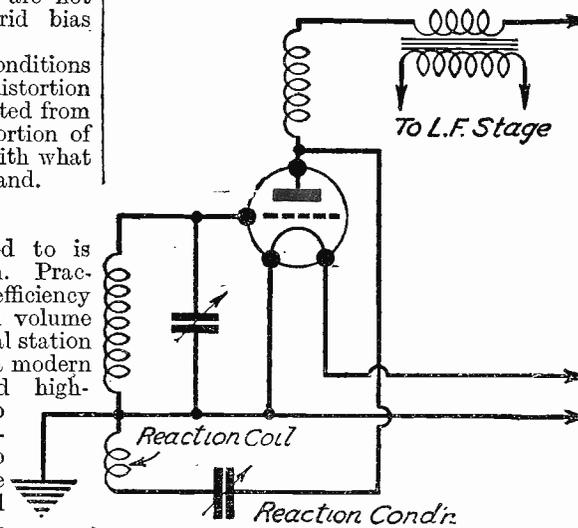


Fig. 1.—The conventional form of capacity reaction control.

of the set, that is to say, the receiver can be more sharply tuned when a fair amount of reaction is applied than when the reaction control is turned back to zero. But under sharpening of the tuning has the effect of cutting off some of those all important side bands which represent the higher tones of the musical scale. The reproduction, therefore, tends to become gruff and "drummy"; the brilliance of the treble notes and the "tone colour" due to the higher harmonics are reduced, and the programme quality becomes decidedly unpleasant.

Distortion With Distant Reception

How serious this distortion can be is realised by anyone who has ever tried to pick up a very weak and distant signal by pushing reaction to the critical point. The hoarse, croaking voices and the travesty of music issuing from the loud-speaker are scarcely distinguishable as a programme.

Even when a considerably less amount of reaction is used the "top" notes lose much of their quality, and this is quite understandable when it is stated that deterioration may well affect all notes

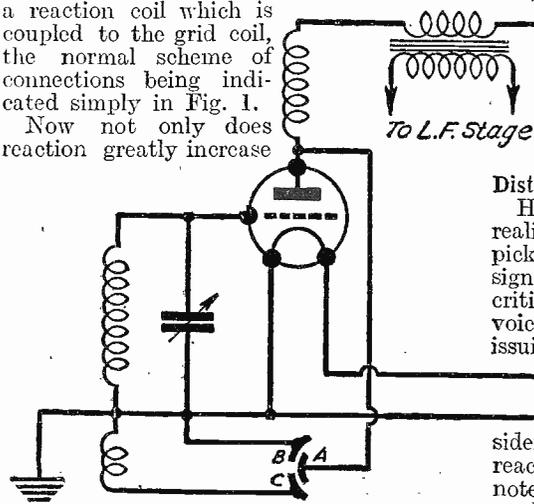


Fig. 2.—The slightly different connections when using a differential reaction condenser.

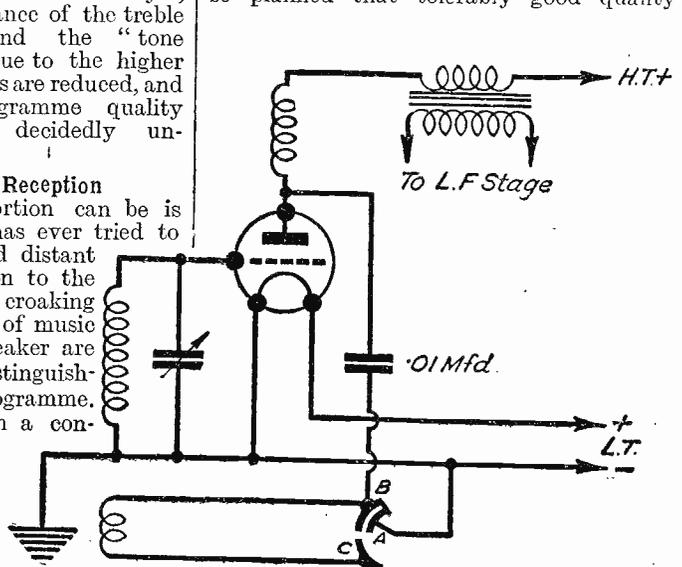


Fig. 3.—Simple connections for an automatic tone balance circuit.

resulted under normal conditions; but it was seldom constant for all conditions. Moreover, as it depends largely upon making up for poor design in one component by poor design (but having the opposite effect) in a second component, the result could never be more than a compromise, and seldom achieved its purpose perfectly.

In a modern automatic tone balance circuit, however, matters are better arranged. The rising losses due to the attenuation of the higher musical frequencies when reaction is increased are balanced by an increase in the upper frequency response of a specially designed low-frequency transformer, which couples the detector valve to the next stage.

Transformers With Rising Characteristics

Theoretically, a perfect low-frequency transformer should give a perfectly even response to all musical frequencies. There are, however, certain losses due to the electrical characteristics of a transformer which may, or may not, be compensated for in the design of the component. Most good low-frequency transformers have a frequency response which is substantially level, although most show slight irregularities at some part or parts of the musical scale. A transformer selected for use in an automatic tone balance circuit must have a characteristic in which the voltage amplification, or response, at the higher audio frequencies is somewhat greater than at the lower frequencies—what engineers term a "rising" characteristic.

It will be clear that, if due to reaction, the detector stage creates losses in the higher register while the intervalve transformer produces an increased upper register response, there will be one setting of the reaction control at which the high note losses will be balanced exactly by the high note gain. At all other settings of the reaction condenser, however, a perfect balance will not occur—smaller settings will result in a net gain of high-frequency response, with consequent shrillness of reproduction, while greater reaction settings will produce a net loss of high notes, and the reproduction will be gruff.

Automatic compensation, however, can be arranged without a great deal of diffi-

culty. It is achieved by shunting a condenser arrangement across the primary winding of the low-frequency transformer, and so designing the circuit that the value of this capacity shunt is varied simultaneously with the adjustment of the reaction setting. The effect of a fairly large capacity shunted across the trans-

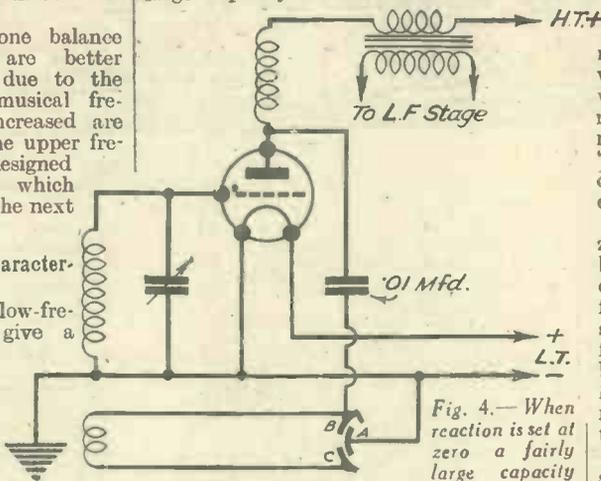


Fig. 4.—When reaction is set at zero a fairly large capacity is shunted across the L.F. transformer primary winding.

former would be to reduce the high note response, while if the capacity were decreased the high note response would be correspondingly increased. A varying capacity shunt is provided by the use of a differential reaction condenser of somewhat special design, and connected in a manner which differs slightly from the normal.

The conventional way of connecting a differential condenser for the control of reaction is shown in Fig. 2. The moving vanes are joined to the detector anode, one set of fixed vanes to the reaction coil, and the other fixed vanes to earth. When the moving vanes A are fully meshed with the earthed vanes B, little or no energy can be transferred to the reaction coil. As the position of the moving vanes is altered by turning the knob, their coupling with the earthed vanes B is reduced and the coupling with the reaction vanes C is increased. More energy will therefore pass to the reaction coil, but, both B and C being at earth potential, the total capacity between the anode and earth will be constant, so that tuning will not be affected by adjustment of reaction.

The automatic tone balance arrangement is shown in Fig. 3. Here the anode is connected to one of the fixed vanes and to one end of the reaction coil, the other end of the reaction coil is joined to the second set of fixed vanes, and the moving vanes are connected to earth. Further, a fixed condenser of fairly high capacity, say, .01 mfd. is interposed between the anode and the differential condenser, while the reaction condenser is so constructed that, when the moving vanes are fully meshed with the "anode" vanes (i.e., when zero reaction is applied) there is a direct connection between the moving vanes and the "anode" vanes—in other words, one half of the reaction condenser is shorted to earth.

Examining the circuit when adjusted to zero reaction, as indicated in Fig. 4, it will be admitted that, in effect, the .01 mfd. condenser is connected across the transformer primary. Actually the shunt consists of the .01 mfd. condenser, the high frequency choke and the high tension battery in series, but from the audio frequency and capacity point of view we may neglect the high frequency choke and the battery.

Now if the reaction control is moved over so that a certain amount of reaction is applied, as in Fig. 3, a certain amount of capacity, i.e., that due to the "anode" and moving vanes of the reaction condenser, is placed in series with the .01 condenser. As most listeners are aware, two condensers in series have together a smaller capacity than either one of the single condensers, so that, as the reaction is increased, and the capacity between "B" and "A" decreases, so the capacity shunted across the transformer is decreased, and the more nearly the frequency response of the transformer approaches its true characteristic. As this characteristic is a rising one, the high note response will increase in proportion as reaction is increased, thus giving automatic control.

The perfection of this control depends upon two things; first the actual frequency characteristic of the transformer, and then the correct choice of capacities and condenser characteristics to give the correct balance. It is for this reason that specially-designed automatic tone control transformers must be used, and the other essentials of the circuit must follow religiously the types and sizes specified.

FOR battery set users the question of which power valve to use resolves itself chiefly into a matter of expense. One is limited to the amount of current which is economically provided by the H.T. battery.

To obtain a reasonable service the standard H.T. battery is rated to give approximately 10 milliamperes, and a valve should not be chosen which exceeds this current unless super-capacity batteries are used.

There are several valves available which will work quite satisfactorily within this limit of 10 milliamperes. Some require an input of 10 volts grid swing to fully load them, others an input of approximately 4½ volts swing.

Where a receiver has one stage of L.F. amplification between the detector and power stage the valve requiring the larger input is called for. If the power valve follows the detector a valve taking a smaller input should be used. This latter

CHOOSING A POWER VALVE

Selecting the Right Valve to Suit the Output.

By C. R. GREEN.

requirement is very suitably met by the economy pentodes now available.

It is a mistake to assume that all pentodes are extravagant in the matter of H.T. current. With 120 volts on the plate and 100 volts on the screen the total consumption is in the neighbourhood of 5 to 6 milliamperes. Considering the output obtained these valves give a creditable performance.

When using pentodes, however, it is essential to have a suitable step-down output transformer in use. By using the proper ratio and careful attention to screen voltages the maximum power is utilized.

The volume available with valves consuming under ten milliamperes is such that the bass response is somewhat weak;

the ear is also less sensitive to bass notes. It is, therefore, a good plan to choose a loud-speaker which has a slight emphasis in the lower register.

The user of a mains eliminator is in a more fortunate position as the question of running costs does not arise. The cost of current consumed in a year is not worth considering, being at the most two shillings.

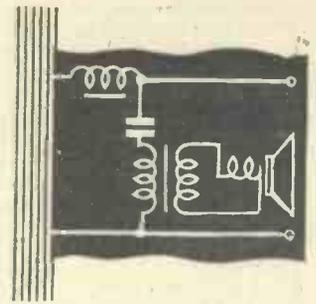
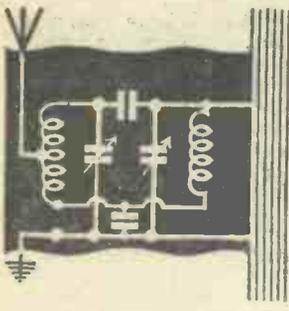
It is then advisable to use the biggest power-valve that is capable of being operated by the eliminator. A valve taking 15 to 25 milliamperes is the correct type to use, and is suitable for working a sensitive moving-coil speaker at sufficient volume to get the necessary detail in the reproduction.

When it is proposed to substitute a larger output valve one should be chosen to give two or three times the output of the original power-valve. It is hardly worth going to the expense of another valve if the increase in power is under about 50 per cent. more than that it is intended to replace.

RADIO RAMBLINGS

By JACE

Gettings from my Notebook



An S.G. Amplifier for S.W.

It is amazing what wonderful D.X. reception the short-wave expert is able to obtain with the simplest of single valve sets, but the beginner is strongly advised to start with at least two valves, so that he has a little "power in hand" to compensate for his lack of experience in operation. I find that a very good tip is to fit an S.G. valve to the short-wave set, for although this does not provide very much amplification, it "steadies" and simplifies tuning wonderfully. There is no need to tune the S.G. stage for it can be made to function quite well with an aperiodic aerial circuit; that is, one consisting of a fixed resistance or an H.F. choke. In case you care to try this idea, a sketch is given of the few components

A.C. or D.C., but these sets are not heard of very much just now. Whether there is some snag in the arrangement, or the public have not shown sufficient interest, I do not know. All I can say is that in a short test I made a few months ago of a set using universal valves, I found it perfectly satisfactory.

D.C. to A.C. Conversions

I AM often asked by people living in houses fitted with D.C. mains, whether they should buy a new D.C. receiver or wait until the supply is changed over to A.C. Unless my querists have definitely been notified by the local Electric Supply Company that a change is shortly to be

charging plant, but it can be taken that the same procedure will apply in connection with radio receivers. (Incidentally, this opinion has now been endorsed by the B.B.C.) As a matter of fact, most Local Authorities convert the apparatus without question, but when in doubt it is well to write notifying them of the proposed purchase and asking if they will hold themselves responsible for any future change in supply.

Extending the Speaker Leads

TALKING of summer-time reception one is reminded of the possibilities of taking the loud-speaker into the garden. On the face of things all that is required to do this is a long piece of twin flex that can be attached to the set at one end and to the speaker at the other. But many readers who have tried that method will have been disappointed by the much poorer reproduction obtained. It is obvious that the flex introduces a fairly appreciable capacity which produces a decided loss of high-note reproduction. In addition to this the flex has to carry the anode current of the output valve, so that if H.T. is derived from the mains there is always a possibility of a shock being felt on handling the wires, and a definite danger of causing a short-circuit, especially when the mains are D.C. It is better in every way to fit a choke-capacity output arrangement, so that only a single wire need be used between the set and speaker. "A single wire?" you say; Yes, the "earth return" can be made at the speaker "end" by means of a short metal rod pushed into the ground.

As an explanation of this excellent method, I show the arrangement in the sketch of Fig. 2. A low-frequency choke (which can easily be made as described on page 794 of PRACTICAL WIRELESS, No. 17, or bought for about ten shillings), is connected directly across the loud-speaker terminals, and this carries the anode current to the last valve. A large fixed

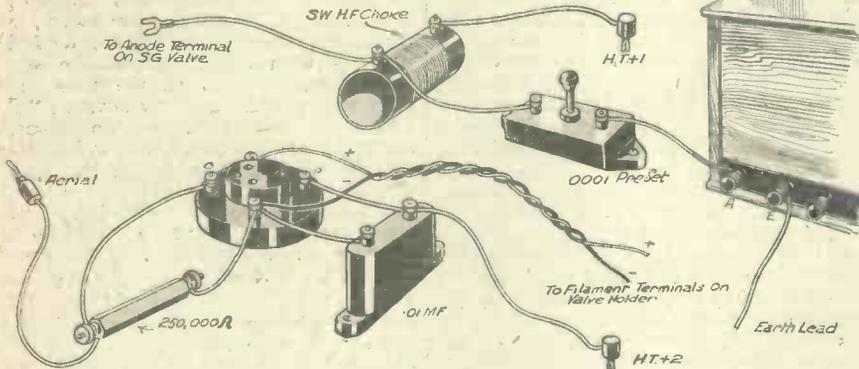


Fig. 1.—This sketch shows the few components and simple connections required for adding an S.G. stage to a short-wave set.

required and their method of connection in Fig. 1. They can be mounted on any small piece of board and attached to the present receiver by means of only three wires. The two flexible wires from the filament terminals of the valve holder are connected to corresponding terminals on a holder in the set, whilst plugs "H.T.+1" and "H.T.+2" should be put into the "100 volt" and "60-volt" tappings respectively of the high-tension battery. After wiring up the "amplifier" the .0001 mfd. pre-set condenser should be adjusted so that the set goes into, and comes out of, oscillation smoothly. Once this adjustment has been made it will "hold" fairly well over the whole tuning range, and the operation of the set will be exactly as before.

Incidentally, it might be added that the S.G. stage will entirely remove "dead spots" on the tuning range, which are caused by peculiarities of the aerial-earth system, and will enable the detector valve to oscillate easily from the lowest to the highest wavelength covered by the set.

"Universal" Receivers

NOT long ago there was a good deal of interest centred around "Universal" receivers, which could be used on either

made, my answer is "Go ahead and get a D.C. set." It is now well known that under the "Grid System," as it is being called, all D.C. supplies will eventually be altered to A.C., but it seems that it must be some few years before the latter kind of current will be universal, and it would be futile to "wait for it." Moreover, unless notification has been given, the Supply Company is bound by law to convert at their own expense all existing apparatus to suit the new kind of supply.

I know that the legal position has been questioned on numerous occasions recently, but in a case which was decided in Court only a few weeks ago a verdict was given in favour of the consumer. In this particular instance the apparatus around which dispute centred was a battery

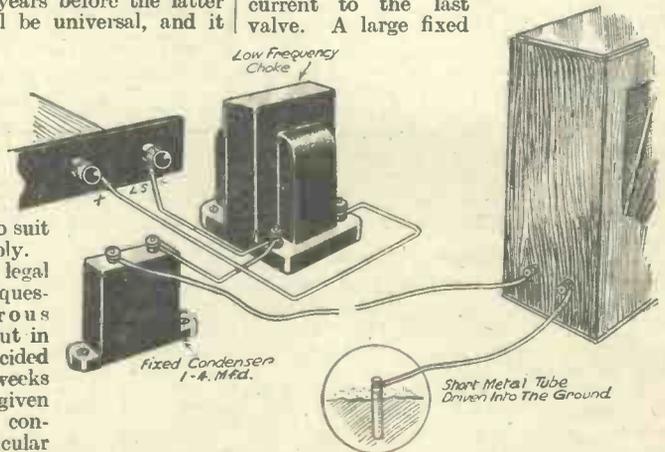


Fig. 2.—The best method of connecting a loud-speaker when it is to be used at a distance from the set.

RADIO RAMBLINGS

condenser (anything from 1 to 4 mfd. will do) is joined between that L.S. terminal which is connected to the plate of the output valve, and the loud-speaker. The second speaker terminal is joined to an odd length of metal tube, which can be pushed into the soil in the corner of a flower bed. This arrangement applies equally well whether the speaker is a moving-coil, balanced armature, or any other type.

The Popularity of S.W.

THE other day I happened to be talking "shop" (in every sense of the word) with a friend who owns a large radio store, and he was deploring the fact that business had fallen off rather considerably with the early approach of summer-like weather. I suggested that he might improve matters by booming short-wave sets and components, since these were bound to attract the interest of the D.X. "fan," who was deprived the pleasure of long-distance reception on the higher wavebands during the light weather. He rather astonished me by saying that he had tried this idea on previous occasions, but with negative results. In fact, he went so far as to say he had enough S.W. kits in stock to make a hundred sets, but there was very little call for them. It is amazing that this should be the case, because I should think that every reader of PRACTICAL WIRELESS knows that short waves are almost the only medium for long-distance reception, at low cost, in summer time. There is no doubt that a two or three-valve short-waver will give excellent reception of American and other distant transmissions all the year round, and the idea that wireless is of only seasonal interest is long since dead.

"Make or buy a short-wave set now and enjoy D.X. the whole year round!" would be a very apt slogan.

Tuning a Short-waver

THE same dealer friend told me of an incident he experienced a short time ago which had rather disgusted him. A customer had bought a short-wave adaptor, and, after having had it for a couple of days took it back to the shop saying it

was faulty. The unit was examined and tested and found to be in perfect order. The owner thereupon took it away again, only to return with the same complaint. Eventually it was found that the only trouble was that he was unable to tune it—not because tuning was difficult, but simply because he had not appreciated the need for rotating the dial slowly enough. When one considers that on a wavelength of, for example, 30 metres (one that is very productive of signals just now, by the way), a movement of a quarter of a degree of the dial of a .0002 mfd. condenser covers the same band of frequencies as does a movement of about ten degrees of the condenser in an ordinary broadcast receiver, it can easily be appreciated that tuning must be carried out very slowly indeed if anything is to be heard at all.

"Wireless in the Car"

IN view of the recent article in PRACTICAL WIRELESS, on "Wireless in the Car," it is interesting to note that a suggestion has been put forward that the time is ripe for motor-car manufacturers to consider the possibilities of making radio receivers as standard fittings of cars coming within the "de-luxe" category. Apparently this would create a little difficulty, for it appears that if the set were made a "fixture" it would become necessary to obtain a broadcast receiving licence specially for it. Bearing this fact in mind, it seems that the most satisfactory solution would be to make provision for housing a portable set and to devise some means by which its power supply could be derived from the car accumulator. A compact receiver, without batteries, could then be used in the car when required, or operated in the house as a normal domestic receiver. In that case a loud-speaker could be built into the car as a permanency, and the bare set made to be easily portable.

I have been experimenting with the latter system and find it an easy matter to build a four-valve set in a shock-proof case, measuring only 6in. square by 12in. long. This can be mounted under the dashboard of quite a small car and held in position by stout elastic bands.

usual way through a transformer or even an R.C.C. unit and should be a small power valve, such as a Cossor 215P, Mazda P.220, or a similar type in another make. As explained before, it may be biased rather more heavily than usual until its anode current is reduced to 2 or 3 milliamps. At the time of writing there is only one Class "B" valve on the market—the Cossor 240B.—but others are shortly to be introduced and the components described should be suitable in every case. Maximum loud-speaker output will depend very largely upon the H.T. voltage employed; for example with 90 volts H.T. an output of some 1,000 milliwatts are available, or approximately 2,000 milliwatts when the voltage is increased to 150.

As most readers will be aware, the Class "B" valve has seven pins and thus requires a special holder of which the connections are shown in Fig. 8; it can be seen that one terminal is a "dummy" and does not require any connection. When the loud-speaker is designed for use with a pentode it should be joined to terminals 1 and 2 on the output transformer, but if it is normally intended to work with a power or super-power valve it will be connected to terminals 3 and 4.



Protect your set, your home, your family from injury by lightning.

Fit a "GARD" between your aerial and earth. It only takes a minute and protects for all time. No interference with your reception of radio entertainment. Fit a "GARD" now and forget to switch off when lightning plays. "GARD" keeps it outside.

From all Dealers, or Post Free for 1/6

CLASS B COMPONENTS

(Continued from page 222.)

A spool must be made in similar manner to that for the transformer, but of different dimensions and having four sections; particulars are given in Fig. 7. To simplify the winding process the turns are arranged in four equal parts, which are connected together on completion. A total of 10,000 turns of 32 gauge enamelled wire are used, and the weight of this is approximately 1 1/2 lbs. Again, it is not essential to count the turns so long as each section is almost filled and contains as nearly as possible the same amount of wire. Core clamps and terminal strips are the same as those for the transformer, except that the former have a total length of 4 1/2 in. and the latter of 3 1/2 in.

The transformer and output choke described above can be used in practically any Class "B" amplifier or any receiver using this form of amplification, but to avoid possible confusion a pictorial wiring plan is given in Fig. 8 of an amplifier using the circuit diagram of Fig. 1. The "driver" valve will normally be part of the receiver to which the amplifier is connected, and is that immediately following the detector. It will be fed in the

EASY TERMS

Everything Wireless supplied on lowest terms. Prompt Delivery Guaranteed. Price List Free on request.

JUST RELEASED

New Lissen All-Electric Sky-scraper Kit. Complete Kit, incl. valves, for building this outstanding new receiver. **14/4**
 Cash Price £7/19/6
 And 11 monthly payments of 14/4.
Lissen Sky-scraper, Battery Model. **5/-**
 Cash Price £4/9/6.
 And 11 monthly payments of 8/6.

NEW BLUE SPOT UNITS

NEW BLUE SPOT 99 P.M. MOVING-COIL UNIT. **5/-**
 Cash Price £2/19/6.
 And 11 monthly payments of 5/6.
NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER **5/-**
 29 P.M. With input transformer. Cash £1/12/6.
 Balance in 6 monthly payments of 5/2.
NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER **5/-**
 45 P.M. With input transformer. Cash £2/5/0.
 Balance in 9 monthly payments of 5/- only.

ATLAS ELIMINATOR A.C. 244. Three H.T. tappings. 20 M/A output. **5/-**
 Cash Price £2/19/6.
 And 11 monthly payments of 5/6.
 All carriage paid. Quotations sent by return.
 To avoid delay will customers kindly send first payment with order.

The LONDON RADIO SUPPLY COMPANY ESTD 1925
 11, Oat Lane, Noble St., LONDON E.C.2
 Phone NATIONAL 1977

FIT THIS ELECTRIC CLOCK TO YOUR SET!
 NO MAINS NEEDED!
 KEEPS CORRECT TIME!
 NO WINDING!

Works off small battery lasting 12 months, or can be plugged into G.B. battery without affecting reception. Uses practically no current. Fits into hole 3 1/2 in. dia. in any panel up to 1/2 in. thick. Easy to fix—no screws required. Only 1/2 in. from front of panel to back of case. Swiss movement. Hands set from front. Nickel-plated bezel. Useful addition to any set.
RIVERSIDE MFG. Co., Ltd.,
 Dept. 2, 25p Road,
 Hammersmith, W.6.
 Telephone: Riverside 6392. **POSTAGE 6D**

THE POLYTECHNIC

307-311, REGENT STREET, W.1.

ELECTRICAL ENGINEERING DEPARTMENT
 (Wireless and High Frequency Section).

A Special Course of Four Lectures on

TELEVISION

will be given by

H. J. BARTON-CHAPPEL, Wh.Sch.,
B.Sc., A.C.G.I., A.M.I.E.E.

On Wednesday Evenings, 6.30-8.0, beginning
 10th May, 1933.

The lectures will be illustrated by experiments, lantern slides, and demonstrations on a televisior with mirror drum and large screen.

Fee for the Course **6/-**
 Syllabus on application to the Director of Education.

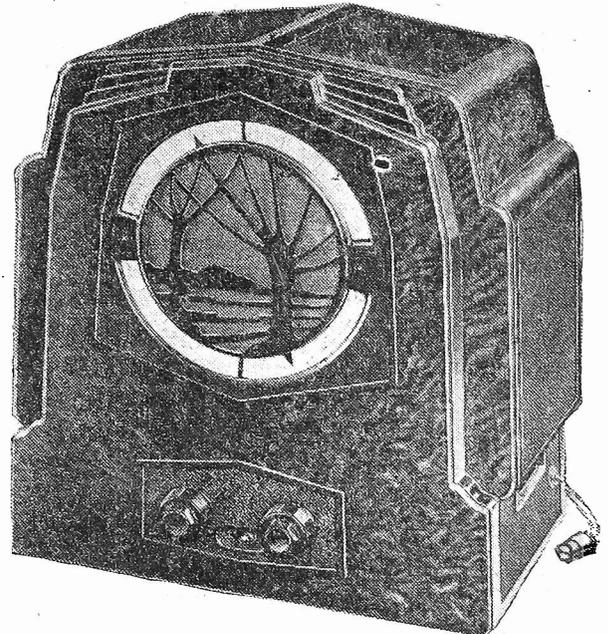
Genuine **AMPLION** Units. Limited number. Over 75 per cent. reduction. Guaranteed. To clear, 2/3 each, carr. paid.—G.B. Pioneer Radio, Copto St., W.O.1.

RECEIVERS AND THEIR RECORDS

Superhet Consolette (Model SH25)
 Ekco 5-Valve All-Mains

SO long as there exists a great number of high-power stations working on neighbouring wavelengths, the greatest degree of selectivity is required, and in these circumstances the superheterodyne circuit easily holds its own. Several makers have placed instruments of this type on the market, and of these, the Ekco model SH25 is an outstanding representative. Generally speaking, the circuit does not depart to any extent from conventional superhet practice, but considerable attention has been paid to the lay-out of components and to many minor details to which so much care is not always devoted. The receiver is very well constructed, and it is housed in a modern bakelite cabinet of prepossessing appearance. Possibly, the large station dial will be the first feature to attract attention; it indicates at a glance both the station and the respective wavelength to which the set is tuned. Although, at first sight, this patent tuning device, whereby a broadcast is actually selected by the name on the dial, may appeal to a certain class of listener, I do not think that it affords all the advantages claimed for it. There are over two hundred and thirty stations in Europe alone, and it is evident that no dial of reasonable size could possibly show all their names. Providing, say, twenty or thirty names were given on that portion of the dial allotted to the medium band, and which, with their corresponding wavelengths, would act as landmarks, it would be better practice to calibrate the rest of the dial in degrees *only*. In the receiver under test, I noticed that neither Leningrad nor Warsaw—both giant transmitters—were marked; in the same way, on the medium band, no mention was made of Bordeaux-Lafayette, Breslau, Stockholm, etc., whereas prominence had been given to such stations as Kosice, Cork, and so on—namely, broadcasting transmitters which are much less frequently heard by distant listeners.

wavechange and gramophone selector, and also as a local and distance switch. In addition, to damp the higher frequencies, and at the same time assist in suppressing interference, there is a small lever which, bringing into operation a filter device to the



The Ekco 5-valve all-mains superhet Consolette.

second detector valve, effects a considerable alteration in the tone of the output. The ordinary "on" and "off" Q.M.B. switch is placed on one side of the cabinet. Best reception results, of course, are obtained with an outside aerial and earth of the standard type, but the receiver is also provided with an internal aerial, which will give excellent results with some of the more powerful transmissions. The volume control is very efficient on both the "short" and "long" wavelengths; its action is smooth and progressive. Provision has been made for the adaption of a pick-up for the electrical reproduction of gramophone records; it is essential, in this case, to use a separate control potentiometer, as the one incorporated in the receiver does not act when the change-switch is fixed at "gram." In the A.C. model under test, the electrical current consumed was roughly 50 watts—an economical figure—and one which compares very favourably with other receivers of the multi-valve class. In the matter of selectivity, the Ekco Superhet SH25 reflected great credit upon its designers; it is an easy matter to log a large number of stations in a very short space of time, and the strength of the signals, even in the case of low-powered stations, is such that the majority of them can be listened to in comfort.

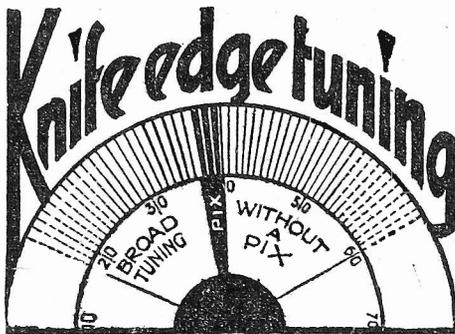
The Ekco Superhet SH25, which can be supplied in either A.C. or D.C. mains-operated models, comprises five valves in superhet sequence, namely, variable mu 1st detector, and intermediate frequency stage, an oscillator, 2nd detector, and pentode output feeding a built-in moving-coil loudspeaker. In the A.C. version, a metal rectifier is used for the mains supply. The receiver is available in three types: A.C. 200/250 v. (40-80 cycles); 100/125 v. (40-80 cycles), and D.C. 200/250 volts. Either model can be easily adjusted to suit individual mains requirements.

The handling of the instrument has been rendered very simple and good results are immediately obtainable, even in the hands of the most unskilled novice. Actually, on the front of the receiver there are only two knobs; on the left, the main tuning condenser, on the right, a volume control. Smaller knobs concentrically mounted act respectively as a combined

second detector valve, effects a considerable alteration in the tone of the output. The ordinary "on" and "off" Q.M.B. switch is placed on one side of the cabinet.

Best reception results, of course, are obtained with an outside aerial and earth of the standard type, but the receiver is also provided with an internal aerial, which will give excellent results with some of the more powerful transmissions. The volume control is very efficient on both the "short" and "long" wavelengths; its action is smooth and progressive. Provision has been made for the adaption of a pick-up for the electrical reproduction of gramophone records; it is essential, in this case, to use a separate control potentiometer, as the one incorporated in the receiver does not act when the change-switch is fixed at "gram." In the A.C. model under test, the electrical current consumed was roughly 50 watts—an economical figure—and one which compares very favourably with other receivers of the multi-valve class. In the matter of selectivity, the Ekco Superhet SH25 reflected great credit upon its designers; it is an easy matter to log a large number of stations in a very short space of time, and the strength of the signals, even in the case of low-powered stations, is such that the majority of them can be listened to in comfort.

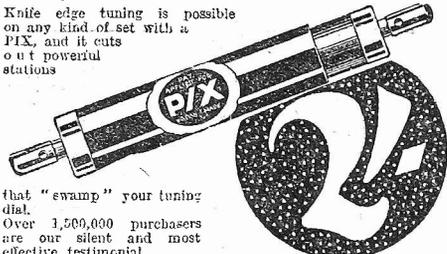
This up-to-date superheterodyne is made by E. K. Cole, Ltd., Ekco Works, Southend-on-Sea (Essex). At the price of twenty-four guineas, it will, without doubt, assist in establishing the popularity of what is really the only type of receiver which deals satisfactorily with the modern chaotic condition of the ether.



WITH A PIX IN YOUR AERIAL

Fix a PIX and have a choice of programmes usually enjoyed by only the most expensive sets. Make your set super selective by the simple operation of fixing a Pix between aerial and set. No other alteration necessary. Just undo aerial from set—connect to one end of PIX and join the other end with a piece of wire to aerial terminal on set.

Knife edge tuning is possible on any kind of set with a PIX, and it cuts out powerful stations



that "swamp" your tuning dial. Over 1,500,000 purchasers are our silent and most effective testimonial.

CLIP THE PIX TO YOUR SET

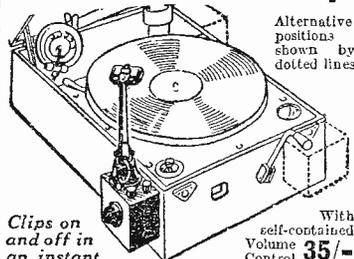
wall or window-ledge, etc. The clip holds the PIX securely, mounted on drilled insulated base with screws 6d.



Get a PIX from your Dealer, or send 2/- Postal Order (with clip, 2/6) direct to:

THE BRITISH PIX COMPANY, LIMITED
(Dept. 509). 118/28, SOUTHWARK ST., LONDON, S.E.1

NEW BELLING-LEE CLIP-ON Unit Pick-up.



Alternative positions shown by dotted lines

Clips on and off in an instant.

With self-contained Volume Control 35/-

ELECTRIC REPRODUCTION from your PORTABLE gramophone without loss of portability.

Write for booklet.

BELLING-LEE
FOR EVERY RADIO CONNECTION

Cambridge Arterial Road, Enfield, Mdx.

M.P.R. BATTERY CHARGER

Send for particulars of complete Charging Equipment for A.C. Mains to charge 100 2-volt Cells weekly.

Price £4:4:0

MAINS POWER RADIO LTD., ROMFORD, ESSEX

LOUD SPEAKERS REPAIRED 4/-

(Blue Spot a Speciality, 5/-) Transformers 4/-, all repairs magnetised free. Eliminator Repairs quoted for. 24 Hours Service. Discount for Trade. Clerkenwell 9069. E. C. MASON, 44, EAST ROAD, LONDON, N.1.

MY OPINION!

By the Editor

8-11, Southamplon Street, Strand, W. C.2.

Correspondence

IN the course of an interesting letter a reader makes the suggestion that we should offer a prize each week for the most interesting letter published in our correspondence pages. I cannot accede to such a request, for editorial correspondence should be a natural corollary to a paper. We are always delighted to hear from our readers. We like to receive their brickbats as well as their bouquets, for it is in the clash of intellect and the admixture of diverse opinions that is generated the dynamic spark which creates the driving force of a healthy publication such as PRACTICAL WIRELESS. Any attempt to force correspondence by the inducement of a prize rather asks for flattery; for no reader would feel that in expressing his true opinion (if it were an adverse opinion) of the paper, he would stand a chance of winning it. Our correspondence pages are always open to our readers, even if their opinions may clash with mine or my contributors'. Your brickbats may be hurled at the editorial cranium without the fear that they will be ignored. Nor have we need with our vast circulation, our leading position, and the esteem in which PRACTICAL WIRELESS is held by its readers, to offer such inducement. Our prizes are limited to practical ideas from our readers, many hundreds of whom have promptly benefited financially by submitting Wrinkles.

Specifications

A READER tells me that it is refreshing to find a paper which actually tells the reader the correct parts to use in making a receiver. He is, of course, referring to our policy of specifying one make of component only for each item in the set. It is a policy which we shall continue with vigour.

Next Week's Free Blue Print

RADIO has become a seasonal hobby largely because very few, if any, have yet produced a portable receiver which could be carried without discomfort or fatigue. I have designed what I think you will judge to be a novel type of light-weight portable receiver, a free blueprint for which will be presented with every copy of next week's issue. The lightest cabinet on the market, so far as I am aware, weighs about 12lbs., which in itself places it outside the genuine portable market. I therefore set to work to apply some of the weight-reducing principles adopted in the aircraft industry, with the result that the cabinet of the Featherweight Class B Portable Four, which is the subject of the blueprint alluded to, weighs only 1 lb. Additionally, you do not need the fingers of a Houdini to assemble it. The total weight of the receiver is much less than anything before attempted in the home-constructor line. Full constructional details will be given next week, and advance information appears on page 215 of this week's issue.

F. J. C.

ORDER NEXT WEEK'S ISSUE NOW, AND MAKE CERTAIN OF YOUR BLUEPRINT!

THE MOVING COIL SPEAKER with a NEW TECHNIQUE



Blue Spot 45P.M. is an unrivalled example of first class workmanship. Its design from an engineering point of view is unique; its reproduction, from your point of view, is little short of astounding.

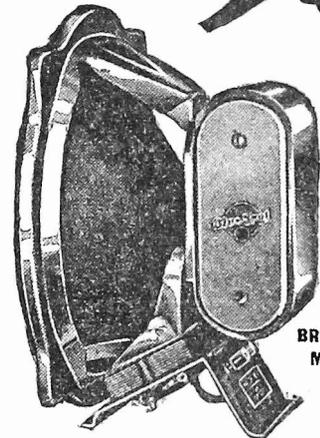
Its response throughout the whole musical range is really excellent. No excessive bass, no shrill top. A specially made Output Transformer is incorporated and is supplied with plugs and sockets, in lieu of troublesome solder tags, for easy matching with Power, Super Power, Pentode, and Q.P.P. (Triode) and Class B Output. Dust-proof plates are fitted to the Special Magnet. New process Cone and Speech Coil—no trouble from moisture, warping or fouling in the gap. Undistorted output 4 watts. Q.P.P. Pentode model 2/6 extra.

45PM



is destined to create a new standard, a new ideal. Price complete

45/-



BRITISH MADE

CABINET MODEL 62 P.M. In Walnut or Mahogany utilises 45P.M. as the driving movement. Cabinets have special acoustic features and are outstanding in themselves. Superior to anything at a like price 67/6

WRITE FOR CATALOGUE PR.12.5

BLUE SPOT

THE BRITISH BLUE SPOT COMPANY LTD. 94/96 Rosoman Street, Rosebery Avenue, London, E.C.1.

Distributors for N. England, Scotland, and Wales: H. C. RAWSON (Sheffield and London), Ltd., 100 London Rd., Sheffield

OUR SHORT WAVE SECTION

TUNING coils for use on waves below about 150 metres can with advantage be of quite different design from those used on the broadcasting waves. This is not to say that compact coils of the

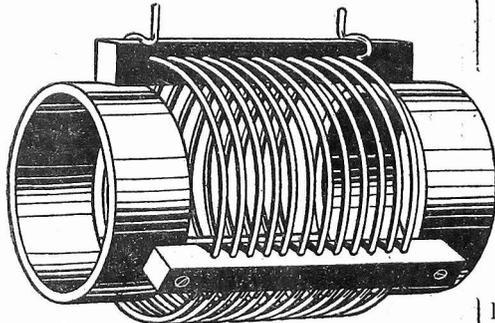


Fig. 1.—A neat short-wave coil design.

ordinary plug-in type will not function on short waves; but they cannot be expected to be very efficient. Possible losses of energy, due to the self-capacity of the coils and their high-frequency resistance, must be guarded against more and more carefully as the frequency of the currents carried increases. You might find that simple "hank" coils of a few turns of fine wire would enable you to receive signals on 100 metres, and even down to 20 metres. Signals would be comparatively weak, however, and your tuning range for one set of coils would be unnecessarily narrow. On lower wavelengths still, difficulties in persuading the detector valve to oscillate would become more and more pronounced. Substitute carefully designed coils, and, with the other components unaltered, you would at once obtain vastly improved results from the receiver, both in signal strength and in ease of handling.

The coils which are to be described do not claim to be the last word in super-

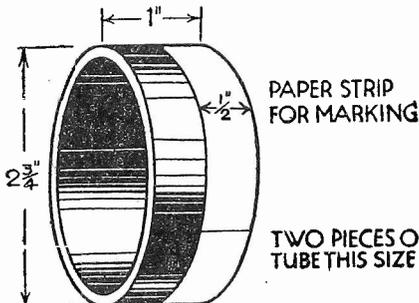


Fig. 3.—Marking the end pieces for the coil.

efficiency. They have, however, been in use in the writer's short-wave equipment for some time, and they have proved entirely satisfactory. The aim has been to make rigid coils, using bare wire with well-spaced turns, and with the smallest possible amount of supporting material. Large masses of ebonite or other insulating

SHORT-WAVE COIL CONSTRUCTION.

A Practical Article on Making Efficient Coils for Short-Wave Work.

By A. V. D. HORT.

material are to be avoided in coils for short waves, as being potential absorbers of energy which should not be permitted to go to waste in this way. **Details of Construction**

The coil illustrated in Fig. 1 is wound with bare 16 s.w.g. soft copper wire. Although wire of this gauge would stand up unsupported in a coil, the coil would not be at all rigid. The least vibration would cause variations in the wavelength to which the receiver was tuned. Hence the ebonite strips and tubes to support and space the turns.

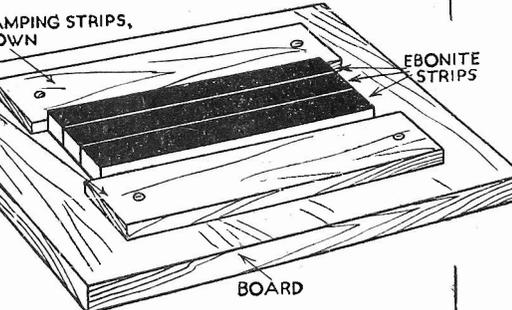
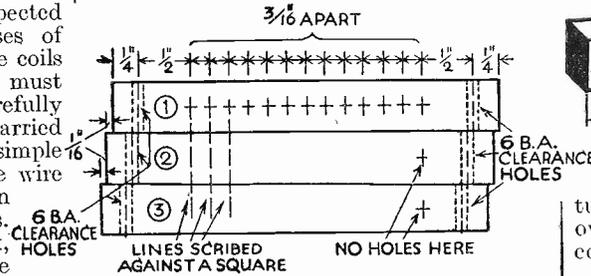


Fig. 2.—How to mark out and cut the coil supports.

You can make your coil of any length or diameter you wish, but you are advised not to make the diameter less than about 2 to 2 1/2 inches. The illustrations show the dimensions for a 12-turn coil, about 3 3/4 inches in diameter, a useful size for a wide range of short waves.

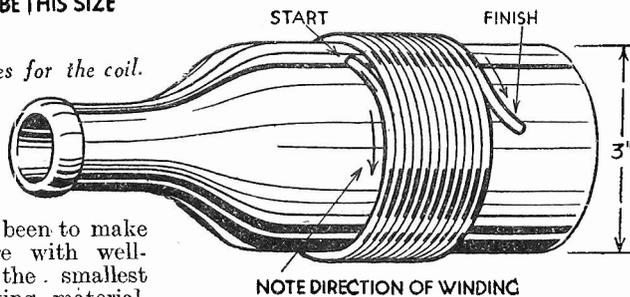


Fig. 4.—Winding the coil round a bottle.

First mark out the supporting strips. These are cut from 3/8 in. ebonite sheet. Lay your strips on a flat board against a fixed wood strip, and fix another strip to hold them firmly together. Now slide them into the exact positions given in Fig. 2. Scratch the numbers 1 to 3 on them with a scriber. With dividers mark off the hole positions on strip 1 1/8 in. apart. Then with a square scribe lines right across all the strips from these marks. Punch-mark all the centres, and drill with a No. 43 drill. The holes at the ends of the strips are drilled 6 B.A. clearance and countersunk.

Next mark out the pieces of ebonite tube. The quickest way to do this is as follows. Wrap a strip of paper round the

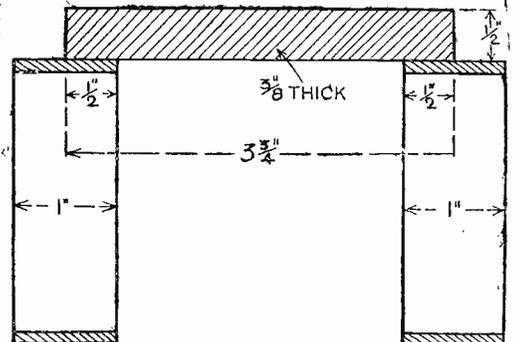


Fig. 5.—The supports, and method of fixing to the end pieces.

tube, and cut it exactly where the ends overlap. Divide the paper into three equal parts by measurement, putting a

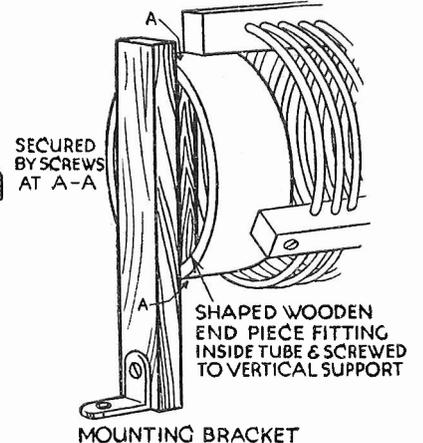
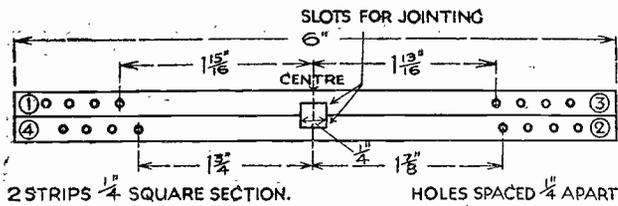


Fig. 6.—The coil supports and method of attaching the coil.

Ends shaped to fit inside each point. Ebonite tube. Wrap the paper at ends of coil round the tube again, scribe a line round against its edge, and make a mark against each division point. This procedure gives you the positions for the strips. Place the strips in position in turn, in the order 1 to 3 round the tube, and mark on the tubes the positions

(Continued on page 243.)



(Continued from page 242.)

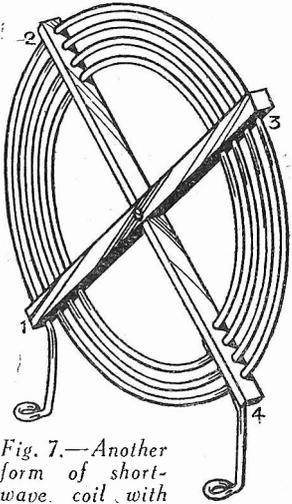


Fig. 7.—Another form of short-wave coil with dimensions of fixing strips.

for the fixing screws. Drill and tap 6 B.A. for these. If you have no taps, drill 6 B.A. clearance holes. Now you are ready to assemble the skeleton former. Be careful to put on the strips in the right order, so that the turns of the coil will be carried forward in an even spiral from end to end of the strips.

For the coil you will need 11 feet of wire. Cut the length, put one end in the vice, and pull on the other end with pliers till the wire "gives" and comes out dead straight. You must straighten the wire before winding. Small kinks and bends in it would make it almost impossible to thread the wire into the former.

Winding the Coil

Wind the coil on a jar or bottle about

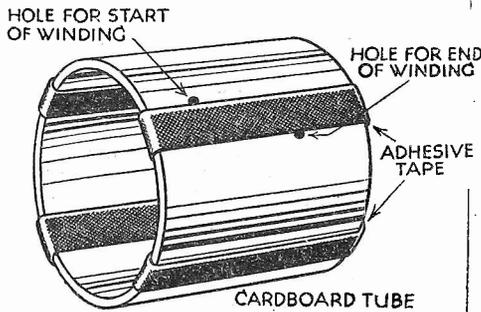


Fig. 8.—The former and adhesive strips for holding another form of coil.

2 1/2 to 3 in. in diameter, turns touching. Be sure to wind in the direction shown in Fig 4, or your coil will not go on the former. Hold the starting end all the time while you are winding, and release both ends at once. The wire will spring out a bit, and should give you a coil of even diameter of turns throughout its length. Thread one end through the end hole in strip 1, on through the end hole of strip 2, and so on. As you work along the strips, keep easing the wire through the earlier holes. Never use force, or you will break the ebonite. When you get near the end, be particularly careful to keep easing the wire through the holes near the centres of the strips. Otherwise these turns will be drawn tight as you feed in the last turns, and an ebonite strip may snap across one of the holes.

When you have finished the coil, of even diameter throughout, and without any twist in the strips, turn up each end of the

wire at right angles to strip 1, and cut them off, leaving 1/2 in. projecting.

You can mount the coil horizontally or vertically, by fitting in two or one wooden end pieces, as in Fig. 6. Make connections by soldering.

A more compact type of coil, useful where space is limited, is the helix. I have found this type of coil especially useful below 40 metres or so, as it enables one to obtain very tight coupling, if required, between aerial and grid, or grid and anode coils. The former you can make of ebonite or wood. Ebonite is harder to work and more fragile, but better electrically. If you use wood, soak the finished former in melted paraffin wax before putting on the wire, draining off all the surplus.

Now wind on a bottle a coil of 6 or 8 turns of 16 s.w.g. bare copper wire, as for the coil already described, but about 5 in. diameter. Pass one end of this coil through the outside hole of No. 1 arm of the former, and thread it round and round in turns of gradually decreasing size.

The inner end is then brought down No. 4 arm and terminated in a loop. The outer end, on No. 1 arm, is similarly looped. Bend these two loops so that they lie horizontal when the coil is vertical.

The coils so far described are meant for use in any short-wave receiver intended mainly or wholly for short-wave reception. If you want to try short waves on a receiver which has ordinary plug-in coils, you will find that the following method of making coils will be of assistance.

Use as a former a short piece of cardboard tube, 2 1/2 in. diameter. Lay strips of adhesive tape on it lengthwise, sticky side

ADHESIVE TAPE BINDERS

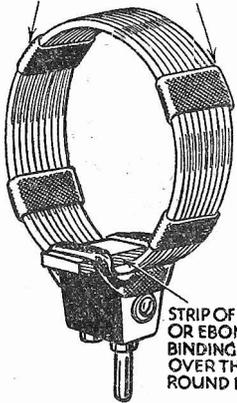


Fig. 9.—The coil wound on former shown in Fig. 8, and method of mounting.

more than 15 turns. Push the starting end through the pierced hole, and finish at the other end in the same way, through a hole close to, but on the other side of, the same strip. Free the ends of the strips, lay them over the turns and stick them down. Draw them tight as you do so, but do not displace any of the turns. Now cut away pieces of the tube up to the ends of the coil, free the ends and slip the winding off gently. If you have any difficulty in removing the coil, crush the tube.

Now mount your coil on its plug, binding it on with adhesive tape; insert a narrow slip of wood or ebonite at the bottom (Fig. 8), to project a trifle beyond each end of the coil. This will prevent the binding from distorting the coil. Make the connections to the plug contacts.

USE A TRANSCOULER AND HEAR THE DIFFERENCE

Universal Type BULGIN Transcoupler

Foxhall Road, Ipswich.

Dear Sirs,
I thank you for the "TRANSCOULER." It is giving entire satisfaction . . . I am more than surprised by the difference its installation has made to my set.

Yours faithfully, R. A. Scrivener.

NEED WE SAY MORE?
Send 2d. postage for 80-page Catalogue and Manual "N."

LIST NO. L.F.10 LIST NO. L.F.10

BULGIN
The Choice of Critics

A. F. BULGIN & CO. LTD., ABBEY RD., BARKING

THIS H.T. BATTERY LASTED 2 1/2 YEARS

User Forgot He Had It

FREE BOOKLET TELLS ABOUT RADIO'S GREATEST ECONOMY

"I have had this battery in use 2 1/2 years, and it was so trouble-free I forgot all about it with rather disastrous results, there being only 30 volts left."

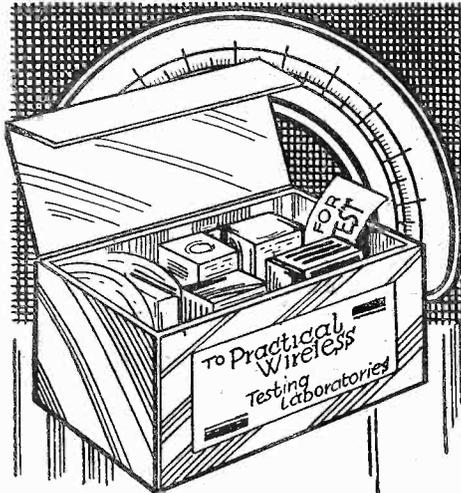
C.H.P. (London).

Here's a man who thought it "disastrous" that his battery gave out! Of course, the **STANDARD PERMANENT H.T. BATTERY** needs attention occasionally, say every year or 18 months. But the replacement is merely a matter of changing cartridges at a few pence each—and you can do it yourself quite easily. Think of the money saved before and after. The **STANDARD** is a special adaptation of the famous Leclanche principle which recharges itself when the set is shut down, giving Level current and Better reception for much less money. We sell direct and Guarantee your satisfaction, whether you pay cash or deferred terms. Why not write now for our interesting Free Booklet?

Model H5
126 VOLT STANDARD BATTERY
No. 3 size. 84 cells, 12,500 milliamps capacity.

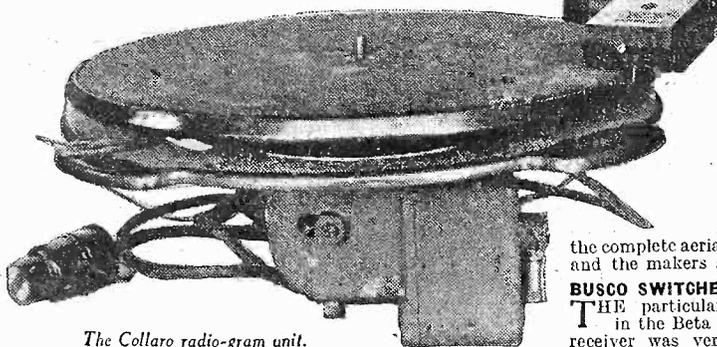
Cash **37/8** Easy deferred terms available
Price **37/8** in England, Scotland and Wales

STANDARD BATTERY Co. (Department N.W.)
184-188, Shaftesbury Avenue, London, W.C.2



COLLARO COMBINED MOTOR UNIT

THE illustration below shows a very compact and useful radio-gramophone unit consisting of a pick-up with built-in volume control and induction motor, with fully automatic start and stop device. This is made by the Collaro Company who are, of course, very well known in the gramophone motor world. The particular instrument we have received bears evidence of very high-class workmanship and has functioned perfectly satisfactory on test. The motor is delightfully silent in operation and starts and stops very smoothly by means of the automatic device. This comes into operation when the pick-up carrier arm is moved to the outside of the centre, the former starting the motor and the latter movement stopping it. The majority of records are nowadays furnished with the "run-off" groove in the centre, and this

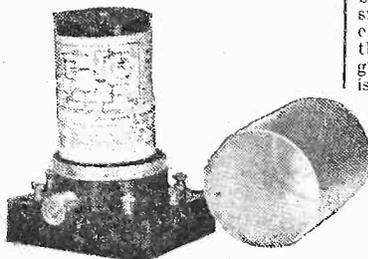


The Collaro radio-gram unit.

enables the device to operate on all records without the necessity for resetting the stop according to the playing length of the record. The Pick-up has very good characteristics, the D.C. resistance being 4,000 ohms and the A.C. impedance (at 1,000 cycles) being 52,000 ohms. The average output (R.M.S.) is 1.1 volts, so that it does not require a very powerful L.F. amplifier to produce really good volume signals. The volume control is of the wire-wound type, and is quite noiseless in adjustment and provides a complete variation in output from inaudibility to maximum. The price of the complete unit is £4.

BULGIN DUAL-RANGE SCREENED MULTI-COIL

THE new dual-range coil which has just been perfected by Messrs. Bulgin is illustrated below. It is completely different from this firm's previous coil, and the advance model which we have tested reveals very good characteristics. In appearance it resembles many of the usual screened coils, until the metal cover is removed. The first and principal difference is then apparent, for, instead of the windings being visible, they are enclosed in an ebonite cylinder, round which is pasted a paper bearing all the coil's details. This gives two circuit diagrams (in pictorial form for the non-technical user), one showing the use of the coil in the ordinary aerial circuit, and the other showing its use as an H.F. coupling coil. The connections are described, and the terminals are numbered for this purpose. One marked improvement over other coils of the dual-range type is the provision of a Q.M.B. wave-change switch. This



Bulgin new dual range coil.

position, and the switch locked (by means of its one-hole fitting) at any height on the bracket. The operating knob then projects from the panel, and by means of ebonite junctions the rod may be extended to any desired length. The price of this switch is 3s., and the special fuse switch is 2s. 6d. The on/off switch costs 1s. 3d. and the wave-change and radio-gram. switch each cost 1s. 6d.

Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF.

springs into its position and definitely does change the range over which the coil tunes. It can be heard, as well as felt, when the knob is rotated, and it provides a really definite position for medium or long waves. The method of winding, and the choice of the values of the individual windings completely removes breakthrough, and the selectivity is of a high order. The wave ranges covered are 200 to 500, and 1,000 to 2,000 with a normal .0005 mfd. condenser. The price is 10s. 6d.

HET INDOOR AERIAL

ANOTHER new idea in indoor aerials has just been submitted to us under the name "Het." This is a simple, but ingenious, arrangement, consisting of an inch wide adhesive paper strip upon one side of which is deposited a very thin metallic veneer. This is gold in colour. At one end is fixed a one-inch square of brass, fitted at the centre with a small terminal. The paper is doubled at this point and the brass plate is very firmly eyeletted. To use it, the brass plate is attached to the wall (fixing screws being provided) at a point adjacent to the receiver, and then the strip is stuck to the walls and carried, where desired.

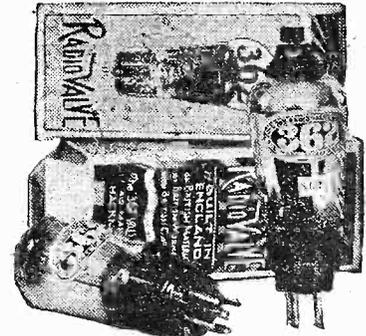
Neat, right-angled bends may be made by folding, and with the gold surface it forms a very neat arrangement. It is quite effective in use, and appears to be as good as a thin wire aerial, and the large quantity which is supplied will enable a full-size aerial to be laid all round the house. The price of the complete aerial, with fixings, is 1s. 6d., and the makers are Univolt Electric, Ltd.

BUSCO SWITCHES

THE particular on/off switch employed in the Beta Universal Class B Four-valve receiver was very interesting in design, as it will be noticed that, although of the three-terminal type, one of the contacts is supplied from its terminal via a fuse lamp. This is one of the interesting range of switches manufactured by Messrs. Busby and Co., of Birmingham. It has a non-rotatable contact, and this is a feature of the complete range of Busco switches. The operating arm is fitted at the end with two strips arranged at right angles, and one of these strips is bent round to form the contact-maker, whilst the remaining strip is of more springy material, and is bent to form a frictional grip with the moulded bakelite side of the switch casing. The result of this right-angle assembly is that the switch rod cannot be turned, and must therefore make a direct backward and forward movement. The contact strip fits into springy contacts connected to the terminals, and makes contact in the same manner as an ordinary "knife-switch." The contact is thus very sound electrically, whilst from a mechanical point of view the whole scheme is very sound. A three-contact switch is easily arranged by joining a terminal on the side of the bakelite casing and fitting a small piece of metal to engage the spring side of the plunger. For radio-gramophones a special switch is manufactured, and this avoids the troubles usually associated with long leads from the grid terminal. The plunger on this switch is about 3in. long, and a special slotted bracket is supplied with it. This bracket may be fitted on the baseboard of the receiver in any convenient position, and the switch locked (by means of its one-hole fitting) at any height on the bracket. The operating knob then projects from the panel, and by means of ebonite junctions the rod may be extended to any desired length. The price of this switch is 3s., and the special fuse switch is 2s. 6d. The on/off switch costs 1s. 3d. and the wave-change and radio-gram. switch each cost 1s. 6d.

362 VALVES

A SERIES of valves produced by the 362 Radio Valve Company has been received for test. These comprise the more usual types of 2-volt valves, including screen grid, variable-mu, H.F., L.F., Power and Pentode. In addition, we were very pleased to

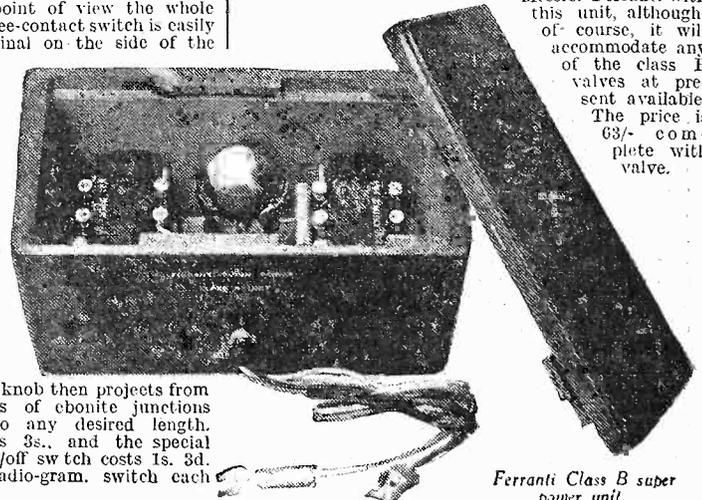


Two of the 362 valves.

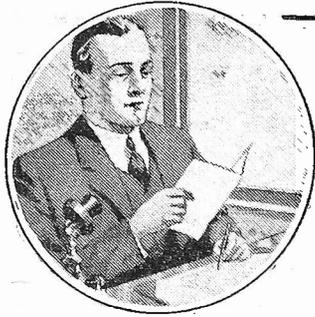
note a valve of the class B type, and this was, in fact the first valve of this type to be received by us. It is not of the 7-pin type, but has a five-pin base, with side terminal. We understand, however, that 7-pin bases are being fitted in future to this type of valve. Tested in the Class B Adaptor, this valve gave splendid results, and on the point of tone, volume and economy of operation gave every satisfaction. The top notes were, as is usual with this type of amplification, splendidly reproduced, and it was found desirable to fit a small fixed condenser across the output transformer to limit the response slightly. The price of this valve is only 9s., which enables everyone to try out the scheme with a minimum of outlay. The other valves all stood up very well to test and the P.2, costing 4s., was found to be the most suitable driver, with a 1/1 driver transformer. The S.G. type of valve costs only 7s. 6d., and the pentode 10s., and the valves are entirely British.

FERRANTI CLASS B UNIT

TO enable users of existing receivers to add a stage of class B amplification Messrs. Ferranti have produced the neat unit shown herewith. This is finished in a very small cabinet with sliding lid and accommodates two transformers and a valve-holder. A tone compensator is fitted to the output transformer to limit the high note response, and battery cords are fed through a hole in the front of the cabinet. Holes are drilled at each end to facilitate connection to the input and output terminals, and the unit is extremely simple to connect up. On test it gave splendid results, the reproduction being very full with the top splendidly reproduced without "edge." A special class B valve is supplied by Messrs. Ferranti with this unit, although, of course, it will accommodate any of the class B valves at present available. The price is 63/- complete with valve.



Ferranti Class B super power unit.



Practical Letters from Readers.

The Editor does not necessarily agree with opinions expressed by his correspondents

Efficient Earths

SIR,—Referring to your "Queries and Enquiries" section in March 4th and the resulting further communications in "Practical Letters from Readers" in April 8th issue, may I hasten to draw the attention of your two correspondents to a fact which possibly may not have been considered seriously by them.

The object of an earth device, such as we manufacture, i.e. "Filt," is to provide a permanently moist area surrounding the metal contact to the set. We feel sure your readers will appreciate that common salt would not achieve this object, moreover it is extremely corrosive and we are afraid an earth tube which has received a weekly dose of two table-spoonsful of common salt would be non-existent after a month or two. Furthermore there are troubles other than corrosion to contend with, for salt rapidly washes away and is not such a good conductor as "Filt" chemical. The "Filt" chemical actually contains copper, and it is on this account that its operation is so satisfactory.

It may interest your readers to know that although upwards of half a million "Filt" have been produced, complaints to date are precisely three, and in these three instances satisfactory foundation for the complaint was not forthcoming.

In conclusion may I add that "Filt" chemical is not obtainable from any other firm, or under any other Brand name, nor are any firms licensed to manufacture this product.—p.p. GRAHAM FARISH LTD., T. GRAHAM FARISH (Bromley, Kent).

For the Veriest Novice

SIR,—I have just received my copy of the "Wireless Encyclopædia," and I must say that on perusal I find it far exceeds my expectations.

So far as I can judge at present, there is nothing that the "home constructor" of wireless sets need be afraid to tackle with such a book at his elbow, the details are given in such a plain and everyday manner that the veriest novice should find no difficulty whatever in delving into the "Innards" of Wireless in all its forms. Thanking you and wishing PRACTICAL WIRELESS every success for the future.—HAROLD S. SHAW (Huddersfield).

Why not a Handbook of Servicing Instructions

SIR,—Now that the manufacturers are preparing the designs of next season's sets it seems opportune to bring to their notice through the medium of your practical journal a very practical point which spoilt many a good set of this year. Several makes were so selective that a station is obtainable on each side of one of the lines on the tuning dial; yet there were spaces of one half-inch or more between the lines on the dial! How is one to log the numerous stations spread over this interval? Further, the difference between

the readings of two such lines are often 30 or 50 metres, so that a mathematical problem has to be worked out before even an approximation could be obtained as to the actual wavelength of the station received.

Therefore, whatever the system employed, whether wavelengths, kilocycles, or names of stations, the greater the number of subdivisions on the scale the easier it is for one to log the stations. From this point of view, a semicircle divided into 180 degrees is better than one of 100 degrees because the subdivisions are finer, and therefore give a closer reading. Another practice that should be universal is to issue with each set a Handbook which includes full servicing instructions as in the case of a motor-car. The wise manufacturer realises that greater interest is taken in an instrument when one knows something of its internals. Many who would prefer to do their own servicing are handicapped through the lack of such a manual with the set. Whether it is advisable to do one's own servicing or not is surely a matter to be decided by the owner who has to bear the cost of repairs. At present, it is forced on the owner to send his set out to be repaired or adjusted however slight this might be.—A. A. (Liverpool).

CUT THIS OUT EACH WEEK.

DO YOU KNOW?

- THAT a filter circuit across the output choke of a pentode output valve is essential for gramophone reproduction.
- THAT in designing a mains unit, the total output must be the maximum required for the valves plus the voltage required for grid-bias.
- THAT the wattage dissipation rating of resistances must be studied when purchasing these components.
- THAT the reaction leads of a high-efficiency receiver may often advantageously be metal sheathed.
- THAT the impedance of a valve is varied as the grid-bias is varied.
- THAT Class B amplification makes the design of a portable receiver much simpler.
- THAT tone control L.F. stages are simple to build and very efficient in operation.
- THAT new types of valves will shortly appear on the English market.

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 addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

Improvements in Resistances

SIR,—As a regular reader of your valuable journal, I was deeply interested in the article by "Cynic" entitled "Some Snags and Suggestions," which appeared in the issue for March 11th, and more particularly the recommendation that resistances should be fitted with longer wire ends than is the present practice.

I have also experienced the difficulty referred to by the writer and it seems a pity that the flexible type of resistance which undoubtedly has many points to recommend it should have gone somewhat out of fashion. It is true that one serious disadvantage exists which may have lessened their popularity and that is the difficulty in joining the ends of a number of such resistances together. The usual method of accomplishing this end is by means of a nut and bolt, the junction being covered with insulating tape.

This no doubt is a very clumsy arrangement, but I have recently patented a neat connecting device which obviates all this difficulty. The latter has several other applications in the construction of wireless receivers and I shall be pleased to supply particulars with drawing to manufacturers or others interested, on application to me, c/o the Editor.—JAMES P. MCGLOIN (Rathmines).

Top Notch

SIR,—I beg to acknowledge receipt of your excellent, very clear and concise Encyclopædia, for which I thank you. I should also like to mention how much I appreciate PRACTICAL WIRELESS. Having taken most wireless periodicals at different times I find it well on top, in fact, "Top Notch." Thanking you again, and with best wishes for larger sales.—L. J. DAWES (Earlsfield).

Far Exceeds my Expectations

SIR,—Very many thanks for my copy of the "Wireless Constructor's Encyclopædia," which arrived in perfect condition. It far exceeds my expectations, and I am sure it will prove itself extremely useful in my work. I consider it a volume which every constructor should have by him for easy and precise reference.—LESLIE A. MOORE (Alexandria, Egypt).

A Reader's Thanks

SIR,—I wish to thank you and the staff for the splendid Gift Encyclopædia which I have received safely. As a regular reader of your weekly publication, PRACTICAL WIRELESS, I think it is the most interesting technical weekly on the subject. I wish your journal the greatest success in the future.—E. W. BLAKE (Southsea).

Fury Four : "Best Set I Have Handled"

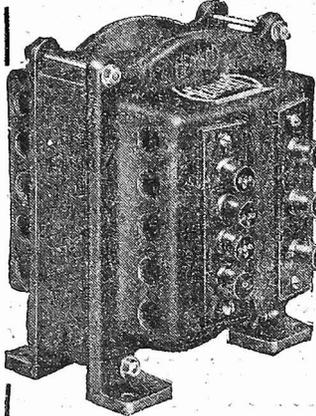
SIR,—I am very pleased to state that I have made up the Fury Four, and that it is the best set that I have handled, I am more than pleased with it, and the first time that I put it into operation I received thirty-four stations on the medium-wave, and six on the long-wave. I have very little doubt that I will be able to tune many more in. All the stations were received at good loud-speaker strength.—J. CARR (Liverpool).

The "Fury Four"

SIR,—I wrote to you some few weeks back with regard to a fault in my construction of the above receiver, and after careful tests I found that the screening

(Continued overleaf.)

EXCLUSIVELY SPECIFIED for the "A.C. Twin" and the "Selectone A.C. Radiogram"



Both the new A.C. sets designed by "Practical Wireless" incorporate Heayberd components. What better testimony to the thorough efficiency of Heayberd mains apparatus? Build your own receiver and make sure of perfect reception—but be sure you build with Heayberd!

FOR THE "A.C. TWIN."

Heayberd "A.C. Twin" Transformer. Secondary Outputs: 350+350 v. 60 ma. 2+2 v. 2 amps. and 2+2 v. 2.5 amps. Price

29/6

FOR THE "SELECTONE A.C. RADIOGRAM."

Heayberd W.25 Transformer. Secondary Outputs: 0-110 v. 70 ma. and 0-135 v. 70 ma. 2+2 v. 4 amps. Price

22/6

Heayberd 751 Choke. 50 henries, 800 ohms, 50 ma. Price

12/6

Heayberd Twin Flex with lamp adapter. 8 feet length—ends trimmed and looped. Price

1/6

Large stocks available. If you cannot obtain locally—write direct.

HEAYBERD

MONARCH OF THE MAINS.

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

— POST THIS NOW —

I enclose 3d. stamps for 36-page illustrated Handbook and Catalogue of mains apparatus. Packed with hints and diagrams.

Mr.

Address.....

Prac.

EASY TERMS PROMPT DELIVERY

Any Amplion, Blue Spot, Baker, Celestion, Epoch, R. & A. Rola, Sonochorde, or W.B. Moving Coil Speaker supplied.

Send 5/- only

and pay the balance by monthly instalments. No references. Entirely private and confidential.

KITS, PARTS, SETS, ELECTRIC CLOCKS ON EASY TERMS.

Write for Catalogue and details to.

TURNADGE & PARTNERS, LTD.
Ludgate House, Fleet Street, London, E.C.4.
Telephone: Central 1908.

THE IMPROVED "TONIC"

self-generating trickle-charger kit keeps 2-volt accumulators fully charged. Electric mains and charging stations unnecessary. Ideal for remote places. 7/- each, postage 9d. Particulars, testimonials, with pleasure. WILLIAMS, Netherend, Cradley, Birmingham.

PRACTICAL LETTERS

(Continued from previous page.)

grid leg of the holder for V.2 was touching a shred of copper on the baseboard, the foil being very badly cut round the hole for the valve-holder. However, since remedying this error, I have achieved all the results that you claim, and am delighted with the performance of the set. On various evenings I have enjoyably listened to all the popular broadcasters in Europe, all of which have come over really well (subject to local conditions and fading, of course).

In conclusion, I would like to thank you for the assistance you have given, and congratulate you and your paper for keeping up its high standard.—K. H. CUDMORE (Hford).

A Fine Book

SIR,—May I thank you for the "Wireless Encyclopædia" which I have just received? and from what I have read of it up to now I must say it is just what is wanted. The articles explain everything in terms which anyone can understand, and the diagrams are clear. It contains just what is required whether one is a beginner or a constructor. Again thanking you for this fine book.—A. HALCROW (Lerwick).

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

PROPOSED TELEVISION SOCIETY FOR BRISTOL

The progression of radio owed its success to the efforts of amateur enthusiasts, and it is with this in mind that we intend forming a Western England Television and Scientific Society. The formation of the Society, besides benefiting local traders, will be the cause of creating and sustaining more new industries. The object of the proposed Society is to form a body of enthusiastic amateurs interested in current research in connection with television, talking films, etc., and to provide facilities for research work and the publication of reports and affairs of interest to members. Further particulars can be obtained from the Hon. Sec., H. Montague Smith, Eden House, Eden Grove, Filton, Bristol, 7.

I.S.W.C. LEICESTER CHAPTER

At the above chapter's last meeting, which was held at The Foresters' Institute, St. Nicholas St., Leicester, a 5-metre receiving set was demonstrated by C. L. Wright, 2 B.H.A., also an 80-metre receiver fitted with a directional aerial. This receiver will be used by the club's members in their forthcoming direction-finding contest. The most popular item of the evening was the "junk" sale, at which every member disposed of his unwanted parts. Anyone interested in the Leicester Chapter should write to Hon. Sec., W. Glover, "Holmstead," Stokes Drive, Groby Road, Leicester, when full particulars of membership will be forwarded.

UXBRIDGE AND DISTRICT RADIO CLUB

A new branch of the Anglo-American Radio and Television Society will shortly be formed. It will be known as the Uxbridge and District Branch. There are a number of interesting features about this branch. It is not being formed merely as a technical club but it will include a social side which will provide a large part of its activities. A club room will be obtained as soon as possible, and this will be open nightly to members. A short-wave receiver will be installed, and probably a transmitter also. The latter would be employed to communicate with members of the A.-A.R. & T.S. throughout the world. Those interested should write to Leslie W. Orton (organizer), at 11, Hawthorn Drive, Willowbank, Uxbridge.

SLADE RADIO

There was a complete diversion from wireless at the meeting last week, when two lantern lectures were given. The first was entitled "Glorious Devon" and described a holiday tour in that county, a number of excellent slides being shown. The second, "The Sunny South Coast," also covered a holiday tour, and again the slides were of great interest. Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

SOLVING THE PORTABLE PROBLEM

(Continued from page 215.)

comfortably be carried without any more fatigue or discomfort than with an ordinary attaché-case. Here again it scores, for the average portable set is at least 10in. from back to front, and considerably over 15in. by 12in. in height and width. To handle the output from the Cossor Class B valve a moving-coil speaker is, of course, necessary. Fortunately, an extremely light, small and efficient instrument, complete with transformer, is available in the form of the Rola, specified on page 215.

In the Featherweight Portable Class B Four I have made a genuine attempt—a successful attempt—to solve the portable problem. The quality of reproduction is really glorious, and it will receive quite a number of foreign transmissions.

An inspection of the design, which will be given next week, will bring you to the conclusion that this receiver more nearly approaches the dictionary definition of the word portable—"that may be carried about"—than anything which has been placed before the home constructor before. Look forward, then, to next week's free full-sized Blueprint.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY (HUDDERSFIELD BRANCH)

At a meeting of the committee on Thursday, March 30th, it was decided to give non-members, an opportunity to visit the Empire Short-Wave Station at Daventry, on Sunday, May 21st. Any member of the A.A.R. & T.S. will also be welcome, but the total number will be limited to twenty. Particulars and fares can be obtained from the District Organizer: L. Goucher, 10, West Grove Avenue, Dalton, Huddersfield.

BURTON-UPON-TRENT AMATEUR RADIO SOCIETY

Before a very good attendance at a meeting held on April 4th, Mr. F. Grekley, gave a very interesting lecture on the commercial uses of photo-electric cells. He demonstrated their use by working models, in one instance he showed how the headlights of a car would open the doors of its garage and switch on the light. Another very interesting experiment was the starting and speed regulating of an electric motor with a variable condenser by means of a photo cell used in conjunction with a gas-filled relay. The Society would welcome new members, and applications should be sent to the Hon. Sec., "Addiscombe," Branston Road, Burton-on-Trent.

THE CROYDON RADIO SOCIETY

The Croydon Radio Society held its final meeting of the session on a recent Thursday, when it met at the house of the President, H. R. Rivers-Moore, B.Sc. He had a great deal of interesting apparatus to show members. There was, for instance, a novel two-valve set having the first valve as a variable mu H.F. amplifier, and the second, an A.C. Pentode, acting as detector, amplifier and automatic volume control for the first valve. Another interesting "exhibit" was Mr. Rivers-Moore's famous receiver, now containing automatic volume control. He explained how he had effected the conversion, and it was seen that the A.V.C. valve, an A.C.H.L., was in series with a potentiometer connected to the H.F. valve's grid. When a stray signal came in the resistance of the A.V.C. valve went down, current increased and so more bias was applied to the H.F. valve. He had the secretary's assurance that the average attendance figure for the past session had not stood so high for nine years, so great things are expected of next session commencing September. Hon. Sec., E. L. Cumbers, Maycourt, Campden Road, Croydon.

THE MOTOR-CYCLISTS' REFERENCE YEAR BOOK, 1932-1933.

The Motor-Cyclists' Encyclopædia.

Edited by F. J. CAMM (Editor of "Practical Wireless").

The Only Year Book relating to Motor-Cycles (Fourth Year of Issue).

Complete and comprehensive information relating to Machines, details, facts, and figures regarding records, legal matters, overhauling.

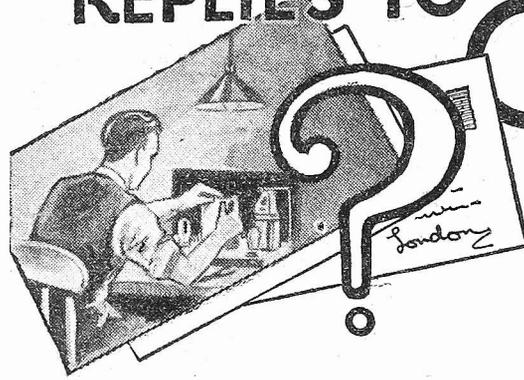
Classified Buyers' Guide, etc., etc.

128 pages, 1/- net or 1/2 by post from

George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO



If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

QUERIES and ENQUIRIES by Our Technical Staff

The coupon on this page must be attached to every query.

SPECIAL NOTE

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
(2) Suggest alterations or modifications of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.

Please note also, that all sketches and drawings which are sent to us, should bear the name and address of the sender.

INTERFERENCE

"I have just finished building my first set, the Fury Four, and must thank you for putting such a good set my way. The reproduction and everything is amazing, and there is only one point which perplexes me. Every night, almost punctually at seven o'clock, a horrible 'burring' starts in the loud-speaker and it keeps on till about ten o'clock. It is not loud enough to drown the signal, but is annoying. I do not see how it can start so regularly, especially as I do not always switch the set on at the same time. Can you tell me what it is?"—(J. R., Luton.)

The noise is not coming from the Fury Four, but from some outside source, and in view of the fact that it appears to commence just when daylight is failing and keeps on till ten o'clock points almost certainly to some form of electric sign. Take a walk round your neighbourhood (not more than a quarter of a mile radius) and see if there is a flashing sign or one of the modern neon signs which starts up about that time, and we think you will find that it is this which is causing the trouble. You can do nothing to your set to stop it, and the remedy rests with the owners of the sign.

REJECTOR CIRCUIT

"In reading through a wireless book the other day I came across the term 'rejector circuit.' Could you explain what this is, please? I presume it rejects something, but how it can do this I cannot see for the moment. I am sorry I have not got your Encyclopaedia, as it is probably in that."—(P. V., Cardiff.)

Yes, the description is in the Encyclopaedia. The rejector circuit is a circuit consisting of a condenser and coil so designed that it offers a high impedance to oscillations of a particular frequency, and a low impedance to oscillations of a different frequency. A very good example of the rejector circuit is a tuned anode circuit.

FAULTY SWITCH

"I find that I cannot get the short-wave stations on my two-valve set. I am using a Lissen dual-range coil and all the parts have been tested, but when I have the switch out I get Daventry and Radio-Paris, yet when I push the switch in nothing happens, and the set is dead. What can I do to find the cause of this?"—(W. G., Portsmouth.)

The obvious cause is a faulty switch, although there is a remote possibility of the coil being faulty. To test the latter, short-circuit, with a piece of bare wire, terminals Nos. 2 and 3 on the actual coil base. This should enable you to hear the short-wave stations. If nothing can be heard the coil is disconnected, and it should be returned to the makers. If, however, signals are obtainable by this means, the contacts of your wave-change switch are faulty and this should be exchanged.

CLASS B STAGE

"Could I add a Class B stage to my receiver? It is a rather old pattern German set, and I am afraid I

do not know the various parts, as they are not the same as English ones. The valves are English, but the condensers and resistances all look alike, and I cannot understand the marking. How could I use the new L.F. arrangement?"—(Y. B., Torquay.)

The Class B stage may be added after any first L.F. stage, and you should therefore try and ascertain which is this stage in your receiver. The detector-valve will, no doubt, have a grid-leak and condenser joined to one terminal, and S.G. valves are obviously identifiable. You must, therefore, first trace out the types of valve, and add the Class B stage to the first L.F. stage, using in that socket a small power valve. If the receiver does not employ more than two L.F. stages, the Class B unit described in our issue dated April 8th could be added to the output terminals of your set, and this would save the trouble of tracing out the various stages. Read the remarks accompanying the article in question.

INDOOR EARTH

"As I am living in a flat I am rather awkwardly situated for aerial and earth. The water system comes from a tank in the roof, and I understand this is bad from the wireless point of view. I have fitted up a good indoor aerial, but would like a better earth lead. Can you suggest any way out of my difficulty. I am much too high up to run a wire down to the ground."—(L. F. S., Westminster.)

A capacity earth would probably prove most useful to you. This consists of a large metal body, such as a copper gauze mat, or a number of thin copper wires running parallel, arranged under a mat or under the lino. If your receiver is a radio-gram, having a large cabinet, a very good idea would be to try the effect of a sheet of thin copper foil arranged inside the lid of the cabinet, using this as an aerial, and a similar sheet, arranged underneath the bottom of the cabinet, connecting this to the earth terminal. This may prove a much more selective arrangement than the indoor aerial and earth mat, and yet will not give an appreciable reduction in signal strength.

DATA SHEET No. 32

Cut this out each week and paste it in a Notebook.

COLOUR CODE FOR FUSES.

Table with 2 columns: Colour and Rating. Rows include Black (60 mA), Grey (100), Red (150), Brown (250), Yellow (500), Green (750), Blue (1 amp), Lt. Blue (1.5 amps), Purple (2.0), White (3.0).

Q.M.B. SWITCHES

"Whilst looking through the advertisements in your pages I have once or twice seen reference to Q.M.B. Switches. I have been unable to see those described in any of your articles. What do the letters stand for and what is the application of this particular type of switch?"—(G. B. V., Littlehampton.)

The letters stand for Quick Make and Break, which means that the mechanism is so arranged that when the switch knob is operated the contact is made quickly or broken quickly. The arrangement usually takes the form of the ordinary electric light wall-switch, which is a Q.M.B. switch. The necessity for quick contact is to prevent arcing. When a high current is passing through a switch contact, if the contact point is brought slowly away a spark will be seen to pass from one point to the other, and this "pits" the contact point and also gives a slight

corroding. The result is that the contact point becomes poor and dirty, resulting in very erratic working. The switch should always be used, therefore, where fairly large currents are dealt with.

CHOOSING A METER

"After studying your various issues I have decided to set up a small workshop, and one of the principal things I shall need will be a meter. I cannot afford much, and would therefore like to have your ruling as to the best type of general purpose meter to buy. I shall want to try and carry out all sorts of tests, as described in your articles, and would therefore like the meter chosen with this point in mind."—(A. N., Llandudno.)

The most useful meter will obviously be a small reading milliammeter. It will then be possible, by means of shunts and series resistances, to arrange for this to give you practically any reading in volts, ohms, and amps. You could, of course, buy one of the all-purpose meters, but as you say you cannot afford a lot, the most accurate results will be obtained by getting a really good low-reading milliammeter, and buying the necessary shunts, etc., as funds permit. You could, in this way, build up a highly efficient instrument, and if you obtain guaranteed resistances the percentage of error will be very small indeed. A similar arrangement was recently described in our pages under the title, "The Practical Wireless Multi-Meter."

FAULTY EARTH

"My receiver has developed most annoying crackling and sizzling noises, and I have hunted all round for the cause. The only thing that will stop it is to take off the earth lead, but as this is not supposed to be good for the set I do not know what to do. Can you help me, please?"—(G. B., Edgware.)

The fault obviously rests with your earth connection, which you will no doubt find has rotted away. Trace through the lead and the actual connection, and undoubtedly you will find that the lead is broken somewhere, or the actual connection to the buried plate or water-pipe (whichever type you have used), is either partially or completely broken.

STROBOSCOPE

"Can you give me the formula for working out the number of lines and spaces for a stroboscope. I want it for ordinary gramophone records, and my mains supply is 200 volts. I only want it for 78 r.p.m., and I think the formula is quite simple to work out, but I cannot find it anywhere."—(R. F., Brighton.)

The voltage of your mains will not affect the design of the stroboscope, and the only figures you require are the number of revolutions per minute and the frequency of the mains supply. The latter is multiplied by 120, and the answer divided by the speed required. The formula, therefore, is

120 x F / R

F being the frequency in cycles per second, and R being the speed required in revolutions per minute.

Handy Books for Home Constructors

By F. J. CAMM.

- Twenty-five Tested Wireless Circuits. Accumulators: Charging, Maintenance and Care. Each 95 pages, fully illustrated, 1/- each or 1/2 post free.
Modern Wireless Sets and How to Make Them. 80 pages 6d. or 7d. post free.
Make Your Own Wireless Set. 80 pages 6d. or 7d. post free from: Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

FREE ADVICE BUREAU COUPON

This coupon is available until May 6th, 1933, and must be attached to all letters containing queries.

PRACTICAL WIRELESS 29/4/33.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.

ALL ABOUT CLASS "B"

EVERYTHING in connection with 'class "B" amplification and its associated equipment' is fully dealt with in a twelve-page folder we have received from Radio Instruments Ltd. Diagrams, tables and technical data are given for the application of the class "B" system of amplification to battery sets, and to enable constructors to easily select the right valves and appropriate Drivermu transformers and output chokes. Prices of these components are also included in the folder. The address is Purley Way, Croydon, Surrey.

BAKER'S LOUD-SPEAKERS

SEVERAL new models of Baker's moving coil speakers are given in the latest list issued by Baker's Selhurst Radio. There is a super-power model for either battery or mains operation; a more powerful speaker for A.C. mains, and two permanent magnet-moving coil instruments. One of these is a new model having a cobalt steel magnet of the cross type and a universal output transformer. It is priced at £3.15s. The list also includes particulars of A.C. rectifier units, a variable tone control and needle-scratch filter, and various high-resistance and other coils. The address is 75 and 77, Sussex Road, Croydon, Surrey.

MULLARD LOOSE LEAF CATALOGUE

A NEW catalogue leaflet, No. VR127, is just to hand giving particulars of the new Mullard 2-volt screened-grid valve, PM 12A. A copy of this leaflet can be obtained from the Mullard Wireless Service Company, Mullard House, Charing Cross Road, London, W.C.2.

BAKELITE ACCESSORIES

PARTICULARS of a useful range of small components in moulded Bakelite are given in a folder recently issued by Ward and Goldstone, Ltd. Plug attachments, lampholders, bell pushes, connectors and switch plates are amongst the fittings illustrated in the folder, a copy of which can be had on application to the firm at Pendleton, Manchester.

DUBILIER COMPONENTS

TWO booklets of special interest to home constructors were recently issued by the Dubilier Condenser Company. One deals with condensers and resistances and gives particulars of mica condensers, paper condensers, block condensers for use with mains receivers and battery eliminators, and high voltage electrolytic condensers. Resistance capacity coupling units and anti-interference filters are amongst the other components listed. The other booklet deals with Dubilier metallized resistances, designed especially for use in mains-operated receivers for voltage dropping and decoupling purposes. Useful tables giving maximum currents and voltages, and graphs showing the voltage and current ratings at a glance, are also included in the booklet. Interested readers should write for copies of these booklets to Dubilier Condenser Co., Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

PIX-PRICE CORRECTION.

Owing to a printer's error, we wrongly gave the price of Pix on page 207 of our April 22nd issue as 2/9. The correct price with clip is 2/6. Will readers please note this.

ODDS and ENDS

Microphones for Medical Men

IN Germany, to prevent doctors being brought out of their beds unnecessarily at night, some surgeries have been specially equipped with microphones and loud-speakers. The two instruments, with the necessary amplifiers, are installed in a weatherproof casing at the front door of the house, with duplex apparatus in the practitioner's bedroom. In this manner the doctor may speak to the outside caller in comfort and ascertain the urgency of his business before admitting him to the surgery.

Radio Luxembourg

THE programmes broadcast from this new high-power station are still in the "skeleton" stage, but as a rule they will be found to consist of the following items: B.S.T., 7.0 p.m., light music (records); 7.45, news, symphony concert (records); 8.30, talk in foreign language; 8.40, records; 9.0, news bulletin (French); 9.15, light music; 9.45, news bulletin (German); 10.0, dance music (records). At intervals between items the studio transmits stock exchange quotations and sporting results.

New American Broadcasting Chain

THE Amalgamated Broadcasting System, is the name of a new network which has been created in the United States to compete with the C.B.S. and N.B.C. It will mainly consist of the link-up of nine important stations in Michigan, but when completed the new organisation may number one hundred transmitters. Most of the programmes will emanate from the studios of WOL, Washington (228.9 m.), 1,310 kc/s, which will act as the key station of the network.

Replies to Broadcast Queries

L. A. MERCHANT, Midway: Apparently wavelength is wrong; too vague to trace. LENIN (Southport): G5KO, not advertised in list; write to Radio Society of Great Britain, 53, Victoria Street, S.W.1; G6OW is the call sign of James Tennant, 65, Hillhead St., Glasgow. D. ROBERTSON (Midlothian): G6YL, Miss Barbara Dunn, Aston House, Felton, Morpeth (Northumberland); cannot trace XZN2B. E. S. W. (Ilford): G5AR, E. D. Ostermeyer, 59, Gordon Rd., Woodford, London, E.13; G2XC, G2AZ, cannot trace; write to Radio Society of Great Britain, 53, Victoria Street, S.W.1; G2LZ, F. A. Mayer, "Stilemans" Wickford (Essex); G5TZ, W. G. Sherratt, 11, Bath Rd., Cowes (Isle of Wight); G6FX, S. A.

MAINS KIT

A.C. ELIMINATOR KIT, METAL CASE WITH FULL INSTRUCTIONS FULLY GUARANTEED 1 YEAR INPUT 200, 250, OUTPUT 120 V. at 12 M/A. **29/6** 1A, EASTERN ROAD, ROMFORD, ESSEX.

French, "Valetta," Alnwickhill Rd., Liberton, Midlothian; G6FY, R. A. Fereday, 37, Wallwood Rd., Leytonstone, E.11. G6NV, J. J. A. Allnut, M.P.S., 193, Brixton Rd., London, S.W.9.; G5NC, H. Osborne, 77, Barrett Rd., Walthamstow, London, E.17; G5GZ, G. L. Grisdale, 39, Ranelagh Gardens, Ilford, Essex; G5JZ, C. W. K. Sands, "Springfield," Heathfield (Sussex); G5SK, W. H. Maycock, 33, Camden St., Stoke, Coventry; ONANC, C. J. Nolf, Chateau de Rameignies, Thumaide, Hainaut (Belgium); PNOBL, PNOBR, PNOKA, PNORAI, cannot trace in published lists; are you sure these call signs did not begin with initial letters P4O (Holland)?; P8JS, Maurice Philippe, Schaer, Solignac (Haute Vienne), France; F8KJ, R. Soulie, 27, rue Toussaint Louverture, Bordeaux (France); F5MK, Georges Beck, c/o C. F. M., rue de la Republique, Rabat (Morocco). F8RM, regret. cannot trace.

Charge your ACCUMULATOR at home

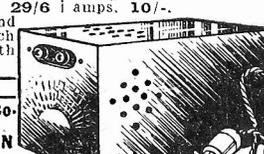
Why Pay 1/- per week for charging? The 'WATBRO' CHARGER does this simply and efficiently at home for less than 4d. per week. A.C. Models (200-250 v.) with Westinghouse Metal Rectifier (as illustrated).

3 amp. 2-6v. accs.	22/6	A.C. Models
1 amp. 2-6v. accs.	25/6	D.C. Models 100-250 v.
1 amp. 2-12v. accs.	29/6	charging rate .05 to 5 aamps. 10/-

Full instructions and guarantee with each charger. Cash with order or C.O.D.

Trade Supplied.

Watkins Bros. & Co.
(Dept. P.W.)
71, HIGH HOLBORN
LONDON, W.C.1.



MAYFAIR RADIO

offers Brand New Set Manufacturers guaranteed surplus Moving-Coil Speakers. RGAS (50 only), F.6, listed 35/-, in following voltages. 2,000 ohms; 2,500 ohms; 4,700 ohms; 6,500 ohms at 18/-, with transformer. State if power or pentode. As above, F.7, list 47/6, at 25/- PERMANENT MAGNETS: F.6 P.M. list 49/6, at 28/-; F.7 P.M. list 23, at 32/-; F.8 P.M., Class B, list 49/6, at 25/- CONDENSERS, multiple blocks, 1,500 test, working 500 VDC, Peak Voltage 700. 20 mfd. 4+4+2+2+2+2+2 +1+1 @ 11/-; 11 mfd. Block 4+2+2+2+2+1 @ 6/9. All carriage paid cash with order, or C.O.D.—MAYFAIR RADIO, 31, George Street, Hanover Square, London, W.1.

NEW H.T. ECONOMY

with the B.M.U. SUPER D.C. mains unit MODEL D.G. 25

Four tappings 40/100v. variable, 60v., 120v. and 150v. fixed. Easily convertible to an A.C. Mains Unit

27'6

Send for folder FREE.

BRITISH MAINS UNIT CO., 17, Edminton Square, Dept. Pr.W. Worcester Park, Surrey.

Write for Illustrated Catalogue of

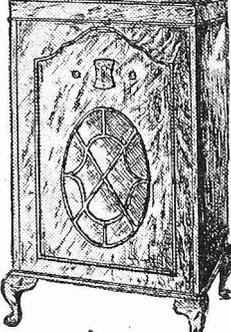
RADIO-GRAMPHONE CABINETS

of exclusive modern design, made by craftsmen, in highly figured Oak, Walnut or Mahogany, post free

REMARKABLE VALUES.
Cabinets made to order a speciality.

Maker, under license, of the **HOWE BOX BAFFLE**. Recommended by the B.B.C. Full details on request.

GILBERT,
Cabinet Maker, - SWINDON
Estimates Free. Est. 1866



ADVERTISEMENT INDEX

<p>Becker, G. 235</p> <p>Belling Lee, Ltd. 241</p> <p>British Blue Spot Co., Ltd. 241</p> <p>British Ebonite Co., Ltd. 235</p> <p>British Mains Unit 248</p> <p>British Pix Co., Ltd. 241</p> <p>Bulgin, A. F., & Co., Ltd. 243</p> <p>Colvern, Ltd. 229</p> <p>Cossor, A. C., Ltd. 223</p> <p>Direct Radio, Ltd. <i>Front Cover Strip</i></p> <p>Edison Swan Electric Co. <i>Back Cover</i></p> <p>Electrical Trading Association 235</p>	<p>Ferranti, Ltd. 227</p> <p>G. B. Pioneer Radio 240</p> <p>Gilbert, J. C. 248</p> <p>Graham Farish, Ltd. 239</p> <p>Hayberd, F. C., & Co. 246</p> <p>Lissen, Ltd. <i>Inside Front Cover</i></p> <p>London Radio Supply Co. 240</p> <p>Mains Kit 248</p> <p>Mains Power Radio Ltd. 241</p> <p>Mason, E. C. 241</p> <p>Mayfair Radio 248</p> <p>Newnes "Strand Magazine" <i>Inside Back Cover</i></p>	<p>Newnes "Modern Motor Repair" <i>Inside B. Cover</i></p> <p>Newnes "Mathematics of Wireless" 235</p> <p>Polytechnic 240</p> <p>Riverside Mfg. Co., Ltd. 240</p> <p>Standard Battery Co. 243</p> <p>Turnadge & Partners, Ltd. 246</p> <p>Univolt Electric Ltd. 235</p> <p>Vinces Dry Batteries, Ltd. 229</p> <p>Watkins Bros. & Co. 248</p> <p>Westinghouse Brake & Saxby Signal Co., Ltd. 235</p> <p>Williams, T. 246</p>
--	--	---

In the May
STRAND
 MAGAZINE

MARGARET KENNEDY

"SAPPER"

GILBERT FRANKAU

W.B. MAXWELL

ROLAND PERTWEE

H. de VERE
STACPOOLE

In the May
STRAND
 MAGAZINE

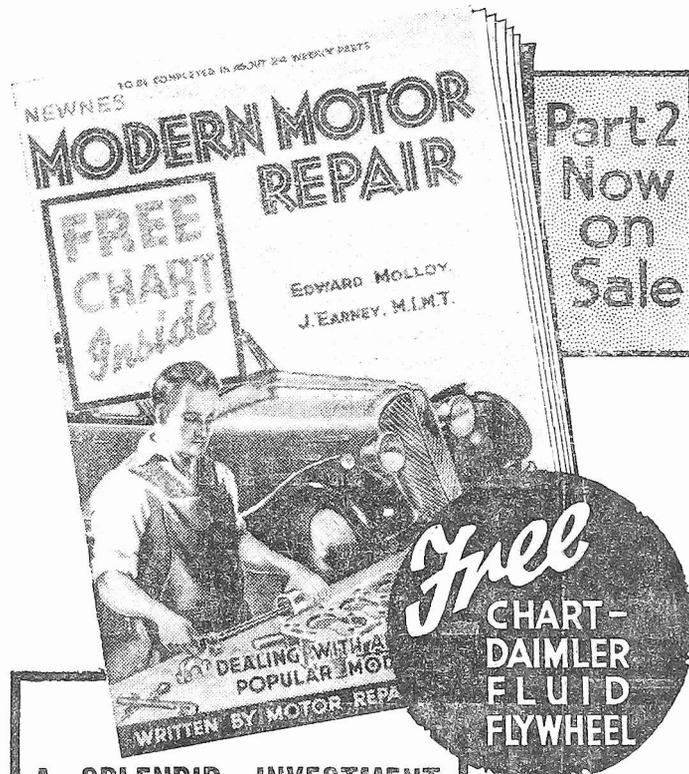
On sale at all Newsagents and Bookstalls, or by post 1/3 from
 George Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2

ONE SHILLING

Geo. Newnes, Ltd.

Important

**TO ALL GARAGE OWNERS,
 WORKERS & MECHANICS**



Part 2
Now
on
Sale

**A SPLENDID INVESTMENT
 FOR ALL INTERESTED IN CAR
 MAINTENANCE AND REPAIR**

In a convenient compass will be found all the practical points and special repair methods applicable to the leading makes of cars.

General methods of overhauling a car from end to end are given. Detailed notes on decarbonising, valve grinding, electrical trouble tracing.

How to deal with engine stoppages and erratic running.

The maintenance of brakes, steering gear, electrical equipment and bodywork.

Under each of these headings special notes are given dealing with the particular car in which you are interested.

This up-to-date work will save you time and money.

Part 2 Contains :

**The Daimler
 Fluid Fly-
 wheel Simply
 Explained.**

Tuning Morris
 Cars.

Causes of Difficult
 Starting.

Door Repairs.

Examining a Car
 after Accidental
 Damage.

To be Completed in about 24 Weekly Parts

**MODERN MOTOR
 REPAIR**



Obtainable at all Newsagents
 and Bookstalls, or by post
 1/2 from George Newnes,
 Ltd., 8-11, Southampton St.,
 Strand, London, W.C.2.

Geo. Newnes, Ltd.



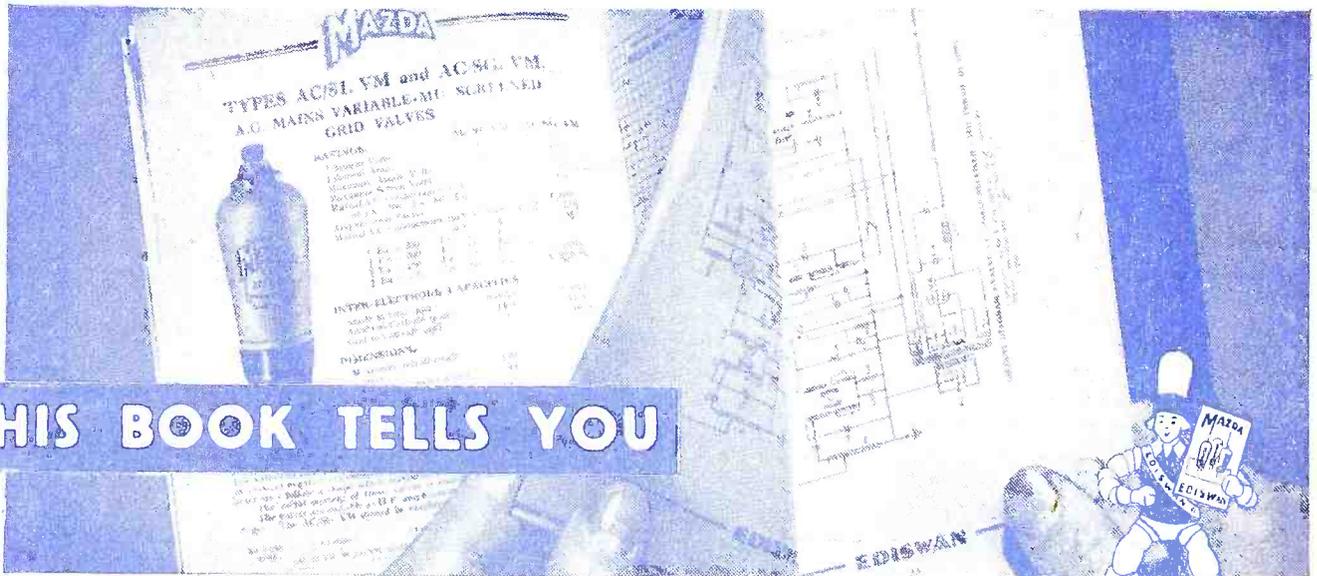
EDISON SWAN

The name that means 'EXCELLENCE'

DO YOU KNOW

the most efficient circuit arrangements for variable-mu valves?

You do? Good—but do you know the correct resistance and condenser values? Yes, that is the difficulty. They depend on the valve used. The best way of making absolutely certain that you are using a multi-mu valve to the fullest advantage is to rely on this book. There are four multi-mu valves in the Mazda range. Full particulars are given about each one but, in addition, circuit recommendations and suitable component values are included. In this way, you are familiar with the valve right from the start. You get the results you want—first time and all the time.



THIS BOOK TELLS YOU

"The Book of the Mazda Valve" No. R.782 is a mine of useful information about valves in general and Mazda Valves in particular. It contains facts and figures, circuit diagrams, component values, characteristic curves—in fact, all the valve user wants to know about valves. Send for your FREE copy to-day—or ask your dealer for one.

MAZDA THE BRITISH VALVES



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

Mazda Radio Valves are manufactured in Great Britain for The British Thomson-Houston Co. Ltd., London and Rugby

RECOMMENDED BY ALL GOOD RADIO DEALERS

P. W. Gift Stamp No. 31

Printed by NEWNES & PEARSON PRINTING CO., LTD., Exmoor Street, Ludbrooke Grove, W.10, and published by GEORGE NEWNES, LTD., 8-11, Southampton Street, Strand, W.C.2. Sole Agents for Australia and New Zealand: GORDON & GORCH LTD., South Africa: CENTRAL NEWS AGENCY, LTD., *Practical Wireless* can be sent to any part of the world, post free, for 17/4 per annum; six months, 8/8. Registered at the General Post Office for Transmission by Canadian Magazine Post.